MCSE EXAM MATERIAL

► Professional
► Server
► Network

Professional ►

Exam 70-210

- Implement, Manage, and Troubleshoot input and output (I/O) devices.
    - Install, configure, and manage modems.
- Connect to computers by using dial-up networking.
    - Connect to computers by using a virtual private network (VPN) connection.
    - Create a dial-up connection to connect to a remote access server.
    - Connect to the Internet by using dial-up networking.
    - Configure and troubleshoot Internet Connection Sharing.

Server ►

Exam 70-215

- Install and configure network services for interoperability.
- Install, configure, and troubleshoot shared access.
- Install, configure, and troubleshoot network protocols.
- Install and configure network services.
- Configure the properties of a connection.

Network ►

Exam 70-216

- Install, configure, and troubleshoot network protocols.
    - Install the NWLink protocol.
    - Configure network bindings.
- Install Internet Connection Sharing.

Creating and Configuring Network and Dial-up Connections

15

Chapter 15 is all about creating and configuring network and dial-up connections on a Windows 2000 computer. You may not think about connections every day, but they're vital to your computer's ability to function on the network — without connections your computer can't access the local area network, the Internet, or other computers.

I'll start by explaining how Windows 2000 automatically creates a local area connection for each network adapter in your computer. Then I'll briefly discuss how to install and configure modems, which are required for dial-up connections. Then I'll spend some time showing you how to create several different types of connections, including: dial-up connections to the Internet, dial-up connections to a remote access server, direct connections between computers, and virtual private network (VPN) connections.

In the second half of this chapter I'll explore how to configure connection properties. I'll show you how to configure modem properties and how to enable Internet Connection Sharing. Then I'll explain how to install and configure protocols, clients, and services on your Windows 2000 computer. Finally, I'll discuss configuring a few other connection properties, including security options.

Chapter Pre-Test

1. What does Windows 2000 automatically create for each network adapter that is installed (and detected) in a Windows 2000 computer?

2. What is a VPN connection?

3. What must you have installed in your Windows 2000 computer before you can create a dial-up connection?

4. In what situation might you want to use Internet Connection Sharing?

5. What are bindings and provider order?

6. In addition to installing network protocols, you may also need to install and configure additional network clients and services to fully support the connections on your Windows 2000 computer, and to support _____ with other _____ _____.

7. What function do network clients perform?

8. What function do services perform?

Creating Connections

Connections provide your Windows 2000 computer with access to a network or another computer, and also provide other computers on the network with access to your computer. A connection includes all of the hardware and software required to communicate on the network that your computer is connected to. Windows 2000 supports several different kinds of connections:

- **Local area connections:** These are connections between a computer and a local area network that require the computer to have a network adapter installed.
- **Dial-up connections:** These are connections between two computers that use modems for communication.
- **Direct connections:** These are connections between two computers that involve the use of a cable or infrared port.
- **Virtual private network (VPN) connections:** These are private, encrypted connections between two computers that can already communicate with each other by using TCP/IP.
- **Incoming connections:** These are inbound connections to a computer that can use a modem, cable, or infrared port.

The `Network and Dial-up Connections` folder in Control Panel is used to create, configure, and manage all of these types of connections.

EXAM TIP

The Professional exam has several objectives on using these various types of connections. Make sure you fully understand how to create and use these connections to connect to other computers and networks.

During installation, Windows 2000 automatically creates a local area connection for each network adapter that it detects in your computer. All other types of connections must be created. In the sections that follow I'll explain how to create new connections by installing network adapters, how to install and configure modems, how to create various types of dial-up connections, and how to create a VPN connection.

Creating New Connections by Installing Network Adapters

If you have a network adapter in your computer when you install Windows 2000, Windows 2000 automatically creates a local area connection for that network adapter. If you install an additional network adapter in your computer, Windows 2000 creates an additional local area connection.

The point is this: Windows 2000 — not you — controls how many local area connections your computer has. Of course, you can configure the connection(s) that you have, and I'll cover how to do that in the last half of this chapter, but you can't just use a wizard to create local area connections on your computer.

Installing and Configuring Modems

Before you can create dial-up connections to the Internet, remote access servers, and so on, you need to install and configure at least one modem in your Windows 2000 computer.

Installing a modem is a two-part process. First, you need to either physically install the modem (if it's an internal device), or connect the modem to your computer (it it's an external device). Then, if Windows 2000 doesn't automatically detect and install the drivers for the modem, you'll need to perform that part of the process manually. In the next section, I'm referring to the second part of this process, where the drivers for the modem are installed.

Installing Modems

You can use either the Phone and Modem Options or the Add/Remove Hardware applications in Control Panel to install a modem. You must be a member of the Administrators group to add and configure modems.

The process of installing a modem is quite similar whether you use Add/Remove Hardware or Phone and Modem Options. Using Phone and Modem Options is slightly faster because it saves you from having to complete several of the beginning screens in the Add/Remove Hardware Wizard.

CROSS-REFERENCE

If you decide to use Add/Remove Hardware to install your modem, you can find specific instructions for using this application in the "Add/Remove Hardware" section in Chapter 5.

STEP BY STEP

INSTALLING A MODEM BY USING PHONE AND MODEM OPTIONS

1. Select Start ⇨ Settings ⇨ Control Panel.

2. In the Control Panel dialog box, double-click Phone and Modem Options.

3. In the Phone And Modem Options dialog box, click the Modems tab.

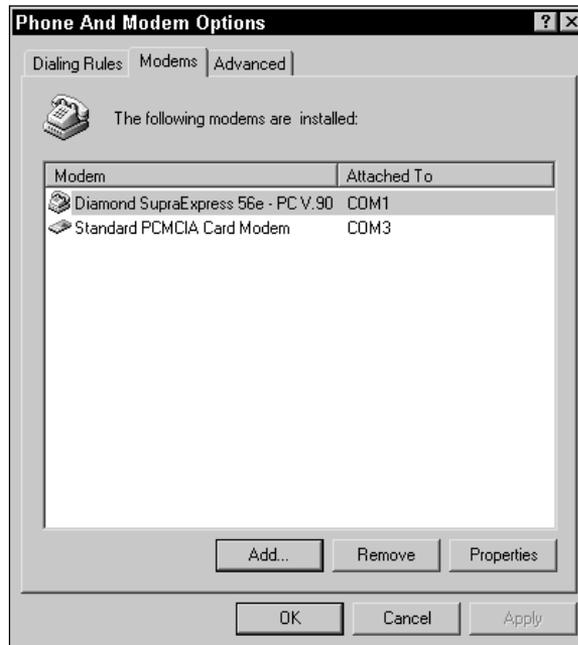4. The Modems tab appears, as shown in Figure 15-1. To install a modem, click Add.

FIGURE 15-1 The Modems tab in Phone And Modem Options

5. The Add/Remove Hardware Wizard starts and displays the Install New Modem screen. If you want Windows 2000 to automatically detect your modem, ensure that the check box next to "Don't detect my modem, I will select it from a list" is cleared. If you want to manually select your modem, select this check box. Click Next.

6. Follow the instructions presented on-screen to complete the installation of your modem.

■ ■ ■

Configuring Modems

Once you've installed a modem you can use the Phone and Modem Options application in Control Panel to configure your modem's properties.

When you use Phone and Modem Options to configure a modem, you're configuring the default properties of that modem, which will be used by any new connections that you create. Any modem settings that you configure in Phone and Modem Options, however, will *not* affect the settings in currently existing connections. I should also point out that you can configure a modem differently for each connection that uses that modem. I'll discuss how to configure modem properties for a specific connection later in this chapter.

⌐ STEP BY STEP

CONFIGURING A MODEM IN PHONE AND MODEM OPTIONS

1. Select Start ⇨ Settings ⇨ Control Panel.
2. In the Control Panel dialog box, double-click Phone and Modem Options.
3. In the Phone And Modem Options dialog box, click the Modems tab.
4. On the Modems tab, highlight the modem you want to configure, and click Properties.
5. The modem's Properties dialog box appears, as shown in Figure 15-2. Notice the three tabs in this dialog box: General, Diagnostics, and Advanced.
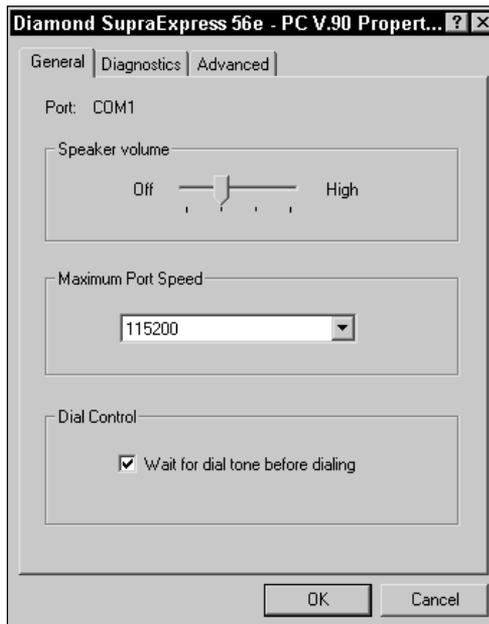

FIGURE 15-2 Configuring a modem's properties

┗┓ **STEP BY STEP**   *Continued* ▌

There are three primary configurations you can make on the General tab:

▶ **Speaker volume:** You can move the slider to adjust the modem's speaker volume to the desired level. Some modems only permit an on or off setting.

▶ **Maximum Port Speed:** In this drop-down list box, you can select a maximum port speed for this modem. The possible range is from 300 bps to 115200 bps. The default setting of 115200 is appropriate for most 56 Kbps modems.

▶ **Dial Control – Wait for tone before dialing:** If you select this check box, the modem will wait for a dial tone before it dials. This check box is selected by default.

Configure the appropriate options on this tab. Click the Diagnostics tab.

6. On the Diagnostics tab, select the check box next to "Record a Log" if you want Windows 2000 to record a log file of modem connection activity. This log file, though not necessary for normal modem operations, can be extremely useful for troubleshooting modem connection problems.

Later, when you want to view this log file, return to this tab, and click the "View log" command button, which brings up the log as a Notepad text file.

Click the Advanced tab.

7. On the Advanced tab, you can specify a custom modem initialization string in the "Extra initialization commands" text box. This is an advanced setting that is not required for most modem applications. You can also configure advanced port settings on the Advanced tab, and change default settings for call and data connection preferences. Again, these settings do not require configuration for most situations. Make the appropriate configurations on this tab and click OK.

8. In the Phone And Modem Options dialog box, click OK. Close Control Panel.

■ ■ ■

Creating a Dial-up Connection to the Internet

Probably the most common connection configured on a Windows 2000 computer is a dial-up connection to the Internet. Before you can connect your Windows 2000 computer to the Internet by using a modem, you need to create a dial-up connection to the Internet. You can create such a dial-up connection, like other connections, by using the Network Connection Wizard in the `Network and Dial-up Connections` folder.

┗┐ **STEP BY STEP**

CREATING A DIAL-UP CONNECTION TO THE INTERNET

1. Access the `Network and Dial-up Connections` folder. (Select Start ➪ Settings ➪ Network and Dial-up Connections.)

2. In the `Network and Dial-up Connections` folder, double-click Make New Connection.

3. The Network Connection Wizard starts. Click Next.

4. The Network Connection Type screen is displayed, as shown in Figure 15-3. Notice the many types of connections you can choose from in this dialog box.

Network Connection Wizard

Network Connection Type
You can choose the type of network connection you want to create, based on your network configuration and your networking needs.

⊙ **Dial-up to private network**
Connect using my phone line (modem or ISDN).

○ **Dial-up to the Internet**
Connect to the Internet using my phone line (modem or ISDN).

○ **Connect to a private network through the Internet**
Create a Virtual Private Network (VPN) connection or 'tunnel' through the Internet.

○ **Accept incoming connections**
Let other computers connect to mine by phone line, the Internet, or direct cable.

○ **Connect directly to another computer**
Connect using my serial, parallel, or infrared port.

[< Back] [Next >] [Cancel]

FIGURE 15-3 Network connection types

Select the "Dial-up to the Internet" option. Click Next.

5. The Internet Connection Wizard starts. Select one of the three options presented:

   ▶ I want to sign up for a new Internet account. (My telephone line is connected to my modem.)

   ▶ I want to transfer my existing Internet account to this computer. (My telephone line is connected to my modem.)

   ▶ I want to set up my Internet connection manually, or I want to connect through a local area network (LAN).

Select the appropriate option, and click Next. (I selected the "I want to set up my Internet connection manually" option, so the next steps are based on that choice. If you select one of the other options, follow the instructions presented on-screen to complete the creation of your dial-up connection to the Internet.)

STEP BY STEP   *Continued*

6. In the "Setting up your Internet connection" screen, select one of the two following options:

   ▶ I connect through a phone line and a modem

   ▶ I connect through a local area network (LAN)

   (I selected the "I connect through a phone line and a modem" option.) Click Next.

7. In the Choose Modem screen, select the modem you want to use for this dial-up connection from the drop-down list box. Click Next.

8. In the "Step 1 of 3: Internet account connection information" screen, enter your area code and telephone number of your Internet service provider (ISP) in the text boxes provided. Select the country you are located in from the "Country/region name and code" drop-down list box.

   If your ISP instructs you to configure a manual logon, a logon script, to use the SLIP or C-SLIP connection protocols, or if you need to manually configure the static IP address your computer will use for this connection, click Advanced, make the necessary configurations specified by your ISP, and click OK.

   Click Next.

9. In the "Step 2 of 3: Internet account logon information" screen, enter the user name and password to log on to your ISP. Click Next.

10. In the "Step 3 of 3: Configuring your computer" screen, either accept the default name for this connection, or type in a new one. Click Next.

11. In the Set Up Your Internet Mail Account screen, select the Yes option to set up an Internet mail account now.

    If you don't want to set up an Internet mail account now, select No and skip to Step 16.

    Click Next.

12. In the Your Name screen, type your name, as you want it to appear, in e-mail messages that you send. Click Next.

13. In the Internet E-mail Address screen, type your e-mail address, and click Next.

14. In the E-mail Server Names screen, select your incoming mail server type from the drop-down list box. Then type in the FQDN of the incoming mail server in the text box provided. Finally, type in the FQDN of your outgoing mail server in the text box provided. Click Next.

15. In the Internet Mail Logon screen, type in the account name and password you will use to send and receive e-mail through your ISP. (Your ISP provides you with this information.) Click Next.

16. In the Completing the Internet Connection Wizard screen, click Finish.

17. In the "Web page unavailable while offline" dialog box that appears, click Connect to connect to the Internet.

⌐ **STEP BY STEP**   *Continued*

18. Windows 2000 attempts to connect to the Internet. If your connection is config-
    ured correctly, a Connection Complete dialog box is displayed. Click OK. (If error
    messages are displayed, you may need to reconfigure this connection.)

19. To disconnect the connection, right-click the connection in the `Network and`
    `Dial-up Connections` folder, and select Disconnect from the menu that
    appears. Or, right-click the network connection icon in the taskbar (near the
    clock) and select Disconnect from the menu that appears.

■ ■ ■

Creating a Dial-up Connection to a Remote Access Server

Many companies use a remote access server to enable their employees to
access the corporate network from home or while traveling by using a
dial-up connection. Before you can connect your Windows 2000
computer to a remote access server by using a modem, you need to create
a dial-up connection to that server. You can create a dial-up connection to
a remote access server by using the Network Connection Wizard in the
`Network and Dial-up Connections` folder.

Creating a dial-up connection to a remote access server is similar to
creating a dial-up connection to the Internet, but there are a few differences.

⌐ **STEP BY STEP**

CREATING A DIAL-UP CONNECTION TO A REMOTE ACCESS SERVER

1. Access the `Network and Dial-up Connections` folder. (Select Start ➪
   Settings ➪ Network and Dial-up Connections.)

2. In the `Network and Dial-up Connections` folder, double-click Make
   New Connection.

3. The Network Connection Wizard starts. Click Next.

4. In the Network Connection Type screen, select the "Dial-up to private network"
   option. Click Next.

5. In the Select a Device screen, select the check box next to the modem you want
   to use for this connection, and click Next.

STEP BY STEP   *Continued*

6. In the Phone Number to Dial screen, type in the area code and phone number of the remote access server you want to connect to in the text boxes provided. Then select the country you are dialing from in the "Country/region code" drop-down list box. Click Next.

7. In the Connection Availability screen, select whether this connection will be available to all users of this computer, or only available to the currently logged on user. Click Next.

8. In the Internet Connection Sharing screen, you can select a check box to enable Internet Connection Sharing for this connection. However, most dial-up connections to remote access servers should *not* be configured to use Internet Connection Sharing. Click Next.

9. In the Completing the Network Connection Wizard screen, either accept the default name for this connection or type in a new name. If desired, select the check box to add a shortcut to your desktop for this connection. Click Finish.

10. The Connect dialog box for your newly created dial-up connection appears.

   If you want to connect to the remote access server now to test your connection, enter a user name and password for the remote access server, and click Dial. Windows 2000 connects to the remote access server and displays the Connection Complete dialog box. Click OK.

   If you don't want to connect now, click Cancel.

   ■ ■ ■

Creating a Connection to Another Computer

Occasionally you may want to directly connect two Windows 2000 computers by using a serial cable, parallel cable, or infrared ports. The most common reason for connecting two computers in this manner is to share files between the two computers.

Before you can directly connect the two Windows 2000 computers, you need to perform two tasks. First, you need to configure one of the computers to accept an incoming connection. Then, you need to configure the other computer to directly connect to another computer. You can accomplish both of these tasks by using the Network Connection Wizard in the `Network and Dial-up Connections` folder.

> **TIP**
>
> You can't configure a Windows 2000 Server computer that is a member of a domain to accept incoming connections by using the Network Connection Wizard. If you need to make this configuration, you must use the Routing and Remote Access administrative tool.

There are two ways you can configure a computer to accept incoming connections. You can select the "Accept incoming connections" option while using the Network Connection Wizard. Or, you can select the "Connect directly to another computer" option, and configure this computer to play the role of "Host" for this connection. I'll explain how to use both of these methods in the next two sets of steps.

⌐ STEP BY STEP

CONFIGURING A COMPUTER TO ACCEPT INCOMING CONNECTIONS

1. Access the `Network and Dial-up Connections` folder. (Select Start ➪ Settings ➪ Network and Dial-up Connections.)

2. In the `Network and Dial-up Connections` folder, double-click Make New Connection.

3. The Network Connection Wizard starts. Click Next.

4. In the Network Connection Type screen, select the "Accept incoming connections" option. Click Next.

5. The Devices for Incoming Connections screen appears, as shown in Figure 15-4.

   Select the check box next to each device on which you want to enable incoming connections. If you don't select a device, your computer won't be able to accept an incoming connection using that device. Click Next.

6. In the Incoming Virtual Private Connection screen, choose whether to allow virtual private connections (VPNs) on this computer. In order for a computer to accept an incoming VPN, it must already be configured with a connection to the Internet that has a static IP address. Click Next.

7. In the Allowed Users screen, select the check box next to each user you want to permit to use the incoming connection to this computer. Click Next.

8. In the Networking Components screen, you can install (or remove) networking components (such as clients, services, and protocols) on this computer to accommodate the computers that will connect to this computer by using an incoming connection. Ensure that the check box next to each client, service, and protocol that you want to enable for incoming connections is selected. Click Next.

9. In the Completing the Network Connection Wizard screen, either accept the default name for the connection or type in a new one. Click Finish.

FIGURE 15-4 Selecting connection devices

CONFIGURING A COMPUTER TO CONNECT DIRECTLY TO ANOTHER COMPUTER

1. Access the `Network and Dial-up Connections` folder. (Select Start ➪ Settings ➪ Network and Dial-up Connections.)

2. In the `Network and Dial-up Connections` folder, double-click Make New Connection.

3. The Network Connection Wizard starts. Click Next.

4. In the Network Connection Type screen, select the "Connect directly to another computer" option. Click Next.

5. In the Host or Guest screen, configure the role this computer will play in the direct connection—either the host (the computer that has the resources to share) or the guest (the computer that will initiate the connection and will access the shared resources on the host computer).

TIP

If you select Host, this connection will be configured as an incoming connection. (The result will be the same as if you had selected the "Accept incoming connections" option in Step 4.) If you select Guest, this connection will be configured as a direct connection.

Click Next.

┌─ **STEP BY STEP**   *Continued*

6. In the Connection Device (or Select a Device) screen, select the device that will be used for the direct connection from the drop-down list box. Options may include: Communications Port (COM 1, COM2, and so on), Direct Parallel (LPT1, LPT2, or LPT3), and Infrared Port (IRDA1-0). Click Next.

7. **If you selected the Host option in Step 5,** in the Allowed Users screen, select the check box next to each user you want to permit to use the incoming connection to this computer. Click Next.

   Or, if you selected the Guest option in Step 5, in the Connection Availability screen, select whether this connection will be available to all users of this computer, or only available to the currently logged on user. Click Next.

8. In the Completing the Network Connection Wizard screen, either accept the default name for the connection or type in a new one. Click Finish.

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Creating a VPN Connection

As I explained at the beginning of this chapter, a virtual private network (VPN) connection is a private, encrypted connection between two computers that can already communicate with each other by using TCP/IP. VPNs are typically used by corporations who want to enable employees to access the corporate network via the Internet. In addition, the corporation wants to ensure that all such connections are secure and encrypted so that the company's data is protected.

Before you can create a VPN connection, both computers that will be involved in the VPN connection must have TCP/IP installed, and each must have an established connection to either the Internet or another TCP/IP network.

Like all of the other connections on a Windows 2000 computer, you can create a VPN connection by using the Network Connection Wizard in the `Network and Dial-up Connections` folder.

⌐ STEP BY STEP

CREATING A VPN CONNECTION

1. Access the `Network and Dial-up Connections` folder. (Select Start ⇨ Settings ⇨ Network and Dial-up Connections.)

2. In the `Network and Dial-up Connections` folder, double-click Make New Connection.

3. The Network Connection Wizard starts. Click Next.

4. In the Network Connection Type screen, select the "Connect to a private network through the Internet" option. Click Next.

5. In the Public Network screen, select one of two options:

   ▶ **Do not dial the initial connection:** Select this option if you're configuring a VPN connection on a computer that has a full-time Internet connection, such as a cable modem or DSL connection.

   ▶ **Automatically dial this initial connection:** Select this option if you're configuring a VPN connection on a computer that uses a modem and a dial-up connection to the Internet. If you select this option, also select the specific dial-up connection to the Internet that you want this VPN connection to use from the drop-down list box.

   Click Next.

6. In the Destination Address screen, type the host name or IP address of the computer you will connect to by using this VPN connection. Click Next.

7. In the Connection Availability screen, select whether this connection will be available to all users of this computer, or only available to the currently logged on user. Click Next.

8. In the Internet Connection Sharing screen, you can select a check box to enable Internet Connection Sharing for this connection. However, most VPN connections should *not* be configured to use Internet Connection Sharing. Click Next.

9. In the Completing the Network Connection Wizard screen, either accept the default name for this connection or type in a new name. If desired, select the check box to add a shortcut to your desktop for this connection. Click Finish.

10. If you selected the "Automatically dial this initial connection" option in Step 5, the Initial Connection dialog box for your newly created VPN connection appears. If you want to test your VPN connection, click Yes to connect to the Internet using the dial-up connection to the Internet you selected in Step 5, and follow the instructions presented on-screen. If you don't want to test your VPN connection now, click No.

If you selected the "Do not dial the initial connection" option in Step 5, the Connect dialog box for the VPN connection appears, prompting you to enter the user name and password for the computer you're connecting to. If you want to test your VPN connection, enter this information and click Connect. If you don't want to test your VPN connection now, click Cancel.

Configuring Connection Properties

After you've created connections on your Windows 2000 computer, you may want to configure them. Often, administrators need to configure a specific property of a connection that isn't configurable in the Network Connection Wizard.

There are numerous properties of connections that can be configured. You can configure modem properties; enable Internet Connection Sharing; install and configure clients, services, and protocols; configure security options; rename connections; and create shortcuts to connections. The specific properties you can configure for a given connection are largely based on the type of connection you're configuring.

Generally, most of a connection's properties can be configured by accessing the connection's Properties dialog box from the `Network and Dial-up Connections` folder.

Configuring Modem Properties

When you need to configure how a modem functions within a specific dial-up connection, you can make that configuration in the dial-up connection's Properties dialog box. All configurations you make in this dialog box will apply to this modem *only as it is used by this specific dial-up connection.* If you want to make configuration changes to your modem that

will apply to all newly created connections, I recommend you use either Device Manager or the Phone and Modem Options application.

Configuring a Modem and Phone Number

You can configure a dial-up connection's modem and phone number (or a direct connection's port) by using the General tab in the connection's Properties dialog box. Figure 15-5 shows the General tab for a dial-up connection.
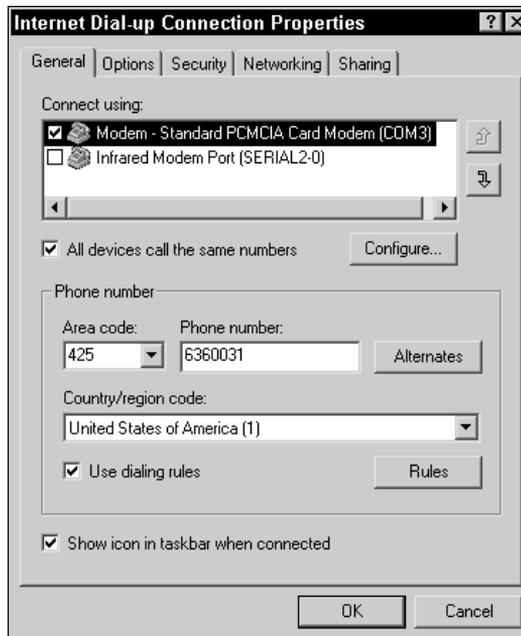

FIGURE 15-5 Configuring options on the General tab

STEP BY STEP

CONFIGURING A DIAL-UP CONNECTION'S MODEM

1. In the `Network and Dial-up Connections` folder, right-click the dial-up connection associated with the modem you want to configure, and select Properties from the menu that appears.

2. In the connection's Properties dialog box, click the General tab.

3. On the General tab, click Configure.

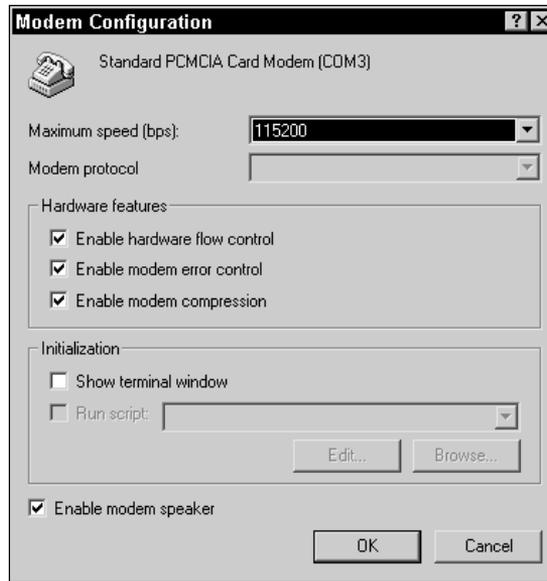4. The Modem Configuration dialog box appears, as shown in Figure 15-6.

Modem Configuration ⃞ ⃠

🕾   Standard PCMCIA Card Modem (COM3)

Maximum speed (bps):   115200 ▾

Modem protocol   ▾

┌ Hardware features ─────────────────────────────
   ☑ Enable hardware flow control
   ☑ Enable modem error control
   ☑ Enable modem compression

┌ Initialization ─────────────────────────────
   ☐ Show terminal window
   ☐ Run script: ▾
        Edit...   Browse...

☑ Enable modem speaker

     OK   Cancel

FIGURE 15-6 Configuring a dial-up connection's modem

There are numerous items you can configure in this dialog box. Remember that the configurations you make in this dialog box apply to this modem *only* as it is used by this specific dial-up connection.

▶ **Maximum speed (bps):** In this drop-down list box you can select the maximum speed the modem will use for this connection. If you don't configure this option, Windows 2000 automatically selects a maximum speed based on the make and model of modem installed in your computer.

▶ **Modem protocol:** This configuration is grayed out and not available unless the manufacturer of your modem supplies you with a custom installation (`.inf`) file.

The Hardware features section includes these options:

▶ **Enable hardware flow control:** Selecting this check box causes Windows 2000 to use the RTS and CTS hardware signals to control the flow of data to and from the modem. This option should be used with high-speed modems, or when modem compression is enabled. This option is selected by default.

▶ **Enable modem error control:** Selecting this check box causes Windows 2000 to negotiate an error correction method with the remote modem (the modem you are dialing in to). Error correction detects and corrects data corruption during transmission over analog phone lines. If no error correction method can be agreed upon, error correction is not used. This option is selected by default.

▶ **Enable modem compression:** Selecting this check box causes Windows 2000 to negotiate a compression method (such as MNP 5 or V.42bis) with the remote modem. If no compression method can be agreed upon, modem compression is not used. If modem compression is enabled, hardware flow control should also be enabled. If software compression is already used on the connection, modem compression should not be used, because software compression is more efficient. This option is selected by default.

The Initialization section includes these options:

▶ **Show terminal window:** If you select this check box, a terminal window will be displayed each time you initialize this connection. This terminal window enables you to send commands from the keyboard directly to the dial-up server. Don't select this option unless the remote server requires it — if you do, your connection may not work correctly.

▶ **Run script:** If you select this check box, you can specify a script that will send commands from your computer directly to the dial-up server. This process automates the connection process and takes the place of using a terminal window. Several default scripts are available in the drop-down list box in this dialog box, or, if you want to write your own script, you can click Edit to display a copy of the `Switch.inf` file in the Notepad text editor. The `Switch.inf` file includes instructions for creating new script files. Don't select this option unless the remote server requires you to send specific commands to establish the connection — if you do, your connection may not work correctly.

▶ **Enable modem speaker:** Selecting this check box turns on the modem's speaker so that you can monitor the connection process. Once a connection is established, the speaker is automatically turned off.

Once you have made all appropriate modem configurations, click OK.

■ ■ ■

In addition to configuring a modem, you can also use the General tab to configure a phone number (and alternates), whether or not to use dialing rules, and whether to show a connection icon in the taskbar when the connection is active.

To configure a phone number, enter the area code and phone number in the text boxes provided. If you want to configure alternate phone numbers, click Alternates and follow the directions presented on-screen.

If you want to use dialing rules, select the check box next to "Use dialing rules" and then click Rules. Windows 2000 displays the Dialing Rules tab in

the Phone and Modem Options application. Follow the instructions presented on-screen to configure your dialing rules.

Configuring Dialing Options

You can configure numerous dialing options on the Options tab in a dial-up or direct connection's Properties dialog box. Figure 15-7 shows the Options tab.
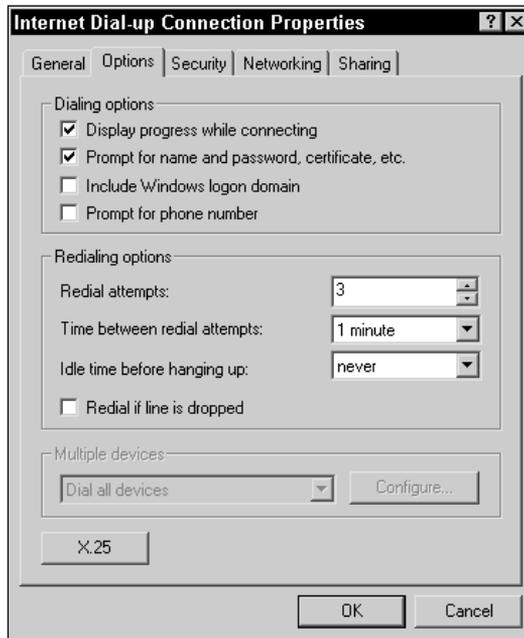

FIGURE 15-7 Configuring dialing options

As Figure 15-7 shows, there are numerous dialing and redialing options in this dialog box. In the Dialing options section are the following options:

- **Display progress while connecting:** If you select this check box, Windows 2000 displays a dialog box during the connection attempt that enables you to view the activity taking place during the process, such as "Dialing," "Verifying user name and password," "Registering your computer on the network," and so on. This option is selected by default.

- **Prompt for name and password, certificate, etc.:** Selecting this check box causes Windows 2000 to display a dialog box that prompts you to enter a user name and password before the connection is

dialed. When this dialog box is displayed and you enter your user name and password, you can select an option to have Windows 2000 save (remember) your password for this connection. Once you've selected the save password option, you can then clear the check box for "Prompt for name and password, certificate, etc." and Windows 2000 will always use your saved user name and password (without prompting you) for this connection. This option is selected by default.

CAUTION

Having Windows 2000 save (remember) your user name and password can save you time, but it can also be a potential breach of security, because anyone using your computer can connect to the remote server without having to provide a user name and password. If security is important to you, I recommend that you *don't* select this option.

- **Include Windows logon domain:** This check box works in conjunction with the "Prompt for name and password, certificate, etc." option. When both of these check boxes are selected, Windows 2000 displays an additional text box in the dialog box that prompts you to enter a user name and password. This additional text box enables you to specify a Windows 2000 domain that will authenticate your user name and password for this connection. This option is typically used only when there are multiple Windows 2000 domains on the remote network you're connecting to.

- **Prompt for phone number:** Selecting this check box causes Windows 2000 to display a dialog box that prompts you to enter a phone number to be used for the connection. In this dialog box you can use the default phone number displayed, select one of the alternate numbers in the drop-down list box, or type in a new phone number to be used for the connection. If you use this option in conjunction with the "Prompt for name and password, certificate, etc." option, all prompts (for user name, password, and phone number) are displayed in a single dialog box. For dial-up connections, this option is selected by default.

The "Prompt for phone number" option is not present on direct connections, because the computers involved in the connection are directly cabled together, and no phone line is used.

In the Redialing options section are the following options:

- **Redial attempts:** In this spin box you can specify the number of times Windows 2000 will attempt to connect if the first connection attempt fails. The default number of redial attempts is 3, and you can configure from 0 to 32,767 attempts.

- **Time between redial attempts:** In this drop-down list box, you can configure the amount of time Windows 2000 will wait between each connection attempt. The default time is 1 minute. You can select from several options ranging from 1 second to 10 minutes.

- **Idle time before hanging up:** In this drop-down list box you can specify the amount of time Windows 2000 will permit the connection to continue, with no activity, before it disconnects. The default setting is "never," and you can select from several options ranging from 1 minute to 24 hours.

TIP

Configuring a long "Idle time before hanging up" setting is no guarantee that the connection will not be dropped by the remote server, which may have a shorter idle time-out setting.

- **Redial if line is dropped:** Selecting this check box causes Windows 2000 to automatically redial if the connection is dropped for any reason other than the user disconnecting the connection.

- **X.25:** Clicking X.25 brings up a dialog box that enables you to configure various X.25 settings, including network, X.121 address, user data, and facilities. You should only configure this option if the network you're connecting to is an X.25 network. The X.25 option is not present on direct connections, because the computers involved in the connection are directly cabled together, and no phone line is used.

Configuring Internet Connection Sharing

If you have a connection to the Internet on your Windows 2000 computer (either dial-up or local area), and you want to enable other computers on your local area network to use that connection to access the Internet, you can enable Internet Connection Sharing for the specific connection that will be shared.

EXAM TIP

The Professional, Server, and Network exams each have an objective on Internet Connection Sharing. Be sure you know when Internet Connection Sharing should and should not be used, how to enable Internet Connection Sharing, and which connection should be shared.

Internet Connection Sharing is a Windows 2000 feature that is commonly used in a home or small-office network setting when a single Internet connection must be shared by multiple computers. Internet Connection Sharing should *not* be used on networks that have existing routers, DNS servers, or DHCP servers, because once Internet Connection Sharing is enabled on a computer, Windows 2000 automatically makes that computer into the gateway, DNS proxy server, and DHCP server for that network segment, and assigns this computer an IP address of 192.168.0.1. If you have a network that has existing routers, DNS servers, or DHCP servers, you might want to consider using a Windows 2000 Server feature called Connection Sharing (NAT). I'll cover this feature in Chapter 16.

CAUTION

You should only enable Internet Connection Sharing on *one* computer on your network. If you enable Internet Connection Sharing on more than one computer, you may experience serious TCP/IP connectivity problems on your network.

Enabling Internet Connection Sharing

In order to enable Internet Connection Sharing on a Windows 2000 computer, the computer must have both a local area connection and a connection (either dial-up or local area) to the Internet. In addition, you must be a member of the Administrators group on the local computer to enable Internet Connection Sharing. You can enable Internet Connection Sharing by using the `Network and Dial-up Connections` folder, as the following steps explain.

⌐ STEP BY STEP

ENABLING INTERNET CONNECTION SHARING

1. In the `Network and Dial-up Connections` folder, right-click the Internet connection you want to share. (This can be either a dial-up or local area connection to the Internet.) Select Properties from the menu that appears.

2. In the connection's Properties dialog box, click the Sharing tab.

3. The Sharing tab appears, as shown in Figure 15-8.

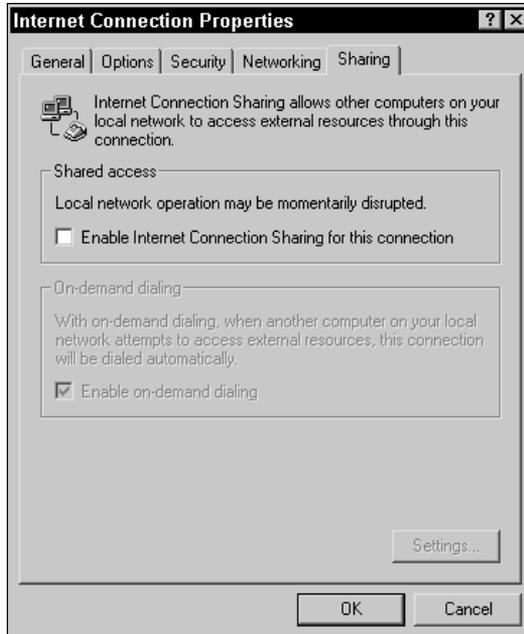**Internet Connection Properties** ? X

General | Options | Security | Networking | Sharing |

Internet Connection Sharing allows other computers on your local network to access external resources through this connection.

Shared access

Local network operation may be momentarily disrupted.

☐ Enable Internet Connection Sharing for this connection

On-demand dialing

With on-demand dialing, when another computer on your local network attempts to access external resources, this connection will be dialed automatically.

☑ Enable on-demand dialing

Settings...

OK Cancel

FIGURE 15-8 Enabling Internet Connection Sharing

Select the check box next to "Enable Internet Connection Sharing for this connection." Once this check box is selected, the "Enable on demand dialing" check box is also automatically selected if the connection being configured is a dial-up connection.

If you want to make a specific Internet application (such as a game) available to users on your network, or, if another computer on your network runs a service (such as a Web server or an FTP server) that needs to be accessed by users who connect to your network by using this shared Internet connection, click Settings and add and configure the application or service. When you finish configuring applications and services, click OK.

Click OK.

4. A Network and Dial-up Connections confirmation dialog box appears. Click Yes to enable Internet Connection Sharing.

STEP BY STEP *Continued*

5. Close the `Network and Dial-up Connections` folder.

6. Configure all computers that will use this shared connection as DHCP clients. (For detailed information on configuring a Windows 2000 computer to be a DHCP client, see Chapter 16.)

∎ ∎ ∎

Troubleshooting Internet Connection Sharing

Typically, once Internet Connection Sharing is enabled and configured, it doesn't cause too many problems. If you do have problems with Internet Connection Sharing, they're most likely to appear during the initial enabling and configuring process, or when a new computer is added to the network after Internet Connection Sharing has been enabled. Here are a few tips to help you when you're troubleshooting an Internet Connection Sharing problem:

- **Ensure that the appropriate connection is shared.** Internet Connection Sharing requires two connections: one to the Internet (which can be either a dial-up or local area connection) and one local area connection. Make sure the connection to the Internet is the one on which you enable Internet Connection Sharing.

- **Ensure that all computers on your network are configured as DHCP clients.** Because the computer on which you enable Internet Connection Sharing becomes that network segment's DHCP and DNS servers, it's imperative that the computers that share this connection are configured to receive their IP addresses automatically from a DHCP server.

- **Ensure that no other DHCP server or DNS server is present on the network segment.** If another DHCP or DNS server is present, your may experience TCP/IP connectivity problems on your network, and computers that share this connection may not be able to connect to the Internet.

Installing, Configuring, and Troubleshooting Protocols

Depending on the types of connections you've created on your Windows 2000 computer, you may need to install additional protocols to fully support those connections. Most of the time, TCP/IP is the only protocol required, because virtually all operating systems support TCP/IP, and it is the protocol used on the Internet. However, other protocols may be required to support interoperability with other operating systems.

Table 15-1 lists and describes the network protocols supported by Windows 2000.

TABLE 15-1 Windows 2000 Network Protocols

Protocol	Description
AppleTalk Protocol	This protocol enables a Windows 2000 computer to connect to AppleTalk network print devices. (AppleTalk is usually associated with Macintosh computers and printers.) This protocol also enables Macintosh computers to communicate with Windows 2000 Server and Advanced Server computers that have File or Print Services for Macintosh installed.
DLC Protocol	This protocol is a datalink protocol. DLC is primarily used by Windows 2000 computers to communicate with older Hewlett-Packard printers that don't support TCP/IP, and to communicate with IBM mainframe computers.
Internet Protocol (TCP/IP)	This protocol is a fast, routable enterprise protocol, and is the protocol used on the Internet. TCP/IP is supported by most operating systems, including: Windows 3.*x*, Windows 95, Windows 98, Windows NT, Macintosh, NetWare, UNIX, Linux, MS-DOS, and IBM mainframes.
NetBEUI Protocol	This protocol is designed for small, nonrouted networks. It doesn't require any configuration and has minimal overhead. NetBEUI is included with Windows 2000 primarily to provide backward compatibility with earlier networking software that uses NetBEUI as its only protocol.
Network Monitor Driver	This protocol enables Network Monitor to capture packets from the local network segment and to gather network statistics.
NWLink IPX/SPX/NetBIOS Compatible Transport Protocol	This protocol is a routable protocol usually associated with NetWare networks. This protocol is included with Windows 2000 primarily to provide connectivity with older NetWare servers.

In the next sections I'll show you how to install network protocols and configure network bindings, as well as provide you with some tips for troubleshooting network protocols.

Installing and Configuring Network Protocols

All network protocols are installed by configuring the properties of a connection in the `Network and Dial-up Connections` folder.

When you install a network protocol, it is generally available to *all* connections on your computer — whether local area, incoming, direct, dial-up, or VPN — (even though you accomplish the protocol installation task by configuring the properties of a *specific* connection). For example, if you install NetBEUI by configuring a local area connection, NetBEUI will be available for all local area, incoming, direct, dial-up, and VPN connections on your Windows 2000 computer.

There are two exceptions to this rule:

- The DLC protocol is only available for (and can only be installed by configuring) local area connections.
- The AppleTalk protocol is only available for (and can only be installed by configuring) local area and incoming connections.

⌐ STEP BY STEP

INSTALLING NETWORK PROTOCOLS

1. Access the `Network and Dial-up Connections` folder. (Select Start ⇨ Settings ⇨ Network and Dial-up Connections.)
2. In the `Network and Dial-up Connections` folder, right-click any Local Area Connection, and select Properties from the menu that appears.
3. In the Local Area Connection Properties dialog box, click Install.
4. The Select Network Component Type dialog box appears, as shown in Figure 15-9. Notice that you can select from three types of network components: clients, services, and protocols. Highlight Protocol and click Add.
5. The Select Network Protocol dialog box appears, as shown in Figure 15-10. Notice the network protocols, such as Internet Protocol (TCP/IP), and NWLink IPX/SPX/NetBIOS Compatible Transport Protocol, that you can install.
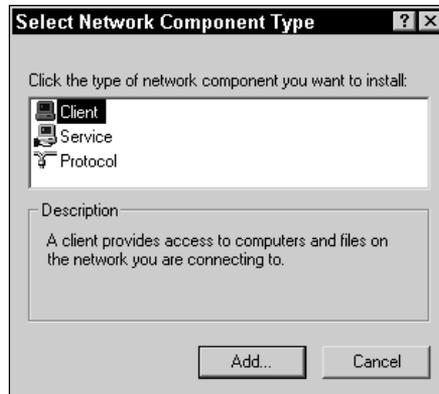
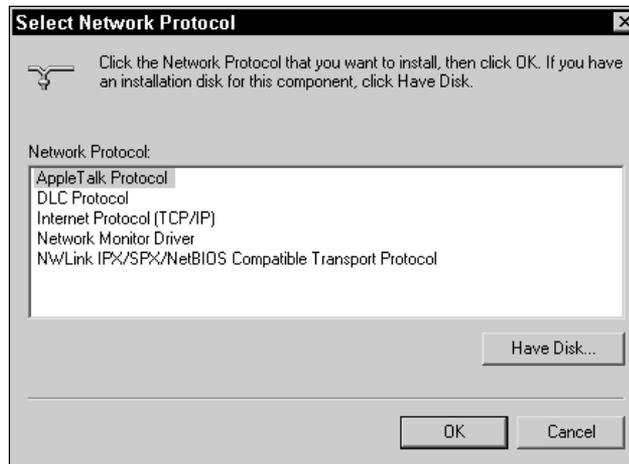**FIGURE 15-9** Selecting a network component type

FIGURE 15-10 Adding a protocol

TIP

Only the network protocols that are *not* already installed on your computer appear in this dialog box. So, depending on your Windows 2000 computer's configuration, your dialog box may differ from the one presented here.

Highlight the protocol you want to add. If the protocol you want to add is not displayed, you can click Have Disk and insert a floppy disk containing the protocol you want to add, and then follow the instructions presented on-screen. Click OK.

STEP BY STEP   *Continued*

6. Windows 2000 installs the protocol you selected, and returns you to the Local Area Connection Properties dialog box. The installation process may take a minute or so. Click Close.

■ ■ ■

Occasionally you may need to configure an installed network protocol to make your Windows 2000 computer function correctly on the network. Although most protocols, once installed, are available for all connections, protocols are *configured* on a connection-by-connection basis. The specific settings you can configure vary greatly from protocol to protocol.

STEP BY STEP

CONFIGURING PROTOCOLS

1. Access the `Network and Dial-up Connections` folder. (Select Start ➪ Settings ➪ Network and Dial-up Connections.)

2. In the `Network and Dial-up Connections` folder, right-click the connection for which you want to configure a protocol, and select Properties from the menu that appears.

3. In the connection's Properties dialog box, highlight the protocol you want to configure and click Properties.

4. In the protocol's Properties dialog box, configure the protocol as desired. Click OK.

5. In the connection's Properties dialog box, click OK.

■ ■ ■

Troubleshooting Network Protocols

Troubleshooting network protocols can be a detailed, painstaking task. TCP/IP, for example, is easy to configure improperly. Several settings must be typed on each computer that uses the protocol, including IP address, subnet mask, and default gateway. The best way to prevent configuration problems in a TCP/IP environment is to use a DHCP server to configure TCP/IP automatically on each computer on the network. If you don't use DHCP, you should manually verify that the settings are correctly entered on each computer that experiences a network communications problem.

The NWLink IPX/SPX/NetBIOS Compatible Transport Protocol also has several configuration settings, and thus is prone to human error during protocol configuration. When troubleshooting NWLink, verify that all of the settings for this (and every other) protocol are correctly entered on each computer that experiences a network communications problem.

The most common configuration problem for the NWLink IPX/SPX/NetBIOS Compatible Transport Protocol is a frame type mismatch. NWLink supports four frame types: Ethernet_II, Ethernet_802.3, Ethernet_802.2, and Ethernet_Snap. Older NetWare operating systems commonly use the Ethernet_802.3 frame type, and newer ones use Ethernet_802.2. It is not uncommon to have networks that use both frame types. When this happens, you must manually configure NWLink to support both frame types also.

Installing and Configuring Network Clients and Services for Interoperability

In addition to installing network protocols, you may also need to install and configure additional network clients and services to fully support the connections on your Windows 2000 computer, and to support interoperability with other operating systems.

Network clients enable your computer to access resources located on other servers on the network. Services enable computers that run other operating systems to access resources on the Windows 2000 computer.

Table 15-2 lists and describes the clients that ship with Windows 2000, and Table 15-3 lists and describes the services that ship with Windows 2000. Some clients and services are installed by default during the installation of Windows 2000. Other clients and services can be added (or removed) after installation by using the `Network and Dial-up Connections` folder or other Windows 2000 tools.

> ### ▶ EXAM TIP
> Before you take the Server exam, I recommend you memorize the information in Tables 15-2 and 15-3. You should know which clients and services can be installed on Professional computers, and which clients and services are available for Server computers only. You should also know what each of these clients and services does.

TABLE 15-2 Windows 2000 Clients

Client	Professional	Server/ Advanced Server	Description
Client for Microsoft Networks	✓	✓	This client enables a Windows 2000 computer to access resources on networks that use Microsoft Windows-based networking.
Client Service for NetWare	✓		This client enables Windows 2000 Professional computers to log in to NetWare servers and to access files and printers on NetWare servers.
Gateway (and Client) Services for NetWare		✓	This client enables Windows 2000 Server/ Advanced Server computers to log in to NetWare servers and to access files and printers on NetWare servers. This client also enables these Windows 2000 Servers to share NetWare files, folders, and printers with client computers that run Client for Microsoft Networks.

TABLE 15-3 Windows 2000 Services

Service	Professional	Server/ Advanced Server	Description
Certificate Services		✓	This service enables an organization to issue and manage digital certificates. This service provides authentication support for clients and services that use the digital certificates issued by this service.
Connection Manager Components		✓	This service enables you to create custom dial-up connection profiles that enable authorized users to connect to your network over phone lines or over the Internet.

TABLE 15-3 *(continued)*

Service	Professional	Server/ Advanced Server	Description
Cluster Service		✓	This service, which is available only on Windows 2000 Advanced Server computers, enables client computers to view a group of 2 to 32 Windows 2000 Advanced Server Computers as a single computer. This service provides high availability and load balancing of mission-critical applications.
COM Internet Services Proxy		✓	This service enables distributed HTTP applications to communicate with each other over the network by using Internet Information Services (IIS).
Domain Name System (DNS)		✓	This service is a TCP/IP-based name resolution service. It is used to resolve a host name or FQDN to its associated IP address.
Dynamic Host Configuration Protocol (DHCP)		✓	This service enables a Windows 2000 Server or Advanced Server computer to provide TCP/IP addresses and other TCP/IP configuration information to DHCP-enabled client computers.
File and Printer Sharing for Microsoft Networks	✓	✓	This service enables a computer to share its resources with client computers that run Client for Microsoft Networks.
File Transfer Protocol (FTP) Server	✓	✓	This service enables a computer to function as an FTP server.
File Services for Macintosh		✓	This service enables a Windows 2000 Server or Advanced Server computer to share its files with Macintosh client computers.
FrontPage 2000 Server Extensions	✓	✓	This service enables users of FrontPage to publish Web pages on Web servers.

Service	Professional	Server/ Advanced Server	Description
Indexing Service	✓	✓	This service indexes the documents on your computer's disks into a catalog. This service then enables you to search the catalog to locate a document that contains a particular word, phrase, or property of the document.
Internet Authentication Service (IAS)		✓	This service provides authentication for users that dial-in to the network, or connect to the network over the Internet using a VPN.
Internet Information Services (IIS)	✓	✓	This service enables you to publish information on your intranet or on the Internet. With IIS, you can host Web sites and publish Web pages, host FTP sites, and host news and mail services.
Message Queuing Services	✓	✓	This service enables distributed applications to communicate with each other over the network, even if the applications run at different times. This service was formerly known as MSMQ.
Network Load Balancing		✓	This service, which is only available on Windows 2000 Advanced Server computers, is associated with Cluster Service. It enables multiple Windows 2000 Advanced Server computers to work together to provide Web and/or other services to more clients than a single server could serve. *See* Cluster Service.
Network Monitor Tools		✓	This service enables you to capture and analyze packets sent over the network to or from the server. This is a limited version of the Network Monitor tool that ships with Microsoft Systems Management Server.

TABLE 15-3 *(continued)*

Service	Professional	Server/ Advanced Server	Description
NNTP Service		✓	This service enables a Windows 2000 Server or Advanced Server computer to function as a news server. NNTP stands for Network News Transfer Protocol.
Print Services for Macintosh		✓	This service enables a Windows 2000 Server or Advanced Server computer to share its printers with Macintosh client computers.
Print Services for Unix	✓	✓	This service enables a Windows 2000 computer to share its printers with UNIX computers or other computers that support LPR printing.
QoS Admission Control Service		✓	This service enables you to manage the allocation of network bandwidth to individual network applications. QoS stands for Quality of Service.
QoS Packet Scheduler	✓	✓	This service enables computers to participate in scheduled delivery of network packets. This service should be installed on all Windows 2000 computers that use applications managed by the QoS Admission Control Service.
Remote Installation Services (RIS)		✓	This service enables you to install Windows 2000 Professional remotely on client computers.
Remote Storage		✓	This service extends disk space on Windows 2000 Server and Advanced Server computers by copying infrequently accessed files from local hard disks to either local or remote tape backup libraries.

Service	Professional	Server/ Advanced Server	Description
RIP Listener	✓		This service enables a Windows 2000 Professional computer to listen to RIP messages between routers, and to use this information to update its routing tables. RIP Listener is also called silent RIP.
SAP Agent	✓	✓	This service enables a Windows 2000 computer to maintain and advertise a list of servers (such as NetWare servers) that use the NWLink IPX/SPX/NetBIOS Compatible Transport Protocol.
Script Debugger	✓	✓	This service enables you to identify errors in scripts that run on the local computer.
Simple Network Management Protocol (SNMP)	✓	✓	This service enables a Windows 2000 computer to send trap messages to, and be managed by, an SNMP management station.
Simple TCP/IP Services	✓	✓	This service is actually a collection of five TCP/IP services: Character Generator, Daytime, Discard, Echo, and Quote of the Day.
Site Server ILS Services		✓	This service enables a Windows 2000 Server or Advanced Server computer to publish IP multicast conferences on the network. It can also be used to publish IP address mappings for IP telephony (H.323). ILS stands for Internet Locator Server.
SMTP Service	✓	✓	This service enables a Windows 2000 computer to receive e-mail messages from e-mail clients, and to forward these messages to the appropriate mail server on the Internet. SMTP stands for Simple Mail Transfer Protocol.

Continued ▶

TABLE 15-3 *(continued)*

Service	Professional	Server/ Advanced Server	Description
Terminal Services		✓	This service enables a Windows 2000 Server or Advanced Server computer to run applications for client computers that are functioning as terminals.
Terminal Services Licensing		✓	This service registers and tracks client licenses for clients that use Terminal Services.
Visual InterDev RAD Remote Deployment Support	✓	✓	This service enables you to deploy applications remotely on your Web server.
Windows Internet Service (WINS)		✓	This service enables a Name Windows 2000 Server or Advanced Server computer to function as a TCP/IP-based NetBIOS name server. It enables client computers to register NetBIOS names and to resolve NetBIOS names to IP addresses.
Windows Media Services		✓	This service enables a Windows 2000 Server or Advanced Server computer to stream multimedia content to network users.
World Wide Web Server	✓	✓	This service enables a Windows 2000 computer to function as an HTTP Web server.

CAUTION

Windows 2000 requires you to reboot your computer after the installation of some clients and services. Because of this fact, I recommend that you install clients and services at a time when you are able to reboot the server without disrupting service to users of client computers.

In the following sections I'll explain how to install network clients and services, how to configure bindings and provider order, and how to configure services.

Installing Network Clients

Installing network clients is a simple task. All network clients are installed by using the `Network and Dial-up Connections` folder.

As with network protocols, when you install a client, the client is available to *all* connections on your computer, even if you accomplish the installation task by configuring the properties of a *specific* connection. For example, if you install Client Service for NetWare by configuring a local area connection, it will be available for all connections on your Windows 2000 computer.

⌐ STEP BY STEP

INSTALLING A NETWORK CLIENT

1. Access the `Network and Dial-up Connections` folder. (Select Start ⇨ Settings ⇨ Network and Dial-up Connections.)
2. In the `Network and Dial-up Connections` folder, right-click any Local Area Connection, and select Properties from the menu that appears.
3. In the Local Area Connection Properties dialog box, click Install.
4. In the Select Network Component Type dialog box, highlight Client and click Add.
5. In the Select Network Client dialog box, highlight the client you want to add. Click OK.

> **△ TIP**
>
> Only the network clients that are *not* already installed on your computer appear in this dialog box.

6. Windows 2000 installs the client you selected. When prompted, click Yes to shut down and restart your computer to complete the installation.

--- ■ ■ ■ ---

Configuring Gateway (and Client) Services for NetWare

Most of the configuration options for Gateway Services for NetWare (GSNW) are pretty straightforward, however, one of its features deserves special attention. GSNW enables a Windows 2000 Server computer to share folders from NetWare servers with Windows 2000 client computers. To configure this option, you must provide GSNW with a username and a password that GSNW will use when accessing the NetWare server. This user account must be a member of a group on the NetWare Server named NTGATEWAY. The NTGATEWAY group must have all of the necessary

permissions to the folder on the NetWare server that is being shared with Windows 2000 client computers. The administrator of the NetWare server must create this group — it does not exist by default. If the NTGATEWAY group does not exist on the NetWare server, or if the user account you supply to GSNW for accessing the NetWare server is not a member of the NTGATEWAY group, this feature will not work correctly.

> **EXAM TIP**
> This particular configuration is very specific and detail oriented, and most people I know can't remember exactly how to configure it off the top of their heads. For these reasons, this is a favorite topic of exam authors. Memorize this information before you take the exams.

Installing Services

Installing services is fairly straightforward. The hardest thing about it is determining which program to use to perform the installation. I'll try to boil it down:

- You can use the `Network and Dial-up Connections` folder to install the QoS Packet Scheduler service and the SAP Agent service. Just like protocols and clients, these services are installed by modifying the properties of one of the computer's connections.

- You can install all other services by using the Add/Remove Programs application. Alternatively, some of these services can be installed by using the Optional Networking Components option in the Advanced menu in the `Network and Dial-up Connections` folder.

In the steps that follow, I'll explain how to install a service by modifying the properties of a connection in the `Network and Dial-up Connections` folder. For detailed steps on installing a service by using the Add/Remove Programs application, see the steps titled "Using Add/Remove Programs to Add/Remove Optional Windows 2000 Components" in the "Add/Remove Programs" section in Chapter 5.

> ## STEP BY STEP
>
> ### INSTALLING A SERVICE BY MODIFYING THE PROPERTIES OF A CONNECTION
>
> 1. Access the `Network and Dial-up Connections` folder. (Select Start ➪ Settings ➪ Network and Dial-up Connections.)
> 2. In the `Network and Dial-up Connections` folder, right-click any Local Area Connection, and select Properties from the menu that appears.
> 3. In the Local Area Connection Properties dialog box, click Install.
> 4. In the Select Network Component Type dialog box, highlight Service and click Add.
> 5. In the Select Network Service dialog box, highlight the service you want to add. Click OK.

> ⚠ **TIP**
>
> Only the services that are *not* already installed on your computer appear in this dialog box.

> 6. Windows 2000 installs the service you selected, and returns you to the Local Area Connection Properties dialog box. Click Close.

■ ■ ■

Configuring Bindings and Provider Order

You may need to configure bindings and provider order to optimize how a Windows 2000 computer accesses network resources through its connections. There are two primary reasons for configuring bindings and provider order — to increase performance and to limit the availability of network services for a connection.

Bindings are local area connection configuration options that specify three specific properties of a local area connection:

- Which installed client(s) or service(s) the connection uses
- Which protocol(s) are used by (or *bound* to) each selected client or service
- The order in which selected protocols are used by each associated client or service

Provider order is a connection configuration option that specifies which installed client the computer's connections will use first when it attempts to connect to a server or a printer.

Bindings are configured for *each* local area connection on a Windows 2000 computer. Provider order is configured *once* for all connections on a Windows 2000 computer. You can configure bindings and provider order in the `Network and Dial-up Connections` folder by selecting Advanced ➪ Advanced Settings.

Configuring bindings and provider order to increase performance is primarily a client computer issue. To optimize the performance of a client computer, the first thing you need to do is determine which type of server(s) the client computer accesses most often. The type of server accessed most frequently will determine both the optimum protocol order and the optimum provider order.

For example, suppose that you have a Windows 2000 Professional computer that frequently accesses several Windows 2000 Server computers, and also accesses, on a less frequent basis, a NetWare server. The Windows 2000 Server computers primarily use TCP/IP, and the NetWare server uses IPX. The bindings and provider order currently configured for this client computer are shown in Figures 15-11 and 15-12, respectively. Notice, on the Adapters and Bindings tab in Figure 15-11, that the NWLink IPX/SPX/NetBIOS Compatible Transport Protocol is listed first under the Client for Microsoft Networks. Also notice, on the Provider Order tab in Figure 15-12, that NetWare or Compatible Network is listed first under Network Providers.

To optimize performance of this client computer, you would first configure, on the Adapters and Bindings tab, the bindings used by the local area connection on this computer. You would change the order of the protocols used by the Client for Microsoft Networks so that the Internet Protocol (TCP/IP) is at the *top* of the list (because TCP/IP is the primary protocol used by the Windows 2000 Server computers this client computer most frequently accesses), and so that the NWLink IPX/SPX/NetBIOS Compatible Transport Protocol is at the bottom of the list. To do this, select the NWLink Protocol in the list, and click the down-arrow button on the right of the dialog box.
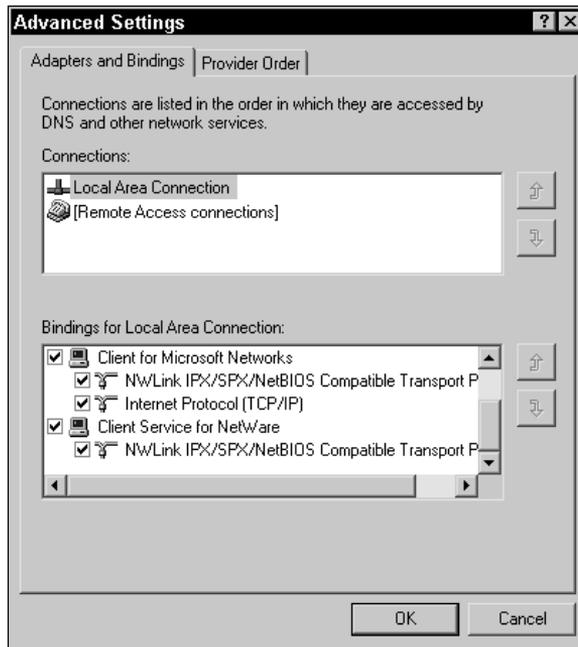
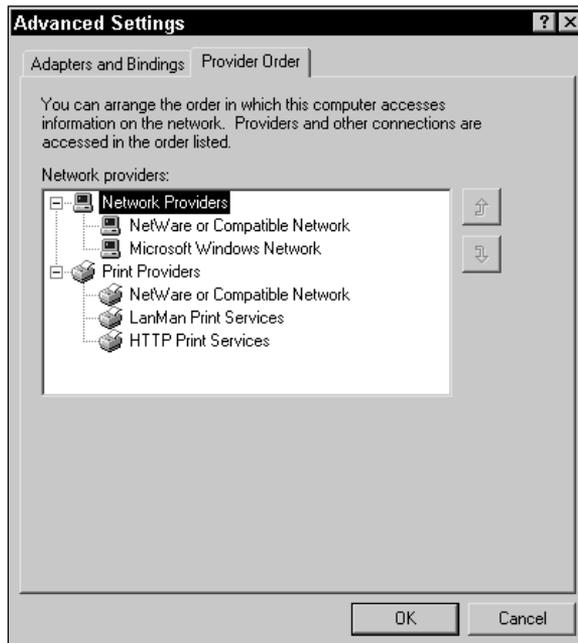**FIGURE 15-11** Bindings on a client computer

FIGURE 15-12 Provider order on a client computer

To further optimize performance of this client computer, you would then configure, on the Provider Order tab, the provider order of this client computer so that the Microsoft Windows Network is listed as the *first* network provider, and so that the NetWare or Compatible Network is listed as the *second* provider. To do this, select NetWare or Compatible Network in the list, and click the down-arrow button on the right of the dialog box. Again, the reason you make this change is because this client computer primarily connects to Windows 2000 Server computers, which use the Microsoft Windows Network provider.

So, you may be wondering, why will making these two configuration changes increase the performance of this client computer? It all boils down to time, and more specifically, to time-outs. When a Windows 2000 client computer attempts to connect to a server, it tries to connect by using the first protocol listed (on the Adapters and Bindings tab) for the first network provider listed (on the Provider Order tab). If the server the client computer is trying to connect to doesn't support this protocol or provider, the client computer receives no reply from the server, and the connection attempt eventually times out. Then the Windows 2000 client computer tries to connect to the server by using the second protocol listed for the first network provider listed. If this doesn't work, after another time out, Windows 2000 tries to connect to the server by using the first protocol listed for the second network provider, and so on, until a connection is established, or until all provider/protocol combinations have been tried. If you configure a client computer to use the primary network provider and protocol of the server(s) it uses most often, you'll increase performance by eliminating (or at least decreasing) time outs.

I'd like to point out one more not-so-obvious tip about configuring provider order. When you change provider order, what you're really doing is configuring the order in which Windows 2000 will use a client (Client for Microsoft Networks, Client Service for NetWare, and so on) when attempting to connect to a server. So, when you put Microsoft Windows Network at the top of the network providers list, what you're doing is telling Windows 2000 to use the Client for Microsoft Networks first. Never mind that the providers and clients aren't called by the same name. Just remember that the Microsoft Windows Network provider is the equivalent of the Client for Microsoft Networks, and that the NetWare or Compatible Network provider is the equivalent of the Client Service for NetWare.

⌐ STEP BY STEP

CONFIGURING BINDINGS AND PROVIDER ORDER

1. Access the `Network and Dial-up Connections` folder. (Select Start ⇨ Settings ⇨ Network and Dial-up Connections.)

2. In the `Network and Dial-up Connections` folder, select Advanced ⇨ Advanced Settings.

3. The Advanced Settings dialog box appears, with the Adapters and Bindings tab on top. If you have more than one local area connection on your computer, in the Connections box, highlight the connection you want to configure.

⚠ TIP

If you have more than one local area connection on your computer, you can configure the order the connections will be used in this box. Highlight the connection, then click either the up arrow or the down arrow button to move the connection up or down in the list.

4. To configure bindings, in the Bindings for Local Area Connection box, highlight the protocol for which you want to change the binding order. Then, to the right of this box, click either the up arrow or the down arrow button to move the protocol up or down in the list.

5. To configure provider order, click the Provider Order tab.

6. On the Provider Order tab, in the "Network providers" box, highlight the provider you want to reorder. Then, to the right of this box, click either the up arrow or the down arrow button to move the provider up or down in the list.

7. When you finish configuring bindings and provider order, click OK.

■ ■ ■

Configuring bindings to limit availability of network services is primarily a server security issue. For example, suppose you have a server that has two network adapter cards — one of which is connected to your local network, and the other is connected to the Internet. In this situation, you might want to disable File and Printer Sharing for Microsoft Networks for the connection that accesses the Internet so that users on the Internet can't access shared files and folders on your server.

You can configure a connection's bindings to limit availability of services by using either the Advanced Settings dialog box, or by using the connection's Properties dialog box. I prefer to use the connection's Properties dialog box, because this dialog box lists all protocols and services that are installed on the computer — the Advanced Settings dialog box

does not. In either the Advanced Settings or the connection's Properties dialog box, to unbind a service for that connection, simply clear the check box next to the service's name, and click OK. Figure 15-13 shows File and Printer Sharing for Microsoft Networks unbound from the local area connection. Notice that the check box next to File and Printer Sharing for Microsoft Networks is cleared.
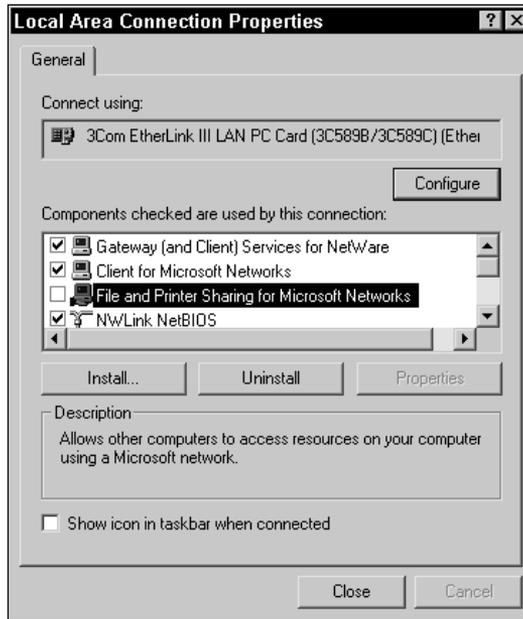

FIGURE 15-13 Unbinding a service

Configuring Services

After you install services on your Windows 2000 computer, you may need to configure them. For example, you may need to start or stop a service, configure the startup type of a service, or configure a service to log on by using a specific user account, or to enable or disable a specific service within a hardware profile.

You can perform all of these service configuration tasks, on both the local computer as well as remote computers, by using the Services tool in Computer Management.

STEP BY STEP

STARTING THE SERVICES TOOL

1. On the desktop, right-click My Computer, and select Manage from the menu that appears. Windows 2000 starts the Computer Management MMC.

2. If you want to manage services on the local computer, skip to Step 4.

   If you want to manage services on a remote computer, in the left pane of the Computer Management dialog box, right-click Computer Management (Local) and select "Connect to another computer" from the menu that appears.

3. In the Select Computer dialog box, double-click the name of the computer to which you want to connect.

4. In the left pane of the Computer Management dialog box, click the + next to Services and Applications. Highlight Services.

5. In the right pane, a list of all of the services installed on the Windows 2000 computer is displayed, as shown in Figure 15-14.
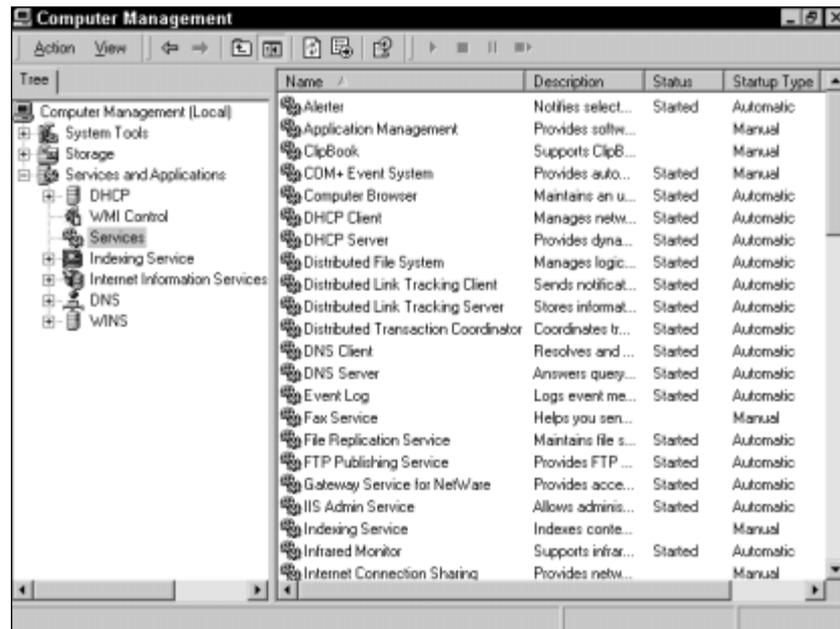
FIGURE 15-14 Using Services in Computer Management

In the next several sections I'll explain how to perform numerous service configuration tasks by using the Services tool.

Starting, Stopping, Pausing, Resuming, or Restarting a Service The Services tool is useful for starting, stopping, pausing, resuming, and restarting a service. These are easy tasks to perform.

⌐ STEP BY STEP ▮

USING SERVICES TO START, STOP, PAUSE, RESUME, OR RESTART A SERVICE

1. Start the Services tool (see the steps on "Starting the Services Tool " in the previous section).

2. In the right pane, right-click the specific service you want to start, stop, pause, resume, or restart. Then select Start, Stop, Pause, Resume, or Restart from the menu that appears.

⚠ **TIP**

Depending on the service you select and the current status of this service, not all actions will be available in this menu.

3. Close Computer Management.

■ ■ ■

Configuring the Startup Type of a Service You can also use the Services tool to configure the startup type of a service. There are three possible startup types:

- **Automatic:** If you select automatic, Windows 2000 starts the service automatically every time the computer is booted.
- **Manual:** If you choose manual, a user or an application must start the service.
- **Disabled:** If you select disabled, the service can't be started by a user or application.

For example, suppose you want to enable remote users to establish Telnet command-line sessions with your Windows 2000 Server computer. Because the default startup type of the Telnet service is Manual, you decide to change its startup type to Automatic. I'll show you how to perform this task in the steps that follow.

CAUTION

Exercise caution when using the Services tool. Changing the startup type of a service or disabling a service can render your computer unable to access (or provide) network resources.

STEP BY STEP

CHANGING THE STARTUP TYPE OF A SERVICE

1. Start the Services tool (see the steps on "Starting the Services Tool" earlier in this chapter).

2. In the right pane, right-click the specific service for which you want to change the startup type, and then select Properties from the menu that appears. (Or, you can double-click the service.)

3. The service's Properties dialog box appears, as shown in Figure 15-15. Notice the information displayed about the service, including its startup type and status.
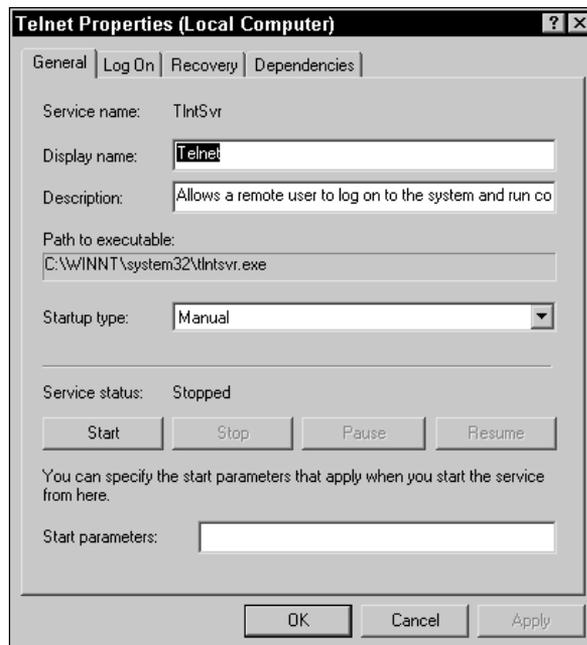
FIGURE 15-15 Telnet service properties

In the "Startup type" drop-down list box, select the startup type you want to assign to this service. Click OK.

⌐ **STEP BY STEP** *Continued*

⚠ **TIP**

If you change the startup type of a service to Automatic, the service doesn't automatically start until the next time you boot the computer. If you want the service to start now (without rebooting the computer), right-click the service, and select Start from the menu that appears.

4. Close Computer Management.

■ ■ ■

Configuring a Service to Log on Using a User Account Occasionally you might want to configure a service to log on using a specific user account. For example, you can configure a service to log on using a user account that is a member of the Guests group. Because the Guests group has few permissions, anyone accessing this service (locally, over the network, or over the Internet) will only have access to the data that is available to members of the Guests group. Administrators sometimes use this technique as a means to limit access to sensitive data on a server, particularly for services that don't require users to log on, such as Internet-based services. Configuring a service to log on using a specific user account can help protect your server from unauthorized Internet access.

⌐ **STEP BY STEP**

CONFIGURING A SERVICE TO LOG ON BY USING A USER ACCOUNT

1. Start the Services tool (see the steps on "Starting the Services Tool" earlier in this chapter).
2. In the right pane, right-click the specific service you want to configure to log on by using a user account, and then select Properties from the menu that appears.
3. In the service's Properties dialog box, click the Log On tab.
4. On the Log On tab, select the "This account" option, then click Browse to display a list of user accounts. Select the user account you want this service to log on using, and click OK.
5. In the service's Properties dialog box, type the password of the user account you selected in Step 4 in the Password text box. Retype this password in the "Confirm password" text box. Click OK.

Figure 15-16 shows the Properties dialog box of a service that has been config-
ured to log on using a user account. Notice that in this case the FTP Publishing
Service has been configured to log on by using the Guest account.
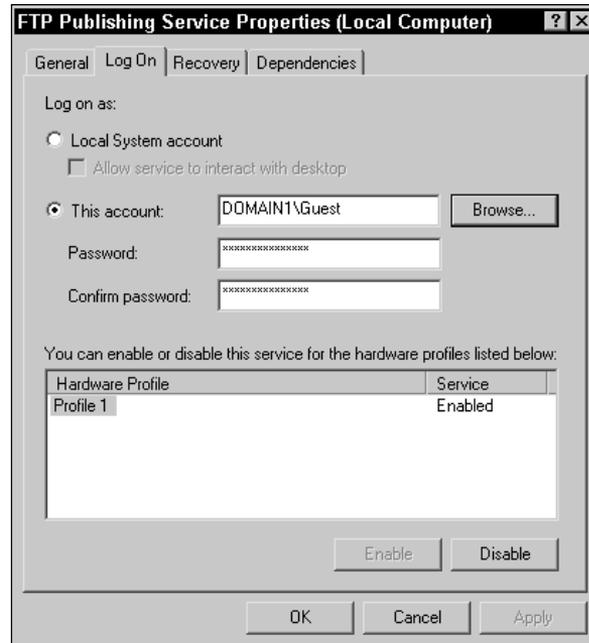

FIGURE 15-16 A service configured to log on by using a user account

6. Windows 2000 displays a message indicating that the selected user account
   has been granted the Log On As A Service right. Click OK.

7. Another message is displayed, indicating that the new logon name will not take
   effect until you stop and restart the service. Click OK.

8. In the right pane, right-click the service you have just configured, and select
   Restart from the menu that appears. Selecting Restart stops and immediately
   restarts the service.

9. Close Computer Management.

■ ■ ■

Enabling or Disabling a Service within a Hardware Profile You can use the
Services tool to enable or disable a service within a hardware profile.

CROSS-REFERENCE

I explained how to use the Services tool to perform this task when I covered hardware profiles in the "System" section in Chapter 5.

Configuring Recovery Options for a Service The Services tool has a useful new feature that enables you to configure, in advance of a service failure, the recovery actions that Windows 2000 will take when the service fails. You can configure it to take one of four specific actions on the service's first, second, and subsequent failures:

- **Take No Action:** Selecting this option causes Windows 2000 to do the obvious — nothing. This is the default setting for all service failures.
- **Restart the Service:** Selecting this option causes Windows 2000 to attempt to restart a service that has failed.
- **Run a File:** Selecting this option causes Windows 2000 to run a specified file (such as a batch file or a script file) when the service fails.
- **Reboot the Computer:** Selecting this option causes Windows 2000 to restart the computer when the service fails. This is probably not the option of choice in most situations.

STEP BY STEP

CONFIGURING RECOVERY OPTIONS FOR A SERVICE

1. Start the Services tool (see the steps on "Starting the Services Tool" earlier in this chapter).
2. In the right pane, right-click the specific service you want to configure recovery options for, and then select Properties from the menu that appears.
3. In the service's Properties dialog box, click the Recovery tab.
4. On the Recovery tab, select the options you want Windows 2000 to take if this service fails. Select an option for the service's first, second, and subsequent failures. Figure 15-17 shows the World Wide Web Publishing Service after its recovery options have been configured.
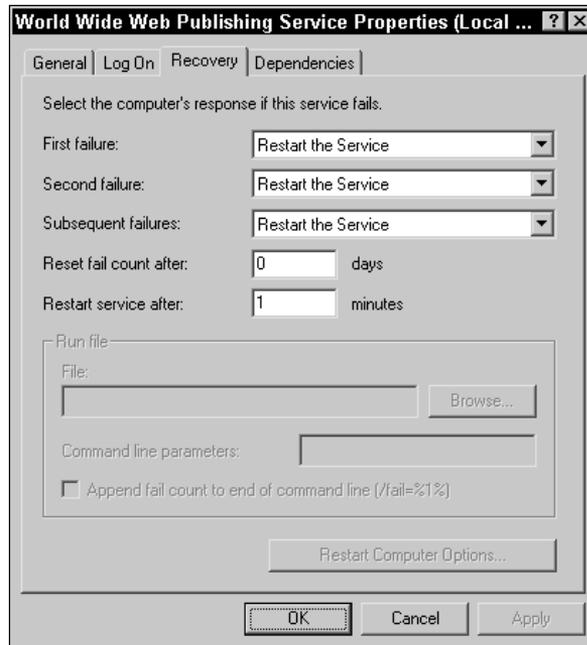
FIGURE 15-17 Configuring a service's recovery options

Notice that you can configure the number of days after which the service's fail count will be reset to 0. Also note that the service will be restarted, by default, after 1 minute. Change either or both of these two configuration settings, as needed.

If you select the Run a File option for any service failure, you must specify the complete path to the file that will be run in the File text box. If you don't know the complete path to the file, you can click Browse to find it. Also specify any command line parameters for this file in the "Command line parameters" text box.

If you select the Reboot the Computer option for any service failure, you can click the Restart Computer Options button (grayed out in Figure 15-17) to set the number of minutes that Windows 2000 will wait, after the service failure, to restart the computer. You can also configure a message that will be sent to all connected computers prior to restarting the computer.

Click OK when you are finished configuring this tab.

5. Close Computer Management.

Using Services to View Service Dependencies   Another nice feature of the Services tool, particularly for troubleshooting, is that you can use it to view service dependencies. Service dependencies are the services and drivers that must be running before the service in question can start. Suppose that you're having trouble starting the Messenger service on your Windows 2000 computer. You receive the warning message shown in Figure 15-18.

FIGURE 15-18 Dependency service error message

The message indicates that a service or group of services that the Messenger service is dependent on is not started. You can use the Services tool to view the service dependencies of the Messenger service. Once you know which services the Messenger service is dependent on, you can ensure that they are all started and running. Then, you should be able to successfully start the Messenger service.

⌐ STEP BY STEP

USING SERVICE TO VIEW SERVICE DEPENDENCIES

1. Start the Services tool (see the steps on "Starting the Services Tool" earlier in this chapter).

2. In the right pane, right-click the specific service for which you want to view service dependencies, and then select Properties from the menu that appears.

3. In the service's Properties dialog box, click the Dependencies tab.

4. The Dependencies tab appears, as shown in Figure 15-19. Notice the list of services that the Messenger service is dependent on. Click OK.

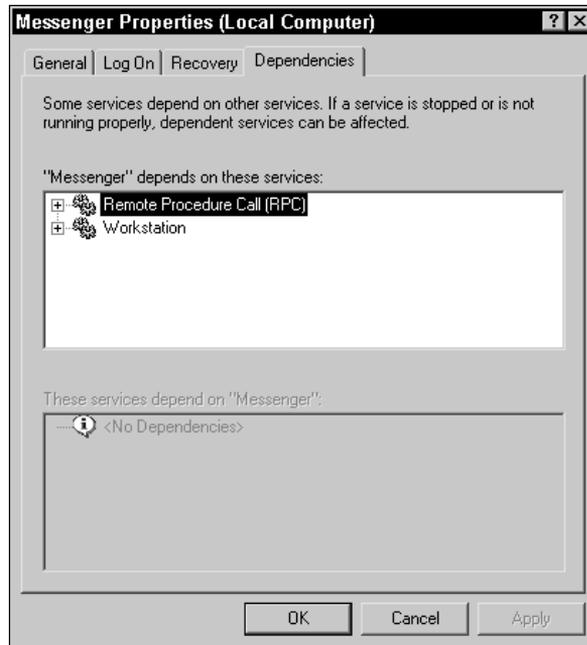⌐ **STEP BY STEP**   *Continued* ▌

FIGURE 15-19 Viewing service dependencies

5. Close Computer Management.

■ ■ ■

Configuring the SNMP service

Configuring the SNMP service is fairly straightforward, however, one of its features deserves special mention. The SNMP service is capable of sending out SNMP trap messages to other Windows 2000 computers that are configured to receive traps and record them in the receiving computers event log, or to a third-party SNMP management station. Trap messages are sent out when errors occur, or when significant system events (such as shutdown) occur. Figure 15-20 shows the Traps tab in the SNMP properties dialog box.
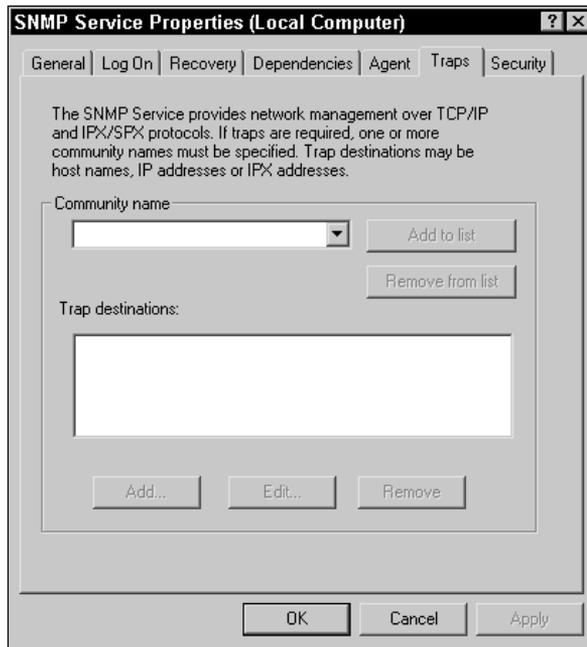
FIGURE 15-20 Configuring SNMP trap options

There are two configurable options in this dialog box, and both should be configured to enable the Windows 2000 computer to send traps.

- **Community name:** A community name is like an SNMP password. If your computer doesn't have the appropriate community name, the computer it is sending traps to will not accept the traps. In this text box, type in the appropriate community name and click Add to list. public is the most commonly used community name. You can add multiple community names if you are sending traps to multiple computers that each require a different community name.

- **Trap destinations:** This box displays the list of all computers to which trap messages will be sent. To add a computer to this list (which is empty by default) click Add, and then type in the computer's name in the SNMP Service Configuration dialog box that appears. You can add multiple trap destinations.

Configuring Other Connection Properties

In addition to configuring a connection's modem, protocols, clients, and services, you can also configure security options (for dial-up and direct

connections), rename connections, and create shortcuts for connections on your desktop.

Configuring Security Options for Dial-up and Direct Connections

You can use the Security tab in a direct or dial-up connection's Properties dialog box to configure security options for that connection. Figure 15-21 shows the Security tab for a dial-up connection, in this case, a dial-up connection to a remote access server.
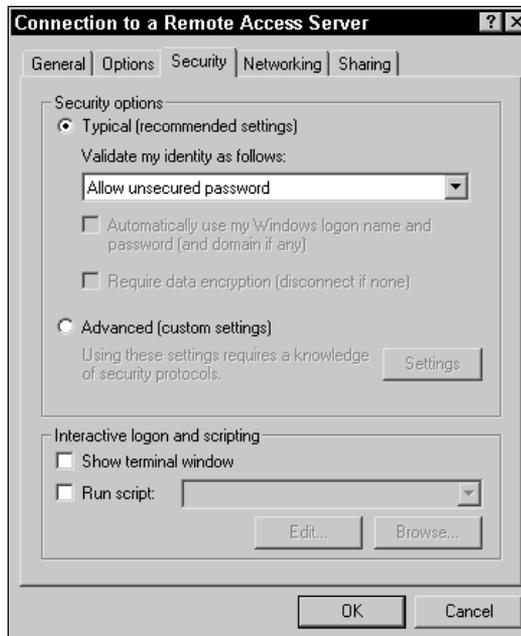

FIGURE 15-21 Configuring security options

There are several options you can configure on this tab. The Security options on this tab are

- **Typical (recommended settings):** This security setting option, which is selected by default, is appropriate for most situations. If you select this option, you can define security settings by configuring three common suboptions:
  - ▶ **Validate my identify as follows:** This configuration determines the type of authentication Windows 2000 requires when establishing this connection. You can select from three options: You can choose to "Allow unsecured password," which means that Windows 2000

will use the least secure method of authentication accepted by the remote server. This option is selected by default. Or, you can choose to "Require secured password," which means that Windows 2000 will encrypt your password before sending it to the remote server to establish a connection, and that Windows 2000 won't be able to connect to the remote server if it does not support some form of encrypted authentication. Or, you can choose "Use smart card," which means that Windows 2000 will require you to insert your smart card into a smart card reader on your computer to authenticate you to the remote server.

> ▸ **Automatically use my Windows logon name and password (and domain if any):** This option is only available if you selected "Require secured password" in the "Validate my identity as follows" drop-down list box. Selecting this option causes Windows 2000 to automatically make the connection by using your currently logged on user name and encrypted password.

> ▸ **Require data encryption (disconnect if none):** This option is only available if you selected "Require secured password" or "Use smart card" in the "Validate my identity as follows" drop-down list box. Selecting this option causes Windows 2000 to require that all data sent on the connection (both to and from the remote server) be sent in an encrypted format. If the remote server does not support data encryption, Windows 2000 will automatically disconnect your computer from the remote server.

■ **Advanced (custom settings):** Selecting this option enables you to choose which specific password authentication methods can be used by this connection, and whether or not data encryption will be used. If you select this option, you should have a knowledge of authentication protocols, and the security implications of using each of these protocols. Once you select the Advanced (custom settings) option, click Settings to configure specific security settings to be used by this connection.

The options in the Interactive logon and scripting section are:

TIP

Only dial-up connections have an option to configure interactive logon and scripting — direct and VPN connections do not.

- **Show terminal window:** If you select this check box, a terminal window will be displayed each time you initialize this connection. This terminal window enables you to send commands from the keyboard directly to the dial-up server. Don't select this option unless the remote server requires it — if you do, your connection may not work correctly.

- **Run script:** If you select this check box, you can specify a script that will send commands from your computer directly to the dial-up server. This process automates the connection process and takes the place of using a terminal window. Several default scripts are available in the drop-down list box in this dialog box, or, if you want to write your own script, you can click Edit to display a copy of the `Switch.inf` file in the Notepad text editor. The `Switch.inf` file includes instructions for creating new script files. Don't select this option unless the remote server requires you to send specific commands to establish the connection — if you do, your connection may not work correctly.

Renaming Connections and Creating Shortcuts

Occasionally you might want to rename a connection, or create a shortcut to a connection on your desktop.

Probably the most common reason for renaming a connection is to make it more readily apparent to users what the connection is used for. For example, suppose you have a dial-up connection named "Connection to 636-0031." It's pretty difficult for a user to know whether this is a connection to an ISP, or a dial-up connection to the company network. If you rename the connection "Connection to the Internet," it will alleviate uncertainty for users.

All types of connections can be renamed except Incoming Connections. Renaming a connection is quite simple: In the `Network and Dial-up Connections` folder, right-click the connection you want to rename, then select Rename from the menu that appears. Type a new name for the connection, and press Enter.

If you use a dial-up, direct, or VPN connection frequently, you may find it useful to create a shortcut to the connection on your desktop. To create a shortcut to a connection, in the `Network and Dial-up Connections` folder, right-click the connection to which you want to create a shortcut, then select Create Shortcut from the menu that appears. Click Yes when Windows 2000 asks if you want the shortcut to be placed on the desktop.

> **TIP**
>
> You can also create a shortcut to a connection by dragging the connection from the `Network and Dial-up Connections` folder and dropping it on your desktop.

▽ **KEY POINT SUMMARY** ▽

This chapter introduced several important connection-related topics:

- Windows 2000 supports several different kinds of connections: local area connections, dial-up connections, direct connections, virtual private network (VPN) connections, and incoming connections.

- A VPN connection is a private, encrypted connection between two computers that can already communicate with each other by using TCP/IP.

- During installation, Windows 2000 automatically creates a local area connection for each network adapter that it detects in your computer. All other types of connections must be created.

- The `Network and Dial-up Connections` folder is used to create, configure, and manage connections. You can use the Network Connection Wizard in this folder to create connections.

- Before you can create dial-up connections to the Internet, remote access servers, and so on, you need to install and configure at least one modem in your Windows 2000 computer.

- Configuring two Windows 2000 computers to directly connect to each other (via a cable or infrared ports) involves configuring one of the computers to accept an incoming connection, and configuring the other computer to directly connect to the other.

- Modem properties configured by using Phone and Modem Options will apply to the modem as it is used by all newly created connections. Modem properties configured by using a dial-up connection's Properties dialog box will apply to the modem only as it is used by that dial-up connection.

- Internet Connection Sharing is commonly used in a home or small-office network setting when a single Internet connection must be shared by multiple computers. In order to enable this feature, the computer must have both a local area connection and a connection to the Internet.

- You may need to install and configure additional network clients, services, and protocols to fully support the connections on your Windows 2000 computer, and to support interoperability with other operating systems.

- When you install a network client, service, or protocol, it is generally available to *all* connections on your computer, even if you accomplish the installation task by configuring the properties of a specific connection.

- All network clients and network protocols can be installed by using the `Network and Dial-up Connections` folder. You can also use this folder to install the QoS Packet Scheduler service and the SAP Agent service. All other services can be installed by using Add/Remove Programs.

- Bindings specify three specific properties of a local area connection: which installed client(s) or service(s) the connection uses, which protocol(s) are used by (or *bound* to) each selected client or service, and the order in which selected protocols are used by each associated client or service.

- You can use the Services tool in Computer Management to perform configuration tasks, including: starting and stopping a service, configuring a service's startup type, configuring a service to log on by using a user account, and so on.

STUDY GUIDE

This section contains several exercises that are designed to solidify your knowledge about creating and configuring connections on a Windows 2000 computer, and to help you prepare for the Professional, Server, and Network exams:

- **Assessment Questions:** These questions test your knowledge of the connection topics covered in this chapter. You'll find the answers to these questions at the end of this chapter.

- **Scenarios:** The situation-based questions in scenarios challenge you to apply your understanding of the material to solve a hypothetical problem. In this chapter's scenario, you are asked to troubleshoot some common connection problems. You don't need to be at a computer to do scenarios. Answers to this chapter's scenarios are presented at the end of this chapter.

- **Lab Exercise:** These exercises are hands-on practice activities that you perform on a computer. The lab in this chapter gives you an opportunity to practice creating and configuring connections on your Windows 2000 computer.

Assessment Questions

1. You want to create a virtual private network (VPN) connection on a Windows 2000 computer. What tool should you use?

    A. Phone and Modem Options

    B. Wireless Link

    C. Internet Connection Wizard

    D. `Network and Dial-up Connections` folder

2. You want to enable Internet Connection Sharing on a Windows 2000 computer. The computer has several existing connections. On which connection should you enable Internet Connection Sharing?

    A. VPN Connection

    B. Local Area Connection

C. Dial-up Connection to the Internet

D. Dial-up Connection to Remote Access Server

3. You are considering enabling Internet Connection Sharing on a Windows 2000 computer on your network. You are concerned about the changes that enabling Internet Connection Sharing will cause on this computer. What changes will Windows 2000 make to this computer once Internet Connection Sharing is enabled? (Choose all that apply.)

A. The computer will become a domain controller.

B. The computer will become a DHCP server.

C. The computer will become a DNS proxy server.

D. The computer's IP address will be changed.

4. You want to connect two computers, Computer_A and Computer_B, to each other by using infrared ports. What type of connection (or connections) should you configure?

A. Configure Computer_A to accept incoming connections, and configure Computer_B to directly connect to Computer_A.

B. Configure both Computer_A and Computer_B with virtual private connections.

C. Configure Computer_A to directly connect to Computer_B, and configure Computer_B with a dial-up connection to a remote access server.

D. Configure a new local area connection on both Computer_A and Computer_B.

5. You are planning to install and configure network services for inter-operability on your Windows 2000 Server computer. You specifically want this server to maintain and advertise a list of servers that use the NWLink IPX/SPX/NetBIOS Compatible Transport Protocol. What service should you install?

A. Indexing Service

B. NNTP Service

C. RIP Listener

D. SAP Agent

6. You want to configure a Windows 2000 Server computer so that it can log in to an older NetWare server and access the files and printers on that NetWare server. Which client and network protocol should you install and configure on the Windows 2000 Server computer?

   A. Client Service for NetWare, and NetBEUI Protocol

   B. Client Service for NetWare, and NWLink IPX/SPX/NetBIOS Compatible Transport Protocol

   C. Gateway (and Client) Services for NetWare, and NWLink IPX/SPX/NetBIOS Compatible Transport Protocol

   D. Gateway (and Client) Services for NetWare, and DLC Protocol

7. You want to configure bindings and provider order on a Windows 2000 computer. Which tool should you use?

   A. `Network and Dial-up Connections` folder

   B. Windows Explorer

   C. System

   D. Device Manager

8. You want to configure a service to log on by using a specific user account. Which tool should you use?

   A. System

   B. Services

   C. Active Directory Users and Computers

   D. `Network and Dial-up Connections` folder

Scenarios

Troubleshooting connection problems on a Windows 2000 computer requires attention to detail and can be quite painstaking. For each of the following problems, consider the facts given and answer the questions that follow.

1. Your Windows 2000 computer has two local area connections. One local area connection is connected to your home network, and the other is connected to a cable modem for Internet access. You recently enabled Internet Connection Sharing for one of these connections, but users on your home network report that they are unable to access the Internet.

    a. What is the most likely cause of this problem?

    b. What should you do to resolve the problem?

2. You recently installed and configured TCP/IP on your Windows 2000 computer. However, your computer is now unable to communicate with all other computers on your network that use TCP/IP.

    a. What is the most likely cause of this problem?

    b. What should you do to resolve the problem?

Lab Exercise

Lab 15-1 Creating and Configuring Connections

► Professional
► Server
► Network

The purpose of this lab is to provide you with an opportunity to create and configure connections on your Windows 2000 computer.

There are five parts to this lab:

- Part 1: Installing and Configuring a Modem
- Part 2: Creating and Configuring Connections
- Part 3: Configuring Internet Connection Sharing
- Part 4: Installing and Configuring Protocols, Clients, and Services
- Part 5: Configuring Bindings

Begin this lab by booting your computer to Windows 2000 Server and logging on as Administrator.

Part 1: Installing and Configuring a Modem

In this part you install and configure a modem on your Windows 2000 computer that will be used by the dial-up connections you'll create later in this lab.

> **TIP**
>
> You'll be installing device drivers for a modem in this part, but you don't have to actually have a modem.

1. Select Start ⇨ Settings ⇨ Control Panel.
2. In the Control Panel dialog box, double-click Phone and Modem Options.
3. In the Phone And Modem Options dialog box, click the Modems tab.
4. On the Modems tab, click Add.
5. The Add/Remove Hardware Wizard starts and displays the Install New Modem screen. Select the check box next to "Don't detect my modem, I will select it from a list." Click Next.
6. In the next Install New Modem screen, select a manufacturer of "(Standard Modem Types)," and select a model of Standard 56000 bps V90 Modem. Click Next.
7. In the next Install New Modem screen, ensure that the "Selected ports" option is selected. Then highlight one of the COM ports and click Next.
8. Windows 2000 installs the modem. Click Finish.
9. In the Phone And Modem Options dialog box, click OK.
10. Close Control Panel.

Part 2: Creating and Configuring Connections

In this part you use the `Network and Dial-up Connections` folder to create and configure several connections. First, you create dial-up connections to the Internet and to a remote access server. Then, you create a VPN connection.

1. Select Start ⇨ Settings ⇨ Network and Dial-up Connections.
2. In the `Network and Dial-up Connections` folder, double-click Make New Connection.

3. The Network Connection Wizard starts. Click Next.

4. In the Network Connection Type screen, select the "Dial-up to the Internet" option. Click Next.

5. The Internet Connection Wizard starts. Select the "I want to set up my Internet connection manually" option, and click Next.

6. In the "Setting up your Internet connection" screen, select the "I connect through a phone line and a modem "option. Click Next.

7. In the Choose Modem screen, select the Standard 56000 bps V90 Modem from the drop-down list box. Click Next.

8. In the "Step 1 of 3: Internet account connection information" screen, enter your area code in the "Area code" text box. Then enter **555-1212** in the "Telephone number" text box. Click Next.

9. In the "Step 2 of 3: Internet account logon information" screen, accept the default user name of Administrator, and type in a password of **password**. Click Next.

10. In the "Step 3 of 3: Configuring your computer" screen, enter a connection name of **Internet Connection** in the text box provided. Click Next.

11. In the Set Up Your Internet Mail Account screen, select the No option. Click Next.

12. In the Completing the Internet Connection Wizard screen, clear the check box next to "To connect to the Internet immediately, select this check box" and click Finish.

13. Windows 2000 creates the Internet Connection and displays it in the `Network and Dial-up Connections` folder. Double-click Make New Connection.

14. The Network Connection Wizard starts. Click Next.

15. In the Network Connection Type screen, select the "Dial-up to private network" option. Click Next.

16. In the Select a Device screen, select the check box next to "Modem - Standard 56000 bps V90 Modem." Ensure that all other check boxes are cleared. Click Next.

17. In the Phone Number to Dial screen, type **555-1212** in the "Phone number" text box. Click Next.

18. In the Connection Availability screen, select the "For all users" option. Click Next.

19. In the Internet Connection Sharing screen, ensure that the check box next to "Enable Internet Connection Sharing for this connection" is cleared. Click Next.

20. In the Completing the Network Connection Wizard screen, type in a connection name of **Remote Access Server** in the text box provided. Click Finish.

21. In the Connect Remote Access Server dialog box, click Cancel.

22. Your new Remote Access Server connection is displayed in the `Network and Dial-up Connections` folder. Double-click Make New Connection.

23. The Network Connection Wizard starts. Click Next.

24. In the Network Connection Type screen, select the "Connect to a private network through the Internet" option. Click Next.

25. In the Public Network screen, ensure that the "Automatically dial this initial connection" option is selected, and that "Internet Connection" is selected in the drop-down list box. Click Next.

26. In the Destination Address screen, type **server01.domain1.mcse** in the text box and click Next.

27. In the Connection Availability screen, select the "For all users" option. Click Next.

28. In the Internet Connection Sharing screen, ensure that the check box next to "Enable Internet Connection Sharing for this connection" is cleared. Click Next.

29. In the Completing the Network Connection Wizard screen, accept the default name for this connection of Virtual Private Connection. Click Finish.

30. In the Initial Connection dialog box, click No.

31. Windows 2000 creates the VPN and displays it in the `Network and Dial-up Connections` folder. Continue to Part 3.

Part 3: Configuring Internet Connection Sharing

In this part, you enable Internet Connection Sharing on your dial-up connection to the Internet.

CAUTION

This part of the lab will modify your computer's TCP/IP configuration. If you are connected to a live network, I recommend you don't do this part.

1. In the `Network and Dial-up Connections` folder, right-click the connection named Internet Connection, and select Properties from the menu that appears.

2. In the Internet Connection Properties dialog box, click the Sharing tab.

3. On the Sharing tab, select the check box next to "Enable Internet Connection Sharing for this connection." Click OK.

4. In the Network and Dial-up Connections confirmation dialog box, click Yes.

5. In the real world, you'd be done enabling Internet Connection Sharing at this point. However, in order to successfully complete the rest of the labs in this book, you'll need to disable Internet Connection Sharing. So, in the `Network and Dial-up Connections` folder, right-click the connection named Internet Connection, and select Properties from the menu that appears. Then click the Sharing tab. Then, on the Sharing tab, clear the check box next to "Enable Internet Connection Sharing for this connection." Click OK. Continue on to Part 4.

Part 4: Installing and Configuring Protocols, Clients, and Services

In this part, you install and configure the NWLink IPX/SPX/NetBIOS Compatible Transport Protocol on your Windows 2000 computer. Then, you install the SAP Agent and Gateway (and Client) Services for NetWare.

1. In the `Network and Dial-up Connections` folder, right-click your Local Area Connection, and select Properties from the menu that appears.

2. In the Local Area Connection Properties dialog box, click Install.

3. In the Select Network Component Type dialog box, highlight Protocol and click Add.

4. In the Select Network Protocol dialog box, highlight NWLink IPX/SPX/NetBIOS Compatible Transport Protocol. Click OK.

5. Windows 2000 installs the protocol you selected, and returns you to the Local Area Connection Properties dialog box. The installation process may take a minute or so.

6. In the Local Area Connection Properties dialog box, highlight NWLink IPX/SPX/NetBIOS Compatible Transport Protocol, and click Properties.

7. In the NWLink IPX/SPX/NetBIOS Compatible Transport Protocol Properties dialog box, type in an internal network number of **48972345**. Select the "Manual frame type detection" option, and click Add.

8. In the Manual Frame Detection dialog box, select a frame type of Ethernet 802.2 from the "Frame type" drop-down list box. Type in a network number of **29987**. Click OK.

9. In the NWLink IPX/SPX/NetBIOS Compatible Transport Protocol Properties dialog box, click OK.

10. In the Local Area Connection Properties dialog box, click Install.

11. In the Select Network Component Type dialog box, highlight Service and click Add.

12. In the Select Network Service dialog box, highlight the SAP Agent and click OK.

13. In the Local Area Connection Properties dialog box, click Install.

14. In the Select Network Component Type dialog box, highlight Client and click Add.

15. In the Select Network Client dialog box, highlight Gateway (and Client) Services for NetWare. Click OK.

16. Two dialog boxes appear, one after the other. In the Select NetWare Logon dialog box (the second dialog box that appears), click OK. In the Local Network dialog box, click Yes to restart your computer now.

17. Reboot your computer to Windows 2000 Server and log on as Administrator. Continue to Part 5.

Part 5: Configuring Bindings

In this part, you configure bindings on your Windows 2000 Server computer.

1. Select Start ⇨ Settings ⇨ Network and Dial-up Connections.

2. In the `Network and Dial-up Connections` folder, select Advanced ⇨ Advanced Settings.

3. In the Advanced Settings dialog box, highlight the Local Area Connection in the Connections box.

4. In the Bindings for Local Area Connection box, in the protocol list under the Client for Microsoft Networks, highlight the NWLink IPX/SPX/NetBIOS Compatible Transport Protocol. Then, to the right of this box, click the down arrow button to move the protocol down in the list. When you finish this procedure, Internet Protocol (TCP/IP) will be the first protocol in the list under Client for Microsoft Networks, and NWLink will be the second protocol in the list. Click OK.

5. Close the `Network and Dial-up Connections` folder.

Answers to Chapter Questions

Chapter Pre-Test

1. Windows 2000 automatically creates a local area connection for each network adapter that it detects in a Windows 2000 computer.

2. A virtual private network (VPN) connection is a private, encrypted connection between two computers that can already communicate with each other by using TCP/IP.

3. Before you can create a dial-up connection, you must have a modem installed in your Windows 2000 computer.

4. If you have a connection to the Internet on your Windows 2000 computer, and you want to enable other computers on your local area network to use that connection to access the Internet, you might want to enable Internet Connection Sharing for the specific connection that will be shared. Internet Connection Sharing is commonly used in a home or small-office network setting when a single Internet connection must be shared by multiple computers.

5. Bindings are local area connection configuration options that specify three specific properties of a local area connection:
    a. Which installed client(s) or service(s) the connection uses
    b. Which protocol(s) are used by (or *bound* to) each selected client or service
    c. The order in which selected protocols are used by each associated client or service

    Provider order is a connection configuration option that specifies which installed client the computer's connections will use first when it attempts to connect to a server or a printer.

6. In addition to installing network protocols, you may also need to install and configure additional network clients and services to fully support the connections on your Windows 2000 computer, and to support *interoperability* with other *operating systems.*

7. Network clients enable your Windows 2000 computer to access resources located on other servers on the network.

8. Services enable computers that run other operating systems to access resources on the Windows 2000 computer.

Assessment Questions

1. **D.** Use the Network Connection Wizard in the `Network and Dial-up Connections` folder to make new connections.

2. **C.** Internet Connection Sharing should always be enabled on the connection that the computer uses to connect to the Internet. In this case, that's a dial-up connection to the Internet.

3. **B, C, D.** Internet Connection Sharing should not be used on networks that have existing routers, DNS servers, or DHCP servers, because once Internet Connection Sharing is enabled on a computer, Windows 2000 automatically makes that computer into the gateway, DNS proxy server, and DHCP server for that network segment, and assigns this computer an IP address of 192.168.0.1.

4. **A.** To directly connect the two computers by using infrared ports, you must configure one of the computers to accept incoming connections, and configure the other computer to directly connect to the other.

5. **D.** The SAP Agent enables a Windows 2000 computer to maintain and advertise a list of servers (such as NetWare servers) that use the NWLink IPX/SPX/NetBIOS Compatible Transport Protocol.

6. **C.** The correct client is Gateway (and Client) Services for NetWare. Any answer that contains Client Service for NetWare is incorrect because this client can only be installed on Windows 2000 Professional computers, not on Windows 2000 Server computers. The correct protocol is NWLink IPX/SPX/NetBIOS Compatible Transport Protocol.

7. **A.** Use the Advanced Settings option in the Advanced menu in the `Network and Dial-up Connections` folder to configure bindings and provider order.

8. **B.** You can use the Services tool in Computer Management to configure services.

Scenarios

1. The most likely cause of this problem is that you enabled Internet Connection Sharing on the wrong connection. Internet Connection Sharing must be enabled on the connection that is used to access the Internet. In this case, Internet Connection Sharing must be enabled on the connection that is connected to the cable modem. To resolve the problem, disable Internet Connection Sharing on the local area connection that connects to your home network, and enable it on the connection that is connected to your cable modem.

2. The most likely cause of this problem is an incorrect TCP/IP setting, such as the computer's IP address. To resolve the problem, ensure that all TCP/IP settings on your computer are configured correctly, with settings that are compatible with the other computers on your network that use TCP/IP.