Managing a Network

"So much of what we call management consists in making it difficult for people to work."

—PETER DRUCKER

In this chapter, you will learn how to:

■ **Describe Windows network management tools**

■ **Implement Windows and NetWare network management**

Building a network can be likened to initiating a project. You try to efficiently complete a project such that the initial and adjusted goals are met using limited resources (and budget). This is true for the network you created, and it is now time for the next step—ensuring that your network's users can continue to use the network. This means you need to manage the network. Management, in the business sense, involves continuing to meet a set of refinable goals using a company's physical, intellectual, and human resources. Your goal now is to manage your network, whether you continue in a technical direction or apply these basics in a more managerial role.

In this chapter, you will learn more about managing your classroom network. You will first learn about tools available on your Windows workstation computers, and also about some available on your server. You will learn how users can help manage their own computers by running utilities that check their disks or defragment their storage, backing up their own files, and viewing their active tasks using Task Manager. On your server, you will learn about using the Simple Network Management Protocol (SNMP), Performance console, and Network Monitor. You will also learn about the compression and quota-management tools available on NTFS volumes. Then, you will learn to use Novell's text-based commands and NetWare Loadable Modules at the NetWare server console. Finally, you will examine some of the features of specific NetWare utilities, such as MONITOR, DSREPAIR, and NWCONFIG.

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◼ Describing Windows Network Management Tools

Your network, like that of SinkRSwim Pools, is centered around the main network operating system server you installed—the Windows 2000 Server—and the computer users access its resources through Windows XP Professional workstations connected to the network. The SinkRSwim Pool workers throughout the company have gradually become accustomed to using their newfound network resources. What's more, they have quickly become dependent upon those networked resources to get their day-to-day jobs done more effectively. Whenever the network is down, the SinkRSwim network community complains loudly that they want their network back. Ricky is only too glad to learn more about keeping the company's network healthy and being able to monitor it for signs that problems may be building so he can head them off before the network fails—even for a moment.

You have seen throughout this course that there are many complicated components associated with today's corporate-sized network operating systems and the advanced workstation computers where their networking services are employed. If any piece at either end, or anywhere in between, breaks down or stops communicating with the other pieces, whoever is managing the network will be expected to know how to fix the problem, and quickly. Therefore, the more you know about networks, the better you will be able to perform network support.

Some things can be managed by the users at their own workstations, but these things will only help support the network, not relieve anyone of the responsibility for keeping the whole system working. Therefore, now that your network is installed and operational, you should learn as much about these components as possible so you can keep them working and know how to get your system, itself, to help maintain your network.

Windows XP Professional Workstation Tools

The heart of most people's work on a network is their workstations. In addition to this being where users perform their work, the remote access that servers allow is fast becoming the most common way to manage a network, from anywhere inside (and oftentimes outside) the company. It is essential, therefore, for workstations to operate properly. The failure of a workstation obviously has an adverse effect on that particular user's network capability. Should that workstation also house additional networked resources, such as shares, other users' capabilities may also be affected.

To make troubleshooting a little complicated, what initially may appear to a user to be a networking failure quite frequently turns out to be a failure somewhere on the user's own workstation (in the workstation's internal hardware or something else locally installed) that requires a technician's intervention. As a networking specialist, you will probably not be making this type of workstation repair, but you should keep in mind that users will often blame the person maintaining the network first, and ultimately the network itself. Additionally, it may be your responsibility to differentiate between network troubles and a hardware problem that gets passed to the technician.
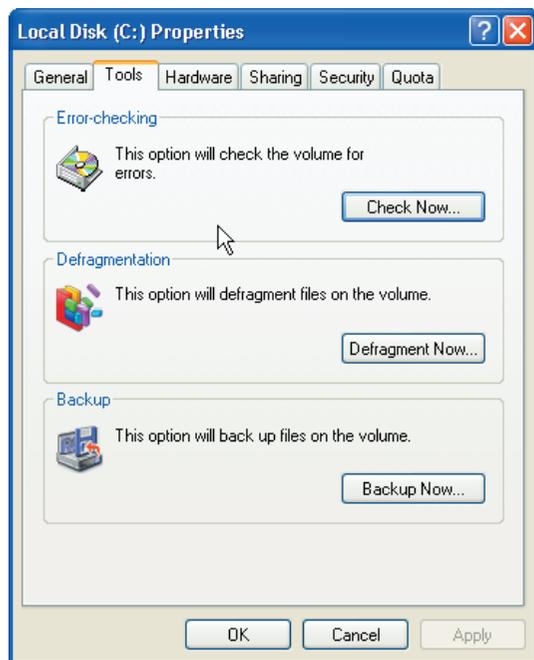
• The three disk drive tools available to users

Many of the tools and techniques covered in the next sections can be used through your users' workstations. Although all the tools discussed here are intended for server management, four can also be used when troubleshooting local components. Making sure your users know how to use some of these tools will help you keep networked resources and the users themselves online, but you will have to decide which of the tools you want them using.

The four tools discussed here can be helpful if used on the workstation by the users themselves. You should think about teaching your users how to use all four so they can perform some local machine management themselves. Three of the tools are available through the disk drive itself, and the other can be reached through the taskbar.

Tools for Use on Local Disks

Three very powerful management tools are available on all your networked computers: the Error-Checking, Defragmentation, and Backup utilities. These tools can be reached by your users through the Properties dialog box by right-clicking on any hard disk attached to their computers.

Error-Checking Tool   The first tool listed on the Tools tab of a workstation's hard disk drive's Properties window is the Error- Checking tool, which, as its name implies, checks your drive for errors—it is also called the Check Disk tool. Clicking the Check Now button starts this tool. Frequent use of the Error-Checking tool lets users scan their hard disk drives and verify whether any operating system or filing system errors have occurred. If such errors exist, it gives them options for fixing those errors.
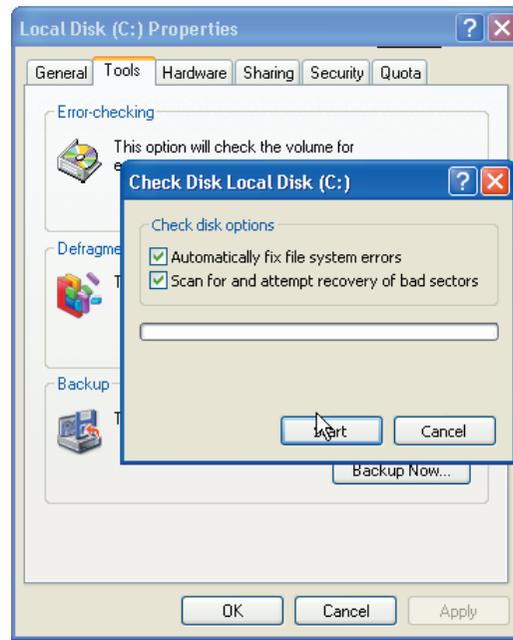

• The Check Now option

   You can also run the Error-Checking utility immediately through a DOS command by typing **chkdsk** in the Run dialog box (accessed through the Start menu). This will run the tool but not make any corrections. Typing **chkdsk /f** will run the tool and make corrections (the /f switch tells it to fix any problems it finds), but it will only run upon restart if the disk drive being tested is currently being used.

After clicking the Check Now button, the Check Now window for the local disk appears, displaying the two option boxes that control which function is to be completed by the Error-Checking tool. Clicking OK at this point, with the default settings (neither option selected), will simply scan the disk and return any errors. No repair actions will be performed, and this scan is accomplished very quickly. However, the typical use of the Error-Checking tool involves clicking the first option box so that the Error-Checking tool automatically fixes any file system errors that are identified in the repair process. When the tool makes those repairs, the process takes a bit longer, but it is still relatively fast.

Inside Information

How Often Is Enough?

Users will often ask how often they should perform the maintenance techniques you show them or run tools similar to those discussed in this section. You should temper your immediate response—that they cannot be run enough—with the realization that users have varying levels of both technical ability and computer use. For both reasons, users may not need to maintain their systems as diligently as you would consider normal.

Rather, your response to them should be to tell them that the three tools should be performed on a monthly, weekly, daily, or hourly basis depending on the numbers and types of files they use and how easily they can get along without those files. A user working with a lot of client financial records that simply cannot be lost should use management tools more often than someone working with relatively few files that are easily re-created.

A better solution would be to recommend the weekly use of these tools by your users. You, yourself, may be performing them on a less frequent basis but you could instruct your users to increase or decrease the frequency of these tests by doing their own tests. You should tell them that a good way to decide how often they should conduct their own use of these management tools should be based on how difficult it would be to work without the material contained on their computer.
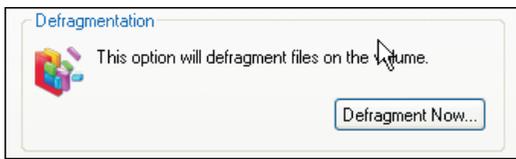
The other option available in the Check Now window allows users to scan for and attempt to recover bad sectors on the hard disk itself (or multiple hard disks if so equipped). While this is normally a fast process, simply because finding errors is rare, this option can take a long time if errors are located. If the tool does find errors and repairs them, you should then run the Defragmentation tool to relocate the information that was moved from the bad sectors so that it is stored contiguously. You should also give serious thought to replacing the disk drive, or at least backing up the information on the drive to another location, and doing so more often.

The hard disk being inspected by the Error-Checking tool must not be in use. If that hard disk's system files or any of its stored files or applications are currently being used, the tool notifies the user that the system cannot be checked without restarting the computer. It also asks whether the user wants the system to be checked when the computer is next started. Upon restart, the system's files are checked before being put into use. Additionally, when the Error-Checking tool is used on NTFS volumes, all actions taken during the repair process are tracked, any bad clusters are repaired automatically, and important information on all files is copied and stored on the disk.

• You can schedule the disk to be checked the next time you restart your computer.

Cross Check

Alternative Defrag Location

Can you remember the discussion about the Disk Defragmenter? If not, go back and read that section, entitled "Windows File Systems," in Chapter 7 again before answering the following questions:

1. For which of the two main Windows file systems is defragmenting your disks more important?

2. The discussion in this chapter shows you how to access the Defragmentation tool through your disk drive's Properties dialog box. What method was used to access the Disk Defragmenter in the discussion in Chapter 7?

• The Defragmentation tool

Defragmentation Tool   You have already learned about defragmenting your hard disks in Chapter 7 of this text. However, the convenience of having the Defragmentation tool in the same location as the Error-Checking and Backup tools makes it easy for your users. When you explain how they can help with their own workstation management, it is better to show them that the tool is easy to use and easy to find as well. Clicking the Defragment Now button will start the same Disk Defragmenter that you studied in Chapter 7, and the procedures for its use are the same when it is started from the Properties dialog box.

The Defragmentation tool uses the Disk Defragmenter window. Along the top of the window are the menus and toolbars, which are like those on Microsoft Management Console. The section shown here lists pertinent information about each of the computer's volumes. To select a drive to defragment, just click on it.

Immediately below the volume-identification section are two horizontal bars where graphic depictions of your disk drive will be displayed. Click the Analyze button to allow the tool to check the drive to see if the data stored there is fragmented. The top bar will show the estimated disk usage before defragmentation.
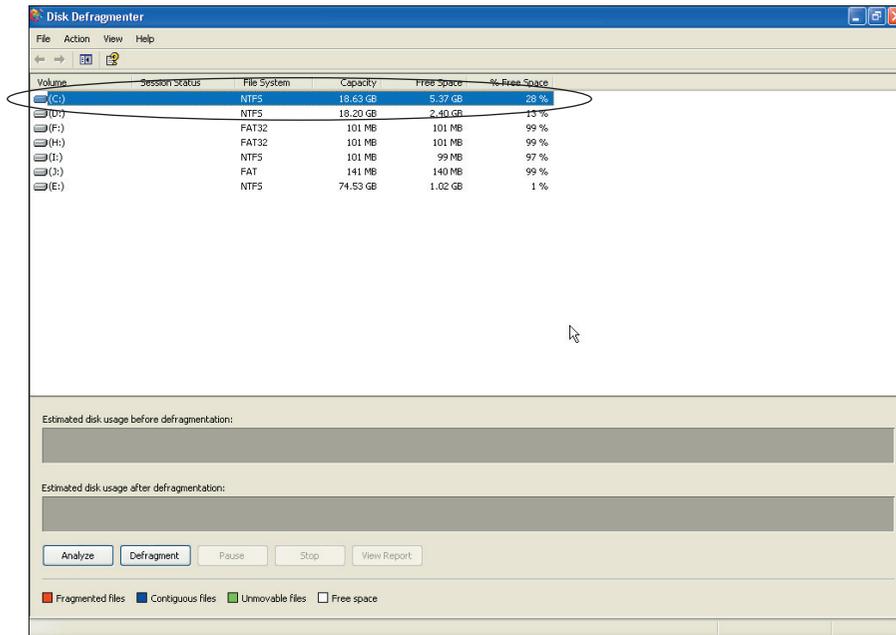

• The Disk Defragmenter window

Clicking the Defragment button also displays the "before defragmentation" depiction, but it does so as a reference point, since the program also begins to actually defragment your drive. The Estimated Disk Usage After Defragmentation bar provides a dynamically updated representation of the defrag process in action. You can actually watch your disk's information being moved from location to location as pieces are joined back together.
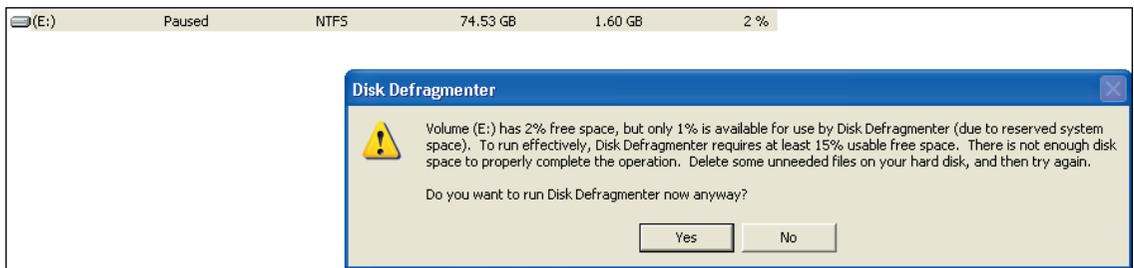
• Your computer will let you know whether you have enough free space for efficient defrag performance.

When the defrag operation is complete, you will be notified and can use the color codes in the fourth section (under the row of buttons below the two rows of graphical information) to determine the status of each identified area on the disk. You also have the option of either reviewing the tool's report to see a listing of files that could not be moved, or clicking the Close button to return to the Disk Defragmenter, where you can select another volume to defragment.

For effective operation, the Defragmentation tool requires that 15 percent of the total space available on your volume be available as free space that can be used when moving files. However, if you don't have that much free space, you can still conduct the defrag operation if you don't mind spending a bit more time completing the process.
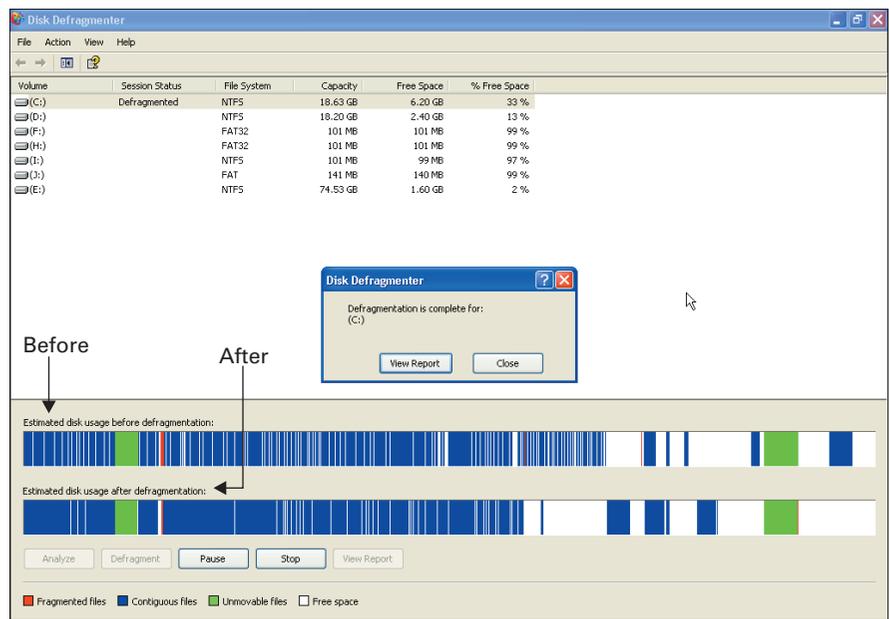
• The Defragmentation tool displays "before" and "after" depictions of your data.

Try This!

Defragmenting Your C: Drive

Use the Defragmentation tool to defrag your hard disk. Try this:

1. Click the Start button, select My Computer, right-click your C: drive, and select Properties. Your drive's Properties dialog box will open.

2. Click the Tools tab, and click the Defragment Now button.

3. Click the Analyze button, and note whether the system suggests that you conduct a defrag operation.

4. Click the Defragment button to initiate the defrag operation, and observe the two graphical depictions of your disk's information.

5. Click OK when the defragmentation is complete.

Remember, no matter how you get to the utility, defragmentation is a matter of taking noncontiguous or fragmented information and re-loating its many pieces such that they are side by side (contiguous). Reading from or writing to contiguous data is much faster than doing either with noncontiguous information—storing or retrieving a file's information can be done in one continuous action on contiguous information. Otherwise, with noncontiguous data, your computer has to read or write a section, pick up the disk's head, look for the next segment, and then similarly continue to read or write additional sections until the file is complete.

Furthermore, after defragmentation is complete, the likelihood of new files being stored in noncontiguous space is lessened. This is because the Defragmentation tool, in putting your files back together, also joins your empty disk spaces together as well. Any new files written to your computer can thus be located in the newly recombined contiguous empty space. Since contiguous space is read and written to more efficiently, your computer can be noticeably faster after a defragmentation operation has been completed.

Backup Tool In Chapters 1 and 9, you learned about the importance of making backups. The Backup tool is another conveniently located management tool that can help your users help you maintain their systems. In this instance, as long as users have the proper permissions to access and use the files they wish to maintain copies of, they can easily use the Backup tool to keep their information backed up and accessible. While there are numerous third-party backup utilities available that you can choose from, simply clicking the Backup Now button in the disk drive's Properties dialog box initiates the Microsoft version of the Backup tool.

As long as users are working with their own files, or they have the Read, Read and Execute, Modify, or Full Control permission to the files, they can perform backup operations on the data. On the opposite end of the process, however, if restoring the data is necessary, users must have either the Write, Modify, or Full Control permission on the original files to overwrite them. Since users have these permissions on their own data, teaching them to use the Backup tool to keep an extra copy of their own data will help them maintain their own working environment.

In practice, the Backup tool is woefully overlooked at the local workstation. You can save yourself some headaches if you get in the habit of using this tool and make sure your users understand that it is available and how it works. Users all too often rely on the administrator's system-wide backups when they need to restore copies of their lost files—no matter why they were lost. Effective use of the Backup tool may let users restore some of their own lost files.
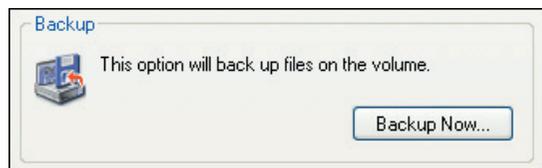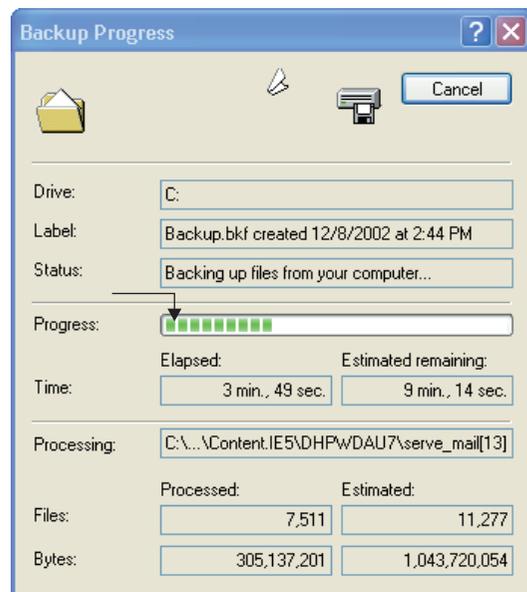

• The Backup tool

If the workstations have excess storage space on their own local drives or are equipped with external storage devices, such as floppy disk drives, Zip drives, or read-write CD drives, you may simply need to instruct users how to use the Backup tool. If users periodically perform a backup operation and save an extra copy of their own data somewhere on their local workstation, administrators called upon to restore a missing file may use these individualized backups to help a user quickly restore the occasional misplaced file or accidentally erased directory when it happens. Thus, restoring a single file from a small backup would likely be much easier than searching for that same file from a company-wide backup that an administrator would normally create.

Task Manager: A Tool on the Taskbar Itself

Many users know next to nothing about a very handy tool that is available to them through their taskbar. The **Task Manager** provides them with a means to not only gather information about their computer but also to start or stop most of their own applications. To access the Task Manager, right-click a blank space on the taskbar and select Task Manager.

If you make the decision to let your users help manage their own workstations, they should be taught about using the Task Manager tool which operates in the Windows Task Manager window.

• The Backup operation in progress
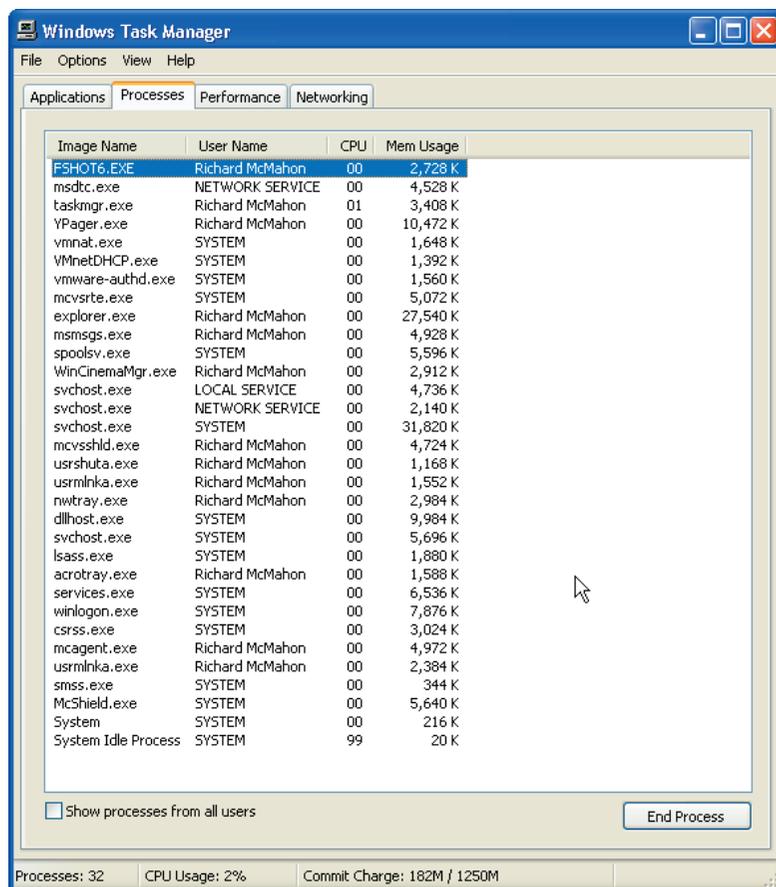
• The Task Manager

You can also open the Task Manager tool with what is affectionately called the Microsoft three-finger salute (CTRL+ALT+DELETE) and then clicking the Task Manager button, or by typing **taskmgr** in the Open field in the Run window, reached through the Start menu.

Try This!

Using the Local Workstation's Backup Tool

Use the local workstation's Backup tool to back up a user's information. Try this:

1. On your Windows XP Professional workstation, click the Start button and select My Computer. Right-click your C: drive and select Properties to open your drive's Properties dialog box.

2. Click the Tools tab and click the Backup Now button to start the Backup or Restore Wizard.

3. Click Next to accept the default backup settings, click Next again to accept the Back Up Files and Settings option, and click Next again to accept the default My Documents and Settings option.

4. Click the Browse button to select where you want to save your backup.

5. The default location for this save action is the floppy diskette. Click the Save button if you intend to save to a floppy diskette in the A: drive. Otherwise, click the Cancel button, click the Desktop button in the left panel of the Save As window, and click the Save button to designate the desktop as the place to save your backup file.

   Keep in mind that clicking the Browse button starts with the default intent of sending a backup to the A: drive, and it will probably take a lot of floppy diskettes to create even a moderately sized backup of your C: drive. If a diskette is not installed in that drive, the Backup tool will instruct you to insert a diskette, and the save action continues trying to save the data there. As indicated in Step 5, you must click the Cancel button if you intend to save data to any other location besides the A: drive.

6. Either accept the default "Backup" name for this backup or enter another name of your choosing.

7. Click Next, confirm the displayed information, and click the Finish button to initiate the backup operation.

When you open Task Manager, the tab that will be displayed is the same tab that was in view the last time the tool was closed, and the same settings will be in place too. On your Windows 2000 Server, there are three tabs available in the Windows Task Manager window: Applications, Processes, and Performance. Your Windows XP workstations will have a new Networking tab.
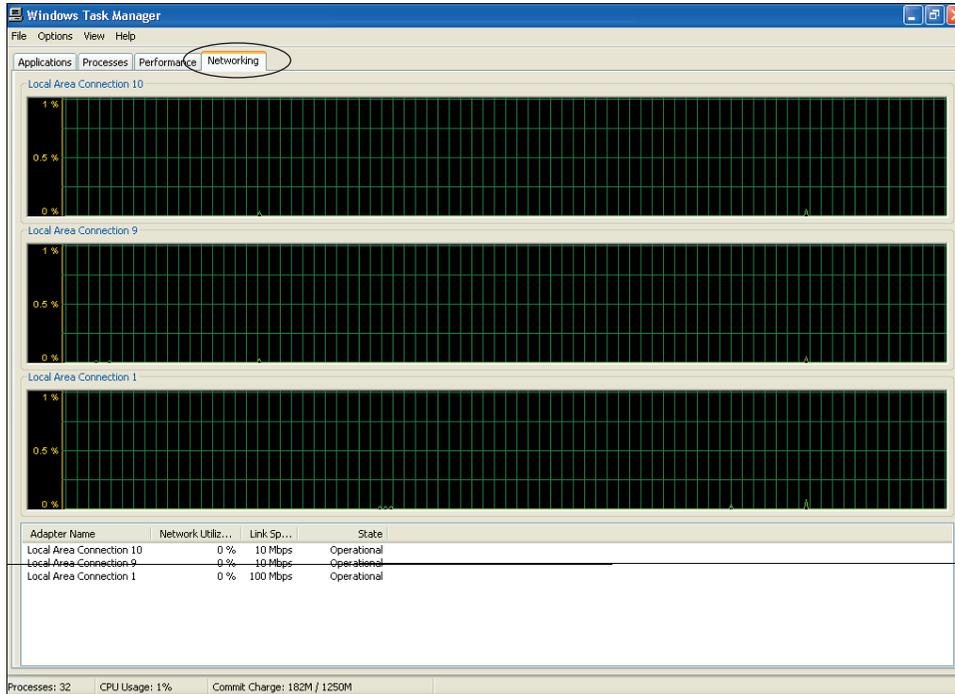
• Windows XP includes a new Networking tab in its Task Manager tool.

Many of the Task Manager's menu options for configuring settings change depending on which of the tabs you have open at the time. Some of the tabs have elaborate settings, and you may want to go through the menu bar options and configure your Task Manager to best suit your needs.
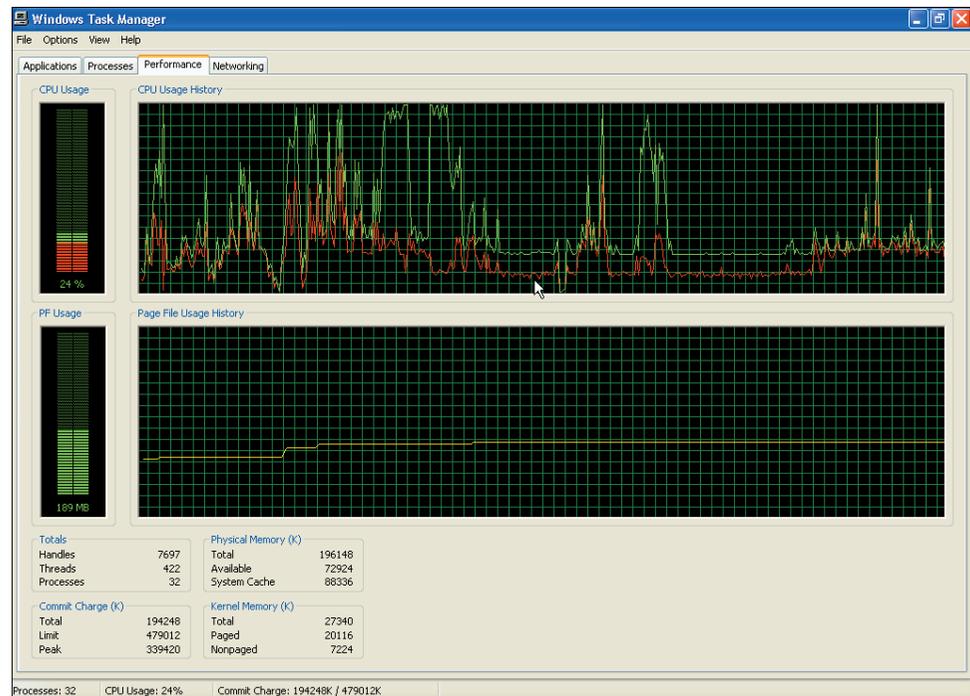
• You can configure the Task Manager to show the information you want.

Step-by-Step 10.01

Touring the Task Manager Tool

Use the local workstation's Task Manager tool to view information about your computer.

    To complete this exercise, you will need the following item:

■ An operational networked Windows XP workstation or Windows 2000 Server

Step 1

At your Windows workstation or server desktop, right-click an empty space on the taskbar and select Task Manager. If you are working on your server, notice that there are only three tabs, which means you will not be able to view your networking information.

Step 2

Click the Applications tab to see the applications currently running on that computer. Choose View and select Details, and notice that the status is given for each application. Click the New Task button, notice that the Create New Task window that appears is similar to the Run window accessed through your Start menu, and click the Cancel button to return to the Applications tab.

Step 3

Click the Processes tab to see the processes currently running. Choose View and select Select Columns to view additional columns that are available, and then click the Cancel button to return to the Processes tab. Right-click a process and notice that you have the option to stop either the process itself (End Process) or the process and all other associated processes as well (End Process Tree). Note, though, that the system will not let you end a process that is critical to the system's continued operation.

Caution: You should not make any alterations to the Set Priority option available when right-clicking a process. Doing so may affect your computer's proper operation. You should also make sure to point out to your users that they should not make any such changes either.

Step 4

Click the Performance tab and note the graphs that provide dynamic information on your CPU and your **page file** (a temporary work space in memory). Click View and select Show Kernel Times to add another line (red) to the CPU Usage History graph depicting how much of the CPU usage was needed by the heart of the operating system—the **kernel**.

Step 5

If you are working on your Windows XP workstation, you can click the Networking tab to view activity to or from each of your own computer's network connections. Choose View, select Network Adapter History, and add either the Bytes Sent or Bytes Received lines to the default Bytes Total displayed in the graphs. The information listed at the bottom of the screen includes the link speed and the **link state** (or operational status) for each connection.

Step 6

Close the Task Manager to return to your desktop.

Windows 2000 Server Tools

Each of the tools discussed in the previous section is also available on your Windows 2000 Server, and you should use all of them as you monitor and manage the health of your server and workstations. However, there are other tools available at the server that will help you even more than the general tools found on the workstations. Three of these tools are the Simple Network Management Protocol (SNMP) service, the Performance console, and Network Monitor.

Simple Network Management Protocol (SNMP) Service

The Simple Network Management Protocol (**SNMP**) is an Internet-standard protocol (one that is widely accepted for use on the Internet) that facilitates monitoring the system and sending status updates to a central location called the network management system (**NMS**), which is also called the host or the **SNMP manager**. The SNMP service can be started or stopped through the Windows Components Wizard.
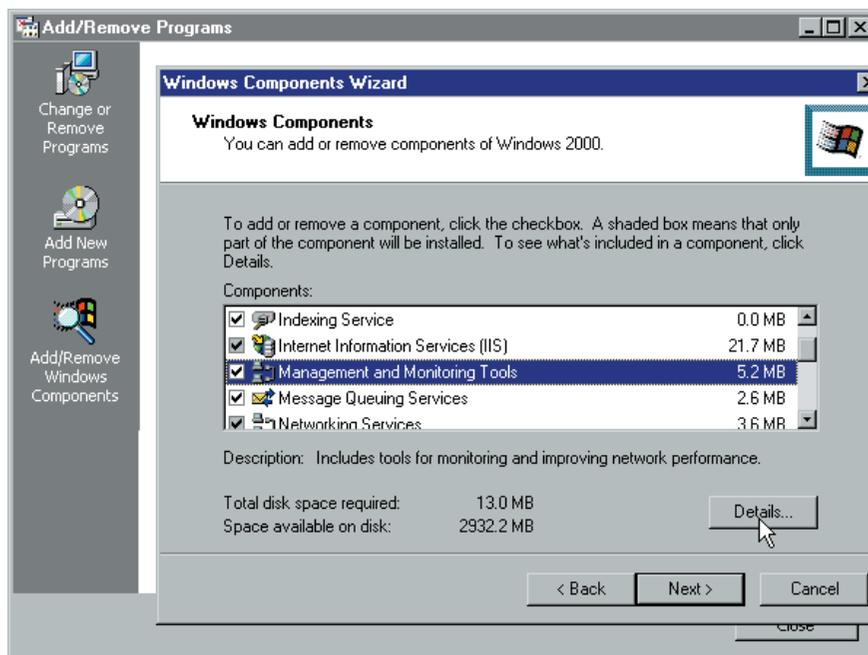
• Start or stop the SNMP service through your Windows Components Wizard.

The objects on your network, such as servers, workstations, printers, hubs, switches, and routers, are called **nodes**. These nodes can be monitored by SNMP and can send status updates to the SNMP manager. Once a network node is monitored by SNMP and managed by the SNMP manager, that node is referred to as an **agent**. Agents, the SNMP service itself, and all its other components are configured through the Services and Applications section of your Computer Management console. Agents normally just respond to queries about their status, but they can also send an alarm message, called a **trap message**, when they are configured to look for specific events (like login failures or other unauthorized access) and report their occurrence.
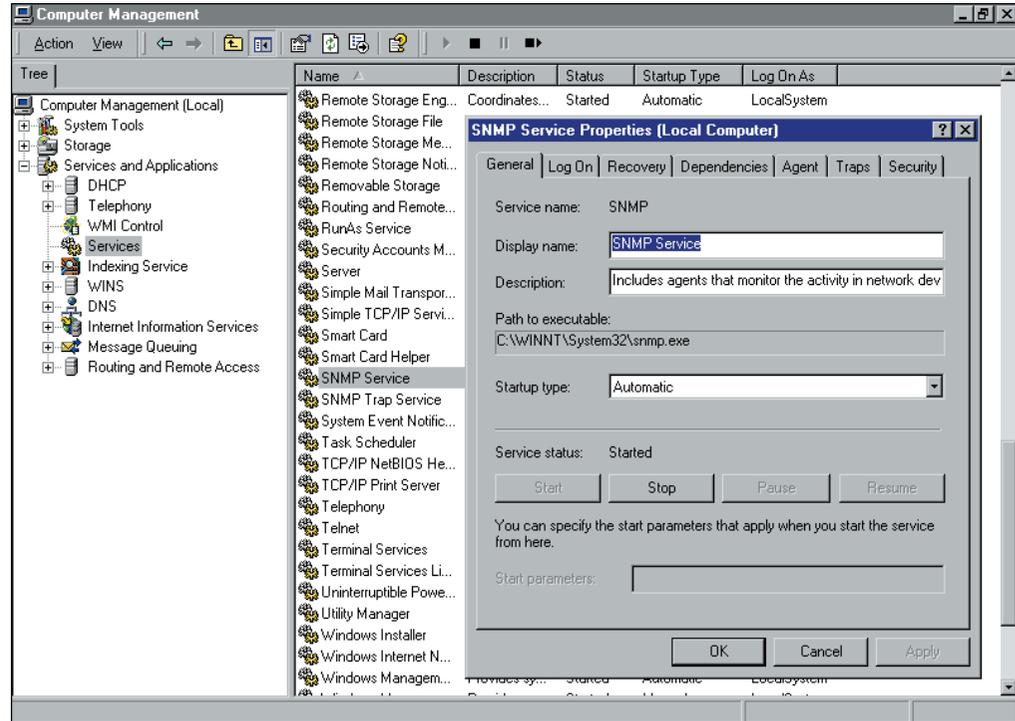
• SNMP is configured through the Services and Applications section of the Computer Management console.

The SNMP manager uses installed network management software (software not included with Windows but purchased from separate vendors) as it performs the monitoring and management duties it has been configured for. It creates and maintains a Management Information Base (**MIB**) that lists the information on each node that should be monitored at the agent and
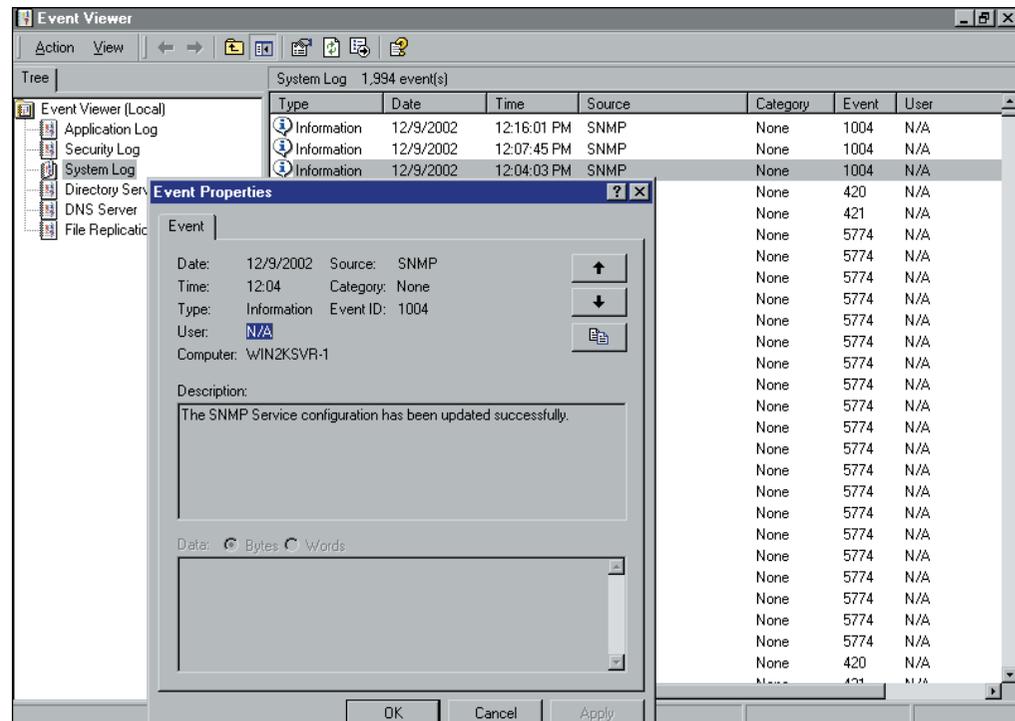
• Your SNMP status is reported in the Event Viewer.

reported back to the manager. You must configure at least one NMS if you intend to use the information that can be collected by SNMP on your system. The information collected can include things such as network performance, security breaches or similar alarmed events, and network auditing.

Although you don't get the true benefit of having SNMP configured on your network without having the third-party network management software installed, larger networks will typically employ this service, and you should know how to configure it. You can verify that the service was updated properly by reviewing the messages in your Event Viewer. You can get to the Event Viewer through Administrative Tools in your Control Panel.

Performance Console

Both Windows 2000 Server and Windows XP Professional provide you with the **Performance console**, a utility program that lets you collect data about your system's performance. Performance console comes preinstalled on both of your network's Windows operating systems and is accessed through Administrative Tools by selecting the Performance option. The Performance console actually provides you with two useful utilities that will help you monitor and analyze your system's health: System Monitor and Performance Logs and Alerts.

Try This!

Installing and Configuring SNMP

You want to install and configure SNMP on your network. A large network will have special monitoring software that works with SNMP and uses the information collected. This exercise won't make you an expert at using SNMP or give you extensive analysis, but it will get the service running and show you some of the configuration steps that are required for proper setup. Try this:

1. On your Windows 2000 Server, click the Start button and select Settings | Control Panel. Double-click Add/Remove Programs and select Add/Remove Windows Components. Highlight the Management and Monitoring Tools option and click the Details button. Note that checking the Management and Monitoring Tools option box configures all tools, whereas clicking the Details button allows you to select each tool separately.

2. Select Simple Network Management Protocol, click OK, click Next, and click the Finish button to implement your changes. Restart the computer as necessary after configuring SNMP.

3. Click the Start button and select Control Panel. Double-click Administrative Tools, double-click Computer Management, expand Services and Applications in the left pane, and click on Services.

4. In the right pane, scroll to and right-click on SNMP Service, and select Properties.

5. On the General tab, ensure the service is Started (and if not, click the Start button). On the Agent tab, enter the contact person and his or her physical location.

6. Click the Traps tab, and in the Community Name field type **SchoolSNMPService**. Click the Add to List button, and click the Add button in the Trap Destinations section. Add the IP addresses for all your networked computers as trap destinations.

7. Click the Security tab, and then click the Add button in the Accepted community names section. Type **SchoolSNMPService** in the Community name field, leave the default Read Only permission set, click OK, and click OK again to implement your changes. Close all windows to return to your desktop.
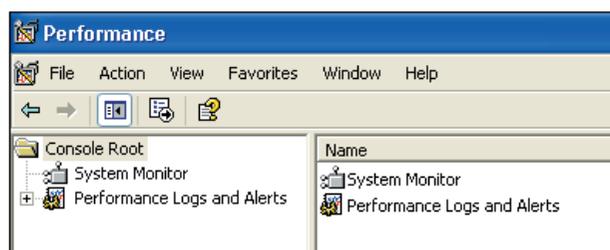
• Performance console opened showing its two utilities

Chapter 10: Managing a Network

Inside Information

Configuring Administrative Tools on Your Start Menu

You will be using Administrative Tools quite a bit. Accessing it through the Control Panel is one way to get there, but you can configure it so that you have access right on your Start menu.

To do this on your Windows 2000 Server, click the Start button and select Settings | Taskbar and Start Menu Properties, click the Advanced tab, and ensure the Display Administrative Tools option is selected.

On your Windows XP Professional workstations, click the Start button, right-click on the blank space to the left of your Log Off button and select Properties. Click the Start Menu tab, click the active Customize button, click the Advanced tab, and scroll to System Administrative Tools and select the option showing where you want Administrative Tools access (on the All Programs menu, on the All Programs menu and the Start menu, or not displayed).

*The remainder of the text assumes you can access Adminisrative Tools through your Start button.*

System Monitor The **System Monitor** portion of your Performance console utility allows you to view either current system activities or those you recorded using Performance Logs and Alerts (discussed in the next section). There are three different views available in System Monitor: graph, histogram, and report. Although the default System Monitor view displays data on three specific items in the graph view, you can select the items you want displayed from a large list and can easily change to either of the other two views.

■ **Graph view** The **graph view** plots the data for each item you are tracking along two axes: time along the horizontal axis and amplitude along the vertical axis. Different colors can be selected for each item being tracked, and the line width and style can also be changed. Items whose amplitude would create large numbers can be displayed by using different scales. Even the scale displayed on the axes can be changed, have text added, or a background added.
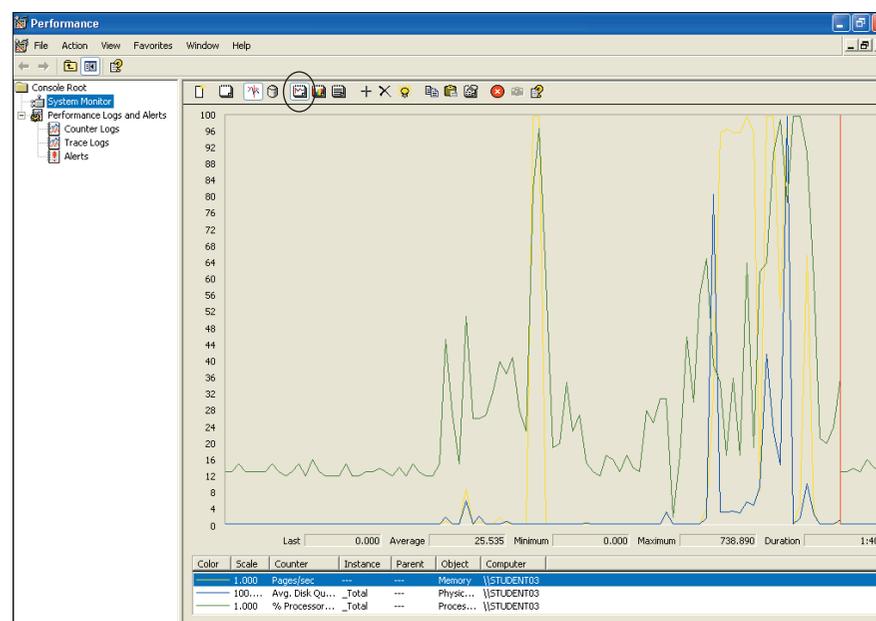
• Performance console showing an example of the System Monitor's data in graph format

■ **Histogram view** The **histogram view** displays the data for each item being tracked along the same two axes, time and amplitude, but does so with bars showing totals for different items. All the changes that can be made to the graph view can similarly be made to the histogram view. The type of data being viewed can also switch between current, minimum, average, or maximum values.

■ **Report view** The **report view** displays the data for each item being tracked in summary format only. Many of the same changes available in displaying the other views are available in the report view, such as different backgrounds, additional items tracked, and the four types of data to display. The graphical changes, however, are obviously not available in this view.
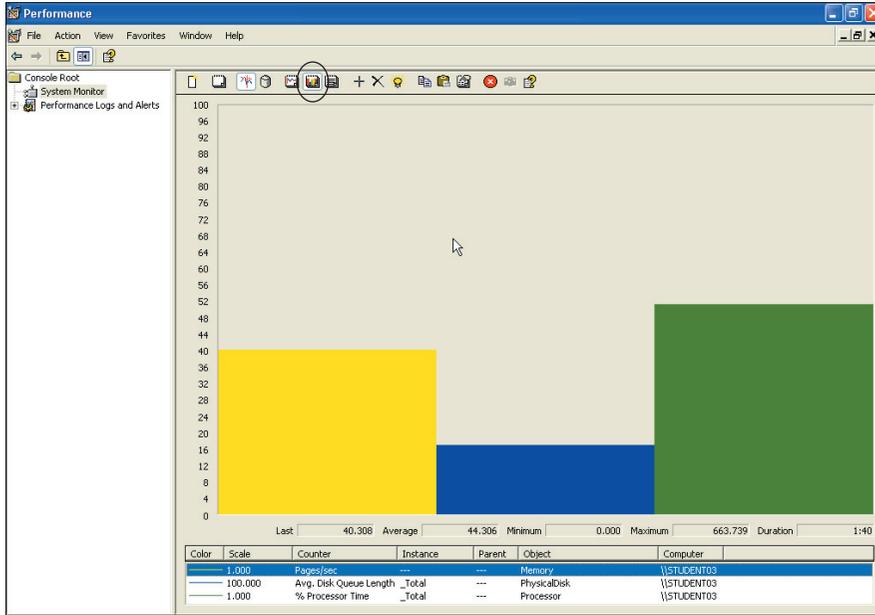
• Performance console showing an example of the System Monitor's data in histogram format
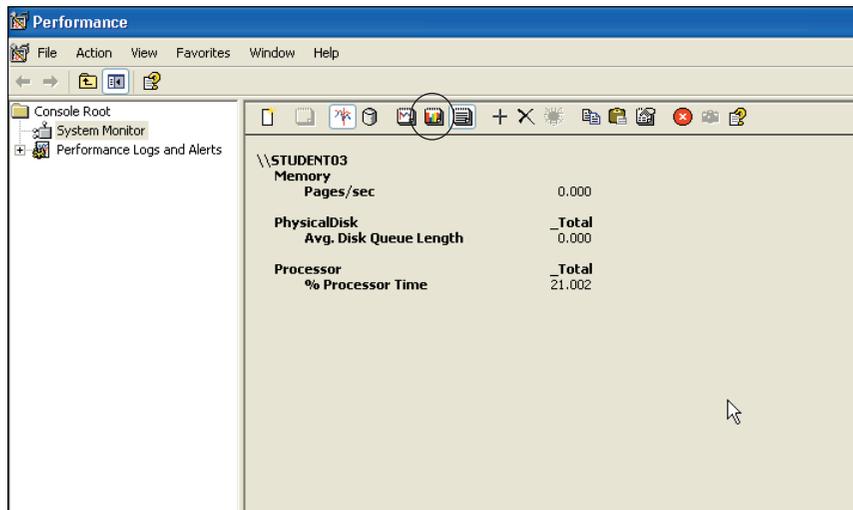
• Performance console showing an example of the System Monitor's data in report format

Performance Logs and Alerts   The Performance Logs and Alerts portion of the Performance console allows you to configure and record the sampled data that is displayed in the System Monitor. You can select the items you want sampled, schedule a time for the sample to be made, and save the information as a log in the default storage location, the Perflogs folder on your C: drive, or change it to another location, as you can see in the following illustration. You can create Performance logs manually when you want one or they can be done automatically at a preset time. Alerts can be configured to send their information when a predetermined condition occurs, such as low drive space or high processor use.
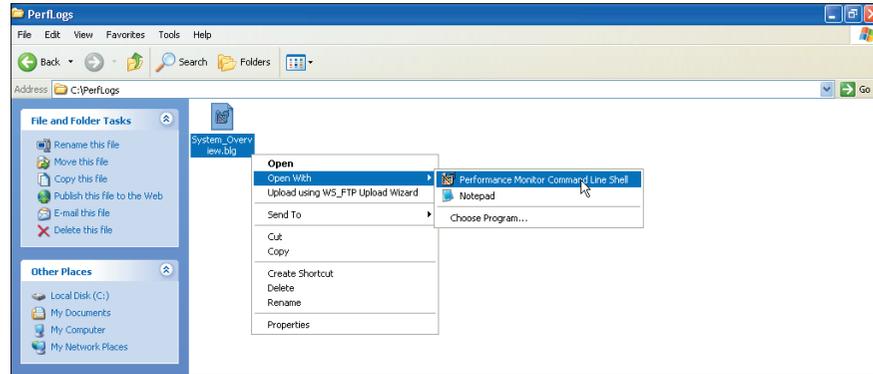
- You can open a Performance Log in the Perflogs folder.

Step-by-Step 10.02

Recording and Viewing a Performance Log

You want to use a System Monitor performance log to capture information on the three default items displayed in Performance Logs and Alerts. Then you want to view the log and check its information.

To complete this exercise, you will need the following item:

- A Windows XP Professional workstation computer

Step 1

On a Windows XP workstation, click the Start button and select Administrative Tools | Performance.

Step 2

In the Performance window's left pane, expand Performance Logs and Alerts, and select Counter Logs to display the default System Overview log. In the right pane, right-click the System Overview log and select Properties. View the information on the General, Log Files, and Schedule tabs of the Properties dialog box. Pay particular attention to (and write down) the current log filename shown on the General tab.
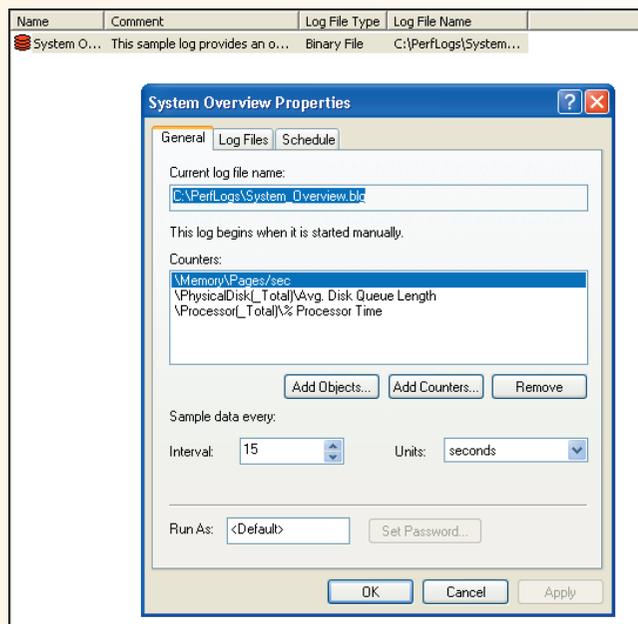
Step 3

Close the Properties dialog box and select the System Overview log. Select Action | Start to start the System Overview log. This begins recording the information that you viewed in Step 2.
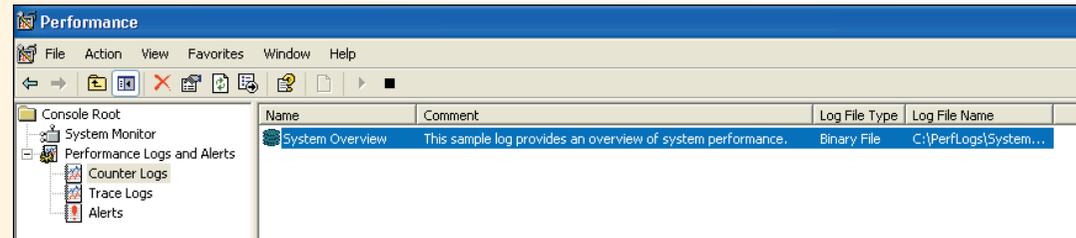
Step 4

After approximately two or three minutes, select Action | Stop to stop recording, and your system will automatically save the log file with the name and in the location that you viewed in Step 2. In the Performance window's left pane, click on System Monitor.

Step 5

At the top of the right pane, pause your mouse pointer over each of the buttons to view its function. Click the second button from the left to clear the display, and then click the View Graph button, and click the View Log Data button. On the Source tab of the System Monitor Properties dialog box, choose the Log Files option and click the Add button. Browse to the location you wrote down in Step 2, and double-click your log file in the Perflog folder.
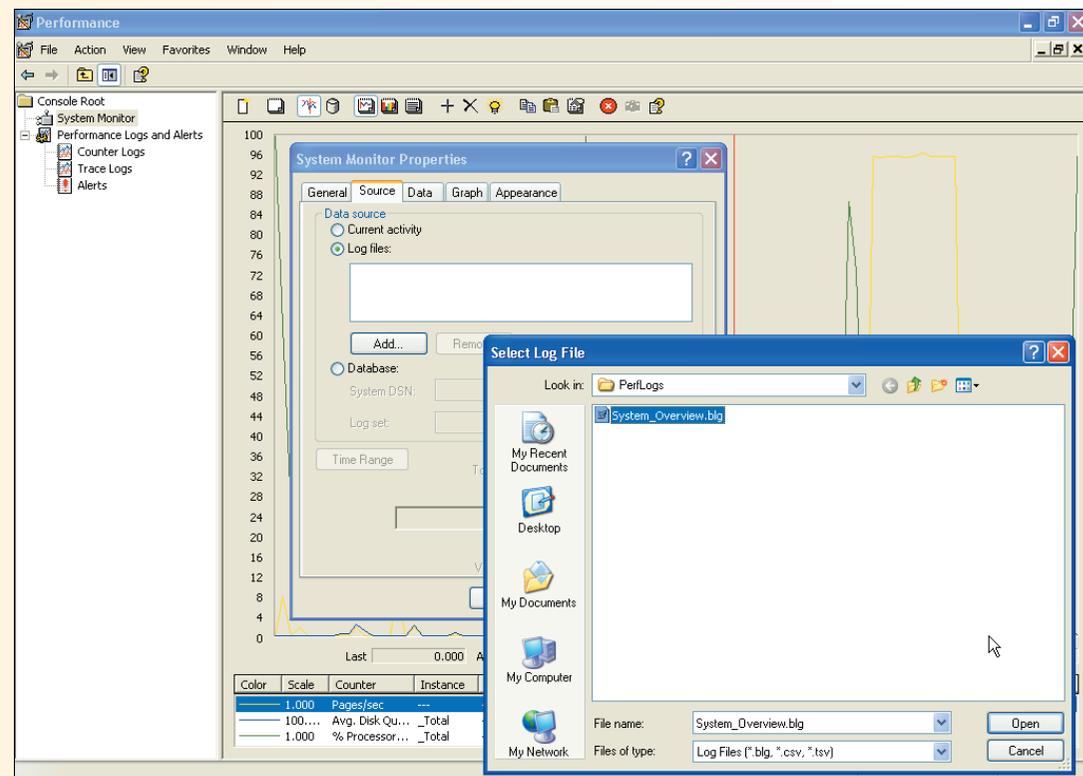
Step 6

Click the Apply button. Notice that your System Monitor now displays the data stored in the log file in the Perflog folder.

Chapter 10: Managing a Network
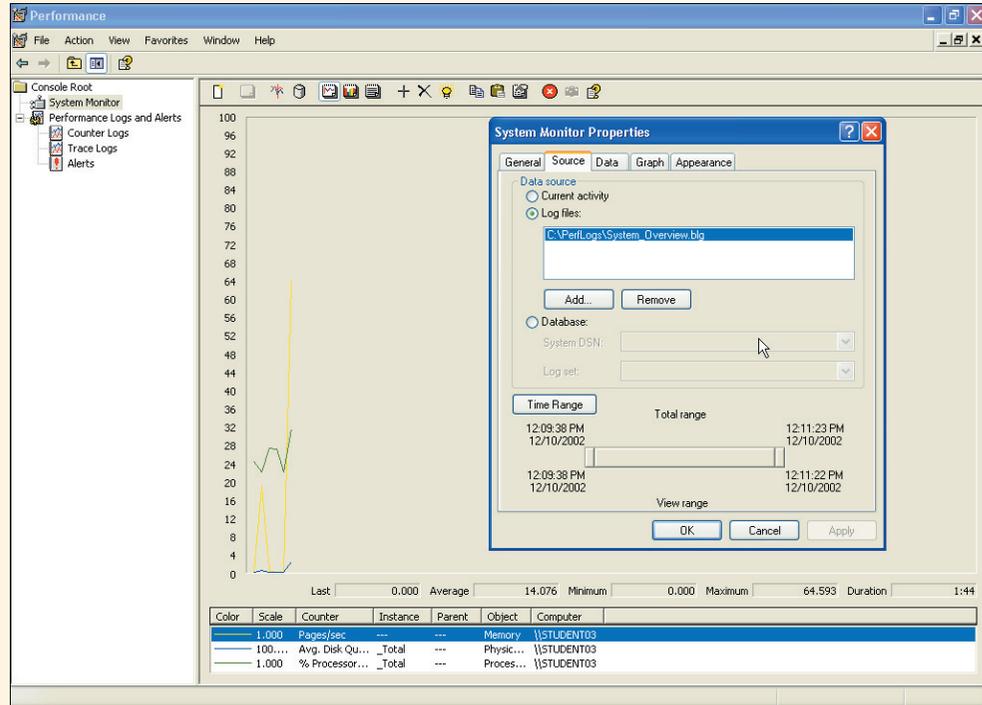
Step 7

Use the different tabs of your System Monitor Properties dialog box to change the appearance of the information in your log as you review the data you recorded. Click OK after returning to the graph view. Select one of the recorded items for emphasis by clicking on the item in the bottom section of the graph view (such as the yellow line in the previous illustration) and clicking the Highlight button. As you can see here, the selected item is highlighted in black.
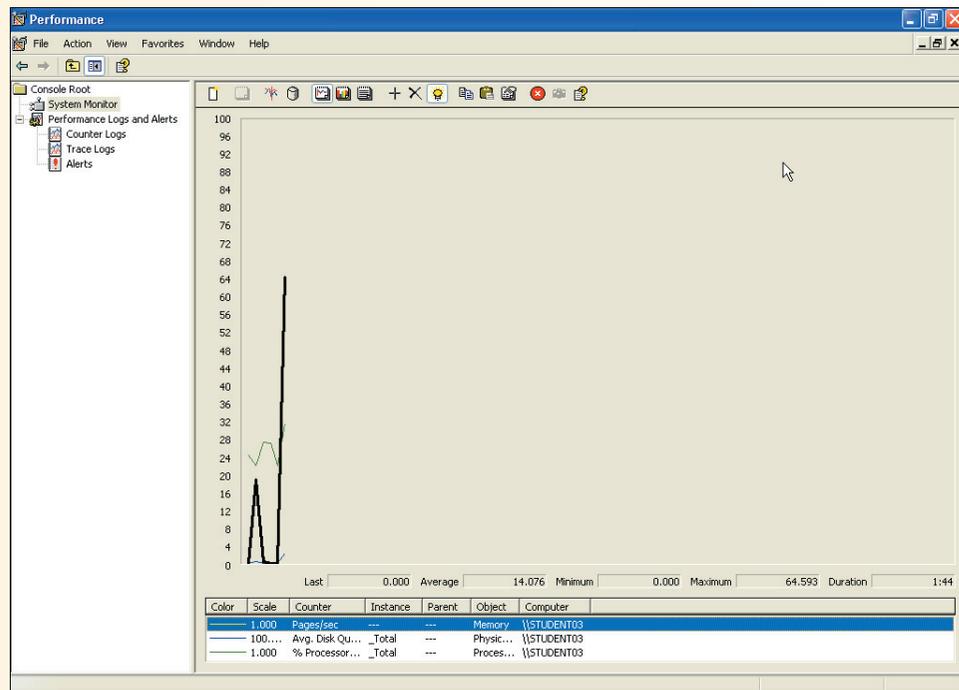
Step 8

Close all windows when you are finished checking your data.

Network Monitor

Network Monitor is another utility available on your Windows 2000 Server that is similar to the Performance console but is intended to provide you with information about the health of your network. Earlier in this chapter you learned how to show your users a similar function on their Windows XP Professional workstations—on the Networking tab of their Task Manager. However, the Network Monitor utility on your server is much more powerful and provides you with considerably more information about your local net-

> ## Try This!
>
> ### Installing Network Monitor
>
> You want to install and configure Network Monitor on your network. Try this:
>
> 1. On your Windows 2000 Server, click the Start button and select Settings | Control Panel. Double-click Add/Remove Programs.
>
> 2. Select Add/Remove Windows Components to start the Windows Components Wizard.
>
> 3. Select Management and Monitoring Tools and click the Details button to see the tools available.
>
> 4. Select the Network Monitor Tools option, click OK, click Next, and then click the Finish button to implement your changes. Note that your computer may have to be restarted after configuring Network Monitor Tools.

work than you can obtain using Windows XP's limited version. Network Monitor is not installed automatically on your server. You must install it like you installed SNMP—through the Windows Components Wizard.

When in use, the Network Monitor utility actually records a copy of the data flowing between the computers on your network and your server. Like a tape recording of a telephone conversation, this monitoring utility does not disturb the conversation but merely records a copy of it. Also, like the tape of that conversation, the recorded network session can be copied, reviewed, sent for analysis, or otherwise broken down and *listened to*. Thus, having Network Monitor running on a network can pose a serious security concern. Someone with the right equipment could interpret much of what goes on over your network. If the network information is not otherwise encoded or protected, it can be understood from the data recorded using Network Monitor.
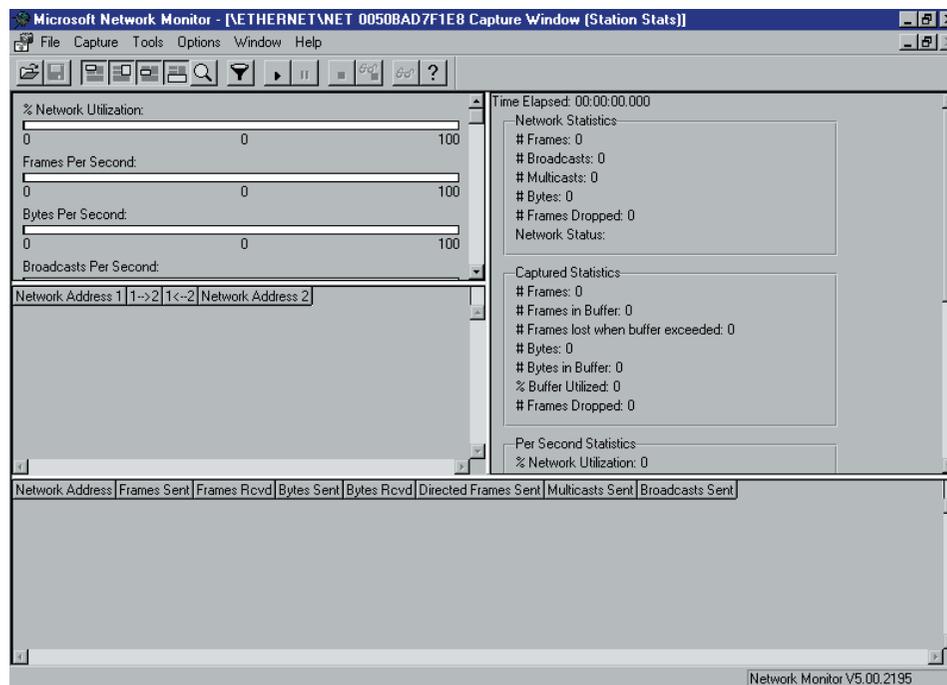

• The Microsoft Network Monitor utility.

Chapter 10: Managing a Network

You can obtain more information about SMS through the Microsoft SMS web site at `http://www.microsoft.com/smserver/default.asp`.

After installing Network Monitor on your server, you are asked which network you want monitored. As powerful as Network Monitor is, it is limited to monitoring a single network as mentioned previously, and it can only monitor traffic flowing to or from your local machine—your server. This is for security reasons. Even more powerful network monitoring is available with Microsoft's Systems Management Server (SMS) or applications from other third-party vendors if you need additional capturing capability.

• Tell Network Monitor which network to monitor.

Network Monitor will detect and alert you to any additional instances of Network Monitor running on your network. This ensures that nobody else is capturing traffic using Network Monitor as it comes from your server.

To use Network Monitor, you simply click the toolbar's Start Capture button. When you feel you have captured enough data to perform your analysis, you just click the Stop Capture button on the toolbar. If you want to pause your capturing for a short time, there is a Pause/Continue Capture button on the toolbar. After stopping your capture, you can then click the toolbar's Display Capture button to see the results. If you want to stop an ongoing capture and immediately view its contents, there is even a Stop and View Capture button that you can use.

• Significant amounts of data are recorded when using Network Monitor.

While this course is not intended to make you an analysis expert, able to decode captured network messages, it is good practice to know how to use the tool and understand the way it works. The data is extremely overwhelming to someone viewing real network traffic for the first time without serious additional training, and it may still be overwhelming to long-time networking specialists. When you make your first captures, remember that they record extremely high levels of data. Each frame recorded can be further broken down into all of its individual elements, and each character can be decoded to some level. Don't waste a lot of storage by unnecessarily recording more than you need to get a feeling for what is being monitored.

■ Implementing Windows and NetWare Network Management

How you manage your network, and how the network's users employ the resources entrusted to them determines the overall value of the network. If you don't properly maintain the network, the effort required to create it in the first place goes to waste.

Studying the network components discussed in the previous section will help you ensure your network's success. Regardless of the size of your network, many of the administrative responsibilities will involve managing networking functions. A healthy network's use will tend to increase rapidly, and the better your networking management skills, the better you will be able to maintain your network.

Windows Networks

When your network is operational and you are using many of the features discussed earlier in this chapter, it will become evident that the amount of storage space needed by your users seems to be ever-increasing. Microsoft makes two additional features available that will help you on the Windows portion of the network. The first, compression, helps reduce the amount of space needed for the data stored on your network. The second, quotas, lets you limit the amount of network storage space your users are authorized to use.

Compressing Data

Because you created your server and all your workstations using NTFS, you can use the Windows advanced storage feature that helps extend your network's existing storage capacity—**compression**. Compressing data reduces the size of a file so that it takes up less storage space. If you have a lot of data stored on your network, and you implement compression, you can store more in the same amount of space, making your network that much more valuable to the users without spending any money on additional storage space.

Compression is not quite as simple as it sounds—there are some trade-offs. For example, when copying a file to a compressed volume, NTFS reserves space for that file to be uncompressed, so if there is enough space for the compressed file but not enough to uncompress the file, the copy action will be disallowed. Furthermore, there is a slight decrease in performance due to the requirement to decompress a file before use.
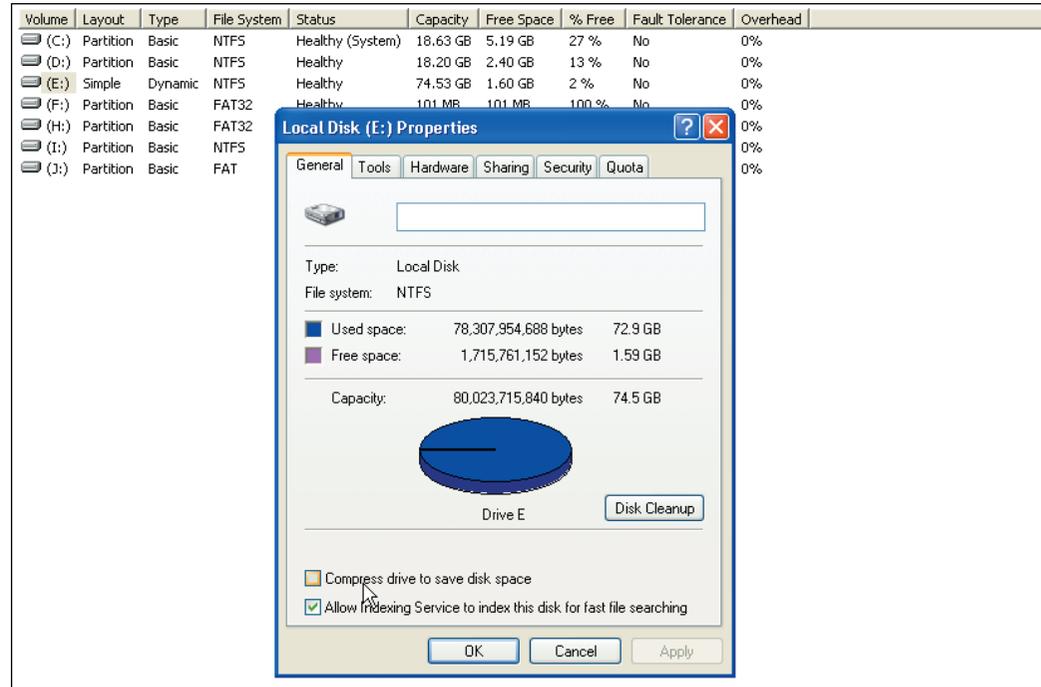
• This volume is an excellent candidate for implementing compression.

Compression Levels Compression can either be initiated at the volume level, which compresses everything on the disk drive, or at the file level. At the file level, you can select individual files you want compressed, while leaving everything else uncompressed. Compression at the file level is implemented using the object's Properties dialog box. At the bottom of the General tab, you simply click the Advanced button and in the bottom section of the Advanced Attributes dialog box select the Compress Contents to Save Disk Space option.
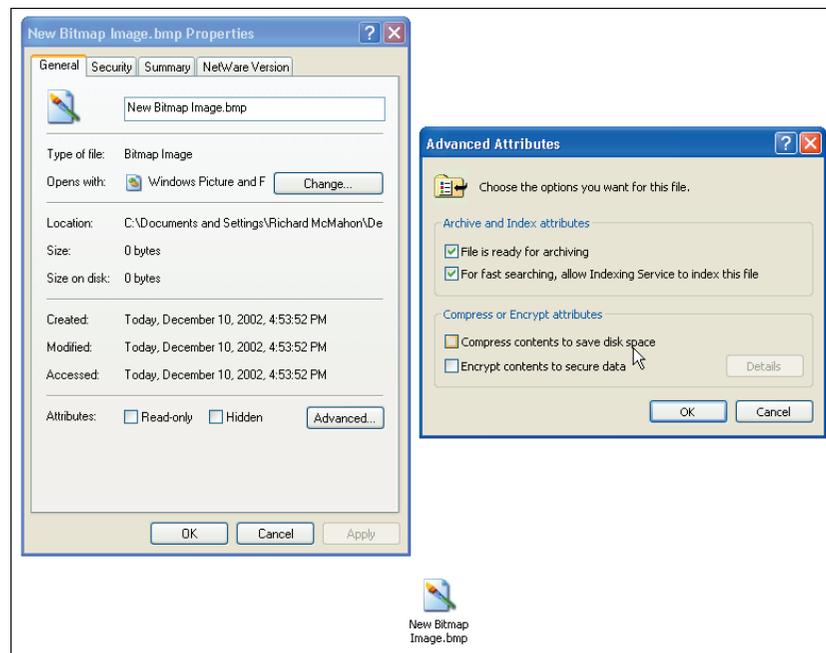
• File-level compression

At the volume level, this is reversed, and everything is compressed with the exception that you can selectively uncompress individual files. When compressing volumes, you again use the object's Properties dialog box, and at the bottom left of the General tab, select the Compress Drive to Save Disk Space option.

Compression on NTFS Volumes Only   Windows 2000 and Windows XP Professional only support compression on NTFS volumes. Whether you set compression to be employed at the file and folder level or at the entire volume level, each file on the volume has its own compressed or uncompressed condition attribute (which, when applied, results in a file's compression state). Applications using compressed files check the compression state and simply uncompress any applicable files prior to using them. All DOS- and Windows-based applications can thus use compressed files. When an application is done with a previously compressed file, or you initiate a save action, NTFS compresses the file once again.

Compression Rules   There is a general rule (with one exception) that helps explain compression attributes: A file, whether copied or moved, will inherit the compression attribute of the new folder it is being copied or moved into. The one exception is that a "move" within the same volume (partition) will not inherit the new folder's compression attribute. The reason for this exception is that the file is not actually being moved from the point of view of the operating system—only a pointer is moved, "pointing" to the original location.

An example will help explain. If you move a file from one location on an NTFS volume to another location on the same volume, the file retains its original compression state in its new location. If you copy that file from the same NTFS volume just discussed to the same new location, though, the new file acquires the compression state of the new location while the old file still remains in the original location with the same compression state.

The rule changes when using FAT partitions. When you copy or move a file from an NTFS volume to a FAT partition, the file is uncompressed first and then copied so that it matches the normally uncompressed level of the FAT partition.

When you implement compression at the directory (folder or above) level, you are given the option of leaving the object's contents in their present compression state (whether compressed or uncompressed) or imposing compression on all its contents. Additionally, once that directory-level object is marked as being in the compressed state, all objects subsequently added are immediately compressed.

Setting Quotas

A second Windows advanced storage feature that you can use on your NTFS computers allows you to share what storage you have with as many users as possible—this involves the use of quotas. Providing users a specific **quota**, or an assigned limit on the amount of network storage space they can use, helps ensure an equitable distribution when such networked resources are limited. The use of quotas is implemented through the Properties dialog box on each disk drive formatted with NTFS. Microsoft's quotas feature is not available on FAT partitions.

When deciding whether to use compression or encryption, which is the other option in the Advanced Attributes dialog box, you should be aware that they are exclusive of one another at whatever level they are incorporated (file/folder or volume). Selecting one means you can't select the other at the same level.
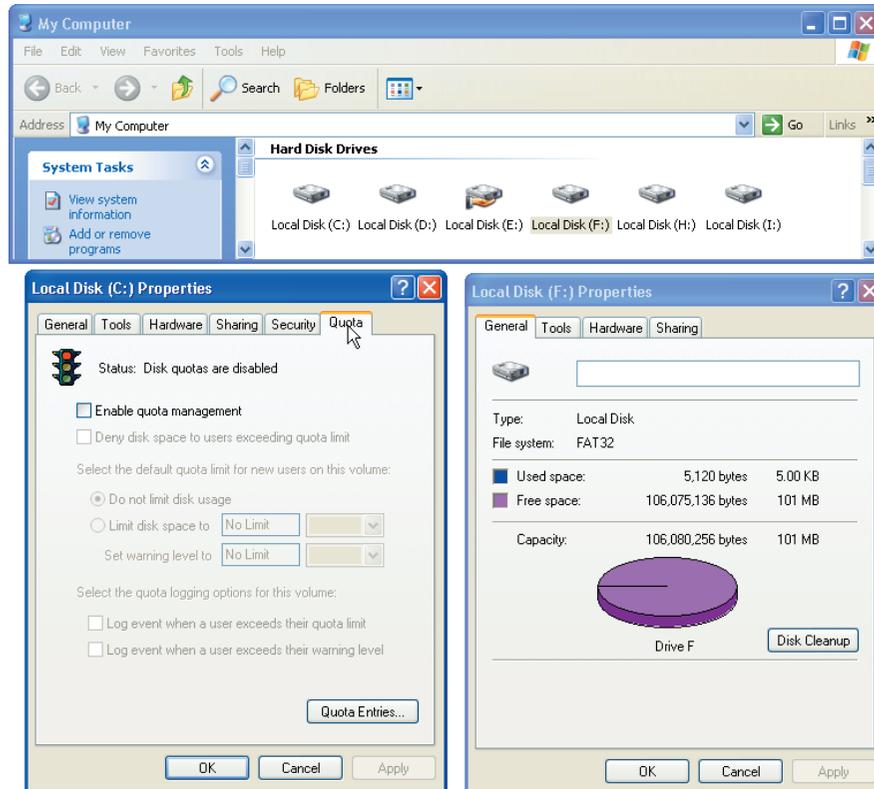
• Notice that the quota tab is available on the NTFS volume, but not the FAT volume.

Equal Access But No Limits   Typically, when networks are first created, storage space appears unlimited and users are granted storage privileges on a first-come-first-served basis. That is, everyone has equal access to the storage, but there are no limits. What frequently happens is that some users quickly take up all the space, and those users with little (or no) space on the disks complain that such a system is not fair. If all was fair, and everyone on your network was to have equal availability for storing their files, then your network's total storage capacity would have to be calculated and divided such that all users get an equal share. Keeping track of such an equitable storage solution at the network level would be burdensome.

Equal Access with Limits   All is not fair, and everyone on your network does not really need an equal amount of the total storage you have available. Nor should network management be unnecessarily burdensome. Rather, Microsoft's implementation of disk quotas lets you assign users limited storage on specified volumes anywhere on your network. The limits you place can be general, so that all users with access to a particular volume have the same amount, or they can be specific, so that some users have a higher storage limit. Thus, storage is divided at the NTFS volume level.

Setting Limits   You set limits on disk space use by implementing quotas on your NTFS volumes. After imposing the quotas, you have the choice of either enforcing their use or simply monitoring users for compliance. In addition to

---

Inside Information

Installed Applications and Quotas

If quota management has been implemented on a volume where you need to install an application, doing so while logged on as a non-administrative user will consume some (or possibly all) of your allotted quota for that volume. However, quota management on your network's volumes does not apply to your administrative users. Their storage is unlimited. Therefore, log in as your administrative user whenever you install applications on your workstations to avoid exceeding quota limits.

---

setting a limit on storage, you can give users a warning whenever they go beyond another, lesser, amount that you can also set. This warns users that they are running out of space and might encourage them to delete some files that they don't need to keep but haven't yet needed to delete.

You have the option of configuring quota management to halt further storage attempts when the quota is reached, or you can then have it simply send a notice to a predetermined recipient that the quota has been exceeded (usually an administrator or manager) who could then take the appropriate action—either increasing storage facilities or requesting compliance with the quota.

Another option you have when setting enforced limits is to reconfigure specific users separately. Some users may really need additional storage space, and you can increase the limits for those users on a case-by-case basis.

> Quota use on compressed volumes is calculated based on the uncompressed size of all stored files, regardless of file type. Although it may look like space remains available, users could still be prevented from saving more files on those volumes.

Step-by-Step 10.03

Implementing Quota Management

Your network storage capacity has been left open for users to store as much as they want on any of the storage devices. You decide to start monitoring potential misuse of this privilege by implementing quota management, and you want to practice on one of your network's NTFS volumes.

To complete this exercise, you will need the following:

■ A Windows XP Professional workstation computer formatted using NTFS

Step 1

Log in to a Windows XP workstation as the administrative user, click the Start button and select Administrative Tools | Computer Management. Expand the Storage item in the left pane and select Disk Management. In the lower section of the right pane, right-click the icon of the disk that houses the volume where you will be implementing quotas, and select Properties.
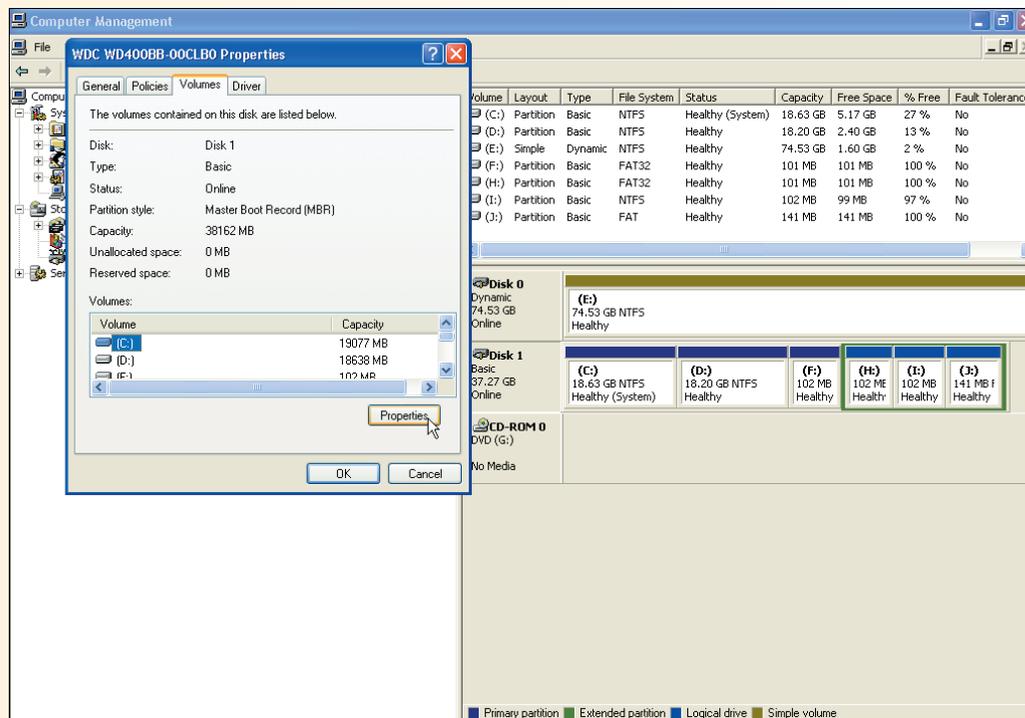
Step 2

In the Properties dialog box, click the Volumes tab and notice that you have access to all the volumes on your selected disk. In the Volumes section, scroll to and select the volume where you want quotas implemented, then click the Properties button.

Note: Accessing the entire disk drive's Properties dialog box gives you an alternative route to the Properties dialog boxes of all the volumes on that disk drive. If you are only configuring one volume, you can go directly to that volume's Properties dialog box through the My Computer window.

Step 3

In the resulting Properties dialog box, click the Quota tab, and check the Enable Quota Management check box. Select the Limit Disk Space To option and set both the limit and the warning levels. Select both logging options, and click the Apply button.
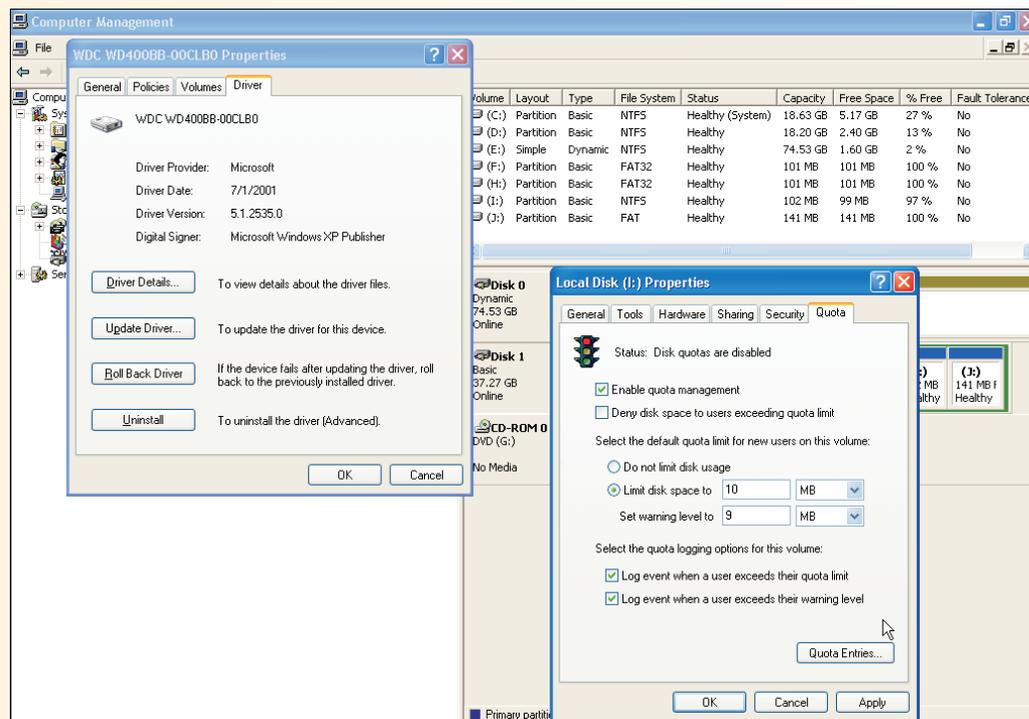
Note: If it is the first time quota management has been implemented on the volume, click the OK button on the Disk Quota window to enable the quota system.

Step 4

Click the Quota Entries button and observe the storage allocations currently set on the disk. In the Quota Entries window, notice that there are no imposed limits on any of the users. No limits are imposed unless you deny users additional space for exceeding their limit.

Step 5

Close all windows and dialog boxes to return to your desktop.

NetWare Networks

When it comes to managing your network components, you should consider the NetWare portion entirely on its own. This is true even though, as you have seen throughout this course, the majority of what you have done so far with your NetWare server has been accomplished from your Windows XP Professional workstation's desktop (and possibly from your Windows 2000 Server's desktop). Your NetWare 6 server offers its own, extremely detailed and oftentimes complex network management components. This course is not intended to prepare you to the point where you are an expert with these tools. Rather, the introductory nature of this course is intended to provide you with an understanding of some of the basic tools available and show you some that are comparable to those you learned about for managing the Windows portion of your network.

Using the Server Console

On large networks using most of NetWare's server capabilities, server management involves extensive communication between the administrator and the server's network operating system. This communication primarily takes the form of text-based commands and NetWare Loadable Modules (NLMs), and the majority of these are still entered or loaded by administrators using the server console. The ConsoleOne and Internet-based administration techniques, such as iManage, used in the Novell portions of this text are gaining more and more acceptance, but, for now, entering text-based commands at your NetWare server's console is still the most widely used management technique.

Entering Text-Based Commands at the Console The NetWare operating system includes numerous commands that operators use when they interface with the file server's hardware and software. The commands are part of the operating system, just as DOS commands are part of the disk operating system (DOS) or Microsoft's utilities that are built into Windows. You must be just as careful when using NetWare commands as when working with DOS commands or Windows utilities. They will act immediately upon whatever part of the server you specify, and they will do whatever you ask of them. Some are stand-alone commands, in that they are used without any command **arguments** (parts of the command that usually tell the system what to execute the command upon). Other commands, such as the `LOAD` command, will not work unless the arguments are there.

If your syntax (the format of the command) is incorrect, the command may not be understood at all, or it may be misunderstood and performed by the software, returning either an error or the wrong result. On the other hand, if your syntax is correct but your command is for the wrong function, you could affect your server's health. Furthermore, in actual operation, many commands are interpreted by the system even if they are omitted. The command `NAME.NLM` could be executed at the console by typing **LOAD NAME.NLM** or by simply typing **NAME**. In the second instance, the system assumes you want it to `LOAD` an NLM and interprets your command appropriately. Therefore, typing **NAME** at the console would be an example of properly using a NetWare text-based command.

The results of using the commands are pretty easy to predict if they are used properly. The `NAME` command simply returns the server's name. Misspell it as `NAM`, however, and the system looks for a file named NAM to load.

Help Available

*There are hundreds of commands available for you to use. You can type **HELP** at the console to list many of the more common commands. There are so many commands listed there that you will have to press another key (other than the ESC key, which terminates the HELP command) to see the rest of the list. You can get additional assistance for any command in that list by typing the desired command immediately after the HELP command. For example, the command HELP DOWN would return help for the DOWN command and give you an example of its proper use.*

Similarly, entering the TIME command at the server console returns the system time, and entering MEMORY returns the server's total memory; on the other hand, entering the misspelled TIM looks for a file named TIM to load. Not all commands are that easily interpreted, however, and depending on how bad your misspelling is, the system could end up doing something entirely different from what you intended.

```
NW6SVR1:name
This is server NW6SVR1
NW6SVR1:time
  Time zone string: "CST6CDT"
  DST status:  OFF
  DST start:    Sunday, April 6, 2003    2:00:00 am CST
  DST end:      Sunday, October 26, 2003   2:00:00 am CDT
  Time synchronization is active.
  Time is synchronized to the network.
Wednesday, December 11, 2002    9:02:15 pm UTC
Wednesday, December 11, 2002    3:02:15 pm CST
NW6SVR1:memory
Total server memory: 261,758 Kilobytes
NW6SVR1:_
```

• Three NetWare text-based commands entered at the server console, and their results

Table 10.1 lists some commonly used commands.

Using NetWare Loadable Modules   Unlike console commands, NetWare Loadable Modules (NLMs) are commands stored in locations outside the operating system. NLMs add functionality to the operating system's core capabilities, and an operator must load the NLMs into the server's memory to use them. Performing a LOAD action tells the server to read the particular module into its memory from the default SYS:SYSTEM location (unless

Table 10.1	Common NetWare Text Commands
Command	**Description**
LOAD <NLM>	Reads the applicable NLM into the server's RAM
UNLOAD <NLM>	Removes the applicable NLM from the server's RAM
DOWN	Closes all open files/volumes and shuts down the server
SECURE CONSOLE	Removes DOS from the server; also allows loading NLMs only from SYS:SYSTEM
MODULES	Displays currently loaded NLMs
CONFIG	Displays server's network interface card information
DISPLAY NETWORKS	Displays all networks to which the server has access
DISPLAY SERVERS	Displays all servers on which the server has information
SET TIME	Allows changing of the current system date and time
SEND	Allows transmitting message to currently logged on users
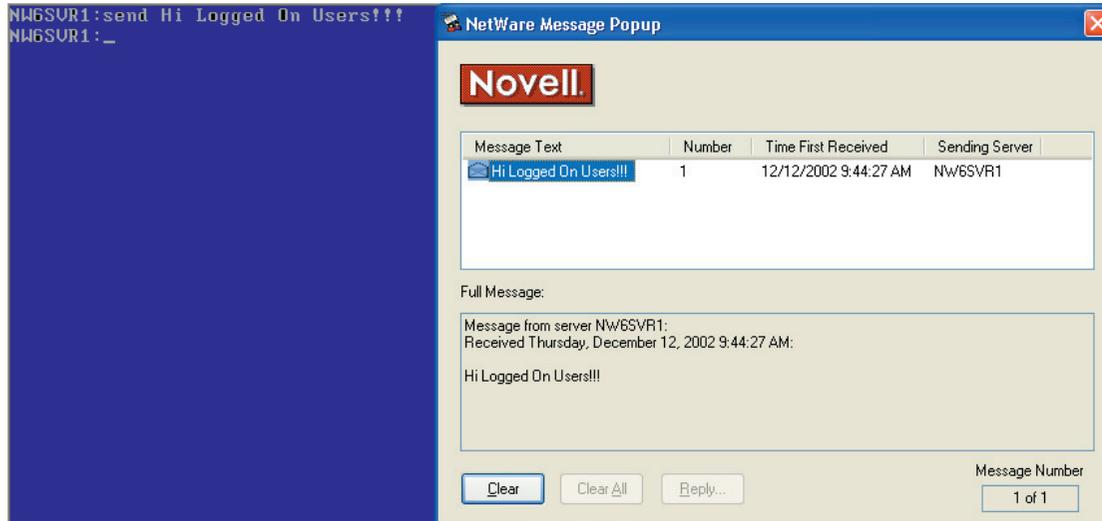
• The `SEND` command entered at the server console and its resulting message at the users' workstations

another path is specified), and to then execute (or run) the module. The added functionality then remains in the server, provided the server continues to run, or until the operator decides to `UNLOAD` the NLM.

At the console prompt, type **CDROM.NLM** to prepare the server to operate the CD drive. The NLM must be loaded before running the `MOUNT` command when working with CDs. The `MOUNT` command makes a volume available for users, and it is run only once after the server is started. The `MOUNT` command then stays in memory until the `DISMOUNT` command is run (making the volume unavailable) or you `DOWN` the server. The NLM can be added to the startup commands so that it loads automatically whenever the server is started.

Although many of the common NLMs have a `.NLM` extension following the command's name, there are other extensions available such as `.DSK` and `.LAN` as shown in Table 10.2. Table 10.3 lists some commonly used NLM modules.

Using the MONITOR NLM

MONITOR is an important NLM that you will likely use very often. If you are responsible for the overall health of your network, you will probably spend a great deal of your time reviewing the `MONITOR.NLM`'s statistics. The server's performance and operating statistics, as well as information about the connections made to the server, can be accessed by using MONITOR at your server console.

Table 10.2	NLM Types
NLM Types	**Description**
`.DSK`	Provides direct control of server drives (located in the DOS partition)
`.LAN`	Provides control drivers for network interface cards
`.NLM`	Adds general purpose capabilities to the server

Table 10.3	Common NLMs
Common NLMs	**Description**
MONITOR.NLM	Provides general performance information on the server
NWCONFIG.NLM	Provides the main functions used for server configuration
CDROM.NLM	Adds CD support to the server
DSREPAIR.NLM	Allows repairs to NDS
VREPAIR.NLM	Allows repairs to specified volumes
REMOTE.NLM	Allows server operation (with password) at workstation
3C509.LAN	An example of a control driver (3Com network card)

Running MONITOR　Typing **LOAD MONITOR** (or just **MONITOR**) at the console prompt and pressing the ENTER key will give you a screen containing several pieces of information about your server, as shown in Figure 10.1.

If nothing else is entered through the console for approximately ten seconds after loading MONITOR.NLM, the General Information part of the screen opens further, as shown in Figure 10.2, and additional information is displayed. This additional information is also available in the initial screen if you press the TAB key. The TAB key also toggles you back and forth between the expanded window and the reduced initial screen.

Quick Snapshot　Sometimes a quick snapshot of a network's traffic flow while the network is in actual operation will tell you if a problem exists. For example, if the total number of **cache buffers** (available working memory) in the General Information window falls below half of the original cache buffers, this indicates that the server is running low on memory, and you should either increase memory or decrease the demands on the amount of memory you have. Either add RAM or UNLOAD NLMs.


```
NetWare 6 Console Monitor  12.00              NetWare Loadable Module
Server name: 'NW6SVR1' in Directory tree 'UNIVERSITY'
Product: Novell NetWare 6

                        General  Information

           Utilization:                          1%
           Server up time:             0:00:36:10
           Online processors:                     1
           Original cache buffers:           64,668
           Total cache buffers:              20,077
           Dirty cache buffers:                   0

                        Available Options

                  Connections
                  Storage devices
                  Volumes
                  LAN/WAN drivers
                  Loaded modules
                  File open/lock activity
                  Disk cache utilization
```

● **Figure 10.1**　The initial results of running the LOAD MONITOR command at your server console

```
NetWare 6 Console Monitor   12.00              NetWare Loadable Module
Server name: 'NW6SVR1' in Directory tree 'UNIVERSITY'
Product: Novell NetWare 6

                         General Information
         Utilization:                        1%
         Server up time:                0:00:36:23
         Online processors:                   1
         Original cache buffers:         64,668
         Total cache buffers:            20,077
         Dirty cache buffers:                 0
         Long term cache hits:               0%
         Current disk requests:               0
         Packet receive buffers:          2,000
         Directory cache buffers:             0
         Maximum service processes:         570
         Current service processes:           7
         Current connections:                 2
         Open files:                        117

              ┌─────────────────────────┐
              │ │File open/lock activity │
              │▼│Disk cache utilization  │
              └─────────────────────────┘
```

● **Figure 10.2**   After ten seconds of inactivity, the General Information section expands.

This course is not intended to give you a complete understanding of each of the preceding items. The goal at this introductory level is to show you where to go should you need to locate such information in times of crisis. Keeping track of the information here also lets you record trends that can help you spot potential problems as they develop.

Using the DSREPAIR NLM

Hopefully, you will not *need* to repair your NDS tree. If you must repair it, though, you should have some idea of where to go to initiate the repairs. Running the DSREPAIR NLM will help you.

You used DSREPAIR after you built your server, so you should know a little about the NLM. Occasionally running DSREPAIR will help remove small network problems before they progress any further.

Copies of NDS are located on other servers in various locations around the network, and this makes the timing of updates critical. If you are wondering whether errors in timing, and the fact that NDS is spread over several locations can cause NDS to become disjointed at times, it can. That is when DSREPAIR really comes in handy.

Inside Information

MONITOR Information

If the expanded General Information window covers the Available Options window, press the TAB key and observe the scroll bar at the left side of the options window to see where the additional information is. Use the keyboard's up or down arrow to reveal this additional information. Selecting any of the listed Available Options will display an information window with the applicable item's information. These options can provide a significant amount of information about the server's operation. Tracking pertinent pieces of this data can alert you to a potential problem.

Cross Check

DSREPAIR Information

Need to know more about DSREPAIR? Go back to Chapter 4 and read the "Installing and Configuring Novell NetWare 6" section and perform the Try This! exercise at the end of that section to run DSREPAIR at your server once again. Then answer these questions:

1. How long did your DSREPAIR take? _____

2. How many repairs did DSREPAIR make? _____

3. Highlight each of the DSREPAIR screen options and copy the information provided by the system at the bottom of the screen.

    a. Single object repair: _____

    b. Unattended full repair: _____

    c. Time synchronization: _____

    d. Report synchronization status: _____

    e. View repair log file: _____

    f. Advanced options menu: _____

Inside Information

NDS Replicas

In larger networks with multiple file servers, NDS stores duplicate pieces of the Directory, called **replicas***, on many of the servers around the network. Replicas provide fault tolerance and backup capability. The servers communicate with each other, sharing updates to the Directory as needed. Whether these updates are passed on to the next recipient is determined by the time stamp placed on them by the servers. If the recipient server has data with a newer time stamp, that update is determined to be unnecessary and is therefore ignored. The timestamp system depends entirely on all servers knowing exactly what time it is, and this is accomplished through a centralized time-allocation system. For successful replica operation, one main server is responsible for providing accurate time to all the other servers working together.*

You should try to activate any repair process, such as DSREPAIR, during the network's idle times. Otherwise, users will be disrupted because the Directory is locked during the entire procedure. Additionally, any repairs made during the repair process will most likely create incorrect time stamps that occurr while your system is offline and you should allow your system time to synchronize after repairs are completed.

Unattended Full Repair   You should recall that selecting the Unattended Full Repair option in DSREPAIR and pressing ENTER immediately initiates the repair action. Depending on the size of your network, this could take some time to complete. On a small network, such as yours, the process should take only a few seconds to complete.

When the repair action is completed, a window is displayed informing you that "All automatic repair operations have been completed." It also tells you the number of errors and the total amount of repair time the operation required. It is not uncommon for DSREPAIR to uncover numerous insignificant errors, so occasionally running DSREPAIR will help keep your network operating properly. You may need to run it several times when removing errors. Provided you have the network idle time available to you, rerun the process until zero errors are found by DSREPAIR.

Advanced Options Menu   Selecting the Advanced Options Menu and pressing ENTER provides the following additional DSREPAIR options:

- **Log File and Login Configuration**   Configures options for the DSREPAIR log file. Logging in to the Directory Services tree is required by some operations.
- **Repair Local DS Database**   Repairs the Directory Services database files stored on this server.
- **Servers Known to This Database**   Shows the names of the servers that have performed the following operations to this server's database: time synchronization, network addresses, and server information.
- **Replica and Partition Operations**   Provides functions to repair replicas, replica rings, and server objects. This option also dynamically displays each server's last synchronization time.
- **Check Volume Objects and Trustees**   Checks all mounted volumes for valid volume objects and valid trustees on the volumes.
- **Check External References**   Checks for illegal external references.
- **Security Equivalence Synchronization**   Allows users to synchronize security equivalence attributes throughout the tree.
- **Global Schema Operations**   Provides functions to update the schema in the tree.
- **View Repair Log File**   Allows you to edit the log file, which is optionally created when repair operations are performed.
- **Create a Database Dump File**   Copies the Directory Services database files to disk in compressed format, to be used for offline repairs and diagnostics. This is not to be used as a backup method.
- **Return to Main Menu**   Exits this menu and returns to the main list.

You will probably be interested in running only the Repair Local DS Database and the Check Volume Objects and Trustees options. The first will behave in the same way as the unattended option that you ran earlier, and the second will require that your fully distinguished administrator user name and password be used for authorization. It is useful to use both of these options on an occasional basis. They should not return major errors unless there is a significant problem.

Step-by-Step 10.04

Using NWCONFIG

You should become familiar with another frequently used NLM—the NWCONFIG NLM. This is the NLM that you will use to accomplish most of the configuration options needed on your NetWare server.

To complete this exercise, you will need the following items:

- An operational NetWare 6 server
- Your administrative user information (if not already logged in to the server)

Step 1

From your NetWare 6 server's GUI desktop, press CTRL+ESC to go to the Current Screens window. Enter the selection number for the System Console.

Step 2

Type **NWCONFIG** at the server console, and press ENTER to view the options available.

Note: Most of the options listed are self-explanatory. Several options have additional features when selected, but three, Legacy Disk Options, NSS Disk Options, and License Options, tell you that they no longer work through NWCONFIG when you select them and press ENTER.

```
NetWare Configuration

                         Configuration Options
         ┌────────────────────────────────────────────────────────┐
         │ Driver Options         (load/unload disk and network drivers) │
         │ Legacy Disk Options    (configure NetWare partitions/volumes) │
         │ NSS Disk Options       (configure NSS storage and volumes)    │
         │ License Options        (install or remove licenses)           │
         │ Directory Options      (install NDS)                          │
         │ NCF files Options      (create/edit server startup files)     │
         │ Multi CPU Options      (install/uninstall SMP)                │
         │ Product Options        (other optional installation items)    │
         │ Exit                                                          │
         └────────────────────────────────────────────────────────┘




Use the arrow keys to highlight an option, then press <Enter>.
```

Step 3

Select Driver Options, press ENTER, and press ENTER again to view the disk drivers currently loaded on your server. You could press ENTER yet again to either search for additional drivers or load new drivers on your server. Press the ESC key twice to return to the initial NWCONFIG screen.

Step 4

Select Directory Options, press ENTER, and notice the important actions available to you here, such as installing or removing Directory Services, creating Directory backups, or extending the schema.

```
NetWare Configuration

                 Configuration Options
           ┌─────────────────────────────────────────┐
        D  │        Directory Services Options        │
        L  ├─────────────────────────────────────────┤
        N  │ Install Directory Services onto this server │
        L  │ Remove Directory Services from this server  │
        D  │ Upgrade NetWare 3.x bindery information to the Directory │
        N  │ Upgrade mounted volumes into the Directory  │
        M  │ Directory backup and restore options        │
        P  │ Extend Schema                               │
        E  │ Return to the previous menu                 │
           └─────────────────────────────────────────┘




 Use the arrow keys to highlight an option, then press <Enter>.
```

Step 5

Select Directory Backup and Restore Options, press ENTER, and press ENTER again to select the Save Local NDS Information Before Hardware Upgrade option. Read the notice that comes up on your computer screen.

```
NetWare Configuration

                 Configuration Options
           ┌─────────────────────────────────────────┐
        D  │        Directory Services Options        │
        L  ├──────┬──────────────────────────────────┤
        N  │      │                                   │
        L  │ Save │ If you proceed, backup data will be created in │
        D  │ Rest │ SYS:SYSTEM. These data contain this server's   │
        N  │ Rest │ object and other NDS information. After this    │
        M  │ Rest │ has completed, you will have an opportunity to  │
        P  │ Rest │ copy these data to another location.           │
        E  │ Retu │                                   │
           │      │ Important: After the backup is complete, NDS   │
           │      │ will be disabled on this server.               │
           │      │                                   │
           │      │ Press <Esc> to cancel;                         │
           │      │ Press <Enter> to continue.                     │
           └──────┴──────────────────────────────────┘


 Use the arrow keys to highlight an option, then press <Enter>.
```

```
Warning: After accomplishing an NDS backup,
NDS on the applicable server will be disabled.
Thus, the server will need to be either
restarted or have its copy of NDS restored.
```
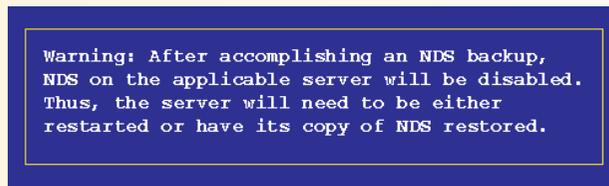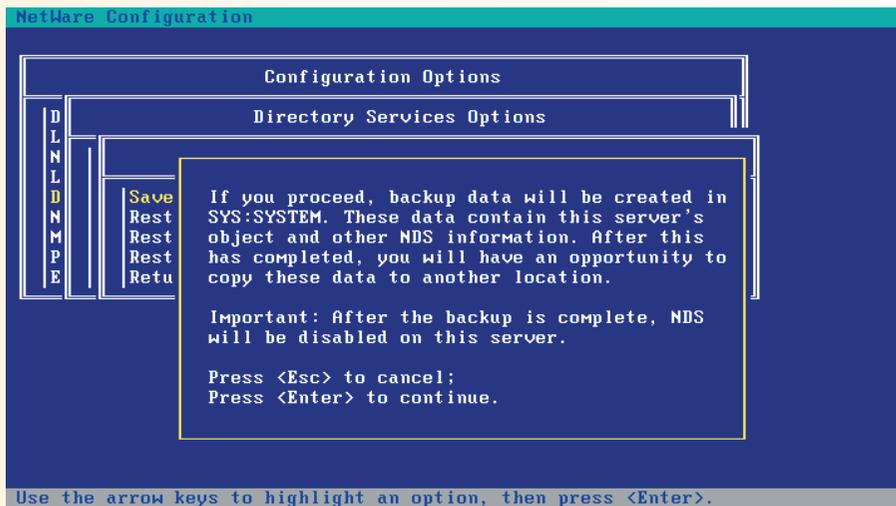
Note: If you do ever have to use this backup technique, you will be required to use your fully qualified administrative user name (CN=Admin.O=LAB) and password.

Step 6

Click Cancel so you do not actually implement the backup action. You could damage your copy of NDS in the process. Press the ESC key twice to return to the initial NWCONFIG screen.

Step 7

Look through the remaining options without implementing any changes (use the same general procedures as in Steps 3 through 6). From the initial NWCONFIG screen, press the ESC key again when you are finished, and select Yes and press ENTER to exit NWCONFIG.

Chapter 10 Review

■ Chapter Summary

After reading this chapter and completing the Step-by-Step tutorials and Try This! exercises, you should understand the following facts about network management:

Describe Windows Network Management Tools

- Access to the server through your workstation is becoming the most common way to manage your network.

- No matter what the problem is with a user's computer, they usually blame the network technicians first and then the network itself.

- Management tools, such as the Error-Checking, Defragmentation, and Backup utilities, are available on Windows workstations.

- The Error-Checking tool is also called the Check Disk tool, and it can be initiated with a DOS command by typing **chkdsk** in the RUN dialog box.

- The defragmentation window includes graphic depictions of your current and projected disk fragmentation.

- The Defragmentation tool requires 15 percent of the total disk space available on the disk to be empty in order to run properly, but it will run with less.

- The Backup tool can be used to keep users' information accessible because users can restore some of their own files if they keep their own backups.

- To initiate a backup, users must be working with their own files or they must have the Read, Read and Execute, Modify, or Full Control permission to the files.

- To restore from a backup, users must have the Write, Modify, or Full Control permission to the backed up files.

- The Task Manager is started by right-clicking the taskbar or using CTRL+ALT+DELETE and selecting Task Manager.

- Windows XP Professional adds a Networking tab to the Applications, Processes, and Performance tabs found on the Windows 2000 Server's Task Manager window.

- SNMP is an Internet-standard protocol that facilitates monitoring the system and sending status updates to a central location.

- SNMP nodes send messages when queried by the manager, but they can also send alarm messages on their own when properly configured.

- Performance console lets you collect data about your system's performance.

- System Monitor is a part of the Performance console that lets you view current or recorded information about your system.

- The different views in System Monitor are graph, histogram, and report.

- The Performance Logs and Alerts section of the Performance console records its data in the Perflogs folder on your hard disk drive.

- Network Monitor provides you with information regarding your network's health.

- Network Monitor actually records the data flowing between the computers on your network and your server.

Implement Windows and NetWare Network Management

- Improperly maintaining networks wastes the effort required to create them.

- A healthy network's use will tend to increase rapidly.

- Compression reduces the size of files so they take up less storage space.

- Having smaller files that contain the same data means that you can store more valuable information on your network without increasing storage space.

- Compression can only be implemented on NTFS volumes.

- Compression can be implemented at the volume level with everything on that volume being stored in the compressed state, or at the file level where only specific files are compressed.

- Compression and encryption are mutually exclusive.

- Applications using compressed files check the compression state and uncompress applicable files prior to use.

- Except for FAT partitions (which are always uncompressed), moving a compressed file from one location on a volume to another location on the same volume has that file retain its original compression state, whereas copying that file to another location on the same volume has the file acquire the compression state of the receiving location.

- When implementing compression, you have the option of leaving an object's contents as they are or compressing them.

- Quota management assigns a limit on the amount of space users can use for storage on specific volumes.

- Quota management is available only on NTFS volumes.

- Quotas can be implemented as mandatory, in which case they are enforced, or as informational, which means compliance is simply monitored.

- Quota use on compressed volumes is calculated based on the uncompressed size of the stored files.

- NetWare 6 has extremely detailed, and sometimes complex, network management components.

- The NetWare server console's text-based commands are still the most widely used management technique.

- Some NetWare commands are stand-alone commands, and others require arguments.

- There are hundreds of commands available for use at the NetWare server console, and you can get information about their use by using the HELP command.

- NLMs are commands stored in locations outside the operating system.

- The NetWare MONITOR NLM is a tool for gathering and monitoring information about your network's health.

- Periodically running DSREPAIR helps maintain your system.

- NWCONFIG is another important utility used to obtain and update information about your network.

■ Key Terms

agent *(323)*	**MIB** *(324)*	**report view** *(326)*
arguments *(339)*	**Network Monitor** *(331)*	**SNMP** *(323)*
cache buffers *(342)*	**NMS** *(323)*	**SNMP manager** *(323)*
compression *(333)*	**nodes** *(323)*	**state** *(322)*
graph view *(326)*	**page file** *(322)*	**System Monitor** *(326)*
histogram view *(326)*	**Performance console** *(325)*	**Task Manager** *(319)*
kernel *(322)*	**quota** *(335)*	**trap message** *(323)*
link state *(322)*	**replicas** *(344)*	

■ Key Term Quiz

Use the preceding vocabulary terms to complete the following sentences. Not all the terms will be used.

1. An alarm message sent by an SNMP agent is also called a(n) _____.

2. When running MONITOR on a NetWare 6 server, if the available memory, also called _____, falls below half of its original amount, a remedy could be to add RAM or UNLOAD NLMs.

3. An assigned limit on the amount of network storage a user can use is called a(n) _____.

4. The name of the tool that includes a Networking tab in its Windows XP implementation is the _____.

5. By clicking the Performance tab on the tool that can be entered using the Microsoft three-finger salute, you can view graphical screens showing dynamic information on your CPU and your _____.

6. Once a network node is monitored by SNMP and managed by SNMP manager, it is referred to as a(n) _____.

7. The Internet-standard protocol that facilitates monitoring the system and communicating status updates is called the _____.

8. The _____ portion of your Performance console utility provides you with optional viewing configurations.

9. The _____ utility records a copy of the data flowing between other computers and your server.

10. The Windows advanced storage feature that helps extend your network's storage capacity by reducing the size of files is called _____.

■ Multiple-Choice Quiz

1. Which of the following tools is not located on the hard disk drive's Properties dialog box?
   a. Backup
   b. Error-Checking
   c. Defragmentation
   d. Task Manager

2. Which of the following can be initiated using the RUN dialog box, accessed through the Start menu, with the *fix* switch?
   a. Backup
   b. Error-Checking
   c. Defragmentation
   d. Task Manager

3. Which of the following makes use of an Analyze button?
   a. Backup
   b. Error-Checking
   c. Defragmentation
   d. Task Manager

4. All of the following are associated with SNMP except:
   a. host
   b. nodes
   c. agents
   d. players

5. Inside the Windows Components Wizard window, you will see all of the following options or features except:
   a. The Add/Remove Programs option
   b. The Management and Monitoring Tools component
   c. A Details button
   d. Selection boxes

6. Which of the following is the default permission for SNMP service community names?
   a. Full Control
   b. Read Only
   c. Write
   d. Read/Write

7. Which of the following views in System Monitor allow(s) you to change the view's background?
   a. graph
   b. histogram
   c. report
   d. All of the above

8. Which of the following is listed in the Name column for the default Counter Log used in the Performance Logs and Alerts section of the Performance window?
   a. System Log
   b. System Overview
   c. System_Overview.blg
   d. C:\System Log

9. Which of the following is a true statement regarding Network Monitor?
   a. It records all network traffic on your network.
   b. Network traffic is only recorded when it is going to the local computer where Network Monitor is configured.

    c. Network traffic can only be recorded at the local computer where Network Monitor is configured.

    d. Network traffic is only recorded when it is going from the local computer where Network Monitor is configured.

10. When you copy a compressed 10MB file to a volume with 19MB of available space, which of the following will be true?

    a. The copy action will be disallowed and the file will remain compressed.

    b. The copy action will be allowed and the file will be uncompressed.

    c. The copy action will be allowed and the file will be compressed.

    d. The copy action will be disallowed and the file will remain uncompressed.

11. If you were to copy a compressed 10MB file from one volume to another volume that is not using compression, which of the following would be true?

    a. The copy action will be disallowed and the file will remain compressed.

    b. The copy action will be allowed and the file will be uncompressed.

    c. The copy action will be allowed and the file will remain compressed.

    d. The copy action will be disallowed and the file will be uncompressed.

12. Two users have 500MB quotas on a particular volume where they each have 550MB of information stored. The administrator then implements compression that reduces all files in

storage by an average of 50 percent. Which of the following is/are definitely true?

    a. Both users have to have specific quotas set on that volume.

    b. Both users will still be over their quotas.

    c. They each can store at least another 225MB.

    d. Quota management is not being enforced.

13. Which of the following deals with NetWare NLMs?

    a. MODULES

    b. CONFIG

    c. DISPLAY

    d. All of the above

14. Which of the following is true when your NetWare 6 server's cache buffers fall below 25 percent of the original cache buffers?

    a. You should decrease memory demand.

    b. You should add RAM.

    c. This is an acceptable condition.

    d. None of the above.

15. Which of the following is/are true about DSREPAIR:

    a. Running DSREPAIR locks the Directory during the entire procedure.

    b. You should run DSREPAIR when user impact would be lessened.

    c. Repairs made will likely have an incorrect time stamp.

    d. All of the above.

■ Essay Quiz

1. How can this course help prepare you to become a better network administrator?

2. Why are network technicians blamed when network workstations malfunction?

3. Explain the benefits of having users involved in managing their own workstations.

4. When considering whether to use compression on your network servers, why is it important that you find out if encryption is being used?

5. What is the main difference between NetWare console commands and NLMs?

Lab Projects

Time to roll up your sleeves and apply what you've learned. The following lab projects will enable you to practice the concepts discussed in this chapter.

• Lab Project 10.1

The data in storage at the TEACH training center has recently been compressed. Your network's users are confused about which files are compressed and which are not. You decide to configure their computers so that the compressed files show up as a different color than those that are uncompressed. You now want to configure their computers to display this information.

You will need the following:

■ A networked lab computer with Windows XP Professional

■ Administrative user login information

Then do the following:

1 At your workstation computer, log in locally as your administrative user.

2 Click the Start button and select My Documents | Tools | Folder Options.

3 Click the View tab, and in the Advanced Settings section, scroll to and select the Show Encrypted or Compressed NTFS Files in Color option. (Note that this only allows you to employ the system-provided "different" colors, not to choose your own colors.)

4 Click OK and close all windows to return to the desktop.

• Lab Project 10.2

You implemented quota management on your TEACH volumes, but users are still storing as much as they want on all of the storage devices because the quotas are not being enforced. You decide to stop this misuse of storage by changing the quota management such that it is enforced, and users are not allowed to exceed their limit.

You will need the following materials:

■ A networked lab computer with Windows XP Professional, formatted using NTFS

■ Your administrative user's information

Then do the following:

1 Log in to a Windows XP workstation (where network storage is allowed) as the administrative user. Click the Start button and select My Computer. Right-click the volume you wish to change, and select Properties.

2 Click the dialog box's Quota tab and ensure the Enable Quota Management option is selected. Select the Deny Disk Space to Users Exceeding

Quota Limit option, and adjust the Limit Disk Space To options as desired. Ensure that both logging options are selected, and click the Apply button.

3 Click the Quota Entries button and observe the storage allocations and limits imposed on users with storage on the disk.

4 Right-click a listed user (not the administrator) and select Properties. Notice the newly imposed limits on the user.

Note: If the user's limits have not been updated to reflect your changes, simply click the Do Not Limit Disk Use option, and then click the Limit Disk Space To option again, and click the Apply button.

5 Close all windows and dialog boxes to return to your desktop.