MCSE

Workstation
Server
Enterprise

Using Performance Monitor

About Chapter 22

The focus of this chapter is on Performance Monitor, a Windows NT tool that can be used to identify bottlenecks, determine usage of system resources, track performance trends over time, predict future usage of system resources, and determine how system configuration changes affect system performance.

The chapter begins by explaining Performance Monitor objects, instances, and counters. Then it details how to install the SNMP Service and Network Monitor Agent to obtain various objects and their counters. It also describes how to enable the PhysicalDisk and LogicalDisk objects and their counters.

The remainder of the chapter is all about using Performance Monitor to gather and view statistics. Each of the four Performance Monitor views—Chart view, Alert view, Report view, and Log view—are explored.

This chapter includes one hands-on lab. In this lab, you'll install Network Monitor Agent and SNMP Service, use Performance Monitor Chart view and Alert view, create a Performance Monitor log file, and import a Performance Monitor log file into Report view and Chart view.

Chapter 22 is a "must read," no matter which of the three Windows NT 4.0 Microsoft Certified Professional exams you're preparing for. This chapter maps to the "Monitor performance" objectives in the Monitoring and Optimization section in these exams' objectives.

What Is Performance Monitor?

Performance Monitor is a Windows NT tool that ships with both Windows NT Workstation and Windows NT Server. You don't need to install Performance Monitor — it's installed automatically when you install Windows NT.

Performance Monitor has several uses. It can be used to:

- Identify performance problems and/or bottlenecks

- Determine current usage of system resources

- Track performance trends over time

- Predict future usage of system resources (capacity planning)

- Determine how system configuration changes affect system performance

Performance Monitor is often used when there's a problem to be resolved, but it can also be used for planning purposes.

The rest of this chapter discusses the basics of how to use Performance Monitor.

concept link **This chapter covers only the basics of monitoring performance. Advanced use of Performance Monitor for system capacity planning is discussed in Chapter 24. Using Performance Monitor to detect common bottlenecks is featured in Chapter 25.**

A good place to start when discussing Performance Monitor is with an explanation of Performance Monitor objects, instances, and counters — the things Performance Monitor can measure.

Performance Monitor Objects, Instances, and Counters

The system components that Performance Monitor can measure, such as processor, memory, and physical disk, are called *objects*.

If a system has more than one of a particular object, such as multiple processors or multiple physical disks, there is said to be more than one *instance* of that object. Some objects, such as memory, do not have instances. This is because there can't be more than one of the particular object.

Each instance of an object can be measured in different ways. Each possible measurement of an object is called a *counter*. For example, the PhysicalDisk object has multiple possible counters, including Disk Reads/sec (second), Disk Writes/sec, % Disk Time, % Disk Read Time, and % Disk Write Time. Each counter is selected individually. An object can be selected multiple times with a different counter for each selection, as shown in Figure 22-1. Notice the Performance Monitor report shows multiple counters selected for the PhysicalDisk object.
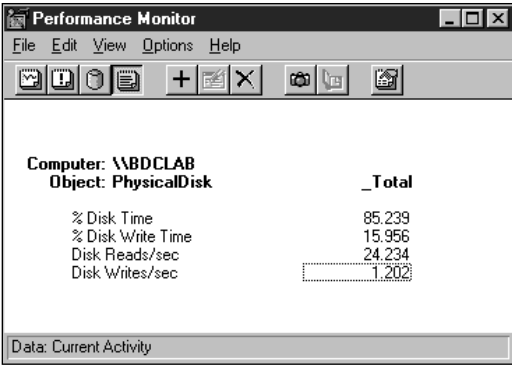

FIGURE 22-1   Measuring multiple counters for a single object

Many different objects and counters can be measured in Performance Monitor. Table 22-1 shows some of the most commonly used Performance Monitor objects and counters.

TABLE 22-1 COMMONLY USED PERFORMANCE MONITOR OBJECTS AND COUNTERS		
OBJECT	*COUNTER*	*DESCRIPTION*
Memory	Pages/sec	This counter measures how often data is written to and read from the paging file. I use this counter to obtain an overall view of how memory is utilized by Windows NT.
		A consistently high number (greater than 2 - 3) indicates that the current amount of RAM may be insufficient for the computer.
Network Segment	% Network utilization	This counter measures the total network utilization on a given network segment as a percentage of the maximum amount of network traffic possible on that segment.

OBJECT	COUNTER	DESCRIPTION
		A consistently high number (a number approaching 100 percent) may indicate that there is too much traffic on that network segment, and that an additional network adapter may need to be installed in the server or a router installed to further segment the network.
PhysicalDisk	Avg. Disk Queue Length	This counter measures the average number of disk reads and writes waiting to be performed.
		A consistently high number (greater than 2–3) may indicate that a faster hard disk and/or hard disk controller, or a different disk configuration (such as a stripe set or a stripe set with parity) may be required for adequate system performance.
PhysicalDisk	% Disk Time	This counter measures the percentage of time the disk performs reads and writes.
		A consistently high number (a number approaching 100 percent) may indicate that a faster hard disk and/or hard disk controller, or a different disk configuration (such as a stripe set or a stripe set with parity) may be required for adequate system performance.
Processor	% Processor Time	This counter measures the percentage of time that the processor is actively used by processes other than the Idle process. (The *Idle process* can be defined as the time the processor spends waiting to be assigned tasks.)
		A consistently high number (a number approaching 100 percent) may indicate that a faster processor (or an additional processor) may be required for adequate system performance.
Server	Bytes Total/sec	This counter measures the total amount of network utilization of a Windows NT Server computer. Specifically, it measures the total number of bytes sent to and received from all network adapters in the Windows NT computer by the Server process.
		The measurement can be used to compare utilization of two similar servers for load balancing purposes. It can also be used in conjunction with other measurements to determine network segment utilization.

Not all Performance Monitor objects and counters are available when Windows NT is first installed. For example, the Transport Control Protocol (TCP) object is not available until the *Simple Network Management Protocol* (SNMP) service is installed, and the Network Segment object is not available until the Network Monitor Agent is installed. Additionally, some objects and counters must be enabled before they can be effectively used in Performance Monitor.

The following sections explain how to add and enable certain Performance Monitor objects and counters.

Installing the SNMP Service to Obtain TCP/IP Objects and their Counters

By default, Performance Monitor does *not* make available TCP/IP objects and their counters, even when TCP/IP is installed and configured on the Windows NT computer. The SNMP Service must be installed before you can monitor TCP/IP objects and counters in Performance Monitor.

Installing the SNMP Service adds four objects and their counters to Performance Monitor:

- IP (Internet Protocol)
- ICMP (Internet Control Message Protocol)
- TCP (Transport Control Protocol)
- UDP (User Datagram Protocol)

These four objects and their counters are used by developers to optimize network usage of applications, and by administrators of large networks to troubleshoot and optimize TCP/IP network traffic.

TO INSTALL THE SNMP SERVICE ON A WINDOWS NT COMPUTER, FOLLOW THESE STEPS:

1. Select Start ≻ Settings ≻ Control Panel.

2. The Control Panel dialog box appears. Double-click the Network icon.

3. The Network dialog box appears. Click the Services tab.

4. The Services tab appears. Click the Add command button.

5. The Select Network Service dialog box appears. Highlight SNMP Service, as shown in Figure 22-2. Click OK.
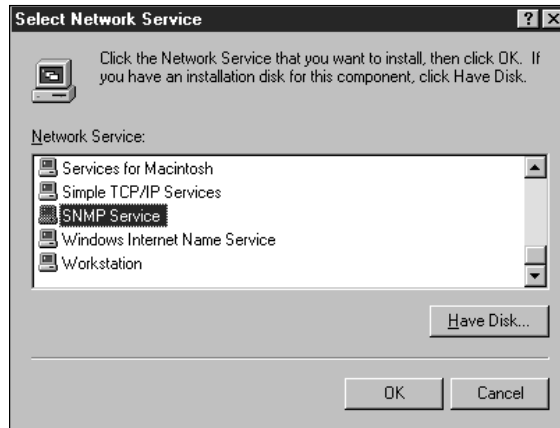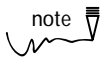

FIGURE 22-2 **Installing the SNMP Service**

6. A Windows NT Setup dialog box appears. Ensure that the correct path to your Windows NT Workstation or Windows NT Server source files (usually the i386 folder on your Windows NT Workstation or Windows NT Server compact disc) is listed in the text box. Edit this text box if necessary. Click the Continue command button.

7. Windows NT copies source files and installs the SNMP Service.

8. The Microsoft SNMP Properties dialog box appears, as shown in Figure 22-3. Notice the three tabs available: Agent, Traps, and Security. Configure the SNMP Service as desired. Click OK.

note ⬇ **If you are installing the SNMP Service only to obtain TCP/IP objects and their counters for use in Performance Monitor, no configuration is required.**

9. The Network dialog box reappears. Click the Close command button.

10. Windows NT performs various bindings operations.

11. A Network Settings Change dialog box appears, indicating that you must shut down and restart the computer for the new settings to take effect. Click the Yes command button to restart the computer.
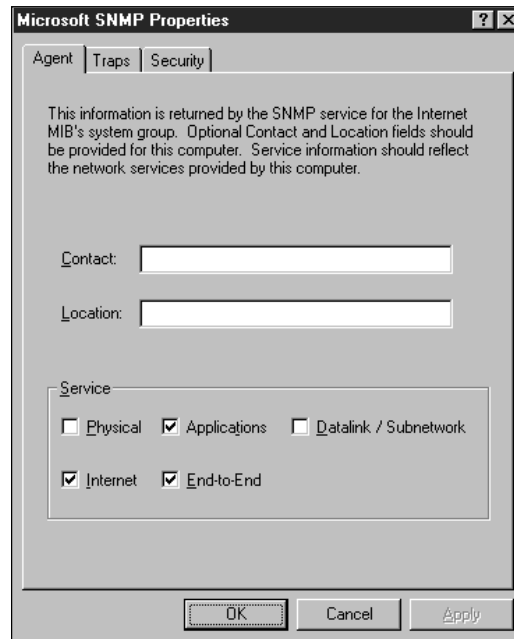
FIGURE 22-3 Configuring SNMP Properties

Installing Network Monitor Agent to Obtain the Network Segment Object and its Counters

By default, the Network Segment object and its counters are *not* available in Performance Monitor. The Network Monitor Agent must be installed to make this object and its counters available.

The counters that are installed with the Network Segment object include: % Broadcast Frames, % Network Utilization, Total Bytes Received/second, and Total Frames Received/second.

The Network Segment object has an instance for each network adapter installed in the Windows NT computer. You can monitor counters for each instance of the Network Segment object. In other words, you can monitor network traffic on each network segment that your Windows NT computer is connected to.

The Network Segment object and its counters are used by network administrators to determine network utilization on individual network segments. In addition, this object and its counters are often used for network capacity planning. The following section explains how to install Network Monitor Agent to obtain the Network Segment object and its counters.

**TO INSTALL NETWORK MONITOR AGENT ON A
WINDOWS NT COMPUTER, FOLLOW THESE STEPS:**

1. Select Start ➢ Settings ➢ Control Panel.

2. The Control Panel dialog box appears. Double-click the Network icon.

3. The Network dialog box appears. Click the Services tab.

4. The Services tab appears. Click the Add command button.

5. The Select Network Service dialog box appears. Highlight Network Monitor Agent, as shown in Figure 22-4. Click OK.
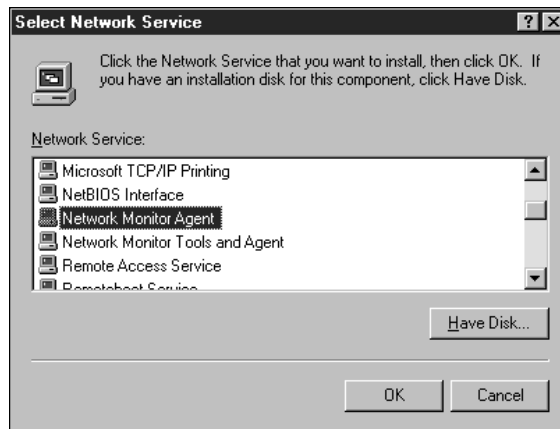
FIGURE 22-4 **Installing the Network Monitor Agent**

6. A Windows NT Setup dialog box appears. Ensure that the correct path to your Windows NT Workstation or Windows NT Server source files (usually the i386 folder on your Windows NT Workstation or Windows NT Server compact disc) is listed in the text box. Edit this text box if necessary. Click the Continue command button.

7. Windows NT copies source files and installs the Network Monitor Agent.

8. The Network dialog box reappears. Click the Close command button.

9. Windows NT performs various bindings operations.

10. A Network Settings Change dialog box appears, indicating that you must shut down and restart the computer for the new settings to take effect. Click the Yes command button to restart the computer.

Enabling the PhysicalDisk and LogicalDisk Objects and their Counters

By default, the PhysicalDisk and LogicalDisk objects and their counters are installed, but *not* enabled. Although you can select these objects and their counters in Performance Monitor, until they are enabled, the counters will always display a value of zero.

The reason these objects and their counters are not enabled by default is that monitoring these objects can cause up to a one-and-a-half-percent increase in processor utilization on an Intel 486 computer. On a Pentium computer, enabling these objects and their counters usually causes a negligible (less than one half of one percent) increase in processor utilization.

The Windows NT `Diskperf.exe` command-line utility is used to enable the PhysicalDisk and LogicalDisk objects and their counters. You must reboot the computer after running `Diskperf.exe` before these objects and their counters will be usable in Performance Monitor.

Table 22-2 shows how the `Diskperf.exe` command-line utility can be used to enable and disable the PhysicalDisk and LogicalDisk objects and their counters.

TABLE 22-2 THE WINDOWS NT DISKPERF.EXE COMMAND
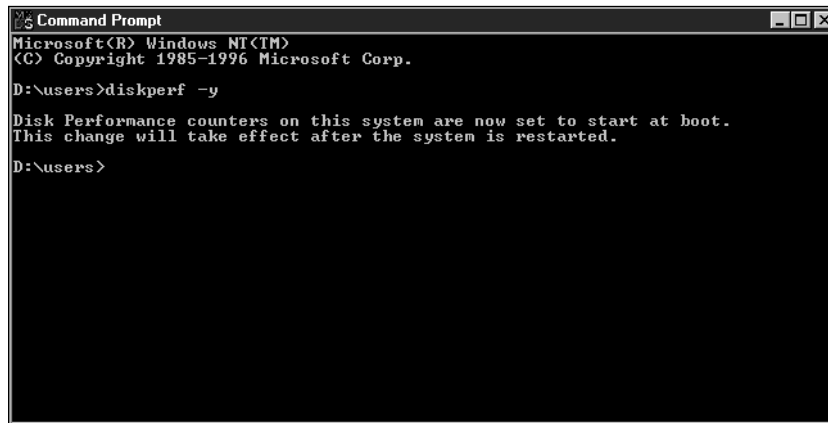
DISKPERF.EXE COMMAND	DESCRIPTION
`diskperf-y`	Enables the PhysicalDisk and LogicalDisk objects and their counters.
`diskperf-ye`	Enables the PhysicalDisk and LogicalDisk objects and their counters for stripe sets and stripe sets with parity.
`diskperf-n`	Disables the PhysicalDisk and LogicalDisk objects and their counters.

The remainder of this section explains how to enable the PhysicalDisk and LogicalDisk objects and their counters by using the `Diskperf.exe` command-line utility.

**TO USE DISKPERF.EXE TO ENABLE THE PHYSICALDISK
AND LOGICALDISK OBJECTS AND THEIR COUNTERS,
FOLLOW THESE STEPS:**

1. Select Start ➣ Programs ➣ Command Prompt.

2. The Command Prompt dialog box appears. At the command prompt, type
diskperf -y and press Enter.

3. The `Diskperf.exe` command displays a message, as shown in Figure 22-5.
Notice that you must reboot the computer before these changes will
become effective. At the command prompt, type **exit** and press Enter.

```
Command Prompt                                                    _ □ ×
Microsoft(R) Windows NT(TM)
(C) Copyright 1985-1996 Microsoft Corp.

D:\users>diskperf -y

Disk Performance counters on this system are now set to start at boot.
This change will take effect after the system is restarted.

D:\users>
```

FIGURE 22-5 **Using** `Diskperf.exe` **to enable disk performance objects
and counters**

4. Shut down and restart the computer.

Using Performance Monitor
to Gather and View Statistics

Now that you have a basic understanding of the Performance Monitor objects and
their counters, you're ready to use the Performance Monitor tool.

In this section, you'll learn how to start Performance Monitor and how to use the "views" within Performance Monitor to gather and view statistics on a Windows NT computer's performance.

To start Performance Monitor, select Start ≻ Programs ≻ Administrative Tools (Common) ≻ Performance Monitor.

The Performance Monitor dialog box appears, as shown in Figure 22-6. Notice that no objects are monitored when Performance Monitor is first started.
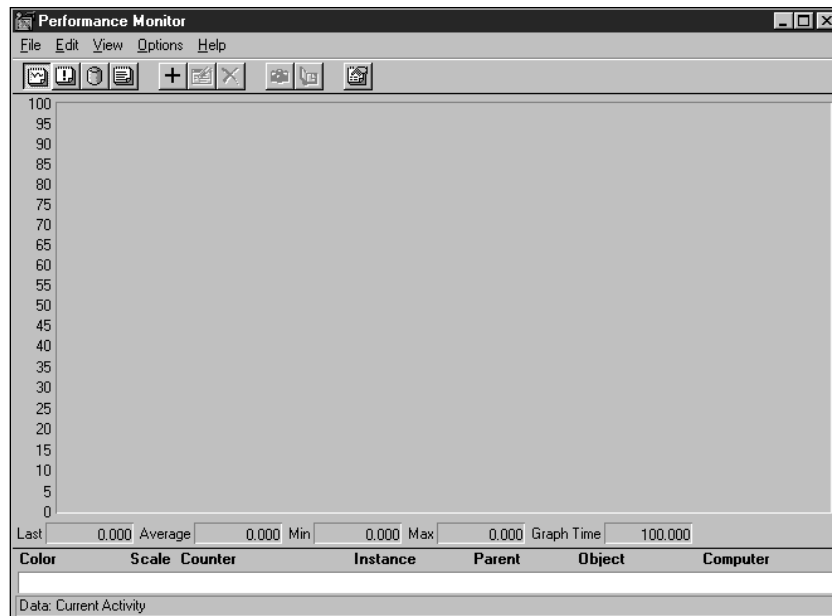

FIGURE 22-6   Starting Performance Monitor

There are four possible views in Performance Monitor: Chart, Alert, Report, and Log. By default, Performance Monitor starts in Chart view. The other views can be selected from the View menu, as shown in Figure 22-7.

The following sections explain how to use each of the four Performance Monitor views.
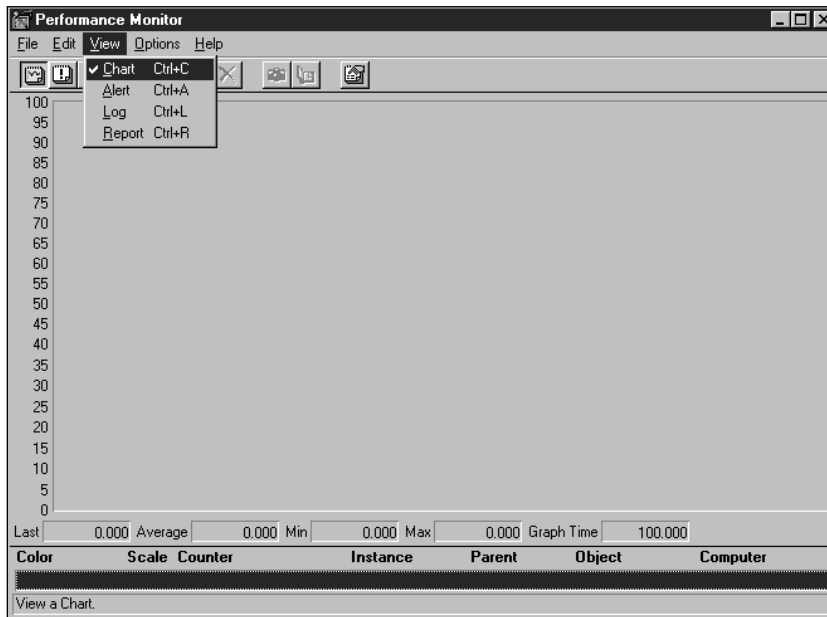
FIGURE 22-7   The four views available in Performance Monitor

Chart View

The Performance Monitor Chart view displays activity in a graphical format. It can be used to view current performance activity, or to view archived performance activity from a Performance Monitor log file. (Log files are discussed later in this chapter.)

Before you can view performance statistics in a Performance Monitor chart, you must first select one or more objects and their counters to be measured and displayed in a Chart view.

To select objects and their counters to be displayed in a Performance Monitor chart, you need to access the Add to Chart dialog box. You can access this dialog box in one of two ways: selecting Edit ≫ Add To Chart, or clicking the + command button in the toolbar at the top of the Performance Monitor dialog box.

The Add to Chart dialog box is shown in Figure 22-8. Notice that you can select objects, counters, and instances in this dialog box.
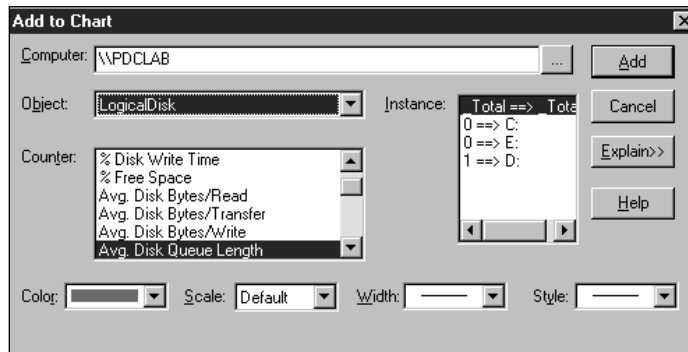
FIGURE 22-8 Selecting objects, counters, and instances in the
Add to Chart dialog box

**TO SELECT OBJECTS AND COUNTERS (IN THE ADD TO CHART
DIALOG BOX) TO BE DISPLAYED IN A PERFORMANCE
MONITOR CHART, FOLLOW THESE STEPS:**

1. In the Computer text box, type in the name of the computer you want to
monitor the performance of in the format *computer_name*, for
example, \\PDCLAB. (The name of the computer you are running
Performance Monitor on is displayed by default.) You can browse for the
computer you want to monitor by clicking the ... command button to the
right of the Computer text box.

note   You can view objects and counters from more than one
computer on a single Performance Monitor chart.

2. Select the object you want to monitor from the list in the Object drop-
down list box.

3. Select the instance of the object you selected in Step 2 (if an instance is
available for this object) from the Instance list box.

4. Select a counter to be monitored for the object you selected in Step 2
from the Counter list box.

tip   When you are configuring the Add to Chart dialog box, you
can click the Explain command button at any time to display
a detailed description of the highlighted object and counter
combination. This description is displayed in the Counter
Definition box at the bottom of the Add to Chart dialog box,
as shown in Figure 22-9.
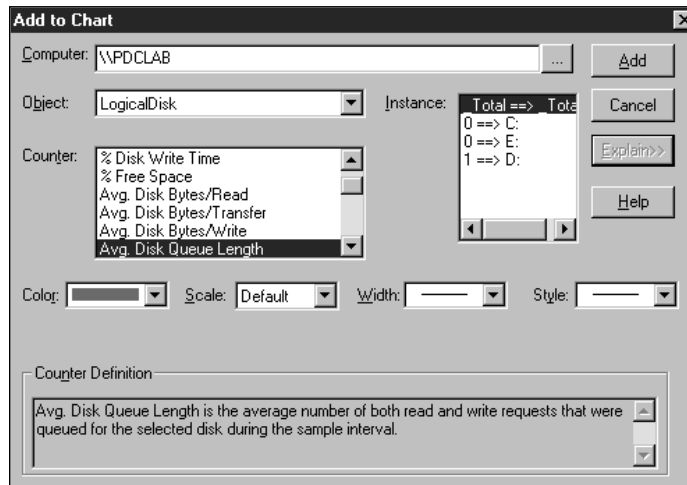
FIGURE 22-9   **Obtaining a counter definition by clicking the Explain command button**

> The Explain command button is also available in the Add to Alert, Add to Report, and Add To Log dialog boxes.

5. In the Color drop-down list box, select the color you want Performance Monitor to use to display the counter's activity in the chart.

6. In the Scale drop-down list box, accept the default or select the multiplier you want Performance Monitor to apply to the counter's measurement in the chart. For example, if the counter's activity normally varies between 0 and 1, you might select a scale setting of 100.0. This will enable you to view a larger picture of the counter's activity in the chart.

Normally the default scale setting is the appropriate setting for the selected counter.

7. In the Width drop-down list box, select the line width you want Performance Monitor to use to display the counter's activity in the chart.

8. In the Style drop-down list box, select the style of the line you want Performance Monitor to use to display the counter's activity in the chart.

9. When you have configured all of the settings for a particular object, instance, and counter combination, click the Add command button to begin displaying the counter's activity on the Performance Monitor chart.

10. Repeat Steps 1–9 if you want to add additional objects, instances, and counter combinations to your Performance Monitor chart.

11. When you are finished adding counters to your chart, click the Done command button to return to the Performance Monitor Chart view.

Figure 22-10 shows a Performance Monitor chart with several objects and counters selected. Notice the Last, Average, Min, Max, and Graph Time boxes toward the bottom of the chart.
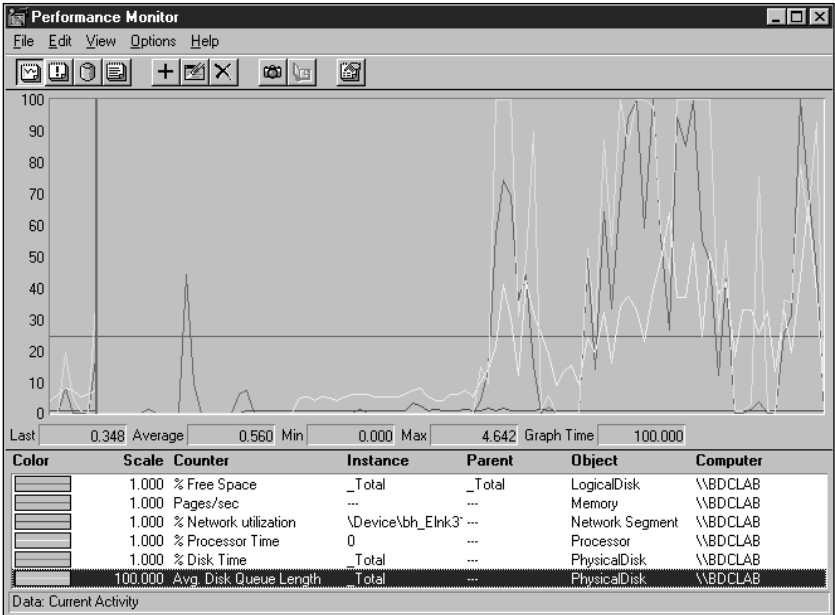
FIGURE 22-10 **Viewing a chart in Performance Monitor**

When you highlight any counter in the section at the bottom of the dialog box, that counter's statistics are displayed in the Last, Average, Min, Max, and Graph Time boxes directly below the chart. Table 22-3 explains the statistics displayed in each of these text boxes.

TABLE 22-3 STATISTICS DISPLAYED IN PERFORMANCE MONITOR CHART VIEW

STATISTIC	*DESCRIPTION*
Last	This is the most recent measurement of the counter.
Average	This is an average of the counter's measurement over the period of time represented by the chart.

STATISTIC	DESCRIPTION
Min	This is the lowest (minimum) measurement of the counter during the period of time represented by the chart.
Max	This is the highest (maximum) measurement of the counter during the period of time represented by the chart.
Graph Time	This is the number of seconds represented by the entire chart. This is the total amount of time it takes Performance Monitor to graph from one side of the chart to the other.

If you have difficulty determining which line on the chart represents the highlighted counter, you can press Ctrl + H to highlight that counter's line. Press Ctrl + H again to stop highlighting the counter's line on the chart.

To export a Performance Monitor chart for review at a later time in a spreadsheet or database application, select File ≻ Export Chart. You can export the chart data in either a tab separated value (tsv) file, or a comma separated value (csv) file.

Alert View

The Performance Monitor Alert view is used to display an alert when a monitored counter's value exceeds or drops below a prespecified value.

Performance Monitor has no preset alerts. Alerts must be created in Alert view by selecting one or more counters to be monitored, and by entering a threshold value for each counter. When this threshold value is exceeded or falls below a minimum level (depending on how the alert is configured), an alert is triggered.

To access Alert view in Performance Monitor, select View ≻ Alert.

To add counters to be monitored in Alert view you need to access the Add to Alert dialog box. You can access this dialog box in one of two ways: either by selecting Edit ≻ Add To Alert, or by clicking the + command button in the toolbar at the top of the Performance Monitor dialog box.

The Add to Alert dialog box is shown in Figure 22-11. Notice that you can select objects, counters, and instances in this dialog box. The next section explains how to create an alert by using this dialog box.
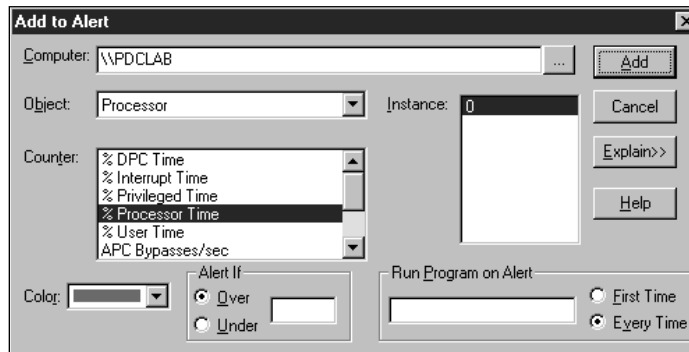
FIGURE 22-11   Selecting objects, counters, and instances in the Add to Alert dialog box

TO CREATE AN ALERT BY USING THE ADD TO ALERT DIALOG BOX, FOLLOW THESE STEPS:

1. In the Computer text box, type in the name of the computer you want to monitor using the format *computer_name,* for example, \\PDCLAB. (The name of the computer on which you are running Performance Monitor is displayed by default.) You can browse for the computer you want to monitor by clicking the ... command button to the right of the Computer text box.

2. Select the object you want to monitor from the list in the Object drop-down list box.

3. Select the instance of the object you selected in Step 2 (if an instance is available for this object) from the Instance list box.

4. Select a counter to be monitored for the object you selected in Step 2 from the Counter list box.

5. In the Color drop-down list box, select the color of dot you want Performance Monitor to use next to the text description when displaying the alert.

6. In the Alert If section:

o Select the radio button next to Over if you want Performance Monitor to generate an alert when the counter being monitored *exceeds* the value you specify.

o Select the radio button next to Under if you want Performance Monitor to generate an alert when the counter being monitored *drops below* the value you specify.

In the text box in the Alert If section, type in a number for the value you want Performance Monitor to use as the threshold value.

7. If you want Performance Monitor to run a program automatically when an alert is generated, type the full path to the program in the "Run Program on Alert" text box.

○ If you want this program to be run only the first time an alert is generated for this counter, select the radio button next to First Time.

○ If you want this program to be run every time an alert is generated for this counter, select the radio button next to Every Time.

8. When you have configured all of the settings for a particular object, instance, and counter combination, click the Add command button to begin monitoring the counter.

9. Repeat Steps 1–8 if you want to create additional alerts.

10. When you are finished creating alerts, click the Done command button.

Figure 22-12 shows a Performance Monitor alert. Notice the Alert Legend at the bottom of the dialog box. In this situation, I configured Performance Monitor to generate an alert when the amount of free space on my computer's hard disk dropped below thirty percent.
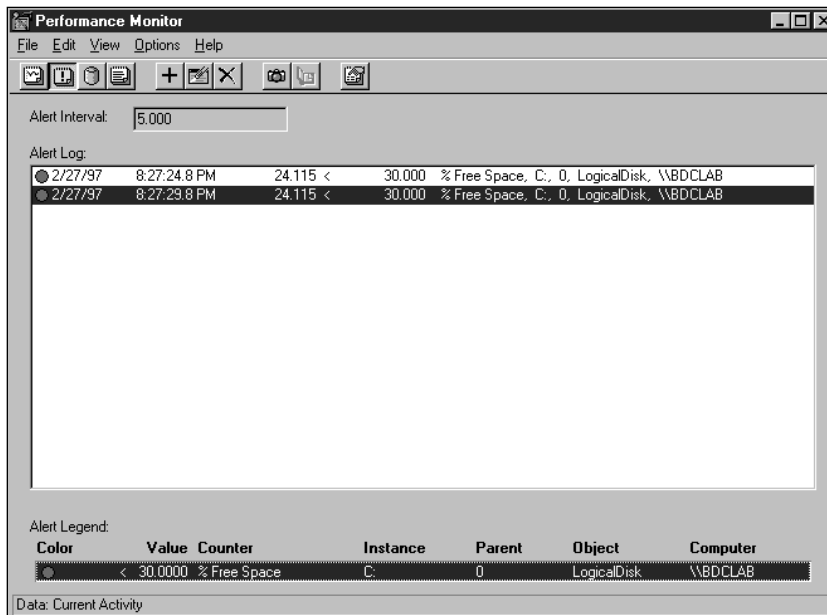

FIGURE 22-12 Viewing an alert in Performance Monitor

By default, Performance Monitor measures each specified counter in five second intervals, and compares each measurement with the threshold value. If the threshold value is exceeded or falls below a minimum level (depending on how the alert is configured), Performance Monitor generates an alert. If the threshold value is consistently exceeded or consistently falls below a minimum level, an alert will be generated every five seconds. You can change the alert interval by selecting Options ➢ Alert (in the Alert view) and then configuring the Alert Options dialog box that appears.

Report View

The Performance Monitor Report view displays activity in a report format. It can be used to view current performance activity, or to view archived performance activity from a Performance Monitor log file. (Log files are discussed later in this chapter.)

To access Report view in Performance Monitor, select View ➢ Report.

Before you can view Performance Monitor statistics in Report view, you must select one or more objects and their counters to be measured and displayed in the report.

To select objects and their counters to be displayed in a Performance Monitor report, you need to access the Add to Report dialog box. You can access this dialog box in one of two ways: selecting Edit ➢ Add To Report, or clicking the + command button in the toolbar at the top of the Performance Monitor dialog box.

The Add to Report dialog box is shown in Figure 22-13. Notice that there are fewer options in this dialog box than are in the Add to Chart and Add to Alert dialog boxes.
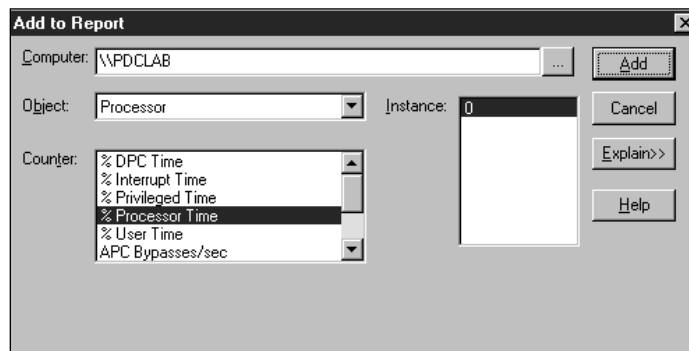

FIGURE 22-13   Selecting objects and counters to be included in a
Performance Monitor report

TO SELECT OBJECTS AND COUNTERS (IN THE ADD TO REPORT DIALOG BOX) TO BE INCLUDED IN A PERFORMANCE MONITOR REPORT, FOLLOW THESE STEPS:

1. In the Computer text box, type the name of the computer you want to monitor using the format *computer_name,* for example, \\PDCLAB. (The name of the computer on which you are running Performance Monitor is displayed by default.) You can browse for the computer you want to monitor by clicking the ... command button to the right of the Computer text box.

2. Select the object you want to monitor from the list in the Object drop-down list box.

3. Select the instance of the object you selected in Step 2 (if an instance is available for this object) from the Instance list box.

4. Select a counter to be monitored for the object you selected in Step 2 from the Counter list box.

5. When you have selected an object, instance, and counter combination, click the Add command button to begin displaying the counter's activity in a Performance Monitor report.

6. Repeat Steps 1–5 if you want to add additional objects, instances, and counter combinations to your Performance Monitor report.

7. When you are finished adding counters to your report, click the Done command button to return to the Performance Monitor Report view.

Figure 22-14 shows a Performance Monitor report with several objects and counters selected.

The value displayed for each counter in the Report view represents an averaage of the last two Performance Monitor measurements for that counter. However, the value is not an average from the time Performance Monitor was started. Performance Monitor, by default, updates the report every five seconds. You can change the report interval by selecting Options ➢ Report (in Report view) and then configuring the Report Options dialog box that appears.
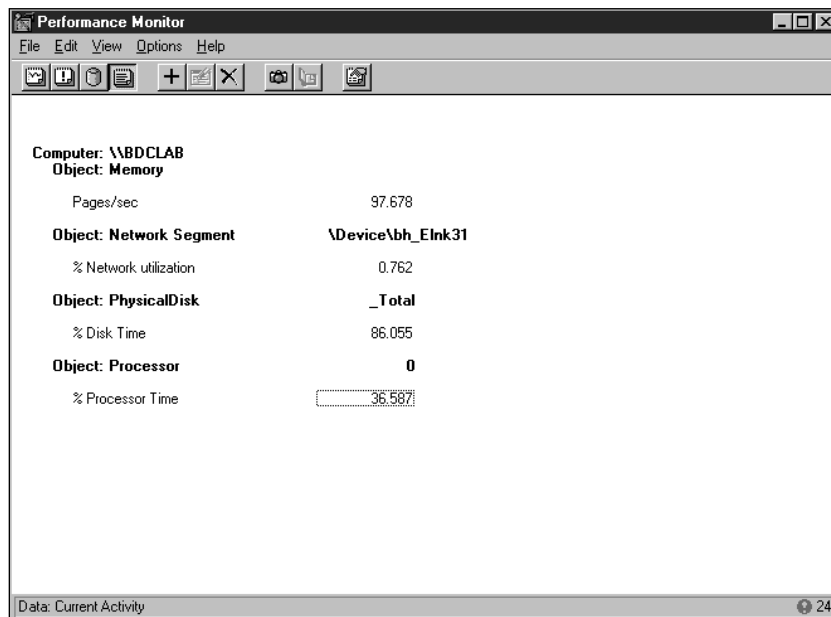
FIGURE 22-14   Viewing a report in Performance Monitor

Log View

The Performance Monitor Log view is used to save statistics gathered by Performance Monitor to a log file. The Performance Monitor log file can be viewed at a later time in Chart, Alert, or Report view.

To access Performance Monitor Log view, select View ⊳ Log.

Before you can create a log file, you must select one or more objects to be monitored. To select objects, you need to access the Add To Log dialog box. You can access this dialog box in one of two ways: selecting Edit ⊳ Add To Log, or clicking the + command button in the toolbar at the top of the Performance Monitor dialog box.

The Add To Log dialog box is shown in Figure 22-15. Notice you can only select a computer and the objects to be monitored in this dialog box. The next section explains how to select objects for a Performance Monitor log in this dialog box.
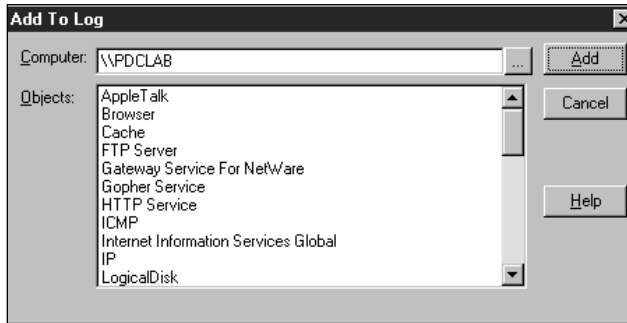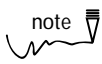
FIGURE 22-15 Selecting objects to be monitored for a
Performance Monitor log

**TO SELECT OBJECTS TO BE MONITORED (IN THE ADD TO LOG DIALOG
BOX) FOR A PERFORMANCE MONITOR LOG, FOLLOW THESE STEPS:**

1. In the Computer text box, type in the name of the computer you want to
log using the format *computer_name,* for example, \\\\PDCLAB. (The
name of the computer on which you are running Performance Monitor is
displayed by default.) You can browse for the computer you want to
monitor by clicking the ... command button to the right of the Computer
text box.

2. Select the objects you want to monitor from the list in the Objects drop-
down list box. (You can select more than one object at a time.)

note You *can't* select individual counters for the objects you select. *All*
counters for the selected object will be monitored and logged.

3. Click the Add command button.

4. Repeat Steps 1–3 until all computers and objects that you want to select
have been selected.

5. Click the Done command button to return to Performance Monitor
Log view.

6. In the Performance Monitor dialog box (Log view), select Options ≻ Log.

7. The Log Options dialog box appears, as shown in Figure 22-16.
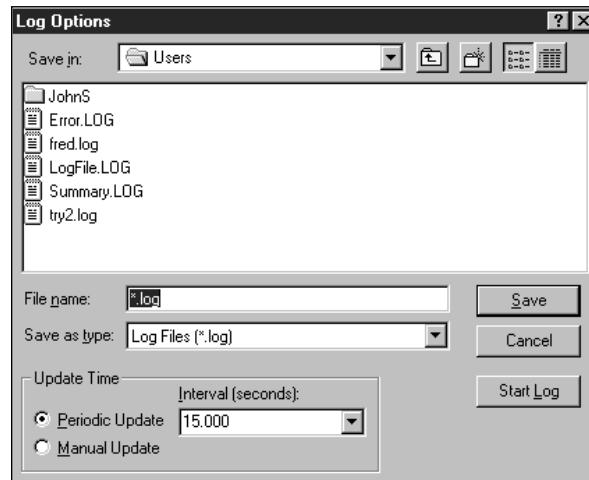
FIGURE 22-16   **Starting a Performance Monitor log**

Use the Explorer view in the top half of the Log Options dialog box to select the folder in which you want to store the log file.

8. In the "File name" text box, type in a name for the log file that uses the `.log` extension.

9. In the Interval (seconds) drop-down list box, select the interval, in seconds, that you want Performance Monitor to use for measuring the selected objects and logging their activity.

Click the Start Log command button to begin logging.

Performance Monitor begins monitoring the selected objects and logging the statistics it gathers to the log file. It will continue to collect and log this data until you stop the process.

Figure 22-17 shows Performance Monitor in the process of collecting data for the log file. Notice the Status and File Size text boxes.

10. When you have collected all the data you want and are ready to stop the logging process, select Options ➢ Log.

11. The Log Options dialog box appears. Click the Stop Log command button. The Performance Monitor log file has been created. Performance Monitor Log view reappears.
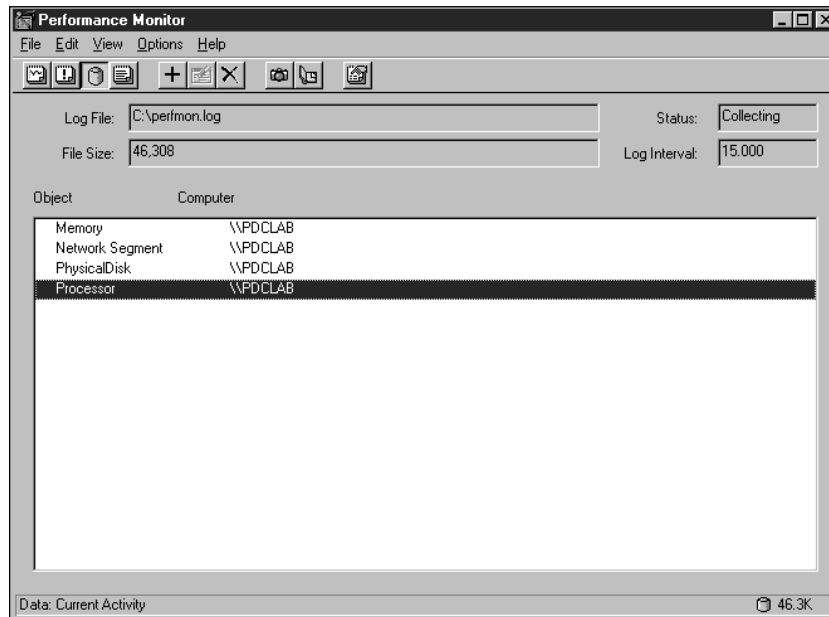
FIGURE 22-17   Logging data to a Performance Monitor log file

The next section explains how to import the log file you've created into Performance Monitor Chart, Alert, or Report views.

Viewing data from log files

Performance Monitor log files can be viewed in Performance Monitor Chart, Alert, and Report views.

To change Performance Monitor's input from current activity to activity archived in a log file, select Options ≻ Data From. The Data From dialog box appears, as shown in Figure 22-18.
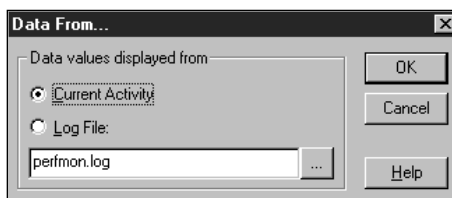
FIGURE 22-18   Changing Performance Monitor's input type from current activity to activity archived in a log file

Select the radio button next to Log File and type in the complete path to the Performance Monitor log file you want to view data from. (You can browse for the file name by clicking the ... command button.) Click OK.

The Performance Monitor dialog box reappears. Select the type of view from the View menu (Chart, Alert, or Report) that you want to use to view log file data.

Once you have selected the view that you want to use, you must select objects, counters, and instances to be viewed. The steps to create a chart, alert, or report from a log file are the same as those used to create a chart, alert, or report from current activity. However, only the objects which were logged are available for selection in the Add to Chart, Add to Alert, and Add to Report dialog boxes.

**FOR EXAMPLE, TO VIEW A PERFORMANCE MONITOR REPORT CONSISTING OF DATA FROM A LOG FILE, FOLLOW THESE STEPS:**

1. Start Performance Monitor. Select View ≻ Report.

2. Select Options ≻ Data From.

3. In the Data From dialog box, select the radio button next to Log File, and type in the complete path to the Performance Monitor log file you want to use. Click OK.

4. Select Edit ≻ Add To Report.

5. The Add to Report dialog box appears. Select the computer, object, instance, and counter you want to view in the report. Click the Add command button.

6. Repeat Step 5 until you have selected all of the counters you want to view in the report. Click the Done command button to view the report.

When you have finished viewing data from a log file, you should change Performance Monitor's input back to current activity. To change Performance Monitor's input from log file to current activity, select Options ≻ Data From. In the Data From dialog box, select the radio button next to Current Activity and click OK.

Key Point Summary

This chapter focused on how to use Performance Monitor. The following points highlight the major issues.

- *Performance Monitor* is a Windows NT tool that can be used to identify performance problems and/or bottlenecks, determine current usage of system resources, track performance trends over time, predict future usage of system resources (capacity planning), and determine how system configuration changes affect system performance.

- The system components that Performance Monitor can measure, such as processor, memory, and physical disk, are called *objects.* If there is more than one of a particular object in the system (such as multiple processors or multiple physical disks) there is said to be more than one *instance* of that object. Some objects, such as memory, do not have instances, because there can't be more than one of the particular object. Each instance of an object can be measured in different ways. Each possible measurement of an object is called a *counter.*

- Commonly used Performance Monitor objects and counters include:

Object	Counter(s)
Memory	Pages/sec
Network Segment	% Network utilization
PhysicalDisk	Avg. Disk Queue Length, % Disk Time
Processor	% Processor Time
Server	Bytes Total/sec

- Not all Performance Monitor objects and counters are available when Windows NT is first installed. For example, TCP/IP-related objects (and their related counters) are not available until the *SNMP Service* is installed, and the Network Segment object (and its counters) is not available until the *Network Monitor Agent* is installed. Additionally, some objects and their counters must be enabled by using the `Diskperf.exe` command before they can be effectively used to monitor performance.

- Performance Monitor has four possible views: Chart, Alert, Report, and Log.

  - *Chart view* displays activity in a graphical format. One or more objects and their counters must be selected (in the Add to Chart dialog box) to be measured and displayed in Chart view. Chart view not only displays a graph of activity, but also displays several statistics for each counter, including: *Last, Average, Min, Max, and Graph Time.*

  - *Alert view* is used to display an alert when a monitored counter's value exceed or drops below a prespecified value. Alerts must be created in Alert view by selecting one or more counters to be monitored and by entering a threshold value that will trigger an alert.

  - *Report view* displays activity in a report format. One or more objects and their counters must be selected (in the Add to Report dialog box) to be measured and displayed in Report view. The value displayed for each counter in the report represents the *most recent measurement* for each counter (not average, minimum, or maximum values).

  - *Log view* is used to save statistics gathered by Performance Monitor to a Performance Monitor log file. The log file can be viewed at a later time in Chart, Alert, or Report view. One or more objects must be selected to be monitored and their activity logged to a file. The Start Log command button (in the Log Options dialog box) is used to begin logging, and the Stop Log command button is used to stop the logging process.

- To view data from Performance Monitor log files in Performance Monitor Chart, Alert, and Report views, you must change Performance Monitor's input from current activity to log file. Then you select the type of view (Chart, Alert, or Report) and proceed as though you were creating a chart, alert, or report of current activity. When you finish viewing data from a log file, you should change Performance Monitor's input back to current activity.

Applying What You've Learned

Now it's time to regroup, review, and apply what you've learned in this chapter.

The following Instant Assessment questions bring to mind key facts and concepts.

The hands-on lab exercise reinforces what you've learned, and gives you an opportunity to practice some of the tasks tested by the Microsoft Certified Professional exams.

Instant Assessment

1. What command button do you click to cause Performance Monitor to *end* the process of gathering data for a Performance Monitor log file?

2. List five uses of Performance Monitor.

3. What are the system components that Performance Monitor can measure, such as processor and memory, called?

4. What is each possible measurement of a Performance Monitor object called?

5. When does more than one instance of a Performance Monitor object exist?

6. You want to obtain an overall view of how memory is being used on a particular Windows NT computer. Which Performance Monitor object and counter should you use?

7. You want to measure the percentage of time that the processor is actively used by processes (other than the Idle process) on a Windows NT computer. Which Performance Monitor object and counter should you use?

8. You want to measure the percentage of total network utilization on a given network segment as a percentage of the maximum amount of network traffic possible on that segment. Which Performance Monitor object and counter should you use?

9. You want to measure the total amount of network utilization on a particular Windows NT Server computer. Which Performance Monitor object and counter should you use?

10. What must you install on your Windows NT computer before the IP, TCP, ICMP, and UDP objects (and their counters) are available for use in Performance Monitor?

11. What must you install on your Windows NT computer before the Network Segment object (and its counters) is available for use in Performance Monitor?

12. What should you type at the command prompt to enable the PhysicalDisk and LogicalDisk Performance Monitor objects and their counters?

13. What are the four possible views in Performance Monitor?

14. Besides a graph, what other statistics are presented for a highlighted counter in Performance Monitor Chart view?

15. What value must you enter in the Alert If section of the Add to Alert dialog box for a Performance Monitor alert to be created?

16. What command button do you click to cause Performance Monitor to *begin* the process of gathering data for a Performance Monitor log file?

17. When Performance Monitor's input is current activity, what value is displayed for each selected counter in Performance Monitor Report view?

18. What is Performance Monitor Log view used for?

                                                                    T/F

19. You can view either current performance activity or archived performance activity from a Performance Monitor log file in Performance Monitor Report view.   ___

20. Performance Monitor is a Windows NT tool that is shipped with Windows NT Server but *not* with Windows NT Workstation.   ___

21. Before you can view data from a Performance Monitor log file, you must change Performance Monitor's input from log file to current activity.   ___

concept link **For answers to the Instant Assessment questions see Appendix D.**

Hands-on Lab Exercise

The following hands-on lab exercise provides you with an opportunity to apply the knowledge you've gained in this chapter about Performance Monitor.

Lab 22.35 *Using Performance Monitor*

The purpose of this hands-on lab exercise is to provide you with experience in using Performance Monitor on a Windows NT computer.

Workstation
Server
Enterprise

This lab consists of four parts:

> Part 1: Adding objects and counters by installing Network Monitor
> Agent and SNMP Service, and enabling the PhysicalDisk and
> LogicalDisk objects and their counters using `Diskperf.exe`
>
> Part 2: Using Performance Monitor Chart view and Alert view
>
> Part 3: Creating a Performance Monitor log file
>
> Part 4: Importing a Performance Monitor log file into Report view and
> Chart view

Begin this lab by booting your computer to Windows NT Server. Log on as Administrator. Place your Windows NT Server compact disc in your computer's CD-ROM drive.

> note ⬗ **If you are preparing *only* for the NT Workstation exam, you might want to perform this lab on your Windows NT Workstation computer (instead of your Windows NT Server computer). The steps are the same regardless of whether you use Windows NT Server or Windows NT Workstation.**
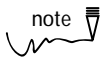
Follow these steps carefully.

**Part 1: Adding objects and counters by installing Network Monitor
Agent and SNMP Service, and enabling the PhysicalDisk and LogicalDisk
objects and their counters by using Diskperf.exe**

In this section, you check for the existence of Performance Monitor objects. Then you install Network Monitor Agent and SNMP Service on your Windows NT Server computer. Finally, you use `Diskperf.exe` to enable the PhysicalDisk and LogicalDisk objects and their disk counters on your Windows NT Server computer.

1. Select Start ➢ Programs ➢ Administrative Tools (Common) ➢ Performance Monitor.

2. The Performance Monitor dialog box appears. Select View ➢ Chart.

3. Click the **+** command button located in the toolbar at the top of the dialog box.

4. The Add to Chart dialog box appears. Click the down arrow in the Object drop-down list box. Look for each of the following objects: ICMP, IP, Network Segment, TCP, and UDP. Notice that *none* of these objects appear in the Object drop-down list box. Click the Cancel command button.

5. The Performance Monitor dialog box reappears. Exit Performance Monitor.

6. Select Start ≻ Settings ≻ Control Panel.

7. The Control Panel dialog box appears. Double-click the Network icon.

8. The Network dialog box appears. Click the Services tab.

9. The Services tab appears. Click the Add command button.

10. The Select Network Service dialog box appears. Highlight Network Monitor Agent. Click OK.

11. A Windows NT Setup dialog box appears. Ensure that the correct path to your Windows NT Server source files (usually the i386 folder on your Windows NT Server compact disc) is listed in the text box. Edit this text box if necessary. Click the Continue command button.

12. Windows NT copies source files and installs Network Monitor Agent.

13. The Network dialog box reappears. Click the Add command button.

14. The Select Network Service dialog box appears. Highlight SNMP Service. Click OK.

15. A Windows NT Setup dialog box appears. Ensure that the correct path to your Windows NT Server source files (usually the I386 folder on your Windows NT Server compact disc) is listed in the text box. Edit this text box if necessary. Click the Continue command button.

16. Windows NT copies source files and installs the SNMP Service.

17. The Microsoft SNMP Properties dialog box appears. Click OK.

18. The Network dialog box reappears. Click the Close command button.

19. Windows NT performs various bindings operations.

20. A Network Settings Change dialog box appears. Click the No command button.

21. The Control Panel dialog box reappears. Exit Control Panel.

22. Select Start ≻ Programs ≻ Command Prompt.

23. The Command Prompt dialog box appears. At the command prompt, type **diskperf -y** and press Enter.

Notice that Windows NT indicates that disk performance counters on your computer are now set to start at boot, and will become effective after the computer is restarted.

24. At the command prompt, type **exit** and press Enter.

25. The Windows NT desktop reappears. Select Start ≻ Shut Down.

26. In the Shut Down Windows dialog box, select the radio button next to "Restart the computer". Click the Yes command button.

27. Reboot the computer to Windows NT Server. Log on as Administrator. Continue to Part 2.

Part 2: Using Performance Monitor Chart view and Alert view

In this section, you install games (if you haven't already done so) on your Windows NT Server computer, and use Performance Monitor Chart view and Alert view to chart server performance and to create an alert.

1. If you have already installed games (including Solitaire and Pinball) on your Windows NT Server computer, skip to Step 8.

If you have *not* already installed games on your Windows NT Server computer, select Start ≻ Settings ≻ Control Panel, and continue to Step 2.

2. The Control Panel dialog box appears. Double-click the Add/Remove Programs icon.

3. The Add/Remove Programs dialog box appears. Click the Windows NT Setup tab.

4. The Windows NT Setup tab appears. Select the check box next to Games. (Or if you have one or two games installed but Solitaire or Pinball is *not* yet installed, deselect and then reselect this check box.) Click OK.

5. The Add/Remove Programs Properties—Copying Files dialog box appears.

If the Files Needed dialog box appears, ensure that the correct path to your Windows NT Server source files (usually the I386 folder on your Windows NT Server compact disc) is listed in the "Copy files from" text box. Edit the text box as necessary. Click OK.

6. Windows NT installs games.

7. The Control Panel dialog box reappears. Exit Control Panel.

8. Select Start ≻ Programs ≻ Administrative Tools (Common) ≻ Performance Monitor.

9. The Performance Monitor dialog box appears. Select View ≻ Chart.

10. Click the **+** command button located in the toolbar at the top of the dialog box.

11. The Add to Chart dialog box appears. Click the down arrow in the Object drop-down list box. Look for each of the following objects: ICMP, IP, Network Segment, TCP, and UDP. Notice that after installing Network Monitor Agent and the SNMP Service (which you did in Part 1), all of these objects now appear in the Object drop-down list box.

Click Memory in the Object drop-down list box. Select Pages/sec from the Counter list box. Click the Add command button.

12. Click the down arrow in the Object drop-down list box. Click Processor in the Object drop-down list box. Select % Processor Time from the Counter list box. Click the Add command button.

13. Click the down arrow in the Object drop-down list box. Click PhysicalDisk in the Object drop-down list box. Select % Disk Time from the Counter list box. Click the Add command button.

14. Click the down arrow in the Object drop-down list box. Click Server in the Object drop-down list box. Select Bytes Total/sec from the Counter list box. Click the Add command button. Click the Done command button.

You have just configured the four most commonly used Performance Monitor counters that monitor server performance.

15. The Performance Monitor dialog box reappears. In the list box at the bottom of the dialog box, highlight % Processor Time in the Counter column. Note the color assigned to the % Processor Time counter.

16. Move your mouse rapidly in a sweeping circular pattern on your mouse pad for several (at least five) seconds. Notice the increase in % Processor time usage, as depicted on the graph, from just moving your mouse.

17. Minimize (*don't* close) Performance Monitor.

18. Select Start ➢ Programs ➢ Accessories ➢ Games ➢ Solitaire.

19. Play Solitaire for a minute or two.

(If you've never played Solitaire before, select Help ➢ Contents to find out how to play.)

When you finish playing, exit Solitaire, and quickly select Performance Monitor from the taskbar.

20. The Performance Monitor dialog box appears. Notice the counters and their levels during your Solitaire game, as depicted on the Performance Monitor chart.

21. Highlight Pages/sec (in the Counter column). Press Delete.

Highlight % Disk Time (in the Counter column). Press delete.

Highlight Bytes Total/sec (in the Counter column). Press Delete.

Highlight % Processor Time (in the Counter column). Press Delete.

22. Select Edit ≻ Add To Chart.

23. The Add to Chart dialog box appears. Click the down arrow in the Object drop-down list box. Click LogicalDisk in the Object drop-down list box. Select % Free Space from the Counter list box. Highlight 0==>C: in the Instance list box. Click the Add command button. Click the Done command button.

24. The Performance Monitor dialog box reappears. Write the number that appears in the Last box here: _____

25. Add 5 to the number that you entered in Step 24, and write the resulting number here: _____

26. Highlight % Free Space (in the Counter column), and press Delete.

27. Select View ≻ Alert.

28. The Alert View appears. Select Edit ≻ Add To Alert.

29. The Add to Alert dialog box appears. Click the down arrow in the Object drop-down list box. Click LogicalDisk in the Object drop-down list box. Select % Free Space from the Counter list box. Select 0==>C: in the Instance list box. Select the radio button next to Under in the Alert If section. Type the number you entered in Step 25 in the text box in the Alert If section. Click the Add command button. Click the Done command button.

30. The Performance Monitor dialog box reappears. Every five seconds an alert should appear in the Alert Log list box, indicating that the % Free Space on your C: drive has fallen below the level that you entered in the previous step.

Press Delete to stop logging this alert.

Continue to Part 3.

Part 3: Creating a Performance Monitor log file

In this section, you create a Performance Monitor log file. (You will view the data in this Performance Monitor log file in Part 4.)

1. In the Performance Monitor dialog box, select View ≻ Log.

2. Select Edit ≻ Add To Log.

3. The Add To Log dialog box appears. Highlight Memory in the Objects list box. Click the Add command button.

4. Highlight PhysicalDisk in the Objects list box. Click the Add command button.

5. Highlight Processor in the Objects list box. Click the Add command button.

6. Highlight Server in the Objects list box. Click the Add command button. Click the Done command button.

7. The Performance Monitor dialog box reappears. Select Options ≻ Log.

8. The Log Options dialog box appears. In the File Name text box, type **practice.log**. Select **1** from the Interval (Seconds) drop-down list box. Click the Start Log command button.

9. Minimize (*don't* close) Performance Monitor.

10. Select Start ≻ Programs ≻ Accessories ≻ Games ≻ Pinball.

11. Play one game of Pinball.

   (Hold down the space bar for a couple of seconds and then release it to launch the ball. The z key on the keyboard controls the left flipper. The ? key on the keyboard controls the right flipper.)

   When you finish playing, exit Pinball, and quickly select Performance Monitor from the taskbar.

12. The Performance Monitor dialog box reappears. Select Options ≻ Log.

13. The Log Options dialog box appears. Click the Stop Log command button. Continue to Part 4.

Part 4: Importing a Performance Monitor log file into Report view and Chart view

In this section, you import the Performance Monitor log file you created in Part 3 into Performance Monitor Report view and Chart view.

1. In the Performance Monitor dialog box, select View ≻ Report.

2. Select Options ≻ Data From.

3. The Data From dialog box appears. Select the radio button next to Log File. Type **practice.log** in the text box. Click OK.

4. Select Edit ≻ Add to Report in the Performance Monitor dialog box.

5. The Add to Report dialog box appears. Click the down arrow in the Object drop-down list box. Notice that only four objects appear in this list, because you only chose to log four objects when you created the log file. Click Memory. Select Pages/sec in the Counter list box. Click the Add command button.

6. Click the down arrow in the Object drop-down list box. Click PhysicalDisk. Select % Disk Time in the Counter list box. Click the Add command button.

7. Click the down arrow in the Object drop-down list box. Click Processor. Select % Processor Time in the Counter list box. Click the Add command button.

8. Click the down arrow in the Object drop-down list box. Click Server. Select Bytes Total/sec in the Counter list box. Click the Add command button. Click the Done command button.

9. The Performance Monitor dialog box reappears.

The report displayed shows the last value measured for each of the four counters you selected, from the time you initially created the log file until after you finished your Pinball game and clicked on the Stop Log command button in Performance Monitor.

Now let's look at the same four counters (for the same time period) in a Chart view (instead of a Report view).

10. Select View ➤ Chart.

11. Select Options ➤ Data From.

12. The Data From dialog box appears. Select the radio button next to Log File. Ensure that **practice.log** appears in the text box. Click OK.

13. Select Edit ➤ Add To Chart in the Performance Monitor dialog box.

14. The Add to Chart dialog box appears. Click the down arrow in the Object drop-down list box. Click Memory. Select Pages/sec in the Counter list box. Click the Add command button.

15. Click the down arrow in the Object drop-down list box. Click PhysicalDisk. Select % Disk Time in the Counter list box. Click the Add command button.

16. Click the down arrow in the Object drop-down list box. Click Processor. Select % Processor Time in the Counter list box. Click the Add command button.

17. Click the down arrow in the Object drop-down list box. Click Server. Select Bytes Total/sec in the Counter list box. Click the Add command button. Click the Done command button.

18. The Performance Monitor dialog box reappears.

The chart displayed shows the values for each of the four counters you selected, from the time you initially created the log file until after you finished your Pinball game and clicked on the Stop Log command button in Performance Monitor.

19. Exit Performance Monitor.