This chapter describes the CiscoWorks features that help you manage the performance level of your network, including managing individual devices, lines, and interfaces. The chapter describes how to do the following to monitor performance using CiscoWorks features:

- Use Device Polling to create tables that poll the network for Management Information Base (MIB) object data.
- Use Polling Summary to view data for analysis.
- Use the Real-Time Graphs to view real-time network information.
- Use the Path Tool to display a routing path between devices and perform analysis on that path.
- Use Show Commands to monitor network information.
- Write reports with the Sybase Data Workbench (DWB).

Performance Management Applications

Several CiscoWorks applications help manage the performance of the SNMP devices in your network. A brief description of each application found in this chapter follows:

- Device Polling—Probes and extracts data about the condition of your network devices.
- Polling Summary—Views polling data, stops and starts polling.
- Real-Time Graphs—Monitors the behavior of device interfaces or other network elements suspected of operating in a degraded mode and displays them in a graph.
- Path Tool—Graphically displays a route of the path from a source device to a destination device.
- Show Commands—Provides data similar to router EXEC show commands output.
- Sybase DWB—Allows you to access the Sybase Data Workbench application to write reports.

These applications enhance your capabilities as a network administrator by collecting network data as a baseline before your network develops problems. The applications are discussed in detail in the following sections.

Figure 4-1 illustrates how to access the CiscoWorks applications from the SunNet Manager (SNM) Tools menu. Figure 4-2 illustrates how to access CiscoWorks applications from the SNM Glyphs Menu. The grayed-out tools are SNM tools.

Figure 4-1 CiscoWorks Applications on the SNM Tools Menu

Figure 4-2 CiscoWorks Applications on the SNM Glyphs Menu

Creating Polling Tables Using Device Polling

This section describes how to set up a customized polling table (or table group) for devices and interfaces on the internetwork using Device Polling.

Device Polling Overview

CiscoWorks allows you to probe and extract information about the condition of your networks using a polling feature. Information acquired from these polls is stored in the database for further analysis. The construction and use of polling configurations allows you to compare relative performance and status of devices and interfaces on the network. You can poll devices individually, in groups, or poll all devices at once based on your disk space availability. Multiple polls can be made to collect a wide range of data at varying polling interval rates.

For consistency, this manual uses the term *object* as a replacement for such terms as MIB variable, MIB object instance, and so on. Other Cisco manuals may use different terms, but they can be used interchangeably.

You must have security privileges to read and write to the Device Polling window. If you do not have write privileges, you might not be able to apply or delete table changes. Use the **Privilege** command on the Security menu to check your privileges for Device Polling. You can use the **Change User** command to change to a username with such privileges.

Device Polling Process

The polling process consists of the following general steps. Each task is described in greater detail later in this chapter.

Step 1: Construct a table (or polling group) in Device Polling that contains the polling configuration components. (When you complete construction of the table, pressActivate Changes to notify the polling daemon of these changes.)

Note: Activate Changes occurs automatically when you exit Device Polling using the **Quit** command on the File menu.

Step 2: Access the table in the Polling Summary and begin or end polling the devices defined in the configuration (if you have not yet done so).

The MIB objects selected in the table are read by the polling table and written to the database where they are retained for your use. Subsequent data polls do not overwrite previous polled data. Data is stacked with all collected information available for analysis.

Step 3: To browse poll data in a text or graph format, click on the data report and use the **Browse Data** command.

This command sends the data report to the Results Browser.

Step 4: While browsing the data report, you can view text or convert the report to a graph using the SNM Results Browser.

Figure 4-3 illustrates the device polling concept. The polling daemon used by CiscoWorks, *nmpolld*, queries and stores information in the Sybase database. Both the Device Polling and Polling Summary applications use the polling daemon.

Device Polling Tables

A Device Polling table consists of the following elements: a polling interval, a set of MIB objects, and a list of devices. The information specified in the table is collected during the polling process. A collection of information from the polling process is called a data segment. A segment is defined as the data selected from the start of polling to the stop of polling, regardless of the interval used to sample. For instance, if you start polling at 1:00 p.m. and stop at 2:00 p.m. on the same day, the data segment will be contained in one hour of polling. If you had set an interval of 1 minute, you would have obtained 60 samples in the segment.

Figure 4-4 illustrates the configuration table construction concept. You can select MIB objects to collect information on a device and choose a polling interval for the poll. The polling interval has a significant impact on the amount of data collected in a given time frame.

Figure 4-4 Polling Table Construction Concept

Note: Because the amount of data collected varies depending upon the type and number of queries made, be sure to monitor the disk space available for storage of polled information. Refer to the "Database Administration" chapter for additional information about database and transaction log space.

Running Multiple Pollers

The polling daemon (nmpolld) allows you to have multiple daemons running. You can have any number of processes running on a single system or you can have processes running on several systems.

The poller ID assigned to a polling group defines which poller process will perform the polling for that poll group. Refer to the manual page for the specific rules.

The polling daemon on separate machines can be started or stopped by running the Process Manager on the various machines. For example, you can run the Process Manager on one workstation to start and stop a single polling daemon and at the same time run the Process Manager on another workstation to start and stop a single polling daemon on that machine. The Process Manager does not assist in starting or stopping multiple polling daemons on a single machine.

The following are the two issues of starting and stopping:

- Starting—The Process Manager will only start one polling daemon. To start more than one polling daemon, you must do it manually, or you could add commands to the /etc/rc.local so that the polling daemons could be started up everytime the workstation comes up. CiscoWorks has already put one line in rc.local to start and stop the polling daemon. You can copy and paste that line into the /etc/rc.local file in order to start a second polling daemon.
- Stopping—You can stop the polling daemons from the command line by issuing a kill -TERM command. You can also use the Process Manager, but we recommend you use the command line method.

Note: Even though you have instructed the Process Manager to stop the polling daemon, the Process Manager may still indicate the polling daemon is running. This does not necessarily indicate that the Process Manager or the polling daemon is working improperly. It may be due to multiple daemons.

Device Polling Window

Before you can begin polling devices for data, you must set up your polling table in the Device Polling window.

Figure 4-5 illustrates the Device Polling window. Table 4-1 describes the components found in this window.

Figure 4-5 Device Polling Window

Table 4-1 Device Polling Window Components

Component	Subcomponent	Description
File	Print Version	Prints a snapshot of the window. Displays the CiscoWorks application version information.
	Quit	Exits the current window.
Options	Activate Changes	Sends a signal to the polling daemon to reread the database so current changes are included in the poll.
	Destroy Table	Deletes the selected polling table.
Security	Change User Privilege	Changes the user ID to another user. Views the current user ID privileges.
Help		Provides a manual page on the current win- dow.
Poll Group	Default=no polling	Describes the table poll group name. For example, CiscoWorks supplies an example table named <i>sample</i> .
Poll Rate		Sets the polling interval for the last table name selected. Polled data segments are date and timestamped with start poll times.
Group	All Devices Device A—Device ?	Lists which devices you are choosing from.
	Device ?—Device Z	
Device		Lists all devices currently in the device group.
Poller	;0 others Default=only one daemon to poll tables	Selects which systems will actually perform the current poll. You can have multiple sys- tems acting as polling engines.
Table	Default=same as poll group name	Describes the Sybase database table name of the current poll. This name can be the same as the poll group name.
Enterprise	(first level)	Lists the SNM enterprise MIB objects from the SNM agent schema file.
Group	(second level)	Lists of related MIB groups from the speci- fied enterprise group above.
Object	(third level)	Lists of MIB object names (also referred to by Cisco as variables) from the specified MIB group above. Objects applied here define objects available in the group.

Component	Subcomponent	Description
Instance	Pick menu for if_tables instances	Describes the list of keys supplied by the MIB object tables to poll. Only lists inter- faces if you use the if_tables. Otherwise, the pick menu will be empty and you must sup- ply your own key for the MIB object selected. If no interface is chosen, all inter- faces (keys) will be polled. Only objects in a table need or can have an instance.
Apply		Applies current changes for this polling table to the database. This does not notify the poll- ing daemon. Use the Activate Changes command to complete the polling setup.
Disk Con- sumption Rate		Describes the disk space growth rate (in kilo- bytes per day) to hold the data for this type of poll.
New		Erases all information currently in the win- dow. The form remains, ready to accept new information. This command does not affect data in the database.
Delete		Erases the devices selected from the data- base.

Object Requirements

The Object field lists the MIB objects you can select to poll. MIB objects define the type of information about devices and interfaces that will be collected with the poll.

When selecting objects, remember the following requirements:

- For protocol-specific MIB objects, for example, *xnsInput*, you must have the corresponding protocol enabled in the device. Otherwise, no data will be stored for the MIB objects.
- If you have modified your MIB database, ensure that the MIB objects you are polling for still exist in the MIB database. Use the **showmib** command to verify the existence of the objects in the database. Refer to Appendix A, "MIB Files and Objects," for detailed information on the **makemib** and **showmib** commands, and a description of the MIB database.

Disk Space Consumption Rate

As each object is selected, the Disk Consumption Rate field is adjusted to reflect an estimate of how fast the disk space will be consumed in order to store the polled data. The algorithm uses the poll rate, number of devices, and number of objects currently selected in the table to estimate the space required to hold one day (24 hours) of polling. The result of the calculation is reflected as whole kilobytes required per day.

Multiply the disk space consumption rate by the length of time you plan to poll. This equals the number you can compare to available disk space. If you do not want to change the polling table, you might have to increase your database space allocation. Before deciding to adjust disk space, review the polling interval and duration and the number of objects to determine if any can be adjusted. To increase the database space, refer to the "Database Administration" chapter for more information.

Creating a New Polling Table

In order to set up polling, access the Device Polling window and complete the necessary information. If you are not familiar with MIB objects, using Device Polling will be more difficult. Contact your network administrator for more information on MIB objects.

To access the Device Polling window to set up a new polling table, perform the following steps:

Step 1: Select the Tools menu on the SNM console and pull down to **Device Polling**.

The Device Polling window appears.

For a description of the device polling fields, refer to Table 4-1 earlier in this chapter.

Step 2: Create a new poll group by selecting the **New** button.

The **New** button clears the poll group data. You must press the **New** button before you enter new information.

Step 3: Create the new poll group name by entering the name in the Poll Group field.

Note: CiscoWorks is based on the Sybase SQL-based relational database. Poll group or table names can include only the alphanumeric characters A through Z, 0 through 9, and underscore (_). A dot (.) is not allowed. For more information on naming tables, refer to your Sybase manual set.

Only one poll group is used with each data configuration. The Poll Group field defines what tables are in the poll groups.

CiscoWorks includes one example poll group table found under the pick menu, called *sample*. You can use this table and modify it to your specific polling needs, but should rename the poll group to describe the type of polling you are performing.

If you overwrite or delete the *sample* table, you can recreate it using the **makesample** program. The **makesample** program adds the *sample* file back to your directory structure. Refer to the "Database Administration" chapter for information on the **makesample** program.

Step 4: Create the new table name or use the poll group name as the table name by default. To create a new table name, enter the name in the Table field.

Your poll group name and table name will default to the same name. You may want to change the table name.

Note: You can only put in a table name prior to pressing the Apply button. After you press Apply, the table is created and the table name cannot change.

Step 5: Select the poll rate for this poll. There are two methods of selecting a poll rate:

- Select a default value from the Poll Rate pick menu pull down.
- Enter a value directly in the Poll Rate field of the Device Polling window and press Return. The poll rate recalculates after you press **Apply**.

Use seconds, minutes, days, or weeks as the unit of measure. If you enter 21 days in the field, the data will be converted to 3 weeks, the largest unit of measure for intervals that retains the integer entered.

Note: Be careful when selecting a poll interval since you need to watch your disk space use.

- Step 6: Select the Poller field and pull down the pick menu to one of the poller options.The default is ;0. Refer to the manual page for Device Polling for a definition of ;0.
- *Step 7:* Select the Enterprise field and pull down the pick menu to one of the enterprise MIB objects.

For example, if you are using the sample table, pull down to cisco.

Step 8: Select the Group field and pull down the pick menu to one of the MIB groups. Select a MIB object.

For example, if you are using the sample table, pull down to if Traffic.

Step 9: Select the Object field and pull down the pick menu to one of the MIB objects you want to include in this poll group.

For example, if you are using the sample table, pull down to ifInOctets.

The Object field lists all MIB objects present in the SNM schema files. To select multiple objects for the object poll group, click on the **Apply** button and then select another object.

The objects selected apply to the last table name entered. If you want an object to apply to a different table name, select the table first.

Step 10: If you have less than 60 devices in your device group, continue to the next step. If you have more than 60 devices in your device group, select the Device Group

field and pull down the pick menu to one of the listed device group options you want to include in this poll.

By selecting a specific device group, your Device field list becomes more defined. For example, if you choose the group of devices from X to Z, your device list will include only those devices beginning with the letters X, Y, and Z.

Step 11: Select the Device field and pull down the pick menu to one of the devices you want to include in this poll.

This list contains all devices in alphabetical order that are present in the CiscoWorks database. To select multiple devices for this poll group, click on the **Apply** button and select another device.

Step 12: After you select the devices from the Device field, select the instances (interface or key) associated with the device.

If you are using tables, for example if_tables, select the instance from the pick menu. If you are not using if_tables, you must know the format of Sun MIB object tables found in the schema file to enter the instance values. If you do not know the format, skip the Instance field. This will cause the poll group to poll all instances. Only objects in a table need or can have an instance. You can skip this field if your object does not belong to an object table.

Step 13: When you click on **Apply**, all data is sent to the database. The scroller windows display what appears in the database. Select **Activate Changes** from the Options menu to send the changes to the device polling daemon.

Note: If you have chosen a poll rate, the Activate Changes command initiates the polling daemon (nmpolld) to start polling this poll table.

This completes the process of creating a new polling table.

Adding Instance Data to an Existing Device and Object Pair

An instance defines which row to go to in a particular database table. The default instance selection in Device Polling is to poll all objects on all devices. If you want to select specific devices and MIB objects to limit your poll group, you need to add an instance to a device and object pair.

When you want to add an instance to a device and object pair, you need to add the instance in the Device Polling window.

To add an instance to a device and object pair, perform the following steps:

- *Step 1:* Specify the device and object pair. To select a device and object pair, click on the device name and then the object in the scroll windows.
- *Step 2:* For if_tables, select an instance using the pick menu. For all other keys, you need to enter the key manually. If you do not know your key, contact your network administrator.

Step 3: Click on the **Apply** button.

The new table with the instance added is now available for polling. The device will now be polled for this specific object and specific instance. An "I" marks the device and object pair you selected for polling. An asterisk (*) marks the polled instance in the instance list.

- *Step 4:* Select **Activate Changes** from the Options menu to send the changes to the polling daemon.
- *Step 5:* Repeat steps 1 through 4 for each instance you want to add to a device and object pair.

Note: When troubleshooting the Device Polling daemon, nmpolld, and the dataserver is up, access the Log Manager's centralized log. Check the log messages for a message that nmpolld was reinitialized after Sybase restarted.

Modifying an Existing Poll Group Table

Device polling has the following limitations:

- You cannot delete an object that already exists.
- You cannot change an existing poll group or table name.

To delete an object, you have to delete the poll group and start again.

To modify an existing poll group table effectively, perform the following steps:

Step 1: Select the Poll Group pick menu and pull down to select the poll group name.

When an existing table name is selected, the configuration displays in the window. If you have selected the table to change a data element, such as the polling interval, perform the necessary changes.

- *Step 2:* Save your changes to the database by clicking on the **Apply** button.
- *Step 3:* Notify the polling daemon (nmpolld) of changes by selecting the Options menu and pull down to **Activate Changes**.

If you do not perform this step, any changes you have made are unknown to nmpolld and cannot be polled for.

Step 4: To switch from one table to another in the Device Polling window, pull down the Poll Group selection and select a new table.

Deleting a Poll Group Table

When you have finished with a poll group and want to remove it from the database, you need to delete it from the Device Polling window.

To delete a poll group, perform the following steps:

- *Step 1:* To select the poll group you want to delete, pull down on the pick menu to the poll group name.
- *Step 2:* Select the Edit menu and pull down to **Destroy Table**.

A confirmation window appears asking you to confirm the deletion. Answer accordingly.

Step 3: Notify the polling daemon (nmpolld) of changes by selecting the Options menu and pulling down to **Activate Changes**.

The Poll Group is now deleted from the Polling Summary table and the database.

Deleting a Device from a Poll Group

When you want to delete a particular device from a poll group, you need to delete the device from the Device Polling window.

To delete a device from a poll group, perform the following steps:

- *Step 1:* Select the poll group you want to change by pulling down on the pick menu to the poll group name.
- *Step 2:* Select the device in the Devices scroller.
- *Step 3:* Click on the **Delete** button.

The new table with the device removed is now available for polling.

Step 4: Notify the polling daemon (nmpolld) of changes by selecting the Options menu and pull down to **Activate Changes**.

The device is now deleted from the poll group.

Deleting Instance Data from a Poll Group Table

When you want to delete a particular instance from a poll group, you need to delete the instance from the Device Polling window.

To delete an instance from a poll group, perform the following steps:

- *Step 1:* To select a device and object pair, click on the device name and then the object in the scroll windows.
- *Step 2:* To select an instance, pull down the pick menu in the Instance field and select the instance marked with an asterisk (*) you want to delete.

Step 3: Click on the **Delete** button.

The new table with the instance removed is now available for polling.

Step 4: Repeat steps 1 through 3 for each instance you want to delete from the device polling group.

Quitting Device Polling

When you exit a Device Polling window, any newly created polling tables with the poll rate intervals set will begin polling automatically. If you do not want tables to begin polling, do not enter the polling interval rate. The polling rate can be entered from the Polling Summary window when you are ready to start polling.

To exit Device Polling, select the File menu and pull down to the Quit command.

Using Polling Summary

Once you create your table using Device Polling, you can use the Polling Summary application to browse data and stop or start polling. You can also delete tables from the Polling Summary window.

Polling Summary Window

The Polling Summary window is the interface to stop, start, and browse poll data.

Figure 4-6 illustrates the Polling Summary window. Table 4-2 describes the components found in this window.

Figure 4-6 Polling Summary Window

Component	Subcomponent	Description
File	Print Version	Prints a snapshot of the window. Displays the CiscoWorks version information for this application.
	Quit	Exits the current window.
Options	Activate Changes	Signals the device polling daemon to reread the database to get polling changes.
	Browse Data	Uses SNM Browser to view selected data
	Destroy Table	Deletes the selected polling group.
Security	Change User Privilege	Changes your user ID to another user. Views the current user ID privileges.
Help		Provides a manual page on the current win- dow.
Poll Rate	1 second 5 seconds	Starts and stops the polling process. Sets the polling time interval for the last table name
selected. Any change	selected. Any change is reflected in the data-	
	1 week	base.
	 No polling	
Disk Consumption Rate		Describes the disk growth rate required (in kilobytes per day) to hold the data for this type of poll.
Poll Groups scrol- ler		Lists the poll groups available with the Device Polling window. These are also known as tables.
Objects scroller		Lists MIB objects defined in Device Polling.
Devices scroller		Lists all devices in the poll group defined in Device Polling. You may need to use Sync w/Sybase to locate new devices.
Data scroller		Lists data reports that contain poll report data. Includes the start time and length of poll interval for the data report.

Table 4-2 Polling Summary Window Components

Starting or Stopping Your Poll Tables

After you have set your polling criteria with the Device Polling application, you can access the **Polling Summary** application to turn polling off, start additional polling tables, or view poll data. The Polling Summary application enables you to start and stop polling, browse polling group data in the SNM Results Browser, and delete polling tables.

From the SNM Results Browser, you can use the SNM Grapher to graph your collected poll data. Refer to the section on "Examining Polling Data."

To start or stop polling your poll group table, perform the following steps:

- *Step 1:* Select the Tools menu on the SNM console and pull down to **Polling Summary**. The Polling Summary window appears. See Figure 4-6.
- *Step 2:* Select a group you want to poll from the Poll Groups scroll window in the Polling Summary window.
- *Step 3:* Select a polling rate if the table is not being polled currently. Then select the Options menu and pull down to the **Activate Changes** command.

The polling daemon (nmpolld) starts polling your devices in the background based on your entries in the Device Polling window. You can continue to work with the Device Polling window.

If your table is currently being polled, continue to the next step.

- *Step 4:* When you have collected the necessary data, stop the polling activity on this group. To stop polling, select the poll rate pick menu and pull down to **No Polling**.
- *Step 5:* Select the Options menu and pull down to **Activate Changes** or exit the Polling Summary window.

Either of these choices will signal the polling daemon to stop polling.



Caution: If you do not stop a polling group process, you will increase your disk space and lose useful information. Remember to use the **No Polling** command in the Poll Rate pick menu and the **Activate Changes** command from the Options menu.

Examining Polling Data

After you have completed your polling activity, you can examine your data in text or graph form. Data is retrieved from the polled information segments obtained in polling operations.

With the SNM Results Browser and Grapher features, you can review your data report information. You can browse text information using the Results Browser. From the Results Browser, you can send data to the SNM Grapher.

For example, you can compare input broadcast packets against the total number of input packets to identify broadcast storms, as well as review and analyze interface performance or traffic patterns by observing in and out packets over specific periods.

Refer to your SNM manuals for more information on using the Results Browser and Grapher features.

To view your polling data, perform the following steps:

Step 1: Select a poll group.

Selecting a poll group updates the devices and interfaces in the Devices scroll window that will be available and, in turn, data segments that can be viewed or graphed. A graph can consist of multiple segment columns and multiple devices.

For example, CiscoWorks ships a *sample* table with the Device Polling application. Click on the *sample* table.

Note: Group selection triggers access to data contained in Devices and Variables browsers. Prior to group selection, any attempts to obtain information from these browsers are ignored. If a group name you want is not present, either it has not been created, has been created but was never active, or has not completed a polling segment. Use the Device Polling window in the Device Polling application to verify the existence of the group.

- *Step 2:* To modify the poll rate interval, click on the pick menu and pull down to your desired poll rate, or type the poll rate in the field and press Return.
- *Step 3:* To view the data collected in your poll, from the Polling Summary window click on the data report in the Data scroller.
- *Step 4:* Select the Options menu and pull down to **Browse Data**.

The SNM Results Browser window appears with the data report (also known as the data stream in SNM) listed in the scroller. Refer to the *SunNet Manager 2.0 Reference Guide* for more information on the Results Browser.

Step 5: To view the text of the data report, click on the report name.

The data report text appears in the lower portion of the results browser.

Step 6: To view the data report in a graph format, click on the report name and selectGraph from the popup menu. Continue to pull the Graph menu to the right and pull down to the specific graphing options you desire.

For this exercise, pull down to **All Attributes**. An SNM Grapher window appears with the data report name in the scroller. Seconds later, a graph appears.

Note: Although multiple graphs can be viewed simultaneously, initially only one poll group can be used with one Grapher window. Refer to the *SunNet Manager 2.0 Reference Guide* for more detailed window information, such as on table data into one graph or altering graph properties.

Step 7: To change the properties on your graph, return to the Results Grapher window, select the report name and click on the **Properties** button. See Figure 4-7.

For more detailed information on customizing the SNM Graph Properties window, refer to your *SunNet Manager 2.0 Reference Guide*.

Figure 4-7 SNM Graph Properties Window

Calculating Traffic Values on Serial Lines

Because serial lines are full duplex, there is no single way to perform a traffic calculation. The following calculation provides the best view:

```
traffic = max(ifInOctets, ifOutOctets)
utilization = traffic/line bandwidth
```

In general, however, it is often less complex and more direct to look at traffic as the amount of data transmitted by a given device onto a line. This is consistent with the router calculation that obtains a load value. In this case, use the following calculation (where the utilization is a function of which end of the serial line that you are measuring):

```
traffic = ifOutOctets
utilization = traffic/line bandwidth
```

If you use *ifInOctets+ifOutOctets* as a traffic measure for serial lines, your utilization levels appear to be greater than 100 percent.

To determine whether you have a serial line, check the interface_type column in the Interfaces table. Table 4-3 lists the serial interface types and the protocols associated with each interface. For detailed information on interfaces and protocols, refer to RFC 1213, *Management Information Base for Network Management of TCP/IP-based Internets: MIB-II.*

Serial Interface Type	Protocol Type
2	1822
3	1822
4	ddnx25
5	RFC 877-x25
16	lapb
17	sdlc
18	ds1
19	e1
20	ISDN
22	serial
23	PPP

Table 4-3 Serial Interface and Protocol Type

To select serial interfaces, use the following with the WHERE clause:

```
select ...
where ...
and interfaces.interface_type in (2,3,4,5,16,17,18,19,20,21,22,23)
```

Using the Real-Time Graphs

When you use the Real-Time Graphs application to manage the performance of your network, you can observe real-time information via a two- or three-dimensional graph.CiscoWorks enables you to graph data about your router health and interface and traffic information.

Real-Time Graphs Window

Figure 4-8 illustrates the Real-Time Graphs window. Table 4-4 describes the components in this window. Table 4-5, Table 4-6, and Table 4-7 describe the buttons in the major fields.

Figure 4-8 Real-Time Graphs Window

Component	Subcomponent	Description
File	Print Version Ouit	Prints a snapshot of the window. Displays the CiscoWorks application version information. Exits the current window
Option	Set Polling Frequency	Changes polling rate.Frequency of analysis performance in seconds. Can be set using slider or typing in on the polling interval field. Default = 2 seconds.
Help		Provides a manual page on the current win- dow.
Polling Frequency	Polling Interval Slider	Changes the polling rate by clicking on the slider.
Router Health		Refer to Table 4-5 for detailed descriptions of the router health buttons.
Interface Health		Refer to Table 4-6 for detailed descriptions of the interface health buttons.
Protocol Traffic ¹		Refer to Table 4-7 for detailed descriptions of the protocol traffic buttons.

Table 4-4 Real-Time Graphs Window Components

¹If a button is grayed out, the selected device does not have this capability. For example, currently only a Cisco AGS+ with firmware 2.0 has the Environment router health button capability.

Graphing Your Real-Time Device Data

The Real-Time Graphs application observes the behavior of devices suspected of being degraded mode or introducing erratic behavior in traffic patterns, error status indications, or statistics.

The Real-Time Graphs application monitors and graphs a single device. You can monitor multiple devices simultaneously by opening more than one Grapher. In addition, you can merge graphs to present the data in one graph.

Since the Real-Time Graphs application uses the SNM graphing utility, documentation on customizing your graph can be found in the *SunNet Manager 2.0 User's Guide*.

To create a graph with real-time device data, perform the following steps:

- *Step 1:* Click on the device and pull down to the Tools menu bar.
- *Step 2:* Pull over to **Real-Time Graphs**.

The Real-Time Graphs window appears. See Figure 4-8.

Note: The device named *pag.cisco.com* whose Real-Time Graphs window appears in Figure 4-8 does not have the following protocols activated on this router: DECnet IV, Novell, VINES, and XNS. CiscoWorks indicates inactive buttons on its application windows by graying the buttons out.

Buttons	Description	MIB Object Names
Buffer Space	Displays the following buffer ele- ments: number of free buffers, maxi- mum number, hits, misses, creates, buffer allocation failures, and buffer create failures due to no free memory.	bufferElFree bufferElMax bufferElHit bufferElMiss bufferElCreate bufferFail bufferNoMem
CPU Load	Displays CPU busy percentage for one- and five-minute averages and for the last five-second period.	avgBusy1 avgBusy5 busyPer
Environment	Displays AGS+ router internal temper- ature and airflow statistics.	envInternalTemperature (envTestPt1Measure) envAirflowTemperature (envTestPt2Measure)
Free Memory	Displays the amount of free memory in bytes.	freeMem
Security	Displays the total number of packets dropped due to access control failures.	ipNoaccess For DECnet, dnNoaccess For AppleTalk, atNoaccess

Table 4-5 Router Health Buttons

Note: To customize your current graph, refer to your *SunNet Manager 2.0 User's Guide* for detailed information. The Grapher is an SNM feature and is not covered within this manual.

Step 3: To gather data on interface health, click on the appropriate button. Table 4-6 describes the buttons and MIB object descriptions that are polled when you press the button.

Note: To gather data on router health, click on one of the button choices for data. Table 4-5 describes the buttons and MIB object descriptions that are polled when you press the button. Refer to the *Cisco MIB User Quick Reference* for a description of MIB objects.

Table 4-6 Interface Health Buttons

Buttons	Description	MIB Object Names
Bits/Sec	Displays the five-minute average of input and output bits per second for <i>Cisco-specific</i> devices.	locIfInBitsSec locIfOutBitsSec
Bytes	Displays the five-minute average of input and output bits per second. For routers with Software Release 9.1, dis- plays all protocols on an interface.	ifInOctets ifOutOctets
Errors	For <i>Cisco-specific</i> devices, displays number of input packets with various characteristics.	For Ethernet, 802.3 CSMA/CD, starLAN: locIfCollisions locIfInRunts locIfInGiants locIfInGRC locIfResets locIfRestarts For FDDI and Token Ring: locIfInRunts locIfInGiants locIfInGiants locIfInCRC locIfResets locIfResets locIfRestarts For serial (Cisco only): locIfInFrame locIfInOverrun locIfInIgnored locIfInAbort locIfResets locIfResets
	For any <i>non-Cisco</i> devices, displays number of input and output errors with various characteristics on an interface.	ifInErrors ifOutErrors
Packets/Sec	Displays the five minute average of input and output packets per second on an interface.	locIfInPktsSec locIfOutPktsSec
Packets	For any device, displays the input and output packets on an interface. For rout- ers with Software Release 9.1, displays all protocols on an interface.	ifInNUcastPkts ifOutNUcastPkts ifInUcastPkts ifOutUcastPkts
Queue	For any Cisco device, displays the num- ber of packets dropped because the input or output queue was full.	locIfInputQueueDrops locIfOutputQueueDrops ifOutQLen (non-Cisco devices)

Step 4: To gather data on protocols, click on the appropriate button. Table 4-7 describes the buttons and MIB object descriptions that are polled when you press the button.

The real-time graphs you create will use the polling frequency that appears in the window. You can enter a new polling frequency.

Button	Description	MIB Object Names
AppleTalk	Displays cumulative AppleTalk packet activity.	atInput atOutput atForward atLocal atBcastin atBcastout atNoencap atInmult
IP	Displays cumulative IP packet activity.	ipForwDatagrams ipInDelivers ipInReceives ipOutRequests ipInDiscards ipOutDiscards ipOutNoRoutes
ICMP	Displays cumulative ICMP activity.	icmpInMsgs icmpOutMsgs icmpInErrors icmpOutErrors icmpInEchos icmpOutEchos icmpInEchoReps icmpOutEchoReps
SNMP	Displays cumulative SNMP packet activity.	snmpInTotalReqVars snmpInTotalSetVars snmpInTraps snmpOutTraps snmpInPkts snmpOutPkts snmpOutGetResponses snmpOutSetRequests
ТСР	Displays cumulative TCP packet activity.	tcpActiveOpens tcpPassiveOpens tcpAttemptFails tcpEstabResets tcpInSegs tcpOutSegs tcpRetransSegs

Table 4-7 Protocol Traffic Buttons

Button	Description	MIB Object Names
UDP	Displays cumulative UDP packet activity.	udpInDatagrams udpOutDatagrams udpInErrors udpNoPorts
DECnet IV	Displays cumulative DECnet IV packet activity.	dnForward dnReceived dnHellos dnHellosent dnDatas dnNoroute dnToomanyhops
Novell	Displays cumulative Novell packet activity.	novellInput novellOutput novellForward novellLocal novellBcastin novellBcastout novellNoroute novellNoencap
VINES	Displays cumulative VINES packet activity.	vinesInput vinesOutput vinesForwarded vinesLocaldest vinesBcastin vinesBcastout vinesBcastfwd vinesNoroute vinesEncapsfailed
XNS	Displays cumulative XNS packet activity.	xnsInput xnsForward xnsLocal xnsBcastin xnsBcastout xnsErrin xnsErrout

Step 5: After you click on a button, a Grapher window appears. Figure 4-9 displays the real-time graph for buffer space.

Figure 4-9 Real-Time Graphs Window for Buffer Space Statistics

Seconds later a Results Grapher window also appears, but is hidden behind the grapher window. The devices and objects you selected appear in the scroller window. See Figure 4-10.

Figure 4-10 Results Grapher Window

Viewing or Changing Graph Properties

The Real-Time Graphs application uses SNM's graphing utility. If you want to change the appearance of your real-time graph, you need to use SNM's Results Grapher window. The following tasks can be performed using the Results Grapher:

- View different graphs listed in the Results Grapher browser.
- Change graph properties, such as color, plot values, and scaling parameters.
- Remove or halt real-time graphs data collection.
- Merge two or more graphs.

Refer to the SunNet Manager 2.0 User's Guide for more information on the SNM grapher.

Using the Path Tool

The Path Tool application enables you to monitor the performance of your routing protocols by displaying the routing path between a source device and a destination device using standard SNMP or IP.

This application is described in the "Fault Management" chapter

When using the Path Tool for performance management vary your severity thresholds over a period of time and monitor the changes accordingly so you can collect baseline data.

A black link in a path displayed in the Path Tool window indicates that the device did not respond to SNMP.

Using Show Commands to View Router Data

You can use the Show Commands to monitor system status, IP information, and traffic information. This information helps you to determine how to change and improve your the efficiency of your network environment.

Refer to the *Router Products Configuration and Reference* publication for more detailed descriptions of all **show** commands; refer to Volume 1 for all but protocol-specific **show traffic** commands and **show** commands.

Refer to Chapter 3 for detailed information on the Show Command window components.

To use the Show Commands application, perform the following steps:

- *Step 1:* Click on a network device. Use a Cisco router or communication server if you have one.
- *Step 2:* While you are clicking over the device, pull down the device or Glyph menu to Tools. Continue to pull the Tools menu to the right to show the next level menu display and select **Show Commands**.

Figure 4-11 illustrates the Show Command window that appears.

Figure 4-11 Show Commands Window

Step 3: To request specific system status, IP information, or traffic information, click on the desired Show Command button.

Each show window is described in detail in "Using Show Commands to View Router Data," in Chapter 3.

Step 4: To exit this window, select the File menu and pull down to **Quit**.

Note: Show command information provided using the CiscoWorks software differs slightly from the show command performed directly at the router console. The difference in statistics may occur if information is not available through the SNMP protocol.

Writing Reports with the Sybase Data Workbench (DWB)

The CiscoWorks **Sybase DWB** application allows you to access the Sybase Data Workbench (DWB) utilities. While Sybase DWB provides several applications, this section only describes how to use the report-writing application in DWB.

There are two ways to access Sybase DWB: through the SNM Tools menu or through the command line. The steps to access Sybase DWB are described in the following sections.

Note: The CiscoWorks system administrator should immediately change the default to a password appropriate to your operation using the instructions contained in the *Sybase System Administration Guide*. Refer to the Sybase manual set for more information on the Data Workbench application. The *Sybase Data Workbench User's Guide* explains the DWB application. The *Sybase Report Workbench User's Guide* explains the report writer accesses through DWB.

For complete information on the Sybase DWB applications, refer to the Sybase manuals listed in the front matter. For an online manual page, enter **syman dwb**. Sybase contains a documentation directory that has several helpful files called *\$SYBASE/doc*.

Invoking Sybase DWB from the Tools Menu

To invoke the Sybase DWB application from the SNM Tools menu, perform the following steps:

Step 1: Select the Tools menu on the SNM console and pull down to **Sybase DWB**. The Sybase Data Workbench Login window appears. See Figure 4-12.

Figure 4-12 Sybase Data Workbench Login Window

Use the username *user* to log in. Press Return to enter the default password.

If your password entry is incorrect, the system will intercept you with a confirmation window. To close the window, press Return. Retry your password entry.

Step 2: If you decide not to proceed with reentry into Data Workbench, click on the DWB window menu icon in the upper left corner of the window.

If your password entry is correct, you are immediately transferred to the DWB main window. See Figure 4-13.

Figure 4-13 Sybase Data Workbench

Note: If you want to exit any window in Data Workbench, click on the DWB window menu icon. Pull down and continue to pull over the **Close** command, or click outside of the menu.

Invoking Sybase DWB from the Command Line

Before running this application from the command line, you need to alter your terminal environment variable. We recommend that you access the application through the SNM Tools menu because it alters the variable automatically. If you need to use the command line, follow these steps:

- *Step 1:* To display the current terminal environment, enter the following at the command line:
 - % echo \$TERM

Make a note of your terminal default. Type this variable in when you finish using Sybase DWB to return your terminal to use other CiscoWorks applications.

Step 2: To set your terminal variable to run using your Sun workstation, enter the following at the command line:

% set term=xterm_c.sun

Step 3: At the command line, enter the following:

% cd \$NMSROOT/sybase/bin

Step 4: Then enter the Sybase DWB command:

% dwb

The DWB Login window appears. See Figure 4-12.

- Step 5: Use the username user to log in. Press Return to enter the default password.
- *Step 6:* Continue with "Using Report Writing" later in this chapter for detailed instructions on how to use this application.
- *Step 7:* When you have finished using DWB from the command line, reset your terminal default to its original state. Enter the following and press Return:
 - % set term=original term setting

Using Report Writing

The Reports menu on the Sybase Data Workbench window enables you to run and print a report on any table created with the **Device Polling** application.

The following are two examples of how to use the report-writing feature:

■ Visual query language (VQL)

VQL is a visually oriented front-end to SQL. VQL relies on menus and a point-and-select method to create the equivalent SQL.

■ Structured query language (SQL)

An industry-standard database query language, SQL is commonly used with most well-known databases.

Running a Sample Report with VQL

This section describes how to run sample reports that are available in the CiscoWorks database.

There are three sample reports in the CiscoWorks database: *devices, totals, and utilization*. These reports correlate to the Sybase polling table named sample.

A brief description of the sample reports appear below:

- *devices*-Reports what network devices are in the database.
- *totals*-Calculates totals for numbers of packets, errors, broadcasts, maximum traffic, and uptime for each device.
- *utilization*–Calculates link utilization for each device interface.

To run the sample reports, perform the following steps:

- *Step 1:* Access **Sybase DWB** from the Tools menu as described in the section, "Invoking Sybase DWB from the Tools Menu," earlier in this chapter.
- *Step 2:* In the main window of DWB, select the Reports menu and pull down to the **Existing** command. See Figure 4-14.

Figure 4-14 Sybase Data Workbench—Reports Menu

- Step 3: Three reports appear: devices, totals, and utilization. Select one of the reports.
- Step 4:Select the Actions menu and pull down to Run.The Standard Report Parameters window appears. See Figure 4-15.

Figure 4-15 Sybase Data Workbench—Standard Report Parameters Window

Step 5: Accept the default settings to run the report to the display. Click on the DWB window menu icon and select the Close option and pull over to Apply.A report similar to the one in Figure 4-16 appears on your screen.

Figure 4-16 Sybase Data Workbench—Standard Report

Creating a New Report with VQL

This section describes how to create a new report. To create a new report, define the report you want to run and then format it. You perform this process within the **Device Polling** and **Polling Summary** applications. You then need to run a script file that substitutes MIB object names for current column names such as var1 and var2.

The following examples use the default VQL layout. Refer to the Sybase *Data Workbench User's Guide* for details on how to customize the format of your reports.

To create a new report, complete the following steps:

Step 1: Define the report in the Polling Summary application.

Refer to "Creating Polling Tables Using Device Polling" for information on setting your polling tables and "Using Polling Summary" for information on performing polling.

Step 2: To check that your SYBASE environment variable is set correctly, enter the following at the command line:

hostname% printenv SYBASE The system should respond with the location of SYBASE on your system, typically /usr/sybase.

Step 3: To run the *genmibview* script, enter the following at the command line:

hostname% cd \$NMSROOT/etc hostname% genmibview -Uuser -P tablename

The *genmibview* script creates separate tables that contain the MIB variable names instead of variable names such as var1, var2, and so on. The new table name will append _*view* to the original table name. For example, if the table name is *traffic*, the new table is called *traffic_view*.

Step 4: Select the Reports menu and pull down to the **New** command. See Figure 4-14. The SQL Batch Editor window appears. See Figure 4-17.

Figure 4-17 SQL Batch Editor Window

- *Step 5:* Select the VQL! menu.
- Step 6:Select the Use menu and pull down to the Table command.The Use Table window appears over the center of the VQL window.
- *Step 7:* At the *Name* prompt, enter the filename of the table that contains the variables on which you would like to run a report.
- *Step 8:* Click on the DWB window menu icon in the upper left corner, select the **Close** option, and pull over to **Apply**.

The contents of the table appear in the window.

Step 9: Select all of the data columns in the table. Select the Add menu and pull down to the **Result Columns** command. See Figure 4-18.

Step 10: Select the Summary Values command.

The Add Summary Values window appears.

Step 11: Select the items to be averaged, then select the Function menu and pull down to **Average**. See Figure 4-19.

Figure 4-19 Sybase Data Workbench—Add Summary Values Window

Step 12: Click on the DWB window menu icon in the upper left corner and select the **Close** option to exit again.

The SQL Batch Editor displays.

Step 13: At the *Name* prompt, enter a name to identify your SQL batch statement. Click on the DWB window menu icon in the upper left corner and select the **Apply** command under the **Close** option. See Figure 4-20.

The Report Workbench window appears.

- *Step 14:* Select the Report menu and pull down to **Processing**. Ensure the filename is entered at the Process prompt.
- Step 15: Select the Compile menu. Click on the DWB window menu icon in the upper left corner and select the Apply command under the Close option. See Figure 4-21.

Figure 4-21 Sybase Data Workbench—Compile Menu

- *Step 16:* Select the Report menu and pull down to **Run**. The Standard Report Parameters window appears.
- Step 17: Accept the default settings to run the report to the display.
- *Step 18:* Click on the DWB window menu icon in the upper left corner and select the **Apply** command under the **Close** option.

A report similar to the one in Figure 4-22 appears on your screen.

Figure 4-22 Sybase Data Workbench—Standard Report

Step 19: To save the report, select the Report menu and pull down to **Save**. See Figure 4-23.

Figure 4-23 Sybase Data Workbench—Saving the Report

- Step 20: At the Save edited report as: prompt, enter the name of the report.
- Step 21: Click on the DWB window menu icon in the upper left corner and select the Apply command under the Close option. Then click on Exit Report Workbench and press Return.

Running a Sample Report with SQL

Presented in this section are several SQL report-writing examples. Using these examples, you can construct your custom reports, print them on a printer or view them on the screen.

A data field contains a single item of information such as device name, device type, or postal code. Related columns of data fields are collected into tables. These collections of related information are arranged in records that relate to entities such as addresses, names, device names, and so on. These horizontal collections of records are also called rows. If you were to look at a database you would see all fields in columns and all records in rows.

For instance, the following columns are in the locations table:

- address_id
- location
- street
- street_two
- city
- state
- country
- zip_code

Static Table Queries

You can create reports using columns of data in the static database. For example, to create a quick report on devices of a certain type including type, name, and serial number, enter the following poll in the SQL parameter window:

select device_id, device_type, device_name, serial_number from
devices where device_type = 0

Run the poll by selecting **Sybase DWB**. Select the SQL option from the Queries menu. When the SQL window appears, you can type the poll directly into the window, or read it in from a file.

To read a file into the window, select **Recall Command** and then **From Host File**. You will be prompted for the name of the file in which you have stored the poll.

Regardless of how you enter the poll, process it by selecting **Run Command**. You can display the results on screen, send them to a printer, or store them in a file. While you are experimenting, a screen display is usually most convenient.

Once the results come back, you can use the Format option. To format each column of your report. Refer to the *Sybase Data Workbench User's Guide* for detailed information. While in the display, you can scroll back and forth or up and down among the results.

If you want to produce hardcopy reports with pagination, headers, and footers rather than just columns of text, use Report Workbench to format the report. The Report Workbench will take your running poll and allow you to lay out the results for output to a printer using a WYSIWYG editor. If you have successfully run a poll and specified the set of data you are interested in, exit the Display Window (click the X icon) and then exit the SQL editor.

Choose the Reports menu item. It will display a submenu with two items: New and Existing. Choose New. This opens the SQL Batch Editor of the Report Workbench. Name the file in which you stored the poll and bring up the default report.

Refer to the *Sybase Data Workbench User's Guide* for a description of how to format your results for output to the printer.

These examples show a simple version of the results assume in an online poll in DWB:

```
device_iddevice_typedevice_nameserial_number
5 0drossNULL
```

Often, data you want is distributed across multiple tables. If you want to know more about the device type than just its number, you can include a description in your report by combining data from the devices and device_types tables. This means you name both tables in your FROM clause. You expand the WHERE clause to find only the relevant type description by linking (the technical term is "joining") the two tables on their shared columns.

The poll to do this would be:

```
select device_id, devices.device_type, device_name, device_types.
type_desc from devices, device_types where device_id = 5 and
devices.device_type = device_types.device_type
```

Notice that a full name in tablename.columnname format is required whenever a column name is not unique in a poll. The results would look something like this, depending on how you formatted them:

```
<u>device_iddevice_typedevice_nametype_descr</u>
5 Odrossdefault
```

You can have as many tables as you want, a poll (and results) drawing data from three tables could look like this:

```
select device_name, device_types.type_desc, vendor_name
from devices, device_types, vendors
where device_type =0
and devices.device_type = device_types.device_type
and devices.vendor_id = vendors.vendor_id
device nametype descrvendor name
dross defaultdefault
```

Running Custom Table Queries

You can also use columns from static tables in conjunction with columns from custom tables you create. These custom tables include real-time data for the MIB variables you select. The following example illustrates what you can do once you get started. No two networks are alike and the type of diagnostic or accounting information you might find interesting is specific to your environment.

These examples are included only as a starting point for your own experimentation. Assume you need information about device utilization levels and uptime percent. Using Device Polling, Polling Summary, and Sybase DWB, you could produce this report:

For the per:	iod From: Mar 27 1992	2 5:44PM To: Mar 28 1992	11:59AM
Device	Interface	Pct Util	
abc	Ethernet0	83.607993	
abc	Ethernet1	75.815578	
abc	Ethernet10	36.269430	
abc	Ethernet11	83.352942	
abc	Ethernet12	36.269430	
abc	Ethernet13	36.269430	
abc	Ethernet14	72.564532	
abc	Ethernet15	82.645540	
abc	Ethernet2	74.855613	
abc	Ethernet3	97.716789	

To obtain these results, use polling tables to collect information from the network and store it in the database. Then use SQL queries to display data from the database.

In the example that follows, the device is 5, the interfaces are 5, 11, and 12, and the MIB variables are: *ifInOctets*, *ifOutOctets*, and *ifSpeed*. The polling interval is 10 minutes. The name of the new table is *device_usage*.

The text of the poll that creates this report is as follows:

/*** Report of % Utilization, % Uptime by Device and Interface*/
SELECT device_id, SUM(sysUpTime)/100 uptime into #t4

```
FROM sample_view
WHERE rec_type = 0
GROUP BY device_id
go
select distinct device_id, convert(int, inst) inst into #t1
from sample_view
where rec_type = 0
order by device_id, convert(int, inst)
qo
select #t4.device_id, inst, uptime into #t2
from #t1, #t4
where #t1.device_id = #t4.device_id
order by #t1.device_id, inst
go
select device_id, convert(int, inst) inst, sum(ifInOctets) ifInOctets,
sum(ifOut
Octets) ifOutOctets, max(ifSpeed) ifSpeed
into #t3
from sample_view
where rec_type = 0
group by device_id, convert(int, inst)
order by device_id, convert(int, inst)
qo
select substring(device_name, 1, 15) Device, substring(interface_name,
1, 15) Interface, 100 * convert(float, (ifInOctets + ifOutOctets))/ con-
vert(float, (uptime))/convert(float, (ifSpeed/8)) "Pct Util"
from #t3, #t2, devices, interfaces
where #t3.device_id = #t2.device_id
and #t3.device_id = devices.device_id
and #t3.inst = interfaces.interface_id
and #t3.device_id = interfaces.device_id
and #t3.inst = #t2.inst
order by substring(device_name, 1, 15), substring(interface_name, 1,
15)
go
drop table #t4
go
drop table #t1
go
drop table #t2
go
drop table #t3
go
```

Improving Report Format

You can improve the appearance of the output from your queries. Simple changes can be made with the Format option after you run a poll from the Data Workbench. More complex changes in the appearance of the output can be achieved using the Report Writer. You can also save your queries and reports and run them later from UNIX without using Data Workbench.

When you run the poll and display the results on the Data Workbench, the Format menu item lets you change the appearance of the results. The following are some of the things you can change:

- Column width
- Column headings
- Data alignment
- Column display order

The Format option is explained in more detail in the *Sybase Data Workbench User's Guide*. For hardcopy reports, make any additional changes with Report Writer.

Writing SQL Reports for Custom Polling Tables

To write SQL-based reports for analyzing data collected in polling tables, you must be familiar with CiscoWorks polling applications, Simple Network Management Protocol (SNMP), and structured query language (SQL).

Table 4-8 shows the columns that are always present in a polling table. The remaining columns are user-defined and contain the values of the polled MIB objects.

Table 4-8 Columns in a Polling Table

Field Name	Field Size	Field Type
timestamp	datetime	Timestamp for each row of data polled
device_id	int	Join to devices table
sysUpTime	int	System up time in 100ths of a second
inst	char (255)	Index into MIB object table
rec_type	tinyint	0 = normal record, $1 =$ start record, $2 =$ not used, $3 =$ restart record, $4 =$ irregular records

If the polled MIB objects are indexed by *ifIndex*, the inst column contains the appropriate value (for example, *ifIndex* or *locIfxxx*). This inst column can be used to join with the interface_id column in the Interfaces table. To join the inst column with the interface_id column, add the following to the SQL WHERE clause:

```
select ...
where ...
and convert(int, inst) = interfaces.interface_id
```

When you start polling a device, CiscoWorks creates a record with rec_type = 1. All the values in this record are absolute. All other records have rec_type = 0 and contain a mix of delta and absolute values. When you stop polling a device, you do not get any additional rows. A new rec_type value of 4 has been added to account for any anomalies or irregularities, which includes absolute values instead of delta values.

You can determine whether a MIB object will contain an absolute or delta value by getting its data type from the *\$SNMHOME/agents/cisco.schema* file and identifying the value for each type. For example, *sysUpTime* uses timeticks as its record type, so the data value will be displayed as a delta value (the difference in value between the current poll and the last poll) if rec_type = 0.

For information on identifying the value for a data type, refer to Table 4-9.

Value
delta
delta
absolute
absolute

Table 4-9 Values for Types of Records

Specifying MIB Object Values

When you create a polling table in Device Polling, you specify the MIB object values that you want to collect. These values are collected by the poller and added to the database as the values are received. When polled values arrive at the poller in different packets, the values are written to the database in different records. Therefore, you might find that the data for a given poll is spread over two or more records, with NULL appearing where data was not available.

The following example shows how polling data is received over time and added to the database:

Polling:					
	time	sysUpTime	varl	var2	inst
	x	100	10		1
	x+1	101		15	1
	x+2	102	10		2
	x+10	110	20		1
	x+11	111	25		2
Database	storage:				
	rec_typ	e sysUpTime	varl	var2	inst
	1	100	10		1
	1	101		15	1
	1	102	10		2
	0	8	10	1	
	0	1	15		2

You cannot perform row operations without first grouping and aggregating your data. You might want to use the timestamp column to perform groupings and then use the AVG or MAX (for absolute values) or SUM (for delta values) to aggregate. You can use the following GROUP BY clause to group by device, inst, and 15-minute intervals:

select ...
group by device_id, convert(int, inst), datepart(dd, timestamp),
datepart(hh, timestamp), convert(int, datepart(mi, timestamp)/15)

Using genmibview

In a custom polling table, the columns containing the polled object values are labeled var[1-*n*], where *n* is the number of polled MIB objects. The *genmibview* script in the *\$NMSROOT/etc* directory enables you to create a view of the polling table that uses the MIB variable names. Use the following command to create a table with meaningful column names:

\$NMSROOT/etc/genmibview -Uuser -Ppassword tablename

The command creates a view called *tablename_view*. For example, to generate a view for a polling table named *traffic*, a user named *netman* and a password *cisco*, use the following command:

```
$NMSROOT/etc/genmibview -Unetman -Pcisco traffic
```

This command creates a view of the traffic table called *traffic_view*, with columns named after the MIB object names.

Computing sysUpTime Over a Polling Interval

To calculate time-dependent statistics for a device, calculate the total device uptime during the polling period. Create a temporary table containing the uptime for each polled device by using the following SQL commands:

```
select device_id, sum(sysUpTime)/100 uptime into #t1 from 
where rec_type = 0 group by device_id
```

The SQL commands create a temporary table called #tI that contains device IDs and the uptime values for each device. The value is divided by 100 so that uptime will be in seconds (*sysUpTime* is in 100ths of a second).

Using ifOperStatus and ifAdminStatus

If you are polling interface values, include *ifOperStatus* and *ifAdminStatus* in your polling values to determine whether a given interface is operational. If you are using a GROUP BY clause in your SQL, add a HAVING condition to the group to check whether the interface was operational. Add the following commands to the group:

```
select ...
group by ...
having max(ifOperStatus) = 1 and max(ifAdminStatus) = 1
```

The possible values for *ifAdminStatus* are listed in Table 4-10.

Table 4-10 Values for ifAdminStatus

Value	Meaning
1	up
2	down
3	testing

These values are also described in RFC 1213, Management Information Base for Network Management of TCP/IP-based Internets: MIB-II.

Using Report Writer to Present Your Data

Once you have written and saved your poll, you can focus on the presentation of data on the printed page. Under the Reports option of the Data Workbench, choose **Define** and then select **Setup**. Under Setup, select **Queries**, and under Queries, select **SQL**. The poll you run appears in the window.

In the window, you can recall queries from files and save them to files. When you use the **Run Report** command, you see a layout of all the elements of the report. You can edit the page layout and the data display, add trim, and change control break processing of the data. **Run Report** allows you to see the default layout on screen.

The poll will collect the set of data to be reported and the report writer will format the current set of data in the way you describe. When you exit from the Reports window, you will be notified to save your report in the database. Give the report a name and confirm your exit from the report menu.

For complete information about Report, refer to the Sybase Data Workbench User's Guide.

Running Reports from UNIX

You can run reports created and saved by the Data Workbench from the UNIX command line with the **runrw** command. The output of the report is automatically sent to your default printer.For more information about **runrw**, see the appropriate UNIX command reference manual furnished with your system.

The following is the command syntax for the sample report called *storm_report*:

runrw storm_report -Uyourname -Ppassword

To run a report owned by another user, enter the following at the command prompt:

hostname% runrw user name.devicerpt -Uyourname -Ppassword