CHAPTER 7

Using Polling to Monitor Network Performance

Introduction to Performance Monitoring

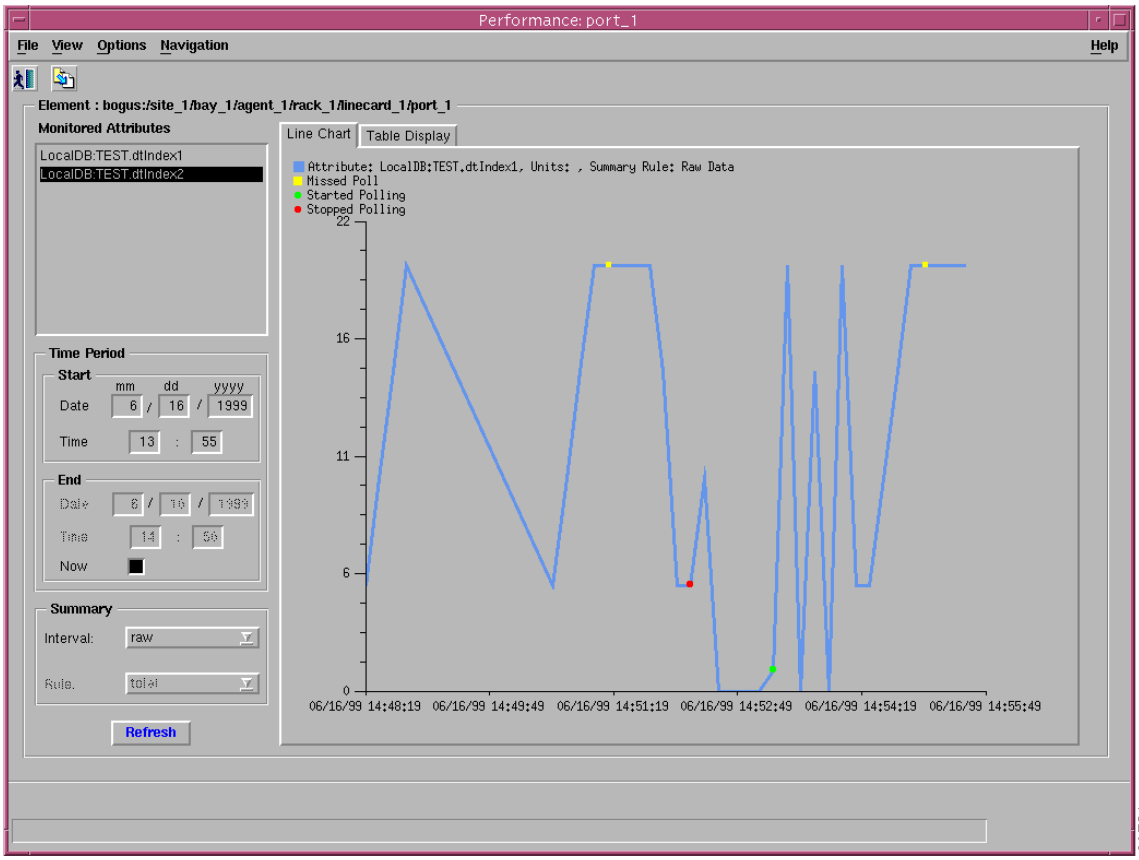
An important component of efficient network management is the ability to receive performance information on a large network of many devices to provide an overall view of the your network's functioning. You can then proactively manage your network elements by analyzing the performance data.

CMNM lets you monitor the performance statistics gathered from network elements managed by CEMF. CMNM collects performance information from the Cisco MGC node, allowing you to monitor the health and performance of the network. You can display the performance information. You can also view performance data associated with a given object and graph that data over time. CMNM collects performance information from all of the components of the Cisco MGC node. You can configure the objects being polled and the frequency of the polling.

Cisco MGC allows you to specify how long performance data should be kept in the database. You can also specify rollup rules and other actions that should be taken on performance data after a set length of time.

The Performance Manager is opened from the Network Maps, Event Browser, or Object Manager by selecting **Performance Manager** from the pop-up menu available on a selected object. A screen similar to Figure 7-1 is displayed.

Figure 7-1 Performance Manager Screen



A selected object or group of objects has a number of different attributes. You can choose to monitor an area of the network, for example, the performance statistics of a particular attribute. This information could then be used to evaluate the performance of specific equipment and assess the requirements for upgrades or software downloads.

Performance statistics also provide a summary view of the performance of network elements. These statistics help you determine the degree to which the network is meeting assigned service levels. You are able to drive down to the chassis level from the network level in a simple manner if you want to view individual chassis statistics.

CMNM Performance Manager can present data in two ways:

- Raw—This is performance data in its most detailed format (not summarized). History storage criteria defines which attributes are to be monitored on specified objects. When these objects are polled, the retrieved data is stored by CEMF and can be viewed using the Performance Manager. This data is raw data. History storage criteria may also specify summary intervals and rules to be applied to the raw data. The resultant data is summarized data.
- Summarized—This gives derived summaries of raw data. This is an approach that displays the data at a level appropriate to the task in hand; for example, you may decide to view data summarized in hourly or daily intervals according to requirements.

Performance data has the potential to overwhelm. For example, you may want to view the Errored Packets for a device over a six-month interval. If the data was displayed in a table or graph at the rate at which it was sampled, this could be tens of thousands of values. In these circumstances, it is preferable to view summaries of the data. For example, if data was originally received at intervals of 5 minutes, the

ability to view it summarized in hourly, daily, or weekly intervals would be an excellent way of managing the network. History storage criteria can be used to specify these summary intervals and the rules that are used to generate the summaries for the history storage criteria's objects and attributes.

Hourly summaries are generated on the hour, daily summaries are generated at midnight, and weekly summaries are generated at midnight on Sundays (that is, the end of Sundays). For example, if polling starts at 9:30 and hourly summaries are to be generated, the first full hour's worth of data is between 10:00 and 11:00. So at 11:00, the first hourly summary is generated and given a timestamp of 10:00. The same pattern is followed for all summaries (daily, weekly, or user-defined). This pattern standardizes summary intervals so that all attributes' summaries have the same timestamps.

Note Data generated between 9:30 and 10:00 is ignored in the above example, because an hourly summary for 9:00 to 10:00 would be misleading as it would have been generated using only half the usual number of values.

In some cases, an object may fail to be polled; for example, if communication to the object is lost. This is referred to as a missed poll, and all missed polls are indicated on Performance Manager graphs and charts.

Performance Manager graphs and charts also indicate when an attribute started and stopped being polled due to history storage criteria being added, edited, or removed. You are therefore able to see when polling on an attribute started, the attribute's values while it was being polled (and any missed polls), and finally when the attribute stopped being polled.

A Performance Manager can be opened for each network element you wish to monitor. To view up-to-date information on the Performance Manager, click **Refresh** and the selected data is displayed.

How Performance Data Is Collected

Depending on the type of device, performance data is collected in different ways.

- Performance data for the active Cisco MGC host is collected by retrieving flat files at user-defined intervals.
- CMNM collects performance data from the Cisco SLT and LAN switch using the standard SNMP mechanisms.

Common Performance Data Collected for Several Devices

Many devices collect the same performance data. Common performance attributes are listed in Table 7-1, Table 7-2, and Table 7-3 and referenced in the following sections.

Table 7-1 IP Performance Counters

Counter	Description
SNMP:RFC1213-MIB.ipInReceived	Number of input datagrams received from interfaces, including those received in error.
SNMP:RFC1213-MIB.ipInHdrErrors	Number of input datagrams discarded due to errors in their IP headers including bad checksums.
SNMP:RFC1213-MIB.ipInAddrErrors	Number of input datagrams discarded because of invalid IP header destination address.

Table 7-1 IP Performance Counters

SNMP:RFC1213-MIB.ipForwDatagrams	Number of input datagrams for which this entity was not their final IP destination.
SNMP:RFC1213-MIB.ipInUnknownProtos	Number of locally addressed datagrams discarded because of an unknown or unsupported protocol.
SNMP:RFC1213-MIB.ipInDiscards	Number of input IP datagrams that were discarded for some reason (such as lack of buffer space).
SNMP:RFC1213-MIB.ipInDelivers	Total number of input datagrams successfully delivered to IP user-protocols.
SNMP:RFC1213-MIB.ipOutRequests	Total number of IP datagrams that local IP user-protocols supplied to IP in requests for transmission.
SNMP:RFC1213-MIB.ipOutDiscards	Number of output IP datagrams that were discarded for some reason (such as lack of buffer space).
SNMP:RFC1213-MIB.ipOutNoRoutes	Number of IP datagrams discarded because no route was found to transmit them to their destination.
SNMP:RFC1213-MIB.ipFragOKs	Number of IP datagrams that have been successfully fragmented at this entity.
SNMP:RFC1213-MIB.ipFragFails	Number of IP datagrams that have been discarded because they could not be fragmented.
SNMP:RFC1213-MIB.ipFragCreates	Number of IP datagram fragments that have been generated as a result of fragmentation.

Table 7-2 TCP Performance Counter

Counter	Description
RFC1213-MIB.tcpActiveOpens	Number of times TCP[1] connections have made a direct transition to the SYN-SENT state from the CLOSED state.
RFC1213-MIB.tcpAttemptFails	Number of times TCP connections have made a direct transition to the CLOSED state from either the SYN-SENT state or the SYN-RCVD state, plus the number of times TCP connections have made a direct transition to the LISTEN state from the SYN-RCVD state.
RFC1213-MIB.tcpCurrEstab	Number of TCP connections for which the current state is either ESTABLISHED or CLOSE-WAIT.
RFC1213-MIB.tcpEstabResets	Number of times TCP connections have made a direct transition to the CLOSED state from either the ESTABLISHED state or the CLOSE-WAIT state.
RFC1213-MIB.tcpInErrs	Total number of segments received in error (for example, bad TCP checksums)
RFC1213-MIB.tcpInSegs	Total number of segments received, including those received in error.
RFC1213-MIB.tcpMaxConn	Total number of TCP connections the entity can support.
RFC1213-MIB.tcpOutRsts	Number of TCP segments sent containing the RST flag.

Table 7-2 TCP Performance Counter

RFC1213-MIB.tcpOutSegs	Total number of segments sent, including those on current connections but excluding those containing only retransmitted octets.
RFC1213-MIB.tcpPassiveOpens	Number of times TCP connections have made a direct transition to the SYN-RCVD state from the LISTEN state.
RFC1213-MIB.tcpRetransSegs	Total number of segments retransmitted - that is, the number of TCP segments transmitted containing one or more previously transmitted octets.
RFC1213-MIB.udpInDatagrams	Total number of UDP[2] datagrams delivered to UDP users.

1. Transmission Control Protocol
2. User Datagram Protocol

Table 7-3 UDP Performance Counters

Counter	Description
RFC1213-MIB.udpInDatagrams	Total number of UDP datagrams delivered to UDP users.
RFC1213-MIB.udpInErrors	Number of received UDP datagrams that could not be delivered for reasons other than the lack of an application at the destination port.
RFC1213-MIB.udpNoPorts	Total number of received UDP datagrams for which there was no application at the destination port.
RFC1213-MIB.udpOutDatagrams	Total number of UDP datagrams sent from this entity.

Performance Data Collected for the Cisco MGC Hosts

The following performance counters are collected for each Cisco MGC host:

- IP performance counters
- TCP performance counters
- UDP performance counters

In addition, the attributes in Table 7-4 are collected for the active Cisco MGC host.

Table 7-4 Cisco MGC Host Performance Counters

Counter	Description
SNMP:HOST-RESOURCES-MIB.hrSystemNumUsers	Number of users on the host
SNMP:HOST-RESOURCES-MIB.hrSystemProcesses	Number of processes running on system

Performance Data Collected for BAMS

The following performance counters are collected for each BAMS:

- IP performance counters
- TCP performance counters

- UDP performance counters

In addition, the attributes in Table 7-5 are collected.

Table 7-5 BAMS Performance Counters

Counter	Description
SNMP:HOST-RESOURCES-MIB.hrSystemNumUsers	Number of users on the host
SNMP:HOST-RESOURCES-MIB.hrSystemProcesses	Number of processes running on the system

Performance Data Collected for the Cisco SLT

The following performance counters are collected for each Cisco SLT:

- IP performance counters
- TCP performance counters
- UDP performance counters

In addition, the attributes in Table 7-6 are collected.

Table 7-6 Cisco SLT Performance Counters

Counter	Description
SNMP:OLD-CISCO-CHASSIS-MIB.nvRamUsed	Amount of RAM in use

No performance collection is done for the SS7 MTP2 channels.

For details on collecting performance data for the Cisco SLT TDM interfaces, see “Performance Data Collected for TDM Interfaces” section on page 7-7.

Performance Data Collected for the LAN Switch

The following performance counters are collected for each LAN switch:

- IP performance counters
- TCP performance counters
- UDP performance counters

In addition, the attributes in Table 7-7 are collected for the IOS LAN switch.

Table 7-7 IOS LAN Switch Performance Counters

Counter	Description
SNMP:OLD-CISCO-CHASSIS-MIB.nvRamUsed	Amount of RAM in use

The attributes in Table 7-8 are collected for the Catalyst LAN switch.

Table 7-8 Catalyst LAN Switch Performance Counters

Counter	Description
SNMP:CISCO-STACK-MIB.sysTrafficPeak	Peak traffic utilization

Performance Data Collected for Network Interfaces

The performance counters in Table 7-9 are collected for each network interface.

Table 7-9 Network Interface Performance Counters[1]

Counter	Description
SNMP:IF-MIB.ifInErrors	Number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
SNMP:IF-MIB.ifInOctets	Total number of octets received on the interface, including framing characters.
SNMP:IF-MIB.ifOutErrors	Number of outbound packets that could not be transmitted because of errors.
SNMP:IF-MIB.ifOutOctets	Total number of octets transmitted out of the interface, including framing characters.

1. No performance attributes are collected for loopback interfaces.

Performance Data Collected for TDM Interfaces

The counters in Table 7-10 are collected for each Cisco SLT TDM interface to the SS7 network.

Table 7-10 TDM Interface Performance Counters

Counter	Description
SNMP:RFC1406-MIB.dsx1*Table*BESs[1]	Number of bursty errored seconds
SNMP:RFC1406-MIB.dsx1*Table*CSSs	Number of controlled slip seconds
SNMP:RFC1406-MIB.dsx1*Table*DMs	Number of degraded minutes
SNMP:RFC1406-MIB.dsx1*Table*ESs	Number of errored seconds
SNMP:RFC1406-MIB.dsx1*Table*LCVs	Number of line code violations
SNMP:RFC1406-MIB.dsx1*Table*LESs	Number of line errored seconds
SNMP:RFC1406-MIB.dsx1*Table*PCVs	Number of path coding violations
SNMP:RFC1406-MIB.dsx1*Table*SEFSs	Number of severely errored framing seconds
SNMP:RFC1406-MIB.dsx1*Table*SESs	Number of severely errored seconds
SNMP:RFC1406-MIB.dsx1*Table*UASs	Number of unavailable seconds

1. *Table* refers to the RFC-1406 DSX1 table and is either Current or Total.

Performance Data Collected for the Cisco 2900XL LAN Switch Port

In addition to the standard interface attributes, the counters in Table 7-11 are also collected for the Cisco 2900XL port.

Table 7-11 Cisco 2900XL LAN Switch Port Performance Counters

Counter	Description
SNMP:CISCO-C2900-MIB.c2900PortRxNoBwFrames	Frames discarded due to lack of bandwidth
SNMP:CISCO-C2900-MIB.c2900PortRxNoBufferFrames	Frames discarded due to lack of buffer
SNMP:CISCO-C2900-MIB.c2900PortRxNoDestUniFrames	Number of unicast frames discarded
SNMP:CISCO-C2900-MIB.c2900PortRxNoDestMultiFrames	Number of multicast frames discarded
SNMP:CISCO-C2900-MIB.c2900PortRxFcsErrFrames	Frames received with an FCS error
SNMP:CISCO-C2900-MIB.c2900PortCollFragFrames	Frames whose length was less than 64
SNMP:CISCO-C2900-MIB.c2900PortTxMulticastFrames	Frames successfully transmitted (mutlicast)
SNMP:CISCO-C2900-MIB.c2900PortTxBroadcastFrames	Frames successfully transmitted (broadcast)

Performance Data Collected for the CIAgent System Components

The following sections list the attributes collected for each CIAgent system component.

Note For information about viewing this information, see the "Viewing CIAgent Device Information" section on page 9-36.

Fixed Disk

The counters in Table 7-12 are collected for each fixed disk object.

Table 7-12 Fixed Disk Performance Counters

Counter	Description
SNMP:HOST-RESOURCES-MIB.hrStorageAllocationFailures	Number of failed allocation requests
SNMP:HOST-RESOURCES-MIB.hrStorageUsed	Amount of storage used

Processor

The counters in Table 7-13 are collected for each processor object.

Table 7-13 Processor Performance Counters

Counter	Description
SNMP:HOST-RESOURCES-MIB.hrDeviceErrors	Number of errors detected on device
SNMP:HOST-RESOURCES-MIB.hrProcessorLoad	Average load on the processor

RAM

The counters in Table 7-14 are collected for each RAM object.

Table 7-14 RAM Performance Counters

Counter	Description
SNMP:HOST-RESOURCES-MIB.hrStorageAllocationFailures	Number of failed allocation requests
SNMP:HOST-RESOURCES-MIB.hrStorageUsed	Amount of storage used

Virtual Memory

The counters in Table 7-15 are collected for each virtual memory object.

Table 7-15 Virtual Memory Performance Counters

Counter	Description
SNMP:HOST-RESOURCES-MIB.hrStorageAllocationFailures	Number of failed allocation requests
SNMP:HOST-RESOURCES-MIB.hrStorageUsed	Amount of storage used

Cisco MGC Host Configuration Performance Counters

The Cisco MGC host writes out performance counters for many of the signaling components. These performance counters are in the form of ASCII flat files containing entries for all collected counters for all signaling components.

Performance data is stored directly on the signaling components themselves. You only see the performance data for any given component, not for all signaling components. All performance counters are predefined in the CEMF object model.

On the Cisco MGC host, you can specify multiple intervals for any given counter. For example, you can specify that a counter is to be written for each 5-minute, 15-minute, 30-minute, 60-minute, and 24-hour interval. However CMNM supports only a single interval for any given counter.

The Cisco MGC host administrator must ensure that the performance configuration writes out each counter only at a single interval by modifying the measProfs.dat and buckets.dat files so there is only a single entry (time interval) for each category. The administrator should choose the most granular interval (shortest time) necessary for each counter. If the administrator fails to do this and the Cisco MGC host

writes out the same counter at multiple intervals, CMNM collects all data points and stores them in the same attribute, causing spikes in the resulting performance displays. For this reason, the user must configure the Cisco MGC host such that each measurement is written out only at a single time interval.

On the Cisco MGC host, there are a number of files that determine which performance counters are collection as well as the frequency of their collection, as shown in Table 7-16.

Table 7-16 Cisco MGC Host Measurements File

MGC Host File	Description
buckets.dat	Defines the measurement buckets and intervals and their associated thresholds.
dmprSinks.dat	Defines how often the performance counters are to be collected and the maximum number of records and the maximum file size of the CSV files.
measCats.dat	Defines all of the counters in each category to be generated by the Cisco MGC host software.
measProfs.dat	Defines the profiles associated with each measurement category, including information concerning reporting intervals and measurements.

Measurement Filters

You can use measurement filters to specify the Cisco MGC host configuration performance counters that CMNM collects. Although the Cisco MGC host continues to write out all of its configuration performance counters, CMNM collects only the subset defined in its measurement filters.

During startup, CMNM reads the measurement filter file:

$CEMF_ROOT/config/hostController/measFilters

This file contains a list of all of the Cisco MGC host configuration performance measurements that CMNM collects. It lets you filter counters based on their measurement names and the MML component names.

The format of the measurement filter file is:

*Measurement Name, *|Component Name*

where the variables are defined in Table 7-17.

Table 7-17 CMNM Measurement Filters

Parameter	Description
Measurement Name	Any measurement specified in the Cisco MGC host measCats.dat file.
Component Name	Any MML component specified in the Cisco MGC host components.dat file. An asterisk (*) matches all components.

Opening the Performance Manager

The Performance Manager can be accessed from pop-up menus on selected objects in the following applications:

- Network Maps
- Event Browser

- Object Manager

To open Performance Manager:

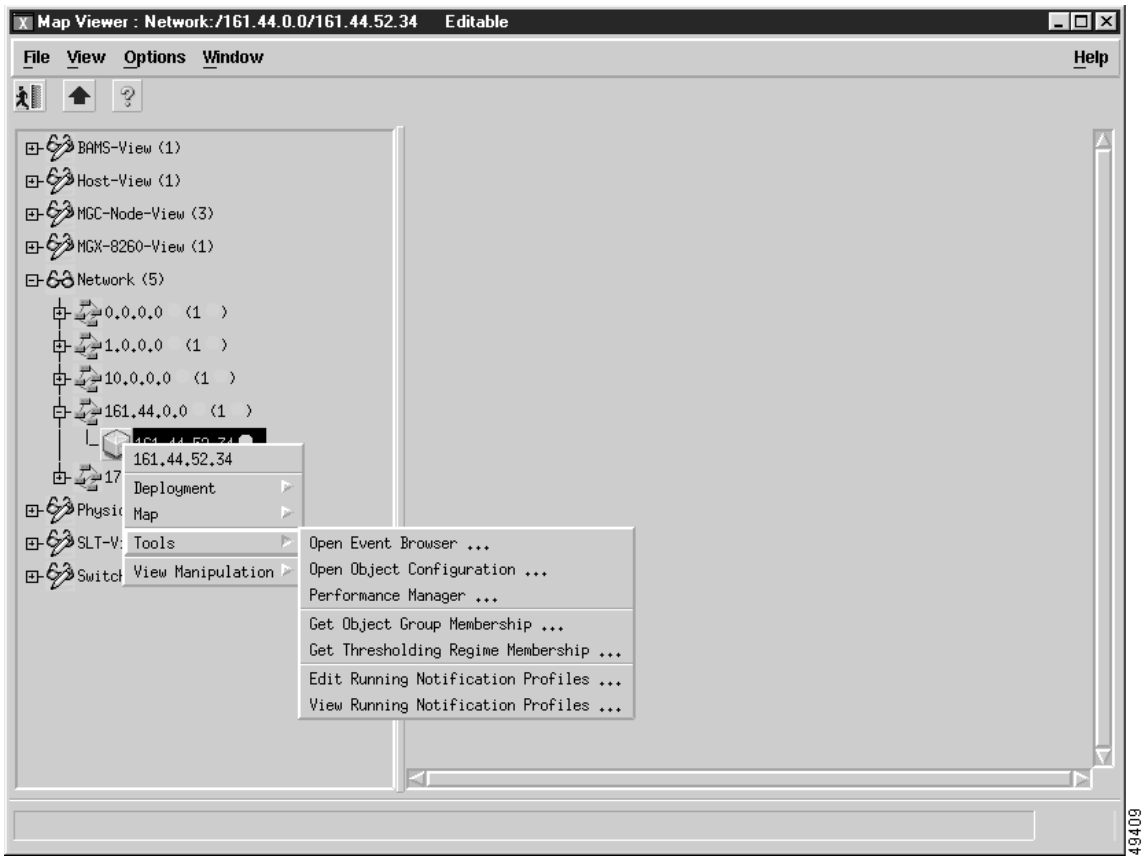
Step 1 Open the appropriate window to display a relevant object.

Step 2 Place the cursor over the object.

Step 3 Press and hold the right mouse button.

Step 4 Move the cursor until the **Tools** option is highlighted, then highlight the **Performance Manager** option, as shown in Figure 7-2.

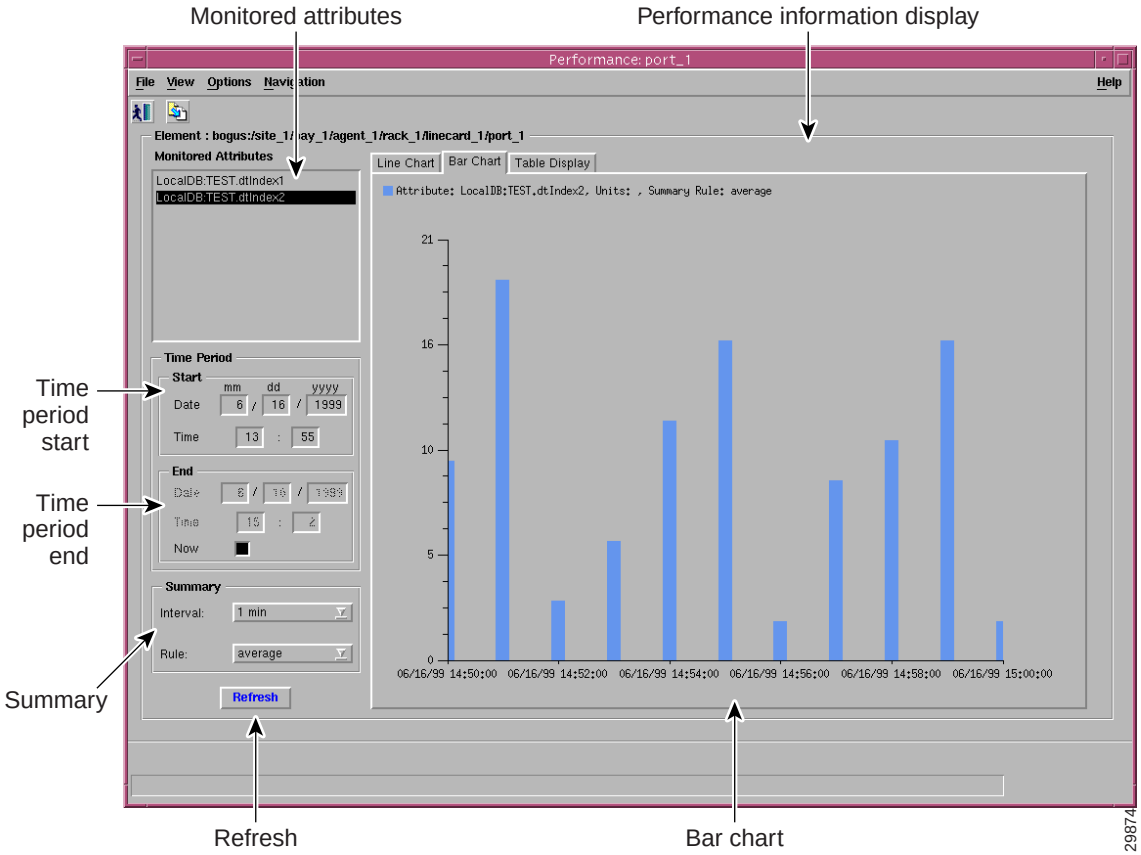
Figure 7-2 Map Viewer Screen—Tools->Performance Manager Option



Step 5 Release the right mouse button.

You see the Performance Manager screen shown in Figure 7-3.

Figure 7-3 Performance Manager Screen



From the Performance Manager screen you can:

- Identify all monitored attributes on a selected managed object.
- Identify all time periods configured for sampling each monitored attribute.
- Identify all summary methods configured for selected monitored attributes and selected summary periods.
- View historical performance data over a requested period of time (in tabular or graphical format).
- Print performance data to a printer or file.

Setting Polling Frequencies

You can set the polling frequency for the various types of devices. While you can specify a separate polling frequency for the Cisco SLTs, the LAN switches, and the Cisco MGC hosts, you cannot set a separate polling frequency for an individual device.

Understanding the Different Polling States of a Device

When an object is polling, its icon is augmented with a small anotation. Each LAN switch, Cisco SLT, and common Cisco MGC host object has this icon when polling. In addition, the Cisco MGC node object has the polling icon if any of its children are doing polling. In this way, the states of the Cisco MGC subobjects are reflected up to the Cisco MGC node object.

CMNM uses many different indicators to indicate the logical state of a device. On the right side of the Map Viewer, the icon representing each device is shown. For some states, a small symbol is placed near the top of the icon to indicate a logical state. In addition, cross-hatching is used to indicate state information.

Table 7-18 shows the different logical states.

Table 7-18 State Symbols

State Symbol	Description
	Indicates that the device has not been discovered. (This is the icon when the device is initially deployed.)
	Indicates that the device is in the process of discovering. The icon also has a hatch pattern.
	Indicates that the device has some outage or operational problem and is, therefore, out-of-service. Icons also have a hatch pattern.
	Indicates that the device is performing polling.
	Indicates that the device is not SNMP reachable. This may be because the device is off the network or its SNMP agent is not responding.
	Indicates that some major service or software process on the device has failed. The icons also have a hatch pattern.
	Indicates that the device is off-duty or administratively down.
	Indicates that the device is providing service.
	Indicates that the device is running in warm-standby mode.
	Indicates that the device is running in an unknown (other) mode.
	Indicates that the device is being tested.
	A hatch-pattern (without any corresponding state symbol) is used to indicate that the device is not being managed.
<None>	An icon with no hatch pattern or symbol indicates the device is running normally.

Changing Collection Defaults

CMNM predefines which performance statistics are collected and simply processes whatever data is available. However, the Cisco MGC host allows you to change these defaults by editing the Cisco MGC host filter file perfMeasFilters. Use the following commands:

install directory/**config/hostController**

perfMeasFilters

Measurements can be turned on or off by commenting out the line with # or by deleting the line.

Setting Different Polling Frequencies

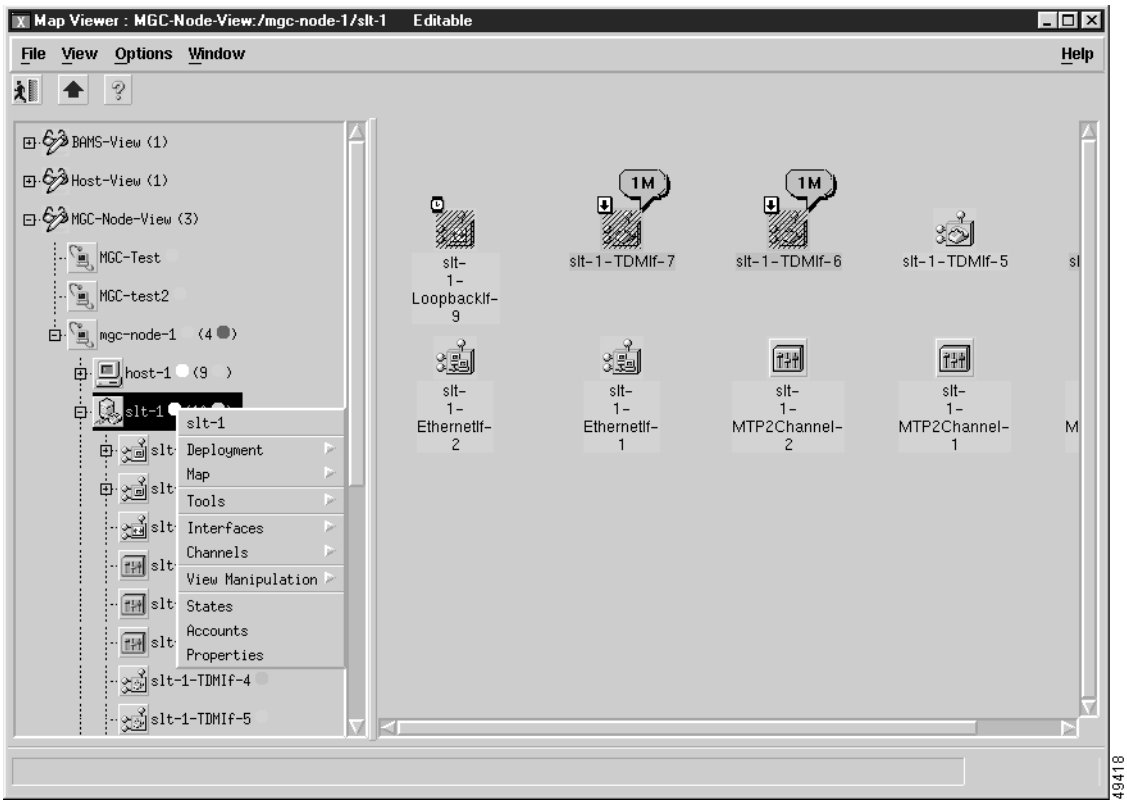
You can define the polling frequency for the various devices, but you should not set the CMNM polling frequency to be less than the Cisco MGC host polling frequency. However, you can increase the CMNM polling frequency so that not all of the Cisco MGC host performance files are processed. For example, you can set Cisco MGC host performance data collection to only once a day.

To configure the polling frequency:

Step 1 On the Map Viewer screen, select the device you want to configure.

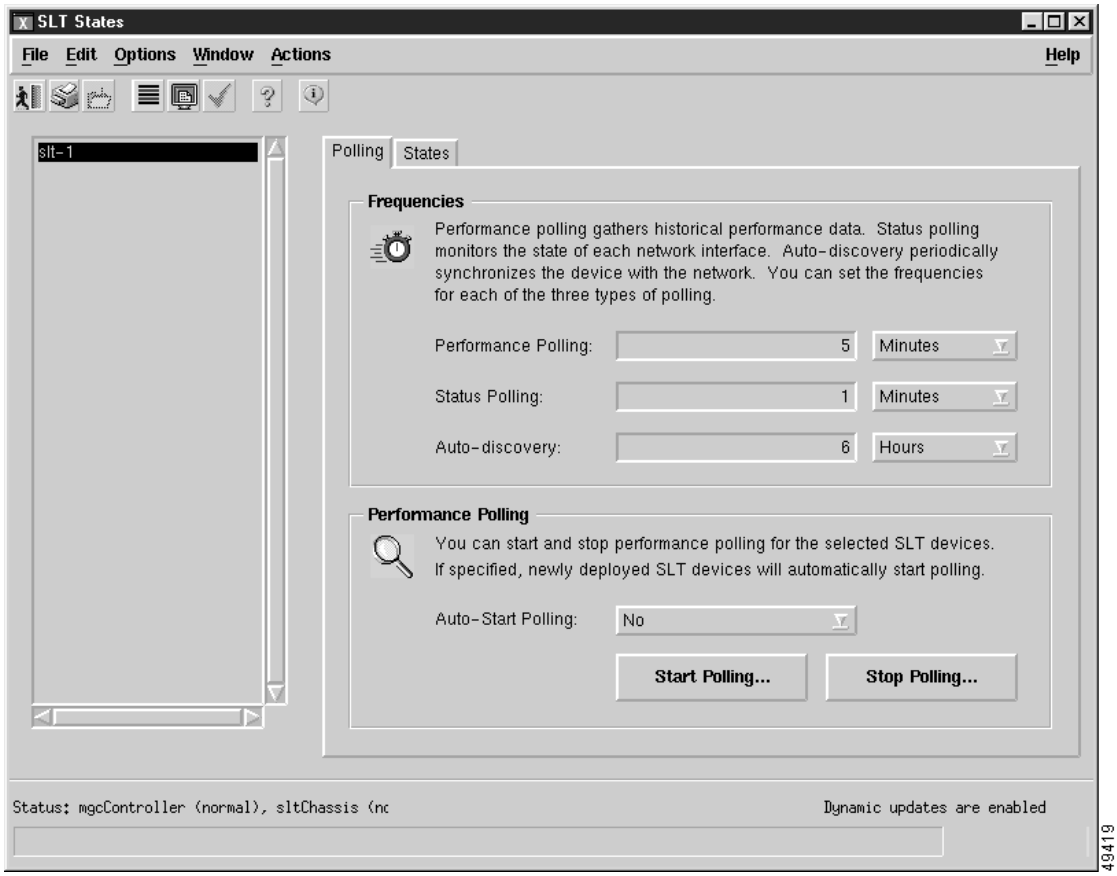
Step 2 Right-click to display the pull-down menu and select **States**, as shown in Figure 7-4. (This example uses a Cisco SLT, but the procedure is the same for other devices.)

Figure 7-4 Map Viewer Screen—Tools>Open Polling Frequencies Option



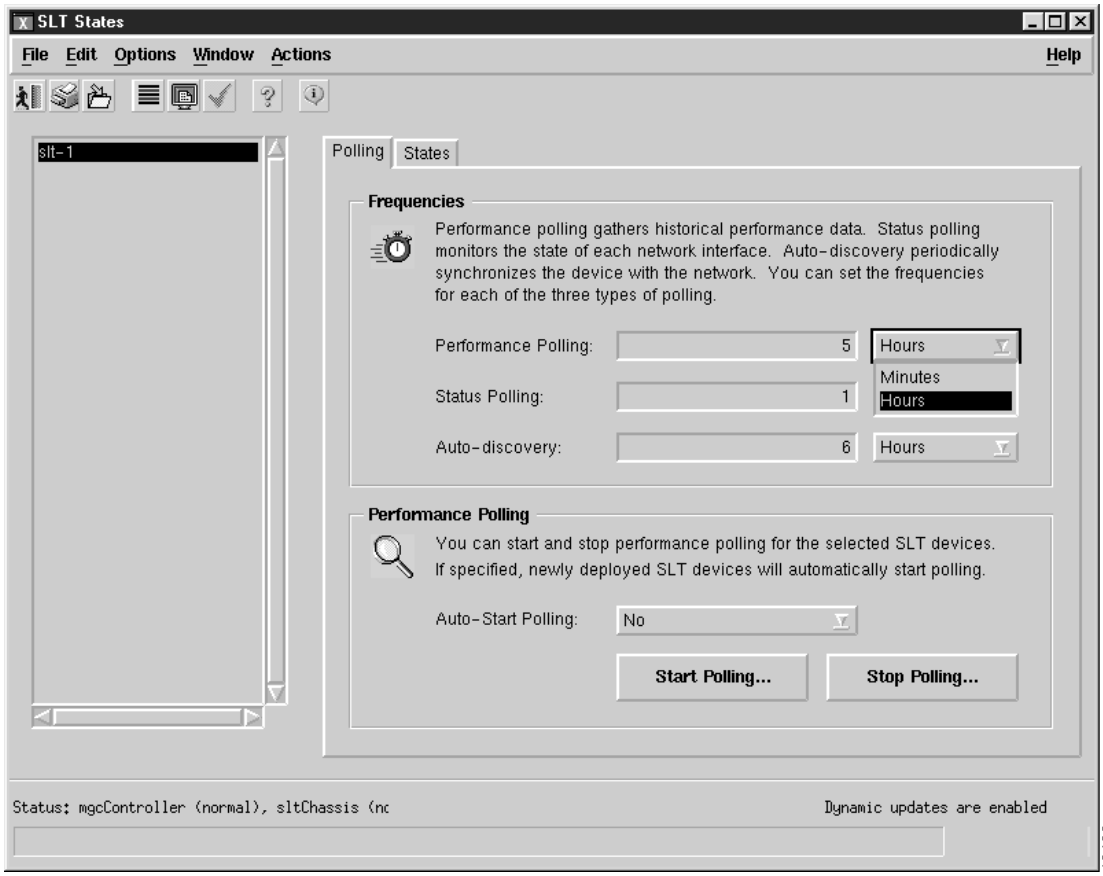
You see the screen in Figure 7-5.

Figure 7-5 Polling Frequencies Screen



Step 3 You can set the frequency for performance polling, status polling, and auto-discovery. To change from minutes to hours, select from the pull-down menu, as shown in Figure 7-6.

Figure 7-6 Polling Frequencies Screen—Frequency Pull-Down Menu



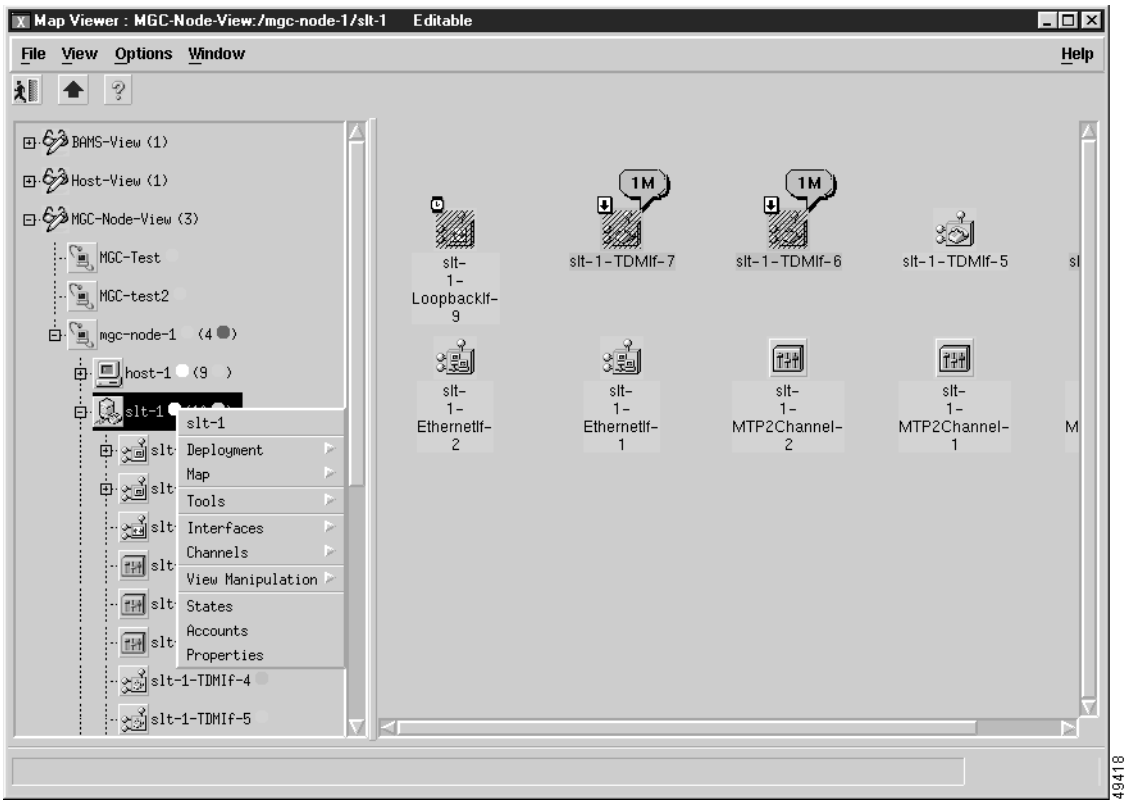
Starting Polling On a Device

By default, performance data is not collected for any object. When an object is first deployed in CEMF, it is in the normal state; no performance polling is done. To enable performance polling, you must transition the object into the polling state. This is done using the dialogs posted from the object. CMNM allows you to transition either a single object or a group of objects between the normal and polling states.

To place a device into a polling state so that data can be collected (this example uses the Cisco SLT, but the procedure is the same for each device):

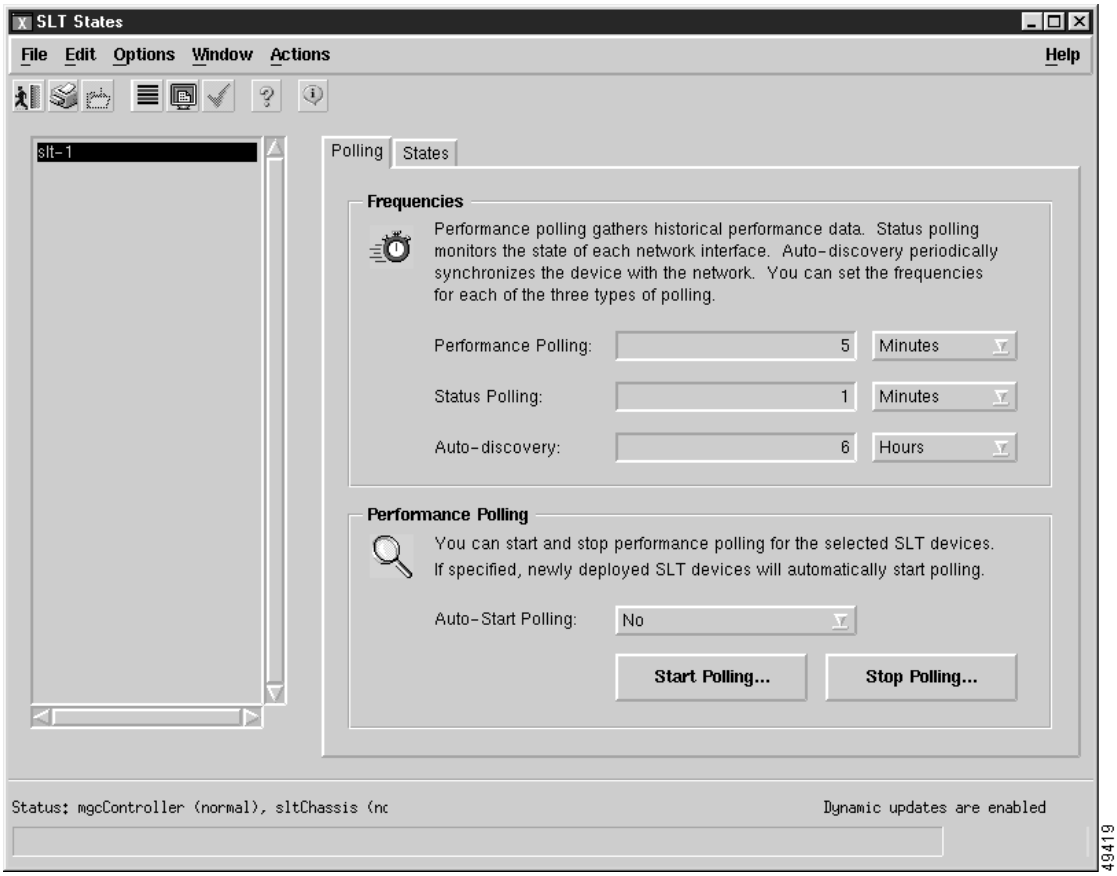
Step 1 Click the network or device, right-click to display the pull-down menu, then select **States** as shown in Figure 7-7.

Figure 7-7 Map Viewer Screen—Open SLT States Option



You see the screen in Figure 7-8.

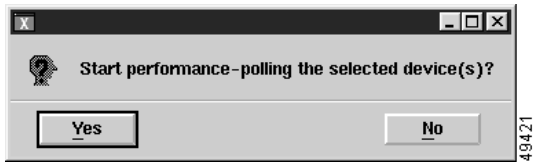
Figure 7-8 SLT States Screen



Step 2 Click **Start Polling**.

You see the screen in Figure 7-9.

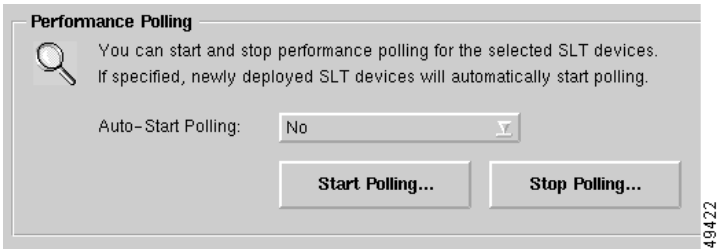
Figure 7-9 Polling Configuration Prompt



Step 3 Click **Yes** to proceed.

To stop polling at anytime during the process, click **Stop Polling**, as shown in Figure 7-10.

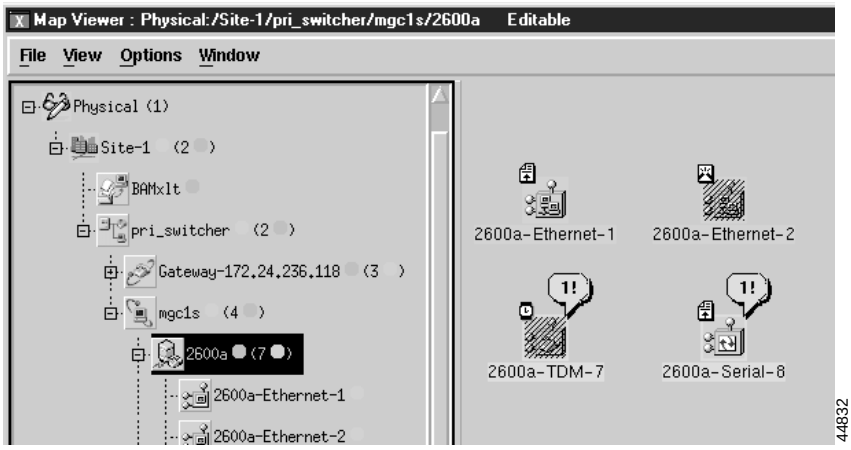
Figure 7-10 Stop Polling Screen



Note Starting and stopping polling on the Cisco MGX 8260, Cisco SLTs, and LAN switch also starts or stops polling for each interface on the chassis.

Note When polling is taking place, a sheet with an arrow pointed up appears just above the network or object icon. Figure 7-11 shows the 2600a-Ethernet-1 and 2600a-Serial-8 in polling states.

Figure 7-11 Map Viewer Screen—2600a in Polling State



Decomissioning, Rediscovering, and Rebooting Devices

You can commission or decomission devices such as the Cisco SLT, LAN switch, Cisco MGX 8260, BAMS, and Cisco MGC host.

Decommissioning a device prevents it from being presence polled or performance polled. A device in the decommissioned state still processes traps, but a presence poll alarm is cleared. Commissioning it brings it back on the network so that it starts presence polling.

The decommissioned state is used in two circumstances:

- When the physical device is administratively off the network.
- When the physical device has a known problem and you do not want to manage it.

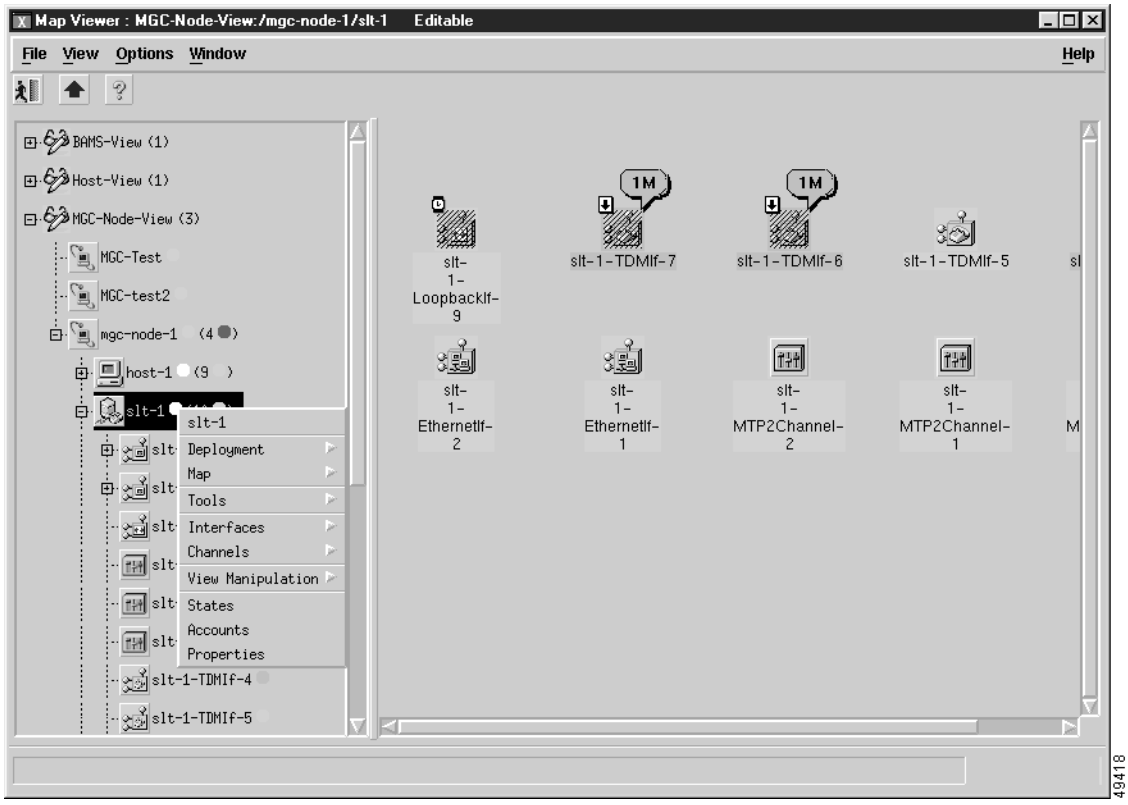
When a trap is received, CMNM checks to see if the destination object is decommissioned. If so, the trap is discarded. Otherwise trap processing continues as normal. In this way, you never receive any traps on a decommissioned device.

Rediscover performs subrack discovery on the device and synchronizes all of the network interfaces and IP addresses. Rebooting shuts down and restarts the device.

To decomission, rediscover, or reboot a device:

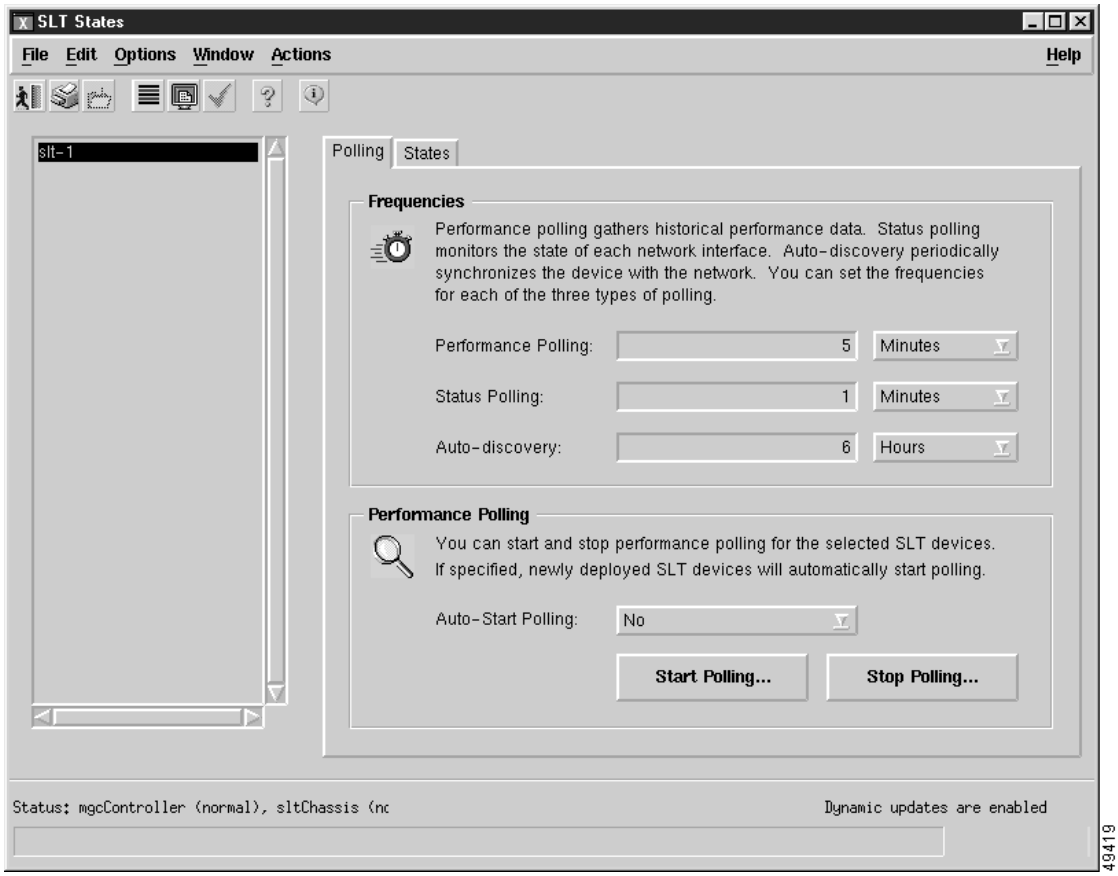
Step 1 Click the network or device, right-click to display the pull-down menu, then select **States** as shown in Figure 7-12.

Figure 7-12 Map Viewer Screen—Open SLT States Option



You see the screen in Figure 7-13.

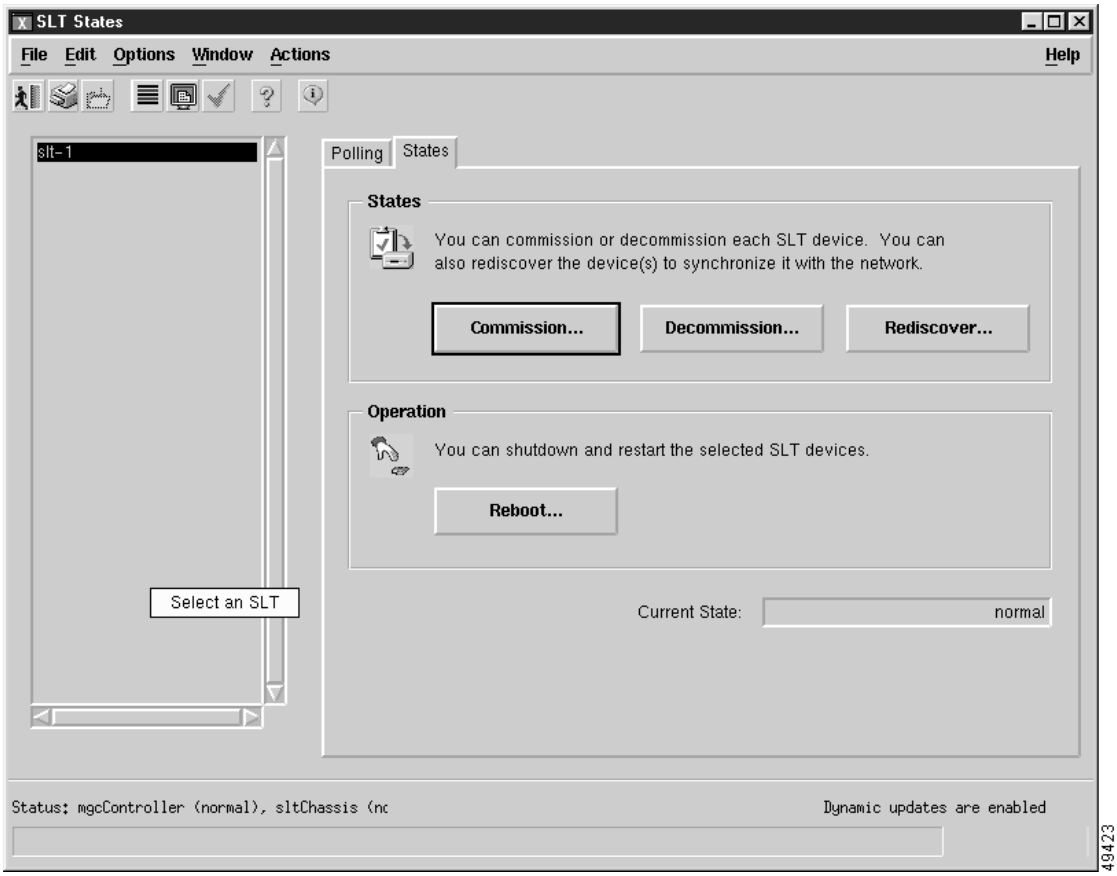
Figure 7-13 SLT States Screen



Step 2 Click the **States** tab.

You see the screen in Figure 7-14.

Figure 7-14 SLT States Screen



Step 3 Click the relevant button to accomplish the task you want to perform.

Viewing Performance Data

CMNM generates simple graphs of performance data (single counter, single object). These screens show the performance data in tabular, near real-time format for SS7, SS7 Link, SS7 Link Set, Voice Traffic, and Interface Utilization measurements. The performance counters associated with these measurements include, but are not limited to:

- Calls cancelled because of CCS congestion
- Number of transmitted IAM messages
- Received answer signaling
- Number of received IAM messages
- Number of transmitted CCS answer signals
- Number of attempts to transmit IAM messages
- Number of MSUs transmitted and received
- Duration of Level 1, 2, and 3 congestion

- Link availability

To view performance data, you need to select:

- Attributes for which performance data is to be displayed
- Time period over which the performance data is gathered
- Format to be used to display the results

Note Before you can view performance data, you must first start performance monitoring on a device or network and wait until polling is complete.

Step 1 Open the Performance Manager. The window shows the name of the selected object.

Step 2 From the Monitored Attributes list, select the attribute to be monitored.

Note You can select multiple attributes in a list by holding down the **Shift** key and selecting attributes in the list. You can select multiple individual attributes by holding down the **Ctrl** key and clicking individual items. The information for all selected attributes is shown in the Table Display. Only the first selected attribute is shown in the line chart or bar chart.

Step 3 In the Start Date data entry boxes, enter the date the view of the performance statistics has to start from. The format is *mm*/*dd*/*yyyy*.

Step 4 You set a start time and an end time using 24-hour notation. The times are inclusive. In the Start Time data entry boxes, enter the time the view of the performance statistics has to start on the Start Date.

Step 5 To set the End Date you have two options:

In the End Date data entry boxes, enter the date the view of the performance statistics has to stop. The format must be *mm*/*dd*/*yyyy* or select the **Now** check box to view the data from the selected start date to the current time. By selecting this option, you do not have to update the End Date and End Time fields.

Note Now is the current time and remains current.

Step 6 To set the End Time you have two options:

In the End Time data entry boxes, enter the time the view of the performance statistics has to stop on the End Date or select the **Now** check box to view the data from the selected start date to the current time. By selecting this option, you do not have to update the End Date and End Time fields.

Step 7 From the Interval pull-down menu, select the summary interval to be used. This varies according to the attribute selected. The summary interval is the period of time over which the rule is applied. This pull-down menu always contains the option to select **raw**. This displays the data in raw format, which is performance data in its most detailed format (not summarized).

Note When raw is selected, the Bar Chart view is not available and the Summary Rule option is grayed out.

Step 8 From the Rule pull-down menu, select the summary rule to be used. This gives you the option to summarize data to a lower granularity as follows:

- Total—Totals all values gathered in the summary period
- Average—Takes the average of all values gathered in the summary period
- Min—Presents the lowest value received over the summary period
- Max—Presents the highest value received over the summary period
- Logical OR—Displays either 1 or 0. This is typically used for status flags. Some attributes may have only two potential values (such as, true or false; yes or no; 1 or 0). When summaries are generated from values such as these, and the logical OR rule is used, the summarized value is 1 if any value in the summary interval is 1. If all values in the summary interval are 0, then the summarized value is 0.

Note The Summary Rule option is not available when the option to view raw data is selected.

Note The default summary rule is one day (24 hours).

Step 9 Click **Refresh**.

Note The Refresh button is blue when it is available for selection. It is grayed out when not available. The Refresh button is available for selection when Now is selected, or when any criteria has changed and you have moved the cursor away from the changed value by clicking the **Tab** key or by using the mouse.

Note SNMP data (that is, data collected from the Cisco SLT and LAN switch) is refreshed in near real-time. When data is collected from the active Cisco MGC host, you can manually collect and display the current performance data by clicking **Refresh**. Refresh simply refreshes the Data view to display the latest data collected during polling. To update the data, you must start polling again.

By default, a line chart of the performance information, to date, is displayed. You can view performance information in the following formats:

- Line Chart, refer to Figure 7-15
- Table Display, refer to Figure 7-16

The performance information displayed corresponds to the attributes' raw values. If a summary period is selected, the information is displayed according to the Summary Rule. No summary period is associated with raw data.

Note In some circumstances, an object may fail to be polled. All missed polls are indicated on graphs and charts by yellow points that show the last valid value collected. A missed poll affects the summary data, and the data should not be relied upon.

CMNM graphs and charts also indicate when an attribute started and stopped being polled due to history storage criteria being added, edited, or removed. Start and end polling events are shown in charts and tables:

- The start polling events point is shown in green.
- The end polling events point is shown in red.

Note A Polling Events key is displayed.

Figure 7-15 Sample Line Chart Screen

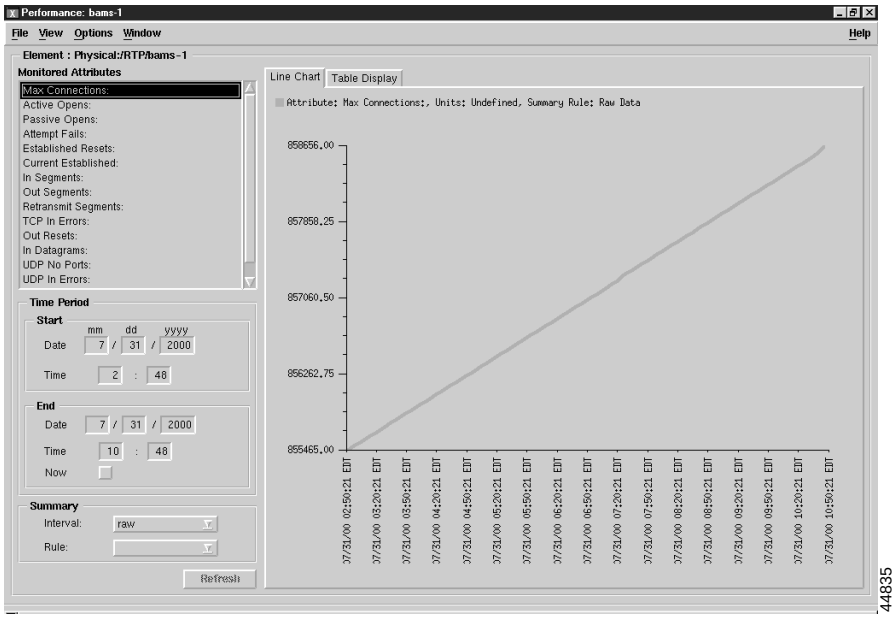
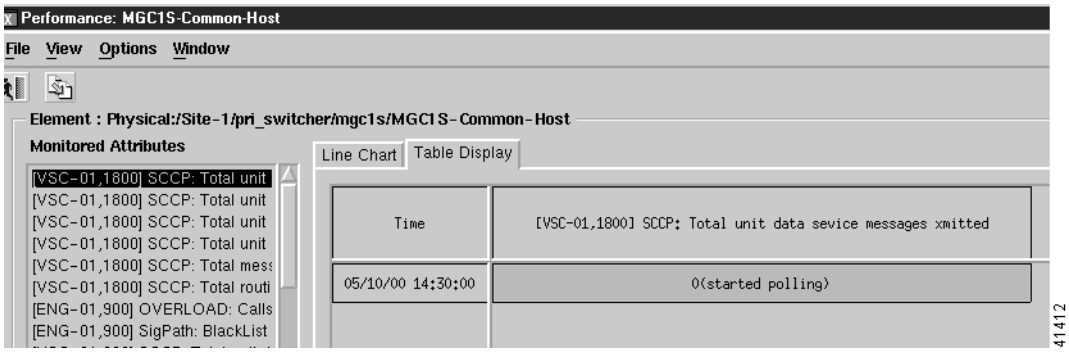


Figure 7-16 Sample Table Display Screen



Viewing Raw Data

You can view raw data as it is received without any summarization. History storage criteria define which attributes are to be monitored on specified objects. When these objects are polled, the retrieved data is stored by CEMF and can be viewed using the Performance Manager. This data is raw data. History storage criteria may also optionally specify summary intervals and rules to be applied to the raw data. The resultant data is summarized data.

Note The Summary Rule option and the Bar Chart view are not available when the option to view raw data is chosen.

Step 1 Launch the Performance Manager.

Step 2 Choose the desired attributes and set the dates and times, as described in the "Viewing Performance Data" section on page 7-23.

Step 3 From the Summary Interval pull-down menu, select **raw**.

Step 4 Click **Refresh**.

The new performance information displayed corresponds to the attributes value returned during the raw period.

Note The Refresh button is blue when it is available for selection. It is grayed out when not available. The Refresh button is available for selection when Now is selected or when any criteria has changed and you have moved the cursor away from the changed value by pressing the **Tab** key or by using the mouse.

Viewing a Chart

You can zoom in, zoom out, and move around the displayed charts by using the keys and mouse buttons described in Table 7-19. Note that you must select a chart before invoking these actions.

Table 7-19 Chart Viewing Actions

Press	Action
Shift and left mouse button	To select multiple attributes in a list.
Up arrow key	Scrolls up the Table display.
Down arrow key	Scrolls down the Table display.
Left mouse button	Clicking and dragging with the left mouse button over an area zooms in on that section of the chart. You cannot zoom in on a chart that has a scroll bar.
Middle mouse button	Takes the view back one zoom level after zooming in using the left mouse button.

Viewing Points and Values on a Line Chart

You can choose to annotate a line chart with color-coded points that represent the polling status. You can also show the values associated with each point.

Step 1 From the View menu, select **Points**. This annotates the line chart with points, which visually indicate the points that are presented in tabular form in the Table Display. A point is colored-coded to show polling status as follows:

- Black—Poll
- Red—Stopped polling
- Green—Started polling
- Yellow—Missed poll

Step 2 From the View menu, select **Values**. This option shows the values associated with each point, which are presented in tabular form in the Table Display.

The values are shown on each chart until the item is deselected in the View menu.

Viewing a Performance Log

Performance data is saved in a log. To view data from past pollings:

Step 1 Using the instructions in the "Viewing Performance Data" section on page 7-23, select the following to define the data you want to view:

- Start time and date
- End time and date (select **Now** for current data)
- Summary interval
- Summary rule

Step 2 Click **Refresh**.

Setting How Performance Data Is Archived

CMNM allows you to specify how long performance data should be kept in the database. You can also specify roll-up rules and other actions that should be taken on performance data after a set length of time.

CEMF manages a database of performance data values, and ensures the database does not grow indefinitely. This is achieved by purging data that is deemed to be old. Several rules are used to determine what data should be purged based on the concept of samples. A sample is either a collection of raw data, or a collection of data that has been summarized using one summary rule for one summary interval.

The attributeHistoryServer.ini file, described in Table 7-20, controls the behavior of the performance purging mechanism:

minValueCount = 50
maxValueCount = 1000
minRawDataAge = 60

Table 7-20 attributeHistoryServer.ini file Attributes

Parameter	Description
minValueCount	Specifies the minimum number of values to be kept for each sample. Data is never removed from a sample if doing so would result in that sample having fewer than this number of values. This value is set to 50 on a standard CEMF installation.
minRawDataAge	Specifies the minimum age of raw data (in seconds) that must be kept. Raw data younger than this age is never removed. This value is set to 60 on a standard CEMF installation. For example, if the system has just received 100 changes to an attribute in the 40 seconds preceding a purge, then the last 100 values would be kept and not just the last 50.
maxValueCount	Specifies the maximum number of values to be kept for each sample. Whenever this number of values is reached for a sample, values are removed until either of the first two settings would be breached if any more were removed. This value is set to 1000 on a standard CEMF installation.

In some cases, these three settings may conflict with history-storage-criteria summary intervals. For example, if the history storage criteria specifies that only daily summaries are to be generated, but the purging criteria specify that one full day's worth of raw data is never available, then the daily summaries could not be generated if the purge settings were followed. In such cases, data is not purged until summaries that depend on that data have been generated.

These values can be modified using the historyAdmin utility. However these values have a significant effect on database size and performance. As such, care must be taken when changing these parameters, because the settings have a direct association with overall disk requirements.

Note For information on configuring how alarms are stored and deleted, see the"Setting How Long Alarms Are Stored" section on page 8-49.

Exporting Performance Data

CEMF has an exporting facility that lets you write performance data to an ASCII file. Using the historyAdmin export command, the northbound system can generate files that contain the performance data for an object during a selected interval.

Note CMNM does not provide any CORBA or GUI interface to the CEMF history export facilities. You must manually perform the export (using the command **/opt/cemf/bin/historyAdmin export *filename***), or the northbound system must perform it using Telnet or another facility.

The data is exported in the following format:

```
Object:<object path>
Object class:<object path>
Attribute: <attribute name>
Summary rule:<rule>
Summary interval: Raw | <summary interval>
<date> <time> <valueType> <value>
<date> <time> <valueType> <value>
...
Data exported: <current date/time>
```

For example, a sample file looks like:

```
> historyAdmin export dumpFile TAB 10 all criteria1
Object: exampleView:/site_1/bay_1/agent_1/rack_1/linecard_2/port_2
Object Class: testPort
Attribute: LocalDB:TEST.dtIndex1
Summary interval: Raw
09 Jun 1999 11:50:03 Polled 10
09 Jun 1999 11:50:23 Polled 10
09 Jun 1999 11:50:43 Polled 15
09 Jun 1999 11:51:03 Missed <no value>
09 Jun 1999 11:51:23 Polled 20
09 Jun 1999 11:51:43 Polled 20
09 Jun 1999 11:52:03 Polled 0
09 Jun 1999 11:52:23 Polled 5
09 Jun 1999 11:52:43 Polled 0
09 Jun 1999 11:53:03 Polled 10
Data exported: Sun Jun 27 17:17:35 1999
```

Printing a Performance File

You can print performance statistics from the Performance Manager, either as a chart or as a table. A chart prints out the information that can be seen in the window. A table prints out all of the performance statistics in a plain text format.

The output is printed by the default printer setup on your network.

Step 1 Open the Performance Manager and select the desired performance statistics.

Step 2 From the **File** menu, select **Print**. Choose either **As Chart** or **As Table**.