Implementing Performance Management

Performance management (PM) on the Cisco IOS XR Software provides a framework to perform these tasks:

- Collect and export PM statistics to a TFTP server for data storage and retrieval
- Monitor the system using extensible markup language (XML) queries
- Configure threshold conditions that generate system logging messages when a threshold condition is matched.

The PM system collects data that is useful for graphing or charting system resource utilization, for capacity planning, for traffic engineering, and for trend analysis.

Note   For more information about PM on the Cisco IOS XR Software and complete descriptions of the PM commands listed in this module, you can refer to the Related Documents, on page 38 section of this module.

Feature History for Implementing Performance Management

Release	Modification
Release 3.7.2	This feature was introduced.
Release 4.0.1	Support for **interface basic-counters** keyword was added. Configuring local disk dump for PM statistics collections and configuring instance filtering by regular-expression sections were added.

Prerequisites for Implementing Performance Management

Before implementing performance management in your network operations center (NOC), ensure that these prerequisites are met:

- You must install and activate the Package Installation Envelope (PIE) for the manageability software.

  For detailed information about optional PIE installation, refer to the *Cisco ASR 9000 Series Aggregation Services Router Getting Started Guide*.

- You must be in a user group associated with a task group that includes the proper task IDs. The command reference guides include the task IDs required for each command. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

- You must have connectivity with a TFTP server.

Information About Implementing Performance Management

PM Functional Overview

The Performance Management (PM) frameworks consists of two major components:

- PM statistics server
- PM statistics collectors

PM Statistics Server

The PM statistics server is the front end for statistic collections, entity instance monitoring collections, and threshold monitoring. All PM statistic collections and threshold conditions configured through the command-line interface (CLI) or through XML schemas are processed by the PM statistics server and distributed among the PM statistics collectors.

PM Statistics Collector

The PM statistics collector collects statistics from entity instances and stores that data in memory. The memory contents are checkpointed so that information is available across process restarts. In addition, the PM statistics collector is responsible for exporting operational data to the XML agent and to the TFTP server.

illustrates the relationship between the components that constitute the PM system.

Figure 1: PM Component Communications
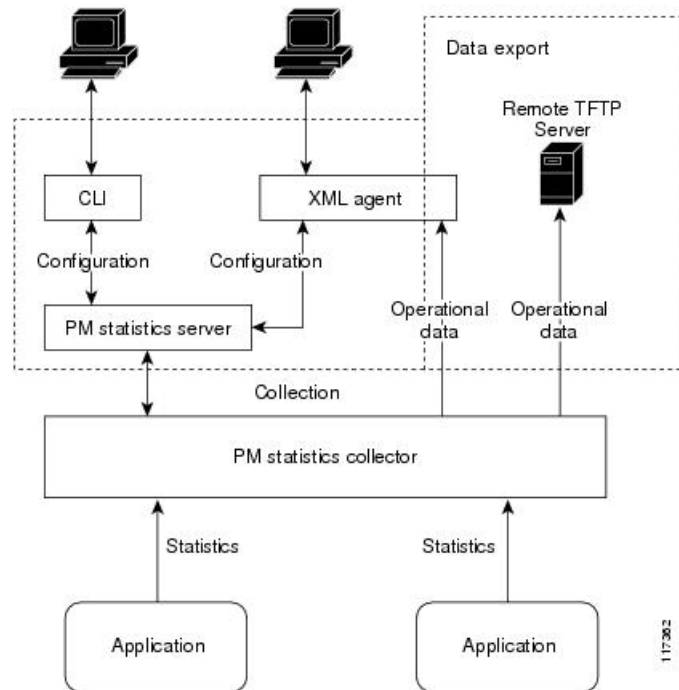
PM Benefits

The PM system provides these benefits:

- Configurable data collection policies

- Efficient transfer of statistical data in the binary format via TFTP

- Entity instance monitoring support

- Threshold monitoring support

- Data persistency across process restarts and processor failovers

PM Statistics Collection Overview

A PM statistics collection first gathers statistics from all the attributes associated with all the instances of an entity in the PM system. It then exports the statistical data in the binary file format to a TFTP server. For example, a Multiprotocol Label Switching (MPLS) Label Distribution Protocol (LDP) statistics collection gathers statistical data from all the attributes associated with all MPLS LDP sessions on the router.

This table lists the entities and the associated instances in the PM system.

Table 1: Entity Classes and Associated Instances

Entity Classes	Instance
BGP	Neighbors or Peers
Interface Basic Counters	Interfaces
Interface Data Rates	Interfaces
Interface Generic Counters	Interfaces
MPLS LDP	LDP Sessions
Node CPU	Nodes
Node Memory	Nodes
Node Process	Processes
OSPFv2	Processes
OSPFv3	Processes

Note For a list of all attributes associated with the entities that constitute the PM system, see Table 9: Attributes and Values, on page 17.

Note Based on the interface type, the interface either supports the interface generic counters or the interface basic counters. The interfaces that support the interface basic counters do not support the interface data rates.

PM Statistics Collection Templates

PM statistics collections are configured through PM statistics collection templates. A PM statistics collection template contains the entity, the sample interval, and the number of sampling operations to be performed before exporting the data a TFTP server. When a PM statistics collection template is enabled, the PM statistics collection gathers statistics for all attributes from all instances associated with the entity configured in the template.

Guidelines for Creating PM Statistics Collection Templates

When creating PM statistics collection templates, follow these guidelines:

- Use the **performance-mgmt statistics** command to create a PM statistics collection template.

- You can define multiple templates for any given entity; however, only one PM statistics collection template for a given entity can be enabled at a time.

- When configuring a template, you must name the template. You can designate the template for the entity as the default template using the **default** keyword or name the template with the **template** keyword and *template-name* argument. The default template contains the following default settings:

    - A sample interval of 10 minutes.

    - A sample size of five sampling operations.

- Configure the settings for the sample interval and sample size in the template.

    - The sample interval sets the frequency of the sampling operations performed during the sampling cycle. You can configure the sample interval with the **sample-interval** keyword and *minutes* argument. The range is from 1 to 60 minutes. The default is 10 minutes.

    - The sample size sets the number of sampling operations to be performed before exporting the data to the TFTP server. You can configure the sample size with the **sample-size** keyword and *minutes* argument. The range is from 1 to 60 samples. The default is five samples.

- The export cycle determines how often PM statistics collection data is exported to the TFTP server. The export cycle can be calculated by multiplying the sample interval and sample size (sample interval x sample size = export cycle). For example, suppose that the sample interval is set at a frequency of 10 minutes, and the sample size is set to five sampling operations. Given that, a total of five sampling operations would be performed at a frequency of one sampling operation every 10 minutes. This cycle is referred to as the sampling cycle. A binary file containing the data collected from those samples would be exported to the TFTP server once every 50 (5 x 10) minutes. This cycle is referred to as the export cycle.

⚠
Caution   Specifying a small sample interval increases CPU utilization, whereas specifying a large sample size increases memory utilization. The sample size and sample interval, therefore, may need to be adjusted to prevent system overload.

Guidelines for Enabling and Disabling PM Statistics Collection Templates

When enabling PM statistics collection templates, follow these guidelines:

- Use the **performance-mgmt apply statistics** command to enable a PM statistics collection template.

- Only one PM statistics collection template for a given entity can be enabled at a time.

✎
Note   Data collection will begin one sampling cycle after you enable the PM statistics collection template with the **performance-mgmt enable statistics** command.

- Once a template has been enabled, the sampling and export cycles continue until the template is disabled with the **no** form of the **performance-mgmt apply statistics** command.

- You must specify either a location with the **location** keyword and *node-id* argument or the **location all** keywords when enabling or disabling a PM statistic collections for the following entities:

    - Node CPU

> • Node memory
>
> • Node process

The **location** keyword with the *node-id* argument enables the PM statistic collections for the specified node. The *node-id* argument is expressed in the *rack/slot/module* notation. The **location all** keywords enable the PM statistic collections for all nodes.

> • Because only one PM statistics collection can be enabled for any given entity at any given time, you are not required to specify the template name with the **default** keyword or **template** keyword and *template-name* argument when disabling a PM statistics collection.

Exporting Statistics Data

The current PM supports exporting of data onto the following:

> • **performance-mgmt resource tftp-server** *ip-address* **directory** *directory-name*
>
> • **performance-mgmt resource dump local**

You can dump PM statistics collections onto local filesystem, for example, /disk0: or /harddisk:. By default, this location is not configured but PM automatically selects the location on the local filesystem. Or, you can also configure a TFTP server for PM statistics collections and export the statistics data on the remote location.

Note Both the local and TFTP destinations are mutually exclusive and you can configure either one of them at a given time.

Binary File Format

This sample describes the binary file format:

```
Version : 4 Bytes
NoOf Entities : 1 Byte  (e.g. . 4 )
Entity Identifier       : 1 Byte  (e.g NODE=1,Interface=2,BGP=3)
Options                 :2 Bytes
NoOf SubEntities          :1 Byte  (2)
SubEntity Identifier    :1 Byte  (e.g BGP-PEERS )
Time Stamp 4 Bytes (Reference Time : Start Ref Time)
No Of Instances    :2 Byte  (e.g 100)
                 Key Instance   :Variable
                    NoOfSamples: 1 Byte (e.g 10 Samples)
                         SampleNo : 1 Byte (e.g Sample No 1)
Time Stamp 4 Bytes (Sample Time)
                         StatCounterName :1 Byte (PeerSessionsEst=1)
                         StatCounterValue :8 Bytes ( for all counters)
                         Repeat for Each StatCounterName
                    Repeat for Each Sample No(Time Interval)
             Repeat for All Instances
        Repeat for All SubTypes
Repeat for All Entities
```

Binary File ID Assignments for Entity, Subentity, and StatsCounter Names

This table describes the assignment of various values and keys which is present in the binary file.

Table 2: Binary Format Values and Keys

Entity	Subentity	Key	StatsCounters
Node (1)	CPU (1)	CPU Key <Node ID>	See Table 3: Supported StatsCounters for Entities and Subentites, on page 8
	Memory (2)	Memory Key <Node ID>	
	Process (3)	Node Process Key <NodeProcessID>	
Interface (2)	Generic Counters (1)	Generic Counters Key <ifName>	
	Data Rate Counters (2)	Data Rate Counters Key <ifName>	
	Basic Counters (3)	Basic Counters Key <ifName>	
BGP (3)	Peer (1)	Peer Key <IpAddress>	
MPLS (4)	Reserved (1)	—	
	Reserved (2)	—	
	LDP (4)	LDP Session Key <IpAddress>	
OSPF (5)	v2protocol (1)	Instance <process_instance>	
	v3protocol (2)	Instance <process_instance	

Note <ifName>—The length is variable. The first two bytes contain the size of the Instance ID; this is followed by the Instance ID string (that is, an Interface name).

<IpAddress>—4 bytes that contain the IP address.

<NodeProcessID>—64-bit Instance ID. The first 32 bits contain the node ID, and the second 32 bits contain the process ID.

<NodeID>—32-bit instance ID that contains the Node ID.

<process_instance>—The length is variable. The first two bytes contain the size of Instance ID followed by Instance ID string (that is, a process name).

Note The numbers in parenthesis (the numbers that are associated with each entity and subentity in Table 2: Binary Format Values and Keys, on page 7) denote the entity and subEntity IDs that are displayed in the TFTP File.

> **Note** Only Cisco IOS XR 32-bit platforms support the StatsCounter **AverageCPUUsed**

This table describes the supported statistics counters that are collected in the binary file for entities and subentities.

Table 3: Supported StatsCounters for Entities and Subentites

Entity	Subentity	StatsCounters
Node (1)	CPU (1)	AverageCPUUsed, NoProcesses
	Memory (2)	CurrMemory, PeakMemory
	Process (3)	PeakMemory, AverageCPUUsed, NoThreads
Interface (2)	Generic Counters (1)	InPackets, InOctets, OutPackets, OutOctets, InUcastPkts, InMulticastPkts, InBroadcastPkts, OutUcastPkts, OutMulticastPkts, OutBroadcastPkts, OutputTotalDrops, InputTotalDrops, InputQueueDrops, InputUnknownProto, OutputTotalErrors, OutputUnderrun, InputTotalErrors, InputCRC,InputOverrun, InputFrame
	Data Rate Counters (2)	InputDataRate, InputPacketRate, OutputDataRate, OutputPacketRate, InputPeakRate, InputPeakPkts, OutputPeakRate, OutputPeakPkts, Bandwidth
	Basic Counters (3)	InPackets, InOctets, OutPackets, OutOctets, InputTotalDrops, InputQueueDrops, InputTotalErrors, OutputTotalErrors, OutputQueueDrops, OutputTotalErrors
BGP (3)	Peer (1)	InputMessages, OutputMessages, InputUpdateMessages, OutputUpdateMessages, ConnEstablished, ConnDropped, ErrorsReceived, ErrorsSent
MPLS (4)	LDP (4)	TotalMsgsSent, TotalMsgsRcvd, InitMsgsSent, InitMsgsRcvd, AddressMsgsSent, AddressMsgsRcvd, AddressWithdrawMsgsSent, AddressWithdrawMsgsRcvd, LabelMappingMsgsSent, LabelMappingMsgsRcvd, LabelWithdrawMsgsSent, LabelWithdrawMsgsRcvd, LabelReleaseMsgsSent, LabelReleaseMsgsRcvd, NotificationMsgsSent, NotificationMsgsRcvd KeepAliveMsgsSent, KeepAliveMsgsRcvd
OSPF (5)	v2protocol (1)	InputPackets, OutputPackets, InputHelloPackets, OutputHelloPackets, InputDBDs, InputDBDsLSA, OutputDBDs, OutputDBDsLSA, InputLSRequests, InputLSRequestsLSA, OutputLSRequests, OutputLSRequestsLSA, InputLSAUpdates, InputLSAUpdatesLSA, OutputLSAUpdates, OutputLSAUpdatesLSA, InputLSAAcks, InputLSAAcksLSA, OutputLSAAcks, OutputLSAAcksLSA, ChecksumErrors

Entity	Subentity	StatsCounters
	v3protocol (2)	InputPackets, OutputPackets, InputHelloPackets, OutputHelloPackets, InputDBDs, InputDBDsLSA, OutputDBDs, OutputDBDsLSA, InputLSRequests, InputLSRequestsLSA, OutputLSRequests, OutputLSRequestsLSA, InputLSAUpdates, InputLSAUpdatesLSA, OutputLSAUpdates, OutputLSAUpdatesLSA, InputLSAAcks, InputLSAAcksLSA, OutputLSAAcks, OutputLSAAcksLSA

Filenaming Convention Applied to Binary Files

These filenaming convention is applied to PM statistics collections that are sent to the directory location configured on the TFTP server:

<LR_NAME>_<EntityName>_<SubentityName>_<TimeStamp>

PM Entity Instance Monitoring Overview

Entity instance monitoring gathers statistics from attributes associated with a specific entity instance. When an entity instance is enabled for monitoring, the PM system gathers statistics from only attributes associated with the specified entity instance. The PM system uses the sampling cycle that is configured in the PM statistics collection template for the entity being monitored. Entity instance monitoring, however, is a separate process from that of the PM statistics collection; therefore, it does not interfere with PM statistics collection. Furthermore, the data from entity instance monitoring collection is independent of PM statistics collection. Unlike PM statistics collection, the data from entity instance monitoring is not exported to the TFTP server.

Note The data from entity instance monitoring can be retrieved through only a XML interface.

This table describes the command used to enable entity instance monitoring for the BGP entity instance.

Table 4: BGP Entity Instance Monitoring

Entity	Command Description
BGP	Use the **performance-mgmt apply monitor bgp** command in global configuration mode to enable entity instance monitoring for a BGP entity instance.
	Syntax:
| | ```
performance-mgmt
    apply monitor
    bgp
    ip-address
    template-name | default}
RP/0/RSP0/CPU0:router(config)# performance-mgmt apply monitor
bgp 10.12.0.4 default
``` |

This table describes the commands used to enable entity instance monitoring for the interface entity instances.

Table 5: Interface Entity Instance Monitoring

Entity	Command Descriptions
Interface Data Rates	Use the **performance-mgmt apply monitor data-rates** command in global configuration mode to enable entity instance monitoring for an interface data rates entity instance. **Syntax:** **performance-mgmt** **apply** **monitor** **interface** **data-rates** *type* *interface-path-id* {*template-name* | **default**} RP/0/RSP0/CPU0:router(config)# performance-mgmt apply monitor interface data-rates gigabitethernet 0/2/0/0 default
Interface Basic Counters	Use the **performance-mgmt apply monitor interface basic-counters** command in global configuration mode to enable entity instance monitoring for an interface basic counters entity instance. **Syntax:** **performance-mgmt** **apply** **monitor** **interface** **basic-counters** *type* *interface-path-id* {*template-name* | **default**} RP/0/RSP0/CPU0:router(config)# performance-mgmt apply monitor interface basic-counters gigabitethernet 0/2/0/0 default

Entity	Command Descriptions

Interface Generic Counters	Use the **performance-mgmt apply monitor interface generic-counters** command in global configuration mode to enable entity instance monitoring for an interface generic counters entity instance.
	
	Syntax:
	
	```performance-mgmt\n apply\n monitor\n interface\n generic-counters\n type\n interface-path-id {template-name |\n default}```
	`RP/0/RSP0/CPU0:router(config)# performance-mgmt apply monitor interface generic-counters gigabitethernet 0/2/0/0 default`

This table describes the command used to enable entity instance monitoring for the MPLS entity instances.

Table 6: MPLS Entity Instance Monitoring

Entity	Command Descriptions

MPLS LDP	Use the **performance-mgmt apply monitor mpls ldp** command in global configuration mode to enable entity instance monitoring for an MPLS LDP entity instance.
	
	Syntax:
	
	```performance-mgmt\n apply monitor\n mpls\n ldp\n ip-address {template-name |\n default}```
	`RP/0/RSP0/CPU0:router(config)# performance-mgmt apply monitor mpls ldp 10.34.64.154 default`

This table describes the commands used to enable entity instance monitoring for the Node entity instances.

Table 7: Node Entity Instance Monitoring

Entity	Command Descriptions
Node CPU	Use the **performance-mgmt apply monitor node cpu** command in global configuration mode to enable entity instance monitoring for a node CPU entity instance. **Syntax:** ```performance-mgmt apply monitor node cpu location node-id {template-name | default}``` RP/0/RSP0/CPU0:router(config)# performance-mgmt apply monitor node cpu location 0/RP1/CPU0 default
Node Memory	Use the **performance-mgmt apply monitor node memory** command in global configuration mode to enable an entity instance monitoring for a node memory entity instance. **Syntax:** ```performance-mgmt apply monitor node memory location node-id {template-name | default}``` RP/0/RSP0/CPU0:router(config)# performance-mgmt apply monitor node memory location 0/RP1/CPU0 default
Node Process	Use the **performance-mgmt apply monitor node process** command in global configuration mode to enable an entity instance monitoring collection for a node process entity instance. **Syntax:** ```performance-mgmt apply monitor node process location node-id pid {template-name | default}``` RP/0/RSP0/CPU0:router(config)# performance-mgmt apply monitor node process location p 0/RP1/CPU0 275 default

PM Threshold Monitoring Overview

The PM system supports the configuration of threshold conditions to monitor an attribute (or attributes) for threshold violations. Threshold conditions are configured through PM threshold monitoring templates. When a PM threshold template is enabled, the PM system monitors all instances of the attribute (or attributes) for the threshold condition configured in the template. If at end of the sample interval a threshold condition is matched, the PM system generates a system logging message for each instance that matches the threshold condition.

Guidelines for Creating PM Threshold Monitoring Templates

When creating a PM threshold template, follow these guidelines:

- Use the **performance-mgmt thresholds** command to create a PM threshold template.

- Specify entity for the *entity* argument.

- You can define multiple PM thresholds templates for an entity; however, note that at a time only one PM threshold template can be enabled.

- Specify a name for an entity's template when you configure it. You can designate the template as the default template using the **default** keyword, or you can name the template with the **template** keyword and *template-name* argument. The default setting for the default template is a sample interval of 10 minutes.

- Specify the attribute associated with the entity to be monitored for threshold violations, for the *attribute* argument.

Note For a list of the attributes associated with each entity, refer to Table 9: Attributes and Values, on page 17.

- Configure the sample interval for PM threshold monitoring with the **sample-interval** keyword and *interval* argument. The sample interval sets the frequency (in minutes) that the PM system waits before determining if any instances of the attribute match the threshold condition.

- Specify the threshold condition for the attribute (or attributes) that are to be monitored. A threshold condition consists of an attribute, an operation, and the threshold value. The threshold condition applies to all instances of the attribute.

Note A PM threshold template may contain multiple threshold conditions. You must define each threshold condition that is to be monitored and apply it to the specified template with the **performance-mgmt thresholds** command.

- Specify the operation to be performed in the threshold condition. The supported operations are as follows:

  - **EQ** —Equal to

  - **GE** —Greater than or equal to

  - **GT** —Greater than

- **LE** —Less than or equal to

- **LT** —Less than

- **NE** —Not equal to

- **RG** —Not in range

- Specify a value for the *value* argument. If you express the *value* argument, the PM system considers the threshold condition absolute, and after each sample interval determines whether any instance of the attribute matches the threshold condition. If you specify the *not in range* operation with the **RG** keyword, you must supply a pair of values that specify the range.

- If you specify the optional **percent** keyword, the *value* argument must be expressed as a percentage from 0 to 100. If you express the value as a percentage with the *value* argument and **percent** keyword, the threshold condition compares the value with the difference between the current and previous sample for each instance of attribute as a percentage.

- You can also specify the optional **rearm toggle** keywords or the optional **rearm window** keywords and *window-size* argument:

  - **rearm toggle**— Suppresses system logging messages for an instance of an attribute when an instance of the attribute matches the threshold condition. System logging messages for that instance of the attribute are suppressed in successive sample intervals until that instance of the attribute does not match the threshold condition.

  - **rearm window** *window-size*—Suppresses system logging messages for the number of intervals specified for the *window-size* argument when an instance of attribute matches the threshold condition.

Note For more information about how the PM system determines whether a threshold condition is met, refer to Table 8: How the PM System Determines if a Threshold Condition Is Met, on page 15.

This table describes how the PM system determines whether a threshold condition is met.

Table 8: How the PM System Determines if a Threshold Condition Is Met

If the threshold condition is composed of...	Then...
...an attribute, an operation, and a specific value,	The threshold condition is absolute because the PM system determines whether any instance of the attribute exactly matches the threshold condition after each sample interval elapses. • For example, suppose that a threshold condition for an entity is configured to check whether an attribute for an instance is greater than 2000. After the sample interval elapses, the PM system, accordingly, determines whether any instance of the attribute matches the condition. • The PM system generates a system logging message for each instance of the attribute that matches the threshold condition after the sample interval elapses. • If no instances of the attribute match the threshold condition, system logging messages are not generated for that sample interval.
...an attribute, an operation, and a value expressed as a percentage,	The threshold condition is relative because the threshold value that is used for comparison is taken as a percentage of the previous sample. • For example, suppose that a threshold condition for an entity is configured to check whether an attribute for an instance increases by more than 50 percent of the threshold value in the previous sample. Now, suppose that after the sample interval elapses, the value of an instance of the attribute is 250. Because the threshold condition is configured to generate a system logging message when any instance of the attribute is greater than 50 percent of the previous threshold value, the PM system would check to see whether that particular instance of the attribute is greater than 375 (250 + 125 [50 percent of 250]) in the following sample interval. **Note** The PM system matches the threshold condition against all instances of the attribute; therefore, the threshold value for this type of threshold condition is relative to the value of each instance of the attribute. • The PM system generates a system logging message for each instance of the attribute that matches the threshold condition after the sample interval elapses. • If no instances of the attribute match the threshold condition, system logging messages are not generated for that sample interval.

If the threshold condition is composed of...	Then...
...an attribute, an operation, a specific value, and the **rearm toggle** keywords...	The threshold condition is modified such that if an instance of an attribute matches the threshold condition, a system logging message is generated for that instance of the attribute, after the sample interval elapses. However, if the same instance of the attribute matches the threshold condition in successive sample intervals following the initial match, system logging messages for that instance of the attribute are suppressed until the instance does not match the threshold condition for a sample interval.
...an attribute, an operation, a specific value, and the **rearm window** keywords and *window-size* argument...	The threshold condition is modified such that if an instance of an attribute matches the threshold condition, a system logging message is generated. However, once an instance of the attribute matches the threshold condition, system logging messages for that instance of the attribute are suppressed for the number of intervals specified with the *window-size* argument.

Note Only Cisco IOS XR 32-bit platforms support the StatsCounter **AverageCPUUsed**

This table describes the attributes and value ranges associated with each attribute for all the entities that constitute the PM system.

Table 9: Attributes and Values

Entity	Attributes	Description	Values
bgp	ConnDropped	Number of times the connection was dropped.	Range is from 0 to 4294967295.
	ConnEstablished	Number of times the connection was established.	Range is from 0 to 4294967295.
	ErrorsReceived	Number of error notifications received on the connection.	Range is from 0 to 4294967295.
	ErrorsSent	Number of error notifications sent on the connection.	Range is from 0 to 4294967295.
	InputMessages	Number of messages received.	Range is from 0 to 4294967295.
	InputUpdateMessages	Number of update messages received.	Range is from 0 to 4294967295.
	OutputMessages	Number of messages sent.	Range is from 0 to 4294967295.
	OutputUpdateMessages	Number of update messages sent.	Range is from 0 to 4294967295.

Entity	Attributes	Description	Values
interface data-rates	Bandwidth	Bandwidth in kbps.	Range is from 0 to 4294967295.
	InputDataRate	Input data rate in kbps.	Range is from 0 to 4294967295.
	InputPacketRate	Input packets per second.	Range is from 0 to 4294967295.
	InputPeakRate	Peak input data rate.	Range is from 0 to 4294967295.
	InputPeakPkts	Peak input packet rate.	Range is from 0 to 4294967295.
	OutputDataRate	Output data rate in kbps.	Range is from 0 to 4294967295.
	OutputPacketRate	Output packets per second.	Range is from 0 to 4294967295.
	OutputPeakPkts	Peak output packet rate.	Range is from 0 to 4294967295.
	OutputPeakRate	Peak output data rate.	Range is from 0 to 4294967295.
interface basic-counters	InPackets	Packets received.	Range is from 0 to 4294967295.
	InOctets	Bytes received.	Range is from 0 to 4294967295.
	OutPackets	Packets sent.	Range is from 0 to 4294967295.
	OutOctets	Bytes sent.	Range is from 0 to 4294967295.
	InputTotalDrops	Inbound correct packets discarded.	Range is from 0 to 4294967295.
	InputQueueDrops	Input queue drops.	Range is from 0 to 4294967295.
	InputTotalErrors	Inbound incorrect packets discarded.	Range is from 0 to 4294967295.
	OutputTotalDrops	Outbound correct packets discarded.	Range is from 0 to 4294967295.

Entity	Attributes	Description	Values
	OutputQueueDrops	Output queue drops.	Range is from 0 to 4294967295.
	OutputTotalErrors	Outbound incorrect packets discarded.	Range is from 0 to 4294967295.

Entity	Attributes	Description	Values
interface generic-counters	InBroadcastPkts	Broadcast packets received.	Range is from 0 to 4294967295.
	InMulticastPkts	Multicast packets received.	Range is from 0 to 4294967295.
	InOctets	Bytes received.	Range is from 0 to 4294967295.
	InPackets	Packets received.	Range is from 0 to 4294967295.
	InputCRC	Inbound packets discarded with incorrect CRC.	Range is from 0 to 4294967295.
	InputFrame	Inbound framing errors.	Range is from 0 to 4294967295.
	InputOverrun	Input overruns.	Range is from 0 to 4294967295.
	InputQueueDrops	Input queue drops.	Range is from 0 to 4294967295.
	InputTotalDrops	Inbound correct packets discarded.	Range is from 0 to 4294967295.
	InputTotalErrors	Inbound incorrect packets discarded.	Range is from 0 to 4294967295.
	InUcastPkts	Unicast packets received.	Range is from 0 to 4294967295.
	InputUnknownProto	Inbound packets discarded with unknown protocol.	Range is from 0 to 4294967295.
	OutBroadcastPkts	Broadcast packets sent.	Range is from 0 to 4294967295.
	OutMulticastPkts	Multicast packets sent.	Range is from 0 to 4294967295.
	OutOctets	Bytes sent.	Range is from 0 to 4294967295.
	OutPackets	Packets sent.	Range is from 0 to 4294967295.
	OutputTotalDrops	Outbound correct packets discarded.	Range is from 0 to 4294967295.
	OutputTotalErrors	Outbound incorrect packets discarded.	Range is from 0 to 4294967295.

Entity	Attributes	Description	Values
	OutUcastPkts	Unicast packets sent.	Range is from 0 to 4294967295.
	OutputUnderrun	Output underruns.	Range is from 0 to 4294967295.

Entity	Attributes	Description	Values
mpls ldp	AddressMsgsRcvd	Address messages received.	Range is from 0 to 4294967295.
	AddressMsgsSent	Address messages sent.	Range is from 0 to 4294967295.
	AddressWithdrawMsgsRcd	Address withdraw messages received.	Range is from 0 to 4294967295.
	AddressWithdrawMsgsSent	Address withdraw messages sent.	Range is from 0 to 4294967295.
	InitMsgsSent	Initial messages sent.	Range is from 0 to 4294967295.
	InitMsgsRcvd	Initial messages received.	Range is from 0 to 4294967295.
	KeepaliveMsgsRcvd	Keepalive messages received.	Range is from 0 to 4294967295.
	KeepaliveMsgsSent	Keepalive messages sent.	Range is from 0 to 4294967295.
	LabelMappingMsgsRcvd	Label mapping messages received.	Range is from 0 to 4294967295.
	LabelMappingMsgsSent	Label mapping messages sent.	Range is from 0 to 4294967295.
	LabelReleaseMsgsRcvd	Label release messages received.	Range is from 0 to 4294967295.
	LabelReleaseMsgsSent	Label release messages sent.	Range is from 0 to 4294967295.
	LabelWithdrawMsgsRcvd	Label withdraw messages received.	Range is from 0 to 4294967295.
	LabelWithdrawMsgsSent	Label withdraw messages sent.	Range is from 0 to 4294967295.
	NotificationMsgsRcvd	Notification messages received.	Range is from 0 to 4294967295.
	NotificationMsgsSent	Notification messages sent.	Range is from 0 to 4294967295.
	TotalMsgsRcvd	Total messages received.	Range is from 0 to 4294967295.
	TotalMsgsSent	Total messages sent.	Range is from 0 to 4294967295.

Entity	Attributes	Description	Values
node cpu	AverageCPUUsed	Average percent CPU utilization.	Range is a percentage from 0 to 100.
node cpu	NoProcesses	Number of processes.	Range is from 0 to 4294967295.
node memory	CurrMemory	Current application memory (in bytes) in use.	Range is from 0 to 4294967295.
	PeakMemory	Maximum system memory (in MB) used since bootup.	Range is from 0 to 4194304.
node process	AverageCPUUsed	Average percent CPU utilization.	Range is a percentage from 0 to 100.
node process	NoThreads	Number of threads.	Range is from 0 to 4294967295.
	PeakMemory	Maximum dynamic memory (in KB) used since startup time.	Range is from 0 to 4194304.
ospf v2protocol	InputPackets	Total number of packets received.	Range is from 0 to 4294967295.
	OutputPackets	Total number of packets sent.	Range is from 0 to 4294967295.
	InputHelloPackets	Number of Hello packets received.	Range is from 0 to 4294967295.
	OutputHelloPackets	Number of Hello packets sent.	Range is from 0 to 4294967295.
	InputDBDs	Number of DBD packets received.	Range is from 0 to 4294967295.
	InputDBDsLSA	Number of LSA received in DBD packets.	Range is from 0 to 4294967295.
	OutputDBDs	Number of DBD packets sent.	Range is from 0 to 4294967295.
	OutputDBDsLSA	Number of LSA sent in DBD packets.	Range is from 0 to 4294967295.
	InputLSRequests	Number of LS requests received.	Range is from 0 to 4294967295.
	InputLSRequestsLSA	Number of LSA received in LS requests.	Range is from 0 to 4294967295.

Entity	Attributes	Description	Values
	OutputLSRequests	Number of LS requests sent.	Range is from 0 to 4294967295.
	OutputLSRequestsLSA	Number of LSA sent in LS requests.	Range is from 0 to 4294967295.
	InputLSAUpdates	Number of LSA updates received.	Range is from 0 to 4294967295.
	InputLSAUpdatesLSA	Number of LSA received in LSA updates.	Range is from 0 to 4294967295.
	OutputLSAUpdates	Number of LSA updates sent.	Range is from 0 to 4294967295.
	OutputLSAUpdatesLSA	Number of LSA sent in LSA updates.	Range is from 0 to 4294967295.
	InputLSAAcks	Number of LSA acknowledgements received.	Range is from 0 to 4294967295.
	InputLSAAcksLSA	Number of LSA received in LSA acknowledgements.	Range is from 0 to 4294967295.
	OutputLSAAcks	Number of LSA acknowledgements sent	Range is from 0 to 4294967295.
	OutputLSAAcksLSA	Number of LSA sent in LSA acknowledgements.	Range is from 0 to 4294967295.
	ChecksumErrors	Number of packets received with checksum errors.	Range is from 0 to 4294967295.
ospf v3protocol	InputPackets	Total number of packets received.	Range is from 0 to 4294967295.
	OutputPackets	Total number of packets sent.	Range is from 0 to 4294967295.
	InputHelloPackets	Number of Hello packets received.	Range is from 0 to 4294967295.
	OutputHelloPackets	Number of Hello packets sent.	Range is from 0 to 4294967295.
	InputDBDs	Number of DBD packets received.	Range is from 0 to 4294967295.
	InputDBDsLSA	Number of LSA received in DBD packets.	Range is from 0 to 4294967295.

Entity	Attributes	Description	Values
	OutputDBDs	Number of DBD packets sent.	Range is from 0 to 4294967295.
	OutputDBDsLSA	Number of LSA sent in DBD packets.	Range is from 0 to 4294967295.
	InputLSRequests	Number of LS requests received.	Range is from 0 to 4294967295.
	InputLSRequestsLSA	Number of LSA received in LS requests.	Range is from 0 to 4294967295.
	OutputLSRequests	Number of LS requests sent.	Range is from 0 to 4294967295.
	OutputLSRequestsLSA	Number of LSA sent in LS requests.	Range is from 0 to 4294967295.
	InputLSAUpdates	Number of LSA updates received.	Range is from 0 to 4294967295.
	InputLSRequestsLSA	Number of LSA received in LS requests.	Range is from 0 to 4294967295.
	OutputLSAUpdates	Number of LSA updates sent.	Range is from 0 to 4294967295.
	OutputLSAUpdatesLSA	Number of LSA sent in LSA updates.	Range is from 0 to 4294967295.
	InputLSAAcks	Number of LSA acknowledgements received.	Range is from 0 to 4294967295.
	InputLSAAcksLSA	Number of LSA received in LSA acknowledgements.	Range is from 0 to 4294967295.
	OutputLSAAcks	Number of LSA acknowledgements sent	Range is from 0 to 4294967295.
	OutputLSAAcksLSA	Number of LSA sent in LSA acknowledgements.	Range is from 0 to 4294967295.

Guidelines for Enabling and Disabling PM Threshold Monitoring Templates

When enabling PM threshold monitoring templates, follow these guidelines:

- Use the **performance-mgmt apply thresholds** command to enable a PM threshold monitoring template.

- Once a template has been enabled, the threshold monitoring continues until the template is disabled with the **no** form of the **performance-mgmt apply thresholds** command.

- Only one PM threshold template for an entity can be enabled at a time.

- You must specify either a location with the **location** keyword and *node-id* argument or with **location all** keywords when enabling or disabling a PM threshold monitoring template for these entities:

  - Node CPU

  - Node memory

  - Node process

  The **location** keyword and *node-id* argument enables or disables PM statistic collections for the specified node. The *node-id* argument is expressed in the *rack/slot/module* notation. The **location all** keywords enable or disable the PM statistic collections for all nodes.

- Because only one PM threshold monitoring template for an entity at any given time, you are not required to specify the template name with the **default** keyword or **template** keyword and *template-name* argument when disabling a PM statistics collection.

How to Implement Performance Management

Configuring an External TFTP Server for PM Statistic Collections

This task explains how to configure an external TFTP server for PM statistic collections.

Note Perform this task before enabling a PM statistics collection template for PM statistic collections. For more information about enabling a PM statistics collection templates, see the task.

Before you begin

You must have access to and connectivity with a TFTP server before performing this task.

SUMMARY STEPS

1. **configure**
2. **performance-mgmt resources tftp-server** *ip-address* **directory** *dir-name*
3. Use the **commit** or **end** command.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `RP/0/RSP0/CPU0:router# configure`	Enters global configuration mode.

	Command or Action	**Purpose**
Step 2	**performance-mgmt resources tftp-server** *ip-address* **directory** *dir-name* **Example:** `RP/0/RSP0/CPU0:router(config)# performance-mgmt resources tftp-server 10.3.40.161 directory mypmdata/datafiles`	Sets the IP address and the directory path for PM data collection. • Include the entire directory path name for the *dir-name* argument. **Note** Files copied to the TFTP server contain a timestamp in their name, which makes them unique. For that reason the TFTP server used should support creation of files as data is transferred, without requiring users to manually create them at the TFTP server host in advance.
Step 3	Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session. **end** —Prompts user to take one of these actions: • **Yes** — Saves configuration changes and exits the configuration session. • **No** —Exits the configuration session without committing the configuration changes. • **Cancel** —Remains in the configuration session, without committing the configuration changes.

Configuring Local Disk Dump for PM Statistics Collections

This task explains how to configure local disk or external TFTP server for PM statistic collections.

SUMMARY STEPS

1. **configure**
2. **performance-mgmt resources dump local**
3. Use the **commit** or **end** command.

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**configure** **Example:** `RP/0/RSP0/CPU0:router# configure`	Enters global configuration mode.
Step 2	**performance-mgmt resources dump local** **Example:**	Sets the local filesystem on which the statistics data is dumped.

	Command or Action	Purpose
	`RP/0/RSP0/CPU0:router(config)# performance-mgmt resources dump local`	**Note** You can also dump the statistics data on the TFTP server location. However, the configuration is rejected if you configure both local dump and TFTP server at the same time.
Step 3	Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session.
		end —Prompts user to take one of these actions:
		• **Yes** — Saves configuration changes and exits the configuration session.
		• **No** —Exits the configuration session without committing the configuration changes.
		• **Cancel** —Remains in the configuration session, without committing the configuration changes.

Configuring Instance Filtering by Regular-expression

This task explains how to apply a defined regular expression group to one or more statistics or threshold templates. You can also define a regular expression group that includes multiple regular expression indices.

The benefits of instance filtering using the regular expression group is:

- You can use the same regular expression group that can be applied to multiple templates.

- You can enhance flexibility by assigning the same index values.

- You can enhance the performance by applying regular expressions, which has OR conditions.

SUMMARY STEPS

1. **configure**
2. **performance-mgmt regular-expression** *regular-expression name*
3. **index** *index-number regular-expression-string*
4. Use the **commit** or **end** command.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `RP/0/RSP0/CPU0:router# configure`	Enters global configuration mode.
Step 2	**performance-mgmt regular-expression** *regular-expression name*	Sets a defined regular expression group to one or more statistics or threshold template.

	Command or Action	Purpose
	Example: `RP/0/RSP0/CPU0:router(config)# performance-mgmt regular-expression regexp`	**Note** By default, no regular expression group is configured. Once the regular expression group is configured, you can apply it to multiple templates.
Step 3	**index** *index-number regular-expression-string* **Example:** `RP/0/RSP0/CPU0:router(config-perfmgmt-regex)# index 10 match`	Specifies a regular expression index to the defined group. **Note** The Instance filtering by regular-expression is currently supported in interface entities only (Interface basic-counters, generic-counters, data-rates.
Step 4	Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session. **end** —Prompts user to take one of these actions: • **Yes** — Saves configuration changes and exits the configuration session. • **No** —Exits the configuration session without committing the configuration changes. • **Cancel** —Remains in the configuration session, without committing the configuration changes.

Creating PM Statistics Collection Templates

This task explains how to create a PM statistics collection template.

SUMMARY STEPS

1. **configure**
2. **performance-mgmt statistics** *entity* {**default** | **template** *template-name*} [**sample-size** *size*] [**sample-interval** *minutes*]
3. Use the **commit** or **end** command.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `RP/0/RSP0/CPU0:router# configure`	Enters global configuration mode.
Step 2	**performance-mgmt statistics** *entity* {**default**	**template** *template-name*} [**sample-size** *size*] [**sample-interval** *minutes*] **Example:**	Creates a PM statistics collection template for the specified entity. • Use the *entity* argument to specify the entity for which you want to create a PM statistics collection template.

	Command or Action	Purpose
	`RP/0/RSP0/CPU0:router(config)# performance-mgmt statistics interface data-rates default`	• Use the **default** keyword to apply the default template to the PM statistics template for the specified entity. The default template contains a default sample interval of 10 minutes and a default sample size of 5 sampling operations. • Use the **template** keyword and *template-name* argument to designate a unique name for a template. • The **sample-size** keyword and *size* argument set the number of sampling operations to be performed before exporting the data to the TFTP server. The range is from 1 to 60 samples. The default is 5 samples. • The **sample-interval** keyword and *minutes* argument set the frequency of the sampling operations performed during the sampling cycle. The range is from 1 to 60 minutes. The default is 10 minutes. **Note** For more information about creating PM collection templates, see the Guidelines for Creating PM Statistics Collection Templates, on page 4 section.
Step 3	Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session. **end** —Prompts user to take one of these actions: • **Yes** — Saves configuration changes and exits the configuration session. • **No** —Exits the configuration session without committing the configuration changes. • **Cancel** —Remains in the configuration session, without committing the configuration changes.

What to do next

After creating a PM statistics collection template, you must enable the template to start the PM statistics collection. See the Enabling and Disabling PM Statistics Collection Templates, on page 30 section for more information about enabling PM statistics collection templates.

Enabling and Disabling PM Statistics Collection Templates

This task explains how to enable and disable PM statistics collection templates.

Before you begin

You must create a PM statistics collection template before performing this task, or you can use a predefined template (default). You must configure a TFTP server resource or local dump resource if you want to export statistics data onto a remote TFTP server or local disk.

Refer to the Configuring an External TFTP Server for PM Statistic Collections, on page 26 and Creating PM Statistics Collection Templates, on page 29 tasks for more information.

SUMMARY STEPS

1. **configure**
2. Do one of the following:
   - **performance-mgmt apply statistics** {*entity* | **interface** {**basic-counters** | **data-rates** | **generic-counters**} *type interface-path-id* } [**location** {**all** | *node-id*}] {*template-name* | **default**}
   - **no performance-mgmt apply statistics** {*entity* | **interface** {**basic-counters** | **data-rates** | **generic-counters**} *type interface-path-id* } [**location** {**all** | *node-id*}]
3. Use the **commit** or **end** command.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `RP/0/RSP0/CPU0:router# configure`	Enters global configuration mode.

Step 2	Do one of the following:
	
	• **performance-mgmt apply statistics** {*entity*
		interface {**basic-counters**	**data-rates**	**generic-counters**} *type interface-path-id* } [**location** {**all**	*node-id*}] {*template-name*	**default**}
						• **no performance-mgmt apply statistics** {*entity*
							interface {**basic-counters**	**data-rates**	**generic-counters**} *type interface-path-id* } [**location** {**all**	*node-id*}]
										
										Example:
										
										`RP/0/RSP0/CPU0:router(config)# `**`performance-mgmt`**
										`apply statistics mpls ldp default`
										
										or
										
										`RP/0/RSP0/CPU0:router(config)# `**`no performance-mgmt`**
										`apply statistics mpls ldp`
											Enables or disables a PM statistics collection template.
											
											• Only one PM statistics collection template for a given entity can be enabled at a time.
											
											• You must specify either a location with the **location** keyword and *node-id* argument or the **location all** keywords when enabling a PM statistic collections for these entities:
											
											    • Node CPU
											
											    • Node memory
											
											    • Node process
											
											The **location** keyword with the *node-id* argument enables PM statistic collections for the specified node. The *node-id* argument is expressed in the *rack*/*slot*/*module* notation. The **location all** keywords enable a PM statistic collection for all nodes.
											
											• Because only one PM statistics collection can be enabled for any given entity at any given time, you are not required to specify the template name with the **default** keyword or **template** keyword and

Command or Action	Purpose

	template-name argument when disabling a PM statistics collection.
	
	Note Data collection will begin one sampling cycle after you enable the PM statistics collection template with the **performance-mgmt apply statistics** command.
	
	• When a template has been enabled, the sampling and export cycles continue until the template is disabled with the **no** form of the **performance-mgmt apply statistics** command.
	
	• You must specify either a location with the **location** keyword and *node-id* argument or the **location all** keywords when disabling a PM statistic collections for these entities:
	    • Node CPU
	    • Node memory
	    • Node process
	
	The **location** keyword with the *node-id* argument disables PM statistic collections for the specified node. The *node-id* argument is expressed in the *rack*/*slot*/*module* notation. The **location all** keyword disables the PM statistic collections for all nodes.
	
	• Because only one PM statistics collection can be enabled for any given entity at any given time, you are not required to specify the template name with the **default** keyword or **template** keyword and *template-name* argument when disabling a PM statistics collection.

Step 3 Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session.
	
	end —Prompts user to take one of these actions:
	    • **Yes** — Saves configuration changes and exits the configuration session.
	    • **No** —Exits the configuration session without committing the configuration changes.
	    • **Cancel** —Remains in the configuration session, without committing the configuration changes.

Enabling PM Entity Instance Monitoring

This task explains how to enable entity instance monitoring.

Before you begin

You must create PM statistics collection template for an entity before performing this task.

SUMMARY STEPS

1. **configure**
2. **performance-mgmt apply monitor** {*entity instance* | **interface** {**basic-counters** | **data-rates** | **generic-counters**} *type interface-path-id* } {*template-name* | **default**}
3. Use the **commit** or **end** command.

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**configure** **Example:** RP/0/RSP0/CPU0:router# configure	Enters global configuration mode.
Step 2	**performance-mgmt apply monitor** {*entity instance*	**interface** {**basic-counters**	**data-rates**	**generic-counters**} *type interface-path-id* } {*template-name*	**default**} **Example:** RP/0/RSP0/CPU0:router(config)# **performance-mgmt apply monitor node cpu 0/**RSP1**/CPU0 default**	Enables entity instance monitoring for the specified instance. • Use the *entity* and *instance* arguments to specify the name of the entity and the instance to be monitored, respectively. • Use either the **default** keyword or the *template-name* argument to specify the template associated with the entity instance to be monitored.
Step 3	Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session. **end** —Prompts user to take one of these actions: • **Yes** — Saves configuration changes and exits the configuration session. • **No** —Exits the configuration session without committing the configuration changes. • **Cancel** —Remains in the configuration session, without committing the configuration changes.

Creating PM Threshold Monitoring Templates

This task explains how to create a PM threshold monitoring template.

SUMMARY STEPS

1. **configure**
2. **performance-mgmt thresholds** {*entity* | **interface** {**basic-counters** |**data-rates** | **generic-counters**} *type interface-path-id* } {**template** *name* } *attribute operation value* [*value2*] [**percent**] [**rearm** {**toggle** | **window** *window-size*}]
3. Use the **commit** or **end** command.

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**configure** **Example:** `RP/0/RSP0/CPU0:router# configure`	Enters global configuration mode.
Step 2	**performance-mgmt thresholds** {*entity*	**interface** {**basic-counters** |**data-rates**	**generic-counters**} *type interface-path-id* } {**template** *name* } *attribute operation value* [*value2*] [**percent**] [**rearm** {**toggle**	**window** *window-size*}] **Example:** `RP/0/RSP0/CPU0:router(config)# performance-mgmt thresholds node memory template mem_thresh1 RP/0/RSP0/CPU0:router(config-threshold-bgp)# CurrMemory GT 50 percent RP/0/RSP0/CPU0:router(config-threshold-bgp)# sample-interval 5`	Creates a PM threshold monitoring template. **Note** For more detailed information about creating PM threshold monitoring templates, see the Guidelines for Creating PM Threshold Monitoring Templates, on page 13 section.
Step 3	Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session. **end** —Prompts user to take one of these actions: • **Yes** — Saves configuration changes and exits the configuration session. • **No** —Exits the configuration session without committing the configuration changes. • **Cancel** —Remains in the configuration session, without committing the configuration changes.

What to do next

After creating a PM threshold monitoring template, you must enable the template to start PM threshold monitoring. Refer to the Enabling and Disabling PM Threshold Monitoring Templates, on page 35 task for more information about enabling PM statistics threshold monitoring templates.

Enabling and Disabling PM Threshold Monitoring Templates

This task explains how to enable and disable PM threshold monitoring templates.

Before you begin

You must create a PM threshold template before performing this task. Refer to tasks for more information.

SUMMARY STEPS

1. **configure**
2. Do one of the following:

   • **performance-mgmt apply thresholds** {*entity* | **interface** {**basic-counters** | **data-rates** | **generic-counters**} *type interface-path-id* } [**location** {**all** | *node-id*}] {*template-name* | **default**}
   • **no performance-mgmt apply thresholds** {*entity* | **interface** {**basic-counters** | **data-rates** | **generic-counters**} *type interface-path-id* } [**location** {**all** | *node-id*}]

3. Use the **commit** or **end** command.

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**configure** **Example:** `RP/0/RSP0/CPU0:router# configure`	Enters global configuration mode.

Step 2	Do one of the following:
	
	• **performance-mgmt apply thresholds** {*entity* | **interface** {**basic-counters** | **data-rates** | **generic-counters**} *type interface-path-id* } [**location** {**all** | *node-id*}] {*template-name* | **default**}
	• **no performance-mgmt apply thresholds** {*entity* | **interface** {**basic-counters** | **data-rates** | **generic-counters**} *type interface-path-id* } [**location** {**all** | *node-id*}]
	
	Example:
	
	`RP/0/RSP0/CPU0:router(config)# performance-mgmt enable thresholds node memory location all template20`
	
	or
	
	`RP/0/RSP0/CPU0:router(config)# no performance-mgmt apply thresholds node memory location all`
		Enables or disables PM threshold monitoring templates for the specified template.
		
		• Only one PM threshold monitoring template for an entity can be enabled at a time.
		
		• You must specify either a location with the **location** keyword and *node-id* argument or the **locationall** keywords when enabling a PM threshold monitoring template for these entities:
		
		    • Node CPU
		
		    • Node memory
		
		    • Node process
		
		The **location** keyword with the *node-id* argument enables the PM threshold monitoring template for the specified node. The *node-id* argument is expressed in the *rack/slot/module* notation. The **location all** keywords enable the PM threshold monitoring template for all nodes.

	Command or Action	Purpose
		• Because only one PM threshold monitoring template for an entity at any given time, you are not required to specify the template name with the **default** keyword or **template** keyword and *template-name* argument when disabling a PM statistics collection.
		• Once a template has been enabled, threshold monitoring continues until the template is disabled with the **no** form of the **performance-mgmt apply thresholds** command.
		• You must specify either a location with the **location** keyword and *node-id* argument or the **location all** keywords when disabling a PM threshold monitoring template for these entities:
		• Node CPU
		• Node memory
		• Node process
		The **location** keyword with the *node-id* argument disables the PM threshold monitoring template for the specified node. The *node-id* argument is expressed in the *rack*/*slot*/*module* notation. The **location all** keywords disable the PM threshold monitoring template for all nodes.
		• Because only one PM threshold monitoring template for an entity can be enabled at a time, you are not required to specify the template name with **default** keyword or *template-name* argument when disabling a PM statistics collection.
Step 3	Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session. **end** —Prompts user to take one of these actions: • **Yes** — Saves configuration changes and exits the configuration session. • **No** —Exits the configuration session without committing the configuration changes. • **Cancel** —Remains in the configuration session, without committing the configuration changes.

Configuration Examples for Implementing Performance Management

This section provides these configuration examples:

Creating and Enabling PM Statistics Collection Templates: Example

This example shows how to configure the TFTP server resource, and how to create and enable a PM statistics collection templates. In this example, the following PM template collection templates are created and enabled:

- A template named template1 with a sample size of 10 and a sample interval of 5 for the interface generic counters entity.

- A template named template2 with a sample size of 30 and a sample interval of 2 for the node memory entity. The template is enabled globally.

- A template name template3 with a sample size of 10 and a sample interval of 5 for the node process entity. The template is enabled for node 0/0/CPU0.

```
performance-mgmt resources tftp-server 10.30.62.154 directory pm/pm_data/pmtest
performance-mgmt statistics interface generic-counters template template1
 sample-size 10
 sample-interval 5
!
performance-mgmt statistics node memory template template2
 sample-size 30
 sample-interval 2
!
performance-mgmt statistics node process template template3
 sample-size 10
 sample-interval 5
!
performance-mgmt apply statistics interface generic-counters template1
performance-mgmt apply statistics node memory global template2
performance-mgmt apply statistics node process 0/0/CPU0 template3
```

Creating and Enabling PM Threshold Monitoring Templates: Example

This example shows how to create and enable a PM threshold monitoring template. In this example, a PM threshold template is created for the **CurrMemory** attribute of the node **memory** entity. The threshold condition in this PM threshold condition monitors the **CurrMemory** attribute to determine whether the current memory use is greater than 75 percent. The sample interval for the template is set to 5 minutes, and the template is enabled globally.

```
performance-mgmt thresholds node memory template template20
 CurrMemory GT 75
 sample-interval 5
!
performance-mgmt apply thresholds node memory global template20
```

Additional References

The following sections provide references related to implementing performance management.

Related Documents

Related Topic	Document Title
Performance management commands	Performance Management Commands on the Cisco ASR 9000 Series Router module in the *System Monitoring Command Reference for Cisco ASR 9000 Series Routers*
Cisco IOS XR Software XML API material	*Cisco IOS XR XML API Guide*
Cisco IOS XR Software getting started material	*Cisco ASR 9000 Series Aggregation Services Router Getting Started Guide*
Information about user groups and task IDs	Configuring AAA Services on the Cisco ASR 9000 Series Router module in the *System Security Configuration Guide for Cisco ASR 9000 Series Routers*

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIBs	MIBs Link
To locate and download MIBs for Cisco IOS XR software, use the Cisco Feature Navigator MIB Locator and click on the IOS XR software type.	Cisco Feature Navigator MIB Locator

RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	*http://www.cisco.com/cisco/web/ support/index.html*