Configuring SNMP Support

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Simple Network Management Protocol (SNMP) is an application-layer protocol that provides a message format for communication between SNMP managers and agents. SNMP provides a standardized framework and a common language that is used for monitoring and managing devices in a network.

This document discusses how to enable an SNMP agent on a Cisco device and how to control the sending of SNMP notifications from the agent. For information about using SNMP management systems, see the appropriate documentation for your network management system (NMS) application.

For a complete description of the router monitoring commands mentioned in this document, see the *Cisco IOS Network Management Command Reference*. To locate documentation of other commands that appear in this document, use the *Cisco IOS Command Reference Master Index* or search online.

Finding Feature Information in This Module

Your Cisco IOS software release may not support all of the features documented in this module. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the "Feature Information for Configuring SNMP Support" section on page 47.

Finding Support Information for Platforms and Cisco IOS and Catalyst OS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS and Catalyst OS software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

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Restrictions for Configuring SNMP Support

Not all Cisco platforms are supported on the features described in this module. Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support.

Information About Configuring SNMP Support

To configure SNMP support on your network, you should understand the following concepts:

Components of SNMP

SNMP is an application-layer protocol that provides a message format for communication between SNMP managers and agents. SNMP provides a standardized framework and a common language used for monitoring and managing devices in a network.

The SNMP framework is made up of three parts:

- SNMP manager
- SNMP agent
- MIB

SNMP Manager

The SNMP manager is a system that controls and monitors the activities of network hosts using SNMP. The most common managing system is an NMS. The term NMS can be applied either to a dedicated device used for network management or to the applications used on such a device. Several network management applications are available for use with SNMP and range from simple command-line applications to applications that use GUIs, such as the CiscoWorks2000 products.

SNMP Agent

The SNMP agent is the software component within a managed device that maintains the data for the device and reports this data, as needed, to managing systems. The agent resides on the routing device (router, access server, or switch). To enable an SNMP agent on a Cisco routing device, you must define the relationship between the manager and the agent.

Note Although it is possible to configure a Cisco router to be an SNMP agent, this practice is not recommended. Commands that an agent needs to control the SNMP process are available through the Cisco IOS command-line interface (CLI) without additional configuration.

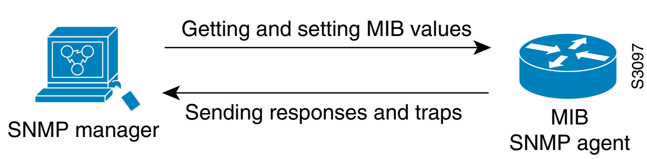
MIB

A MIB is a virtual information storage area for network management information and consists of collections of managed objects. Within a MIB are collections of related objects defined in MIB modules. MIB modules are written in the SNMP MIB module language, as defined in STD 58, RFC 2578, RFC 2579, and RFC 2580 (see the "MIBs and RFCs" section for an explanation of RFC and STD documents). Individual MIB modules are also referred to as MIBs; for example, the Interfaces Group MIB (IF-MIB) is a MIB module within the MIB on your system.

An SNMP agent contains MIB variables whose values the SNMP manager can request or change through Get or Set operations. A manager can get a value from an agent or store a value in that agent. The agent gathers data from the MIB, the repository for information about device parameters and network data. The agent can also respond to manager requests to get or set data.

Figure 1 illustrates the communications between the SNMP manager and agent. A manager sends an agent requests to get and set MIB values. The agent responds to these requests. Independent of this interaction, the agent can send the manager unsolicited notifications (traps or informs) to notify the manager about network conditions.

Figure 1 Communication Between an SNMP Agent and Manager



SNMP Notifications

A key feature of SNMP is its capability to generate unsolicited notifications from an SNMP agent.

Traps and Informs

Unsolicited (asynchronous) notifications can be generated as traps or inform requests (informs). Traps are messages alerting the SNMP manager to a condition on the network. Informs are traps that include a request for confirmation of receipt from the SNMP manager. Notifications can indicate improper user authentication, restarts, the closing of a connection, loss of connection to a neighbor router, or other significant events.

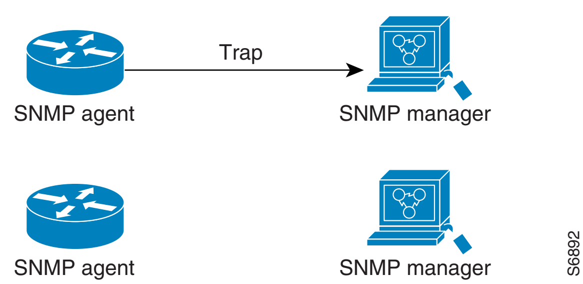
Traps are less reliable than informs because the receiver does not send an acknowledgment when it receives a trap. The sender does not know if the trap was received. An SNMP manager that receives an inform acknowledges the message with an SNMP response protocol data unit (PDU). If the sender never receives a response, the inform can be sent again. Thus, informs are more likely to reach their intended destination.

Traps are often preferred even though they are less reliable because informs consume more resources in the router and in the network. Unlike a trap, which is discarded as soon as it is sent, an inform must be held in memory until a response is received or the request times out. Also, traps are sent only once, whereas an inform may be resent several times. The retries increase traffic and contribute to higher overhead on the network. Use of traps and informs requires a trade-off between reliability and resources. If it is important that the SNMP manager receives every notification, use informs, but if traffic volume or memory usage are concerns and receipt of every notification is not required, use traps.

Figure 2 through Figure 5 illustrate the differences between traps and informs.

Figure 2 shows that an agent successfully sends a trap to an SNMP manager. Although the manager receives the trap, it does not send an acknowledgment. The agent has no way of knowing that the trap reached its destination.

Figure 2 Trap Successfully Sent to SNMP Manager



In Figure 3, the agent successfully sends an inform to the manager. When the manager receives the inform, a response is sent to the agent and the agent knows that the inform reached its destination. Notice that in this example the traffic generated is twice as much as in the interaction shown in Figure 2.

Figure 3 Inform Request Successfully Sent to SNMP Manager

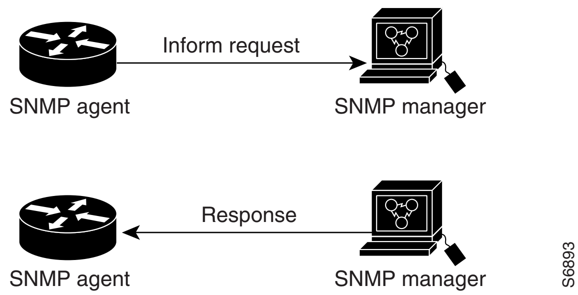


Figure 4 shows an agent sending a trap to a manager that the manager does not receive. The agent has no way of knowing that the trap did not reach its destination. The manager never receives the trap because traps are not resent.

Figure 4 Trap Unsuccessfully Sent to SNMP Manager

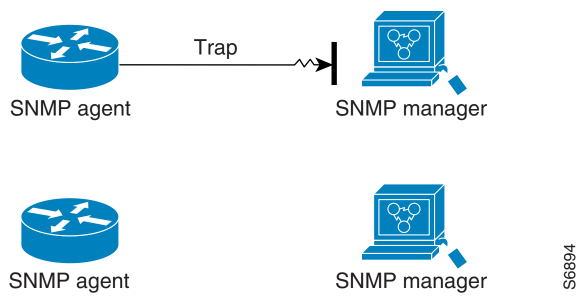
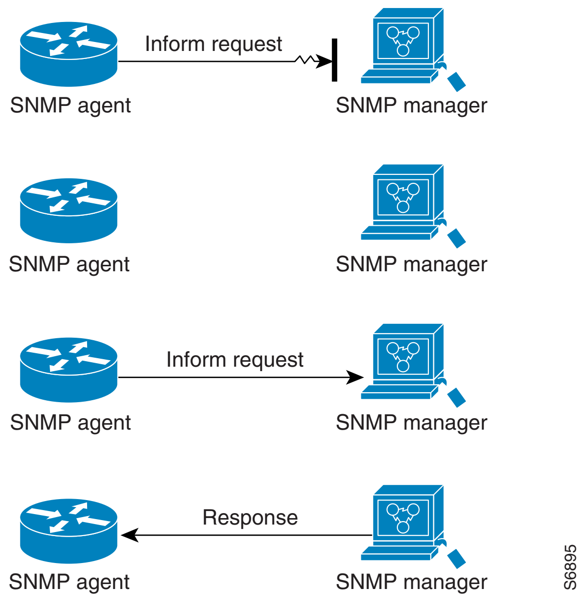


Figure 5 shows an agent sending an inform to a manager that does not reach the manager. Because the manager did not receive the inform, it does not send a response. After a period of time, the agent resends the inform. The manager receives the inform from the second transmission and replies. In this example, more traffic is generated than in the scenario shown in Figure 4 but the notification reaches the SNMP manager.

Figure 5 Inform Unsuccessfully Sent to SNMP Manager



MIBs and RFCs

MIB modules typically are defined in RFC documents submitted to the Internet Engineering Task Force (IETF), an international standards body. RFCs are written by individuals or groups for consideration by the Internet Society and the Internet community as a whole, usually with the intention of establishing a recommended Internet standard. Before being given RFC status, recommendations are published as Internet Draft (I-D) documents. RFCs that have become recommended standards are also labeled as standards (STD) documents. You can learn about the standards process and the activities of the IETF at the Internet Society website at http://www.isoc.org. You can read the full text of all RFCs, I-Ds, and STDs referenced in Cisco documentation at the IETF website at http://www.ietf.org.

The Cisco implementation of SNMP uses the definitions of MIB II variables described in RFC 1213 and definitions of SNMP traps described in RFC 1215.

Cisco provides its own private MIB extensions with every system. Cisco enterprise MIBs comply with the guidelines described in the relevant RFCs unless otherwise noted in the documentation. You can find the MIB module definition files and list of MIBs supported on each Cisco platform on the Cisco MIB website on Cisco.com.

Versions of SNMP

Cisco IOS software supports the following versions of SNMP:

- SNMPv1—Simple Network Management Protocol: a full Internet standard, defined in RFC 1157. (RFC 1157 replaces the earlier versions that were published as RFC 1067 and RFC 1098.) Security is based on community strings.
- SNMPv2c—The community-string based Administrative Framework for SNMPv2. SNMPv2c (the “c” is for “community”) is an experimental Internet protocol defined in RFC 1901, RFC 1905, and RFC 1906. SNMPv2c is an update of the protocol operations and data types of SNMPv2p (SNMPv2 Classic) and uses the community-based security model of SNMPv1.

- SNMPv3—Version 3 of SNMP. SNMPv3 is an interoperable standards-based protocol defined in RFCs 3413 to 3415. SNMPv3 provides secure access to devices by authenticating and encrypting packets over the network.

  The security features provided in SNMPv3 are as follows:

  - Message integrity—Ensuring that a packet has not been tampered with in transit.
  - Authentication—Determining that the message is from a valid source.
  - Encryption—Scrambling the contents of a packet to prevent it from being learned by an unauthorized source.

Both SNMPv1 and SNMPv2c use a community-based form of security. The community of SNMP managers able to access the agent MIB is defined by an IP address access control list (ACL) and password.

SNMPv2c support includes a bulk retrieval mechanism and detailed error message reporting to management stations. The bulk retrieval mechanism supports the retrieval of tables and large quantities of information, minimizing the number of round trips required. The SNMPv2c improved error handling support includes expanded error codes that distinguish different types of errors; these conditions are reported through a single error code in SNMPv1. The following three types of exceptions are also reported: no such object, no such instance, and end of MIB view.

SNMPv3 is a security model in which an authentication strategy is set up for a user and the group in which the user resides. A security level is the permitted level of security within a security model. A combination of a security model and a security level determines which security mechanism is employed when handling an SNMP packet.

Three security models are available: SNMPv1, SNMPv2c, and SNMPv3. Table 1 lists the combinations of security models and levels and their meanings.

Table 1 SNMP Security Models and Levels

Model	Level	Authentication	Encryption	What Happens
v1	noAuthNoPriv	Community String	No	Uses a community string match for authentication.
v2c	noAuthNoPriv	Community String	No	Uses a community string match for authentication.
v3	noAuthNoPriv	Username	No	Uses a username match for authentication.

Table 1 SNMP Security Models and Levels (continued)

Model	Level	Authentication	Encryption	What Happens
v3	authNoPriv	Message Digest 5 (MD5) or Secure Hash Algorithm (SHA)	No	Provides authentication based on the HMAC-MD5 or HMAC-SHA algorithms.
v3	authPriv	MD5 or SHA	Data Encryption Standard (DES)	Provides authentication based on the HMAC-MD5 or HMAC-SHA algorithms. Provides DES 56-bit encryption in addition to authentication based on the CBC-DES (DES-56) standard.

Note SNMPv2p (SNMPv2 Classic) is not supported in Cisco IOS Release 11.2 and later releases. SNMPv2c replaces the Party-based Administrative and Security Framework of SNMPv2p with a Community-based Administrative Framework. SNMPv2c retained the bulk retrieval and error handling capabilities of SNMPv2p.

You must configure an SNMP agent to use the version of SNMP supported by the management station. An agent can communicate with multiple managers, however, and you can configure Cisco IOS software to support communications with one management station using the SNMPv1 protocol, one using the SNMPv2c protocol, and another using SMNPv3.

SNMPv3 supports RFCs 1901 to 1908, 2104, 2206, 2213, 2214, and 2271 to 2275. For additional information about SNMPv3, see RFC 2570, *Introduction to Version 3 of the Internet-standard Network Management Framework* (this is not a standards document).

Detailed Interface Registration Information

The Interface Index Display for SNMP feature introduces new commands and command modifications that allow advanced users of SNMP to view information about the interface registrations directly on the managed agent. You can display MIB information from the agent without using an external NMS.

Note For the purposes of this document, the agent is a routing device running Cisco IOS software.

This feature addresses three objects in the Interfaces MIB: ifIndex, ifAlias, and ifName. For a complete definition of these objects, see the IF-MIB.my file available from the Cisco SNMPv2 MIB website at ftp://ftp.cisco.com/pub/mibs/v2/.

Interface Index

The ifIndex object (ifEntry 1) is called the Interface Index. The Interface Index is a unique value greater than zero that identifies each interface or subinterface on the managed device. This value becomes the interface index identification number.

The CLI command **show snmp mib ifmib ifindex** allows you to view the SNMP Interface Index Identification numbers assigned to interfaces and subinterfaces. An NMS is not required.

Interface Alias

The ifAlias object (ifXEntry 18) is called the Interface Alias. The Interface Alias is a user-specified description of an interface used for SNMP network management. The ifAlias is an object in the Interfaces Group MIB (IF-MIB) that can be set by a network manager to "name" an interface. The ifAlias value for an interface or subinterface can be set using the **description** command in interface configuration mode or subinterface configuration mode or by using a Set operation from an NMS. Previously, ifAlias descriptions for subinterfaces were limited to 64 characters. (The OLD-CISCO-INTERFACES-MIB allows up to 255 characters for the locIfDescr MIB variable, but this MIB does not support subinterfaces.) A new CLI command, **snmp ifmib ifalias long**, configures the system to handle IfAlias descriptions of up to 256 characters. IfAlias descriptions appear in the output of the CLI **show interfaces** command.

Interface Name

The ifName object (ifXEntry 1) is the textual name of the interface. The purpose of the ifName object is to cross reference the CLI representation of a given interface. The value of this object is the name of the interface as assigned by the local device and is suitable for use in CLI commands. If there is no local name or this object is otherwise not applicable, this object contains a zero-length string. No commands introduced by this feature affect the ifName object, but it is discussed here to show its relation to the ifIndex and ifAlias objects.

The **show snmp mib** command shows all objects in the MIB on a Cisco device (similar to a mibwalk). The objects in the MIB tree are sorted using lexical ordering, meaning that object identifiers are sorted in sequential, numerical order. Lexical ordering is important when using the GetNext operation from an NMS because these operations take an object identifier (OID) or a partial OID as input and return the next object from the MIB tree based on the lexical ordering of the tree.

SNMP Support for VPNs

The SNMP Support for VPNs feature allows SNMP traps and informs to be sent and received using virtual private network (VPN) routing/forwarding (VRF) tables. In particular, this feature adds support to Cisco IOS software for the sending and receiving of SNMP traps and informs specific to individual VPNs.

A VPN is a network that provides high connectivity transfers on a shared system with the same usage guidelines as a private network. A VPN can be built on the Internet over IP, Frame Relay, or ATM networks.

A VRF stores per-VPN routing data. It defines the VPN membership of a customer site attached to the network access server (NAS). A VRF consists of an IP routing table, a derived Cisco Express Forwarding table, and guidelines and routing protocol parameters that control the information that is included in the routing table.

The SNMP Support for VPNs feature provides configuration commands that allow users to associate SNMP agents and managers with specific VRFs. The specified VRF is used for sending SNMP traps and informs and responses between agents and managers. If a VRF is not specified, the default routing table for the VPN is used.

Support for VPNs allows you to configure an SNMP agent to accept only SNMP requests from a certain set of VPNs. With this configuration, service providers can provide network management services to their customers, so customers can manage all user VPN devices.

MIB Persistence

The MIB Persistence features allow the SNMP data of a MIB to be persistent across reloads; that is, MIB information retains the same set object values each time a networking device reboots. MIB Persistence is enabled by issuing the **snmp mib persist** command, and the MIB data of all MIBs that have had persistence enabled using this command is then written to NVRAM by issuing the **write mib-data** command. All modified MIB data must be written to NVRAM using the **write mib-data** command.

Both Event and Expression MIBs allow you to configure a value for an object and to set up object definitions. Both also allow rows of data to be modified while the row is in an active state.

Scalar objects are stored every time they are changed, and table entries are stored only if the row is in an active state. The Event MIB has two scalar objects and nine tables to be persisted into NVRAM. Following are the tables:

- mteEventNotificationTable
- mteEventSetTable
- mteEventTable
- mteObjectsTable
- mteTriggerBooleanTable
- mteTriggerDeltaTable
- mteTriggerExistenceTable
- mteTriggerTable
- mteTriggerThresholdTable

The Expression MIB has two scalar objects and three tables to be stored in NVRAM. The scalar objects are expResourceDeltaMinimum and expResourceDeltaWildcardInstanceMaximum. Following are the tables:

- expExpressionTable
- expNameTable
- expObjectTable

Writing MIB data to NVRAM may take several seconds. The length of time depends on the amount of MIB data.

Event MIB Persistence and Expression MIB Persistence both allow MIB objects to be saved from reboot to reboot, allowing long-term monitoring of specific devices and interfaces and configurations of object values that are preserved across reboots.

Circuit Interface Identification Persistence

The Circuit Interface MIB (CISCO-CIRCUIT-INTERFACE-MIB) provides a MIB object (cciDescr) that can be used to identify individual circuit-based interfaces for SNMP monitoring. The Circuit Interface Identification Persistence for SNMP feature maintains this user-defined name of the circuit across reboots, allowing the consistent identification of circuit interfaces. Circuit Interface Identification Persistence is enabled using the **snmp mib persist circuit** global configuration command.

Cisco IOS Release 12.2(2)T introduces the Circuit Interface Identification Persistence for SNMP feature. The Circuit Interface MIB (CISCO-CIRCUIT-INTERFACE-MIB) provides a MIB object (cciDescr) that can be used to identify individual circuit-based interfaces for SNMP monitoring. The Cisco Circuit Interface MIB was introduced in Cisco IOS Release 12.1(3)T.

The Circuit Interface Identification Persistence for SNMP feature maintains the user-defined name of the circuit (defined in the cciDescr object) across reboots, allowing for the consistent identification of circuits.

The Circuit Interface Identification Persistence for SNMP feature is a supplement to the Interface Index Persistence feature introduced in Cisco IOS Release 12.1(3)T and in Cisco IOS Release 12.0(11)S. Circuit Interface Identification Persistence is enabled with the **snmp mib persist circuit** global configuration command. Use this command if you need to consistently identify circuits using SNMP across reboots. This command is disabled by default because this feature uses NVRAM.

In addition, the **show snmp mib ifmib ifindex** EXEC mode command allows you to display the Interfaces MIB ifIndex values directly on your system without an NMS; the **show snmp mib** EXEC mode command allows you to display a list of the MIB module identifiers registered directly on your system with an NMS. And the **snmp ifmib ifalias long** command allows you to specify a description for interfaces or subinterfaces of up to 256 characters in length. Prior to the introduction of this command, ifAlias descriptions for SNMP management were limited to 64 characters.

Event MIB

The Event MIB provides the ability to monitor MIB objects on a local or remote system using SNMP and initiate simple actions whenever a trigger condition is met; for example, an SNMP trap can be generated when an object is modified. When the notifications are triggered through events, the Network Management System (NMS) does not need to constantly poll managed devices to track changes.

By allowing the SNMP notifications to take place only when a specified condition is met, Event MIB reduces the load on affected devices and improves the scalability of network management solutions.

The Event MIB operates based on event, object lists configured for the event, event action, trigger, and trigger test.

Events

The event table defines the activities to be performed when an event is triggered. These activities include sending a notification and setting a MIB object. The event table has supplementary tables for additional objects that are configured according to event action. If the event action is set to notification, notifications are sent out whenever the object configured for that event is modified.

Object List

The objects table lists objects that can be added to notifications based on trigger, trigger test type, or the event that sends a notification. The Event MIB allows wildcarding, which enables you to monitor multiple instances of an object. To specify a group of object identifiers, you can use the wildcard option.

Trigger

The trigger table defines conditions to trigger events. The trigger table lists the objects to be monitored and associates each trigger with an event. An event occurs when a trigger is activated. To create a trigger, you should configure a trigger entry in the mteTriggerTable of the Event MIB. This trigger entry specifies object identifier of the object to be monitored. Each trigger is configured to monitor a single object or a group of objects specified by a wildcard (*). The Event MIB process checks the state of the monitored object at specified intervals.

Trigger Test

The trigger table has supplementary tables for additional objects that are configured based on the type of test performed for a trigger. For each trigger entry type such as existence, theshold, or boolean, the corresponding tables (existence, threshold, and boolean tables) are populated with the information required to perform the test. Event MIB allows you to set event triggers based on existence, threshold, and boolean trigger types. When the specified test on an object returns a value of *true*, the trigger is activated. You can configure Event MIB to send out notifications to the interested host when a trigger is activated.

Expression MIB

The Expression MIB allows you to create expressions based on a combination of objects. The expressions are evaluated according to the sampling method. The Expression MIB supports the following types of object sampling:

- Absolute
- Delta
- Changed

If there are no delta or change values in an expression, the expression is evaluated when a requester attempts to read the value of expression. In this case, all requesters get a newly calculated value.

For expressions with delta or change values, evaluation is performed for every sampling. In this case, requesters get the value as of the last sample period.

Absolute Sampling

Absolute sampling uses the value of the MIB object during sampling.

Delta Sampling

Delta sampling is used for expressions with counters that are identified based on delta (difference) from one sample to the next. Delta sampling requires the application to do continuous sampling, because it uses the value of the last sample.

Changed Sampling

Changed sampling uses the changed value of the object since the last sample.

SNMP Notification Logging

Systems that support SNMP often need a mechanism for recording notification information. This mechanism protects against notifications being lost because they exceeded retransmission limits. The Notification Log MIB provides a common infrastructure for other MIBs in the form of a local logging function. The SNMP Notification Logging feature adds Cisco IOS CLI commands to change the size of the notification log, to set the global ageout value for the log, and to display logging summaries at the command line. The Notification Log MIB improves notification tracking and provides a central location for tracking all MIBs.

Note The Notification Log MIB supports notification logging on the default log only.

How to Configure SNMP Support

There is no specific command that you use to enable SNMP. The first **snmp-server** command that you enter enables the supported versions of SNMP. All other configurations are optional.

Perform the following tasks to configure SNMP support.

- Setting Up System Information, page 12 (optional)
- Configuring SNMP Versions 1 and 2, page 13
- Configuring SNMP Version 3, page 16 (optional)
- Configuring a Router As an SNMP Manager, page 20 (optional)
- Enabling the SNMP Agent Shutdown Mechanism, page 24 (optional)
- Defining the Maximum SNMP Agent Packet Size, page 24 (optional)
- Limiting the Number of TFTP Servers Used via SNMP, page 25 (optional)
- Disabling the SNMP Agent, page 26 (optional)
- Configuring SNMP Notifications, page 27 (optional)
- Configuring Interface Index Display and Interface Indexes and Configuration of Long Name Support, page 34 (optional)
- Configuring SNMP Support for VPNs, page 38 (optional)
- Configuring MIB Persistence, page 39 (optional)
- Configuring Event MIB, page 42 (optional)
- Configuring Expression MIB, page 54 (optional)

Setting Up System Information

You can set the system contact, location, and serial number of the SNMP agent so that these descriptions can be accessed through the configuration file. Although the configuration items described below are optional, setting up this basic information is recommended because it may be useful when troubleshooting your configuration. In addition, the first **snmp-server** command that you issue enables SNMP on the device.

Perform this task as needed.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server contact** *text*
4. **snmp-server location** *text*
5. **snmp-server chassis-id** *number*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp-server contact** *text* **Example:** `Router(config)# snmp-server contact NameOne`	Sets the system contact string.
Step 4	**snmp-server location** *text* **Example:** `Router(config)# snmp-server location LocationOne`	Sets the system location string.
Step 5	**snmp-server chassis-id** *number* **Example:** `Router(config)# snmp-server chassis-id 987654`	Sets the system serial number.

Configuring SNMP Versions 1 and 2

When you configure SNMP versions 1 and 2, you can optionally create or modify views for community strings to limit which MIB objects an SNMP manager can access.

Perform the following tasks when configuring SNMP version 1 or version 2.

- Creating or Modifying an SNMP View Record, page 13 (optional)
- Creating or Modifying Access Control for an SNMP Community, page 14 (required)
- Configuring a Recipient of an SNMP Trap Operation, page 15 (required)

Prerequisites

- An established SNMP community string that defines the relationship between the SNMP manager and the agent
- A host defined to be the recipient of SNMP notifications

Creating or Modifying an SNMP View Record

You can assign views to community strings to limit which MIB objects an SNMP manager can access. You can use a predefined view or create your own view. If you are using a predefined view or no view at all, skip this task.

Perform this task to create or modify an SNMP view record.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server view** *view-name oid-tree* {**included** | **excluded**}
4. **no snmp-server view** *view-name oid-tree* {**included** | **excluded**}

DETAILED STEPS

	Command or Action	Purpose
Step 1	**`enable`** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**`configure terminal`** **Example:** `Router# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 3	**snmp-server view** *view-name oid-tree* {**included** | **excluded**} **Example:** `Router(config)# snmp-server view mib2 mib-2 included`	This example creates a view that includes all objects in the MIB-II subtree. • You can enter this command multiple times for the same view record. Later lines take precedence when an object identifier is included in two or more lines
Step 4	**no snmp-server view** *view-name oid-tree* {**included** | **excluded**} **Example:** `Router(config)# no snmp-server view mib2 mib-2 included`	Removes a server view.

Creating or Modifying Access Control for an SNMP Community

Use an SNMP community string to define the relationship between the SNMP manager and the agent. The community string acts like a password to regulate access to the agent on the router. Optionally, you can specify one or more of the following characteristics associated with the string:

- An access list of IP addresses of the SNMP managers that are permitted to use the community string to gain access to the agent.
- A MIB view, which defines the subset of all MIB objects accessible to the given community.
- Read and write or read-only permission for the MIB objects accessible to the community.

Perform this task to create or modify a community string.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server community** *string* [**view** *view-name*] [**ro** | **rw**] [**ipv6** *nacl*] [*access-list-number*]
4. **no snmp-server community** *string*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp-server community string** [**view** *view-name*] [**ro** | **rw**] [**ipv6** *nacl*] [*access-list-number*] **Example:** `Router(config)# snmp-server community comaccess ro 4`	Defines the community access string. • You can configure one or more community strings.
Step 4	**no snmp-server community** *string* **Example:** `Router(config)# no snmp-server community comaccess`	Removes the community string from the configuration.

Configuring a Recipient of an SNMP Trap Operation

SNMP traps are unreliable because the receiver does not send acknowledgments when it receives traps. The sender does not know if the traps were received. However, a SNMP entity that receives an inform acknowledges the message with a SNMP response protocol data unit (PDU). If the sender never receives the response, the inform can be sent again. Thus, informs are more likely to reach their intended destination.

Compared to traps, informs consume more resources in the agent and in the network. Unlike a trap, which is discarded as soon as it is sent, an inform must be held in memory until a response is received or the request times out. Also, traps are sent only once; an inform may be sent several times. The retries increase traffic and overhead on the network.

If you do not enter a **snmp-server host** command, no notifications are sent. To configure the router to send SNMP notifications, you must enter at least one **snmp-server host** command. If you enter the command without keywords, all trap types are enabled for the host.

To enable multiple hosts, you must issue a separate **snmp-server host** command for each host. You can specify multiple notification types in the command for each host.

When multiple **snmp-server host** commands are given for the same host and type of notification, each succeeding command overwrites the previous command. Only the last **snmp-server host** command will be in effect. For example, if you enter an **snmp-server host inform** command for a host and then enter another **snmp-server host inform** command for the same host, the second command replaces the first.

The **snmp-server host** command is used in conjunction with the **snmp-server enable** command. Use the **snmp-server enable** command to specify which SNMP notifications are sent globally. For a host to receive most notifications, at least one **snmp-server enable** command and the **snmp-server host** command for that host must be enabled.

Some notification types cannot be controlled with the **snmp-server enable** command. For example, some notification types are always enabled and others are enabled by a different command. For example, the linkUpDown notifications are controlled by the **snmp trap link-status** command. These notification types do not require an **snmp-server enable** command.

A *notification-type* option's availability depends on the router type and Cisco IOS software features supported on the router. For example, the envmon notification type is available only if the environmental monitor is part of the system. To see what notification types are available on your system, use the command help (?) at the end of the **snmp-server host** command.

Perform this task to configure the recipient of an SNMP trap operation.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server host** *host-id* [**traps** | **informs**][**version** {**1** | **2c** | **3** [**auth** | **noauth** | **priv**]}] *community-string* [**udp-port** *port-number*] [*notification-type*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp-server host** *host-id* [**traps** | **informs**][**version** {**1** | **2c** | **3** [**auth** | **noauth** | **priv**]}] *community-string* [**udp-port** *port-number*] [*notification-type*] **Example:** `Router(config)# snmp-server host 172.16.1.27 version 2c public`	Specifies whether you want the SNMP notifications sent as traps or informs, the version of SNMP to use, the security level of the notifications (for SNMPv3), and the recipient (host) of the notifications.

Configuring SNMP Version 3

When you configure SNMP version 3 and you want to use the SNMPv3 security mechanism for handling SNMP packets, you must establish SNMP groups and users with passwords.

Perform the following tasks to configure SNMP version 3.

- Specifying SNMP-Server Group Names, page 17 (required)
- Configuring SNMP Server Users, page 19 (required)

Specifying SNMP-Server Group Names

SNMPv3 is a security model. A security model is an authentication strategy that is set up for a user and the group in which the user resides.

No default values exist for authentication or privacy algorithms when you configure the **snmp-server group** command. Also, no default passwords exist. For information about specifying a MD5 password, see the documentation for the **snmp-server user** command.

Perform this task to specify a new SNMP group or a table that maps SNMP users to SNMP views.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp group** [*groupname* {**v1** | **v2c** | **v3** [**auth** | **noauth** | **priv**]}][**read** *readview*] [**write** *writeview*] [**notify** *notifyview*] [**access** *access-list*]
4. **exit**
5. **show snmp group**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp group** [*groupname* {**v1** | **v2c** | **v3** [**auth** | **noauth** | **priv**]}][**read** *readview*] [**write** *writeview*] [**notify** *notifyview*] [**access** *access-list*] **Example:** `Router(config)# snmp-server group group1 v3 auth access lmnop`	Configures the SNMP server group *group1*, enabling user authentication for members of the named access list *lmnop*.
Step 4	**exit** **Example:** `Router(config)# exit`	Exits global configuration mode.
Step 5	**show snmp group** **Example:** `Router# show snmp group`	Displays information about each SNMP group on the network.

Examples

The following example shows information about each SNMP group on the network:

```
Router# show snmp group

groupname: ILMI                             security model:v1
readview : *ilmi                            writeview: *ilmi
notifyview: <no notifyview specified>
row status: active

groupname: ILMI                             security model:v2c
readview : *ilmi                            writeview: *ilmi
notifyview: <no notifyview specified>
row status: active

groupname: public                           security model:v1
readview : <no readview specified>          writeview: <no writeview specified>
notifyview: *tv.FFFFFFFF.FFFFFFFF.FFFFFFFF0F
row status: active


groupname: public                           security model:v2c
readview : <no readview specified>          writeview: <no writeview specified>
notifyview: *tv.FFFFFFFF.FFFFFFFF.FFFFFFFF0F
row status: active
```

Configuring SNMP Server Users

To configure a remote user, specify the IP address or port number for the remote SNMP agent of the device where the user resides. Also, before you configure remote users for a particular agent, configure the SNMP engine ID, using the **snmp-server engineID** command with the remote option. The remote agent's SNMP engine ID is required when computing the authentication and privacy digests from the password. If the remote engine ID is not configured first, the configuration command will fail.

For the *privpassword* and *auth-password* arguments, the minimum length is one character; the recommended length is at least eight characters, and should include both letters and numbers.

SNMP passwords are localized using the SNMP engine ID of the authoritative SNMP engine. For informs, the authoritative SNMP agent is the remote agent. You must configure the remote agent's SNMP engine ID in the SNMP database before you can send proxy requests or informs to it.

Passwords and Digests

No default values exist for authentication or privacy algorithms when you configure the command. Also, no default passwords exist. The minimum length for a password is one character, although we recommend using at least eight characters for security. If you forget a password, you cannot recover it and will need to reconfigure the user. You can specify either a plain text password or a localized MD5 digest.

If you have the localized MD5 or SHA digest, you can specify that string instead of the plain text password. The digest should be formatted as aa:bb:cc:dd where aa, bb, and cc are hexadecimal values. Also, the digest should be exactly 16 octets in length.

Perform this task to add a new user to an SNMP group.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server user** *username groupname* [**remote** *ip-address* [**udp-port** *port*]] {**v1** | **v2c** | **v3** [**encrypted**] [**auth** {**md5** | **sha**} *auth-password*]} [**access** *access-list*]
4. **exit**
5. **show snmp user** [*username*]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp-server user** *username groupname* [**remote** *ip-address* [**udp-port** *port*]] {**v1** | **v2c** | **v3** [**encrypted**] [**auth** {**md5** | **sha**} *auth-password*]} [**access** *access-list*] **Example:** `Router(config)# snmp-server user user1 group1 v3 auth md5 password123`	Configures a new user to an SNMP group with the plain text password "password123" for the user "user1" in the SNMPv3 group "group1".
Step 4	**exit** **Example:** `Router(config)# exit`	Exits global configuration mode and returns to privileged EXEC mode.
Step 5	**show snmp user** [*username*] **Example:** `Router# show snmp user user123`	Displays the information about the configured characteristics of an SNMP user.

Examples

The following example shows the information about the configured characteristics of the SNMP user1:

```
Router# show snmp user user1

User name: user1
Engine ID: 00000009020000000C025808
storage-type: nonvolatile       active access-list: 10
Rowstatus: active
Authentication Protocol: MD5
Privacy protocol: DES
Group name: group1
```

Configuring a Router As an SNMP Manager

The SNMP manager feature allows a router to act as a network management station—an SNMP client. As an SNMP manager, the router can send SNMP requests to agents and receive SNMP responses and notifications from agents. When the SNMP manager process is enabled, the router can query other SNMP agents and process incoming SNMP traps.

Security Considerations

Most network security policies assume that routers will accept SNMP requests, send SNMP responses, and send SNMP notifications.

With the SNMP manager functionality enabled, the router may also send SNMP requests, receive SNMP responses, and receive SNMP notifications. Your security policy implementation may need to be updated prior to enabling this feature.

SNMP requests typically are sent to User Datagram Protocol (UDP) port 161. SNMP responses are typically sent from UDP port 161. SNMP notifications are typically sent to UDP port 162.

SNMP Sessions

Sessions are created when the SNMP manager in the router sends SNMP requests, such as informs, to a host or receives SNMP notifications from a host. One session is created for each destination host. If there is no further communication between the router and host within the session timeout period, the session will be deleted.

The router tracks statistics, such as the average round-trip time required to reach the host, for each session. Using the statistics for a session, the SNMP manager in the router can set reasonable timeout periods for future requests, such as informs, for that host. If the session is deleted, all statistics are lost. If another session with the same host is later created, the request timeout value for replies will return to the default value.

Sessions consume memory. A reasonable session timeout value should be large enough that regularly used sessions are not prematurely deleted, yet small enough such that irregularly used or one-time sessions are purged expeditiously.

Enabling the SNMP Manager

Perform this task to enable the SNMP manager process and to set the session timeout value.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server manager**
4. **snmp-server manager session-timeout** *seconds*
5. **exit**
6. **show snmp**
7. **show snmp sessions** [**brief**]
8. **show snmp pending**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp-server manager** **Example:** `Router(config)# snmp-server manager`	Enables the SNMP manager.
Step 4	**snmp-server manager session-timeout** *seconds* **Example:** `Router(config)# snmp-server manager session-timeout 30`	(Optional) Changes the session timeout value.
Step 5	**exit** **Example:** `Router(config)# exit`	Exits global configuration mode.
Step 6	**show snmp** **Example:** `Router# show snmp`	(Optional) Displays the status of SNMP communications.
Step 7	**show snmp sessions** [**brief**] **Example:** `Router# show snmp sessions`	(Optional) Displays displays the status of SNMP sessions.
Step 8	**show snmp pending** **Example:** `Router# show snmp pending`	(Optional) Displays the current set of pending SNMP requests.

Examples

The following example shows the status of SNMP communications:

```
Router# show snmp

Chassis: 01506199

37 SNMP packets input
    0 Bad SNMP version errors
    4 Unknown community name
    0 Illegal operation for community name supplied
```

```
    0 Encoding errors
    24 Number of requested variables
    0 Number of altered variables
    0 Get-request PDUs
    28 Get-next PDUs
    0 Set-request PDUs

78 SNMP packets output
    0 Too big errors (Maximum packet size 1500)
    0 No such name errors
    0 Bad values errors
    0 General errors
    24 Response PDUs
    13 Trap PDUs


SNMP logging: enabled
    Logging to 172.17.58.33.162, 0/10, 13 sent, 0 dropped.

SNMP Manager-role output packets
    4 Get-request PDUs
    4 Get-next PDUs
    6 Get-bulk PDUs
    4 Set-request PDUs
    23 Inform-request PDUs
    30 Timeouts
    0 Drops

SNMP Manager-role input packets
    0 Inform response PDUs
    2 Trap PDUs
    7 Response PDUs
    1 Responses with errors

SNMP informs: enabled
    Informs in flight 0/25 (current/max)
    Logging to 172.17.217.141.162
        4 sent, 0 in-flight, 1 retries, 0 failed, 0 dropped
    Logging to 172.17.58.33.162
        0 sent, 0 in-flight, 0 retries, 0 failed, 0 dropped
```

The following example displays the status of SNMP sessions:

```
Router# show snmp sessions

Destination: 172.17.58.33.162, V2C community: public
  Round-trip-times: 0/0/0 (min/max/last)
  packets output
    0 Gets, 0 GetNexts, 0 GetBulks, 0 Sets, 4 Informs
    0 Timeouts, 0 Drops
  packets input
    0 Traps, 0 Informs, 0 Responses (0 errors)

Destination: 172.17.217.141.162, V2C community: public, Expires in 575 secs
  Round-trip-times: 1/1/1 (min/max/last)
  packets output
    0 Gets, 0 GetNexts, 0 GetBulks, 0 Sets, 4 Informs
    0 Timeouts, 0 Drops
 packets input
    0 Traps, 0 Informs, 4 Responses (0 errors)
```

The following example shows the current set of pending SNMP requests:

```
Router# show snmp pending
```

```
req id: 47, dest: 172.17.58.33.161, V2C community: public, Expires in 5 secs

req id: 49, dest: 172.17.58.33.161, V2C community: public, Expires in 6 secs

req id: 51, dest: 172.17.58.33.161, V2C community: public, Expires in 6 secs

req id: 53, dest: 172.17.58.33.161, V2C community: public, Expires in 8 secs
```

Enabling the SNMP Agent Shutdown Mechanism

Using SNMP packets, a network management tool can send messages to users on virtual terminals and on the console. This facility operates in a similar fashion to the **send** EXEC command; however, the SNMP request that causes the message to be issued to the users also specifies the action to be taken after the message is delivered. One possible action is a shutdown request. After a system is shut down, typically it is reloaded. Because the ability to cause a reload from the network is a powerful feature, it is protected by the **snmp-server system-shutdown** global configuration command. If you do not issue this command, the shutdown mechanism is not enabled.

Perform this task to enable the SNMP agent shutdown mechanism.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server system-shutdown**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**`enable`** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**`configure terminal`** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**`snmp-server system-shutdown`** **Example:** `Router(config)# snmp-server system-shutdown`	Enables system shutdown using the SNMP message reload feature.

Defining the Maximum SNMP Agent Packet Size

You can define the maximum packet size permitted when the SNMP agent is receiving a request or generating a reply.

Perform this task to set the maximum permitted packet size.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server packetsize** *byte-count*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp-server packetsize** *byte-count* **Example:** `Router(config)# snmp-server packetsize 512`	Establishes the maximum packet size.

Limiting the Number of TFTP Servers Used via SNMP

You can limit the number of TFTP servers used for saving and loading configuration files via SNMP by using an access list. Limiting the use of TFTP servers in this way conserves system resources and centralizes the operation for manageability.

Perform this task to limit the number of TFTP servers.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server tftp-server-list** *number*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp-server tftp-server-list** *number* **Example:** `Router(config)# snmp-server tftp-server-list 12`	Limits the number of TFTP servers used for configuration file copies via SNMP to the servers in an access list.

Troubleshooting Tips

To monitor SNMP trap activity in real time for the purposes of troubleshooting, use the SNMP **debug** commands, including the **debug snmp packet** EXEC command. For documentation of SNMP **debug** commands, see the *Cisco IOS Debug Command Reference.*

Disabling the SNMP Agent

Perform this task to disable any version of an SNMP agent.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **no snmp-server**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**no snmp-server** **Example:** `Router(config)# no snmp-server`	Disables SNMP agent operation.

Configuring SNMP Notifications

To configure a router to send SNMP traps or informs, perform the tasks described in the following sections:

- Configuring the Router to Send SNMP Notifications, page 27 (required)
- Changing Notification Operation Values, page 30 (optional)
- Controlling Individual RFC 1157 SNMP Traps, page 31 (optional)
- Configuring SNMP Notification Log Options, page 32 (optional)

Note Most Cisco IOS commands use the word "traps" in their command syntax. Unless there is an option within the command to specify either traps or informs, the keyword **traps** should be taken to mean traps, informs, or both. Use the **snmp-server host** command to specify whether you want SNMP notifications to be sent as traps or informs.

The SNMP Proxy manager must be available and enabled on a device for informs to be used. The SNMP Proxy manager is shipped with PLUS software images only.

Configuring the Router to Send SNMP Notifications

Perform this task to configure the router to send traps or informs to a host.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server engineID remote** *remote-ip-address remote-engineID*
4. **snmp-server user** *username groupname* [**remote** *host* [**udp-port** *port*] {**v1** | **v2c** | **v3** [**encrypted**] [**auth** {**md5** | **sha**} *auth-password*]} [**access** *access-list*]

5. **snmp group** *groupname* {**v1** | **v2c** | **v3** {**auth** | **noauth** | **priv**}} [**read** *readview*] [**write** *writeview*] [**notify** *notifyview*] [**access** *access-list*]
6. **snmp-server host** *host* [**traps** | **informs**] [**version** {**1** | **2c** | **3** [**auth** | **noauth** | **priv**]}] *community-string* [*notification-type*]
7. **snmp-server enable traps** [*notification-type* [*notification-options*]]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp-server engineID remote** *remote-ip-address remote-engineID* **Example:** `Router(config)# snmp-server engineID remote 172.16.20.3 80000009030000B064EFE100`	Specifies the SNMP engine ID and configures the VRF name traps-vrf for SNMP communications with the remote device at 172.16.20.3.
Step 4	**snmp-server user** *username groupname* [**remote** *host* [**udp-port** *port*] {**v1** | **v2c** | **v3** [**encrypted**] [**auth** {**md5** | **sha**} *auth-password*]} [**access** *access-list*] **Example:** `Router(config)# snmp-server user abcd public remote 172.16.20.3 v3 encrypted auth md5 publichost remotehostusers`	Configures an SNMP user to be associated with the host created in Step 3. **Note** You cannot configure a remote user for an address without first configuring the engine ID for that remote host. This restriction is imposed in the design of these commands; if you try to configure the user before the host, you will receive a warning message and the command will not be executed.
Step 5	**snmp group** *groupname* {**v1** | **v2c** | **v3** {**auth** | **noauth** | **priv**}} [**read** *readview*] [**write** *writeview*] [**notify** *notifyview*] [**access** *access-list*] **Example:** `Router(config)# snmp group GROUP1 v2c auth read viewA write viewA notify viewB`	Configures an SNMP group.

	Command or Action	Purpose
Step 6	**snmp-server host** *host* [**traps** | **informs**] [**version** {**1** | **2c** | **3** [**auth** | **noauth** | **priv**]}] *community-string* [*notification-type*] **Example:** `Router(config)# snmp-server host myhost.host3.com informs version 3 public`	Specifies whether you want the SNMP notifications sent as traps or informs, the version of SNMP to use, the security level of the notifications (for SNMPv3), and the recipient (host) of the notifications. • The **snmp-server host** command specifies which hosts will receive SNMP notifications, and whether you want the notifications sent as traps or informs.
Step 7	**snmp-server enable traps** [*notification-type* [*notification-options*]] **Example:** `Router(config)# snmp-server enable traps bgp`	Enables sending of traps or informs and specifies the type of notifications to be sent. • If a *notification-type* is not specified, all supported notification will be enabled on the router. • To discover which notifications are available on your router, enter the **snmp-server enable traps ?** command. • The **snmp-server enable traps** command globally enables the production mechanism for the specified notification types (such as Border Gateway Protocol [BGP] traps, config traps, entity traps, Hot Standby Router Protocol [HSRP] traps, and so on).

Changing Notification Operation Values

You can specify a value other than the default for the source interface, message (packet) queue length for each host, or retransmission interval.

Perform this task to change notification operation values as needed.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server trap-source** *interface*
4. **snmp-server queue-length** *length*
5. **snmp-server trap-timeout** *seconds*
6. **snmp-server informs** [**retries** *retries*] [**timeout** *seconds*] [**pending** *pending*]

DETAILED STEPS

Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.

Step 3	**snmp-server trap-source** *interface* **Example:** `Router(config)# snmp-server trap-source ethernet 2/1`	Sets the IP address for the Ethernet interface in slot2, port 1 as the source for all SNMP notifications.
Step 4	**snmp-server queue-length** *length* **Example:** `Router(config)# snmp-server queue-length 50`	Establishes the message queue length for each notification. • This example shows the queue length set to 50 entries.
Step 5	**snmp-server trap-timeout** *seconds* **Example:** `Router(config)# snmp-server trap-timeout 30`	Defines how often to resend notifications on the retransmission queue.
Step 6	**snmp-server informs** [**retries** *retries*] [**timeout** *seconds*] [**pending** *pending*] **Example:** `Router(config)# snmp-server informs retries 10 timeout 30 pending 100`	Configures inform-specific operation values. • This example sets the maximum number of times to resend an inform, the number of seconds to wait for an acknowledgment before resending, and the maximum number of informs waiting for acknowledgments at any one time.

Controlling Individual RFC 1157 SNMP Traps

Starting with Cisco IOS Release 12.1(3)T, you can globally enable or disable authenticationFailure, linkUp, linkDown, warmStart, and coldStart traps or informs individually. (These traps constitute the “generic traps” defined in RFC 1157.) Note that linkUp and linkDown notifications are enabled by default on specific interfaces but will not be sent unless they are enabled globally.

Perform this task to enable the authenticationFailure, linkUp, linkDown, warmStart, and coldStart notification types.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server enable traps snmp [authentication**] [**linkup**] [**linkdown**] [**warmstart**] [**coldstart**]
4. **interface** *type slot/port*
5. **no snmp-server link status**

DETAILED STEPS

	Command or Action	Purpose

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters global configuration mode.

Step 3	`snmp-server enable traps snmp [authentication] [linkup] [linkdown] [warmstart] [coldstart]`
	
	Example:
	`Router(config)# snmp-server enable traps snmp`
		Enables RFC 1157 generic traps.
		• When used without any of the optional keywords, enables authenticationFailure, linkUp, linkDown, warmStart, and coldStart traps.
		• When used with keywords, enables only the trap types specified. For example, to globally enable only linkUp and linkDown SNMP traps or informs for all interfaces, use the **snmp-server enable traps snmp linkup linkdown** form of this command.

Step 4	`interface` *type slot/port* **Example:** `Router(config)# interface Ethernet 0/1`	Enters interface configuration mode for a specific interface.

Step 5	`no snmp-server link status`
	
	Example:
	`Router(config-if)# no snmp-server link status`
		Disables the sending of linkUp and linkDown notifications.

Configuring SNMP Notification Log Options

Perform this task to configure SNMP notification log options. These options allow you to control the log size and timing values. The SNMP log can become very large and long if left unmodified.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp mib notification-log default**
4. **snmp mib notification-log globalageout** *seconds*
5. **snmp mib notification-log globalsize** *size*
6. **exit**
7. **show snmp mib notification-log**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp mib notification-log default** **Example:** `Router(config)# snmp mib notification-log default`	Creates an unnamed SNMP notification log.
Step 4	**snmp mib notification-log globalageout** *seconds* **Example:** `Router(config)# snmp mib notification-log globalageout 20`	Sets the maximum amount of time SNMP notification log entries remain in the system memory. • In this example, the system is configured to delete entries in the SNMP notification log that were logged more than 20 minutes ago.
Step 5	**snmp mib notification-log globalsize** *size* **Example:** `Router(config)# snmp mib notification-log globalsize 600`	Sets the maximum number of entries that can be stored in all SNMP notification logs.
Step 6	**exit** **Example:** `Router(config)# exit`	Exits global configuration mode.
Step 7	**show snmp mib notification-log** **Example:** `Router# show snmp mib notification-log`	Displays information about the state of the local SNMP notification logging.

Examples

This example shows information about the state of local SNMP notification logging:

```
Router# show snmp mib notification-log

GlobalAgeout 20, GlobalEntryLimit 600
Total Notifications logged in all logs 0
Log Name"", Log entry Limit 600, Notifications logged 0
Logging status enabled
Created by cli
```

Configuring Interface Index Display and Interface Indexes and Configuration of Long Name Support

The display of Interface Indexes lets advanced users of SNMP view information about the interface registrations directly on a managed agent. An external NMS is not required.

Configuration of Long Alias Names for the interfaces lets users configure the ifAlias (the object defined in the MIB whose length is restricted to 64) up to 255 bytes.

Prerequisites

SNMP is enabled on your system.

Restrictions

The Interface Index Display and Interface Alias Long Name Support feature is not supported on all Cisco platforms. Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support.

Perform this task to configure the IF-MIB to retain ifAlias values of longer than 64 characters and to configure the ifAlias values for an interface.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp ifmib ifalias long**
4. **interface** *type number*
5. **description** *text-string*
6. **exit**
7. **show snmp mib**
8. **show snmp mib ifmib ifindex** [*interface-type*] [*slot*/] [*port-adapter*/] [*port*]

DETAILED STEPS

Step 1	`enable`
	
	Example:
	`Router> enable`
		Enables privileged EXEC mode.
		• Enter your password if prompted.

Step 2	`configure terminal`
	
	Example:
	`Router# configure terminal`
		Enters global configuration mode.

Step 3	`snmp ifmib ifalias long`
	
	Example:
	`Router(config)# snmp ifmib ifalias long`
		Configures the Interfaces MIB (IF-MIB) on the system to return ifAlias values of longer than 64 characters to a Network Management System.

Step 4	**interface** *type number* **Example:** `Router(config)# interface ethernet 2/4`	Enters interface configuration mode. • The form of this command varies depending on the interface being configured.
Step 5	**description** *text-string* **Example:** `Router(config)# description This text string description can be up to 256 characters long`	Configures a free-text description of the specified interface. • This description can be up to 256 characters in length and is stored as the ifAlias object value in the IF-MIB.
Step 6	**exit** **Example:** `Router(config)# exit`	Exits global configuration mode.
Step 7	**show snmp mib** **Example:** `Router# show snmp mib`	Displays a list of the MIB module instance identifiers registered on your system. • The resulting display could be lengthy.
Step 8	**show snmp mib ifmib ifindex** [*interface-type*] [*slot*/] [*port-adapter*/] [*port*] **Example:** `Router# show snmp mib ifmib ifIndex Ethernet 2/0`	Displays the Interfaces MIB ifIndex values registered on your system for all interfaces or the specified interface.

Note To verify that the ifAlias values of longer than 64 characters, perform an SNMP MIB walk for the ifMIB ifAlias variable from an NMS and verify that the entire description is displayed in the values for ifXEntry.18.

The description for interfaces also appears in the output of the **more system:running config** privileged EXEC mode command.

Examples

The following example shows a list of the MIB module instance identifiers registered on your system. The resulting display could be lengthy. Only a small portion is shown here.

```
Router# show snmp mib

system.1
system.2
sysUpTime
system.4
system.5
system.6
system.7
system.8
sysOREntry.2
sysOREntry.3
sysOREntry.4
interfaces.1
```

```
ifEntry.1
ifEntry.2
ifEntry.3
ifEntry.4
ifEntry.5
ifEntry.6
ifEntry.7
ifEntry.8
ifEntry.9
ifEntry.10
ifEntry.11

 --More--

captureBufferEntry.2
captureBufferEntry.3
captureBufferEntry.4
captureBufferEntry.5
captureBufferEntry.6
captureBufferEntry.7
capture.3.1.1
eventEntry.1
eventEntry.2
eventEntry.3
eventEntry.4
eventEntry.5
eventEntry.6

eventEntry.7
logEntry.1
logEntry.2
logEntry.3
logEntry.4
rmon.10.1.1.2
rmon.10.1.1.3
rmon.10.1.1.4
rmon.10.1.1.5
rmon.10.1.1.6
rmon.10.1.1.7
rmon.10.2.1.2
rmon.10.2.1.3
rmon.10.3.1.2

--More--
```

The following example shows output for the Interfaces MIB ifIndex values registered on a system for a specific interface:

```
Router# show snmp mib ifmib ifIndex Ethernet2/0

Ethernet2/0: Ifindex = 2
```

The following example shows output for the Interfaces MIB ifIndex values registered on a system for all interfaces:

```
Router# show snmp mib ifmib ifindex

ATM1/0: Ifindex = 1

ATM1/0-aal5 layer: Ifindex = 12

ATM1/0-atm layer: Ifindex = 10
```

```
ATM1/0.0-aal5 layer: Ifindex = 13

ATM1/0.0-atm subif: Ifindex = 11

ATM1/0.9-aal5 layer: Ifindex = 32

ATM1/0.9-atm subif: Ifindex = 31

ATM1/0.99-aal5 layer: Ifindex = 36

ATM1/0.99-atm subif: Ifindex = 35

Ethernet2/0: Ifindex = 2

Ethernet2/1: Ifindex = 3

Ethernet2/2: Ifindex = 4

Ethernet2/3: Ifindex = 5

Null0: Ifindex = 14

Serial3/0: Ifindex = 6

Serial3/1: Ifindex = 7

Serial3/2: Ifindex = 8

Serial3/3: Ifindex = 9
```

Troubleshooting Tips

An alternative to using the ifAlias value for the identification of interfaces across reboots is to use the cciDescr object in the Cisco Circuit Interface MIB (CISCO-CIRCUIT-INTERFACE-MIB.my). This MIB object can be used only for circuit-based interfaces such as ATM or Frame Relay interfaces. Cisco IOS Release 12.2(2)T introduced the Circuit Interface Identification Persistence for SNMP feature, which maintains the user-defined name of the circuit (defined in the cciDescr object) across reboots, allowing for the consistent identification of circuit-based interfaces.

Configuring SNMP Support for VPNs

This section describes how to configure SNMP support for VPNs. The SNMP Support for VPNs feature provides configuration commands that allow users to associate SNMP agents and managers with specific VRFs. The specified VRF is used to send SNMP traps and informs and responses between agents and managers. If a VRF is not specified, the default routing table for the VPN is used.

Support for VPNs allows users to configure an SNMP agent to only accept SNMP requests from a certain set of VPNs. With this configuration, providers can provide network management services to their customers who then can manage all user VPN devices.

Restrictions

- This feature is not supported on all Cisco platforms. Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support.

- Not all MIBs are VPN aware. For more information about VPN aware MIBs see the following URL: http://www.cisco.com/univercd/cc/td/doc/product/software/ios123/123newft/123t/123t_2/gtsnmpvp.htm

Perform this task to configure SNMP over a specific VPN.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp-server host** *host-address* [**traps** | **informs**][**version** {**1** | **2c** | **3** [**auth** | **noauth** | **priv**]}] *community-string* [**udp-port** *port*] [*notification-type*] [**vrf** *vrf-name*]
4. **snmp-server engineID remote** *ip-address* [**udp-port** *udp-port-number*] [**vrf** *vrf-name*] *engineid-string*
5. **exit**
6. **show snmp-server host**

DETAILED STEPS

Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp-server host** *host-address* [**traps** | **informs**][**version** {**1** | **2c** | **3** [**auth** | **noauth** |**priv**]}] *community-string* [**udp-port** *port*] [*notification-type*] [**vrf** *vrf-name*] **Example:** `Router(config)# snmp-server host company.com public vrf trap-vrf`	Specifies the recipient of an SNMP notification operation and specifies the VRF table to be used for the sending of SNMP notifications.
Step 4	**snmp-server engineID remote** *ip-address* [**udp-port** *udp-port-number*] [**vrf** *vrf-name*] *engineid-string* **Example:** `Router(config)# snmp-server engineID remote 172.16.20.3 vrf traps-vrf 80000009030000B064EFE100`	Configures a name for the remote SNMP engine on a router when configuring SNMP over a specific VPN for a remote SNMP user.

Step 5	**exit** **Example:** `Router(config)# exit`	Exits global configuration mode.
Step 6	**show snmp-server host** **Example:** `Router(config)# show snmp-server host`	Displays the SNMP configuration and verifies that the SNMP Support for VPNs feature is configured properly.

Configuring MIB Persistence

The MIB Persistence features allow the SNMP data of a MIB to be persistent across reloads; that is, MIB information retains the same set of object values each time a networking device reboots. The following sections contain tasks for using Distributed Management Event and Expression MIB persistence.

- Enabling and Disabling Event MIB Persistence, page 40 (optional)
- Enabling and Disabling Expression MIB Persistence, page 41 (optional)

Prerequisites

- SNMP is configured on your networking device
- Values for Event MIB and Expression MIB have been configured

Restrictions

- If the number of MIB objects to persist increases, NVRAM storage capacity may be strained. Occasionally, the time taken to write MIB data to NVRAM may be longer than expected.
- The Distributed Management Event MIB Persistence feature is not supported on all Cisco platforms. Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support.

Enabling and Disabling Event MIB Persistence

Perform this task to configure Event MIB Persistence.

Note Event MIB Persistence is disabled by default.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp mib persist event**
4. **no snmp mib persist event**

5. **exit**
6. **write mib-data**
7. **copy running-config startup-config**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp mib persist event** **Example:** `Router(config)# snmp mib persist event`	Enables MIB Persistence for Event MIB.
Step 4	**no snmp mib persist event** **Example:** `Router(config)# no snmp mib persist event`	(Optional) Disables MIB Persistence for Event MIB.
Step 5	**exit** **Example:** `Router(config)# exit`	Exits global configuration mode.
Step 6	**write mib-data** **Example:** `Router(config)# write mib-data`	Saves Event MIB Persistence configuration data to NVRAM.
Step 7	**copy running-config startup-config** **Example:** `Router(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.

Enabling and Disabling Expression MIB Persistence

Perform this task to configure Expression MIB Persistence.

Note Expression MIB Persistence is disabled by default.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp mib persist expression**
4. **no snmp mib persist expression**
5. **exit**
6. **write mib-data**
7. **copy running-config startup-config**
8. **more system:running-config**

DETAILED STEPS

Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp mib persist expression** **Example:** `Router(config)# snmp mib persist expression`	Enables MIB Persistence for Expression MIB.
Step 4	**no snmp mib persist expression** **Example:** `Router(config)# no snmp mib persist expression`	(Optional) Disables MIB Persistence for Expression MIB.
Step 5	**exit** **Example:** `Router(config)# exit`	Exits global configuration mode.
Step 6	**write mib-data** **Example:** `Router(config)# write mib-data`	Saves Expression MIB Persistence configuration data to NVRAM.

Step 7	**copy running-config startup-config** **Example:** `Router(config)# copy running-config startup-config`	Copies the running configuration to the startup configuration.
Step 8	**more system:running-config** **Example:** `Router(config)# more system:running-config`	Displays the currently running configuration. • Use this command to verify MIB persistence configuration.

Configuring Event MIB

Event MIB can be configured using SNMP directly. In this procedure, the Event MIB is configured to monitor the delta values of ifInOctets for all interfaces once per minute. If any of the samples exceed the specified threshold, a trap notification will be sent.

However, in the Cisco IOS Release 12.4(20)T, the Event MIB feature is enhanced to add CLIs to configure events, event action, and trigger.

This section contains the following tasks to configure Event MIB:

- Configuring Scalar Variables, page 42
- Configuring Event MIB Object List, page 43
- Configuring Event, page 44
- Configuring Event Action, page 45
- Configuring Event Trigger, page 47
- Configuring Existence Trigger Test, page 49
- Configuring Boolean Trigger Test, page 50
- Configuring Threshold Trigger Test, page 52

Configuring Scalar Variables

Perform this task to configure scalar variables for Event MIB.

Prerequisites

To configure the scalar variables for Event MIB, you should be familiar with the Event MIB scalar variables.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp mib event sample minimum** *value*
4. **snmp mib event sample instance maximum** *value*
5. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**`enable`** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**`configure terminal`** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**`snmp mib event sample minimum`** *`value`* **Example:** `Router(config)# snmp mib event sample minimum 10`	Sets the minimum value for object sampling.
Step 4	**`snmp mib event sample instance maximum`** *`value`* **Example:** `Router(config)# snmp mib event sample instance maximum 50`	Sets the maximum value for object instance sampling.
Step 5	**`exit`** **Example:** `Router(config)# exit`	Exits global configuration mode.

Configuring Event MIB Object List

To configure Event MIB, you need to set up a list of objects that can be added to notifications according to trigger, trigger test, or the event.

Prerequisites

To configure the Event MIB object list, you should be familiar with the Event MIB objects and object identifiers, which can be added to notifications according to event, trigger, or the trigger test.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp mib event object list owner** *object-list-owner* **name** *object-list-name* **number** *object-number*
4. **object id** *object-identifier*
5. **wildcard**
6. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp mib event object list owner** *object-list-owner* **name** *object-list-name* **number** *object-number* **Example:** `Router(config)# snmp mib event object list owner john name objectA number 10`	Configures the Event MIB object list.
Step 4	**object id** *object-identifier* **Example:** `Router(config-event-objlist)# object id ifInOctets`	Specifies the object identifier for the object configured for the event.
Step 5	**wildcard** **Example:** `Router(config-event-objlist)# wildcard`	(Optional) Starts a wildcarded search for object identifiers. By specifying a partial object identifier, you can obtain a list of object identifiers.
Step 6	**exit** **Example:** `Router(config-event-objlist)# exit`	Exits object list configuration mode.

Configuring Event

Perform this task to configure a management event.

Prerequisites

To configure a management event, you should be familiar with the SNMP MIB events and object identifiers.

SUMMARY STEPS

1. **enable**
2. **config terminal**
3. **snmp mib event owner** *event-owner* **name** *event-name*
4. **description** *event-description*

5. **object id** *object-identifier*
6. **enable**
7. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp mib event owner** *event-owner* **name** *event-name* **Example:** `Router(config)# snmp mib event owner john event EventA`	Enters the event configuration mode.
Step 4	**description** *event-description* **Example:** `Router(config-event)# description eventA is an RMON event.`	Describes the function and use of the event.
Step 5	**object id** *object-identifier* **Example:** `Router(config-event)# object id ifInOctets`	Specifies the object identifier of the object. **Note** When the event action information is set to **notification**, the object identifier specifies the notification type to be sent out. If the event action information is configured as **set**, the object identifier identifies the object to be set.
Step 6	**enable** **Example:** `Router(config-event)# enable`	Enables the event. **Note** The event can be executed during an event trigger only if it is enabled.
Step 7	**exit** **Example:** `Router(config-event)# exit`	Exits event configuration mode.

Configuring Event Action

By configuring an event action, you can define the actions that an application can perform during an event trigger. The actions for an event include sending a notification, setting a MIB object and so on. You can set the event action information to either **set** or **notification**. The actions for the event can be configured only in the event configuration mode.

The following sections contain the tasks to configure event action:

- Configuring Action Notification, page 46
- Configuring Action Set, page 46

Configuring Action Notification

Perform this task to set the notification action for the event.

SUMMARY STEPS

1. **action notification**
2. **object** *object-id*
3. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**action notification** **Example:** `Router(config-event)# action notification`	Sets the notification action for an event. **Note** If the event action is set to notification, a notification is generated whenever an object associated with an event is modified.
Step 2	**object** *object-id* **Example:** `Router(config-event-action-notification)# object ifInOctets`	Configures object for action notification. When the object specified is modified, a notification will be sent to the host system.
Step 3	**exit** **Example:** `Router(config-event-action-notification)# exit`	Exits action notification configuration mode.

Configuring Action Set

Perform this task to set actions for an event.

SUMMARY STEPS

1. **action set**
2. **object wildcard**
3. **value** *integer-value*
4. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**`action set`** **Example:** `Router(config-event)# action set`	Enters action set configuration mode.
Step 2	**`object wildcard`** **Example:** `Router(config-event-action-set)# object wildcard`	Enables wildcarded search for the objects based on the object identifiers assigned to each object.
Step 3	**`value`** *`integer-value`* **Example:** `Router(config-event-action-set)# value 10`	Sets a value for the object.
Step 4	**`exit`** **Example:** `Router(config-event-action-set)# exit`	Exits action set configuration mode.

Configuring Event Trigger

By configuring an event trigger, you can list the objects to monitor, and associate each trigger to an event.

Perform this task to configure an event trigger.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp mib event trigger owner** *trigger-owner* **name** *trigger-name*
4. **description** *trigger-description*
5. **frequency** *seconds*
6. **object list owner** *object-list-owner* **name** *object-list-name*
7. **object id** *object-identifier*
8. **wildcard**
9. **sample** [**absolute**] [**delta**] [**changed**]
10. **enable**
11. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp mib event trigger owner** *trigger-owner* **name** *trigger-name* **Example:** `Router(config)# snmp mib event trigger owner john name EventTriggerA`	Enables event trigger configuration mode for the specified event trigger.
Step 4	**description** *trigger-description* **Example:** `Router(config-event-trigger)# description EventTriggerA is an RMON alarm.`	Describes the function and use of the event trigger.
Step 5	**frequency** *seconds* **Example:** `Router(config-event-trigger)# frequency 120`	Configures the waiting time (number of seconds) between trigger samples.
Step 6	**object list owner** *object-list-owner* **name** *object-list-name* **Example:** `Router(config-event-trigger)# object list owner john name ObjectListA`	Specifies the list of objects that can be added to notifications.
Step 7	**object id** *object-identifier* **Example:** `Router(config-event-trigger)# object id ifInOctets`	Configures object identifiers for an event trigger.
Step 8	**wildcard** **Example:** `Router(config-event-trigger)# wildcard`	(Optional) Enables wildcarded search for the object.

	Command or Action	Purpose
Step 9	**sample**[**absolute**][**delta**][**changed**] **Example:** `Router(config-event-trigger)# sample absolute`	Enables the specified sampling method for the object. This example uses the absolute sampling method. You can specify any of the three sampling methods; absolute, delta, and changed. • Absolute sampling—Uses the value of the MIB object during sampling. • Delta sampling—Considers the last sampling value maintained in the application. Delta sampling requires the applications to do continuous sampling. • Changed sampling—Uses the changed value of the object since the last sample.
Step 10	**enable** **Example:** `Router(config-event-trigger)# enable`	Enables the event trigger.
Step 11	**exit** **Example:** `Router(config-event-trigger)# exit`	Exits event trigger configuration mode.

Configuring Existence Trigger Test

Perform this task to configure trigger parameters for the test existence trigger type.

You should configure this trigger type in the event trigger configuration mode.

SUMMARY STEPS

1. **test existence**
2. **object list owner** *object-list-owner* **name** *object-list-name*
3. **event owner** *event-owner* **name** *event-name*
4. **type** [**present**] [**absent**] [**changed**]
5. **startup** [**present**] [**absent**]
6. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**test existence** **Example:** `Router(config-event-trigger)# test existence`	Enables test existence configuration mode.
Step 2	**event owner** *event-owner* **name** *event-name* **Example:** `Router(config-event-trigger-existence)# event owner John name EventA`	Configures event for existence trigger test.
Step 3	**object list owner** *object-list-owner* **name** *object-list-name* **Example:** `Router(config-event-trigger-existence)# object list owner John name ObjectListA`	Configures the list of objects for Existence trigger test.
Step 4	**type** [**present**][**absent**][**changed**] **Example:** `Router(config-event-trigger-existence)# type present`	Performs the specified type of existence test. This example uses the present test type. There are three types of existence tests; present, absent and changed. • Present—Setting type to present tests if the objects that appear during the event trigger exist. • Absent—Setting type to absent tests if the objects that disappear during the event trigger exist. • Changed—Setting type to changed tests if the objects that changed during the event trigger exist.
Step 5	**startup** [**present**][**absent**] **Example:** `Router(config-event-trigger-existence)# startup present`	Triggers an event if the test is performed successfully.
Step 6	**exit** **Example:** `Router(config-event-trigger-existence)# exit`	Exits existence trigger test configuration mode.

Configuring Boolean Trigger Test

Perform this task to configure trigger parameters for Boolean trigger type. You should configure this trigger test in the event trigger configuration mode.

SUMMARY STEPS

1. **test boolean**
2. **comparison** [**unequal** |**equal** | **less** | **lessOrEqual** | **greater** | **greaterOrEqual**]

3. **object list owner** *object-list-owner* **name** *object-list-name*
4. **event owner** *event-owner* **name** *event-name*
5. **value** *integer-value*
6. **startup**
7. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**test boolean** **Example:** `Router(config-event-trigger)# test boolean`	Enables Boolean trigger test configuration mode.
Step 2	**comparison** [**unequal** | **equal** | **less** | **lessOrEqual** | **greater** | **greaterOrEqual**] **Example:** `Router(config-event-trigger-boolean)# comparison unequal`	Performs the specified Boolean comparison test. The value for the Boolean comparison test can be set to unequal, equal, less, lessOrEqual, greater, or greaterOrEqual.
Step 3	**value** *integer-value* **Example:** `Router(config-event-trigger-boolean)# value 10`	Sets a value for the Boolean trigger test.
Step 4	**object list owner** *object-list-owner* **name** *object-list-name* **Example:** `Router(config-event-trigger-boolean)# object list owner John name ObjectListA`	Configures the list of objects for Boolean trigger test.
Step 5	**event owner** *event-owner* **name** *event-name* **Example:** `Router(config-event-trigger-boolean)# event owner John name EventA`	Configures event for the Boolean trigger type.
Step 6	**startup** **Example:** `Router(config-event-trigger-boolean)# startup`	Triggers an event if the test is performed successfully.
Step 7	**exit** **Example:** `Router(config-event-trigger-boolean)# exit`	Exits Boolean trigger test configuration mode.

Configuring Threshold Trigger Test

Perform this task to configure trigger parameters for the threshold trigger test. You should configure this trigger test in the event trigger configuration mode.

SUMMARY STEPS

1. **test threshold**
2. **object list owner** *object-list-owner* **name** *object-list-name*
3. **rising** *integer-value*
4. **rising event owner** *event-owner* **name** *event-name*
5. **falling** *integer-value*
6. **falling event owner** *event-owner* **name** *event-name*
7. **delta rising** *integer-value*
8. **delta rising event owner** *event-owner* **name** *event-name*
9. **delta falling** *integer-value*
10. **delta falling event owner** *event-owner* **name** *event-name*
11. **startup** [**rising|falling|rising-or-falling**]
12. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**`test threshold`** **Example:** `Router(config-event-trigger)# test threshold`	Enables threshold trigger test configuration mode.
Step 2	**`object list owner`** *`object-list-owner`* **`name`** *`object-list-name`* **Example:** `Router(config-event-trigger-threshold)# object list owner John name ObjectListA`	Configures the list of objects for threshold trigger test.
Step 3	**`rising`** *`integer-value`* **Example:** `Router(config-event-trigger-threshold)# rising 100`	Sets the rising threshold to the specified value.
Step 4	**`rising event owner`** *`event-owner`* **`name`** *`event-name`* **Example:** `Router(config-event-trigger-threshold)# rising event owner John name EventA`	Configures event for Threshold trigger test for rising threshold.

	Command or Action	Purpose
Step 5	**falling** *integer-value* **Example:** `Router(config-event-trigger-threshold)# falling 50`	Sets the falling threshold to the specified value.
Step 6	**falling event owner** *event-owner* **name** *event-name* **Example:** `Router(config-event-trigger-threshold)# falling event owner Jane name EventB`	Configures event for Threshold trigger test for falling threshold.
Step 7	**delta rising** *integer-value* **Example:** `Router(config-event-trigger-threshold)# delta rising 30`	Sets the delta rising threshold to the specified value when the sampling method specified for the event trigger is delta.
Step 8	**delta rising event owner** *event-owner* **name** *event-name* **Example:** `Router(config-event-trigger-threshold)# delta rising event owner Jack name EventC`	Configures event for Threshold trigger test for delta rising threshold.
Step 9	**delta falling** *integer-value* **Example:** `Router(config-event-trigger-threshold)# delta falling 10`	Sets the delta falling threshold to the specified value when the sampling method specified for the event trigger is delta.
Step 10	**delta falling event owner** *event-owner* **name** *event-name* **Example:** `Router(config-event-trigger-threshold)# delta falling event owner John name EventAA`	Configures event for Threshold target test for delta falling threshold.
Step 11	**startup** [**rising**|**falling**|**rising-or-falling**] **Example:** `Router(config-event-trigger-threshold)# startup rising`	Triggers an event when the threshold trigger test conditions are met.
Step 12	**exit** **Example:** `Router(config-event-trigger-threshold)# exit`	Exits threshold trigger test configuration mode.

Configuring Expression MIB

Expression MIB can be configured using SNMP directly. However, in the Cisco IOS Release 12.4(20)T, Expression MIB feature is enhanced to add CLIs to configure expressions. You should be familiar with expressions, object identifiers and sampling methods before configuring Expression MIB.

The following sections contain the tasks to configure Expression MIB:

- Configuring Expression MIB Scalar Objects, page 54
- Configuring Expressions, page 55

Configuring Expression MIB Scalar Objects

Expression MIB has the following scalar objects:

- expResourceDeltaMinimum
- expResourceDeltaWildcardInstanceMaximum

Perform this task to configure Expression MIB scalar objects.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp mib expression delta minimum** *seconds*
4. **snmp mib expression delta wildcard maximum** *number-of-instances*
5. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp mib expression delta minimum** *seconds* **Example:** `Router(config)# snmp mib expression delta minimum 20`	(Optional) Sets the minimum delta interval in seconds. **Note** Application may use larger values for this minimum delta interval to lower the impact of constantly computing deltas. For larger delta sampling intervals, the application samples less often and has less overhead. By using this command, you can enforce a lower overhead for all expressions created after the delta interval is set.
Step 4	**snmp mib expression delta wildcard maximum** *number-of-instances* **Example:** `Router(config)# snmp mib expression delta maximum 120`	(Optional) Limits the maximum number of dynamic instance entries for wildcarded delta objects in expressions. For a given delta expression, the number of dynamic instances is the number of values that meet all criteria to exist, times the number of delta values in the expression. There is no preset limit for the instance entries and it is dynamic based on a system's resources.
Step 5	**exit** **Example:** `Router(config)# exit`	Exits global configuration mode.

Configuring Expressions

Perform this task to configure an expression.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **snmp mib expression owner** *expression-owner* **name** *expression-name*
4. **description** *expression-description*
5. **expression** *expression*
6. **delta interval** *seconds*
7. **value type** [**counter32** | **unsigned32** | **timeticks** | **integer32** | **ipaddress** | **octetstring** | **objectid** | **counter64**]
8. **enable**
9. **object** *object-number* **id** *object-identifier*

10. **wildcard**
11. **prefix object** *object-id*
12. **discontinuity object** *discontinuity-object-id* [**wildcard**] [**type timeticks** | **timestamp** | **date-and-time**]
13. **conditional object** *conditional-object-id*
14. **sample** [**absolute**] [**delta**] [**changed**]
15. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**snmp mib expression owner** *expression-owner* **name** *expression-name* **Example:** `Router(config-expression)# snmp mib expression owner John name ExpA`	Enables the expression to be configured.
Step 4	**description** *expression-description* **Example:** `Router(config-expression)# description this expression is created for the sysLocation MIB object`	Configures description for expression.
Step 5	**expression** *expression* **Example:** `Router(config-expression)# expression ($1+$2)*800/$3`	Configures the expression to be evaluated. **Note** The expression are in ANSI C syntax. However, the variables in an expression are defined as combination of the dollar sign ($) and an integer that corresponds to the object number of the object used in evaluating the expression.
Step 6	**delta interval** *seconds* **Example:** `Router(config-expression)# delta interval 180`	Configures the sampling interval for objects in the expression if the sampling method is delta.
Step 7	**value type** [**counter32** | **unsigned32** | **timeticks** | **integer32** |**ipaddress** | **octetstring** | **objectid** | **counter64**] **Example:** `Router(config-expression)# value type`	Sets the specified value type for expression.

	Command or Action	Purpose
Step 8	**enable** **Example:** `Router(config-expression)# enable`	Enables expression for evaluation.
Step 9	**object** *object-number* **id** *object-identifier* **Example:** `Router(config-expression)# object 2 id ifInOctets`	Configures the objects that are used for evaluating an expression. The object number is used to associate the object with the variables in the Expression. The variable corresponding to the object is $ and the object number. Thus the variable in the example used here corresponds to $10.
Step 10	**wildcard** **Example:** `Router(config-expression-object)# wildcard`	(Optional) Enables wildcarded search for objects used in evaluating expression.
Step 11	**prefix object** *object-id* **Example:** `Router(config-expression-object)# prefix object 0.2.2`	(Optional) Sets an object prefix. The prefix object assists an application in determining the instance indexing to use while evaluating expression.
Step 12	**discontinuity object** *discontinuity-object-id* [**wildcard**][**type timeticks** |**timestamp** | **date-and-time**] **Example:** `Router(config-expression-object)# discontinuity object sysUpTime`	(Optional) Configures the discontinuity properties for the object if the object sampling type is set to delta or changed. The discontinuity object ID supports normal checking for a discontinuity in a counter. • Using the wildcard keyword, you can enable wildcarded search for the objects with discontinuity properties. • Using the type keyword, you can set value for objects with discontinuity properties.
Step 13	**conditional object** *conditional-object-id* **[wildcard]** **Example:** `Router(config-expression-object)# conditional object mib-2.90.1.3.1.1.2.3.112.99.110.4.101.120.112.53`	(Optional) Configures the conditional object identifier. • Using the wildcard keyword, you can enable wildcarded search for the conditional objects with discontinuity properties.

	Command or Action	Purpose
Step 14	**sample** [**absolute**] [**delta**] [**changed**] **Example:** `Router(config-expression-object)# sample delta`	Enables the specified sampling method for the object. This example uses the delta sampling method. You can set any of the three sampling methods; absolute, delta, and changed. • Absolute sampling—Uses the value of the MIB object during sampling. • Delta sampling—Uses the last sampling value maintained in the application. This method requires the applications to do continuous sampling. • Changed sampling—Uses the changed value of the object since the last sample.
Step 15	**exit** **Example:** `Router(config-expression-object)# exit`	Exits expression object configuration mode.

Configuration Examples for SNMP Support

This section provides the following configuration examples:

Configuring SNMPv1, SNMPv2c, and SNMPv3: Example

The following example shows how to enable SNMPv1, SNMPv2c, and SNMPv3. The configuration permits any SNMP manager to access all objects with read-only permissions using the community string named public. This configuration does not cause the router to send traps.

```
snmp-server community public
```

The following example shows how to permit SNMP access to all objects with read-only permission using the community string named public. The router also will send ISDN traps to the hosts 172.16.1.111 and 172.16.1.33 using SNMPv1 and to the host 172.16.1.27 using SNMPv2c. The community string named public is sent with the traps.

```
snmp-server community public
snmp-server enable traps isdn
snmp-server host 172.16.1.27 version 2c public
snmp-server host 172.16.1.111 version 1 public
snmp-server host 172.16.1.33 public
```

The following example shows how to allow read-only access for all objects to members of access list 4 that specify the comaccess community string. No other SNMP managers have access to any objects. SNMP Authentication Failure traps are sent by SNMPv2c to the host host3.com using the community string named public.

```
snmp-server community comaccess ro 4
snmp-server enable traps snmp authentication
snmp-server host host3.com version 2c public
```

The following example shows how to send Entity MIB inform notifications to the host host3.com. The community string is restricted. The first line enables the router to send Entity MIB notifications in addition to any traps or informs previously enabled. The second line specifies that the notifications should be sent as informs, specifies the destination of these informs, and overwrites previous **snmp-server host** commands for the host host3.com.

```
snmp-server enable traps entity
snmp-server host informs host3.com restricted entity
```

The following example shows how to send the SNMP and Cisco environmental monitor enterprise-specific traps to address 172.30.2.160:

```
snmp-server enable traps
snmp-server host 172.30.2.160 public snmp envmon
```

The following example shows how to enable the router to send all traps to the host myhost.host3.com using the community string public:

```
snmp-server enable traps
snmp-server host myhost.host3.com public
```

The following example shows a configuration in which no traps are sent to a host. The BGP traps are enabled for all hosts, but only the ISDN traps are enabled to be sent to a host.

```
snmp-server enable traps bgp
snmp-server host bob public isdn
```

The following example shows how to enable a router to send all informs to the host myhost.host3.com using the community string named public:

```
snmp-server enable traps
snmp-server host myhost.host3.com informs version 2c public
```

In the following example, the SNMP manager is enabled and the session timeout is set to a value greater than the default:

```
snmp-server manager
snmp-server manager session-timeout 1000
```

Configuring IfAlias Long Name Support: Example

In the following example a long description is applied to the Ethernet interface in slot 1, port adapter 0, and port 0:

```
Router# configure terminal
Router(config)# interface Ethernet1/0/0
Router(config-if)# description ethernet1/0/0 this is a test of a description that exceeds
64 characters in length
Router(config-if)# ip address 192.168.134.55 255.255.255.0
Router(config-if)# no ip directed-broadcast
Router(config-if)# no ip route-cache distributed
```

Assuming that ifAlias long name support is not yet enabled (the default), the following example shows the results of a mibwalk operation from an NMS:

```
***** SNMP QUERY STARTED *****
 .
 .
 .
 ifXEntry.18.10 (octets) (zero-length)
 ifXEntry.18.11 (octets) ethernet1/0/0 this is a test of a description that exceeds 64 ch
 ifXEntry.18.12 (octets) (zero-length)
 .
 .
 .
```

The following output shows the description that is displayed at the CLI:

```
Router# show interface Ethernet0/0/0

Ethernet1/0/0 is administratively down, line protocol is down
  Hardware is Lance, address is 0010.7b4d.7046 (bia 0010.7b4d.7046)
  Description: ethernet1/0/0 this is a test of a description that exceeds 64 chh
  MTU 1500 bytes, BW 10000 Kbit, DLY 1000 usec,
     reliability 252/255, txload 1/255, rxload 1/255
 .
 .
 .
```

In the following example, ifAlias long name support is enabled and the description is displayed again:

```
Router(config)# snmp ifmib ifalias long
Router(config)# interface Ethernet1/0/0
Router(config-if)# description ethernet1/0/0 this is a test of a description that exceeds
64 characters in length
Router(config)# end
Router# show interface Ethernet1/0/0

Ethernet1/0/0 is administratively down, line protocol is down
  Hardware is Lance, address is 0010.7b4d.7046 (bia 0010.7b4d.7046)
  Description: ethernet1/0/0 this is a test of a description that exceeds 64 characters in
length
  MTU 1500 bytes, BW 10000 Kbit, DLY 1000 usec,
     reliability 252/255, txload 1/255, rxload 1/255
 .
 .
 .
***** SNMP QUERY STARTED *****
 .
 .
 .
 ifXEntry.18.10 (octets) (zero-length)
 ifXEntry.18.11 (octets) ethernet1/0/0 this is a test of a description that exceeds 64
characters in length
 ifXEntry.18.12 (octets) (zero-length)
 .
 .
 .
```

Configuring SNMP Support for VPNs: Example

In the following example all SNMP notifications are sent to xyz.com over the VRF named trap-vrf:

```
Router(config)# snmp-server host xyz.com vrf trap-vrf
```

In the following example the VRF named "traps-vrf" is configured for the remote server 172.16.20.3:

```
Router(config)# snmp-server engineID remote 172.16.20.3 vrf traps-vrf
80000009030000B064EFE100
```

Enabling Event MIB Persistence: Example

The following example shows how to enable Event MIB Persistence using the **snmp mib persist event** command in global configuration mode:

```
Router(config)# snmp mib persist event
Router# write mib-data
```

Enabling Expression MIB Persistence: Example

The following example shows how to enable Expression MIB Persistence using the **snmp mib persist expression** command in global configuration mode:

```
Router(config)# snmp mib persist expression
Router# write mib-data
```

Configuring Event MIB: Example

The following example shows how to configure scalar variables for an event:

```
Router# configure terminal
Router(config)# snmp mib event sample minimum 10
Router(config)# snmp mib event sample instance maximum 50
Router(config)# exit
```

The following example shows how to configure object list for an event:

```
Router# configure terminal
Router(config)# snmp mib event object list owner john name objectA number 1
Router(config-event-objlist)# object id ifInOctets
Router(config-event-objlist)# wildcard
Router(config-event-objlist)# exit
```

The following example shows how to configure an event:

```
Router# configure terminal
Router(config)# snmp mib event owner john event EventA
Router(config-event)# description eventA is an RMON event.
Router(config-event)# object id ifInOctets
Router(config-event)# enable
Router(config-event)# exit
```

The following example shows how to set the notification action for an event:

```
Router#(config-event)# action notification
Router(config-event-action-notification)# object id ifInOctets
Router(config-event-action-notification)# exit
```

The following example shows how to set actions for an event:

```
Router#(config-event)# action set
Router#(config-event-action-set)# object wildcard
Router#(config-event-action-set)# value 10
Router(config-event-action-set)# exit
```

The following example shows how to configure trigger for an event:

```
Router# configure terminal
Router(config)# snmp mib event trigger owner john name EventTriggerA
Router(config-event-trigger)# description EventTriggerA is an RMON alarm.
Router(config-event-trigger)# frequency 120
Router(config-event-trigger)# object list owner john name ObjectListA
Router(config-event-trigger)# object id ifInOctets
Router(config-event-trigger)# wildcard
Router(config-event-trigger)# sample absolute
Router(config-event-trigger)# enable
Router(config-event-trigger)# exit
```

The following example shows how to configure existence trigger test:

```
Router(config-event-trigger)# test existence
Router(config-event-trigger-existence)# event owner John name EventA
Router(config-event-trigger-existence)# object list owner John name ObjectListA
Router(config-event-trigger-existence)# type present
Router(config-event-trigger-existence)# startup present
Router(config-event-trigger-existence)# exit
```

The following example shows how to configure Boolean trigger test:

```
Router(config-event-trigger)# test boolean
Router(config-event-trigger-boolean)# event owner John name EventA
Router(config-event-trigger-boolean)# object list owner John name ObjectListA
Router(config-event-trigger-boolean)# comparison unequal
Router(config-event-trigger-boolean)# value 10
Router(config-event-trigger-boolean)# startup
Router(config-event-trigger-boolean)# exit
```

The following example shows how to configure threshold trigger test:

```
Router(config-event-trigger)# test threshold
Router(config-event-trigger-threshold)# object list owner John name ObjectListA
Router(config-event-trigger-threshold)# rising 100
Router(config-event-trigger-threshold)# rising event owner John name EventA
Router(config-event-trigger-threshold)# falling 50
Router(config-event-trigger-threshold)# falling event owner Jane name EventA
Router(config-event-trigger-threshold)# delta rising 30
Router(config-event-trigger-threshold)# delta rising event owner Jack name EventA
Router(config-event-trigger-threshold)# delta falling 10
Router(config-event-trigger-threshold)# delta falling event owner John name EventA
Router(config-event-trigger-threshold)# startup rising
Router(config-event-trigger-threshold)# exit
```

Configuring Expression MIB: Example

The following example shows how to configure Expression MIB using the **snmp mib expression** command in global configuration mode:

```
Router(config)# snmp mib expression owner pcn name exp6
Router(config-expression)# expression ($1+$2)*800/$3
Router(config-expression)# delta interval 120
Router(config-expression)# enable
Router(config-expression)# object 2 id ifInOctets
Router(config-expression-object)# wildcard
Router(config-expression-object)# sample delta
Router(config-expression-object)# conditional object
mib-2.90.1.3.1.1.2.3.112.99.110.4.101.120.112.53 wildcard
Router(config-expression-object)# object 2 id ifOutOctets
Router(config-expression-object)# wildcard
Router(config-expression-object)# sample delta
Router(config-expression-object)# exit
```

Additional References

The following sections provide references related to configuring SNMP support.

Related Documents

Related Topic	Document Title
SNMP commands: complete command syntax, command mode, command history, defaults, usage guidelines, and examples	*Cisco IOS Network Management Command Reference*
Cisco IOS implementation of RFC 1724, RIP Version 2 MIB Extensions	*RIPv2 Monitoring with SNMP Using the RFC 1724 MIB Extensions* feature module
DSP Operational State Notifications for notifications to be generated when a digital signaling processor (DSP) is used	*DSP Operational State Notifications* feature module

Standards

Standard	Title
CBC-DES (DES-56) standard	*Symmetric Encryption Protocol*
STD: 58	*Structure of Management Information Version 2 (SMIv2)*

MIBs

MIB	MIBs Link
• Circuit Interface Identification MIB • Cisco SNMPv2 • Ethernet-like Interfaces MIB • Event MIB • Expression MIB Support for Delta, Wildcarding, and Aggregation • Interfaces Group MIB (IF-MIB) • Interfaces Group MIB Enhancements • MIB Enhancements for Universal Gateways and Access Servers • MSDP MIB • NTP MIB • Response Time Monitor MIB	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
RFC 1067	*A Simple Network Management Protocol*
RFC 1091	*Telnet terminal-type option*
RFC 1098	*Simple Network Management Protocol (SNMP)*
RFC 1157	*Simple Network Management Protocol (SNMP)*
RFC 1213	*Management Information Base for Network Management of TCP/IP-based internets:MIB-II*
RFC 1215	*Convention for defining traps for use with the SNMP*
RFC 1901	*Introduction to Community-based SNMPv2*
RFC 1905	*Common Management Information Services and Protocol over TCP/IP (CMOT)*
RFC 1906	*Telnet X Display Location Option*
RFC 1908	*Simple Network Management Protocol (SNMP)*
RFC 2104	*HMAC: Keyed-Hashing for Message Authentication*
RFC 2206	*RSVP Management Information Base using SMIv2*
RFC 2213	*Integrated Services Management Information Base using SMIv2*
RFC 2214	*Integrated Services Management Information Base Guaranteed Service Extensions using SMIv2*
RFC 2271	*An Architecture for Describing SNMP Management Frameworks*
RFC 2570	*Introduction to Version 3 of the Internet-standard Network Management Framework*

RFC	Title
RFC 2578	*Structure of Management Information Version 2 (SMIv2)*
RFC 2579	*Textual Conventions for SMIv2*
RFC 2580	*Conformance Statements for SMIv2*
RFC 2981	*Event MIB*
RFC 2982	*Distributed Management Expression MIB*
RFC 3413	*SNMPv3 Applications*
RFC 3415	*View-based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP)*

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/techsupport

Command References

The following commands are introduced or modified in the feature or features documented in this module. For information about these commands, see the *Cisco IOS Network Management Command Reference* at http://www.cisco.com/en/US/docs/ios/netmgmt/command/reference/nm_book.html. For information about all Cisco IOS commands, use the Command Lookup Tool at http://tools.cisco.com/Support/CLILookup or the *Cisco IOS Master Command List, All Releases*, at http://www.cisco.com/en/US/docs/ios/mcl/allreleasemcl/all_book.html.

- **action notification**
- **action set**
- **comparison**
- **conditional object**
- **debug snmp detail**
- **delta falling event owner**
- **delta falling**
- **delta interval**
- **delta rising event owner**

- **delta rising**
- **description (event)**
- **description (expression)**
- **description (trigger)**
- **discontinuity object**
- **enable (event)**
- **enable (expression)**
- **event owner**
- **expression**
- **falling (threshold trigger test)**
- **falling event owner**
- **frequency (event trigger)**
- **object (expression)**
- **object id (action notification)**
- **object id (action set)**
- **object id (event trigger)**
- **object list (test existence)**
- **object list (test boolean)**
- **object list (test threshold)**
- **object wildcard**
- **rising (threshold trigger test)**
- **rising event owner**
- **sample (event-trigger)**
- **sample (expression)**
- **show snmp stats OID**
- **snmp mib event object list**
- **snmp mib event owner**
- **snmp mib event sample instance maximum**
- **snmp mib event sample minimum**
- **snmp mib event trigger**
- **snmp mib expression delta minimum**
- **snmp mib expression delta wildcard maximum**
- **snmp mib expression owner**
- **startup (test existence)**
- **startup (test boolean)**
- **startup (test threshold)**
- **test boolean**
- **test existence**

- **test threshold**
- **type (event trigger)**
- **value (event)**
- **value (action set)**
- **value type**
- **wildcard (event)**
- **wildcard (expression)**

Feature Information for Configuring SNMP Support

Table 2 lists the features in this module and provides links to specific configuration information. Only features that were introduced or modified in Cisco IOS Release 12.(1) or a later release appear in the table.

For information about a feature in this technology that is not documented here, see the SNMP Features Roadmap.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS and Catalyst OS software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Note Table 2 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 2 Feature Information for Configuring SNMP Support

Feature Name	Releases	Feature Information
Distributed Management Event and Expression MIB Persistence	12.0(5)T 12.0(12)S 12.1(3)T 12.2(4)T 12.2(4)T3	The MIB Persistence features allow the SNMP data of a MIB to be persistent across reloads; that is, MIB information retains the same set object values each time a networking device reboots. MIB Persistence is enabled by using the **snmp mib persist** command, and the MIB data of all MIBs that have had persistence enabled using this command is then written to NVRAM storage by using the **write mib-data** command. Any modified MIB data must be written to NVRAM memory using the **write mib-data** command. The following sections provide information about this module: • "MIB Persistence" section on page 10 • "Configuring MIB Persistence" section on page 39

Table 2 Feature Information for Configuring SNMP Support (continued)

Feature Name	Releases	Feature Information
Interface Index Display and Interface Alias Long Name Support for SNMP	12.2(2)T	The Interface Index Display for SNMP feature introduces new commands and command modifications that allow advanced users of SNMP to view information about the interface registrations directly on the managed agent. You can display MIB information from the agent without using an external NMS. This feature addresses three objects in the Interfaces MIB: *ifIndex*, *ifAlias*, and *ifName*. For complete definitions of these objects, see the IF-MIB.my file available from the Cisco SNMPv2 MIB website at ftp://ftp.cisco.com/pub/mibs/v2/. The following sections provide information about this feature: • "Detailed Interface Registration Information" section on page 8 • "Configuring Interface Index Display and Interface Indexes and Configuration of Long Name Support" section on page 34
SNMP Notification Logging	12.0(22)S 12.2(13)T	The SNMP Notification Logging feature adds Cisco IOS CLI commands to change the size of the notification log, to set the global ageout value for the log, and to display logging summaries at the command line. The following sections provide information about this feature: • "SNMP Notification Logging" section on page 11 • "Configuring SNMP Notifications" section on page 27
SNMP Support for VPNs	12.0(23)S 12.2(2)T 12.2(33)SXH 12.2(33)SB	The SNMP Support for VPNs feature allows SNMP traps and informs to be sent and received using VRF tables. In particular, this feature adds support to Cisco IOS software for sending and receiving SNMP traps and informs specific to individual VPNs. The following sections provide information about this feature: • "SNMP Support for VPNs" section on page 9 • "Configuring SNMP Support for VPNs" section on page 38
Circuit Interface Identification Persistence for SNMP feature	12.1(3)T	This feature can be used to identify individual circuit-based interfaces for SNMP monitoring. The following section provides information about this feature: • "Circuit Interface Identification Persistence" section on page 11
Circuit Interface Identification MIB	Cisco IOS XE Release 2.1	This feature was introduced on Cisco ASR 1000 Series Routers.
Distributed Management Event MIB Conformance to RFC 2981	Cisco IOS XE Release 2.1	This feature was introduced on Cisco ASR 1000 Series Routers.

Table 2 Feature Information for Configuring SNMP Support (continued)

Feature Name	Releases	Feature Information
SNMP (Simple Network Management Protocol)	Cisco IOS XE Release 2.1	This feature was introduced on Cisco ASR 1000 Series Routers.
SNMP Version 3	Cisco IOS XE Release 2.1	This feature was introduced on Cisco ASR 1000 Series Routers.
SNMPv2C	Cisco IOS XE Release 2.1	This feature was introduced on Cisco ASR 1000 Series Routers.
SNMP Diagnostics	12.4(20)T	The SNMP Diagnostics feature adds Cisco IOS CLI commands to display the object identifiers that are recently requested by the network management system, and to display the SNMP debug messages. The following section provides the list of commands added to this feature: • “Command References” section on page 65
Event MIB and Expression MIB CLIs	12.4(20)T	The CLIs to configure Event MIB and Expression MIB are introduced on Cisco ASR 1000 Series routers. The following section provides information about configuring Event MIB: • “Configuring Event MIB” section on page 42 The following section provides information about configuring Expression MIB: • “Configuring Expression MIB” section on page 54 The following section the list commands used for configuring Event MIB and Expression MIB: • “Command References” section on page 65

Glossary

ifAlias—SNMP Interface Alias. The ifAlias is an object in the Interfaces MIB (IF-MIB). The ifAlias is an alias name for the interface as specified by a network manager that provides a nonvolatile description for the interface. For a complete definition, see the IF-MIB.my file.

ifIndex—SNMP Interface Index. The ifIndex is an object in the Interfaces MIB (IF-MIB). The ifIndex is a unique integer assigned to every interface (including subinterfaces) on the managed system when the interface registers with the IF-MIB. For a complete definition, see the IF-MIB.my file.

OID—MIB object identifier. An object identifier is expressed as a series of integers or text strings. Technically, the numeric form is the *object name* and the text form is the *object descriptor*. In practice, both are called object identifiers, or OIDs. For example, the object name for the interfaces MIB is 1.3.6.1.2.1.2, and the object descriptor is 'iso.internet.mgmt.mib-2.interfaces' but either can be referred to as the OID. An OID can also be expressed as a combination of the two, such as iso.internet.2.1.2.

Note See *Internetworking Terms and Acronyms* for terms not included in this glossary.