Preface

Revised: November 2009, OL-15724-03

This guide describes the implementation of the Simple Network Management Protocol (SNMP) for Cisco Cable Modem Termination System (CMTS) routers.

SNMP provides a set of commands for setting and retrieving the values of operating parameters on the router. Router information is stored in a virtual storage area called a Management Information Base (MIB). The MIB contains objects that describe router components and provides information about the status of these components.

This preface provides an overview of this guide with the following sections:

Document Revision History

The following Revision History tables record technical changes, additions, and corrections to this document. The table shows the release number and document revision number for the change, the date of the change, and a brief summary of the change.

Cisco IOS Release	Cisco RF Switch Firmware Version	Part Number	Publication Date
12.2(33)SCC	3.90	OL-15724-03	November 2009

Description of Changes

- Added the following MIBs in this release:
  - CISCO-CABLE-L2VPN-MIB
  - CISCO-IETF-PW-MIB
  - CISCO-IETF-PW-MPLS-MIB
  - DOCS-IF-M-CMTS-MIB
  - DOCS-LOADBAL3-MIB
  - DOCS-LOADBALANCING-MIB

  - DOCS-MCAST-AUTH-MIB
  - DOCS-SEC-MIB
  - DOCS-SUBMGT3-MIB
  - ENTITY-SENSOR-MIB
  - MPLS-LSR-MIB
  - MPLS-LDP-MIB
  - MPLS-TE-MIB
  - MPLS-TE-STD-MIB
- Updated the following MIBs in this release:
  - CISCO-CABLE-ADMISSION-CTRL-MIB
  - CISCO-CABLE-SPECTRUM-MIB
  - CISCO-CABLE-WIDEBAND-MIB
  - CISCO-ENTITY-SENSOR-MIB
  - DOCS-BPI-PLUS-MIB
  - DOCS-CABLE-DEVICE-MIB
  - DOCS-IF3-MIB
  - DOCS-IF-MIB
  - DOCS-DRF-MIB
  - DOCS-DSG-IF-MIB
  - DOCS-QOS3-MIB
  - DTI-MIB
  - ENTITY-MIB
  - IF-MIB

Cisco IOS Release	Cisco RF Switch Firmware Version	Part Number	Publication Date
12.2(33)SCB	3.90	OL-15724-02	December 2008

Description of Changes

- Added the following MIBs to support DOCSIS 3.0:
  - CLAB-TOPO-MIB
  - DOCS-IF3-MIB
  - DOCS-DIAG-MIB
  - DOCS-DRF-MIB
  - DOCS-QOS3-MIB
  - DOCS-IETF-CABLE-DEVICE-NOTIFICATION-MIB
  - DOCS-IETF-BPI2-MIB
  - DOCS-IETF-QOS-MIB

- Added the following MIBs to support DOCSIS 2.0:
  - DOCS-IFEXT2-MIB
  - DOCS-TEST-MIB

Cisco IOS Release	Cisco RF Switch Firmware Version	Part Number	Publication Date
12.2(33)SCA	3.90	OL-15724-01	February 2008

Description of Changes

- Cisco RF Switch Firmware Version 3.90, installed on Cisco RF Switch, provides the following changes or enhancements to be used with Cisco IOS release 12.3(21)BC through Cisco IOS release 12.2(33)SCA:
  - The updated Firmware version 3.90 resolves the Address Resolution Protocol (ARP) cache handling issue and ensures ARP updates after timeout.
  - Version 3.90 provides enhancement in the telnet server to negotiate with the client regarding the desired settings of the echo mode. The user can set the initial state of the local echoing using the set telnet echo command. However, the telnet server can bypass this and use the client settings if the echo options negotiation is supported.
  - In version 3.90, the Trivial File Transfer Protocol (TFTP) is enhanced to display the number of bytes as transfer progresses.
  - In version 3.90, the command-line interface (CLI) task priority is pushed below that of the network task. From this release, **ping** command has higher priority than an **interface** command.
  - In version 3.90, the command **show version** is modified so that the full cyclic redundancy check (CRC) validation is not done on the flash contents. It now validates only the file header contents. To perform a full CRC check, use the command **show files**.
  - Version 3.90 allows RF Switch to accept passwords that match CLI keywords. In version 3.80, they were not accepted and shown as Invalid Syntax.
  - Version 3.90 updates real-time operating system (RTOS) kernel to be compatible with new IP stack.
- Added a new MIB, DOCS-L2VPN-MIB, in Chapter 3, "MIB Specifications" to support L2VPN support over Cable. The Layer 2 VPN (L2VPN) Support over Cable feature on the Cisco CMTS provides point-to-point Transparent LAN Service (TLS) to support the Business Services over DOCSIS (BSOD) CableLabs specification. Key features of L2VPN support are:
  - Supports point-to-point L2VPN forwarding mode.
  - Supports up-to 4 VPN IDs per cable modem (CM).
  - Supports multiple upstream service flows (SFs) per CM, with one or more SFs belonging to the same VPN ID.
  - Supports a single Ethernet Network System Interface (NSI) that serves as a trunking port for one or more L2VPN tunnels on the Cisco CMTS router.
  - Supports Baseline Privacy Interface Plus (BPI+) encryption using primary Security Association Identifier (SAID) of the CM.
  - Supports L2VPN encodings in the CM configuration file and CM registration (REG-REQ with L2VPN encoding).
  - Supports upstream L2VN tunnel in support of per-CM and per-SF forwarding.

  - Supports synchronization and recovery of the L2VPN database and upstream and downstream SFs during PRE2 NSF/SSO and N+1 line card redundancy switchovers.
  - Supports Quality of Service (QoS) in upstream and downstream.
  - Supports stacked IEEE 802.1q tags.
  - Supports exclusion of traffic from the L2VPN tunnel for a single Embedded Service/Application Functional Entity (eSAFE) host.
  - Supports Layer 2 classifier via Cable Modem Interface Mask (CMIM) and priority.
  - Supports detection of provisioning errors such as duplicate VLAN IDs across CMs or existing VLAN IDs in use and moves a CM offline with a corresponding error message.
  - Supports coexistence of L2VPN and non-L2VPN traffic on the same RF MAC domain, with non-L2VPN traffic isolation from other tunnel traffic.

- Added three new MIBs (CISCO-TAP2-MIB, CISCO-IP-TAP-MIB, and CISCO-802-TAP-MIB) in Chapter 3, "MIB Specifications" to support Service Independent Intercept (SII) on the Cisco CMTS. The SII feature enhances the current Lawful Intercept (LI) capability for the Cisco uBR7246VXR and Cisco uBR10012 Universal Broadband Routers using Simple Network Management Protocol Version 3 (SNMPv3). SII extends this LI capability in Cisco IOS Release 12.2(33)SCA by adding support for CPE-based and CM-based MAC intercepts using SNMPv3. SII is designed to provide data intercepts via SNMPv3, while PacketCable intercepts are designed for voice IP intercepts using a Common Open Policy Service (COPS) interface. Key features of SII feature are:
  - Allows multiple law enforcement agencies (LEAs) to run a lawful intercept on the same target without each other's knowledge.
  - Does not affect subscriber services on the router.
  - Cannot be detected by the target.
  - Allows LEAs to perform lawful intercepts without the knowledge of service providers.
  - Uses SNMPv3 and security features like the View-based Access Control Model (SNMP-VACM-MIB) and User-based Security Model (SNMP-USM-MIB) to restrict access to lawful intercept information and components.
  - Supports intercepts of Layer 3 and Layer 2 traffic.
  - Supports Layer 2 intercepts for upstream and downstream traffic.
  - Hides information about lawful intercepts from all but the most privileged users. An administrator must set up access rights to enable privileged users to access lawful intercept information.
  - Provides two secure interfaces for performing an intercept: one for setting up the wiretap and another for sending the intercepted traffic to the mediation device.
  - Coexists with Packet Intercept (PI). To support Packet Intercept (PI) in a PacketCable environment for voice intercepts, you must enable PacketCable operation on the CMTS and perform any other related PacketCable configurations as required.

Cisco IOS Release	Part Number	Publication Date
12.3(23)BC	OL-4952-08	December 2007

Description of Changes

Cisco IOS Release 12.3(23)BC introduces support for DOCSIS 3.0 Downstream Solution on the Cisco uBR10012 router and Cisco SIP and SPA. The following MIBs are introduced or enhanced further in Cisco IOS Release 12.3(23)BC for DOCSIS 3.0 Downstream Solution on the Cisco CMTS:

- CISCO-CABLE-SPECTRUM-MIB
- CISCO-CABLE-WIDEBAND-MIB
- CISCO-DOCS-EXT-MIB
- DOCS-DSG-IF-MIB
- DOCS-IF-MIB
- DTI-MIB
- DOCS-BPI-PLUS-MIB
- DOCS-CABLE-DEVICE-MIB
- DOCS-CABLE-DEVICE-TRAP-MIB
- ENTITY-MIB
- IF-MIB

Cisco IOS Release	Cisco RF Switch Firmware Version	Part Number	Publication Date
12.3(21)BC	3.80	OL-4952-06	August 2007

Description of Changes

Cisco RF Switch Firmware Version 3.80, installed on the Cisco RF Switch, supports the following changes or enhancements for SNMP MIBs on the Cisco RF Switch, to be used with Cisco IOS release 12.3BC on the Cisco CMTS:

- SNMP MIB get and set variables can be saved to cache in the AdminState MIB module. The SNMP Cache can be disabled or reenabled using the system-level **set snmp cache** firmware command. The setting for this command is stored in non-volatile memory on the Cisco RF Switch.
- Cisco RF Switch Firmware Version 3.80 adds a new MIB object identifier (OID) to control caching on the Cisco CMTS. To control caching in this manner, use the SNMP object nruCacheSnmpData, which is a read/write integer at OID 1.3.6.1.4.1.6804.2.1.1.9.
- Three system-level Cisco RF Switch firmware commands have been introduced or enhanced to reflect these additional caching functions and options:
  - **set snmp cache**
  - **show config**
  - **show module**

Refer to the following document on Cisco.com for additional command information:

- *Release Notes for Cisco RF Switch Firmware, Version 3.92*

http://www.cisco.com/en/US/docs/cable/rfswitch/ubr3x10/release/notes/rfswrn36.html

Cisco IOS Release	Part Number	Publication Date
12.3(21)BC	OL-4952-05	February 2007

Description of Changes

- CISCO-CABLE-WIDEBAND-MIB support on the Cisco uBR10012 universal broadband router. Cisco Wideband Protocol supports downstream wideband channels consisting of multiple bonded RF channels.

  Note CISCO-CABLE-WIDEBAND-MIB support is only on the uBR100012 CMTS router and is a Cisco proprietary MIB that supports the DOCSIS 3.0 standard.

  - Updated the ENTITY-MIB with the new wideband shared port adapter card, SPA-24XWBD-SFP support, OID 1.3.6.1.4.1.9.12.3.1.9.2.145. See Cisco uBR100012 SPA-24XWBD-SFP Shared Port Adapter, page 94 for the shared port adapter physical entities and values in the ENTITY-MIB.
  - Update the IF-MIB for interface wideband management support.
  - Added ccwbFiberNodeTable which provides configuration and topology information for Fiber nodes. See CISCO-CABLE-WIDEBAND-MIB, page 21.
  - Updated Cisco SNMP Notifications, page 3 with wideband cable trap support.
- Enhanced the CISCO-DOCS-EXT-MIB, page 30 with new table objects that can query both CM and CPE information.
- Added tables (docsQosParamSetEntry, docsQosServiceFlowEntry, docsQosServiceFlowStatsEntry, docsQosPHSEntry, docsQosPktClassEntry, docsQosUpstreamStatsEntry) to support SNMP enhancements in the DOCS-QOS-MIB. This enhancement significantly improves QoS MIB query time in a large scale system with much less CPU consumption.
- Enhanced CISCO-CABLE-SPECTRUM-MIB, page 18 with new tables and objects to support the retrieval of spectrum group information using SNMP query.
- Updated Cisco CMTS platform support for unique device identifier (UDI) compliance. Added support for the unique device identifier (UDI) standard which displays information from any Cisco product that has electronically stored identity information. See Overview of the ENTITY-MIB, page 95.
- Updated the CISCO-CABLE-METERING-MIB with the ccmtrCollectionSrcIfIndex object which is used to specify the source interface for billing packets.
- Added the docsIfCmtsChannelUtilizationInterval object to the DOCS-IF-MIB. This object provides operators with a mechanism to evaluate the load/utilization of both upstream and downstream physical channels. This information may be used for capacity planning and incident analysis, and may be particularly helpful in provisioning of high value QOS.
- Added support on the uBR10012and uBR7246VXR router platforms for the CISCO-CABLE-ADMISSION-CTRL-MIB

  Note For detailed information about admission control for Cisco CMTS, go to the following URL: http://www.cisco.com/en/US/docs/cable/cmts/feature/guide/ufg_adm.html

Cisco IOS Release	Part Number	Publication Date
12.3(17a)BC2	OL-4952-04	July 2006

Description of Changes

- Added the DOCS-DSG-IF-MIB, page 77.
- Added cable traps, Cable MIB Notifications, page 20.
- Added section describing the DOSCS-DSG-IF-MIB validation capabilities. See, DOCS-DSG-IF-MIB Validation Requirements, page 41.
- The CISCO-ENHANCED-MEMPOOL-MIB is supported on cable line cards.
- Added cable device traps. SeeCable MIB Notifications, page 20.
- DOCS-IF-MIB, page 73 is updated to draft-ietf-ipcdn-docs-rfmibv2-05.txt.
- IF-MIB, page 101 supports subinterfaces in the ifTable.
- Updated the CISCO-DOCS-EXT-MIB, page 30 for the Dynamic Shared Secret feature.

Cisco IOS Release	Part Number	Publication Date
12.3(17a)BC	OL-4952-03	February 2006

Description of Changes

- Added table (Table 3-2 on page 7) of cable-specific MIBs.
- Updated the following MIBs:
  - CISCO-CLASS-BASED-QOS-MIB—This MIB is now supported on the Cisco uBR10012 router
  - CISCO-DOCS-EXT-MIB—Supports the dynamic shared secret (DMIC) feature which ensures that every online cable modem uses the DOCSIS configuration file assigned to it. This protects against theft-of-service attempts from subscribers and safeguards operators against stolen or fraudulently downloaded configuration files.
  - ENTITY-MIB
  - CISCO-ENTITY-VENDORTYPE-OID-MIB—Updated OIDs.
  - CISCO-ENVMON-MIB
  - CISCO-CABLE-SPECTRUM-MIB notifications. See Cable MIB Notifications, page 20.
  - DOCS-QOS-MIB—MIB object information is updated to support DCC for load balancing.
- Updated Chapter 4, “Monitoring Notifications”—Added the following information:
  - Brief description—What the event indicates
  - Probable cause—What might have caused the notification
  - Recommended action—Recommendation as to what should be done when the particular notification occurs
- Added the usage-based billing support feature to section, Usage-Based Billing, page 36. This feature was introduced on Cisco uBR7246VXR and Cisco uBR10012 universal broadband routers.

Feature support includes the new CISCO-CABLE-METERING-MIB, which contains objects that provide subscriber account and billing information in the Subscriber Account Management Interface Specification (SAMIS) format

For complete documentation about using the Usage-Based Billing feature for Cisco CMTS, go to:

http://www.cisco.com/en/US/docs/cable/cmts/feature/ubrsamis.html

Cisco IOS Release	Part Number	Publication Date
12.3(9a)BC 12.1(20)EC	OL-4952-02	September 2004 (no revision table available).

Audience

This guide is intended for system and network administrators who must configure the Cisco CMTS Router for operation and monitor its performance in the network.

This guide may also be useful for application developers who are developing management applications for the router.

Organization

This guide contains the following chapters:

Chapter	Description
Chapter 1, "Cisco CMTS Router MIB Overview"	Provides background information about SNMP and its implementation on Cisco CMTS routers.
Chapter 2, "Configuring SNMP and MIB Support"	Provides instructions for configuring SNMP management support on the router.
Chapter 3, "MIB Specifications"	Describes each MIB included in the software image. Each description lists any constraints as to how the MIB is implemented on the router.
Chapter 4, "Monitoring Notifications"	Describes the SNMP traps and notifications supported by the router.
Appendix A, "Using Cisco CMTS MIBs"	Describes how to perform common tasks on the router.
Chapter B, "Relationship Between MIB Objects and CLI Show Commands"	Provides a cross-reference between commonly used objects in the MIBs and the related cable-related **show** commands.

Terminology and Definitions

This section discusses conventions and terminology used in this guide.

- Alarm—In SNMP, the word *alarm* is commonly misused to mean the same as a trap (see the Trap definition below). *Alarm* represents a condition which causes an SNMP trap to be generated.

Note Many commands use the word **traps** in the command syntax. Unless there is an option in the command to select either traps or informs, the keyword **traps** refers to traps, informs, or both. Use the **snmp-server host** and **snmp-server enable** *notification* command to specify whether to send SNMP notifications as traps or informs.

- Element Management System (EMS)—An EMS manages a specific portion of the network. For example, the SunNet Manager, an SNMP management application, is used to manage SNMP-manageable elements. Element Managers may manage asynchronous lines, multiplexers, Private Automatic Branch Exchange (PABX), proprietary systems, or an application.
- Inform—Reliable SNMP notifications that are stored in memory until the SNMP manager issues a response. Informs use more system resources than traps. The SNMP Inform mechanism can be used when a reliable fault reporting system is required.
- Lawful Intercept (LI)—The term used to describe the process by which law enforcement agencies conduct electronic surveillance as authorized by judicial or administrative order. Legislation and regulations are increasingly being adopted that require service providers (SPs) to design and implement their networks to explicitly support authorized electronic surveillance.
- Management Information Base (MIB)—The objects that are available in an SNMP-managed device. The information is represented in Abstract Syntax Notation 1 (ASN.1). This is a way of logically grouping data so that it is easily understood by all.
- MIB-II—The successor to MIB-I, which was the original standard SNMP MIB.
- Multiprotocol Label Switching (MPLS)—MPLS is the standardized version of the Cisco original tag-switching proposal. It uses a label-forwarding paradigm (forward packets based on labels).
- Remote Network Monitoring (RMON) MIB—SNMP MIB for remote management of networks. While other MIBs are usually created to support a network device with primary function other than management, RMON was created to provide management of a network. RMON is one of the many SNMP-based MIBs that are of IETF Standards.
- Simple Network Management Protocol (SNMP)—An application layer protocol that allows you to remotely manage networked devices. The *simple* in SNMP is only in contrast to protocols that are thought to be even more complex than SNMP. SNMP consists of the following components: a management protocol, a definition of management information and events, a core set of management information and events, and a mechanism and approach used to manage the use of the protocol including security and access control.
- Synchronous Optical Network (SONET)—A physical layer interface standard for fiber-optic transmission.
- Trap—A device-initiated SNMP notification message. The contents of the message might be simply informational, but it is mostly used to report real-time trap information. Traps can be used in conjunction with other SNMP mechanisms, as in trap-directed polling.
- User Datagram Protocol (UDP)—A connectionless, non-reliable IP-based transport protocol.

Obtaining Documentation and Submitting a Service Request

For information on obtaining documentation, submitting a service request, and gathering additional information, see the monthly *What's New in Cisco Product Documentation*, which also lists all new and revised Cisco technical documentation, at:

http://www.cisco.com/en/US/docs/general/whatsnew/whatsnew.html

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