

Lawful Intercept Architecture

The Lawful Intercept (LI) feature supports service providers in meeting the requirements of law enforcement agencies to provide the ability to intercept Voice-over-Internet protocol (VoIP) or data traffic going through the edge routers. This document explains LI architecture, including Cisco Service Independent Intercept architecture and PacketCable Lawful Intercept architecture. It also describes the components of the LI feature and provides instructions on how to configure the LI feature in your system.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the Feature Information Table at the end of this document.

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

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Hardware Compatibility Matrix for Cisco cBR Series Routers



Note

The hardware components introduced in a given Cisco IOS-XE Release are supported in all subsequent releases unless otherwise specified.

Table 1: Hardware Compatibility Matrix for the Cisco cBR Series Routers

Cisco CMTS Platform	Processor Engine	Interface Cards
Cisco cBR-8 Converged Broadband Router	Cisco IOS-XE Release 3.15.0S and Later Releases	Cisco IOS-XE Release 3.15.0S and Later Releases
	Cisco cBR-8 Supervisor:	Cisco cBR-8 CCAP Line Cards:
	• PID—CBR-CCAP-SUP-160G	• PID—CBR-LC-8D30-16U30
	• PID—CBR-CCAP-SUP-60G ¹	• PID—CBR-LC-8D31-16U30
	• PID—CBR-SUP-8X10G-PIC	• PID—CBR-RF-PIC
		• PID—CBR-RF-PROT-PIC
		Cisco cBR-8 Downstream PHY Modules:
		• PID—CBR-D30-DS-MOD
		• PID—CBR-D31-DS-MOD
		Cisco cBR-8 Upstream PHY Modules:
		• PID—CBR-D30-US-MOD

Effective with Cisco IOS-XE Release 3.17.0S, CBR-CCAP-SUP-60G supports 8 cable line cards. The total traffic rate is limited to 60Gbps, the total number of downstream service flow is limited to 72268, and downstream unicast low-latency flow does not count against the limits.

Prerequisites for Lawful Intercept

Access to the Cisco LI MIB view should be restricted to the mediation device and to system administrators who need to be aware of lawful intercepts on the router. To access the MIB, users must have level-15 access rights on the router.

Communication with Mediation Device

For the router to communicate with the mediation device to execute a lawful intercept, the following configuration requirements must be met:

• The domain name for both the router and the mediation device must be registered in the Domain Name System (DNS).

In DNS, the router IP address is typically the address of the TenGigabitEthernet5/1/0 or TenGigabitEthernet4/1/0 interface (depending on the slot in which the Supervisor is installed) on the router.

• The mediation device must have an access function (AF) and an access function provisioning interface (AFPI).

• You must add the mediation device to the Simple Network Management Protocol (SNMP) user group that has access to the CISCO-TAP2-MIB view. Specify the username of the mediation device as the user to add to the group.

When you add the mediation device as a CISCO-TAP2-MIB user, you can include the mediation device's authorization password if you want. The password must be at least eight characters in length.

Restrictions for Lawful Intercept

General Restrictions

There is no command-line interface (CLI) available to configure LI on the router. All error messages are sent to the mediation device as SNMP notifications. All intercepts are provisioned using SNMPv3 only.

Lawful Intercept MIBs

Only the mediation device and users who need to know about lawful intercepts are allowed to access the LI MIBs.

Due to its sensitive nature, the Cisco LI MIBs are only available in software images that support the LI feature. These MIBs are not accessible through the Network Management Software MIBs Support page (http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml).

SNMP Notifications

SNMP notifications for LI must be sent to User Datagram Protocol (UDP) port 161 on the mediation device, not port 162 (which is the SNMP default). For more information, see the Enabling SNMP Notifications for Lawful Intercept, on page 9.

Information About Lawful Intercept

Introduction to Lawful Intercept

LI is the process by which law enforcement agencies (LEAs) conduct electronic surveillance as authorized by judicial or administrative order. Increasingly, legislation is being adopted and regulations are being enforced that require service providers (SPs) and Internet service providers (ISPs) to implement their networks to explicitly support authorized electronic surveillance. The types of SPs or ISPs that are subject to LI mandates vary greatly from country to country. LI compliance in the United States is specified by the Commission on Accreditation for Law Enforcement Agencies (CALEA).

Cisco supports two architectures for LI: PacketCable and Service Independent Intercept. The LI components by themselves do not ensure customer compliance with applicable regulations but rather provide tools that can be used by SPs and ISPs to construct an LI-compliant network.

Cisco Service Independent Intercept Architecture

The Cisco Service Independent Intercept Architecture Version 3.0 document describes implementation of LI for VoIP networks using the Cisco BTS 10200 Softswitch call agent, version 5.0, in a non-PacketCable

network. Packet Cable Event Message specification version 1.5-I01 is used to deliver the call identifying information along with version 2.0 of the Cisco Tap MIB for call content.

The Cisco Service Independent Intercept Architecture Version 2.0 document describes implementation of LI for VoIP networks using the Cisco BTS 10200 Softswitch call agent, versions 4.4 and 4.5, in a non-PacketCable network. Although not a PacketCable network, PacketCable Event Messages Specification version I08 is still used to deliver call identifying information, along with version 1.0 or version 2.0 of the Cisco Tap MIB for call content. The *Cisco Service Independent Intercept Architecture Version* 2.0 document adds additional functionality for doing data intercepts by both IP address and session ID, which are both supported in version 2.0 of the Cisco Tap MIB (CISCO-TAP2-MIB).

The Cisco Service Independent Intercept Architecture Version 1.0 document describes implementation of LI for VoIP networks that are using the Cisco BTS 10200 Softswitch call agent, versions 3.5 and 4.1, in a non-PacketCable network. Although not a PacketCable network, PacketCable Event Message Specification version I03 is still used to deliver call identifying information, along with version 1.0 of the Cisco Tap MIB (CISCO-TAP-MIB) for call content. Simple data intercepts by IP address are also discussed.

PacketCable Lawful Intercept Architecture

The *PacketCable Lawful Intercept Architecture for BTS Version 5.0* document describes the implementation of LI for VoIP using Cisco BTS 10200 Softswitch call agent, version 5.0, in a PacketCable network that conforms to PacketCable Event Messages Specification version 1.5-I01.

The *PacketCable Lawful Intercept Architecture for BTS Versions 4.4 and 4.5* document describes the implementation of LI for VoIP using Cisco BTS 10200 Softswitch call agent, versions 4.4 and 4.5, in a PacketCable network that conforms to PacketCable Event Messages Specification version I08.

The PacketCable Lawful Intercept Architecture for BTS Versions 3.5 and 4.1 document describes the implementation of LI for voice over IP (VoIP) using Cisco Broadband Telephony Softswitch (BTS) 10200 Softswitch call agent, versions 3.5 and 4.1, in a PacketCable network that conforms to PacketCable Event Message Specification version I03.

The *PacketCable Control Point Discovery Interface Specification* document defines an IP-based protocol that can be used to discover a control point for a given IP address. The control point is the place where Quality of Service (QoS) operations, LI content tapping operations, or other operations may be performed.



Note

The Cisco cBR router does not support PacketCable Communications Assistance for Law Enforcement Act (CALEA).

Cisco cBR Series Routers

The Cisco cBR series router support two types of LI: regular and broadband (per-subscriber). Regular wiretaps are executed on access subinterfaces and physical interfaces. Wiretaps are not required, and are not executed, on internal interfaces. The router determines which type of wiretap to execute based on the interface that the target's traffic is using.

LI on the Cisco cBR series routers can intercept traffic based on a combination of one or more of the following fields:

- Destination IP address and mask (IPv4 or IPv6 address)
- Destination port or destination port range

- Source IP address and mask (IPv4 or IPv6 address)
- Source port or source port range
- Protocol ID
- Type of Service (TOS)
- Virtual routing and forwarding (VRF) name, which is translated to a vrf-tableid value within the router.
- Subscriber (user) connection ID
- · Cable modem
- · MAC address

The LI implementation on the Cisco cBR series routers is provisioned using SNMP3 and supports the following functionality:

- Interception of communication content. The router duplicates each intercepted packet and then places the copy of the packet within a UDP-header encapsulated packet (with a configured CCCid). The router sends the encapsulated packet to the LI mediation device. Even if multiple lawful intercepts are configured on the same data flow, only one copy of the packet is sent to the mediation device. If necessary, the mediation device can duplicate the packet for each LEA.
- Interception of IPv4, IPv4 multicast, IPv6, and IPv6 multicast flows.

LI includes two ways of setting a MAC-based tap:

- On CPE—Only intercepts traffic whose source or destination match the MAC address of the CPE device.
- On CM—Intercepts all of the traffic behind the CM, including the CM traffic itself. This form of intercept might generate a lot of traffic to the mediation device.

VRF Aware LI

VRF Aware LI is the ability to provision a LI wiretap on IPv4 data in a particular Virtual Private Network (VPN). This feature allows a LEA to lawfully intercept targeted data within that VPN. Only IPv4 data within that VPN is subject to the VRF-based LI tap.

VRF Aware LI is available for the following types of traffic:

- ip2ip
- ip2tag (IP to MPLS)
- tag2ip (MPLS to IP)

To provision a VPN-based IPv4 tap, the LI administrative function (running on the mediation device) uses the CISCO-IP-TAP-MIB to identify the name of the VRF table that the targeted VPN uses. The VRF name is used to select the VPN interfaces on which to enable LI in order to execute the tap.

The router determines which traffic to intercept and which mediation device to send the intercepted packets based on the VRF name (along with the source and destination address, source and destination port, and protocol).



Note

When using the Cisco-IP-TAP-MIB, if the VRF name is not specified in the stream entry, the global IP routing table is used by default.

Lawful Intercept- Redundant Mediation Devices

The Cisco cBR Series Converged Broadband Routers supports replicating Lawful Intercept (LI) packets to multiple Mediation Devices (MDs). To use this feature, multiple identical taps are configured. The Cisco cBR Series Converged Broadband Routers support up to two identical taps to replicate to two MDs. Only MAC-and CM-taps are supported with multiple MDs.

For a sample SNMP configuration command set to configure two identical taps to tap to two MDs, see Example: Configuring Lawful Intercept- Redundant Mediation Devices, on page 12.

Lawful Intercept MIBs

Due to its sensitive nature, the Cisco LI MIBs are only available in software images that support the LI feature. These MIBs are not accessible through the Network Management Software MIBs Support page (http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml).

Restricting Access to the Lawful Intercept MIBs

Only the mediation device and users who need to know about lawful intercepts should be allowed to access the LI MIBs. To restrict access to these MIBs, you must:

- 1. Create a view that includes the Cisco LI MIBs.
- **2.** Create an SNMP user group that has read-and-write access to the view. Only users assigned to this user group can access information in the MIBs.
- **3.** Add users to the Cisco LI user groups to define who can access the MIBs and any information related to lawful intercepts. Be sure to add the mediation device as a user in this group; otherwise, the router cannot perform lawful intercepts.

For more information, see the Creating a Restricted SNMP View of Lawful Intercept MIBs module.



Note

Access to the Cisco LI MIB view should be restricted to the mediation device and to system administrators who need to be aware of lawful intercepts on the router. To access the MIB, users must have level-15 access rights on the router.

Service Independent Intercept

Cisco developed the Service Independent Intercept (SII) architecture in response to requirements that support lawful intercept for service provider customers. The SII architecture offers well-defined, open interfaces between the Cisco equipment acting as the content Intercept Access Point (IAP) and the mediation device. The modular nature of the SII architecture allows the service provider to choose the most appropriate mediation

device to meet specific network requirements and regional, standards-based requirements for the interface to the law enforcement collection function.

The mediation device uses SNMPv3 to instruct the call connect (CC) IAP to replicate the CC and send the content to the mediation device. The CC IAP can be either an edge router or a trunking gateway for voice, and either an edge router or an access server for data.



Note

The Cisco cBR router does not support encryption of lawful intercept traffic.

To increase the security and to mitigate any SNMPv3 vulnerability, the following task is required:

Restricting Access to Trusted Hosts (without Encryption)

SNMPv3 provides support for both security models and security levels. A security model is an authentication strategy that 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 will determine the security mechanism employed when handling an SNMP packet.

Additionally, the SNMP Support for the Named Access Lists feature adds support for standard named access control lists (ACLs) to several SNMP commands.

To configure a new SNMP group or a table that maps SNMP users to SNMP views, use the **snmp-server group** command in global configuration mode.

```
access-list my-list permit ip host 10.10.10.1 snmp-server group my-group v3 auth access my-list
```

In this example, the access list named **my-list** allows SNMP traffic only from 10.10.10.1. This access list is then applied to the SNMP group called **my-group**.

How to Configure Lawful Intercept

Although there are no direct user commands to provision lawful intercept on the router, you do need to perform some configuration tasks, such as providing access to LI MIBs, and setting up SNMP notifications. This section describes how to perform the required tasks:

Creating a Restricted SNMP View of Lawful Intercept MIBs

To create and assign users to an SNMP view that includes the Cisco lawful intercept MIBs, perform the steps in this section.

Before you begin

- You must issue the commands in global configuration mode with level-15 access rights.
- SNMPv3 must be configured on the device.

Procedure

	Command or Action	Purpose
Step 1	enable	Enables privileged EXEC mode.
	Example:	Enter your password if prompted.
	Device> enable	
Step 2	configure terminal	Enters global configuration mode.
	Example:	
	Device# configure terminal	
Step 3	snmp-server view view-name MIB-name included	Creates an SNMP view that includes the CISCO-TAP2-MIB (where <i>exampleView</i> is the
		name of the view to create for the MIB).
	Example:	This MIB is required for both regular and
	Device(config)# snmp-server view exampleView ciscoTap2MIB included	broadband lawful intercept.
Step 4	snmp-server view view-name MIB-name included	Adds the CISCO-IP-TAP-MIB to the SNMP view.
	Example:	
	Device(config)# snmp-server view exampleView ciscoIpTapMIB included	
Step 5	snmp-server view view-name MIB-name included	Adds the CISCO-802-TAP-MIB to the SNMP view.
	Example:	
	Device(config)# snmp-server view exampleView cisco802TapMIB included	
Step 6	snmp-server group group-name v3 noauth read view-name write view-name	Creates an SNMP user group that has access to the LI MIB view and defines the group's access
	Example:	rights to the view.
	Device(config)# snmp-server group exampleGroup v3 noauth read exampleView write exampleView	
Step 7	snmp-server user user-name group-name v3 auth md5 auth-password	Adds users to the specified user group.
	Example:	
	Device(config)# snmp-server user exampleUser exampleGroup v3 auth md5 examplePassword	

	Command or Action	Purpose
Step 8	end	Exits the current configuration mode and returns
Example:	Example:	to privileged EXEC mode.
	Device(config)# end	

Where to Go Next

The mediation device can now access the lawful intercept MIBs and issue SNMP set and get requests to configure and run lawful intercepts on the router. To configure the router to send SNMP notification to the mediation device, see the Enabling SNMP Notifications for Lawful Intercept.

Enabling SNMP Notifications for Lawful Intercept

SNMP automatically generates notifications for lawful intercept events. To configure the router to send lawful intercept notifications to the mediation device, perform the steps in this section.

Before you begin

- You must issue the commands in global configuration mode with level-15 access rights.
- SNMPv3 must be configured on the router.

Procedure

	Command or Action	Purpose
Step 1	enable	Enables privileged EXEC mode.
	Example:	• Enter your password if prompted.
	Device> enable	
Step 2	configure terminal	Enters global configuration mode.
	Example:	
	Device# configure terminal	
Step 3	snmp-server host ip-address community-string udp-port port notification-type	Specifies the IP address of the mediation device and the password-like community-string that is sent with a notification request.
	Example:	• For lawful intercept, the udp-port must be 161 and not 162 (the SNMP default).
	Device(config) # snmp-server 10.2.2.1 community-string udp-port 161 udp	
Step 4	snmp-server enable traps snmp authentication linkup linkdown coldstart warmstart	Configures the router to send RFC 1157 notifications to the mediation device.

	Command or Action	Purpose
	Example:	These notifications indicate authentication failures, link status (up or down), and
	Device(config)# snmp-server enable traps snmp authentication linkup linkdown coldstart warmstart	router restarts.
Step 5 end Example:	end	Exits the current configuration mode and returns
	to privileged EXEC mode.	
	Device(config)# end	

Disabling SNMP Notifications

To disable SNMP notifications on the router, perform the steps in this section.



Note

To disable lawful intercept notifications, use SNMPv3 to set the CISCO-TAP2-MIB object cTap2MediationNotificationEnable to false(2). To reenable lawful intercept notifications through SNMPv3, reset the object to true(1).

Procedure

	Command or Action	Purpose
Step 1	enable	Enables privileged EXEC mode.
	Example:	• Enter your password if prompted.
	Device> enable	
Step 2	configure terminal	Enters global configuration mode.
	Example:	
	Device# configure terminal	
Step 3	no snmp-server enable traps	Disables all SNMP notification types that are
	Example:	available on your system.
	Device(config)# no snmp-server enable traps	
Step 4 end Example:	end	Exits the current configuration mode and returns
	Example:	to privileged EXEC mode.
	Device(config)# end	

Provisioning a MAC Intercept for Cable Modems Using SNMPv3

- 1. Configure the c802tapStreamInterface object.
- 2. Set the following bit flags in the c802tapStreamFields object:
 - dstMacAddress (bit 1)
 - srcMacAddress (bit 2)
 - cmMacAddress (bit 6)—The cmMacAddress bit field is newly introduced for cable modem support and determines whether the intercept is a CPE-based or CM-based intercept.
- **3.** Configure the following objects with the same CM MAC address value:
 - c802tapStreamDestinationAddress
 - c802tapStreamSourceAddress

Provisioning a MAC Intercept for a CPE Device Using SNMPv3

- 1. Configure the c802tapStreamInterface object.
- 2. Set the following bit flags in the c802tapStreamFields object:
 - dstMacAddress (bit 1)
 - srcMacAddress (bit 2)
- 3. Configure the following objects with the same CPE MAC address value:
 - c802tapStreamDestinationAddress
 - c802tapStreamSourceAddress

Configuration Examples for Lawful Intercept

Example: Enabling Mediation Device Access Lawful Intercept MIBs

The following example shows how to enable the mediation device to access the lawful intercept MIBs. It creates an SNMP view (tapV) that includes four LI MIBs (CISCO-TAP2-MIB, CISCO-IP-TAP-MIB, CISCO-802-TAP-MIB, and CISCO-USER-CONNECTION-TAP-MIB). It also creates a user group that has read, write, and notify access to MIBs in the tapV view.

```
snmp-server view tapV ciscoTap2MIB included
snmp-server view tapV ciscoIpTapMIB included
snmp-server view tapV cisco802TapMIB included
snmp-server view tapV ciscoUserConnectionTapMIB included
snmp-server group tapGrp v3 noauth read tapV write tapV notify tapV
snmp-server user MDuser tapGrp v3 auth md5 MDpasswd
snmp-server engineID local 1234
```

Example: Configuring Lawful Intercept- Redundant Mediation Devices

Lawful Intercept is configured using SNMPv3. The following example shows SNMP configuration command set to configure two identical taps to tap two MDs:

• Setup MD1:

```
setany -v3 -timeout 30 -retries 3 10.12.0.34 user1 cTap2MediationStatus.1 -i 4 cTap2MediationDestAddressType.1 -i 1 cTap2MediationTimeout.1 -o 07:E0:04:01:B:15:1A:0 cTap2MediationTransport.1 -i 1 cTap2MediationSrcInterface.1 -i 0 cTap2MediationDestAddress.1 -o 0a:0a:00:35 cTap2MediationDestPort.1 -g 63
```

• Setup CM tap:

```
setany -v3 -timeout 30 -retries 3 10.12.0.34 user1 c802tapStreamStatus.1.2 -i 4 c802tapStreamFields.1.2 -o 62 c802tapStreamInterface.1.2 -i -1 c802tapStreamDestinationAddress.1.2 -o "c8 fb 26 a5 55 98" c802tapStreamSourceAddress.1.2 -o "c8 fb 26 a5 55 98" setany -v3 -timeout 30 -retries 3 10.12.0.34 user1 cTap2StreamStatus.1.2 -i 5 cTap2StreamType.1.2 -i 2 cTap2StreamInterceptEnable.1.2 -i 1 cTap2StreamStatus.1.2 -i 4
```

• Setup MD2:

```
setany -v3 -timeout 30 -retries 3 10.12.0.34 user1 cTap2MediationStatus.2 -i 4 cTap2MediationDestAddressType.2 -i 1 cTap2MediationTimeout.2 -o 07:E0:03:03:7:15:1A:0 cTap2MediationTransport.2 -i 1 cTap2MediationSrcInterface.2 -i 0 cTap2MediationDestAddress.2 -o 0a:0a:00:06 cTap2MediationDestPort.2 -g 63
```

• Setup CM tap:

```
setany -v3 -timeout 30 -retries 3 10.12.0.34 user1 c802tapStreamStatus.2.2 -i 4 c802tapStreamFields.2.2 -o 62 c802tapStreamInterface.2.2 -i -1 c802tapStreamDestinationAddress.2.2 -o "c8 fb 26 a5 55 98" c802tapStreamSourceAddress.2.2 -o "c8 fb 26 a5 55 98" setany -v3 -timeout 30 -retries 3 10.12.0.34 user1 cTap2StreamStatus.2.2 -i 5 cTap2StreamType.2.2 -i 2 cTap2StreamInterceptEnable.2.2 -i 1 cTap2StreamStatus.2.2 -i
```

Get tapped packets count:

```
getmany -v3 -timeout 30 -retries 3 10.12.0.34 user1 cTap2StreamInterceptedPackets
```

Additional References

Related Documents

Related Topic	Document Title
Configuring SNMP Support	Configuring SNMP Support
Security commands	Cisco IOS Security Command Reference

Standards and RFCs

Standard/RFC	Title
PacketCable [™] Control Point Discovery Interface Specification	PacketCable [™] Control Point Discovery Interface Specification (PKT-SP-CPD-I02-061013)
RFC-3924	Cisco Architecture for Lawful Intercept in IP Networks

MIBs

MIB	MIBs Link
• CISCO-TAP2-MIB	To locate and download MIBs for selected platforms, Cisco IOS
• CISCO-IP-TAP-MIB	releases, and feature sets, use Cisco MIB Locator found at the following URL:
• CISCO-802-TAP-MIB	http://www.cisco.com/go/mibs
CISCO-USER-CONNECTION-TAP-MIB	

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.	http://www.cisco.com/support
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.	

Feature Information for Lawful Intercept

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



Note

The below table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Table 2: Feature Information for Lawful Intercept

Feature Name	Releases	Feature Information
Service Independent Intercept	Cisco IOS-XE Release 3.15.0S	This feature was introduced on the Cisco cBR Series Converged Broadband Router.
Lawful Intercept- Redundant Mediation Devices	Cisco IOS-XE Release 3.18.0SP	This feature was introduced on the Cisco cBR Series Converged Broadband Router.