Cisco Service Independent Intercept Architecture Version 2.0

Version History

Version Number	Date	Notes
1	3/15/2006	This document was created and includes version I08 of the PacketCable Event Message Specification, BTS versions 4.4 and 4.5, and version 2.0 of Cisco LI MIB.

Abstract

Cisco Service Independent Intercept (SII) architecture version 2.0 was developed in response to the needs of Cisco's service provider (SP) and Internet service provider (ISP) customers for compliance with Lawful Intercept (LI) legislation and regulations. It provides a common approach for intercepting IP communications using existing network elements.

LI is the process (not a specific regulatory requirement) by which law enforcement agencies (LEAs) conduct electronic surveillance as authorized by judicial or administrative order. Legislation and regulations are increasingly being adopted that require SPs and ISPs to design and implement their networks to explicitly support authorized electronic surveillance. Types of SPs and ISPs that are subject to LI mandates vary greatly from country to country. The *Cisco Service Independent Intercept Architecture Version 2.0* document describes the implementation of an LI architecture on a Cisco IP network that uses version 2.0 of Cisco LI Management Information Base (MIB) for Voice over IP (VoIP) and IP data intercepts.

This architecture is designed to support "plug-and-play" capability, which means that any architecture component can be replaced by any other Cisco SII-compliant component. Because of this flexibility in component choices, it is impractical for this document to completely describe all aspects of LI implementation for all of the possible components. Therefore, this document is intended as a high-level description of the end-to-end Cisco SII LI version 2.0 architecture including how LI works, the roles of the various components, and the available component options. The document also provides some information on design, implementation, operation, and troubleshooting of LI on a Cisco SII network. For detailed specifics on the various devices (such as image and memory requirements, configurations, and so on), this document references the product documentation of the devices.

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Contents

This document contains the following sections:

Business Objectives of the Cisco SII LI Architecture

The following sections describe the business objectives of implementing the Cisco SII LI architecture:

Key Requirements of LI Architecture

The following are the key requirements any LI architecture must meet:

- LI must be undetectable by the intercept subject. Thus providing a wiretap at the customer premise equipment (CPE) or diverting the call to a conference unit (where the replication would take place) is not acceptable because the intercept subject can detect the LI. (Sophisticated users can determine that their call has been diverted because the source and destination IP addresses do not match.) Therefore, the tapping must take place on equipment that is within the domain of trust of the SP or ISP (on an edge router or access server) and must be performed along the normal path of the data.
- Multiple LEAs intercepting the same subject must not be aware of each other. This confidentiality is achieved by having a one-way flow of intercept information from the mediation device to the LEA such that no information in the flow can indicate that multiple flows to different LEAs exist. It also implies limited access of LEAs to the SP's or ISP's equipment.
- Unauthorized personnel's knowledge of and capability to perform LI must be prevented. Security mechanisms must be in place to limit unauthorized personnel from performing or knowing about wiretaps as much as possible.
- The information identifying intercepts (phone numbers, IP addresses, and so on) must be correlated with the corresponding content of the intercepts.
- The reliability of delivery of information to the LEAs must be on the same order as the original delivery of the packets to customers.

Business Drivers

SPs and ISPs are required to meet LI requirements for voice and data in a variety of countries worldwide. Communications Assistance for Law Enforcement Act (CALEA) is a public law that describes how telephony service providers in the United States must support LI. In Europe there are a number of similar laws, including the Regulation of Investigatory Powers Act (RIPA) in the United Kingdom, the Telecom Act/Telekommunications Uberwachungsverordnung (TKUV) in Germany, the Telecom Act in France, the Criminal Code in Italy, and the Telecom Act in the Netherlands. However, in Europe, legal requirements and specific interfaces vary from country to country.

Two specifications define the interface to the LEAs for the purposes of meeting the CALEA requirements:

- The J-STD-025A specification that was developed by the Telephone Industry Association (TIA).
- The *PacketCable Electronic Surveillance Specification* document. (See the "Related Documents" section on page 47.)

Cisco Service Independent Intercept Architecture

The following sections describe the Cisco SII version 2.0 of Cisco LI MIB architecture:

Overview

The SII architecture was developed in response to the needs of Cisco's SP and ISP customers for compliance with LI legislation and regulations. It provides a common approach for intercepting IP communications using existing network elements. The architecture addresses the key LI requirements mentioned earlier and does so in a cost-effective manner. Key features of the architecture include the following:

- Use of standard access list technology to provide the intercept.
- Encapsulation of the entire intercepted and replicated packet so that the original source and destination addresses are available (important information for intercept purposes).
- Use of a control plane for intercept that is different from call control, which prevents network operations personnel from detecting the presence of active intercepts in the network.

Note A control plane defines the transport used for sending or receiving the messages that initiate the LI. Since it is important that network operations personnel not know that intercepts are active on the network, it is important to hide or keep separate the active intercept messages from those messages used for routine call setup. However, many SPs and ISPs routinely monitor all messages for diagnostic purposes.

- An integrated approach that limits the intercept activity to the router or gateway that is handling the target's IP traffic and only activates an intercept when the target is accessing the network.

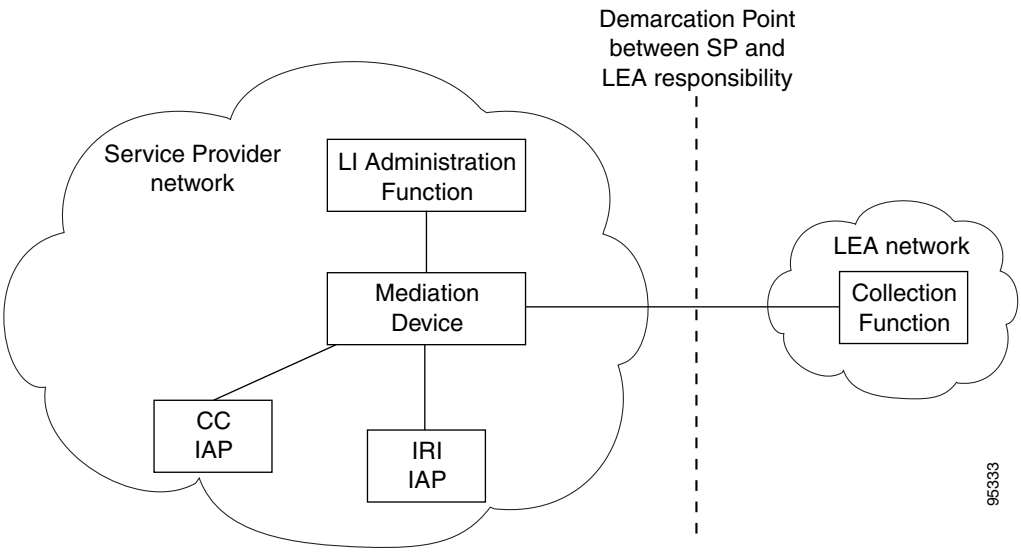
- No LI-related command-line interface (CLI) commands that could allow for the detection of intercept activity on a router or gateway.
- LI-related MIBs and traps sent only to the (third-party) equipment controlling the intercept.
- Support for multiple encapsulation and transport formats.

Note At this time, the only format implemented is the format specified in the PacketCable Electronic Surveillance Specifications that use User Datagram Protocol (UDP) frames to encapsulate duplicated packets.

Network Topology

Figure 1 shows a functional depiction of a generic IP network that supports LI of voice or data traffic.

Figure 1 Functional Depiction of a Generic LI Network



Note IRI IAP is defined as the Intercept-Related Information intercept access point and CC IAP is defined as the Communication Content intercept access point.

The following sections describe the components that are integral to the Cisco SII network:

- LI Administration Function, page 5
- Mediation Device/Delivery Function, page 5
- Intercept-Related Information Intercept Access Point, page 5
- Communication Content Intercept Access Point, page 5
- Collection Function, page 5

LI Administration Function

The SP and ISP uses the LI administration function to provision intercepts by interfacing with the other components in the network. It is responsible for provisioning components in the network, administering intercept orders, and tracking and maintaining intercept information. It also supervises the security and integrity of the LI process by continuously auditing activity logs to ensure that only authorized intercepts are provisioned and that authorized intercepts are not disrupted.

Note Provisioning intercepts is defined as accessing a device and changing the device's operational parameters to activate a desired function on that device.

Mediation Device/Delivery Function

The mediation device (MD) is maintained by the SP or ISP and is the center of the LI process. It sends configuration commands to the various IAPs to enable intercepts, receives intercept information (both IRI and CC), and delivers this information to the LEA. If more than one LEA is monitoring an intercept target, the mediation device duplicates the intercept information for each LEA. The mediation device is sometimes called the delivery function.

In some cases, the mediation device performs additional filtering of the information. It is also responsible for formatting the information to be compliant with the country or technology-specific requirements for delivery to law enforcement.

Mediation devices are third-party equipment. Cisco has performed end-to-end testing with a number of mediation device vendors. A list of these vendors can be found at the following URL: http://www.cisco.com/wwl/regaffairs/lawful_intercept/index.html

Intercept-Related Information Intercept Access Point

The Intercept-Related Information intercept access point (IRI IAP) is the device that provides identification information to the mediation device. IRI for voice includes the source and destination phone numbers and IP addresses and the time of the call. It also includes any post call-establishment messaging such as call forwarding or three-way calling. IRI for data includes login and logout times and source and destination IP addresses. For voice intercepts, the IRI IAP is the call control entity. The call control entity can be a call agent, Session Initiation Protocol (SIP) proxy, or H.323 gateway. For data intercepts, the IRI IAP is the authentication, authorization, and accounting (AAA) server.

Communication Content Intercept Access Point

The Communication Content IAP (CC IAP) is the device that intercepts communication content information, replicates it, and forwards the replicated information to the mediation device. The CC IAP should be located as close to the source of the call as possible to minimize the number of simultaneous calls the device will have to monitor and to ensure that CC can be reliably intercepted. The edge device is the only device that can guarantee CC intercept. The CC IAP can be an edge router, a trunking gateway, or an access server.

Collection Function

The collection function is a third-party device maintained by the LEA that receives, sorts, and stores intercept information from the mediation device. The collection function may also include case management capabilities.

Interfaces Between Devices

Figure 2 shows a functional depiction of the device interfaces in a Cisco SII LI network.

Figure 2 Functional Depiction of a Cisco SII LI Network

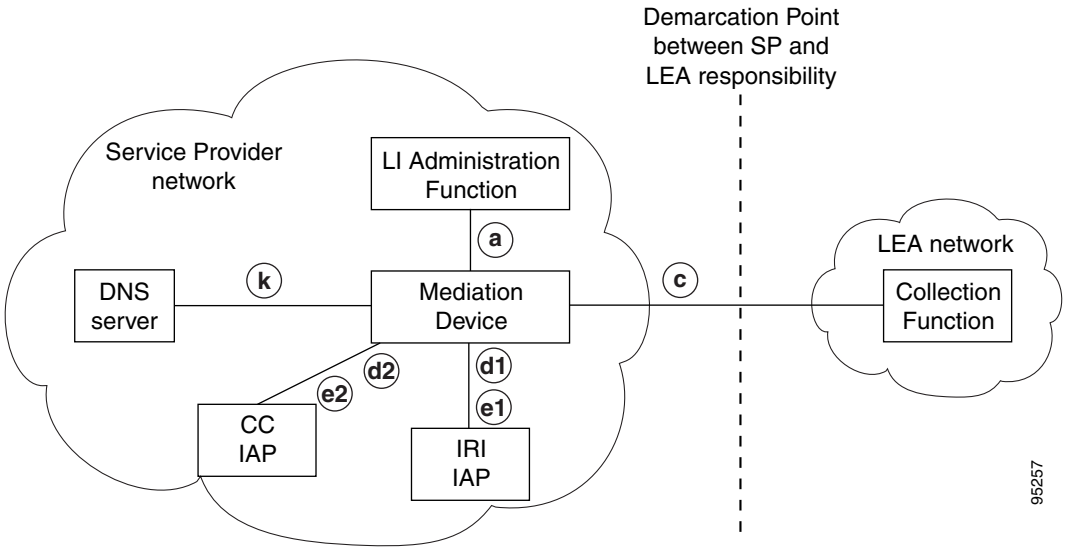
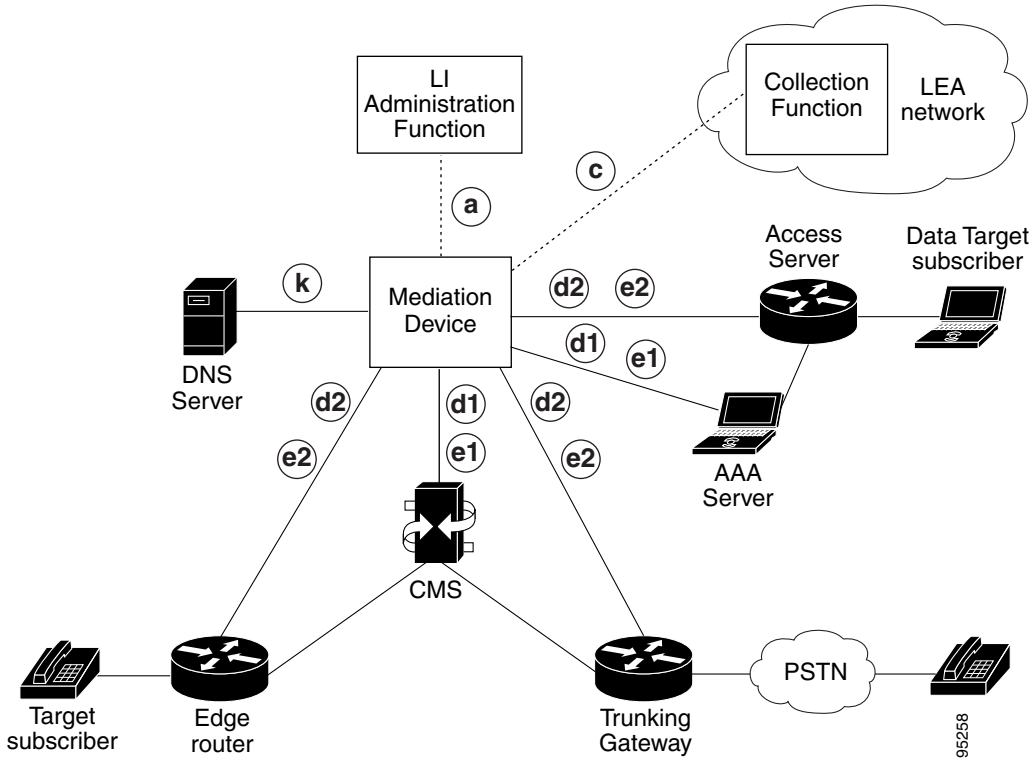


Figure 3 shows the device interfaces in the context of the specific devices that are used in a Cisco SII network.

Figure 3 Cisco SII Voice Intercept Device Interfaces



Note PSTN is defined as public switched telephone network.

Table 1 describes the interfaces between devices shown in Figure 2 and Figure 3.

Table 1 Cisco SII LI Network Device Interfaces

Interface	Description	Description
a	Authorization: administration function and mediation device	The LI administration function sends intercept provisioning information (target identifier, duration of intercept, and so on) to the mediation device.
c	Content: mediation device and collection function	The mediation device delivers intercept information to the collection function. If more than one LEA is intercepting the same target, the mediation device must duplicate the intercept information to send to the collection function of each LEA. This interface meets the specifications found in the *PacketCable Electronic Surveillance Specification* document in the "Related Documents" section on page 47.

Table 1 Cisco SII LI Network Device Interfaces (continued)

Interface	Description	Description
d1	IRI Delivery: IRI IAP and mediation device	This is the delivery interface. The IRI IAP uses this interface to deliver IRI to the mediation device. For voice, this is according to the *PacketCable Event Messages Specification* document in the "Related Documents" section on page 47. For data, this is Remote Authentication Dial-In User Service (RADIUS) accounting messages. For voice intercepts, the IRI IAP is the call control entity (call agent, SIP proxy, or H.323 gateway). For data intercepts, the IRI IAP is the AAA server (or a sniffer monitoring RADIUS traffic).
d2	CC delivery: CC IAP and mediation device	The CC IAP replicates call content (CC) and sends it to the mediation device. The CC IAP encapsulates the packets with additional UDP and IP headers and a 32-bit call content connection identifier (CCCID) header. (See the *PacketCable Electronic Surveillance Specification* document in the "Related Documents" section on page 47.) The CCCID is used to associate the CC with the target. The CCCID is included so that the mediation device can map intercepts to the appropriate warrants. Usually, the mediation device will rewrite the CCCID before forwarding intercept information to collection functions. The CC IAP is an edge router, trunking gateway, or access server.
e1	Provisioning: mediation device and IRI IAP	The mediation device uses Secure Shell (SSH) to provision an intercept on the IRI IAP.
e2	Provisioning: mediation device and CC IAP	The mediation device uses Simple Network Management Protocol version 3 (SNMPv3) to instruct the CC IAP to replicate CC and send it to the mediation device. The CC IAP can be either an edge router or a trunking gateway for voice. It is an edge router or access server for data.
k	DNS Lookup: mediation device and DNS server	The mediation device queries the Domain Name Service (DNS) server to determine the fully qualified domain name (FQDN) of the CC IAP.

How Cisco SII LI Architecture Works

The following sections describe how the Cisco SII LI architecture works:

Types of Intercepts

There are two types of intercepts:

- Intercept-Related Information only—This is the most common type of intercept. It intercepts only the IRI. For voice intercepts, IRI includes the source and destination phone numbers and IP addresses and the time of the call, and any post call-establishment messaging, such as call forwarding or three-way calling. For data intercepts, IRI includes login and logout times and source and destination IP addresses. Intercepting IRI has minimal impact on the bandwidth and processing power of the network. This type of intercept is also referred to as Pen Register or Trap and Trace.
- Intercept-Related Information and Communication Content—Typically, a small percentage of intercepts require the capture of both IRI and CC. Intercepting CC has a substantial impact on network bandwidth and device processing power. This type of intercept is also referred to as a Full Content or, in the United States, as Title 3 intercept.

Initiating an Intercept

When a warrant is issued, the LEA physically delivers the warrant to the SP or ISP. When the SP or ISP receives the warrant, it uses the LI administration function to enable LI on the target specified in the warrant. If the warrant is delivered prior to the authorized start date and time, the mediation device waits until the authorized start date and time to configure the tap. Once the intercept is provisioned on the mediation device, the process of initiating individual intercepts is completely automated.

Terminating an Intercept

When a warrant is issued, the warrant includes an expiration date that is typically 30 days. This expiration date is configured on the mediation device. When the warrant expires, the mediation device automatically removes the configuration for the warrant. The mediation device provisioning interface can be used to remove a warrant before the expiration date.

Cisco SII Voice Intercept Process Flows

The following sections describe the various Cisco SII voice intercept process flows:

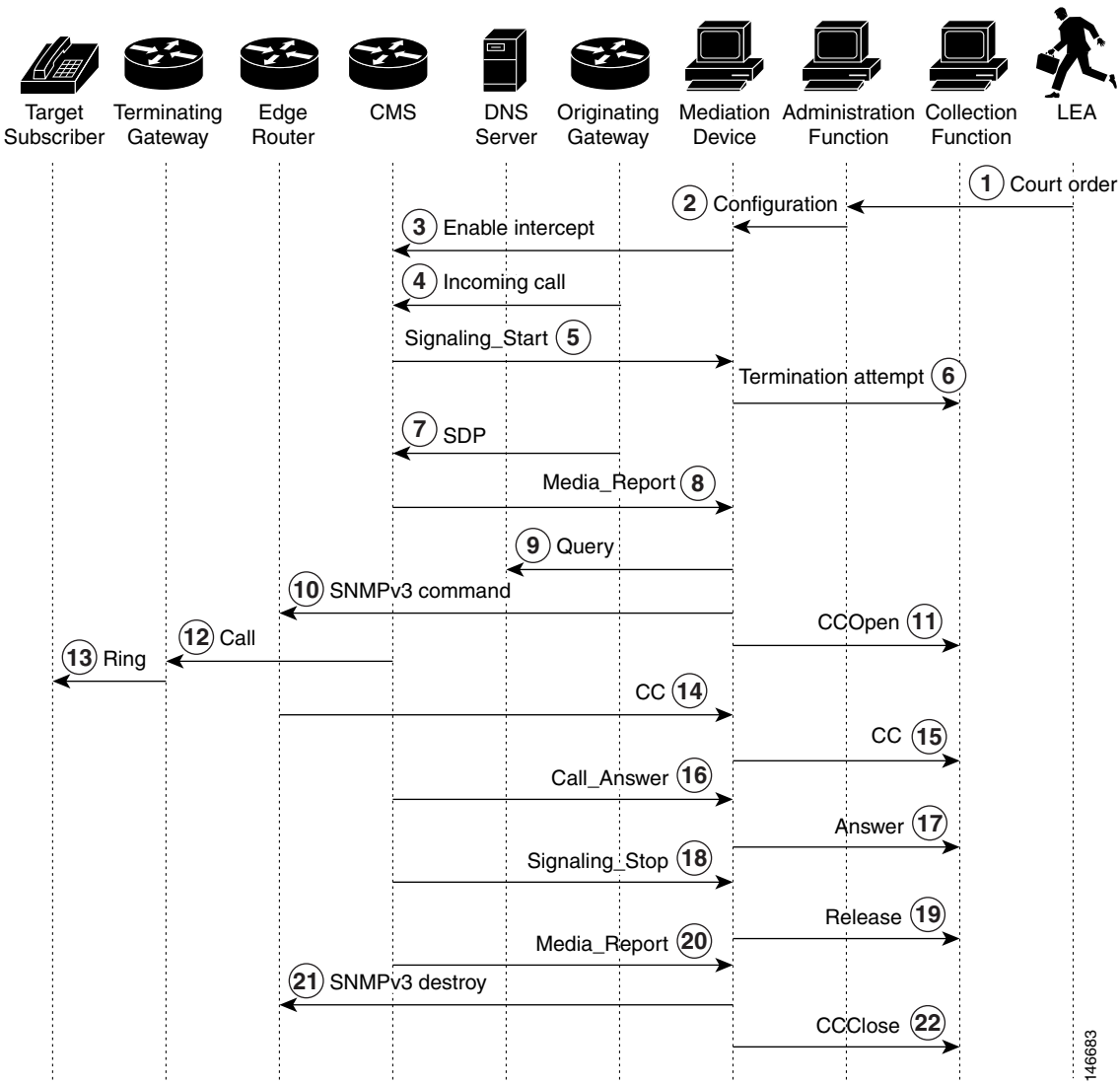
- Standard Cisco SII Voice Intercept, page 10
- Hairpin Cisco SII Voice Intercept, page 12
- Cisco SII Three-Way Voice Intercept, page 13
- Cisco SII Call Forward to Voice Mail Intercept, page 17
- Cisco SII Data Intercept, page 19

Standard Cisco SII Voice Intercept

Figure 4 shows the topology for a standard Cisco SII voice intercept.

Note This is a high-level call flow that does not include all details of the protocol messaging involved.

Figure 4 Standard Cisco SII Voice Intercept at Gateway or Aggregation Router



The following steps describe the sequence of events shown in Figure 4.

Step 1 The LEA physically delivers a court order to the network administrator who operates the LI administration function.

Step 2 The LI administration function sends a configuration to the mediation device that enters the intercept.

Step 3 The mediation device sends a configuration command to the call management server (CMS) to enable the intercept.

Step 4 The intercept target receives an incoming call.

Step 5 The CMS sends a Signaling_Start message to the mediation device.

Step 6 The mediation device sends a termination attempt message to the collection function.

Step 7 The originating gateway sends Session Definition Protocol (SDP) information to the CMS.

Step 8 The CMS sends the SDP information to the mediation device in a Media_Report message.

Step 9 The mediation device queries the DNS server to determine the IP address of the edge router (based on the IP address of the target gateway).

Step 10 The mediation device sends an SNMPv3 command to the edge router or network access server (NAS) to initiate the intercept.

Step 11 The mediation device sends a CCOpen message with the SDP to the collection function.

Step 12 The CMS delivers the call to the terminating gateway.

Step 13 The terminating gateway rings the target phone.

Step 14 The call is connected end-to-end, the edge router or NAS intercepts and replicates all voice packets and sends the packets to the mediation device.

Step 15 The mediation device delivers CC to the collection function.

Step 16 The CMS sends a Call_Answer message to the mediation device.

Step 17 The mediation device forwards this message as an Answer message to the collection function.

Step 18 When the parties hang up, the CMS sends a Signaling_Stop message to the mediation device.

Step 19 The mediation device forwards this message as a Release message to the collection function.

Step 20 The CMS sends a Media_Report message to the mediation device.

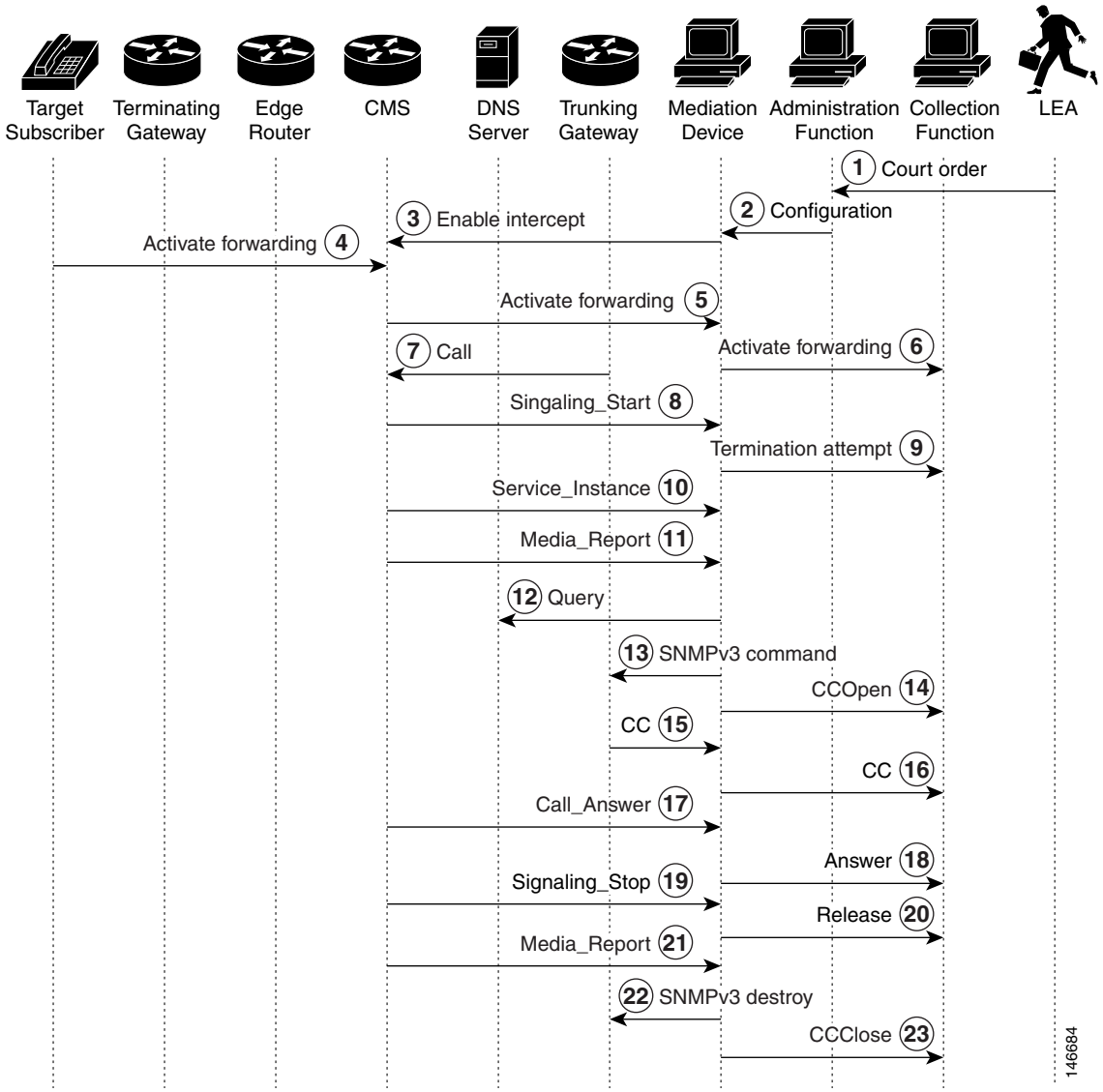
Step 21 When the mediation device receives the Media_Report message, it sends SNMPv3 messages to the edge router or NAS instructing it to destroy the CC monitoring sessions and the mediation device MIB. Three destroy messages are sent: one for each of the two CC streams and one for the mediation device MIB.

Step 22 The mediation device sends a CCClose message to the collection function.

Hairpin Cisco SII Voice Intercept

Figure 5 shows the topology for a Cisco SII voice intercept in a hairpin scenario (when a call coming in from the PSTN to the intercept target is forwarded off the network and back to the PSTN).

Figure 5 Hairpin Cisco SII Voice Intercept at Trunking Gateway



The following steps describe the sequence of events shown in Figure 5.

Step 1 The LEA physically delivers a court order to the network administrator who operates the LI administration function.

Step 2 The LI administration function sends a configuration to the mediation device that enters the intercept.

Step 3 The mediation device sends a configuration command to the CMS to enable the intercept.

Step 4 The intercept target activates call forwarding to an off network (off-net) number.

Step 5 The CMS informs the mediation device that the target has activated call forwarding.

Step 6 The mediation device forwards the feature activation code for call forwarding to the collection function.

Step 7 The target receives a call from the PSTN that triggers call forwarding.

Step 8 The CMS sends a Signaling_Start message to the mediation device.

Step 9 The mediation device sends a termination attempt message to the collection function.

Step 10 The CMS sends a Service_Instance message to the mediation device indicating that the call is being forwarded.

Step 11 The CMS sends a Media_Report message to the mediation device.

Step 12 The mediation device queries the DNS server to determine the IP address of the trunking gateway.

Step 13 The mediation device sends an SNMPv3 command to the trunking gateway to enable an intercept (if call content is to be intercepted) and to route the call back to the PSTN.

Note If the terminating gateway does not support SNMPv3, Media Gateway Control Protocol (MGCP) is used instead.

Step 14 The mediation device sends a CCOpen message to the collection function.

Step 15 The trunking gateway duplicates all packets and sends them to the mediation device.

Step 16 The mediation device delivers CC to the collection function.

Step 17 The CMS sends a Call_Answer message to the mediation device.

Step 18 The mediation device forwards this message as an Answer message to the collection function.

Step 19 When the parties hang up, the CMS sends a Signaling_Stop message to the mediation device.

Step 20 The mediation device forwards this message as a Release message to the collection function.

Step 21 The CMS sends a Media_Report message to the mediation device.

Step 22 When the mediation device receives the Media_Report, it sends SNMPv3 messages to the trunking gateway instructing it to destroy the CC monitoring sessions and the mediation device MIB. Three destroy messages are sent: one for each of the CC streams and one for the mediation device MIB.

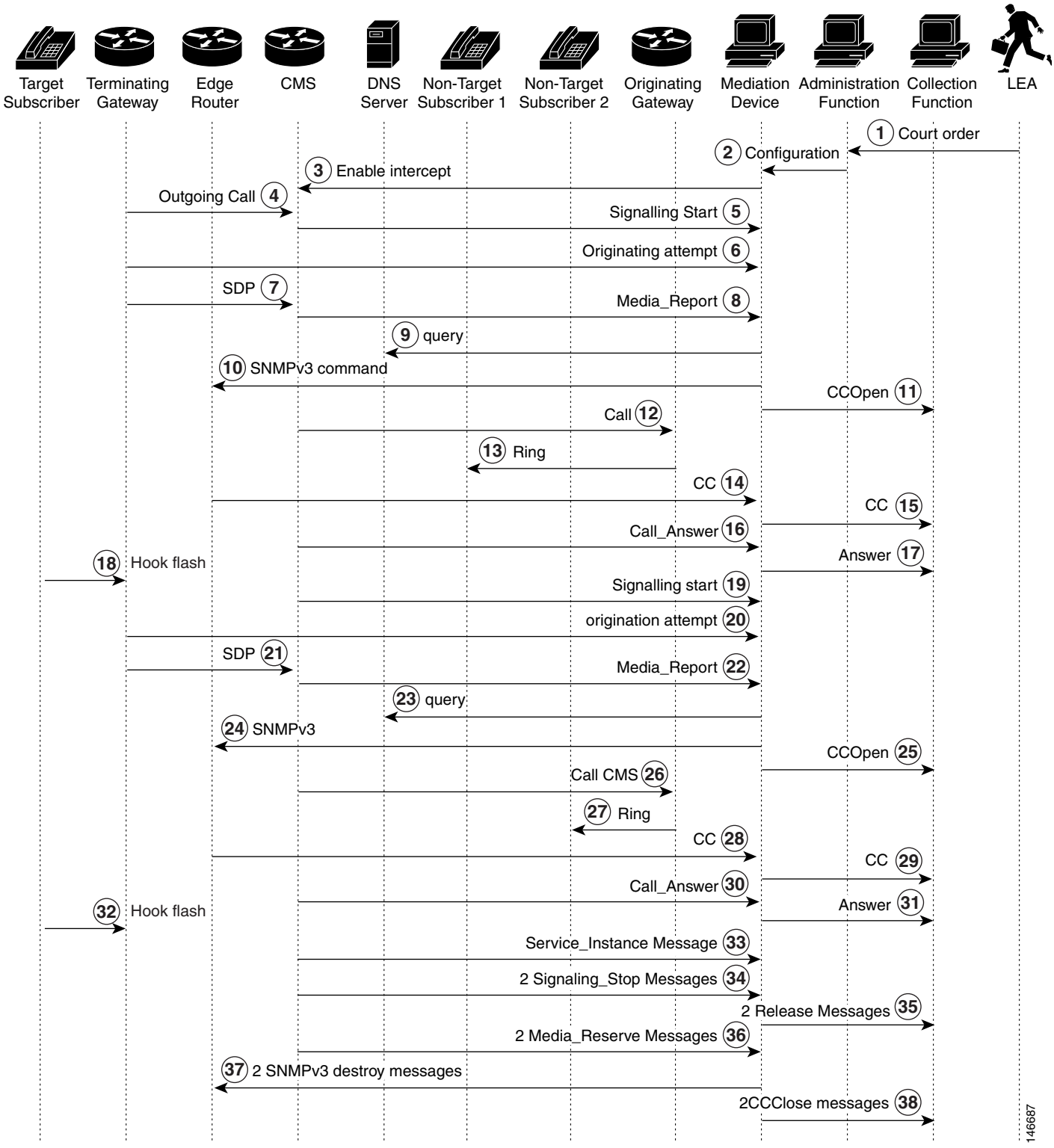
Note If MGCP was used by the mediation device to access CC, then the instruction from the CMS to delete the connection also stops CC duplication. In this case, the mediation device does not need to send any additional messages to terminate the intercept.

Step 23 The mediation device sends a CCClose message to the collection function.

Cisco SII Three-Way Voice Intercept

Figure 6 shows the topology for a Cisco SII of a three-way voice conference call.

Figure 6 Cisco SII Three-Way Voice Intercept



The following steps describe the sequence of events shown in Figure 6.

Step 1 The LEA physically delivers a court order to the network administrator who operates the LI administration function.

Step 2 The LI administration function sends a configuration to the mediation device that enters the intercept.

Step 3 The mediation device sends a configuration command to the CMS to enable the intercept.

Step 4 In this scenario, the intercept target initiates an outgoing call.

Step 5 The CMS sends a Signaling_Start message to the mediation device.

Step 6 The terminating gateway sends an originating attempt message to the mediation device.

Step 7 The terminating gateway sends SDP information to the CMS.

Step 8 The CMS sends the SDP information to the mediation device in a Media_Report message.

Step 9 The mediation device queries the DNS server to determine the IP address of the edge router (based on the IP address of the target gateway).

Step 10 The mediation device sends an SNMPv3 command to the edge router to initiate the intercept.

Step 11 The mediation device sends a CCOpen message with the SDP to the collection function.

Step 12 The CMS delivers the call to the originating gateway.

Step 13 The originating gateway rings non-target subscriber 1.

Step 14 The call is connected end-to-end, the edge router intercepts and replicates all voice packets and sends the packets to the mediation device.

Step 15 The mediation device delivers CC to the collection function.

Step 16 The CMS sends a Call_Answer message to the mediation device.

Step 17 The mediation device forwards this message as an Answer message to the collection function.

Step 18 The target hook flashes to put the Hook non-target subscriber 1 on hold and initiate a second call.

Step 19 The CMS sends a Signaling_Start message to the mediation device.

Step 20 The terminating gateway sends an originating attempt message to the mediation device.

Step 21 The terminating gateway sends SDP information to the CMS.

Step 22 The CMS sends the SDP information to the mediation device in a Media_Report message.

Step 23 The mediation device queries the DNS server to determine the IP address of the edge router (based on the IP address of the target gateway).

Step 24 The mediation device sends an SNMPv3 command to the edge router to initiate the intercept.

Step 25 The mediation device sends a CCOpen message with the SDP to the collection function.

Step 26 The CMS delivers the call to the originating gateway.

Step 27 The originating gateway rings non-target subscriber 2.

Step 28 The call is connected end-to-end, the edge router intercepts and replicates all voice packets and sends the packets to the mediation device.

Step 29 The mediation device delivers CC to the collection function.

Step 30 The CMS sends a Call_Answer message to the mediation device.

Step 31 The mediation device forwards this message as an Answer message to the collection function.

Step 32 The target hook flashes to create a three-way call.

Step 33 The CMS sends a Service_Instance message indicating Three_Way_Call to the mediation device.

Step 34 When the parties hang up, the CMS sends two Signaling_Stop messages to the mediation device, one for each part of the three-way call.

Step 35 The mediation device forwards these messages as Release messages to the collection function.

Step 36 The CMS sends two Media_Report messages to the mediation device.

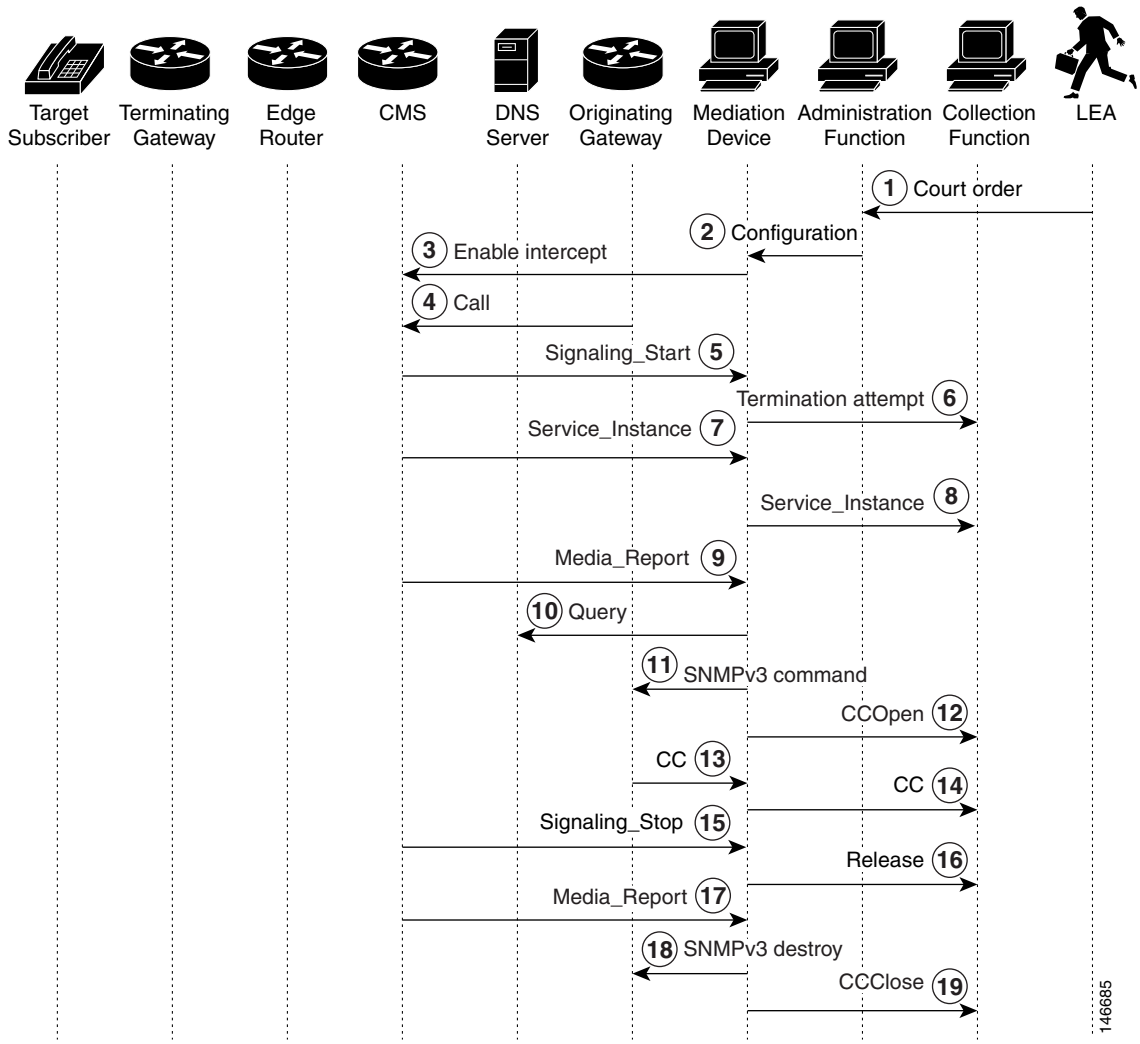
Step 37 When the mediation device receives the Media_Report message, it sends SNMPv3 messages to the terminating gateway instructing it to destroy the CC monitoring sessions and the mediation device MIB. Six destroy messages are sent: three for each part of the three-way call.

Step 38 The mediation device sends two CCClose messages to the collection function.

Cisco SII Call Forward to Voice Mail Intercept

Figure 7 shows the topology for a Cisco SII of a voice call that is forwarded to voice mail.

Figure 7 Cisco SII Call Forward to Voice Mail Intercept



The following steps describe the sequence of events shown in Figure 7.

Step 1 The LEA physically delivers a court order to the network administrator who operates the LI administration function.

Step 2 The LI administration function sends a configuration to the mediation device that enters the intercept.

Step 3 The mediation device sends a configuration command to the CMS to enable the intercept.

Step 4 The target receives a call from the PSTN that is not answered, which triggers call forwarding to voice mail.

Step 5 The CMS sends a Signaling_Start message to the mediation device.

Step 6 The mediation device sends a termination attempt message to the collection function.

Step 7 The CMS sends a Service_Instance message to the mediation device indicating that the call is being forwarded.

Step 8 The mediation device forwards the Service_Instance message to the collection function.

Step 9 The CMS sends a Media_Report message to the mediation device.

Step 10 The mediation device queries the DNS server to determine the IP address the call is being forwarded to. When the mediation device determines the call is being forwarded to the voice mail system, it knows that the call must be intercepted on the originating side.

Step 11 The mediation device sends an SNMPv3 command to the originating gateway to enable an intercept (if call content is to be intercepted).

Step 12 The mediation device sends a CCOpen message to the collection function.

Step 13 The originating gateway duplicates all packets and sends them to the mediation device.

Step 14 The mediation device delivers CC to the collection function.

Step 15 When the caller hang up, the CMS sends a Signaling_Stop message to the mediation device.

Step 16 The mediation device forwards this message as a Release message to the collection function.

Step 17 The CMS sends a Media_Report message to the mediation device.

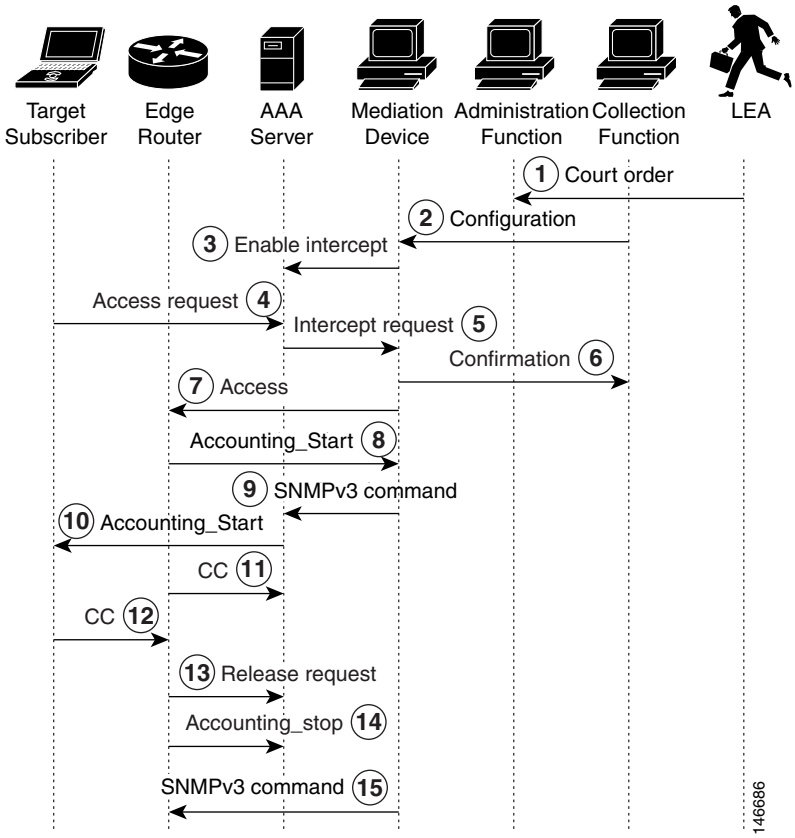
Step 18 When the mediation device receives the Media_Report message, it sends SNMPv3 messages to the terminating gateway instructing it to destroy the CC monitoring sessions and the mediation device MIB. Six destroy messages are sent: three for each part of the three-way call.

Step 19 The mediation device sends a CCClose messages to the collection function.

Cisco SII Data Intercept

Figure 8 shows the topology for a Cisco SII data intercept. Although only an edge router is shown, this same topology applies if the target accesses the network via dialup and a NAS such as a Cisco AS 5350, Cisco AS 5400, or Cisco AS 5850.

Figure 8 Cisco SII Data Intercept



The following steps describe the sequence of events shown in Figure 8.

Step 1 The LEA physically delivers a court order to the network administrator who operates the LI administration function.

Step 2 The LI administration function sends a configuration to the mediation device that enters the intercept.

Step 3 The mediation device enables the intercept on a sniffer or a probe that is configured to sniff all AAA traffic and inform the mediation device when the target subscriber authenticates in the network.

Step 4 When the target subscriber accesses the network, the target subscriber's computer sends an access request to the AAA server.

Step 5 The mediation device is notified that the intercepted target subscriber is active in the network by the sniffer or probe monitoring the AAA server.

Step 6 The AAA server grants access to the target subscriber.

Step 7 The edge router forwards the Accounting_start message to the AAA server.

Step 8 The mediation device is notified that the intercepted target subscriber's session has been successfully authenticated and is now active in the network.

Step 9 The mediation device sends an SNMPv3 command to the edge router to enable the intercept (if communication content is to be intercepted).

Step 10 When the data stream begins, the edge router intercepts the CC, replicates it, and forwards it to the mediation device.

Step 11 The mediation device forwards the CC to the collection function.

Step 12 The target subscriber's computer sends a release request to the edge router to disconnect the session from the network.

Step 13 The edge router sends an Accounting_stop message to the AAA server.

Step 14 The mediation device is notified that the target subscriber's session has stopped.

Step 15 The mediation device sends an SNMPv3 command to the edge router to remove the intercept and to stop duplication of the communication content.

Security Considerations

Given the sensitive nature of lawful intercept—both from the standpoint of the need to protect sensitive data, and to conceal the identities of law enforcement agencies and the intercept targets—the LI architecture must contain stringent security measures to combat the following types of threats:

- Impersonation of LEAs and mediation devices
- Privacy and confidentiality breaches
- Message forgery
- Replay attacks

Because legal intercept is expected to run on the wide-open Internet, very few assumptions should be made about how well the networks of the LEA's and the SP's or ISP's can be secured. Although this document does not examine the issues of physical security, operating system, or application hardening within the principles of the LI architecture, they are clearly important considerations. In particular, both the MD and LEA servers must be considered prime targets for attacks by hackers. Hardening measures commensurate with other highly vulnerable servers, such as key distribution and AAA servers, must be considered in any design.

The following section describes security requirements:

- Overall Security Requirements, page 20

Overall Security Requirements

All interfaces must be able to provide strong cryptographic authentication to establish the identity of the principles, and must correlate the identity of the principle with the action they are attempting to perform. That is, it is *not sufficient* to expect that authentication alone implies any specific authorization. Providing the ability to use strong crypto is *not* identical to requiring its use. Since many Cisco devices do not have crypto accelerators, actual use of crypto accelerators will be the choice of the SP or ISP, and will be dependent on how the device is deployed and its relative exposure. For devices placed in open, hostile environments (such as access routers), the SP or ISP must consider customer requirements for LI when making decisions about crypto acceleration hardware.

Because LI is an interesting target for attackers, all interfaces must perform some sort of cryptographic message integrity checking (such as Hash-based Message Authentication Code [HMAC]-Message Digest 5 [MD5]). Message integrity checking must also counter replay attacks. Because of privacy and confidentiality considerations, the architecture should allow for the use of encryption. Although encryption is not necessarily a requirement, it is highly recommended and may be a requirement in some LI deployments.

Interface Between MD and IRI IAP: Control

SSH is used for the control interface between the MD and the IRI IAP.

Interface Between MD and CC IAP: SNMPv3 Control

SNMPv3 View-based Access Control Model (VACM) and User-Based Security Model (USM) are used for the control interface between the MD and the CC IAP. The native SNMPv3 security module mechanism must be used, and the minimum requirement is that preshared keys must be supported. The additional requirement is that the IAP must support the ability to protect the LI MIBs from disclosure or control by unauthorized USM users. In general VACM should provide the necessary tools to limit the views to particular USM users, but there are also special considerations given that USM and VACM provide the ability to create arbitrary view/user mappings to authorized entities. The security requirements of the Cisco Lawful Intercept Control MIB (CISCO-TAP-MIB) with respect to SNMP require the following actions:

- The MIB *must* be accessed (or accessible) only via SNMPv3.
- By default, no access *must* be granted to the MIB.
- Access to the MIB *must* be granted only by an administrative authority with the highest privileges:
  - The CISCO-TAP-MIB can be added to a view only at privilege level 15 (the highest level).
  - Including CISCO-TAP-MIB into a view on a router via the SNMP-VACM-MIB will be disallowed.

SNMPv3 *must* be configured correctly to maintain security. The MD acts as a network manager and the CC IAP acts as an agent.

Interface Between MD and IRI IAP: Data

The IRI is delivered from the IRI IAP to the MD. This information is delivered in RADIUS format. Currently, this information is not encrypted.

Interface Between MD and CC IAP: Data

The CC information is delivered from the CC IAP to the MD. IP security (IPsec) (via standard router cryptographic features) is used for this interface.

Failure Recovery

The mediation device monitors the network elements involved in LI. If any network element involved in LI fails or anything else happens to interrupt an intercept, the MD implements an audit to ensure that all network elements are configured properly. If any problems are detected, the MD attempts to correct them. The errors are also reported to the LI administration function.

Note The CC IAPs do not maintain information about active intercepts in static memory. If the CC IAP reboots or fails over to the redundant side, the MD will detect the reboot and reprovision the intercept.

Implementation of Cisco SII Lawful Intercept

The following section describes the implementation of the Cisco SII LI architecture:

Prerequisites and Design Considerations

Before configuring your network for LI, you must establish or verify reliable end-to-end IP connectivity on your existing network. The main concern when designing an LI network is ensuring that the network has sufficient bandwidth and CPU capacity to handle the anticipated load of intercepts. The following sections describe design considerations for implementing LI:

Bandwidth and Processing Power Considerations

The CPUs of the following devices will be impacted by LI:

- Edge router—must be able to intercept and replicate all intercepted IP communication on its section of the network.
- Trunking gateway—must be able to intercept and replicate all intercepted calls that are forwarded off-net.
- Mediation device—must be able to support the required maximum number of simultaneous intercepts.

The following interfaces must be engineered with sufficient bandwidth to support LI traffic:

- IRI IAP—mediation device
- CC IAP—mediation device
- Mediation device—collection functions

You should also take into consideration that three-way calls require twice the bandwidth of regular calls because they require two pairs of transmit and receive channels.

You must also provision a network management system to perform DNS and Dynamic Host Configuration Protocol (DHCP) such as Cisco Network Registrar.

The use of SNMPv3 in SII requires that Network Time Protocol (NTP) is enabled and that all network elements involved in LI are synchronized to a stable time source.

The various devices involved in LI have minimum software and memory requirements that must be met. However, because of the number of possible devices and the fact that these requirements are subject to change, see the various product documents listed in the "Related Documents" section on page 47 for the specific requirements.

IP Address Provisioning Considerations

In general, Cisco recommends that service providers not use static IP addresses, particularly for CPEs. Static provisioning of IP addresses is time consuming, expensive, and error prone. On the IAPs, it can be helpful to use loopback interfaces for the interface with the mediation device because the loopback interface remains constant if physical interfaces go out of service or if the routing path changes.

Device Configuration Files

The following sections provide detailed configuration information on the devices involved in LI:

Note For additional information on the Cisco products that support LI, see Table 17 on page 44.

Aggregation Router and Trunking Gateway Configuration

The following aggregation router platforms support version 2.0 of Cisco LI MIB:

- Cisco 7200 series routers
- Cisco 7301 router

The following trunking gateway platforms support version 2.0 of Cisco LI MIB:

- Cisco AS 5350
- Cisco AS 5400
- Cisco AS 5850

The following configuration enables Cisco SII on an aggregation router or trunking router using version 2.0 of the Cisco LI MIB:

```
7200(config)# snmp-server view tapView ciscoTap2MIB included
7200(config)# snmp-server view tapView ciscoIpTapMIB included
7200(config)# snmp-server group tapGroup v3 auth read tapView write tapView notify tapView
7200(config)# snmp-server user mduserid tapGroup v3 auth md5 mdpasswd
```

Additionally, if trunking gateways support dialup data access and if intercept by session is desired, then an additional MIB must be added to view as shown below:

```
AS5400(config)# snmp-server view tapView ciscoUserConnectionTapMIB included
```

The following configuration synchronizes the router's clock with the mediation device and enables SNMP traps to be sent to the mediation device:

```
7200(config)# snmp-server enable traps snmp authentication linkdown linkup coldstart
warmstart
7200(config)# snmp-server host 10.15.113.9 version 3 auth mduserid
7200(config)# ntp server 10.15.113.9
```

The username "mduserid" and password "mdpasswd" must match the username and password that is provisioned on the mediation device for this particular router. In this case, the router's clock is synchronized to the mediation device's clock. A better option is to synchronize all devices in the network to an NTP time server.

Note Usernames, passwords, and security levels must match those provisioned on the mediation device. For the SS8 Networks Xcipio mediation device, see the "Access Function SNMPv3 Configuration" section on page 30. Passwords must be at least eight characters in length. SS8 Networks supports only MD5 authentication.

Cisco BTS 10200 Softswitch Call Agent Configuration

The Cisco Broadband Telephony Softswitch (BTS) 10200 softswitch call agent can be configured to operate in SII mode only or to operate in a mixed mode that supports both PacketCable and SII intercept access point (IAP) devices. This is configured in table Electronic Surveillance Subsystem (ESS) using the USE_PACKETCABLE_IAP parameter. If this parameter is set to N (that is, no), then BTS will support only SII IAP devices. When set to Y (that is, yes), then BTS is in mixed mode and supports both SII and PacketCable IAP devices.

To be compatible with mediation devices that support Event Message Specification I08, the PROTOCOL_VERSION in table ESS must be set to I03.

An example of table ESS configuration is shown below.

```
CDC_DF_PORT=1813
CDC_DF_ADDRESS=10.15.113.9
ENCRYPTION_KEY=0000000000000000
ACC_REQ_RETRANSMIT=3
ACC_RSP_TIMER=2
PROTOCOL_VERSION=I03
IPSEC_SA_ESP_CS=3DES-MD5,3DES-SHA1,NULL-MD5,NULL-SHA1
IPSEC_SA_LIFETIME=86400
IPSEC_SA_GRACE_PERIOD=21600
IPSEC_ULP_NAME=IP
IKE_GROUP=2
IKE_SA_LIFETIME=86400
IKE_CS=3DES-MD5,3DES-SHA1
USE_PACKETCABLE_IAP=N
```

Because the BTS 10200 call agent has no information about network topology and is not aware of aggregation routers, no configuration is necessary for aggregation routers.

On the call agent's profile for trunking gateways, local hairpinning must be disabled. The following line in the trunking gateway profile disables local hairpinning:

```
MGCP_HAIRPIN_SUPP=N
```

Cisco PGW 2200 Softswitch Call Agent Configuration

The Cisco PSTN Gateway 2200 (PGW 2200) softswitch call agent only operates in SII mode using PacketCable Event Message Specification version I03. Provisioning on the Cisco PGW 2200 requires enabling the LI feature and identifying the mediation devices.

Before adding an MD to the Cisco PGW 2200, you should verify that LI is enabled by verifying that the "SysConnectDataAccess=true" and "LISupport=enable" parameters are set as shown in the /opt/CiscoMGC/etc/XECfgParm.dat file.

Following is an example of provisioning a mediation device using default RADIUS timeouts and retries. The recommended RADIUS key of 16 zeros is automatically provisioned.

```
prov-add:extnode:name="mdname",type="LIMD",desc="Mediation_Device"
mml> prov-add:lipath:name="md-path",desc'"MD_Path",extnode="aqsacom"
mml> prov-add:iplnk:name="md-link",desc="MD_link",svc="md-path",
ipaddr="IP_Addr2",port=14146,peeraddr="192.168.9.2",peerport=1813,pri=1
```

In the above example, the value of "ipaddr" is selected from the /opt/CiscoMGC/etc/XECfgParm.dat file and must match the physical interface that has connectivity to the mediation device.

SS8 Networks Xcipio Mediation Device Configuration

The SS8 Networks Xcipio version 3.6.x mediation device runs on a series of Sun Microsystems workstations. The first Sun workstation can handle all call data intercepts and up to five simultaneous communication content intercepts. Each additional workstation can handle up to 20 simultaneous communication content intercepts.

Note The number of intercepts described are for a typical system and may depend upon the model of Sun Microsystems workstation that is used. Both Sun Microsystems and SS8 Networks should be consulted for the latest engineering guidelines.

The SS8 Networks Xcipio mediation device includes audio and visual alarms, and it can support secure sockets and other UNIX security measures.

Most (if not all) of the initial configuration of SS8 Networks Xcipio mediation devices is performed by SS8 Networks as part of the commissioning process. The following section describes the basics of configuring the Xcipio mediation device and is not meant as an authoritative guide.

The three methods of accessing the SS8 Networks Xcipio mediation device are through a CLI, a direct GUI, and a JAVA web interface. Except for surveillance information, all configurations must be done using Man-Machine Language (MML) commands. Surveillance information can be configured using the GUI or by the user calea_gui. Some configuration information (such as call agents) can be viewed using the GUI or user calea_gui but cannot be modified through the GUI or user calea_gui.

Calea_gui is an X Window application that must be run on the SS8 Networks mediation device and displayed either locally or by being sent to a remote X Window server. The SS8 Networks mediation device also supports a web interface that can be used to provision targets through any web browser or UNIX or LINUX workstation.

The built-in help feature for MML commands can display all available commands. To access the help level, enter the following command:

```
MML_calea_opr> help:;
```

For detailed information on a command, enter the command in help mode followed by **:;**. For example, to display help information for the **add-cf** command, enter:

```
HELP_MML_CMD> add-cf:;
```

Note Because the functions and features of the SS8 Networks Xcipio mediation device may depend upon the hardware platforms used, see the *SS8 Xcipio SSDF User Manual* described in the "Related Documents" section on page 47 for details on configuring the Xcipio mediation device and for commands.

The general format for MML commands is:

```
operation - object-of-operation
```

when typical operations are ADD, DISPLAY, MODIFY, or DELETE, and typical objects of operation are collection function (cf) and TCP/IP collection function interface (tcpipcfi).

Note Strings are case-sensitive in all MML commands.

The following configurations must be performed on the SS8 Networks Xcipio mediation device:

Collection Function Configuration

The **add-cf** command adds the collection function and must be executed by user calea_adm.

```
MML_calea_adm> add-cf:cfid=1,name=PenLink;
```

Table 2 describes the strings in the **add-cf** command.

Table 2 add-cf Command Strings

String	Description
cfid	Collection function ID. Any number that has not already been used.
name	Any meaningful string to make the entry easily identifiable.

Collection Function TCP Interface Configuration

The **add-tcpipcfi** command adds the collection function to a TCP/IP interface. The command must be executed by user calea_adm.

```
MML_calea_adm> add-tcpipcfi:cfid=1,ipaddr=172.18.137.94,port=43000,reqstate=ACTIVE;
```

Table 3 describes the strings in the **add-tcpipcfi** command.

Table 3 add-tcpipcfi Command Strings

String	Description
cfid	Collection function ID. Must match a CFID that has been previously added (by the **add-cf:;** command).
ipaddr	IP address of the LEA, which must be statically defined.
port	Port number used to send messages. This port number must match the port number configured on the collection function.
reqstate	Required state must be ACTIVE.

IP Delivery Unit Configuration

The **add-ipdu** command adds the IP delivery unit (IPDU). The command must be executed by user calea_adm. The IPDU is used for the call content portion of intercepts, and up to 16 can be configured on the mediation device. The first IPDU is typically on the same Sun Microsystems' device as the Softswitch Delivery Function (SSDF), while additional IPDUs are located on separate Sun Microsystems devices.

```
MML_calea_adm> add-ipdu:ipduid=1,ipaddr=10.15.113.9,port=15001,hostname=brie;
```

Table 4 describes the strings in the **add-ipdu** command.

Table 4 add-ipdu Command Strings

String	Description
ipduid	IPDU ID number from 1 to 16 that uniquely identifies the IPDU.
ipaddr	IP address of the Sun Microsystems device.
port	Port ID for the first IPDU. The first port ID number must start at 15001.
hostname	Hostname provisioned for a Sun Microsystems device.

IP Port Pools Configuration

The **add-ipport** command creates pools of ports for call content delivery. The command must be executed by user calea_adm. Both incoming and outgoing ports must be created.

```
MML_calea_adm> add-ipport:ipduid=1,portid=1,end_portid=10,direction=IN;
MML_calea_adm> add-ipport:ipduid=1,portid=11,end_portid=20,direction=OUT;
```

Table 5 describes the strings in the **add-ipport** command.

Table 5 add-ipport Command Strings

String	Description
ipduid	IPDU ID number from 1 to 16 that must match an IPDU configured earlier.
portid	Starting port ID number.
end_portid	Ending port ID number.
direction	Allowed values are either IN or OUT.

Surveillance Record Configuration

The **add-surveillance** command is used to add a record for each subject that is to be monitored for call data or call data and call content. It must be executed by user calea_opr. Most of the strings in this command must match corresponding strings provisioned on the LEA collection function. In particular, the caseid string is used as a key to uniquely identify surveillance data. For ease of reading, the command is divided into three lines. The command must be configured as one string with no spaces.

```
MML_calea_opr> add-surveillance:state=AA,county=main-county,city=Home-Town,warrantid=6789,
caseid=1234,subsid=1111000001,startdate=05/01/2002,expdate=06/01/2002,
cfid=1,survtype=CONTENT,content=COMBINED,user=calea_opr,access=PUBLIC;
```

Table 6 describes the strings in the **add-surveillance** command.

Table 6 add-surveillance Command Strings

String	Description
state	Two-character abbreviation for the state of surveillance.
county	County of surveillance.
city	City of surveillance.
warrantid	Warrant ID number.
caseid	String that uniquely identifies the subject.
subsid	Phone number of the subject, or MIN if it is a mobile phone. This string must match that provisioned on the call agent.
startdate	Start date that observation is to begin in mm/dd/yyyy format, or NOW if observation is to begin immediately.
expdate	Expiration date that observation is to end in mm/dd/yyyy format, or UNSPEC for no expiration date.
cfid	Collection function ID. Must match a CFID that has been previously added (by the **add-cf:;** command).
survtype	Surveillance type. DATA for call data only, or CONTENT for call data and call content.
content	Currently, the only value supported is COMBINED, which specifies call data and call content are to be intercepted.
user	Person creating the surveillance instance.
access	PUBLIC if every mediation device web user can view the record, or PRIVATE if only the user who created the record can view it.

AFTDN Configuration

The **add-aftdn** command adds the access function target directory number (AFTDN). It must be executed by user calea_opr. The AFTDN associates a subject with the call agent serving that subject. The AFTDN must be added after the surveillance record is configured (using the **add-surveillance** command).

```
MML_calea_opr> add-aftdn:subsid=2222111112,afid=Cable;
```

Table 7 describes the strings in the **add-aftdn** command.

Table 7 add-aftdn Command Strings

String	Description
subsid	Phone number of the subject, or MIN if it is a mobile phone. This string must match that provisioned on the call agent.
afid	Must match the call agent that serves the targeted phone number.

IP Call Content Channel Configuration

The **add-ipccc** command adds the IP call content channel (IPCCC) and must be executed by user calea_opr. The IPCCC associates a target subscriber with a particular collection function. The IPCCC must be added after the surveillance record and AFTDN have been configured.

```
MML_calea_opr> add-ipccc:ipcccid=1,cccid=0001,state=AA,county=main-county,city=Home-Town,
warantid=6789,subsid=3333000111,cfipaddr=172.18.137.56,cfport=9000;
```

Table 8 describes the strings in the **add-ipccc** command.

Table 8 add-ipccc Command Strings

String	Description
ipcccid	IP call content channel ID
cccid	String appended to call content, CCOpen, and CCClose messages before they are sent to the collection function. **Note** The cccid value should be left blank for VoIP applications since the CMS or mediation device will automatically pick up a unique cccid. The string can be used for data intercepts to force a known cccid.
state	Two-character abbreviation for the state of surveillance.
county	County of surveillance.
city	City of surveillance.
warrantid	Warrant ID number.
subsid	Phone number of the subject, or MIN if it is a mobile phone. This string must match that provisioned on the call agent.
cfipaddr	IP address of the LEA collection function.
cfport	Port on which the collection function receives call content.

Access Function Configuration

The **add-af** command adds access functions (AF), which are devices that intercept call data or call content, including call agents, gateways, and aggregation routers. The command must be executed by user calea_adm.

If the network includes aggregation routers supporting SNMPv3 interfaces, they must also be added with the type of SNMPER. (SNMPER identifies devices that support an SII interface). Trunking gateways that support only MGCP LI options must be provisioned using type TGW. Trunking gateways that support SNMPv3 should be provisioned as such.

```
MML_calea_adm> add-af:afid=Cable,name=Cable,type=BTS10200,version=4.4,preprov=000:00;
MML_calea_adm> add-af:afid=7246-1705,name=7246-1705,type=CMTS,version=12.3,preprov=000:00;
MML_calea_adm> add-af:afid=AS5850-2,name=AS5850-2,type=TGW,version=12.4,preprov=000:00;
MML_calea_adm> add-af:afid=ESR-egw,name=ESR-egw,type=SNMPER,version=12.2,preprov=000:00;
```

Table 9 describes the strings in the **add-af** command.

Table 9 add-af Command Strings

String	Description
afid	Access Function ID (AFID) that is a user-specified string (up to 16 characters) that uniquely identifies the device. The AFID specified in the **add-af** command is then used to reference the device in subsequent commands.
name	A user-specified string (up to 16 characters) that is used for further identification of the device. The name string does not have any meaning to the SS8 Networks mediation device and is not used for any other purpose.
type	Type of physical device. Allowed values are BTS10200, CMS, CMTS, DCFD, GENERIC, MGC, SM, SNMPER, TGW, or SYION. **Note** CMS is defined as call management server. CMTS is defined as cable modem termination system. DCFD is defined as Data Collection and Filtering Device. MGC is defined as Media Gateway Controller. SM is defined as the Telecordia Service Manager. SNMPER identifies devices that support an SII interface. TGW is defined as trunking gateway. SYION is a call management server product of the Syndeo Corporation.
version	Version of software release running on the AF (optional).
preprov	Time zone of the access function.

Access Function SNMPv3 Configuration

The **add-afsi** command adds the access function SNMPv3 interface (AFSI), which contains information needed to interface with the provisioning interface for Cisco SNMPv3 interfaces. It must be executed by user calea_adm. The AFSI must be added after the corresponding access function has been added with the **add-af** command.

```
MML_calea_adm> add-afsi:afid=ESR-egw,ifid=1,domainname=ESR-egw.sm02.cisco.com,
ipaddr=10.15.115.3,port=161,reqstate=ACTIVE,username=ss8user,authpasswd=ss8passwd,
privpasswd=ss8passwd,securitylvl=AUTHNOPRIV,interfaceid=ANY_INTERFACE;
```

Table 10 describes the strings in the **add-afsi** command.

Table 10 add-afsi Command Strings

String	Description
afid	Access function ID. A user-specified string (up to 16 characters) that uniquely identifies the device. The AFID must match an AFID previously specified in the **add-af** command.
ifid	Interface ID. Must be 1.
domainname	Domain name configured in DNS.
ipaddr	IP address of the access function.

Table 10 add-afsi Command Strings (continued)

String	Description
port	Port 161 is the default for SNMP.
reqstate	Required state. ACTIVE if this interface is to try to initialize and come into service. INACTIVE if the intercept is being pre-provisioned and is not meant to begin service.
username authpasswd privpasswd	The username and passwords must match those provisioned on the access function. Passwords must be at least eight characters in length.
securitylvl	Must be AUTHNOPRIV. Aggregation routers will not allow NOAUTHNOPRIV.
interfaceid	For aggregation routers, use ANY_INTERFACE. For trunking gateways or other devices that contain Digital Signal Processors (DSPs), use VOIP_SESSION.

Access Function Trunking Gateway Interface Configuration

The **add-afti** command adds the access function trunking gateway interface (AFTI). The command must be executed by user calea_adm. The AFTI contains information required to allow access to call content for calls passing through trunking gateways that support only the MGCP LI method. Gateways that support SNMPv3 interfaces are provisioned in the AFSI table. All gateways must also be provisioned in DNS in the same way as aggregation routers so that the mediation device can map an IP address to serving gateways with the pointer record (PTR) returned.

```
MML_calea_adm> add-afti;afid=AS5850-2,ifid=1,domainname=AS5850-2.sm02.cisco.com
ipaddr=10.15.111.6,protocol=MGCP,version=1.0;
```

Table 11 describes the strings in the **add-afti** command.

Note The AFTI table is no longer required for use with BTS; however, it may still be required if using the Cisco MGX 8850 switch as a trunking gateway with the Cisco PGW 2200. The Cisco AS5350, Cisco AS5400, and Cisco AS5850 trunking gateways should be provisioned in AFSI as they will support SII.

Table 11 add-afti Command Strings

String	Description
afid	Access function ID that has been previously configured in the AF table.
ifid	Interface ID. Must be 1.
domainname	Domain name configured in DNS.
ipaddr	IP address of the access function.
protocol	MGCP is the only value that should be used. If the gateway supports SNMPv3, it should be provisioned using the **add-afsi** command.
version	Version of MGCP software being used that must match the version provisioned on the gateway. Typically this is 1.0.

Access Function BTS Provisioning Interface Configuration

The **add-afbi** command adds the access function BTS interface (AFBI), which provisions the interface that the SS8 Networks SSDF uses to provision wiretaps on the BTS Element Management System (EMS). The command must be executed by user calea_adm. Because the EMS typically consists of active and standby units that each have different IP addresses, the **add-afbi** command must be configured for both units.

```
MML_calea_adm> add-afbi:afid=Cable,ifid=1,ipaddr=10.8.100.100,username=calea
passwd=test123,reqstate=ACTIVE;
MML_calea_adm> add-afbi:afid=Cable,ifid=2,ipaddr=10.8.100.101,username=calea
passwd=test123,reqstate=ACTIVE;
```

Table 12 describes the strings in the **add-afbi** command.

Table 12 add-afbi Command Strings

String	Description
afid	Access function ID that has been previously configured in the AF table.
ifid	Interface ID. Each EMS unit must have a unique IFID.
ipaddr	IP address of the EMS unit.
username	Username “calea” must be configured on the EMS.
passwd	Password must match that provisioned on the EMS. Passwords must be at least eight characters in length.
reqstate	ACTIVE if this interface is to try to initialize and come into service.

Note On the SS8 Networks’ mediation device, in the file $ASVCRUN/config/MML/btsrhost.cnf, uncomment the appropriate lines for provisioning BTS using either SSH (the normal default) or Telnet. You must be logged in to the SS8 Networks MD as user calea_adm to edit this file. If calea is running on the MD when this edit is made, calea must be stopped and restarted before the change will take effect. For details on this process, see the *SS8 Xcipio SSDF User Manual* in the “Related Documents” section on page 47.

Access Function Provisioning Interface Configuration

The **add-afpi** command adds the access function provisioning interface (AFPI) which provisions the interface that the SS8 Networks’ SSDF software uses to access the TopLayer DCFD. The TopLayer DCFD is required only when data intercepts that require sniffing of RADIUS traffic are needed.

```
MML_calea_admin> add-afpi:afid=TopLayer,ifid=1,ipaddr=10.15.113.61,username=calea,
port=ACTIVE,reqstate=ACTIVE;
```

Table 13 describes the strings in the **add-afbi** command.

Table 13 add-afpi Command Strings

String	Description
afid	Access function ID that has been previously configured in the AF table.
ifid	Interface ID. Each TopLayer DCFD must have a unique IFID.

Table 13 add-afpi Command Strings

String	Description
ipaddr	IP address of the DCFD unit.
username	Username “calea” must be configured on the EMS.
port	Port to be used on the DCFD unit. Recommended value is 0 (zero).
reqstate	Required state. State is ACTIVE if this interface is trying to initialize and come into service.

Access Function PGW Provisioning Interface Configuration

The **add-afgi** command adds the access function PGW interface (AFGI), which provisions the interface that SS8 Networks SSDF uses to provision wiretaps on the PGW. The command must be executed by user calea_adm. Because the PGW typically consists of an active and standby unit that each have different IP addresses, the **add-afgi** command must be configured for both units.

```
MML_calea_adm> add-afgi:afid=PGW,ifid=1,ipaddr=10.15.113.80,username=liusr,
passwd=test123,reqstate=ACTIVE
```

Table 14 describes the strings in the **add-afgi** command.

Table 14 add-afgi Command Strings

String	Description
afid	Access function ID that has been previously configured in the AF table.
ifid	Interface ID. Each PGW unit must have a unique IFID.
ipaddr	IP address of the PGW unit.
username	Must match that provisioned on the access function.
passwd	Password must be at least eight characters in length.
reqstate	Allowed values are ACTIVE or INACTIVE.

Access Function RADIUS Interface Configuration

The **add-afri** command adds the access function RADIUS interface (AFRI), which provisions the PacketCable event message interface between the call agent and the SS8 Networks mediation device. The command must be executed by user calea_adm. As with the **add-afbi** command, the **add-afri** command must be performed for both active and standby call agent units. The AFID is the same for both, and the IFID is unique for each.

```
MML_calea_adm> add-afri:afid=Cable,ifid=1,ipaddr=10.8.100.102,port=14146,
reqstate=ACTIVE,version=I08,sharedsecret=0000000000000000;
MML_calea_adm> add-afri:afid=Cable,ifid=2,ipaddr=10.8.100.103,port=14146,
reqstate=ACTIVE,version=I08,sharedsecret=0000000000000000;
```

Table 15 describes the strings in the **add-afri** command.

Table 15 add-afri Command Strings

String	Description
afid	An AFID that has been previously configured in the AF table.
ifid	Interface ID. Each call agent unit must have a unique IFID.
ipaddr	The IP address of the call agent unit.
port	The default RADIUS port for BTS is 14146.
reqstate	Allowed values are ACTIVE or INACTIVE.
version	Allowed values are I03 or I08, which specifies the supported version of the EMS specification. BTS release 4.4 or release 4.5 should be I08, and PGW should be I03.
sharedsecret	Must match the shared secret provisioned on the BTS using the **add ess** command by the user calea.

In this example, port 14146 is the default source port used by the BTS. If port validation for security is not desired, then the port number in AFRI can be set to 0 (zero).

SNMP Alarms and Traps Configuration

The **add-almdest** command configures SNMP alarms. It must be executed by user calea_adm.

```
MML_calea_adm> add-almdest:name=SNMP,type=SNMP;
MML_calea_adm> add-almstream:name=SNMP,group=ALL,module=ALL,number=ALL,severity=ALL,
type=ALL;
```

The **add-almstream** command configures SS8 to send SNMP traps to the network management system. It must be executed by user calea_adm.

```
MML_calea-adm> add-almstream:name=SNMP,group=ALL,module=ALL,number=ALL,severity=ALL,
type=PASS;
```

For information on editing files to set up the addresses and ports of the SNMP network management server, see the *SS8 Xcipio SSDF User Manual* in the "Related Documents" section on page 47. The files that need to be edited will depend upon whether the network management server supports SNMPv1 or SNMPv2. The SS8 MIB definition files will also need to be installed into the network management software.

DNS Server Configuration

The DNS server must be provisioned to allow the mediation device to map the gateway to the aggregation router. Table 16 shows a DNS resource record entry that maps a range (an entire C class) of Integrated Access Device (IAD) endpoint IP addresses to the serving aggregation router, Edge Services Router (ESR)-eg2.sm02.cisco.com.

Table 16 DNS Server Configuration

Name(v)	TTL	Type	Data
0	—	PTR	ESR-egw.sm02.cisco.com
0	—	A	255.255.255.0

For SSDF to map an analog access device IP to the serving aggregation router, DNS must be configured according to RFC 1101, *DNS Encoding of Network Names and Other Types*.

Note By adding an "A" record to the DNS server, performance can be improved since the MD may look for the "A" record before trying to look for the PTR record. A record must contain a valid mask for the range of addresses served by the device in the PTR record.

Verifying the Cisco SII LI Network

The following sections describe how to verify that the Cisco SII LI network has been configured correctly:

- Verifying the Cisco BTS 10200 Softswitch Call Agent Configuration, page 35
- Verifying the Cisco PGW 2200 Softswitch Call Agent Configuration, page 36
- Verifying the SS8 Networks Mediation Device Configuration, page 37
- Verifying the DNS Configuration from the Mediation Device, page 40
- Verifying Edge Router and Trunking Gateway Configurations, page 41

Verifying the Cisco BTS 10200 Softswitch Call Agent Configuration

The following commands can be used to verify the LI configuration on the Cisco BTS 10200 softswitch call agent. Each of these EXEC commands can be issued only by the user calea.

```
BTS> show ess
Reply: Success: Entry 1 of 1 returned.

CDC_DF_PORT=1813
CDC_DF_ADDRESS=10.15.113.9
ENCRYPTION_KEY=0000000000000000
ACC_REQ_RETRANSMIT=3
ACC_RSP_TIMER=2
PROTOCOL_VERSION=I03
IPSEC_SA_ESP_CS=3DES-MD5,3DES-SHA1,NULL-MD5,NULL-SHA1
IPSEC_SA_LIFETIME=86400
IPSEC_SA_GRACE_PERIOD=21600
IPSEC_ULP_NAME=IP
IKE_GROUP=2
IKE_SA_LIFETIME=86400
IKE_CS=3DES-MD5,3DES-SHA1
USE_PACKETCABLE_IAP=Y
```

Note In the above example, since USE_PACKETCABLE_IAP=Y, this example is for PacketCable mode or mixed mode. If USE_PACKETCABLE_IAP is set to N, the example is for SII mode only.

```
CLI> show wiretap

SUBSCRIBER_DN=e4d8721cb4f1d60d784195177e1c46f7
TAPTYPE=INTERCEPT
CDC_DF_ADDRESS=10.15.113.9
CDC_DF_PORT=1813
CCC_DF_ADDRESS=10.15.113.9
CCC_DF_PORT=45010
```

```
SUBSCRIBER_DN=e4d8721cb4f1d60dfa44bb16bbd6afc1
TAPTYPE=PEN_AND_TRACE
CDC_DF_ADDRESS=10.15.113.9
CDC_DF_PORT=1813

SUBSCRIBER_DN=f9e4495092d9f3b9928b014403aacc0a
TAPTYPE=PEN_AND_TRACE
CDC_DF_ADDRESS=10.15.113.9
CDC_DF_PORT=1813

SUBSCRIBER_DN=f9e4495092d9f3b9b85194d1ccfbc155
TAPTYPE=INTERCEPT
CDC_DF_ADDRESS=10.15.113.9
CDC_DF_PORT=1813
CCC_DF_ADDRESS=10.15.113.9
CCC_DF_PORT=45010

Reply: Success: Entries 1-4 of 4 returned.

CLI>
```

The following command shows the wiretap information for a specific subscriber.

```
CLI> show wiretap subscriber_dn=6213000001

SUBSCRIBER_DN=f9e4495092d9f3b9b85194d1ccfbc155
TAPTYPE=INTERCEPT
CDC_DF_ADDRESS=10.15.113.9
CDC_DF_PORT=1813
CCC_DF_ADDRESS+10.15.113.9
CCC_DF_PORT=45010

Reply: Success: Entry 1 of 1 returned
CLI>
```

Verifying the Cisco PGW 2200 Softswitch Call Agent Configuration

Use the following commands to verify the configuration on the Cisco PGW 2200 softswitch call agent configuration.

To verify the mediation device configuration, enter the following commands from a PGW user that is authorized to access MML.

```
MML> PROV-RTRV:EXTNODE:NAME="NAME OF MEDIATION DEVICE"
MML> PROV-RTV:LIPATH:NAME="NAME OF PATH TO MD"
MML> PROV-RTRV:IPLNK:NAME="NAME OF LINK TO MD"
MML> PROV-RTRV:SIGSVCPROP:NAME="NAME OF PATH TO MD"
```

Note At any time, you can enter a tab character in MML to provide a list of valid arguments

To verify the wiretap configuration, enter the following commands from a PGW user that is authorized to access the wiretap command set:

```
MML> wiretap-rtrv:subscriber:number="target's phone number"
MML> wiretap-rtrv:subscriber:"all"
```

Verifying the SS8 Networks Mediation Device Configuration

The following commands can be used to verify the SS8 Networks mediation device configuration. For more information on verifying the SS8 Networks mediation device, see the *SS8 Xcipio SSDF User Manual* in the "Related Documents" section on page 47.

```
MML_calea> display-almdest:;
------------------------------------------------------------------
NAME     TYPE     DEST                ARG                 STATUS
------------------------------------------------------------------
CONSOLE  CONSOLE  stdout                                  OK
LOG      LOGFILE  /opt/SS8/access/AlarmLogs AccessAlarms.0      OK
PANEL    PANEL    0x16000001          819296              OK
SNMP     SNMP                                            OK
<SUCCESS>:: 4 records found.

MML_calea> display-almstream:;
-------------------------------------------------
NAME     GROUP    MODULE NUMBER SEVERITY TYPE
-------------------------------------------------
CONSOLE  ALL      ALL    ALL    ALL      PASS
LOG      ALL      ALL    ALL    ALL      PASS
PANEL    ALL      ALL    ALL    ALL      PASS
SNMP     ALL      ALL    ALL    ALL      PASS
<SUCCESS>:: 4 records found.

MML_calea> display-ipdu:;
-------------------------------------------------------------------------------------
IPDUID HOSTNAME         IPADDR          PORT  STATE      INSTR INEND OUTSTR OUTEND
-------------------------------------------------------------------------------------
1      swiss            10.15.93.29     15001 ACTIVE     45001 45128 45129  45512
<SUCCESS>:: 1 records found.

MML_calea> display-ipport:;
-----------------------------------------------
IPDUID PORTID PORT  DIRECTION PROTOCOL STATE
-----------------------------------------------
1      1      45010 IN        UDP      BUSY
1      2      45009 IN        UDP      BUSY
1      3      45008 IN        UDP      IDLE
1      4      45007 IN        UDP      IDLE
1      5      45006 IN        UDP      IDLE
1      6      45005 IN        UDP      IDLE
1      7      45004 IN        UDP      IDLE
1      8      45003 IN        UDP      IDLE
1      9      45002 IN        UDP      IDLE
1      10     45001 IN        UDP      IDLE
1      11     45138 OUT       UDP      BUSY
1      12     45137 OUT       UDP      BUSY
1      13     45136 OUT       UDP      IDLE
1      14     45135 OUT       UDP      IDLE
1      15     45134 OUT       UDP      IDLE
1      16     45133 OUT       UDP      IDLE
1      17     45132 OUT       UDP      IDLE
1      18     45131 OUT       UDP      IDLE
1      19     45130 OUT       UDP      IDLE
1      20     45129 OUT       UDP      IDLE

<SUCCESS>:: 20 records found.
```

```
MML_calea> display-cf:;
------------------------------------------------------
CFID NAME            TYPE  GRP1 GRP2 GRP3 GRP4 CARRIER
------------------------------------------------------
1    CF-1            TCPIP N/A  N/A  N/A  N/A  000
2    CF-2            TCPIP N/A  N/A  N/A  N/A  000
<SUCCESS>:: 2 records found.

MML_calea> display-tcpipcfi:;
------------------------------------------------------------
CFID OWNIP           IPADDR          PORT  REQSTATE STATE
------------------------------------------------------------
1    172.18.137.105  172.18.137.94   43001 ACTIVE   ACTIVE
2    172.18.137.105  172.18.137.56   43001 ACTIVE   ACTIVE
<SUCCESS>:: 2 records found.

MML_calea> display-af:;
------------------------------------------------------------------------------------------------
-
AFID             NAME             TYPE     SERIAL           VERSION          PREPROV INDEX
------------------------------------------------------------------------------------------------
TopLayer         TopLayer         DCFD      N/A              1.0              000:00    8
PGW              PGW              PGW2200   N/A              9.6              000:00   11
7246-I1705       7246-I1705       SNMPER    N/A             12.3              000:00    3
Beyond           Beyond           BTS10200  N/A              4.4              000:00    1
Cable            Cable            BTS10200  N/A              4.4              000:00    2
7200-egw         7200-egw         SNMPER    N/A             12.4              000:00    2
7500-egw         7500-egw         SNMPER    N/A             12.4              000:00    3
ESR-egw          ESR-egw          SNMPER    N/A             12.2              000:00    1
<SUCCESS>:: 8 records found.

MML_calea> display-afbi:;
------------------------------------------------------------------------------------------------
AFID             IFID IPADDR          REQSTATE STATE    USERNAME         PASSWD
------------------------------------------------------------------------------------------------
Beyond           1    10.15.69.7      INACTIVE INACTIVE calea           test123
Cable            1    10.8.100.100    ACTIVE   ACTIVE   calea           test123
Cable            2    10.8.100.101    ACTIVE   INACTIVE calea           test123
<SUCCESS>:: 3 records found.

MML_calea> display-afgi:;
------------------------------------------------------------------------------------------------
AFID             IFID IPADDR          REQSTATE STATE USERNAME
------------------------------------------------------------------------------------------------
PGW              1    10.15.113.80    ACTIVE   ACTIVE  liusr
<SUCCESS>:: 1 record found.

MML_calea> display-afpi:;
------------------------------------------------------------------------------------------------
AFID             IFID IPADDR          PORT REQSTATE STATE
------------------------------------------------------------------------------------------------
TopLayer         1    10.15.113.61    0    ACTIVE   ACTIVE
<SUCCESS>:: 1 record found.
```

```
MML_TH> display-afsi:;
------------------------------------------------------------------------------------------
------------------------------------------------------------
AFID           IFID DOMAINNAME         IPADDR         PORT  REQSTATE STATE    USERNAME
    AUTHPASSWD           PRIVPASSWD           SECURITYLVL  INTERFACEID
------------------------------------------------------------------------------------------
------------------------------------------------------------
7200-egw       1    7200-egw.sm02.cisco.com 10.15.115.1  161  ACTIVE  ACTIVE  ss8user
    ss8passwd            ss8passwd            AUTHNOPRIV   ANY_INTERFACE
7500-egw       1    7500-egw.sm02.cisco.com 10.15.115.2  161  ACTIVE  ACTIVE  ss8user
    ss8passwd            ss8passwd            AUTHNOPRIV   ANY_INTERFACE
ESR-egw        1    ESR-egw.sm02.cisco.com  10.15.115.3  161  ACTIVE  ACTIVE  ss8user
    ss8passwd            ss8passwd            AUTHNOPRIV   ANY_INTERFACE
<SUCCESS>:: 3 records found.

MML_calea> display-afti:;
------------------------------------------------------------------------------------------
AFID     IFID DOMAINNAME                 IPADDR       PORT REQSTATE STATE PROTOCOL VERSION

------------------------------------------------------------------------------------------
AS5850-2   1  AS5850-2.sm02.cisco.com    10.15.111.6   2427 ACTIVE  ACTIVE  MGCP   1.0
mgxc701-11 1  mgxc701-11.sm02.cisco.com  10.15.112.193 2427 ACTIVE  ACTIVE  MGCP   1.0
<SUCCESS>:: 2 records found.
MML_TH>
MML_calea> display-afri:;
--------------------------------------------------------------------------------
AFID             IFID IPADDR          PORT  REQSTATE VERSION SHAREDSECRET
--------------------------------------------------------------------------------
PGW              1    10.15.113.80    14146 ACTIVE   I08 0000000000000000
PGW              2    10.15.113.81    14146 ACTIVE   I08 0000000000000000
Beyond           1    10.15.69.35     14146 ACTIVE   I08 0000000000000000
Beyond           2    10.15.69.36     14146 ACTIVE   I08 0000000000000000
Beyond           3    10.15.69.67     14146 ACTIVE   I08 0000000000000000
Beyond           4    10.15.69.68     14146 ACTIVE   I08 0000000000000000
Cable            1    10.8.100.102    14146 ACTIVE   I08 0000000000000000
Cable            2    10.8.100.103    14146 ACTIVE   I08 0000000000000000
<SUCCESS>:: 8 records found.

MML_calea> display-surveillance:;
------------------------------------------------------------------------------------------
------------------------------------------------------------------------------------------
STATE COUNTY              CITY               WARRANTID           JAREA    CASEID
SUBSID          ENTRYDATE  STARTDATE  EXPDATE    STATUS  CFID SURVTYPE CONTENT  USER
ACCESS
------------------------------------------------------------------------------------------
------------------------------------------------------------------------------------------
AA    Main-County         Home-Town           0305               COUNTRY  0305
9844950305       08/30/2002 08/30/2002 12/31/2002 ACTIVE  1    DATA     NONE     calea_opr
PUBLIC
AA    Main-County         Home-Town           0306               COUNTRY  0306
9844950306       08/22/2002 08/22/2002 12/30/2002 ACTIVE  2    DATA     NONE     calea_opr
PUBLIC
AA    Main-County         Home-Town           0308               COUNTRY  0308
9844950308       08/22/2002 08/22/2002 12/31/2002 ACTIVE  2    CONTENT  COMBINED calea_opr
PUBLIC
AA    Main-County         Home-Town           9192621001         COUNTRY  1001
9192621001      09/30/2002 09/30/2002 12/31/2003 ACTIVE  2    CONTENT  COMBINED calea_opr
PUBLIC
AA    Main-County         Home-Town           9844950307         COUNTRY  0307
9844950307       10/01/2002 10/01/2002 11/01/2003 ACTIVE  2    CONTENT  COMBINED calea_opr
PUBLIC
<SUCCESS>:: 5 records found.
```

In the following output from the **display-aftdn:;** command, the first and last entries are for call data only. The middle three entries are for call data and call content. The SSDF software automatically selects the IP address and port number.

```
MML_calea> display-aftdn:;
------------------------------------------------------------------------------
SUBSID           AFID             IPADDR          PORT  REQSTATE   STATE
------------------------------------------------------------------------------
9192621001       Cable            10.8.100.17     45009 ACTIVE     PROVED
9844950305       Cable            N/A             0     ACTIVE     PROVED
9844950306       Cable            N/A             0     ACTIVE     PROVED
9844950307       Cable            N/A             0     ACTIVE     TOBEPROV
9844950308       Cable            10.8.100.17     45010 ACTIVE     PROVED
<SUCCESS>:: 5 records found.


MML_calea> display-ipccc:;
------------------------------------------------------------------------------------------------------
-------------------------------------------
IPCCCID STATE COUNTY             CITY               WARRANTID          CCCID
SUBSID           CFIPADDR        CFPORT STATUS
------------------------------------------------------------------------------------------------------
-------------------------------------------
1       AA    Home-Town           Home-Town           0308               ----
9844950308       172.18.137.56   9000   ACTIVE
8       AA    Home-Town           Home-Town           9192621001         ----
9192621001       172.18.137.56   9000   ACTIVE
<SUCCESS>:: 2 records found.
```

Verifying the DNS Configuration from the Mediation Device

The following commands can be used to verify that DNS is properly configured from the SS8 mediation device. The first example of the **nslookup** command verifies that the PTR record is properly configured. The IP address of the target's IAD loopback interface is 10.142.133.2. Therefore, to mask the last octet of the IP address, the lookup is performed for 0.133.142.10.

```
brie% nslookup -type=PTR 0.133.142.10.in-addr.arpa
Server:  aulander.cisco.com
Address:  172.18.135.89

0.133.142.10.in-addr.arpa       name = ESR-egw.sm02.cisco.com
133.142.10.in-addr.arpa nameserver = sm02cnra.sm02.cisco.com
```

The second example of the **nslookup** command verifies that the A record is properly configured. The IAD address is used.

```
brie% nslookup -type=A 0.133.142.10.in-addr.arpa
Server:  aulander.cisco.com
Address:  172.18.135.89

Name:    0.133.142.10.in-addr.arpa
Address:  255.255.255.0
```

To subsequently determine the IP address of the edge router, the net mask is "AND"ed with the original target IP address, and another **nslookup** command is performed.

Verifying Edge Router and Trunking Gateway Configurations

The **show snmp view** command can be used to verify the SNMPv3 configuration on an aggregation router. The **show snmp view** command displays SNMPv3 LI information, where the tapView line is the line of interest.

```
7200-egw# show snmp view
*ilmi system - included permanent active
*ilmi atmForumUni - included permanent active
tapView ciscoIpTapMIB - included nonvolatile active
tapView ciscoTap2MIB - included nonvolatile active
v1default iso - included permanent active
v1default internet.6.3.15 - excluded volatile active
v1default internet.6.3.16 - excluded volatile active
v1default internet.6.3.18 - excluded volatile active
v1default ciscoIpTapMIB - excluded volatile active
v1default ciscoMgmt.395 - excluded volatile active
v1default ciscoTap2MIB - excluded volatile active
v1default ciscoMgmt.400 - excluded volatile active
```

The **show snmp view** command can be used to verify the gateway configuration for session-based intercept on a trunking gateway router.

```
AS5400-022# show snmp view
tapView ciscoIpTapMIB - included nonvolatile active
tapView ciscoTap2MIB - included nonvolatile active
tapView ciscoUserConnectionTapMIB - included nonvolatile active
v1default iso - included permanent active
v1default internet.6.3.15 - excluded volatile active
v1default internet.6.3.16 - excluded volatile active
v1default internet.6.3.18 - excluded volatile active
v1default ciscoIpTapMIB - excluded volatile active
v1default ciscoMgmt.395 - excluded volatile active
v1default ciscoTap2MIB - excluded volatile active
v1default ciscoUserConnectionTapMIB - excluded volatile active
AS5400-022#
```

The **show snmp group** command displays information on SNMP groups, where the tapGroup line is the line of interest.

```
7200-egw# 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: tapGroup                      security model:v3 auth
readview : tapView                       writeview: tapView
notifyview: tapView
row status: active
```

The **show snmp user** command displays information about configured users of SNMP.

```
7200-egw# show snmp user
User name: mduserid
Engine ID: 80000009030000B04AD1B000
storage-type: nonvolatile        active
Authentication Protocol: MD5
```

```
Privacy Protocol: None
Group-name: tapGroup
```

Troubleshooting a Cisco SII LI Network

The following sections provide guidance in troubleshooting a Cisco SII LI network:

General Troubleshooting Notes

The most common problem encountered in configuring LI on a network is general networking problems. All of the involved devices must have static IP addresses, and most require the use of specific ports. All of the firewalls involved (end customer, SP, ISP, LEA, and so on) must allow the static IP addresses and port numbers to go through. When firewalls prohibit ping traffic, pings cannot be used for troubleshooting. Instead, you may have to use a sniffer to verify connectivity.

Another common problem is mismatched usernames and passwords. The following sections include details about the device interfaces that must have matching usernames and passwords.

Troubleshooting the Mediation Device

If you have trouble with a mediation device, first check the mediation device logs and alarms. In case of serious trouble, the mediation devices have various tracing mechanisms. On the SS8 Networks Xcipio mediation device, if the file /etc/resolv.conf is edited to add or modify IP addresses of DNS servers while the CALEA application is running, CALEA must be stopped and restarted (using the **calea_stop** and **calea_start** commands) before the application will recognize the configuration changes. For more information on troubleshooting the SS8 Networks Xcipio mediation device, see the *SS8 Xcipio SSDF User Manual* in the "Related Documents" section on page 47.

When SNMPv3 is used, the usernames, passwords, and security levels provisioned on the mediation device must match those provisioned on the aggregation devices.

If the IP address or port number provisioned on the mediation device for the collection function is incorrect, the collection function will appear in the "FAIL" state on the mediation device, and logs on the mediation device will detail connection attempt failures. On the SS8 Networks mediation device, the logs are located at $ASVCRUN/mlog/Mlog[date]. If the port number for call content delivery to the collection function is incorrect, the collection function will never receive call content.

The mediation device log files will also contain error records if incorrect IP addresses or port numbers are provisioned for the call agent, aggregation routers, or edge routers.

Troubleshooting the BTS Call Agent

To perform ESS and wiretap commands on the BTS, you must log in as user **calea**. All other commands can be entered by any user with the proper permissions.

When accessing the BTS, you must log in as user **calea**. The username and password must match those provisioned on the mediation device.

The BTS will not function properly if the $ASVCRUN/config/MML/btsrhost.cnf file is not properly edited to change it from Telnet to SSH. Six lines in the file need to be edited, which are described in the software installation instructions.

The following section describes troubleshooting procedures on the BTS call agent.

For more information on debugging and tracing tools for the BTS, see the *Cisco BTS 10200 Documentation Access Information* document in the "Related Documents" section on page 47.

Troubleshooting Table ESS

As user calea, enter the **show ess** EXEC command to verify the data in table ESS:

```
CLI> show ess

CDC_DF_PORT=1813
CDC_DF_ADDRESS=10.15.113.9
ENCRYPTION_KEY=0000000000000000
ACC_REQ_RETRANSMIT=3
ACC_RSP_TIMER=2
PROTOCOL_VERSION=I03
IPSEC_SA_ESP_CS=3DES-MD5,3DES-SHA1,NULL-MD5,NULL-SHA1
IPSEC_SA_LIFETIME=86400
IPSEC_SA_GRACE_PERIOD=21600
IPSEC_ULP_NAME=IP
IKE_GROUP=2
IKE_SA_LIFETIME=86400
IKE_CS=3DES-MD5,3DES-SHA1
USE_PACKETCABLE_IAP=N
```

Verify the following items:

- The CDC_DF_ADDRESS string equals that of the MD (and must match the string used when the MD performs an **add wiretap** command).
- The ENCRYPTION_KEY is the same string that is configured on the MD.
- The PROTOCOL_VERSION should be I03.
- The USE_PACKETCABLE_IAP value is N if you want to be in SII mode only. Use Y if you want to be in mixed mode.

Appendix

This section contains the following information:

Cisco Products That Support Lawful Intercept

Table 17 provides the following additional information on the Cisco products that support LI:

- Cisco Product—name of product that supports LI
- Product Type—the role that the product performs
- Voice Support—describes the software versions that the platform supports:
  - SIIv1—Cisco SII software that supports version 1.0 of Cisco LI MIB
  - SIIv2—Cisco SII software that supports version 2.0 of Cisco LI MIB
  - PC—PacketCable
  - CISCO-TAP-MIB, CISCO-TAP2-MIB, CISCO-IP-TAP-MIB—version of Cisco LI MIB
- Data Support—describes the software versions that the platform supports:
  - SIIv1—Cisco SII software that supports version 1.0 of LI
  - SIIv2—Cisco SII software that supports version 2.0 of LI
  - PC—PacketCable
  - CISCO-TAP-MIB, CISCO-TAP2-MIB, CISCO-IP-TAP-MIB—version of Cisco LI MIB

Table 17 displays the Cisco products that support LI architecture.

Table 17 Cisco Products That Support Lawful Intercept

Cisco Product	Product Type	Voice Support	Data Support
Cisco BTS 10200	Call agent	• SIIv1 and SIIv2—supports BTS Release 4.4 and later releases • PC—supports BTS Release 4.4 and later releases	—
Cisco PGW 2200	Call agent	• SIIv1 and SIIv2—supports PGW Release 9.5(1) and later releases • PC—N/A	—
Cisco 7200 series	Aggregation router	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.3(8)T until Release 12.3(14)T • SIIv2 (Cisco-TAP2-MIB, Cisco-IP-TAP-MIB)—supports Cisco IOS Release 12.3(14)T and later releases • PC—N/A	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.3(8)T until Release 12.3(14)T • SIIv2 (Cisco-TAP2-MIB, Cisco-IP-TAP-MIB)—supports Cisco IOS Release 12.3(14)T and later releases • PC—N/A
Cisco 7301	Aggregation router	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.3(8)T until Release 12.3(14)T • SIIv2 (Cisco-TAP2-MIB, Cisco-IP-TAP-MIB)—Cisco IOS Release 12.3(14)T and later releases • PC—N/A	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.3(8)T until Release 12.3(14)T • SIIv2 (Cisco-TAP2-MIB, Cisco-IP-TAP-MIB)—Cisco IOS Release 12.3(14)T and later releases • PC—N/A

Table 17 Cisco Products That Support Lawful Intercept (continued)

Cisco Product	Product Type	Voice Support	Data Support
Cisco 7505	Aggregation router	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.3(9) and later releases • PC—N/A	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.3(9) and later releases • PC—N/A
Cisco 7507	Aggregation router	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.3(9) and later releases • PC—N/A	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.3(9) and later releases • PC—N/A
Cisco 7513	Aggregation router	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.3(9) and later releases • PC—N/A	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.3(9) and later releases • PC—N/A
Cisco 10000	Aggregation router	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.0(25)S and later releases • PC—N/A	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.3(7)XI and later releases; Layer 2 Tunneling Protocol (L2TP) support using RADIUS provisioning available in Cisco IOS Release 12.2SB1 • PC—N/A
Cisco 12000 Gigabit Switch Router (GSR)	Aggregation router	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.0(32)S and later releases require engine 3 or engine 5 cards at the edge router (customer facing); core facing cards can be any generation • PC—N/A	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.0(32)S and later releases require engine 3 or engine 5 cards at the edge router (customer facing); core facing cards can be any generation • PC—N/A
Cisco Universal Broadband Router (uBR)7246 VXR	CMTS	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.3(13)a-BC and later releases • PC—Cisco IOS Release 12.2(15)BC1b and later releases	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.3(13)a-BC and later releases • PC—N/A
Cisco uBR10000	CMTS	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.2(15)BC1b and later releases • PC—Cisco IOS Release 12.2(15)BC1b and later releases	• SIIv1 (Cisco-TAP-MIB)—Cisco IOS Release 12.3(13)a-BC and later releases • PC—N/A

Table 17 Cisco Products That Support Lawful Intercept (continued)

Cisco Product	Product Type	Voice Support	Data Support
Content Services Gateway (CSG)	Blade for Cisco Catalyst 6000 and Cisco Catalyst 7600	• Cisco Catalyst 6000: – SIIv1 (Cisco-TAP-MIB): native IOS Release c6k222-jsu2v-mz.ZA4-LI; hybrid image c6msfc2-jsu2v-mz.ZA4-LI of Cisco IOS Release 12.2(18d)SXC – PC—N/A • Cisco Catalyst 7600: – SIIv1 (Cisco-TAP-MIB): Supervisor software—s72033-adventerprisek9_wan-mz.122-18.SXE1.bin; s72033-advipservicesk9_wan-mz.122-18.SXE1.bin; CSG software -WS-SVC-CSG-L4.0 – PC—N/A	• Cisco Catalyst 6000: – SIIv1 (Cisco-TAP-MIB): native IOS Release c6k222-jsu2v-mz.ZA4-LI; hybrid image c6msfc2-jsu2v-mz.ZA4-LI of Cisco IOS Release 12.2(18d)SXC – PC—N/A • Cisco Catalyst 7600: – SIIv1 (Cisco-TAP-MIB): Supervisor software—s72033-adventerprisek9_wan-mz.122-18.SXE1.bin; s72033-advipservicesk9_wan-mz.122-18.SXE1.bin; CSG software -WS-SVC-CSG-L4.0 – PC—N/A
Cisco 3660	Trunking gateway	• SIIv1 (Cisco-TAP-MIB) –Cisco IOS Release 12.3(5) and later releases –Enterprise Plus LI software feature set •PC—Cisco IOS Release 12.3(7)T and later releases	—
Cisco 7200 series	Trunking gateway	• SIIv1 (Cisco-TAP-MIB): Cisco IOS Release 12.3(7)T until Release 12.3(14)T • SIIv2 (Cisco-TAP2-MIB): Cisco IOS Release 12.3(14)T and later releases • PC—N/A	—
Cisco MGX 8850 VG	Trunking gateway	• SII—N/A • PC – Voice Interworking Service Module (VISM) 2.2 and later releases – Voice Switch Service Module (VXSM) 2.0 and later releases	—

Table 17 Cisco Products That Support Lawful Intercept (continued)

Cisco Product	Product Type	Voice Support	Data Support
Cisco AS 5350	Access server/ trunking gateway	• SIIv1 (Cisco-TAP-MIB)—N/A • SIIv2 (Cisco-TAP2-MIB)—Cisco IOS Release 12.3(14)T and later releases • PC—Cisco IOS Release 12.3(7)T and later releases	• SIIv1 (Cisco-TAP-MIB)—N/A • SIIv2 (Cisco-TAP2-MIB)—Cisco IOS Release 12.3(14)T and later releases • PC—N/A
Cisco AS 5400	Access server/ trunking gateway	• SIIv1 (Cisco-TAP-MIB)—N/A • SIIv2 (Cisco-TAP2-MIB)—Cisco IOS Release 12.3(14)T and later releases • PC—Cisco IOS Release 12.3(7)T and later releases	• SIIv1 (Cisco-TAP-MIB)—N/A • SIIv2 (Cisco-TAP2-MIB, Cisco-IP-TAP-MIB, Cisco-USER-CONNECTION-TAP-MIB)—Cisco IOS Release 12.3(14)T and later releases • PC—N/A
Cisco AS 5850	Access server/ trunking gateway	• SIIv1 (Cisco-TAP-MIB)—N/A • SIIv2 (Cisco-TAP2-MIB)—Cisco IOS Release 12.4(4)T and later releases • PC—Cisco IOS Release 12.3(7)T and later releases	• SIIv1 (Cisco-TAP-MIB)—N/A • SIIv2 (Cisco-TAP2-MIB, Cisco-IP-TAP-MIB, Cisco-USER-CONNECTION-TAP-MIB)—Cisco IOS Release 12.4(4)T and later releases • PC—N/A

Related Documents

Table 18 lists related documents.

Table 18 Related Documents

Title	URL or Part Number
PacketCable Electronic Surveillance Specification	http://www.packetcable.com/specifications
PacketCable Electronic Surveillance Call Flows Technical Report	http://www.packetcable.com/specifications
PacketCable Event Messages Specification	http://www.packetcable.com/specifications
PacketCable Dynamic Quality of Service Specification	http://www.packetcable.com/specifications
PacketCable Security Specification	http://www.packetcable.com/specifications
SS8 Xcipio SSDF User Manual	2700-2493-01
Cisco BTS 10200 Documentation Access Information	http://www.cisco.com/univercd/cc/td/doc/product/voice/index.htm
Cisco Lawful Intercept Control MIB	http://www.ietf.org/rfc/rfc3924.txt
NewNet Enhanced IP Node User Manual	D-0534-US-350-000

Table 18 Related Documents (continued)

Title	URL or Part Number
Lawful Intercept on Cisco 12000 Series Router ISE Line Cards	OL-8679-01 (Rev. A0)
Lawful Intercept on Cisco AS5000 Series Universal Gateways - Feature Module	http://www.cisco.com/en/US/products/sw/accesssw/ps511/products_feature_guide09186a00802cafa8.html

Standards

Standard	Title
TR-45 J-STD-025A	*Telephone Industry Association Lawfully Authorized Electronic Surveillance*
PKT-SP-EM-I08	*PacketCable Event Messages Specification*
PKT-SP-ESP-I03	*PacketCable Electronic Surveillance Specification*

MIBs

MIB	MIBs Link
• CISCO-TAP-MIB • CISCO-TAP2-MIB • CISCO-IP-TAP-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 1101	*DNS Encoding of Network Names and Other Types*
RFC 3924	*Cisco Architecture for Lawful Intercept in IP Networks*

Technical Assistance

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

Glossary

AAA—authentication, authorization, and accounting

AF—access function

AFBI—access function BTS interface

AFGI—access function PGW interface

AFID—access function ID

AFPI—access function Provisioning interface

AFRI—access function RADIUS interface

AFSI—access function SNMPv3 interface

AFTDN—access function Target Directory Number

AFTI—access function Trunking Gateway interface

BTS—Broadband Telephony Softswitch. A call agent.

CALEA—Communications Assistance for Law Enforcement Act

CC—call content

CCC—call content connection

CCCid—call content connection identifier

CC IAP—Communication Content intercept access point

CFID—collection function ID

CISCO-TAP-MIB—Cisco Lawful Intercept Control MIB

CLI—command-line interface

CMS—call management server

CMTS—cable modem termination system

CPE—customer premise equipment

CSG—Content Services Gateway

DCFD—Data Collection and Filtering Device. A sniffer that collects and analyzes RADIUS traffic.

DHCP—Dynamic Host Configuration Protocol

DNS—Domain Name Service

DSP—Digital Signal Processor

EMS—Element Management System

ESR—Edge Services Router

ESS—Electronic Surveillance Subsystem

FQDN—fully qualified domain name

GSR—Gigabit Switch Router

HMAC—Hash-based Message Authentication Code

IAD—Integrated Access Device

IAP—intercept access point

IFID—Interface ID

IPCCC—IP call content channel

IPDU—IP delivery unit

IPDUID—IP delivery unit ID

IPsec—IP security

IRI IAP—Intercept-Related Information intercept access point

ISP—Internet Service Provider

L2TP—Layer 2 Tunneling Protocol

LEA—law enforcement agency

LI—lawful intercept

MD—mediation device. A hardware device that receives signal and voice information from an SP or ISP network and translate the information into the correct protocol.

MD5—Message Digest 5

MGC—Media Gateway Controller

MGCP—Media Gateway Control Protocol

MIB—Management Information Base

MML—Man Machine Language

NAS—network access server

NTP—Network Time Protocol

off-net—off network

PGW—PSTN Gateway

PSTN—public switched telephone network

PTR—pointer record

RADIUS—Remote Authentication Dial-In User Services

reqstate—required state

RIPA—Regulation of Investigatory Powers Act

SDP—Session Definition Protocol

SII—Service Independent Intercept

SIP—Session Initiation Protocol

SM—Telecordia Service Manager—a call agent

SMDS—Switched Multimegabit Data Service

sniffer—A network analyzer used to capture packets transmitted in a network for inspection and problem detection.

SNMPv3—Simple Network Management Protocol version 3

SP—service provider

SSDF—Softswitch Delivery Function. A software program provided by SS8 Networks called Xcipio SSDF.

SSH—Secure Shell

tcpipcfi—TCP/IP collection function interface

TGW—trunking gateway

TIA—Telephone Industry Association

TKUV—Telekommunications Uberwachungsverordnung

TopLayer—A company that provides a sniffer that makes data intercepts function with SSDF.

uBR—Universal Broadband Router

UDP—User Datagram Protocol

USM—User-based Security Model

VACM—View-based Access Control Model

VISM—Voice Interworking Service Module

VoIP—Voice over IP

VXSM—Voice Switch Service Module

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