APPENDIX A

Configuring the Cisco IPICS RMS Component

This appendix describes the configuration steps that you must follow to configure the RMS router for use with the Cisco IPICS server. The Cisco IPICS server accesses the RMS by using Secure Shell Client software; it authenticates the RMS by using the credentials that you configure in the RMS in the Cisco IPICS Administration Console. For more information, see the RMS tasks that are described in Chapter 2, "Performing Cisco IPICS System Administrator Tasks."

Note

- Before you can use an RMS with Cisco IPICS or perform RMS management tasks, you must first configure the RMS.
  - You manage the RMS from the Cisco IPICS server.
  - You must configure at least one RMS per Cisco IPICS server.
  - You cannot configure the same RMS in multiple Cisco IPICS servers.
- To ensure proper functionality, make sure that you map one RMS to one Cisco IPICS server; otherwise, you may encounter usability issues. For example, if the same RMS is mapped to more than one server, PMC users may hear a busy tone when they attempt to activate a channel or VTG because of configuration discrepancies.
- If you have more than one RMS component configured in the server, make sure that you configure each RMS according to the instructions that are documented in this appendix.

Note Be aware that Cisco IPICS provides support only for RMS components that are configured, as described in this appendix.

This appendix contains information about how to configure the RMS, and includes the following topics:

Configuring Security Features

As with other routers that you use, Cisco recommends that you configure security features, such as access control, on the RMS. Access control allows you to designate the users who may access the router and specific services. The Cisco IOS software enables authentication, authorization, and accounting (AAA) network security services to provide access control on your router.

Cisco recommends that you configure AAA as your primary method for access control to provide an additional layer of security for your network. Specifically, Cisco recommends that you configure authentication on the RMS to enable the identification of users before they are permitted to access the network and network services. This identification includes login and password dialog, challenge and response, messaging support, and encryption (depending on the security protocol that you choose).

You configure AAA authentication by defining a named list of authentication methods, and then applying that list to various interfaces. The method list defines the types of authentication to be performed and the sequence in which they will be performed; it must be applied to a specific interface before any of the defined authentication methods will be performed.

Note Cisco IPICS supports the *default* method list, which is automatically applied to all interfaces if no other method list is defined.

To configure AAA and implement a basic level of security on the RMS, perform the following procedure:

Procedure

Step 1 To enable the AAA access control system, enter the following CLI command in global configuration mode:

Router(config)# **aaa new-model**

This command initializes AAA.

Step 2 To set AAA authentication at login to use the default method with the *local* method keyword, enter the following command:

Router(config)# **aaa authentication login default local**

The default method list is automatically applied to all interfaces.

The *local* method keyword configures the router to use the local user name database for authentication.

Step 3 To configure a password for privileged EXEC mode, enter the following command:

Router(config)# **enable password** <*password*>

where *password specifies the enable password.*

Step 4 Establish a username-based authentication system by entering the following command in global configuration mode.

Router(config)# **username** <*name*> **privilege 15 password 0** <*password*>

where:

name specifies the user name that you configure on the RMS and *password* specifies the user enable password that you configured in Step 3.

Note Make sure that you configure the RMS with a valid user name and password.

This command creates a user name and password on the router. You enter this user name and password in the Cisco IPICS Administration Console when you configure the RMS.

The privilege parameter defines the privilege level for the user; this value ranges from 0 to 15, with 15 designating the highest privilege level.

Note To ensure successful authentication, the Cisco IPICS server requires that the user name that you create to access the RMS be configured with a minimum privilege level of 7.

The single digit that follows the password parameter defines whether the text that follows the password is encrypted; a value of 0 signifies that the password is entered in clear text.

Step 5 Enable Secure Shell (SSH) version 2 protocol by entering the following command:

Router(config)# **ip ssh version 2**

This command specifies the SSH control parameters for the RMS. Version 2 ensures that the RMS does not inadvertently establish a weaker SSH version 1 connection.

Note The only protocol that the Cisco IPICS server requires to properly communicate with the RMS is SSH version 2. To ensure that the RMS is as secure as possible, Cisco recommends that you disable FTP, TFTP, HTTP, and HTTPS on the RMS after it has been deployed. For more information about the Cisco IOS commands that are required to disable these services, refer to the Cisco IOS documentation.

Step 6 Create cryptographic keys to enable Secure Sockets Layer (SSL) access from the Cisco IPICS server via SSH by entering the following commands:

Router(config)# **ip domain name** <*any domain name*>

where:

any domain name specifies default domain name that the Cisco IOS software uses to complete unqualified host names (names without a dotted-decimal domain name).

Router(config)# **crypto key generate rsa**

When you are prompted to enter the number of bits in the modulus, enter **768**.

The **crypto key generate rsa** command generates Rivest, Shamir, and Adelman (RSA) key pairs, one public RSA key and one private RSA key, for the RMS.

Step 7 To disable the HTTP server (which is enabled by default), enter the following command:

Router(config)# **no ip http server**

If you enable the secure HTTP server by using the **ip http secure-server** command, you should disable the standard HTTP server by using the **no ip http server** command to ensure that secure data cannot be accessed through the standard HTTP connection.

Step 8 To enable log in by using SSH version 2, enter the following commands:

Router(config)# **line vty 0 15**
Router(config-line)# **transport input ssh**
Router(config-line)# **exec-timeout 22 0**
Router(config-line)# **privilege level 15**

Note The exec-timeout parameter sets the interval that the EXEC command interpreter waits until user input is detected. Optimally, you should set the exec-timeout to 22 (22 minutes). Setting this value to a shorter time, such as 5 or 10 minutes, can cause undesirable delays every time that Cisco IPICS accesses the router (such as when you change a VTG). Setting a longer time, such as 60 minutes, can cause authorized logins to accumulate and result in the router running out of open lines. Make sure that you do not set the exec-timeout to 0, which specifies no timeout.

You may implement more stringent security measures and harden your system security by configuring additional security features that Cisco IOS provides. For more information about configuring authentication, password security, and additional layers of security, refer to the *Cisco IOS Security Configuration Guide* at the following URL:
http://www.cisco.com/en/US/products/ps6441/products_configuration_guide_book09186a008049e249.html

Connecting and Configuring T1/E1 Controllers

The Cisco IPICS solution requires that you install at least one T1 or E1 loopback in the RMS to support mixing. (The RMS provides support for mixing multicast channels in support of VTGs and for mixing remote PMC SIP-based (unicast) connections to a multicast channel or VTG.)

The configuration steps that are required to implement the loopback pairs may vary depending on card type, Cisco IOS version, and the type of supported RMS that you use.

Note For a complete list of supported interface cards and RMS routers, refer to the *Cisco IPICS Compatibility Matrix* at the following URL: http://www.cisco.com/en/US/products/ps7026/tsd_products_support_series_home.html

This section contains guidelines for using T1 and E1 connectivity with Cisco IPICS and configuration procedures that you must follow for these card types; it includes the following topics:

RMS Connectivity Guidelines

To configure an RMS router for T1 or E1 connectivity, follow these guidelines:

- Configure at least two T1 or E1 controllers and assign ds0 groups to each controller.
- Allocate only as many ds0s on a controller as the RMS router can support simultaneously.
- Make sure that the ports that you allocate start with port 0 and are configured sequentially.
- Typically, a T1 controller will support 24 ds0s, but your controller may support fewer ds0s, depending on the number of available digital signal processors (DSPs). For more information about DSPs, see Step 6.

Note Timeslot 24 must always be configured even if you use a fractional T1. For more information, see the "DS0 Group-to-Timeslot Mapping Guidelines" section on page A-8.

- Typically, an E1 controller will support 30 ds0s, but your controller may support fewer ds0s, depending on the number of available DSPs.

Note Timeslot 31 must always be configured, even if you use a fractional E1. For more information, see the "DS0 Group-to-Timeslot Mapping Guidelines" section on page A-8.

- Be careful not to allocate more ds0s than a controller has resources to support; otherwise, you may encounter lost audio and other voice quality issues.
- Configure T1 or E1 controllers for individual voice ports by entering the following command in the router configuration:

  ds0-group *ds0-group-number* **timeslots** *timeslot-list* **type e&m-lmr**

  This command specifies the ds0 time slots that define logical voice ports on a T1 or E1 controller and configure the signaling type by which the router communicates with the PSTN.

  where:

  – **ds0-group** *ds0-group number* identifies the ds0 group

  For T1 connectivity, the allowable values range from 0 to 23
  For E1 connectivity, the allowable values range from 0 to 29

Note Be aware that ds0 groups must start with 0 and they must be sequential.

  – **timeslots** *timeslot-list* specifies a single time-slot number

  For T1 connectivity, the allowable values range from 1 to 24
  For E1 connectivity, the allowable values range from 1 to 31

DS0 Group-to-Timeslot Mapping Guidelines

You must configure the ds0-group-to-timeslot mapping according to the following associations. If you deviate from this configuration, the server will not be able to properly add the loopback pairs (one loopback equals one ds0 pair).

- T1:
  - ds0-group 0 = timeslot 24
  - ds0-group 1-23 = timeslot 1-23 (1 to 1, 2 to 2....23 to 23)

  For example, if you need to configure only 12 ds0s, configure ds0-group 0 through ds0-group 11. Be aware that ds0-group 0 must always map to timeslot 24.
- E1:
  - ds0-group 0 = timeslot 31
  - ds0-group 1-15 = timeslot 1-15
  - ds0-group 16 = timeslot 30
  - ds0-group 17-29 = Timeslot 17-29

  For example, if you need to configure only 16 ds0s, configure ds0-group 0 through ds0-group 15. Be aware that ds0-group 0 must always map to timeslot 31 and ds0-group 16 must always map to timeslot 30.

Note For detailed configuration information, see the procedure in the "Configuring T1/E1 Controllers, Interfaces, and Voice Parameters" section on page A-10. The configuration must be entered exactly as it is shown in this procedure.

RMS IP Address Selection Guidelines

The following guidelines pertain to the IP addresses that you must use with Cisco IPICS, as described in the "Configuring T1/E1 Controllers, Interfaces, and Voice Parameters" section on page A-10.

For successful interoperability with Cisco IPICS components, you must configure the following interfaces for the RMS:

- Ethernet0 Interface
  - This interface is the physical port that provides network connectivity

  - The IP address that you configure must be routable; that is, reachable by the network

- Loopback0 Interface
  - This virtual interface is used for network connectivity
  - The IP address that you configure must be routable (that is, reachable by the network); otherwise, your SIP connectivity will be affected
  - This IP address is assigned as the RMS IP address
  - The server and the PMC components use this address to connect to the RMS

Note Cisco recommends that you specifically configure the Loopback0 interface when there is more than one IP path to the RMS. However, you may configure an interface other than Loopback0 if the following criteria is met:

– The IP address that you assign to the interface matches the IP address of the RMS in the Cisco IPICS RMS configuration. For configuration information about assigning this IP address, see Step 11 in the "Configuring T1/E1 Controllers, Interfaces, and Voice Parameters" section. (Make sure that you substitute the interface that you are configuring for the Loopback0 interface that is documented in this step.)

– The SIP **bind control source-interface** and **bind media source-interface** commands specify the interface that you configured. For configuration information about binding the source address for signaling and media packets to the IP address of the interface, see Step 12 in the "Configuring T1/E1 Controllers, Interfaces, and Voice Parameters" section. (Make sure that you substitute the interface that you configured for the Loopback0 interface that is documented in this step.)

– If you configure an interface other than Loopback0, remember to substitute the interface that you use with the Loopback0 references that appear in related documentation.

- Vif1 Interface
  - This virtual interface (Vif) is used to associate an IP address with the voice ports on the RMS

- The VIF subnet that you configure must be routable (that is, reachable by the network); otherwise, your Cisco IPICS network connectivity will be affected
- The actual IP address that is associated with the voice ports is the configured vif1 address + 1

Note Be aware that the IP addresses that you configure for both the Loopback0 and the Vif interfaces must be routable; this requirement is mandatory for both of these interfaces to ensure proper operation with Cisco IPICS. If the IP addresses for either of these interfaces are not routable, you may experience intermittent delays, of varying duration, from the time that you press the PMC PTT button to the time that the media is established between the remote PMC and multicast channels. This delay results from the inability of the RMS to perform Reverse Path Forwarding (RPF) checks on multicast Real-time Transport Protocol (RTP) packet source addresses. Therefore, to avoid this issue, make sure that the IP addresses for both the Loopback0 and the Vif interfaces are routable.

Configuring T1/E1 Controllers, Interfaces, and Voice Parameters

To configure T1 or E1 controllers, interfaces, and required voice parameters on an RMS, perform the following procedure.

Procedure

Step 1 If you use a T1/E1 combination interface card, such as the Cisco 1- and 2-port T1/E1 Multiflex Trunk (MFT) Voice/WAN Interface Card (VWIC2), you must configure the card type for T1 or E1 by entering the following command:

Router(config)# **card type {t1 | e1}** *slot* [*bay*]

where:

slot specifies the port number of the interface, and *bay* is an optional parameter that specifies the card interface bay number in a slot on certain route/switch processor [RSP] platforms.

Examples of this command for both T1 and E1 connections appears below:

```
Router(config)# card type t1 0 3
Router(config)# card type e1 0 3
```

If you are using a T1/E1 combination interface card and want to replace one card type for another, proceed to Step 2. Otherwise, continue with Step 3.

Note Be aware that you cannot use an E1-only interface card or T1/E1 combination interface card in E1 mode with other interface cards, such as T1-only, in the same router because the global **signal pattern idle transmit 0000** command is not supported with all interface cards. (This command is supported for use only with the E1-only interface card and the T1/E1 combination card in E1 mode.) For more information about this command, see Step 15.

Step 2 To change the card type configuration and replace the T1 with an E1, as an example, enter the following commands:

a. Router(config)# **no card type t1** *slot* [*bay*]

Note When you use the card type command to change your configuration, be aware that changes become effective only after you reload or reboot the router.

b. Exit the router configuration mode by entering the following command:

Router(config)# **exit**

a. Execute the following commands to save your changes and to reload the router:

Router# **copy running-config startup-config**
Router# **reload**

b. Configure the card type for E1 connectivity by entering the following command:

Router(config)# **card type e1** *slot* [*bay*]

where:

slot specifies the port number of the interface and *bay* is an optional parameter that specifies the card interface bay number in a slot on certain route/switch processor [RSP] platforms.

An example of this command appears below:

```
Router(config)# card type e1 0 3
```

Step 3 To enable the ports on the interface card to use the network clock for timing and ensure that the router backplane clock references are synchronized with the T1/E1 interface card, enter the following command:

Router(config)# **network-clock-participate** [**slot** *slot-number* | **wic** *wic-slot* | **aim** *aim-slot-number*]

where:

slot *slot-number* is an optional parameter that specifies the network module slot number on the router chassis
wic *wic-slot* specifies the WAN interface card (WIC) slot number on the router chassis
aim *aim-slot-number* specifies the Advanced Integration Module (AIM) in the specified slot (for applicable hardware)

An example of this command appears below; wic 3 designates the WAN interface card in physical slot 3:

```
Router(config)# network-clock-participate wic 3
```

To configure T1 controllers, proceed to Step 4. To configure E1 controllers, continue with Step 5.

Note The following steps use Protocol Independent Multicast, or ip pim, sparse mode on the interface. Check to make sure that the design of your multicast network does not require you to use a different ip pim mode. For more information about multicast configurations, refer to the Cisco IOS Software Release 12.4 product documentation at the following URL and click the link for "Cisco IOS IP Multicast Configuration Guide, Release 12.4" http://www.cisco.com/en/US/products/ps6350/tsd_products_support_configure.html

Step 4 Configure ds0 groups on the T1 controllers by entering the following commands in the router configuration:

Tip Make sure that you configure the ds0-group-to-timeslot mapping exactly as shown and according to the guidelines that are described in the "DS0 Group-to-Timeslot Mapping Guidelines" section on page A-8.

Note The clock command should be used for only one of the two T1 controllers in the loopback.

a. To configure the first controller in the loopback pair, enter the following commands:

```
Router(config)# controller T1 1/0
Router(config-controller)# framing esf
Router(config-controller)# clock source internal
Router(config-controller)# linecode b8zs
Router(config-controller)# cablelength short 133
Router(config-controller)# ds0-group 0 timeslots 24 type e&m-lmr
Router(config-controller)# ds0-group 1 timeslots 1 type e&m-lmr
Router(config-controller)# ds0-group 2 timeslots 2 type e&m-lmr
Router(config-controller)# ds0-group 3 timeslots 3 type e&m-lmr
Router(config-controller)# ds0-group 4 timeslots 4 type e&m-lmr
Router(config-controller)# ds0-group 5 timeslots 5 type e&m-lmr
Router(config-controller)# ds0-group 6 timeslots 6 type e&m-lmr
Router(config-controller)# ds0-group 7 timeslots 7 type e&m-lmr
Router(config-controller)# ds0-group 8 timeslots 8 type e&m-lmr
Router(config-controller)# ds0-group 9 timeslots 9 type e&m-lmr
Router(config-controller)# ds0-group 10 timeslots 10 type e&m-lmr
Router(config-controller)# ds0-group 11 timeslots 11 type e&m-lmr
Router(config-controller)# ds0-group 12 timeslots 12 type e&m-lmr
Router(config-controller)# ds0-group 13 timeslots 13 type e&m-lmr
Router(config-controller)# ds0-group 14 timeslots 14 type e&m-lmr
Router(config-controller)# ds0-group 15 timeslots 15 type e&m-lmr
Router(config-controller)# ds0-group 16 timeslots 16 type e&m-lmr
Router(config-controller)# ds0-group 17 timeslots 17 type e&m-lmr
Router(config-controller)# ds0-group 18 timeslots 18 type e&m-lmr
Router(config-controller)# ds0-group 19 timeslots 19 type e&m-lmr
Router(config-controller)# ds0-group 20 timeslots 20 type e&m-lmr
Router(config-controller)# ds0-group 21 timeslots 21 type e&m-lmr
Router(config-controller)# ds0-group 22 timeslots 22 type e&m-lmr
Router(config-controller)# ds0-group 23 timeslots 23 type e&m-lmr
Router(config-controller)# no shutdown
```

where:

ds0-group ds*0-group number* identifies the ds0 group and must be a value from 0 to 23; ds0 groups must start with 0 and must be sequential.

timeslots *timeslot-list* specifies a single time-slot number; for T1 connectivity, allowable values range from 1 to 24.

b. To configure the second controller in the loopback pair, enter the following commands:

```
Router(config)# controller T1 1/1
Router(config-controller)# framing esf
Router(config-controller)# linecode b8zs
Router(config-controller)# cablelength short 133
Router(config-controller)# ds0-group 0 timeslots 24 type e&m-lmr
Router(config-controller)# ds0-group 1 timeslots 1 type e&m-lmr
Router(config-controller)# ds0-group 2 timeslots 2 type e&m-lmr
Router(config-controller)# ds0-group 3 timeslots 3 type e&m-lmr
Router(config-controller)# ds0-group 4 timeslots 4 type e&m-lmr
Router(config-controller)# ds0-group 5 timeslots 5 type e&m-lmr
Router(config-controller)# ds0-group 6 timeslots 6 type e&m-lmr
Router(config-controller)# ds0-group 7 timeslots 7 type e&m-lmr
Router(config-controller)# ds0-group 8 timeslots 8 type e&m-lmr
Router(config-controller)# ds0-group 9 timeslots 9 type e&m-lmr
Router(config-controller)# ds0-group 10 timeslots 10 type e&m-lmr
Router(config-controller)# ds0-group 11 timeslots 11 type e&m-lmr
Router(config-controller)# ds0-group 12 timeslots 12 type e&m-lmr
Router(config-controller)# ds0-group 13 timeslots 13 type e&m-lmr
Router(config-controller)# ds0-group 14 timeslots 14 type e&m-lmr
Router(config-controller)# ds0-group 15 timeslots 15 type e&m-lmr
Router(config-controller)# ds0-group 16 timeslots 16 type e&m-lmr
Router(config-controller)# ds0-group 17 timeslots 17 type e&m-lmr
Router(config-controller)# ds0-group 18 timeslots 18 type e&m-lmr
Router(config-controller)# ds0-group 19 timeslots 19 type e&m-lmr
Router(config-controller)# ds0-group 20 timeslots 20 type e&m-lmr
Router(config-controller)# ds0-group 21 timeslots 21 type e&m-lmr
Router(config-controller)# ds0-group 22 timeslots 22 type e&m-lmr
Router(config-controller)# ds0-group 23 timeslots 23 type e&m-lmr
Router(config-controller)# no shutdown
```

where:

ds0-group ds*0-group number* identifies the ds0 group and must be a value from 0 to 23; ds0 groups must start with 0 and must be sequential.

timeslots *timeslot-list* specifies a single time-slot number; for T1 connectivity, allowable values range from 1 to 24.

Step 5 Configure ds0 groups on the E1 controllers by entering the following commands in the router configuration.

Note

- The clock command should be used for only one of the two E1 controllers in the loopback.
- In E1 framing and signaling, 30 of the 32 available channels, or time slots, are used for voice or data transmission. Time slot 0 and time slot 16, which you do not configure, do not carry voice or data. Time slot 0 provides frame synchronization, alarm transport, and international carrier use while time slot 16 provides supervisory signaling for the 30 voice and data channels.

a. To configure the first controller in the loopback pair, enter the following commands:

Router(config)# **controller e1** *slot port*
Router(config-controller)# **clock source internal**
Router(config-controller)# d**s0-group 0 timeslots 31 type e&m-lmr**
Router(config-controller)# **ds0-group 1 timeslots 1 type e&m-lmr**
Router(config-controller)# **ds0-group 2 timeslots 2 type e&m-lmr**
Router(config-controller)# **ds0-group 3 timeslots 3 type e&m-lmr**
Router(config-controller)# **ds0-group 4 timeslots 4 type e&m-lmr**
Router(config-controller)# **ds0-group 5 timeslots 5 type e&m-lmr**
Router(config-controller)# **ds0-group 6 timeslots 6 type e&m-lmr**
Router(config-controller)# **ds0-group 7 timeslots 7 type e&m-lmr**
Router(config-controller)# **ds0-group 8 timeslots 8 type e&m-lmr**
Router(config-controller)# **ds0-group 9 timeslots 9 type e&m-lmr**
Router(config-controller)# **ds0-group 10 timeslots 10 type e&m-lmr**
Router(config-controller)# **ds0-group 11 timeslots 11 type e&m-lmr**
Router(config-controller)# **ds0-group 12 timeslots 12 type e&m-lmr**
Router(config-controller)# **ds0-group 13 timeslots 13 type e&m-lmr**
Router(config-controller)# **ds0-group 14 timeslots 14 type e&m-lmr**
Router(config-controller)# **ds0-group 15 timeslots 15 type e&m-lmr**
Router(config-controller)# **ds0-group 16 timeslots 30 type e&m-lmr**
Router(config-controller)# **ds0-group 17 timeslots 17 type e&m-lmr**
Router(config-controller)# **ds0-group 18 timeslots 18 type e&m-lmr**
Router(config-controller)# **ds0-group 19 timeslots 19 type e&m-lmr**

Router(config-controller)# **ds0-group 20 timeslots 20 type e&m-lmr**
Router(config-controller)# **ds0-group 21 timeslots 21 type e&m-lmr**
Router(config-controller)# **ds0-group 22 timeslots 22 type e&m-lmr**
Router(config-controller)# **ds0-group 23 timeslots 23 type e&m-lmr**
Router(config-controller)# **ds0-group 24 timeslots 24 type e&m-lmr**
Router(config-controller)# **ds0-group 25 timeslots 25 type e&m-lmr**
Router(config-controller)# **ds0-group 26 timeslots 26 type e&m-lmr**
Router(config-controller)# **ds0-group 27 timeslots 27 type e&m-lmr**
Router(config-controller)# **ds0-group 28 timeslots 28 type e&m-lmr**
Router(config-controller)# **ds0-group 29 timeslots 29 type e&m-lmr**
Router(config-controller)# **no shutdown**

where:

slot port specifies the backplane slot number and port number on the interface. An example of this command appears below:

```
Router(config)# controller e1 0/3/0
```

b. To configure the second controller in the loopback pair, enter the following commands:

Router(config)# **controller e1** *slot port*
Router(config-controller)# d**s0-group 0 timeslots 31 type e&m-lmr**
Router(config-controller)# **ds0-group 1 timeslots 1 type e&m-lmr**
Router(config-controller)# **ds0-group 2 timeslots 2 type e&m-lmr**
Router(config-controller)# **ds0-group 3 timeslots 3 type e&m-lmr**
Router(config-controller)# **ds0-group 4 timeslots 4 type e&m-lmr**
Router(config-controller)# **ds0-group 5 timeslots 5 type e&m-lmr**
Router(config-controller)# **ds0-group 6 timeslots 6 type e&m-lmr**
Router(config-controller)# **ds0-group 7 timeslots 7 type e&m-lmr**
Router(config-controller)# **ds0-group 8 timeslots 8 type e&m-lmr**
Router(config-controller)# **ds0-group 9 timeslots 9 type e&m-lmr**
Router(config-controller)# **ds0-group 10 timeslots 10 type e&m-lmr**
Router(config-controller)# **ds0-group 11 timeslots 11 type e&m-lmr**
Router(config-controller)# **ds0-group 12 timeslots 12 type e&m-lmr**
Router(config-controller)# **ds0-group 13 timeslots 13 type e&m-lmr**
Router(config-controller)# **ds0-group 14 timeslots 14 type e&m-lmr**
Router(config-controller)# **ds0-group 15 timeslots 15 type e&m-lmr**
Router(config-controller)# **ds0-group 16 timeslots 30 type e&m-lmr**
Router(config-controller)# **ds0-group 17 timeslots 17 type e&m-lmr**
Router(config-controller)# **ds0-group 18 timeslots 18 type e&m-lmr**
Router(config-controller)# **ds0-group 19 timeslots 19 type e&m-lmr**

```
Router(config-controller)# ds0-group 20 timeslots 20 type e&m-lmr
Router(config-controller)# ds0-group 21 timeslots 21 type e&m-lmr
Router(config-controller)# ds0-group 22 timeslots 22 type e&m-lmr
Router(config-controller)# ds0-group 23 timeslots 23 type e&m-lmr
Router(config-controller)# ds0-group 24 timeslots 24 type e&m-lmr
Router(config-controller)# ds0-group 25 timeslots 25 type e&m-lmr
Router(config-controller)# ds0-group 26 timeslots 26 type e&m-lmr
Router(config-controller)# ds0-group 27 timeslots 27 type e&m-lmr
Router(config-controller)# ds0-group 28 timeslots 28 type e&m-lmr
Router(config-controller)# ds0-group 29 timeslots 29 type e&m-lmr
Router(config-controller)# no shutdown
```

where:

slot port specifies the backplane slot number and port number on the interface. An example of this command appears below:

```
Router(config)# controller e1 0/3/1
```

Step 6 Determine if dspfarms are enabled by executing the following command:

Router# **show run**

If dspfarms are enabled, the output displays as shown in the following example; continue with Step 8:

```
voice-card 0
 dspfarm
!
voice-card 1
 dspfarm
```

If dspfarms are not enabled, the output displays as shown in this example; proceed to Step 7 to enable dspfarms:

```
voice-card 0
 no dspfarm
!
voice-card 1
 no dspfarm
```

Note

- For DSPs to be shared, you must first enable dspfarm, as described in Step 7, and make sure that all modules are participating in the network clock, as described in Step 3.

- When you enable dspfarm, you add specific voice cards to the DSP resource pool; this configuration allows multiple interface cards to share the installed DSP resources. (DSPs can be shared among digital modules and/or ports (such as T1/E1) and the motherboard, but DSPs cannot be shared among analog ports (such as an FXS)).
- At a minimum, you should enable one dspfarm.
- After the dspfarm is enabled on all modules that have DSPs installed, and all modules are participating in the main network clock, Cisco IOS interacts with these DSPs as part of the DSP resource pool.

Tip To help calculate the DSPs that you need, based on your specific configuration, refer to *High-Density Packet Voice Digital Signal Processor Modules*, which is available at the following URL: http://www.cisco.com/en/US/products/hw/modules/ps3115/products_qanda_item0900aecd8016c6ad.shtml

Step 7 To enable dspfarms, enter the following commands:

Router(config)# **voice-card** <*slot number*>
Router(config-voicecard)# **dspfarm**

where:

slot number specifies the slot number for the voice interface card.

For example, the following command enables the dspfarm on the interface card that is installed in slot 0:

```
Router(config)# voice-card 0
Router(config-voicecard)# dspfarm
```

Step 8 To enable multicast routing, enter the following command:

Router(config)# **ip multicast-routing**

When IP multicast routing is enabled, the Cisco IOS software is enabled to forward multicast packets.

Step 9 If you use Cisco IPICS over a high latency, low bandwidth link, modify the maximum TCP outgoing queue per connection by entering the following command:

Router(config)# **ip tcp queuemax 100000**

This command sets the maximum TCP outgoing queue to 100000 packets.

Note This step is optional; if you do not use Cisco IPICS over a high latency, low bandwidth connection, you do not need to configure this command.

Step 10 Create a virtual interface for multicast communications by entering the following commands:

Router(config)# **interface vif1**
Router(config-if)# **ip address** *ip_address subnet_mask*
Router(config-if)# **ip pim sparse-mode**

where:

ip_address specifies the IP address that you assign to this interface
subnet_mask specifies the 30-bit subnet mask that you assign to this interface; for example, 255.255.255.252

This command configures a virtual interface that is similar to a loopback interface; that is, a logical IP interface that is always up when the router is active. The RMS assigns a virtual address of vif1 + 1 as the source address when it mixes voice traffic and then sends out this traffic via multicast.

For more information about IP address guidelines, see the "RMS IP Address Selection Guidelines" section on page A-8.

Step 11 To enable loopback mode and assign an IP address and subnet mask to the interface, create a loopback interface for voice signaling and media by entering the following commands:

Router(config)# **interface Loopback0**
Router(config-if)# **ip address** *ip_address subnet_mask*
Router(config-if)# **ip pim sparse-mode**

where:

ip_address specifies the IP address that you assign to this interface; this IP address gets assigned to the RMS
subnet_mask specifies the 30-bit subnet mask that you assign to this interface; for example, 255.255.255.252
0 specifies the identification number that you assign to the loopback interface

This command creates a software-only loopback interface that emulates an interface that is always up. (This virtual interface is supported on all platforms.) For more information about IP address guidelines, see the "RMS IP Address Selection Guidelines" section on page A-8.

Note Cisco recommends that you configure the Loopback0 interface if there is more than one IP path to the RMS.

Step 12 To configure voice signaling and media on the loopback interface, enter the following commands:

a. Router(config)# **voice service voip**

This command switches to voice-service configuration mode, from global configuration mode, and specifies the voice encapsulation type.

b. Router(conf-voi-serv)# **allow-connections sip to sip**

This command specifies that connections between SIP endpoints are allowed.

c. Router(conf-voi-serv)# **sip**

This command enables Session Initiation Protocol (SIP) configuration mode.

d. Router(conf-serv-sip)# **bind control source-interface Loopback0**
Router(conf-serv-sip)# **bind media source-interface Loopback0**

These commands bind the source address for signaling and media packets to the IP address of the loopback interface.

Note

- When you enter the **bind control source-interface Loopback0** command, make sure that there are no active voice calls on the RMS.
- To verify that there are no active voice calls on the RMS, enter the **show call active voice brief** command from the RMS command line. The command output must indicate 0 total call legs, as shown below:
  Total call-legs: 0
- To verify that the **bind control source-interface Loopback0** command was successful, enter the **show run** command from the RMS command line. Look for the presence of the **bind control source-interface Loopback0** in the running configuration output.

- If the **bind control source-interface Loopback0** command is not present in the running configuration output, it was not successfully applied. In this situation, you will encounter a fast busy tone when you call the dial engine directory number. In addition, the Cisco IOS SIP debug logs show a SIP 403 (forbidden) message from the dial engine.
- To resolve this situation, enter the **shutdown** <*voice-port*> command in voice-port configuration mode to take the voice ports for a specific voice interface card offline. Enter this command for any voice ports that may be online. Then, reenter the **bind control source-interface Loopback0** command, followed by the **no shutdown** <*voice-port*> command to bring your voice ports back online. Enter this command for any voice ports that you brought offline.

---

e. Enter the following command to return to privileged EXEC mode:

Router(conf-serv-sip)# **end**

Step 13 Return to configuration mode by entering the following command:

Router# **configure terminal**

Step 14 To enable multicast routing for each interface that routes multicast traffic, enter the following commands:

a. Router(config)# **interface** <*interface*>

where:

<*interface*> specifies the interface that you want to enable Protocol Independent Multicast (PIM).

b. Router(config-if)# **ip pim sparse-mode**

Configure this command for each interface that routes multicast traffic. This command enables PIM sparse mode on the interface.

Step 15 To create a voice class that will be applied to all voice configurations, enter the following commands based on your connectivity:

a. When you use T1 connectivity, enter these commands:

Router(config)# **voice class permanent 1**
Router(config-class)# **signal timing oos timeout disabled**
Router(config-class)# **signal keepalive disabled**
Router(config-class)# **signal sequence oos no-action**

where:

1 specifies the unique number that you assign to the voice class.

b. When you use an E1-only interface card or a T1/E1 combination interface card specifically for E1 connectivity, enter all of the following commands:

Router(config)# **voice class permanent 1**
Router(config-class)# **signal timing oos timeout disabled**
Router(config-class)# **signal keepalive disabled**
Router(config-class)# **signal sequence oos no-action**
Router(config-class)# **signal pattern idle transmit 0000**

where:

1 specifies the unique number that you assign to the voice class.

Note Make sure that you enter only the first four commands when you use T1 connectivity; when you use an E1-only interface card or a T1/E1 combination interface card specifically for E1 connectivity, you must also enter the **signal pattern idle transmit 0000** command as documented in Step 15.

Be aware that the **signal pattern idle transmit 0000** command is a global command that is supported for use only with E1-only interface cards and T1/E1 combination interface cards that you configure for E1 mode. (This command is not supported for use with other interface cards, such as T1-only cards.) When you configure this command, it affects all interface cards in the router; therefore, make sure that all interface cards are either E1-only interface cards or T1/E1 combination cards in E1 mode and that you do not mix T1-only, E1-only, and T1/E1 combination card types in the same router when you use this command.

Step 16 Configure the SIP inactivity timeout by entering the following commands:

a. Router(config)# **ip rtcp report interval 5001**

This command configures the average reporting interval between subsequent Real-Time Control Protocol (RTCP) report transmissions.

b. Router(config)# **gateway**

This command enables the H.323 VoIP gateway.

c. Router(config-gateway)# **media-inactivity-criteria rtcp**

This command specifies the use of RTCP for media inactivity (silence) detection.

Note This command is required to enable RTCP packet detection as the only mechanism to use for SIP media inactivity criteria and prevent the RMS from disconnecting SIP calls when no RTP packets are detected.

d. Router(config-gateway)# **timer receive-rtcp 5**

This command enables the RTCP timer and configures a multiplication factor for the RTCP timer interval for SIP or H.323.

Step 17 Configure the list of codecs that Cisco IPICS will support by entering the following commands:

Router(config)# **voice class codec 1**
Router(config-class)# **codec preference 1 g729r8**
Router(config-class)# **codec preference 2 g711ulaw**

These commands enable voice-class configuration mode, assign an identification tag number for a codec voice class, and specify the preferred codecs to use on a dial peer.

Step 18 Create the following inbound dial peer by entering the following commands:

Note Although Cisco IOS supports other values for some of the fields in this configuration, Cisco recommends that you configure the values that are shown below to ensure consistency.

Router(config)# **dial-peer voice 555 voip**
Router(config-dial-peer)# **voice-class codec 1**
Router(config-dial-peer)# **session protocol sipv2**
Router(config-dial-peer)# **incoming called-number .**
Router(config-dial-peer)# **no vad**
Router(config-dial-peer)# **dtmf-relay rtp-nte**

These commands configure the voice dial peer and turn off voice activity detection (VAD) on the default SIP PMC connection.

To enable Tone Remote Control (TRC) functionality for remote PMC users, you must also configure the following commands as part of this dial-peer command:

```
Router(config-dial-peer)# rtp payload-type nte-tone 108
Router(config-dial-peer)# rtp payload-type lmr-tone 107
```

Note For information about how to obtain the Cisco IOS software that supports the Tone Remote Control functionality, contact ask-ipics-support@external.cisco.com.

Step 19 Create the following outbound dial peer to configure the voice dial peer for direct dial calls to the SIP provider by entering the following commands:

Note This step is optional; if you do not use the PMC direct dial feature, you do not need to configure this dial peer.

Tip Although Cisco IOS supports other values for some of the fields in this configuration, Cisco recommends that you configure the values that are shown below to ensure consistency.

```
Router(config)# dial-peer voice 556 voip
Router(config-dial-peer)# destination-pattern 9T
Router(config-dial-peer)# voice-class codec 1
Router(config-dial-peer)# session protocol sipv2
Router(config-dial-peer)# session target ipv4:<Cisco Unified Communications
Manager or Cisco IOS SIP Provider IP address>
Router(config-dial-peer)# session transport tcp
Router(config-dial-peer)# dtmf-relay rtp-nte
```

where:

Cisco Unified Communications Manager or Cisco IOS SIP Provider IP address specifies the IP address of your SIP provider.

These commands configure the voice dial peer that enables the PMC direct dial feature and specifies the RTP-based mechanism to transport DTMF tones for SIP calls. In this configuration, the dial peer is set to 9T. If you need to use a different dial plan for the PMC direct dial capability, you can change this dial peer or add additional dial peer entries to allow for other destination patterns, as needed.

Note If you have more than one RMS component configured in the server, make sure that you perform the direct dial configuration, as documented in Step 19 and Step 20, for each RMS. When more than one RMS component is configured in the server, Cisco IPICS may use any one of these configured components, depending on load conditions, to set up the SIP connection for the direct dial functionality.

For more information about configuring the PMC direct dial feature, see the "Managing the Direct Dial Feature" section on page 8-44. For information about using the PMC direct dial feature, refer to the *Cisco IPICS PMC Installation and User Guide*.

Step 20 Configure the digest authentication credentials that the RMS should use when it is challenged by the SIP provider on direct dial call attempts by entering the following commands:

Note This step is optional; if you do not use the PMC direct dial feature, or if you do not use Cisco Unified Communications Manager as your SIP provider, you do not need to configure these credentials.

Router(config)# **sip-ua**
Router(config-sip-ua)# **authentication username** <*username*> **password** <*password*>
Router(config-sip-ua)# **exit**

where:

username and *password* match the configured username and password for the Application User in Cisco Unified Communications Manager and are used to authenticate this user. For more information, see the "Configuring Cisco Unified Communications Manager as the SIP Provider" section on page 8-49.

Step 21 Enter the following command to reset the router command prompt:

Router(config)# **no prompt**

Step 22 Execute the following command to display the contents of the current, running configuration file and verify that the output reflects the modifications that you performed in this procedure:

Router# **show running-config**

Step 23 Execute the following command to save your changes:

Router# **copy running-config startup-config**

Step 24 If you reconfigured a T1/E1 combination interface card from T1 to E1 mode, you may need to reset the loopback cable. To determine if you need to reset the loopback cable, take one of the following actions:

- Check the LEDs on the interface card to see if the LP LED is amber.

  This LED should be off during normal operation.

- Enter the following CLI command to determine if there are alarms or errors displayed by the controller:

  Router# **show controllers e1**

  The command output should display the e1 in an "up" state with no alarms, as shown in the following sample output:

  ```
  e1 3/0 is up
  No alarms detected
  ```

  If the output displays the e1 in a "down" state, as shown in the following example, continue with Step 21:

  ```
  e1 3/1 is down
  alarm-trigger is not set
  ```

Step 25 To resolve this problem, disconnect the loopback cable from the router; then, reconnect it.

The LP LED should now be off.

Step 26 Verify that the e1 is up by entering the **show controllers e1 command, as shown above.** The command output should display the e1 controllers in an "up" state, with no alarms detected, as shown in the following sample output:

```
e1 3/0 is up
No alarms detected

e1 3/1 is up
No alarms detected
```

Note Cisco IPICS supports the use of Land Mobile Radio (LMR) gateways, which functionality is usually installed as an additional feature in a supported Cisco router. LMR gateways provide voice interoperability between radio and non-radio networks by bridging radio frequencies to IP multicast streams. For detailed LMR gateway configuration information, refer to the Land Mobile Radio over IP documentation at the following URL:
http://www.cisco.com/en/US/products/sw/iosswrel/ps5207/products_implementation_design_guide_book09186a0080347c1b.html