CHAPTER 16

Media Resource Management

Cisco IP telephony functionality requires the use of media resources. Media resources provide services such as transcoding, conferencing, music on hold, and media termination. In previous releases, these resources were accessible only to the local Cisco CallManager with which the media resources registered but not available to all Cisco CallManagers within the cluster. The media resource manager allows all Cisco CallManagers within the cluster to share these media resources.

The media resource manager enhances Cisco CallManager features by making Cisco CallManager more readily able to deploy media termination point, transcoding, conferencing and music on hold services. Distribution throughout the cluster uses resources to their full potential, making them more efficient and more economical.

This chapter covers the following topics:

Understanding Media Resources

Media resource management provides access to media resources for all Cisco CallManagers in a cluster. Every Cisco CallManager contains a software component called a media resource manager. The media resource manager locates the media resource necessary to connect media streams to complete a feature. The Cisco CallManager interfaces to these media resources using Skinny protocol.

The media resource manager manages the following media resource types:

- Music On Hold (MOH) server
- Unicast conference bridge (CFB)
- Media streaming application server (software media termination point)
- Transcoder (XCODE)

The following reasons explain why resources are shared:

- To allow both hardware and software devices to coexist within a Cisco CallManager
- To enable Cisco CallManager to share and access resources available in the cluster
- To enable Cisco CallManager to do load distribution within a group of similar resources
- To enable Cisco CallManager to allocate resources based on user preferences

Initialization of the Cisco CallManager creates a media resource manager. Each media termination point, music on hold, transcoder, and conference bridge device defined in the database registers with the media resource manager. The media resource manager obtains a list of provisioned devices from the database and constructs and maintains a table to track these resources. The media resource manager uses this table to validate registered devices. The media resource manager keeps track of the total devices available in the system, also tracking the devices that have available resources.

When a media device registers, Cisco CallManager creates a controller to control this device. After the device is validated, the system advertises its resources throughout the cluster. This mechanism allows the resource to be shared throughout the cluster.

Resource reservation takes place based on search criteria. The given criteria provide the resource type and the media resource group list. When the Cisco CallManager no longer needs the resource, resource deallocation occurs. Cisco CallManager updates and synchronizes the resource table after each allocation and deallocation.

The media resource manager interfaces with the following major components:

- Call control
- Media control
- Media termination point control
- Unicast bridge control
- Music on hold control

Call Control

Call control software component performs call processing, including setup and tear down of connections. Call control interacts with the feature layer to provide services like transfer, hold, conference, and so forth. Call control interfaces with the media resource manager when it needs to locate a resource to set up conference call and music on hold features.

Media Control

Media control software component manages the creation and teardown of media streams for the endpoint. Whenever a request for media to be connected between devices is received, depending on the type of endpoint, media control sets up the proper interface to establish a stream.

The media layer interfaces with the media resource manager when it needs to locate a resource to set up a media termination point.

Media Termination Point Control

Media termination point (MTP) provides the capability to bridge an incoming H.245 stream to an outgoing H.245 stream. Media termination point maintains an H.245 session with an H.323 endpoint when the streaming from its connected endpoint stops. Media termination point currently supports only codec G.711. Media termination point can also transcode a-law to mu-law.

For each media termination point device defined in the database, Cisco CallManager creates a media termination point control process. This media termination point control process registers with the media resource manager when it initializes. The media resource manager keeps track of these media termination point resources and advertises their availability throughout the cluster.

Unicast Bridge Control

A unicast bridge (CFB) provides the capability to mix a set of incoming unicast streams into a set of composite output streams. Unicast bridge provides resources to implement ad hoc and meet-me conferencing in the Cisco CallManager.

For each unicast bridge device defined in the database, Cisco CallManager creates a unicast control process. This unicast control process registers with the media resource manager when it initializes. The media resource manager tracks unicast stream resources and advertises their availability throughout the cluster.

Music On Hold Control

Music on hold (MOH) provides the capability to redirect a party on hold to an audio server. For each music on hold server device defined in the database, Cisco CallManager creates a music on hold control process. This music on hold control process registers with the media resource manager when it initializes. The media resource manager tracks music on hold resources and advertises their availability throughout the cluster. Music on hold supports both unicast and multicast audio sources.

Media Resource Groups

Cisco CallManager media resource groups and media resource group lists provide a way to manage resources within a cluster. Use these resources for conferencing, transcoding, media termination, and music on hold.

Media resource groups define logical groupings of media servers. You can associate a media resource group with a geographical location or a site as desired. You can also form media resource groups to control the usage of servers or the type of service (unicast or multicast) desired.

After media resources are configured, if no media resource groups are defined, all media resources belong to the default group, and, as such, all media resources are available to all Cisco CallManagers within a given cluster.

The following rules govern selection of a resource from a media resource group in a media resource group list:

- Search the first media resource group in a media resource group list to find the requested resource. If located, return the device name.
- If the requested resource is not found, search the next media resource group in the media resource group list. Return the device name if a match is found.
- If no resource of the requested type is available in any media resource group in a media resource group list, the resource manager attempts to use the resource in the default group.

Example

The default media resource group for a Cisco CallManager comprises the following media resources: MOH1, MTP1, XCODE1, XCODE2, XCODE3. For calls requiring a transcoder, this Cisco CallManager distributes the load evenly among the transcoders in its default media resource group. The following allocation order occurs for incoming calls that require transcoders:

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Call 1 - XCODE1
Call 2 - XCODE2
Call 3 - XCODE3
Call 4 - XCODE1
Call 5 - XCODE2
Call 6 - XCODE3
Call 7 - XCODE1
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Media Resource Group Lists

Media resource group lists specify a list of prioritized media resource groups. An application can select required media resources among the available resources according to the priority order defined in the media resource group list. Media resource group lists, which are associated with devices, provide media resource group redundancy.

The following rules govern selection of media resource group lists:

- Media resource group list, configured on the Media Resource Group List Configuration window, is assigned either to a device or to a device pool.
- Call processing uses media resource group list in the device level if the media resource group list is selected.

- Call processing uses media resource group list in the device pool only if no media resource group list is selected in the device level.

Example of Using Media Resource Group List to Group Resources by Type

Assign all resources to three media resource groups as listed:

- SoftwareGroup media resource group: MTP1, MTP2, SW-CONF1, SWCONF2
- HardwareGroup media resource group: XCODE1, XCODE2, HW-CONF1, HW-CONF2
- MusicGroup media resource group: MOH1, MOH2

Create a media resource group list called RESOURCE_LIST and assign the media resource groups in this order: SoftwareGroup, HardwareGroup, MusicGroup.

Result: With this arrangement, when a conference is needed, Cisco CallManager allocates the software conference resource first; the hardware conference is not used until all software conference resources are exhausted.

Example of Using Media Resource Group List to Group Resources by Location

Assign resources to four media resource groups as listed:

- DallasSoftware: MTP1, MOH1, SW-CONF1
- SanJoseSoftware: MTP2, MOH2, SW-CONF2
- DallasHardware: XCODE1, HW-CONF1
- SanJoseHardware: XCODE2, HW-CONF2

Cisco CallManagers are designated as CM1 and CM2.

Create a DALLAS_LIST media resource group list and assign media resource groups in this order: DallasSoftware, DallasHardware, SanJoseSoftware, SanJoseHardware

Create a SanJose_LIST media resource group list and assign media resource groups in this order: SanJoseSoftware, SanJoseHardware, DallasSoftware, DallasHardware.

Assign a phone in Dallas CM1 to use DALLAS_LIST and a phone in San Jose CM2 to use SanJose_LIST.

Result: With this arrangement, phones in CM1 use the DALLAS_LIST resources before using the SanJose_LIST resources.

Example of Using Media Resource Group List to Restrict Access to Conference Resources

Assign all resources to four groups as listed, leaving no resources in the default group:

- MtpGroup: MTP1, MTP2
- ConfGroup: SW-CONF1, SW-CONF2, HW-CONF1, HW-CONF2
- MusicGroup: MOH1, MOH2
- XcodeGroup: XCODE1, XCODE2

Create a media resource group list called NO_CONF_LIST and assign media resource groups in this order: MtpGroup, XcodeGroup, MusicGroup.

In the device configuration, assign the NO_CONF_LIST as the device media resource group list.

Result: The device cannot use conference resources. Only media termination point, transcoder, and music resources are available to the device.

Media Resource Group and Media Resource Group List Configuration Checklist

Table 16-1 provides a checklist to configure media resource groups and media resource group lists.

Table 16-1 Media Resource Group/Media Resource Group List Configuration Checklist

Configuration Steps		Procedures and Related Topics
Step 1	Create a media resource group.	Media Resource Group Configuration, *Cisco CallManager Administration Guide*
Step 2	Assign device to the media resource group. (Order is not significant.)	Media Resource Group Configuration, *Cisco CallManager Administration Guide*
Step 3	Create a media resource group list. (Order is significant.)	Media Resource Group List Configuration, *Cisco CallManager Administration Guide*

Table 16-1 Media Resource Group/Media Resource Group List Configuration Checklist (continued)

Configuration Steps		Procedures and Related Topics
Step 4	Assign a media resource group to a media resource group list.	Media Resource Group List Configuration, *Cisco CallManager Administration Guide*
Step 5	Assign a media resource group list to a device or device pool.	Device Defaults Configuration, *Cisco CallManager Administration Guide* Device Pool Configuration, *Cisco CallManager Administration Guide*

Requirements and System Limits

The following lists detail the limits that apply to the various media resources.

Media Termination Point Limits

For media termination points, the following limits apply:

- Up to 128 full-duplex streams are configurable.
- With 128 configured streams, 64 resources are available for media termination point application.

Software Conference Limits

For software conferences, the following limits apply:

- Up to 128 full-duplex streams are configurable.
- With 128 streams, a software conference media resource can handle 128 users in a single conference or
- With 128 streams, a software conference media resource can handle up to 42 conferencing resources with three users per conference

Transcoder Limits

For transcoders, 48 streams register and provide up to 24 transcoding resources.

Hardware Conference Limits

For hardware conference, 32 streams register, so the hardware conference media resource can handle 32 users in a single conference or up to 10 conferencing resources with three users per conference.

Music On Hold Server Limits

For music on hold media resources, the following limits apply:

- Up to 500 simplex streams are configurable.
- With 500 configured streams, up to 500 resources are available for music on hold application.

Chapter 19, "Music On Hold," covers further music on hold details.

Monitoring Media Resources

Counters in the Performance Monitor software supplied with Windows2000 monitor media resource usage. Cisco CallManager statistics include these counters. Counters track the following media resource devices:

- Hardware conference
- Media termination point
- Music on hold
- Software conference
- Transcoder

Monitoring Media Termination Point Resources

The following counters monitor media termination point resources:

- MediaTermPointsActive—The number of media termination points currently in use
- MediaTermPointsAvailable—The number of media termination points currently registered with the Cisco CallManager but not currently in use
- MediaTermPointsOutOfResources—The number of times a media termination point was requested for a call, but no resources were available

Monitoring Transcoder Resources

The following counters monitor transcoder resources:

- TranscoderActive—The number of transcoders currently in use
- TranscoderAvailable—The number of transcoders currently registered with the Cisco CallManager but not currently in use
- TranscoderOutOfResources—The number of times a transcoder was requested for a call, but no resources were available

Monitoring Software Conference Resources

The following counters monitor software conference resources:

- UnicastSoftwareConferencesAvailable—The number of conferences currently registered with the Cisco CallManager but not currently in use
- UnicastSoftwareConferenceActive—The number of conferences currently in use
- UnicastSoftwareConferenceCompleted—The number of times a conference was completed
- UnicastSoftwareOutOfResources—The number of times a conference was requested for a call, but no resources were available

Monitoring Hardware Conference Resources

The following counters monitor hardware conference resources:

- UnicastHardwareConferenceActive—The number of hardware conferences currently in use
- UnicastHardwareConferenceAvailable—The number of hardware conferences currently registered with the Cisco CallManager but not currently in use
- UnicastHardwareConferenceCompleted—The number of times a hardware conference was completed
- UnicastHardwareConferenceOutOfResources—The number of times a hardware conference was requested for a call, but no resources were available

Monitoring MOH Resources

The following PerfMon counters monitor MOH resources:

- MOHMulticastActiveStreams
- MOHMulticastAvailableStreams
- MOHOutOfResources
- MOHTotalMulticastStreams
- MOHTotalUnicastStreams
- MOHUnicastActiveStreams
- MOHUnicastAvailableStreams

Chapter 19, "Music On Hold," discusses MOH-related counters.

Where to Find More Information

Additional Cisco Documentation

- Media Resource Group Configuration, *Cisco CallManager Administration Guide*
- Media Resource Group List Configuration, *Cisco CallManager Administration Guide*
- Music On Hold Configuration, *Cisco CallManager Administration Guide*