



Media Resource Management

Cisco Unified Communications functionality requires the use of media resources. Media resources provide services such as annunciator, transcoding, conferencing, music on hold, and media termination. In previous releases, only the local Cisco Unified Communications Manager with which the media resources registered could access these resources that are not available to all Cisco Unified Communications Managers within the cluster. The media resource manager allows all Cisco Unified Communications Managers within the cluster to share these media resources.

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

This chapter covers the following topics:

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Media Resource Group and Media Resource Group List Configuration Checklist

Cisco Unified Communications Manager 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 (MOH).

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) that is desired.

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

Table 22-1 provides a checklist to configure media resource groups and media resource group lists. For more information, see the “Where to Find More Information” section on page 22-11.

Table 22-1 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 , <i>Cisco Unified Communications Manager Administration Guide</i>
Step 2	Assign device to the media resource group. (Order has no significance.)	Media Resource Group Configuration , <i>Cisco Unified Communications Manager Administration Guide</i>
Step 3	Create a media resource group list. (Order has significance.)	Media Resource Group List Configuration , <i>Cisco Unified Communications Manager Administration Guide</i>
Step 4	Assign a media resource group to a media resource group list.	Media Resource Group List Configuration , <i>Cisco Unified Communications Manager Administration Guide</i>
Step 5	Assign a media resource group list to a device or device pool.	Device Defaults Configuration , <i>Cisco Unified Communications Manager Administration Guide</i> Device Pool Configuration , <i>Cisco Unified Communications Manager Administration Guide</i>

Understanding Media Resources

Media resource management provides access to media resources for all Cisco Unified Communications Managers in a cluster. Every Cisco Unified Communications Manager contains a software component called a media resource manager. The media resource manager locates the media resource that is necessary to connect media streams to complete a feature.

The media resource manager manages the following media resource types:

- Music On Hold (MOH) server
- Unicast conference bridge (CFB)
- Media termination point (MTP)
- Transcoder (XCODE)
- Annunciator (ANN)
- Trusted relay point (TRP)

The following reasons explain why resources are shared:

- To allow both hardware and software devices to coexist within a Cisco Unified Communications Manager
- To enable Cisco Unified Communications Manager to share and access resources that are available in the cluster

- To enable Cisco Unified Communications Manager to do load distribution within a group of similar resources
- To enable Cisco Unified Communications Manager to allocate resources on the basis of user preferences

Initialization of the Cisco Unified Communications Manager creates a media resource manager. Each media termination point, music on hold, transcoder, conference bridge, and annunciator device that is 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 that are available in the system, while also tracking the devices that have available resources.

When a media device registers, Cisco Unified Communications Manager 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 Unified Communications Manager no longer needs the resource, resource deallocation occurs. Cisco Unified Communications Manager 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
- Annunciator control
- Trusted relay point

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 or transcoding.

Media Termination Point Control

Media termination point (MTP) provides the capability to bridge an incoming H.245 stream to an outgoing H.245 stream. MTP maintains an H.245 session with an H.323 endpoint when the streaming from its connected endpoint stops. MTP supports the G.711 and G.729 codecs. MTP can also transcode G.711 a-law to mu-law. MTP also enables Early Offer on SIP trunks and Fast Start on H.323 trunks. MTPs also get dynamically inserted to perform DTMF transport translation for endpoints that do not support a common DTMF transport method.

The Media Resource Manager (MRM) provides resource reservation of transcoders within a Cisco Unified Communications Manager cluster. Transcoders comprise another media resource type that is hardware based and uses Digital Signal Processing (DSP). DSP resources also support MTP functionality. Cisco Unified Communications Manager supports simultaneous registration of both the MTP and transcoder and concurrent MTP and transcoder functionality within a single call. A transcoder takes the stream of one codec and transcodes (converts) it from one compression type to another compression type. For example, it could take a stream from a G.711 codec and transcode (convert) it in real time to a G.729 stream. In addition, a transcoder provides MTP capabilities and may be used to enable supplementary services for H.323 endpoints when required.

For each media termination point device and each transcoder that is registered with Cisco Unified Communications Manager, Cisco Unified Communications Manager creates a media termination point control process. This media termination point control process registers with the device manager when it initializes. The device manager advertises the availability of the media termination point control processes throughout the cluster.

Annunciator Control

An annunciator enables Cisco Unified Communications Manager to play prerecorded announcements (.wav files) and tones to Cisco Unified IP Phones, gateways, and other configurable devices. The annunciator, which works with Cisco Unified Communications Manager Multilevel Precedence and Preemption, enables Cisco Unified Communications Manager to alert callers as to why the call fails. Annunciator can also play tones for some transferred calls and some conferences.

For each annunciator device that is registered with Cisco Unified Communications Manager, Cisco Unified Communications Manager creates an annunciator control process. This annunciator control process registers with the device manager when it initializes. The device manager advertises the availability of the annunciator control process throughout the cluster.

Unicast Bridge Control

A unicast bridge (CFB), more commonly known as a conference bridge, 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 Unified Communications Manager.

For each unicast bridge device that is registered with Cisco Unified Communications Manager, Cisco Unified Communications Manager creates a unicast control process. This unicast control process registers with the device manager when it initializes. The device manager advertises the availability of unicast stream resources 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 that is registered with Cisco Unified Communications Manager, Cisco Unified Communications Manager creates a music on hold control process. This music on hold control process registers with the device manager when it initializes. The device manager advertises the availability of music on hold resources throughout the cluster. Music on hold supports both unicast and multicast audio sources.

Additional Information

See the [“Where to Find More Information”](#) section on page 22-11.

Trusted Relay Point

The Cisco Unified Communications system can be deployed in a network virtualization environment. Cisco Unified Communications Manager enables the insertion of trusted relay points (TRPs). The insertion of TRPs into the media path constitutes a first step toward VoIP deployment within a virtual network.

The underlying network infrastructure comprises one of the key shared assets in an overall network design. A number of customer use cases require support for network infrastructure virtualization, such as the following examples:

- Guest internet access
- Partner access
- Departmental or divisional separation
- Subsidiaries/mergers and acquisitions
- Application segregation (data/voice)

All these applications include a requirement to maintain traffic separation on the network device as well as between network devices.

Traffic separation translates into concepts such as Virtual Routing and Forwarding (VRF). VRF allows multiple instances of a routing table to co-exist within the same router at the same time. In a virtualized network, these different routing domains, or VRFs, typically cannot communicate directly without transiting through the data center. This situation challenges applications such as Cisco Unified Communications, where devices in the data VRF domain, such as software endpoints running on PCs, need to communicate directly with hard phones in the voice VRF domain without hairpinning media in the data center and without directly exposing the voice and data VRFs to each other.

This section covers the following subtopics:

- [Quality-of-Service Enforcement, page 22-5](#)
- [Trusted Relay Point Service Parameter, page 22-6](#)
- [TRP Insertion in Cisco Unified Communications Manager, page 22-6](#)

Additional Information

See the “[Where to Find More Information](#)” section on page 22-11.

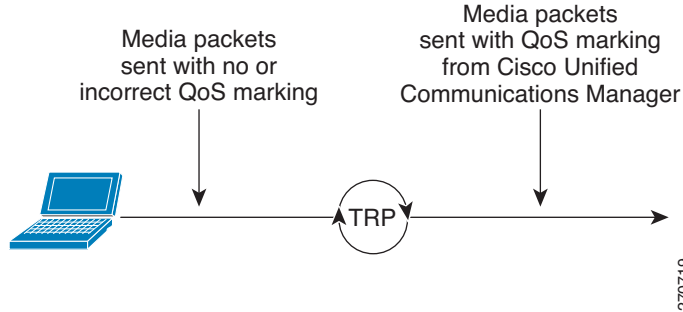
Quality-of-Service Enforcement

In a Cisco voice network, the switch detects Cisco Unified IP Phones that use Cisco Discovery Protocol (CDP), and the switch trusts the Differentiated Services Code Point (DSCP) marking of packets that the Cisco Unified IP Phones send. Because CDP is not secure and can easily be replicated from a PC, the switch generally does not trust the traffic that is coming from a PC. Because it is almost impossible to ensure that only Cisco Unified Communications Manager-authorized traffic will get marked with DSCP, the packets that come from a PC get re-marked to best effort.

To resolve this problem, Cisco Unified Communications Manager inserts a trusted relay point (TRP) in front of the softphone that runs on the PC, and the media stream from the endpoint can be forced to flow through the TRP. The TRP re-marks the DSCP according to instructions from Cisco Unified Communications Manager. The switch honors and trusts media packets that are sent from the TRP.

[Figure 22-1](#) illustrates quality-of-service (QoS) enforcement through use of TRPs.

Figure 22-1 QoS Enforcement by TRPs



Additional Information

See the [“Where to Find More Information”](#) section on page 22-11.

Trusted Relay Point Service Parameter

Cisco Unified Communications Manager uses the following service parameter with trusted relay points:

- Fail Call If Trusted Relay Point Allocation Fails

This service parameter, which is found in the Clusterwide Parameters (System - General) section, determines whether a call that requires a Trusted Relay Point (TRP) is allowed to proceed if no TRP resource is available. Valid values specify True (the call fails if no TRP resource is available) or False (the call proceeds regardless even if a TRP resource is not available).

The administrator should choose the best value for a system based on how the system uses TRPs. If a TRP is used for Quality of Service (QoS) enforcement, Cisco Unified Communications Manager can complete the call if a TRP resource is unavailable, but the call will not have the correct Differentiated Services Code Point (DSCP) marking.

Additional Information

See the [“Where to Find More Information”](#) section on page 22-11.

TRP Insertion in Cisco Unified Communications Manager

From the Cisco Unified Communications Manager point of view, the trusted relay point (TRP) always gets placed closest to the endpoint device that requires it. The high-level requirements for TRP insertion follow:

- The administrator configures the Use Trusted Relay Point check box in the Common Device Configuration window. The administrator configures the Use Trusted Relay Point drop-down list with On/Off/Default options in the configuration windows of all devices where media terminate, so Cisco Unified Communications Manager knows when to insert a TRP.
- The administrator configures the Trusted Relay Point check box in the Media Termination Point Configuration and Transcoder Configuration windows. If the administrator checks this check box when configuring a particular device, Cisco Unified Communications Manager knows that it can use the device as a TRP. The administrator must ensure that a device that is configured as a TRP in Cisco

Unified Communications Manager has the appropriate network connectivity and configuration between the TRP and any endpoints that are involved in the call. If the TRP is invoked but does not have the needed connectivity, an audio or video call will not succeed.

- The service parameter, Fail Call If Trusted Relay Point Allocation Fails, applies. See the [“Trusted Relay Point Service Parameter”](#) section on page 22-6 for details.
- Cisco Unified Communications Manager must insert a TRP for the endpoint if the Use Trusted Relay Point check box is checked for either the endpoint or the device pool that is associated with the device. The call may fail if Cisco Unified Communications Manager fails to allocate a TRP while the Fail Call If Trusted Relay Point Allocation Fails service parameter is set to True.
- If both the Media Termination Point Required check box and the Use Trusted Relay Point check box are checked for the endpoint, Cisco Unified Communications Manager should allocate an MTP that is also a TRP. If the administrator fails to allocate such an MTP/TRP, the following table shows the call status, which the values of the Fail Call If Trusted Relay Point Allocation Fails service parameter and the Fail Call if MTP Allocation Fails service parameter also affect.

Fail Call If TRP Allocation Fails	Fail Call If MTP Allocation Fails	Fail Call?
True	True	Yes
True	False	Yes
False	True	Yes, if MTP is required for H.323 endpoint. No, if MTP is required for SIP endpoint.
False	False	No

- If RSVP is enabled for the call, Cisco Unified Communications Manager should first try to allocate an RSVPAgent that is also labeled as TRP. Otherwise, another TRP device gets inserted between the RSVPAgent and the endpoint.
- If a transcoder is needed for the call and needs to be allocated on the same side as the endpoint that needs TRP, Cisco Unified Communications Manager should first try to allocate a transcoder that is also labeled as TRP. Otherwise, another TRP device gets inserted between the transcoder and the endpoint.
- Assuming that both the Fail Call If Trusted Relay Point Allocation Fails service parameter and the Fail Call If MTP Allocation Fails service parameter are set to False, the following table shows the call behavior in relationship to the MTP that is required and Use Trusted Relay Point settings and the resource allocation status.

MTP Required	Use TRP	Resource Allocation Status	Call Behavior
Y	Y	TRP allocated	Audio call only because no pass-through support exists.
Y	Y or N	MTP only	Audio call only. No TRP support.
Y	Y or N	None allocated	If MTP required is checked for H.323 endpoint, supplementary services will be disabled.

MTP Required	Use TRP	Resource Allocation Status	Call Behavior
N	Y	TRP allocated	Audio or video call depends on endpoint capabilities, and call admission control (CAC). Supplementary services still work.
N	Y	None allocated	Audio or video call. Supplementary services still work, but no TRP support exists.

- In most instances, TRP is allocated after users answer the call, so if a call fails due to failure to allocate the TRP, users may receive fast-busy tone after answering the call. (The SIP outbound leg with MTP required, or H.323 outbound faststart, represents an exception.)

Additional Information

See the [“Where to Find More Information”](#) section on page 22-11.

Media Resource Groups

Cisco Unified Communications Manager 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 (MOH).

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) that is 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 Unified Communications Managers within a given cluster.



Tip

Deactivating the Cisco IP Voice Media Streaming Application deletes associated devices (Annunciator, Conference Bridge, Music-on-Hold, and Media Termination Point) from media resource groups. If the deletion results in an empty media resource group, you cannot deactivate the service; in this case, you must delete the media resource group before deactivating the service.

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 resource ID.
- If the requested resource is not found, search the next media resource group in the media resource group list. Return the resource ID 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 Unified Communications Manager comprises the following media resources: MOH1, MTP1, XCODE1, XCODE2, XCODE3. For calls that require a transcoder, this Cisco Unified Communications Manager distributes the load evenly among the transcoders in its default media resource group. The following allocation order occurs for incoming calls that require transcoders:

```
Call 1 - XCODE1
Call 2 - XCODE2
Call 3 - XCODE3
Call 4 - XCODE1
Call 5 - XCODE2
Call 6 - XCODE3
Call 7 - XCODE1
```

Additional Information

See the [“Where to Find More Information”](#) section on page 22-11.

Media Resource Group Lists

Media resource group lists specify a list of prioritized media resource groups. An application can select required media resources from among the available resources according to the priority order that is 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:

- A media resource group list, which is configured in the Media Resource Group List Configuration window, gets assigned to either a device or to a device pool.
- Call processing uses a media resource group list in the device level if the media resource group list is selected. If a resource is not found, call processing may retrieve it from the default allocation.
- Call processing uses media resource group list in the device pool only if no media resource group list is selected in the device level. If a resource is not found, call processing may retrieve it from the default allocation.

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 Unified Communications Manager allocates the software conference resource first; the hardware conference does not get 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

CM1 and CM2 designate Cisco Unified Communications Managers.

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 that is 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. This means that only media termination point, transcoder, annunciator, and music resources are available to the device.

Additional Information

See the [“Where to Find More Information” section on page 22-11](#).

Dependency Records

To find out which media resource group lists are associated with the media resource groups, click the Dependency Records link that displays in the Cisco Unified Communications Manager Administration Media Resource Group Configuration window. To find out more information about the media resource group list, click the record type, and the Dependency Records Details window displays.

To find out which phones or trunks are associated with media resource group lists, click the Dependency Records link that displays in the Cisco Unified Communications Manager Administration Media Resource Group List Configuration window.

If the dependency records are not enabled for the system, the dependency records summary window displays a message.

For more information about Dependency Records, see “[Dependency Records](#)” in the *Cisco Unified Communications Manager Administration Guide*.

Additional Information

See the “[Where to Find More Information](#)” section on page 22-11.

Where to Find More Information

Related Topics

- [Media Resource Group and Media Resource Group List Configuration Checklist](#), page 22-1
- [Understanding Media Resources](#), page 22-2
- [Trusted Relay Point](#), page 22-5
- [Media Resource Groups](#), page 22-8
- [Media Resource Group Lists](#), page 22-9
- [Dependency Records](#), page 22-10
- [Media Resource Group Configuration](#), *Cisco Unified Communications Manager Administration Guide*
- [Media Resource Group List Configuration](#), *Cisco Unified Communications Manager Administration Guide*
- [Music On Hold Audio Source Configuration](#), *Cisco Unified Communications Manager Features and Services Guide*
- [Music On Hold Server Configuration](#), *Cisco Unified Communications Manager Features and Services Guide*
- [Accessing Dependency Records](#), *Cisco Unified Communications Manager Administration Guide*
- [Annunciator](#), page 23-1
- [Conference Bridges](#), page 24-1
- [Transcoders](#), page 25-1
- [Media Termination Points](#), page 27-1

