Music On Hold

Music On Hold Overview

Use the integrated Music On Hold (MOH) feature to place on-net and off-net users on hold with music from a streaming source. This source makes music available to any on-net or off-net device that you place on hold. On-net devices include station devices and applications that an interactive voice response (IVR) or call distributor places on hold, consult hold, or park hold. Off-net users include those users who are connected through Media Gateway Control Protocol (MGCP) or Skinny Call Control Protocol (SCCP) gateways, Cisco IOS H.323 gateways, and Cisco IOS Media Gateway Control Protocol gateways. The system also makes the Music On Hold feature available for Cisco IP POTS phones that connect to the Cisco IP network through Foreign Exchange Station (FXS) ports on Cisco IOS H.323 or MGCP and for Cisco MGCP or SCCP gateways.

Start Cisco Unified Communications Manager to create a media resource manager. Music On Hold server registers to the media resource manager with its music on hold resources. Music On Hold server is a software application that provides music on hold audio sources and connects a music on hold audio source to multiple streams.

When an end device or feature places a call on hold, Cisco Unified Communications Manager connects the held device to a music resource. When the held device is retrieved, it disconnects from the music on hold resource and resumes normal activity.

Caller-Specific Music On Hold

For SIP calls that a phone receives over the SIP trunk, Cisco Unified Communications Manager can use a different MOH audio source.

An external application, such as the Cisco Unified Customer Voice Portal (CVP) contact center solution, determines the most appropriate MOH audio source based on the caller ID, dialed number, or IVR interaction when a call is received from the public switched telephone network (PSTN).

For details, see the Cisco Unified Customer Voice Portal documentation at http://www.cisco.com/c/en/us/ support/customer-collaboration/unified-customer-voice-portal/tsd-products-support-series-home.html.

Increased Capacity of IP Voice Media Streaming Application and Expanded MOH Audio Source

Cisco IP Voice Media Streaming application is installed automatically when you install Cisco Unified Communications Manager. Activate this application to enable the Music On Hold (MOH) feature.

With this release, the capacity of Cisco Unified Communications Manager to support unique and concurrent MOH audio sources, while the Music On Hold service is running on the MOH server, is increased from 51 to 501. The MOH audio sources are numbered from 1 to 501 with the fixed MOH audio source remaining at the number 51.

The fixed MOH device cannot use an audio source that connects through a USB MOH device, because Cisco Unified Communications Manager does not support USB when running on VMware. Use of the fixed MOH USB device is not supported on VMware. However, provision the external sound device for use with deployments that utilize Cisco Unified Survivable Remote Site Telephony (SRST) multicast MOH.

You can configure each MOH audio source to use a custom announcement as an initial greeting and/or an announcement that is played periodically to callers who are hearing the music. Cisco Unified Communications Manager provides 500 custom announcements that you can use on one or multiple MOH audio sources. These announcements are not distributed between the Cisco Unified Communications Manager servers within a cluster. You have to upload these custom announcement files to each server that provides the MOH and announcement services. You must also upload each custom music file for MOH audio sources to each server.

Performance Impact of Media Devices with Services

The Cisco IP Voice Media Streaming application runs as a service for four media devices—annunciator (ANN), software conference bridge, Music On Hold (MOH), and software media termination point. Activate this service on a Cisco Unified Communications Manager server as coresident with call processing. When you activate this service, ensure that you configure these media devices for limited capacity to avoid any impact on the call processing. The default settings for the media devices are defined based on this coresident operation. You can adjust these settings by reducing the use of one or more media devices to increase other settings.

For example, if you are not using software media termination point devices, you can choose the **Run Flag** setting for the SW MTP to **False**, select **System** > **Service Parameters** > **Cisco IP Voice Media Streaming App service** > **MTP Parameters** , and add the **MTP Call Count** setting to **Media Resource** > **MOH Server** > **Maximum Half Duplex Streams** configuration. Depending on the call traffic, you can modify the default settings. However, monitor the server performance activity for CPU, memory, and IO wait. For higher capacity clusters, such as the ones using 7500 user OVA configuration, it is possible to increase the default media device settings for Call Count by 25%.

For installations where you expect high usage of the media devices, such as Music On Hold, or where high call volumes require higher number of media connections, activate the Cisco IP Voice Media Streaming application service on one or more of the Cisco Unified Communications Manager servers which do not have call processing activated. Activating this service limits the impact of media device usage to other services,

such as call processing. Then, you can increase the configuration settings for maximum number of calls for the media devices.

When you activate Cisco IP Voice Media Streaming application as co-resident with Cisco Unified Communications Manager service, it can impact call processing performance. To increase the capacity settings for Music On Hold or annunciator from the default settings, it is suggested to activate Cisco IP Voice Media Streaming application on a server without activating Cisco Unified Communications Manager.

The CPU performance is impacted by MOH when active callers are on hold or when multicast MOH audio streams are configured.

Table 1: General Performance Results

Configuration Notes	CPU Performance
Dedicated MOH server, 1000 held calls, 500 MOH sources with greeting and periodic announcements.	25–45% (7500 user OVA configuration)
Native call queuing with dedicated MOH server and annunciator server, 1000 queued calls, 500 MOH sources with greeting and periodic announcements. An annunciator can play up to 300 simultaneous greeting announcements.	25–45% (7500 user OVA configuration)
Dedicated MOH server, 500 held calls, 500 MOH sources with greeting and periodic announcements.	15–35% (7500 user OVA configuration)

Table 2: Extrapolated Recommendations

Configuration	Recommendation Limit
When Cisco IP Voice Media Streaming application is co-resident with Cisco Unified Communications Manager on 2500 OVA (moderate call processing).	MOH: 500 held callers, 100 MOH sources, and 48 to 64 annunciator callers.
When Cisco IP Voice Media Streaming application is a dedicated server on 2500 OVA.	MOH: 750 held callers, 250 MOH sources, and 250 annunciator callers.
When Cisco IP Voice Media Streaming application is co-resident with Cisco Unified Communications Manager on 7500/10K OVA (moderate call processing).	MOH: 500 held callers, 250 MOH sources, and 128 annunciator callers.
When Cisco IP Voice Media Streaming application is a dedicated server on 7500/10K OVA.	MOH: 1000 held callers, 500 MOH sources, and 300-700 annunciator callers (with 1 MOH codec). **Note** Reduce annunciator to 300 for two MOH codecs.

Note These recommendations are specific to MOH/ANN devices. If you combine these devices with the software media termination point (MTP) and call forward busy (CFB) devices, reduce the limits to provide streams.

Configuration Limitations for Capacity Planning

The Cisco IP Voice Media Streaming application and Self Provisioning IVR services use a media kernel driver to create and control Real-time Transfer Protocol (RTP) streams. This media kernel driver has a capacity of 6000 streams. These streams allow the media devices and IVR to make resource reservations.

These reservations are based on the following capacity calculations:

Media Device	Capacity
Annunciator	(Call Count service parameter) * 3 Where 3 indicates total of receiving (RX) and transmitting (TX) calls for endpoint and 1 for .wav file.
Software Conference Bridge	(Call Count service parameter) * 2 Where 2 indicates total streams of RX and TX endpoints.
Software Media Termination Point	(Call Count service parameter) * 2 Where 2 indicates total streams of RX and TX endpoints.
Music On Hold	((Maximum Half Duplex Streams) * 3) + (501 * 2 * [number of enabled MOH codecs]) Where: • (Maximum Half Duplex Streams) is a configuration setting on the MOH device configuration administration web page. • 3 indicates total steams of RX, TX, and greeting announcement .wav file. • 501 indicates the maximum number of Music On Hold (MOH) sources. • 2 indicates music .wav stream and possible multicast TX stream. • [number of enabled MOH codecs] is based on how many MOH codecs are enabled in the Cisco IP Voice Media Streaming application service parameters.
Self Provisioning IVR Service	(500 * 2) Where 500 indicates callers, and 2 indicates total streams from RX and TX streams.

Hence, to enable MOH to support a maximum of 1000 callers, use the following equation: `1000 * 3 + 501 * 2 * 1 = 4002` driver streams with one enabled codec and `1000 * 3 + 501 * 2 * 2 = 5004` with two enabled codecs. Reduce the remaining devices and deactivate the Self Provisioning IVR service to limit total reservations to 6000, which allows the MOH device to make these reservations. It may also require that you do not activate the Self Provisioning IVR service on the same server with Cisco IP Voice Media Streaming application.

If configuration settings of the media devices exceed the capacity of the media device driver, the media devices that register with the device driver first will be able to reserve their required stream resources. The media devices that register later are restricted to fewer than requested stream resources. The later registered media

devices result in logging some alarm messages and automatically reducing the call count for the restricted media device.

Note A media kernel driver with a capacity of 6000 streams might not support that many simultaneous media device connections.

Interwork External Multicast MOH to Unicast MOH

With this release, you can configure a Cisco Unified Survivable Remote Site Telephony (SRST) router as an audio source. This router provides multicast MOH audio for devices that are capable of multicast reception. In this approach, devices act as if Cisco Unified Communications Manager is sending the multicast MOH audio. However, devices that are capable of only the unicast reception cannot hear the MOH audio that an external MOH source (for example, Cisco Unified SRST router) sends. Examples of devices that are capable of unicast reception only can be public switched telephone network (PSTN) phones, destination to session border controllers (SBC), and Session Initiation Protocol (SIP) trunks.

In this release of Cisco Unified Communications Manager, this feature is enhanced to receive multicast MOH audio from an external audio source and send it as unicast MOH audio. Cisco Unified Communications Manager uses this feature to play multicast MOH audio as unicast MOH for the devices that are capable of unicast MOH reception only. Examples of an external MOH audio source can be a Cisco Unified SRST router or software that can send multicast MOH audio.

An administrator configures the fields for this feature from Cisco Unified CM Administration **Music On Hold Audio Source Configuration** window.

Note
- This feature has no impact on existing functionality of playing multicast MOH audio using an external audio source for the devices that are capable of multicast reception.

- For the unicast media connection, Cisco Unified Communications Manager MOH Server plays the initial announcement and periodic announcement even if you configure the MOH audio source with external multicast source.

Configuration Tips for the Codec-Specific Inbound Audio Stream

Configure an external multicast audio source, such as Cisco Unified SRST router, to MOH server for streaming the required audio feed.

To configure an external multicast audio source, such as a Cisco Unified SRST router, configure the **Source IPv4 Multicast Address** and **Source Port Number** fields in the **MOH Audio Source Configuration** window.

- Cisco Unified Communications Manager listens to multicast G.711 mu-law stream on external multicast IP address and port that you configured on the **MOH Audio Source configuration** window. An MOH server can transcode between the G.711 mu-law or a-law or L16 256K wideband MOH codecs. The external multicast RTP stream uses G.711 mu-law codec for MOH as a source for G.711 mu-law or a-law or L16 256K wideband MOH codecs. For G.711 a-law and wideband calls, Cisco Unified Communications Manager MOH server transcodes the inbound G.711 mu-law stream to outbound G.711 a-law or wideband stream before sending it to the device.

- Cisco Unified Communications Manager listens to multicast G.729 stream on external multicast IP and port value added with four that is configured on the **MOH audio source configuration** window. For example, if you configure an MOH audio Source with 239.1.1.1:16384, Cisco Unified Communications Manager listens to G.711 mu-law stream on 239.1.1.1:16384 and G.729 stream on 239.1.1.1:16388 (port value added with four). An MOH server cannot transcode for G.729 codecs. Callers who are using MOH G.729 codec require an external multicast RTP stream using G.729 or G.729a codec.

Music On Hold Prerequisites

- Before you configure multicast, ensure that you configure MOH server and audio sources. If you want to use fixed audio source, configure it before you configure multicast.

- Make sure to decide whether you are going to do unicast or multicast Music On Hold

- It is crucial to plan the capacity of the deployed and configured hardware and ensure that it can support the anticipated call volume of the network. You need to know the hardware capacity for MOH resources and consider the implications of multicast and unicast MOH in relation to this capacity. Ensure that network call volumes do not exceed these limits. When MOH sessions reach these limits, an additional load can result in poor MOH quality, erratic MOH operation, or loss of MOH functionality.

- If you use multicast MOH and the devices that listen to multicast MOH streams are not in the same IP network, you must enable multicast routing in the IP network. Take care when you enable the multicast routing to avoid the potential flooding of parts of the network with wrongly sent multicast packets (specially, across WAN links). Disable multicasts on interfaces on which the multicast MOH packets are not required and use the Max Hops parameter.

- For detailed information on planning your Music On Hold deployment, including server capacities, refer to the Music On Hold capacities topics in the *Cisco Collaboration System Solution Reference Network Design*.

Music On Hold Configuration Task Flow

Complete these tasks to configure Music On Hold (MOH) for your system.

Procedure

	Command or Action	**Purpose**
Step 1	Activate Cisco IP Voice Media Streaming, on page 7	Activate the **Cisco IP Voice Media Streaming Service Application** service to enable Music On Hold.
Step 2	Configure Music On Hold Server, on page 7	Configure basic server settings for the MOH server.
Step 3	Upload Audio File for Music On Hold, on page 8	Optional. Upload your own audio files to make them available as MOH audio streams.
Step 4	Configure Music On Hold Audio Source, on page 9	Configure Music On Hold audio streams. You can also associate an uploaded audio files to an MOH audio stream.

	Command or Action	Purpose
Step 5	Configure Fixed Music On Hold Audio Source, on page 10	Configure the fixed Music On Hold audio source. The system supports a single fixed MOH audio source (stream 51).
Step 6	Add MOH to Media Resource Group, on page 10	Assign the Music On Hold service to a Media Resource Group. The group compiles the media resources that are available to an endpoint in a call.
Step 7	Configure Media Resource Group List, on page 10	Assign your Media Resouce Groups to a prioritized Media Resource Group List.
Step 8	Add Media Resources to Device Pool, on page 11	Make Music On Hold available to endpoints by assigning the Media Resource Group List to a device or device pool.
Step 9	Configure MOH Service Parameters, on page 11	Optional. Configure optional Music On Hold parameters such as default codecs and default audio streams for calls on hold.

Activate Cisco IP Voice Media Streaming

The **Cisco IP Voice Media Streaming Application** service must be **Activated** in order to use Music On Hold.

Note During installation, Unified Communications Manager installs and configures a default Music On Hold audio source. Music On Hold functionality can proceed by using the default audio source.

Step 1 From Cisco Unified CM Administration, choose **Tools** > **Service Activation**.

Step 2 Choose a server from the **Server** drop-down list.

Step 3 Under **CM Services** , make sure the **Cisco IP Voice Media Streaming App** service is **Activated**. If the service is deactivated, check the service and click **Save**.

Configure Music On Hold Server

Before you begin

Make sure one or multiple Music On Hold (MOH) servers are available.

Note The Cisco Unified Communications Manager MOH server is automatically added when the **Cisco IP Voice Media Streaming Application** service is activated.

Step 1   From Cisco Unified CM Administration, choose **Media Resources** > **Music On Hold Server**.

Step 2   Click **Find** and select the Music On Hold server that you want to update.

Step 3   Select the **Host Server**.

Step 4   Enter a descriptive **Music On Hold Server Name** along with a **Description**.

Step 5   Select the **Device Pool** you want to use for this server.

Step 6   Configure server capacity by configuring the following fields:

- **Maximum Half Duplex Stream**—Set this to the maximum number of devices that can be on unicast music on hold that is streamed from this music on hold server at any given time. You can use the following formula to calculate the maximum:

Note   `(Server and deployment capacity) - ([Number of multicast MOH sources] * [Number of enabled MOH codecs])`

- **Maximum Multi-cast Connections**—Set this to a value that is greater than or equal to the number of devices that might be placed on multicast MOH at any given time.

Step 7   (Optional) To enable multi-casting, check the **Enable Multi-cast Audio Sources on this MOH Server** check box, and configure the multicast IP address ranges.

Step 8   Configure the additional fields in the **Music On Hold Server Configuration** window. For help with the fields and their settings, see the online help.

Step 9   Click **Save**.

Upload Audio File for Music On Hold

Use this procedure if you want to upload customized audio files that you can make available as Music On Hold audio streams.

Step 1   From Cisco Unified CM Administration, choose **Media Resources** > **MOH Audio File Management**.

Step 2   Click **Upload File**.

Step 3   Click **Choose File** and browse to the file you want to upload. Once you've selected the file, click **Open**.

Step 4   Click **Upload**.

The **Upload Result** window shows the result of the upload. The uploading procedure uploads the file and performs audio conversions to create codec-specific audio files for MOH. Depending on the size of the original file, processing may take several minutes to complete.

Step 5   Click **Close** to close the **Upload Result** window.

Step 6   Repeat this procedure if you want to upload additional audio files.

| Note | When you import an audio source file, Unified Communications Manager processes the file and converts the file to the proper formats for use by the Music On Hold server. Following are examples of valid input audio source files: |

- 16-bit PCM .wav file

- Stereo or mono

- Sample rates of 48 kHz, 44.1 kHz, 32 kHz, 16 kHz, or 8 kHz

| Note | MOH audio source files do not automatically propagate to other MOH servers in a cluster. You must upload an audio source file to each MOH server or each server in a cluster separately |

Configure Music On Hold Audio Source

Use this procedure to configure Music On Hold audio sources. You can configure audio streams and associate uploaded files to an audio stream. You can configure up to 500 audio streams.

| Note | If a new version of an audio source file is available, perform the update procedure to use the new version. |

Step 1 From Cisco Unified CM Administration, choose **Media Resources** > **Music On Hold Audio Source**.

Step 2 Do either of the following:

- Click **Find** and select an existing audio stream.
- Click **Add New** to configure a new stream.

Step 3 From the **MOH Audio Stream Number**, select an audio stream.

Step 4 Enter a unique name in the **MOH Audio Source Name** field.

Step 5 Optional. Check the **Allow Multi-casting** check box if you want to allow this file to be multi-casted.

Step 6 Configure the audio source:

- Check the **Use MOH WAV file** source radio button and from the **MOH Audio Source File**, select the file you want to assign.
- Check the **Rebroadcast External Multicast Source** radio button and enter the multicast source IP Address details.

Step 7 In the **Announcement Settings for Held and Hunt Pilot Calls** section, assign the announcements that you want to use for this audio source.

Step 8 Configure the remaining fields in the **Music On Hold Audio Source Configuration** window. For help with the fields and their settings, see the online help.

Step 9 Click **Save**.

Configure Fixed Music On Hold Audio Source

For each cluster, you may define one fixed audio source (Source 51). You must set up the fixed audio source that is configured per cluster on each MOH server. The fixed audio source originates from a fixed device that uses the local computer audio driver.

Step 1 From Cisco Unified CM Administration, choose **Media Resources** > **Fixed MOH Audio Source**.

Step 2 Optional. Check the **Allow Multi-casting** check box if you want to allow this audio source to be multi-casted.

Step 3 Check the **Enable** check box to enable the fixed audio source. When you check this check box, a **Name** is required.

Step 4 In the **Announcement Settings for Held and Hunt Pilot Calls** area, configure announcements for this audio source.

Step 5 Configure the fields in the **Fixed MOH Audio Source Configuration** window. For help with the fields and their settings, see the online help.

Step 6 Click **Save**.

Add MOH to Media Resource Group

A Media Resource Group is a logical grouping of media resources. You may associate a media resource group with a geographical location or a site, as required. You can also form media resource groups to control server usage, or unicast or multicast service type.

Step 1 From Cisco Unified CM Administration, choose **Media Resources** > **Media Resource Group**.

Step 2 Do either of the following:

- Click **Find** and select an existing group.
- Click **Add New** to create a new group.

Step 3 Enter a **Name** and **Description**.

Step 4 In the **Available Media Resources** list, select the Music On Hold resource and use the down arrow to add the resource to the **Selected Media Resources**. Repeat this step for the other media resources you want to assign to this group.

Step 5 (Optional) Check the **Use Multi-cast for MOH Audio** check box if you want to allow Music On Hold multi-casting.

Step 6 Click **Save**.

Configure Media Resource Group List

Media Resource Group List lists the prioritized media resource groups. An application can select required media resources from among ones that are available according to the priority order that is defined in a media resource group list.

Step 1 From Cisco Unified CM Administration, choose **Media Resources** > **Media Resource Group List**.

Step 2 Do either of the following:

- Click **Find** and select an existing media resource group list.
- Click **Add New** to create a new media resource group list.

Step 3   Enter a **Name** for the list.

Step 4   From the **Available Media Resource Groups** list, select the groups you want to add to this list and use the down arrow to move them to **Selected Media Resource Groups**.

Step 5   In the **Selected Media Resource Groups** list use the up and down arrows to the right of the list to edit the prioritized order of groups.

Step 6   Click **Save**.

Add Media Resources to Device Pool

You can make MOH available to devices by assigning the media resource group list that contains the MOH resource to a device or to the device pool.

Note   The device in a call will use the media resource group list that is assigned to the device in the **Phone Configuration** window. If none is assigned, it will use the media resource group list for the device pool that is used for the call.

Step 1   From Cisco Unified CM Administration, do either of the following:

   • Choose **System** > **Device Pool**.
   • Choose **Device** > **Phone**.

Step 2   Click **Find** and select an existing phone or an existing device pool.

Step 3   From the **Media Resource Group List** drop-down list, select the media resource group list that contains the Music On Hold resource.

Step 4   Complete the remaining fields in the configuration window. For more information on the fields and their configuration options, see Online Help.

Step 5   Click **Save**.

Configure MOH Service Parameters

Use this procedure to configure optional service parameters for Music On Hold (MOH). For many deployments the default settings will be sufficient.

Step 1   In Cisco Unified CM Administration, choose **System** > **Service Parameters**.

Step 2   From the **Server** drop-down list, select the server.

Step 3   From the **Service** drop-down list, select **Cisco IP Voice Media Streaming**.

Step 4   From the **Clusterwide Parameters (Parameters that apply to all servers)** area, configure optional MOH service parameters.

Step 5   Click **Save**.

Step 6   From the **Service** drop-down list, select **Cisco CallManager**.

Step 7   Configure optional MOH parameters. For example, under **Clusterwide Parameters (Service)**, you can assign the default audio sources for Hold.

Step 8   Click **Save**.

> **Note**   All parameters apply only to the current server except parameters that are in the cluster-wide group.

View Music on Hold Audio File

View existing Music On Hold audio files that are stored on the system.

Step 1   In Cisco Unified CM Administration, choose **Media Resources** > **MOH Audio File Management**.
The **Music On Hold Audio File Management** window appears.

Step 2   View the following information for each record:

- **Check box**—If the audio file can be deleted, a check box appears before the **File Name** column.

- **File Name**—This column displays the audio file name.

- **Length**—This column displays the audio file length in minutes and seconds.

- **File Status**—This column displays one of the following statuses of an audio file:

    - **Translation Complete**—This status appears after a file is uploaded successfully and is available for use as audio files for a music on hold audio source.

    - **In Use**—This status appears after you add a Music On Hold audio source that uses this audio file as its MOH audio source file.

      > **Note**   You cannot a delete a file with **In Use** status.

Unicast and Multicast Audio Sources

Unicast Music On Hold is the system default option. However, you need to configure for multicast, if required. Both multicast and unicast configurations present the same audio-source behavior to held parties. Each audio source is used once, and the stream is split internally and is sent to the held parties. The only difference between multicast and unicast, in this case, is how the data is sent over the network.

Table 3: Differences Between Unicast and Multicast Audio Sources

Unicast Audio Source	Multicast Audio Source
Consists of streams that are sent directly from the MOH server to the endpoint that requests an MOH audio stream.	Consists of streams that are sent from the MOH server to a multicast group IP address. Endpoints that request an MOH audio stream can join multicast MOH, as needed.

Unicast Audio Source	Multicast Audio Source
A unicast MOH stream is a point-to-point, one-way audio RTP stream between the server and the endpoint device.	A multicast MOH stream is a point-to-multipoint, one-way audio RTP stream between the MOH server and the multicast group IP address.
Unicast MOH uses a separate source stream for each user or connection. As more endpoint devices go on hold through a user or network event, the number of MOH streams increases.	Enables multiple users to use the same audio source stream to provide MOH.
An MOH audio source may be configured with an initial (greeting) announcement, which will be played to unicast held parties. For unicast MOH users, this announcement is heard from the beginning.	For multicast users, this announcement is not heard.
The additional MOH streams can have a negative effect on network throughput and bandwidth.	Multicast MOH conserves system resources and bandwidth.
Extremely useful in networks in which multicast is not enabled or devices are incapable of multicast.	Can be problematic in situations in which a network is not enabled for multicast or the endpoint devices are incapable of processing multicast.
Includes managing devices only.	Includes managing devices, IP addresses, and ports.
No requirement to define the Music On Hold server.	Administrators must define at least one audio source to allow multicasting. To define Music On Hold servers for multicast, first define the server to allow multicasting.
Functions without configuring MOH audio source, MOH server, or media resource group list.	Functions only if both media resource groups and media resource group lists are defined to include a multicast Music On Hold server. For media resource groups, you must include a Music On Hold server that is set up for multicast. These servers are labeled as (MOH) [Multicast]. Also, check the **Use Multicast for MOH Audio** check box when you define a media resource group for multicast.

Note   The Multicast MOH Direction Attribute for SIP service parameter determines whether Cisco Unified Communications Manager sets the direction attribute of the Session Description Protocol (SDP) in its multicast Music On Hold (MOH) INVITE message to sendOnly or recvOnly.

If your deployment uses SIP phone uses Release 8.4 and earlier for Cisco Unified IP Phones 7940 and 7960, or SIP phone uses Release 8.1(x) and earlier for Cisco Unified IP Phones 7906, 7911, 7941, and 7961, set this parameter to **sendOnly**. Otherwise, leave this parameter set to the default value, **recvOnly**.

Music On Hold Interactions

Feature	Interaction
Multicast Music On Hold over H.323 Intercluster Trunks	Using the multicast MOH over H.323 intercluster trunk feature, you can multicast MOH to work over H.323 intercluster trunks (ICT). When a call connects over an intercluster trunk and one of the parties presses the Hold key, MOH streams over the intercluster trunk. If you have turned on the multicast MOH and have configured the holding party and trunk to use the multicast MOH server, MOH streams with multicast. Only one multicast MOH stream streams over the trunk regardless of the number of calls that are put on hold on this trunk. Additional points regarding this feature: • This feature does not work if any middle box between Cisco Unified Communications Managers does not pass the new fields in Terminal Capability Set (TCS) and OLC message. • This feature requires no additional configuration for field up multicast MOH, and applies only between Cisco Unified Communications Managers that support single-transmitter multicast. • The feature is On by default, but can be turned off by setting the **Send Multicast MOH in H.245 OLC Message** service parameter to **False**. Setting this value can resolve interoperability issues that the feature might cause.
Music On Hold Failover and Fallback	The MOH server supports Cisco Unified Communications Manager lists and failover as implemented by the software conference bridge and media termination point. Upon failover, the system maintains connections to a backup Cisco Unified Communications Manager, if available. When a Music On Hold server fails during an active Music On Hold session, the held party hears no music from this point. However, this situation does not affect normal call functions.
Call Park and Directed Call Park	Music On Hold allows users to place calls on hold with music that a streaming source provides. Music On Hold allows two types of hold: • User hold—The system invokes this type of hold when a user presses the Hold button or Hold softkey. • Network hold—This type of hold takes place when a user activates the Transfer, Conference, or Call Park feature, and the hold automatically gets invoked. This hold type applies to directed call park because directed call park is a transfer function. However, Directed Call Park uses the Cisco Call Manager service parameter, Default Network Hold MOH Audio Source, for the audio source.
Extension Mobility Cross Cluster—Media resources for the visiting phone	Examples include RSVP Agent, TRP, Music On Hold (MOH), MTP, transcoder, and conference bridge. Media resources are local to the visiting phone (other than RSVP Agents).

Feature	Interaction
Hold Reversion	Cisco Unified Communications Manager supports MOH on a reverted call if MOH is configured for a normal held call.
Media Resource Selection	Held parties determine the media resource group list that a Cisco Unified Communications Manager uses to allocate a Music On Hold resource.
Secured Music On Hold with SRTP	Cisco Unified Communications Manager enhances the Cisco IP Voice Media Streaming application service to support Secure Real-Time Protocol (SRTP). Hence, when you enable the Cisco Unified Communications Manager cluster or system for security, the MOH server registers with Cisco Unified Communications Manager as an SRTP capable device. If the receiving device is also SRTP-capable, the music media is encrypted before streaming to the receiving device. Make sure of the following: • Cluster security should be mixed mode—Run the `utils ctl set-cluster mixed-mode` CLI command • SIP trunks in the path support SRTP—The **SRTP Allowed** check box must be checked in the **Trunk Configuration** window for SRTP to work over the trunk. • Devices support SRTP—In the Phone Security Profile used by the endpoint, the **Device Security Mode** must be **Encrypted**.

Music On Hold Restrictions

Restriction	Description
Multicast Music On Hold Support	Computer Telephony Integration (CTI) and media termination point (MTP) devices do not support the multicast Music On Hold feature. If you configure CTI or MTP devices with a multicast MoH device in the media resource group list of the CTI device, call control issues may result. CTI and MTP devices do not support multicast media streaming.
Internet Protocol Support	Multicast Music On Hold supports only IPv4. The Cisco IP Voice Media Streaming Application, which is a component of Music On Hold, supports both IPv4 and IPv6 audio media connections for unicast Music On Hold. Multicast Music On Hold supports IPv4 only. Devices with an IP addressing mode of IPv6 only cannot support multicast.
Distribution of fixed-device audio sources	Cisco Unified Communications Manager does not support distribution of fixed-device (hardware) audio sources across Music On Hold servers within a media resource group.
Unacceptable Audio Quality with G.729a codec	Because the G.729a codec is designed for human speech, if you use it with Music On Hold for music, it may not provide acceptable audio quality.

Restriction	Description
Cisco Unified Communications Manager System Support	A Cisco Unified Communications Manager cluster or system supports only virtualized deployments on Cisco Unified Computing System (UCS) servers or other Cisco-approved third-party server configurations. You cannot use the Music On Hold feature with an external source (USB audio dongle) for the nodes that provide MOH from an external source.
Multicast Support	The administrator can designate a Music On Hold server as either unicast or multicast, provided that resources exist to support multicast.
Caller-specific MOH Support	Caller-specific MOH is not supported when calls are received or transferred over QSIG tunneling-enabled SIP trunks.
MP3 Format Support	The Music On Hold feature does not support the MP3 format.
Interoperability between H.323 and SIP Protocols	Multicast MOH does not support interoperability between H.323 and SIP protocols.
SRTP Support	Multicast MoH audio streams are not encrypted and do not support SRTP.
Multicast Streams	MTPs do not support multicast streams.
Encryption of Multicast Music On Hold RTP Streams	Cisco Unified Communications Manager does not support encryption of multicast Music On Hold RTP streams. For secure MOH audio, you should not configure multicast audio sources.
Fixed Music On Hold Device	The fixed Music On Hold device cannot specify an audio source that connects through a USB, because Cisco Unified Communications Manager does not support USB when running on VMware. However, VMware supports internal Music On Hold.
MOH Server Failure	Cisco Unified Communications Manager takes no action when a Music On Hold server fails during an active Music On Hold session.
Multicast MOH	When an MTP resource gets invoked in a call leg at a site that is using multicast MOH, Cisco Unified Communications Manager falls back to unicast MOH instead of multicast MOH.
Provisioning	If you do not provision the user and network MOH audio source identifiers, or if one or both values are invalid, the caller-specific MOH information in the SIP header is ignored. The call reverts to tone on hold and an invalid MOH audio source alarm is raised.
Header Values	• When both the user and network MOH audio source identifiers are present in the header, any invalid value is replaced by the default value (0). • If both values are zero, or the only value is zero, the header in the incoming INVITE is ignored.

Restriction	Description
MOH Audio Source Identifier	• If you provide only one MOH audio source identifier in the SIP header, including if a comma appears before or after the MOH audio source identifier value, the same MOH ID is used for both user and network MOH. The SIP trunk populates both the user and the network MOH audio source identifiers in the SIP header so that Call Control always receive both values. • If there are more than two MOH audio source identifier values separated by a comma in the header, then the first two values are used. Subsequent values are ignored.
Administrators for Consistent Caller-specific MOH Configurations	Administrators are responsible to maintain consistent caller-specific MOH configurations when multiple Cisco Unified Communications Manager clusters are involved.
Original Incoming Caller	The original incoming caller to the call center cannot change during the course of the entire call.
MOH Information	The Music On Hold information is shared only across SIP trunks.

Music On Hold Troubleshooting

Music On Hold Does Not Play on Phone

Phone user cannot hear Music On Hold.

• G.729a codec is used with MOH for music, which may not provide acceptable audio quality.

• An MTP resource is invoked in a call leg at a site that is using multicast MoH.

• When an MTP resource gets invoked in a call leg at a site that is using multicast MoH, the caller receives silence instead of Music On Hold. To avoid this scenario, configure unicast MoH or Tone on Hold instead of multicast MoH.

Music On Hold Does Not Play on Phone