



# Integrating Cisco Unified Communications Manager and Cisco Unified SRST to Use Cisco Unified SRST as a Multicast MOH Resource

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**Revised: February 4, 2009**

This chapter describes how to configure Cisco Unified Communications Manager and Cisco Unified Survivable Remote Site Telephony (Cisco Unified SRST) to allow Cisco Unified Communications Manager to use Cisco Unified SRST gateways as multicast music-on-hold (MOH) resources during fallback and normal Cisco Unified Communications Manager operation. A distributed MOH design with local gateways providing MOH eliminates the need to stream MOH across a WAN and saves bandwidth.

## **Finding Feature Information in This Module**

Your Cisco Unified CME version may not support all of the features documented in this module. For a list of the versions in which each feature is supported, see the [“Feature Information for Cisco Unified SRST as a Multicast MOH Resource”](#) section on page 150.

## **Contents**

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## Prerequisites for Using Cisco Unified SRST Gateways as a Multicast MOH Resource

- Multicast MOH for H.323 and MGCP is supported on Cisco Unified Communications Manager 3.1.1 and higher versions.
- Cisco Unified Communications Manager must be configured as follows:
  - With multicast MOH enabled.
  - With Media Resource Groups (MRGs) and Media Resource Group Lists (MRGLs) controlling which devices receive multicast MOH and which devices receive unicast MOH.
  - With Cisco Unified Communications Manager regions assigned so that G.711 is used whenever a Cisco Unified SRST multicast MOH resource is invoked.
- The Cisco Unified SRST gateways must run on Cisco Unified SRST 3.0 on Cisco IOS Release 12.2(15)ZJ2 or a later release.
- Cisco Unified Communications Manager and Cisco Unified SRST must run on either H.323 or MGCP.
- For branches that do not run Cisco Unified SRST, Cisco Unified Communications Manager multicast MOH packets must cross the WAN. To accomplish this, you must have multicast routing enabled in your network. For more information about multicast routing, see the “IP Multicast” section of the [Cisco IOS IP Configuration Guide, Release 12.4T](#).
- With Cisco IOS earlier than 12.3(14)T, configure Cisco Unified SRST as your MGCP gateway’s fallback mode using the **ccm-manager fallback-mgcp** and **call application alternate** commands. With Cisco IOS releases after 12.3(14)T, the **ccm-manager fallback-mgcp** and **service** commands must be configured. Configuring these two commands allows Cisco Unified SRST to assume control over the voice port and over call processing on the MGCP gateway. A complete configuration describing setting up Cisco Unified SRST as your fallback mode is shown in the [Cisco Unified Communications Manager Administration Guide, Release 5.1\(3\) Survivable Remote Site Telephony Configuration](#).

## Restrictions for Using Cisco Unified SRST Gateways as a Multicast MOH Resource

- Cisco Unified SRST multicast MOH does not support unicast MOH.
- Only a single Cisco Unified Communications Manager audio source can be used throughout the network. However, the audio files on each Cisco Unified SRST gateway’s flash memory can be different.
- Cisco Unified SRST multicast MOH supports G.711 only.
- Multicast MOH support for H.323 is unavailable in all versions of Cisco Unified Communications Manager 3.3.2. For more information, see CSCdz00697 using the Cisco [Bug Toolkit](#).
- In the Cisco IOS Release 12.2(15)ZJ image for Cisco 1700 series gateways, Cisco Unified SRST multicast MOH does not include support for H.323 mode.

# Information About Using Cisco Unified SRST Gateways as a Multicast MOH Resource

To configure Cisco Unified SRST gateways as an MOH resource, you should understand the following concepts:

- [Cisco Unified SRST Gateways and Cisco Unified Communications Manager, page 121](#)
- [Codecs, Port Numbers, and IP Addresses, page 122](#)
- [Multicast MOH Transmission, page 124](#)
- [MOH from a Live Feed, page 124](#)
- [MOH from Flash Files, page 125](#)

## Cisco Unified SRST Gateways and Cisco Unified Communications Manager

Cisco Unified SRST gateways can be configured to multicast Real-Time Transport Protocol (RTP) packets from flash memory during fallback and normal Cisco Unified Communications Manager operation. To make this happen, Cisco Unified Communications Manager must be configured for multicast MOH so that the audio packets do not cross the WAN. Instead, audio packets are broadcast from the flash memory of Cisco Unified SRST gateways to the same multicast MOH IP address and port number configured for Cisco Unified Communications Manager multicast MOH. IP phones at remote sites are able to pick up RTP packets that are multicast from the local branch gateways instead of from the central Cisco Unified Communications Manager.

Multicast MOH for PSTN callers is supported when the Cisco Unified SRST router is used as the Cisco IOS voice gateway for Cisco Unified Communications Manager. In this state the Cisco Unified SRST function of the router remains in standby mode (no phones registered) with call control of the phones and gateway provided by Cisco Unified Communications Manager. This feature does not apply when the Cisco Unified SRST router is in fallback mode (phones are registered to Cisco Unified SRST). Instead, MOH is provided to PSTN callers via a direct internal path rather than through the multicast loopback interface.

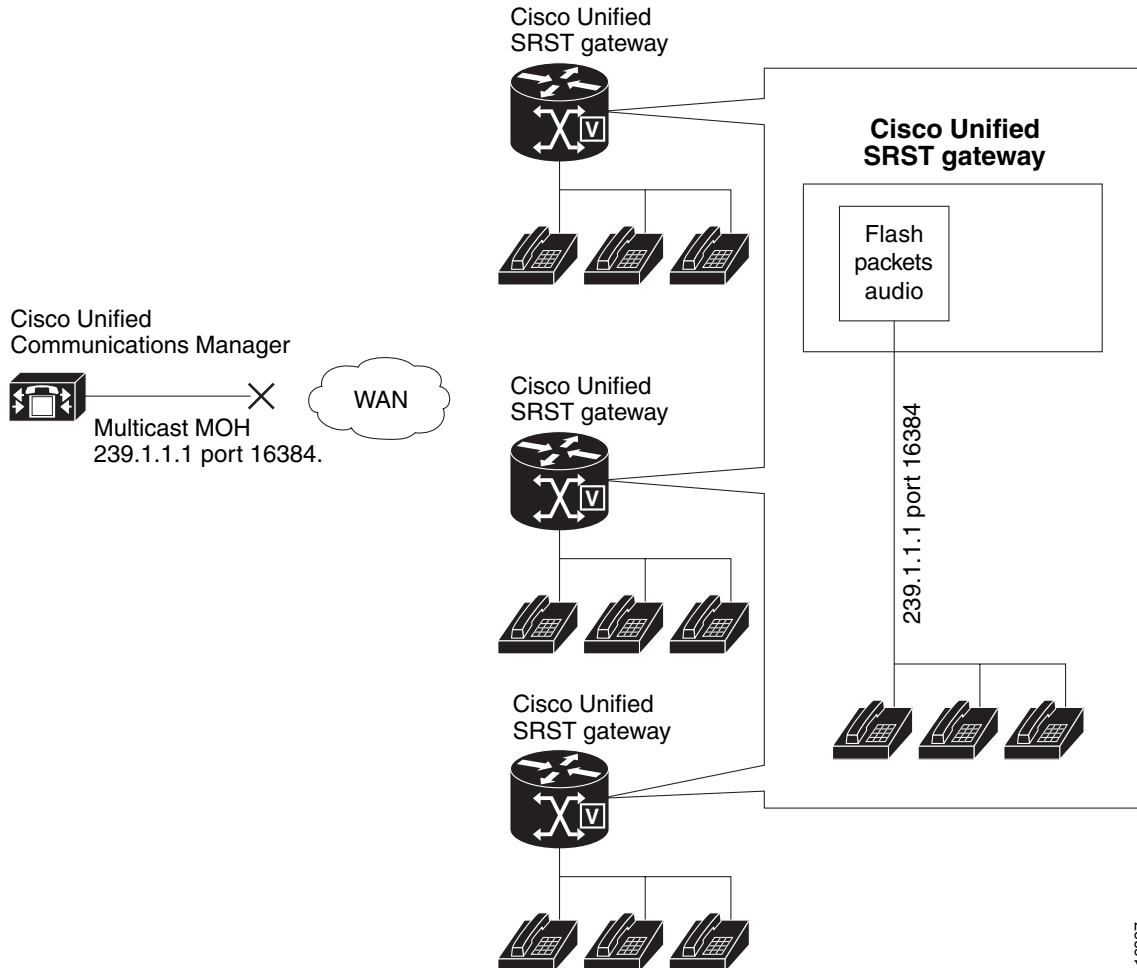
[Figure 1](#) shows a sample configuration in which all phones are configured by Cisco Unified Communications Manager to receive multicast MOH through port number 16384 and IP address 239.1.1.1. Cisco Unified Communications Manager is configured so that multicast MOH cannot reach the WAN, and local Cisco Unified SRST gateways are configured to send audio packets from their flash files to port number 16384 and IP address 239.1.1.1. Cisco Unified Communications Manager and the IP phones are spoofed and behave as if Cisco Unified Communications Manager were originating the multicast MOH.

**Note**

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Phone users at the central site would use multicast MOH from the central site.

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**Figure 1** Multicast MOH from Cisco Unified SRST Flash Memory

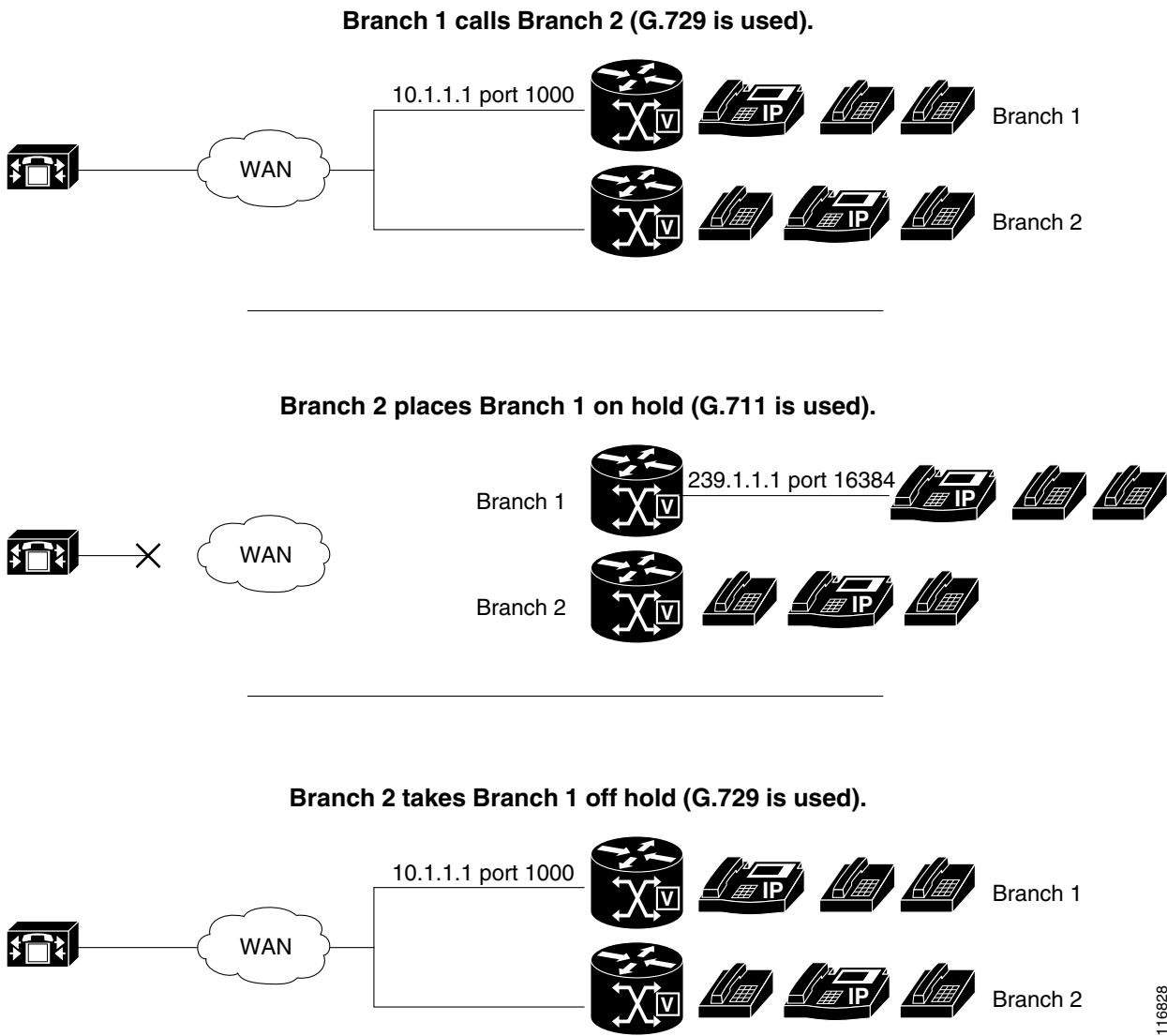
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## Codecs, Port Numbers, and IP Addresses

Cisco Unified SRST multicast MOH supports G.711 only. [Figure 2](#) shows an example in which G.711 is the only codec used by a central Cisco Unified Communications Manager and three branches. In some cases, a Cisco Unified Communications Manager system may use additional codecs. For example, for bandwidth savings, Cisco Unified Communications Manager may use G.711 for multicast MOH and G.729 for phone conversations.

As shown in the example in [Figure 2](#), IP address 10.1.1.1 and port 1000 are used during phone conversations when G.729 is in use, and IP address 239.1.1.1 and port 16384 are used when a call is placed on hold and G.711 is in use.

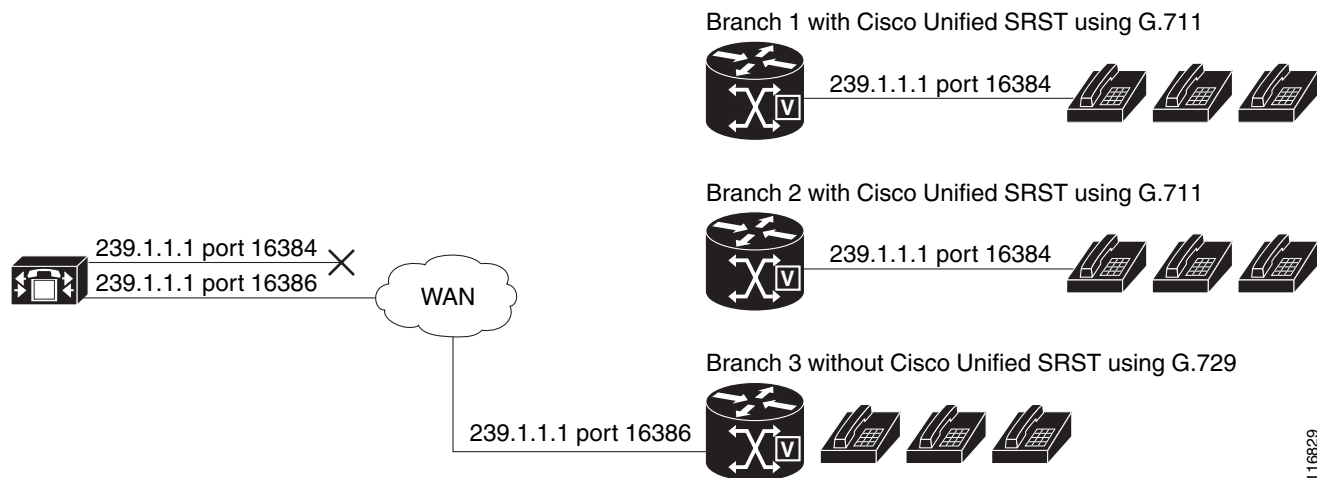
**Figure 2** IP Address and Port Usage for G.711 and G.729 Configuration



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Figure 1 and Figure 2 show all branches using Cisco Unified SRST multicasting MOH. Figure 3 shows a case in which some gateways are configured with Cisco Unified SRST and other gateways are not. When the central site and Branch 3 phone users are put on hold by other IP phones in the Cisco Unified Communications Manager system, MOH is originated by Cisco Unified Communications Manager. When Branch 1 and Branch 2 phone users are put on hold by other phone users in the Cisco Unified Communications Manager system, MOH is originated by the Cisco Unified SRST gateways.

Figure 3 MOH Sources for Cisco Unified SRST and Other Unified SRST IP Phones Using MOH



To enable MOH audio packet transmission through two paths, the Cisco Unified Communications Manager MOH server must be configured with either one IP address and two different port numbers or one port address and two different IP multicast addresses so that one set of branches can use Cisco Unified SRST multicast MOH and the other can use Cisco Unified Communications Manager multicast MOH.

## Multicast MOH Transmission

If Cisco Unified SRST multicast MOH is supported by all branches in a system, such as in [Figure 1](#), Cisco Unified Communications Manager must be configured to keep all multicast MOH audio packets from reaching the WAN. When there is a mix of Cisco Unified SRST branches, as shown in [Figure 3](#), one set of Cisco Unified Communications Manager MOH audio files must reach the WAN and another set must not. Audio packets from the central Cisco Unified Communications Manager must cross the WAN to reach branches running Cisco Unified Communications Manager. For branches running Cisco Unified SRST, the packets must not reach the WAN. For more information about Multicast MOH, see the [“Configuring Cisco Unified SRST for Multicast MOH from an Audio File”](#) section on page 135.

## MOH from a Live Feed

MOH live feed provides live feed MOH streams from an audio device connected to an E&M or FXO port to Cisco IP phones in SRST mode. Music from a live feed is from a fixed source and is continuously fed into the MOH playback buffer instead of being read from a flash file.

Cisco Unified SRST is enhanced with the **moh-live** command. The **moh-live** command provides live feed MOH streams from an audio device connected to an E&M or FXO port to Cisco IP phones in SRST mode. Live feed MOH can also be multicast to Cisco IP phones. For more information about Cisco Unified SRST MOH live feed, see the [“Configuring Cisco Unified SRST for MOH from a Live Feed”](#) section on page 143.

## MOH from Flash Files

The MOH Multicast from Flash Files feature facilitates the continuous multicast of MOH audio feed from files in the flash memories of Cisco Unified SRST branch office routers during Cisco Unified Communications fallback and normal Cisco Unified Communications service. Multicasting MOH from individual branch routers saves WAN bandwidth by eliminating the need to stream MOH audio from central offices to remote branches.

The MOH Multicast from Flash Files feature can act as a backup mechanism to the MOH live feed feature. Using the Flash to backup the live-feed is the recommend method rather than using just the live feed feature alone.

Cisco Unified Communications Manager MOH audio files must reach the WAN and another set must not. Audio packets from the central Cisco Unified Communications Manager must cross the WAN to reach branches running Cisco Unified Communications Manager. For branches running Cisco Unified SRST, the packets must not reach the WAN.

[Table 1](#) provides a summary of options for MOH.

**Table 1** *Music on Hold (MOH)*

Audio Source	Description	How to Configure
Flash memory	No external audio input is required.	<a href="#">Configuring Cisco Unified SRST for Multicast MOH from an Audio File</a>
Live feed	The multicast audio stream has minimal delay for local IP phones. The MOH stream for PSTN callers is delayed by a few seconds. If the live feed audio input fails, callers on hold hear silence.	<a href="#">Configuring Cisco Unified SRST for MOH from a Live Feed</a>
Live feed and flash memory	The live feed stream has a few seconds of delay for both PSTN and local IP phone callers. The flash MOH acts as backup for the live-feed MoH.  We recommend this option if you want live-feed because it provides guaranteed MOH if the live-feed input is not found or fails.	<a href="#">Configuring Cisco Unified SRST for Multicast MOH from an Audio File</a> and <a href="#">Configuring Cisco Unified SRST for MOH from a Live Feed</a>

# How to Use Cisco Unified SRST Gateways as a Multicast MOH Resource

To use Cisco Unified SRST gateways as a multicast MOH resource, perform the following tasks:

- [Configuring Cisco Unified Communications Manager for Cisco Unified SRST Multicast MOH, page 126](#)
- [Configuring Cisco Unified SRST for Multicast MOH from an Audio File, page 135](#)
- [Configuring Cisco Unified SRST for MOH from a Live Feed, page 143](#)

## Configuring Cisco Unified Communications Manager for Cisco Unified SRST Multicast MOH

The following sections describe the Cisco Unified Communications Manager configuration tasks for Cisco Unified SRST multicast MOH:

- [Configuring the MOH Audio Source to Enable Multicasting, page 127](#)
- [Enabling Multicast on the Cisco Unified Communications Manager MOH Server and Configuring Port Numbers and IP Addresses, page 128](#)
- [Creating an MRG and an MRGL, Enabling MOH Multicast, and Configuring Gateways, page 131](#)
- [Creating a Region for the MOH Server, page 133](#)
- [Verifying Cisco Unified Communications Manager Multicast MOH, page 134](#)

To use Cisco Unified SRST gateways as multicast MOH resources, you must configure Cisco Unified Communications Manager to multicast MOH to the required branch sites. To accomplish this, you must configure IP addresses, port numbers, the MOH source, and the MOH audio server.

Even though the MOH routing is set up to prevent the Cisco Unified Communications Manager-sourced multicast MOH from actually reaching the WAN and the remote phones, the configured Cisco Unified Communications Manager MOH IP port and address information are still used by Cisco Unified Communications Manager to tell the phones which multicast IP address to listen to for MOH (for the MOH sourced by SRST).

Configuring the MOH server involves designating a maximum number of hops for the audio source. A configuration of one hop keeps Cisco Unified Communications Manager multicast MOH packets from reaching the WAN, thus spoofing Cisco Unified Communications Manager and allowing Cisco Unified SRST multicast MOH packets to be sent from Cisco Unified SRST gateways to their component phones. For cases in which Cisco Unified Communications Manager multicast must reach gateways that do not run Cisco Unified SRST, use the Cisco IOS **ip multicast boundary** command to control where multicast packets go.

After the MOH server is configured, the MOH server must be added to a Media Resource Group (MRG); the MRG is added to a Media Resource Group List (MRGL); and the designated Cisco Unified Communications Manager branch gateways are configured to use the MRGL.

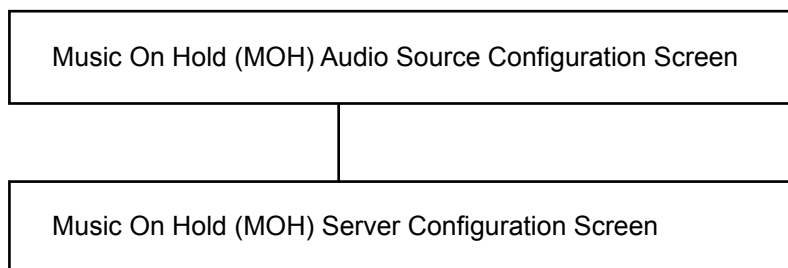
Five Cisco Unified Communications Manager windows are used to configure the MOH server, audio source, MRG, MRGL, and individual gateways. [Figure 4](#) provides an overview of this process.

The last Cisco Unified Communications Manager configuration task involves creating an MOH region that assigns MOH G.711 codec usage for the central site or sites and branch office or offices.

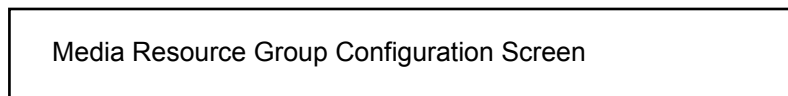
Regions specify the codecs that are used for audio and video calls within a region and between existing regions. For information about regions, see the “Region Configuration” section in the *Cisco Unified Communications Manager Administration Guide*. From the [Cisco Unified Communications Manager](#) documentation directory, click **Maintain and Operate Guides** and select the required Cisco Unified Communications Manager version to locate the administration guide for your version.

**Figure 4** Unified Communications Manager Screens for Configuring Multicast MOH

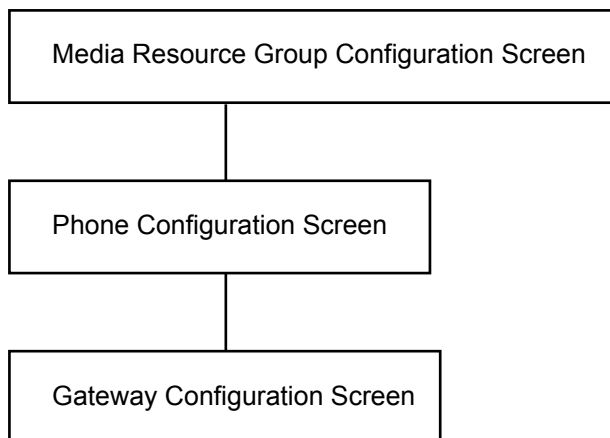
#### Configure MOH Server



#### Add Server



#### Add MRG



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## Configuring the MOH Audio Source to Enable Multicasting

The MOH audio source is a file from which Cisco Unified Communications Manager transmits RTP packets. You can create an audio file or use the default audio file. For Cisco Unified SRST multicast MOH, only one audio source can be used, even if, for example, one out of 500 sites uses Cisco Unified SRST multicast MOH. In addition, all Cisco Unified Communications Manager systems must use the same audio source for user and network MOH because Cisco Unified SRST multicast MOH can stream audio only to a single multicast IP address and port. For Cisco Unified SRST multicast MOH, the Cisco Unified Communications Manager audio source file must be configured for G.711 bandwidth.

**Tip**


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The simplest way to create an audio source is to use the default audio source.

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Whether you use a default Cisco Unified Communications Manager MOH audio source or you create one, the MOH audio source must be configured for multicasting in the Music On Hold (MOH) Audio Source Configuration window.

Note that the MOH Audio Source File Status section shows that the MOH audio source file is configured for four codec formats. If you are planning to use several codecs, ensure that the audio source file accommodates them.

For further information about the creation of an MOH audio source, see the *Cisco Unified Communications Manager Administration Guide*. From the [Cisco Unified Communications Manager](#) documentation directory, click **Maintain and Operate Guides** and select the required Cisco Unified Communications Manager version.

Use this procedure to configure the MOH audio source to enable multicasting and continuous play.

**Note**


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These instructions assume that an MOH audio source file was already created.

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**SUMMARY STEPS**

1. Enable multicast MOH for the MOH audio source.
2. Enable the audio source.
3. Allow multicasting.
4. Apply all multicasting changes.

**DETAILED STEPS**

- 
- |               |                                                                                                                                                                                                    |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Step 1</b> | To enable multicast MOH for the MOH audio source, choose <b>Service &gt; Media Resources &gt; Music On Hold Audio Source</b> to display the Music On Hold (MOH) Audio Source Configuration window. |
| <b>Step 2</b> | Double-click the required audio source listed in the MOH Audio Sources column.                                                                                                                     |
| <b>Step 3</b> | In the Music On Hold (MOH) Audio Source Configuration window, check <b>Allow Multicasting</b> .                                                                                                    |
| <b>Step 4</b> | Click <b>Update</b> .                                                                                                                                                                              |
- 

## Enabling Multicast on the Cisco Unified Communications Manager MOH Server and Configuring Port Numbers and IP Addresses

Enter a base multicast IP address and port number in the Multicast Audio Source Information section of the Music On Hold (MOH) Server Configuration window. If you are using Cisco Unified Communications Manager multicast MOH and Cisco Unified SRST multicast MOH (see the [“Codecs, Port Numbers, and IP Addresses”](#) section on page 122 and the [“Multicast MOH Transmission”](#) section on page 124), you must select a port and IP address increment method to configure for two sets of port numbers and IP address.

If the Increment Multicast on radio button is set to IP address, each MOH audio source and codec combination is multicast to different IP addresses but uses the same port number. If it is set to Port Number, each MOH audio source and codec combination is multicast to the same IP address but uses different destination port numbers.

Table 2 shows the difference between incrementing on an IP address and incrementing on a port number, using the base IP address of 239.1.1.1 and the base port number of 16384. The table also matches Cisco Unified Communications Manager audio sources and codecs to IP addresses and port numbers.

**Table 2** *Example of the Differences Between Incrementing Multicast on IP Address and Incrementing Multicast on Port Number*

Audio Source	Codec	Increment Multicast on IP Address		Increment Multicast on Port Number	
		Destination IP Address	Destination Port	Destination IP Address	Destination Port
1	G.711 mu-law	239.1.1.1	16384	239.1.1.1	16384
1	G.711 a-law	239.1.1.2	16384	239.1.1.1	16386
1	G.729	239.1.1.3	16384	239.1.1.1	16388
1	Wideband	239.1.1.4	16384	239.1.1.1	16390
2	G.711 mu-law	239.1.1.5	16384	239.1.1.1	16392
2	G.711 a-law	239.1.1.6	16384	239.1.1.1	16394
2	G.729	239.1.1.7	16384	239.1.1.1	16396
2	Wideband	239.1.1.8	16384	239.1.1.1	16398

Incrementation is triggered by a change in codec usage. When codec usage changes, a new IP address or port number (depending on the incrementation selected) is assigned to the new codec type and is put into use. The original codec keeps its IP address and port number. For example, as seen in Table 2, if your baseline IP address and port number are 239.1.1.1 and 16384 for a G.711 mu-law codec and the codec usage changes to G.729 (triggering an increment on the port number), the IP address and port number in use changes, or increment, to 239.1.1.1 and 16386. If G.711 usage resumes, the IP address and port number returns to 239.1.1.1 and 16384. If G.729 is in use again, the IP address and port goes back to 239.1.1.1 and 16386, and so forth.

It is important to configure a Cisco Unified Communications Manager port number and IP address that use a G.711 audio source for Cisco Unified SRST multicast MOH. If Cisco Unified Communications Manager multicast MOH is also being used on gateways that do not have Cisco Unified SRST and use a different codec, such as G.729, ensure that the additional or incremental port number or IP address uses the same audio source as the Cisco Unified SRST gateways and the required codec.

The Music On Hold (MOH) Server Configuration window is also where the multicast audio source for the MOH server is configured. For Cisco Unified SRST multicast MOH, the Cisco Unified Communications Manager MOH server can use only one audio source. An audio source is selected by inputting the audio source's maximum number of hops.


The Max Hops configuration sets the length of the transmission of the audio source packets. Limiting the number of hops is one way to stop audio packets from reaching the WAN and thus spoofing Cisco Unified Communications Manager so Cisco Unified SRST can multicast MOH. If all of your branches run Cisco Unified SRST, use a low number of hops to prevent audio source packets from crossing the WAN. If your system configuration includes routers that do not run Cisco Unified SRST, enter a high number of hops to allow source packets to cross the WAN. Use the **ip multicast boulder** and **access-list** commands to keep resource packets from specific IP addresses from reaching the WAN.

Use this procedure to enable multicast and configure port numbers and IP addresses.

## SUMMARY STEPS

1. Enable multicast MOH for Cisco Unified Communications Manager.
2. Set the base IP address and port number.
3. Select whether Cisco Unified Communications Manager increments port numbers or IP addresses.
4. Enter a maximum number of hops.
5. Use Cisco IOS commands to stop Cisco Unified Communications Manager signals from crossing the WAN and reaching Cisco Unified SRST gateways.

## DETAILED STEPS

- 
- Step 1** Enable multicast MOH for Cisco Unified Communications Manager.
- a. Choose **Service > Media Resource > Music On Hold Server**.
  - b. The Music On Hold (MOH) Server Configuration window appears.
  - c. Call up an existing MOH server by clicking **Find** and double-clicking the required MOH server.
  - d. Whether you are updating an existing MOH server or creating a new one, click **Enable Multicast Audio Sources on this MOH Server**.
- Step 2** Set the base IP address and port number.
- In the Music On Hold (MOH) Server Configuration window, enter an IP address in the Base Multicast IP Address field and enter a port number in the Base Multicast Port Number field. Ensure that the IP address and port number use the required audio source and codec. See [Table 2](#).
- Step 3** Select whether Cisco Unified Communications Manager increments port numbers or IP addresses.
- In the Music On Hold (MOH) Server Configuration window, in the Increment Multicast on field, choose **Port Number** if you want port numbers to be incremented and the IP address to remain unchanged. Choose **IP Address** if you want IP addresses to be incremented and the port number to remain unchanged.
- If all of your branches run Cisco Unified SRST and thus use G.711 for MOH, use either setting because incrementation does not take place and a selection does not matter.
  - If your system configuration includes routers that do not run Cisco Unified SRST and use a different codec, select an incrementation method.
-  **Note** If your branches include routers that do not run Cisco Unified SRST and do use G.711, configure separate audio sources: one for the routers that run Cisco Unified SRST and one for the routers that do not.
- 
- Step 4** Enter a maximum number of hops.
- In the Music On Hold (MOH) Server Configuration window, next to the Audio Source Name field, enter 1 in the Max Hops field if all of your branches run Cisco Unified SRST. If your system configuration includes routers that do not run Cisco Unified SRST, enter 16 in the Max Hops field.
- Step 5** Use Cisco IOS commands to stop Cisco Unified Communications Manager signals from crossing the WAN and reaching Cisco Unified SRST gateways.

If all of your branches run Cisco Unified SRST, skip this step. If your system configuration includes routers that do not run Cisco Unified SRST and use a different codec, enter the following Cisco IOS commands starting from global configuration mode on the central site router:

**a. interface {serial | fastethernet} slot/port**

Enters interface configuration mode, where *slot* is the slot number and *port* is the port number.

**b. ip multicast boundary access-list-number**

Configures an administratively scoped boundary, where *access-list-number* is a number from 1 to 99 that identifies an access list that controls the range of group addresses affected by the boundary.

**c. exit**

Exits interface configuration mode.

**d. access-list access-list-number deny ip-address**

Configures the access list mechanism for filtering frames by IP address. For the *ip-address* argument, enter the MOH IP address that you want to prevent from going over the WAN. Normally this would be the base IP address entered in Step 2.

The following is an example configuration:

```
Router(config)# interface serial 0/0
Router(config-if)# ip multicast boundary 1
Router(config-if)# exit
Router(config)# access-list 1 deny 239.1.1.1
```

## Creating an MRG and an MRGL, Enabling MOH Multicast, and Configuring Gateways

The next task involves configuring individual gateways to use an MOH server that can transport the required MOH audio source to their IP phones on hold. This is accomplished by creating a Media Resource Group (MRG). An MRG references media resources, such as MOH servers. The MRG is then added to a Media Resource Group List (MRGL), and the MRGL is added to the phone and gateway configurations.

MRGs are created in the Media Resource Group Configuration window. MRGLs are created in the Media Resource Group List Configuration window. Phones are configured in the Phone Configuration window. Gateways are configured in the Gateway Configuration window.



**Note**

The Gateway Configuration window for an H.323 gateway is similar for MGCP gateways.

Add MRGL to a gateway or IP phone configuration by adding the MRGL to a device pool configuration. For further information about device pools, see the *Cisco Unified Communications Manager Administration Guide*. From the [Cisco Unified Communications Manager](#) documentation directory, click **Maintain and Operate Guides** and select the required Cisco Unified Communications Manager version.

Use the following procedure to create an MRG and MRGL, to enable MOH multicast, and to configure gateways.

## SUMMARY STEPS

1. Create an MRG with a multicast MOH media resource.
2. Create an MRGL that contains the newly created MRG.
3. Add the MRGL to the required IP phones.
4. Add the MRGL to the required gateway.

## DETAILED STEPS

- 
- Step 1** Create an MRG with a multicast MOH media resource.
- a. Choose **Service > Media Resource > Media Resource Group**.
  - b. In the upper-right corner of the window, click the **Add a New Media Resource Group** link. The Media Resource Group Configuration window appears.
  - c. Complete the Media Resource Group Name field.
  - d. Complete the Description field.
  - e. Select a media resource from the Available Media Resources pane.  
This pane lists the media resources that can be chosen for an MRG and can include the following media resource types:
    - Conference bridges (CFB)
    - Media termination points (MTP)
    - Music-on-hold servers (MOH)
    - Transcoders (XCODE)
    - Annunciator (ANN)
 Music-on-hold servers that are configured for multicast are labeled as (MOH) [Multicast].
  - f. Click the down arrow so that the selected media resource moves to the Selected Media Resources pane.
  - g. Click **Insert**.
- Step 2** Create an MRGL that contains the newly created MRG.
- a. Choose **Service > Media Resource > Media Resource Group List**.
  - b. In the upper-right corner of the window, click the **Add a New Media Resource Group List** link. The Media Resource Group List Configuration window appears.
  - c. Complete the Media Resource Group List Name field.
  - d. In the Available Media Resource Groups pane, select the MRG that you just created.
  - e. Add the MRG to the Selected Media Resource Groups pane by clicking the down arrow. After a media resource group is added, its name moves to the Selected Media Resource Groups pane.
  - f. Click **Insert**.
- Step 3** Add the MRGL to the required IP phones.
- a. Choose **Device > Phone** to display the Find and List Phones window.

- b. Click **Find** to display a list of phones.
- c. Double-click the device name of the phone that you want to update.
- d. Complete the Media Resource Group List field by choosing the required MRGL from the drop-down menu.
- e. Click **Update**.

**Step 4** Add the MRGL to the required gateway.

- a. Choose **Device > Gateway** to display the Find and List Gateways window.
  - b. Click **Find** to display a list of gateways.
  - c. Double-click the device name of the gateway that you want to update.
  - d. If the gateway is H.323, complete the Media Resource Group List field by choosing the required MRGL from the drop-down menu.
  - e. Click **Update**.
- 

## Creating a Region for the MOH Server

To ensure that the MOH server uses G.711 for Cisco Unified SRST gateways, you must create a separate region for the MOH server. For more information about codecs, see the [“Codecs, Port Numbers, and IP Addresses” section on page 122](#). For information about regions, see the *Cisco Unified Communications Manager Administration Guide*. From the [Cisco Unified Communications Manager](#) documentation directory, click **Maintain and Operate Guides** and select the required Cisco Unified Communications Manager version.

Configure the Region Configuration window. If the Cisco Unified Communications Manager system uses G.711 only, all of the central sites and their constituent branches for the MOH region must be set to G.711. If a Cisco Unified Communications Manager system has a combination of branches that do and do not run Cisco Unified SRST multicast MOH and the branches that do not run Cisco Unified SRST require a different codec for Cisco Unified Communications Manager multicast MOH, they must be configured accordingly.

A Region Configuration window where the “MOH Server” region is configured to use the G.711 and G.729 codecs might look like this:

- G.711 is used for Branch 1 because its gateway is configured to run Cisco Unified SRST multicast MOH, which requires G.711.
- G.729 is used for Branch 2 because its gateway does not run Cisco Unified SRST and it is configured to use a port and IP address that use G.729.
- G.711 is configured for the central site and the MOH server region.

Use the following procedure to create a region for the MOH server.

### SUMMARY STEPS

1. Create an MOH server region.
2. Create other regions as needed for different codecs.

## DETAILED STEPS

- 
- Step 1** Create an MOH server region.
- a. Choose **System > Region**.
  - b. In the upper-right corner of the window, click **Add a New Region**. The Region Configuration window appears.
  - c. In the Region Name field, enter the name that you want to assign to the new region and click **Insert**.
  - d. If other regions were created, a list of regions appear. Use the drop-down list boxes to choose the audio codec to use for calls between the new region and existing regions. The audio codec determines the type of compression and the maximum amount of bandwidth that is allocated for these calls.
  - e. In addition to other regions, the newly created region appears in the list. Use its drop-down box to choose the codec for use within the new region.
  - f. Click **Update**.
- Step 2** Create other regions as needed for different codecs.
- 

## Verifying Cisco Unified Communications Manager Multicast MOH

The Cisco Unified Communications Manager multicast MOH configuration must run correctly in order for Cisco Unified SRST multicast MOH to work. Verification of Cisco Unified Communications Manager multicast MOH differs for configurations using a WAN with multicast enabled and a WAN with multicast disabled.

You must verify that the Cisco Unified Communications Manager multicast MOH is provided through multicasting and not unicasting. Because unicast MOH is enabled by default, it is easy to mistakenly conclude that multicast MOH is working when it is not.

## SUMMARY STEPS

1. Verify that Cisco Unified Communications Manager system's multicast MOH is heard on a remote gateway.
2. Verify that Cisco Unified Communications Manager system's MOH is multicast, not unicast.

## DETAILED STEPS

- 
- Step 1** Verify that Cisco Unified Communications Manager system's multicast MOH is heard on a remote gateway.
- a. If multicast is enabled on the WAN, make sure that the number of hops configured on the Cisco Unified Communications Manager MOH server is sufficient to allow audio packets to reach the remote site (see the [“Enabling Multicast on the Cisco Unified Communications Manager MOH Server and Configuring Port Numbers and IP Addresses”](#) section on page 128). Then call an IP phone on a remote gateway, place the call on hold, and verify that MOH is heard.
  - b. If multicast is not enabled on the WAN, place an IP phone on the same subnet as the Cisco Unified Communications Manager MOH server and verify that MOH can be heard. Because the IP phone and the MOH server are on the same subnet, no multicast routing capabilities in the network are required.

- Step 2** Verify that the Cisco Unified Communications Manager system's MOH is multicast, not unicast.
- From Microsoft Windows, select **Start > Programs > Administrative Tools > Performance**.
  - In the Performance window, click the + (plus) icon located at the top of the right pane.
  - In the Add Counters window, select Cisco MOH Device.
  - In the Performance window, you can monitor the MOHMulticastResourceActive and MOHUnicastResourceActive counters to check on multicast activity.

## Configuring Cisco Unified SRST for Multicast MOH from an Audio File



### Note

Use the steps in this section only when you are using Microsoft Windows to run Cisco Unified Communications Manager version 4.3 or below. Use the RTMT (Real-Time Monitoring Tool) in Cisco Unified Communications Manager version 5.0 and later versions on the Linux operating system to monitor MOH activity in Cisco Unified Communications Manager version. See the *Cisco Unified Communications Serviceability System Guide, Release 4.0(1)* for more information about RTMT.

Use the following procedures to configure Cisco Unified SRST for multicast MOH from an audio file.

- [Enabling Multicast MOH on the Cisco Unified SRST Gateway, page 136](#)
- [Verifying Basic Cisco Unified SRST Multicast MOH Streaming, page 139](#)
- [Verifying Cisco Unified SRST MOH to PSTN, page 140](#)
- [Verifying Cisco Unified SRST Multicast MOH to IP Phones, page 143](#)

## Prerequisites

- The Cisco Unified SRST gateways must run Cisco IOS Release 12.2(15)ZJ2 or a later release.
- The flash memory in each of the Cisco Unified SRST gateways must have an MOH audio file. The MOH file can be in .wav or .au file format, but must contain 8-bit 8-kHz data, such as an a-law or mu-law data format. A known working MOH audio file (music-on-hold.au) is included in the program .zip files that can be downloaded from <http://www.cisco.com/cgi-bin/tablebuild.pl/ip-key>. Or the music-on-hold.au file can be downloaded from <http://www.cisco.com/cgi-bin/tablebuild.pl/ip-iostsp> and copied to the flash memory on your Cisco Unified SRST router.
- For Cisco Unified Communications Manager versions 4.3 or earlier versions running on Windows, download MOH files by copying one of the MOH files, such as SampleAudioSource.ULAW.wav, from C:\Program Files\Cisco\MOH on Cisco Unified Communications Manager.



### Note

During the copying process, four files are added to each router's flash automatically. One of the files must use a mu-law format as indicated by the extension.ULAW.wav.

- You must configure a loopback interface and include its IP addresses in the Cisco Unified SRST multicast MOH configuration. This configuration allows multicast MOH to be heard on POTS ports on the gateway. The loopback interface does not have to bind to either H.323 or MGCP.
- Configure at least one ephone and directory number (DN), even if the gateway is not used for Cisco Unified SRST. Cisco Unified SRST multicast MOH streaming never starts without an ephone and directory number.

## Enabling Multicast MOH on the Cisco Unified SRST Gateway

No multicast MOH routing configuration is required for Cisco Unified SRST gateways because each Cisco Unified SRST gateway is configured to act as a host running an application that streams multicast MOH packets from the network. The **multicast moh** command declares the Cisco Unified Communications Manager multicast MOH address and port number and allows Cisco Unified SRST gateways to route MOH from flash memory to up to four IP addresses. If no route IP addresses are configured, the flash MOH is sent through the IP address configured in the Cisco Unified SRST **ip source-address** command.

### SUMMARY STEPS

1. **ccm-manager music-on-hold**
2. **interface loopback** *number*
3. **ip address** *ip-address mask*
4. **exit**
5. **interface fastethernet** *slot/port*
6. **ip address** *ip-address mask*
7. **exit**
8. **call-manager-fallback**
9. **ip source-address** *ip-address [port port]*
10. **max-ephones** *max-phones*
11. **max-dn** *max-directory-number*
12. **moh** *filename*
13. **multicasting-enabled**
14. **multicast moh** *multicast-address port port [route ip-address-list]*
15. **exit**

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>ccm-manager music-on-hold</b>  <b>Example:</b> Router(config)# ccm-manager music-on-hold	Enables the multicast MOH feature on a voice gateway.
Step 2	<b>interface loopback</b> <i>number</i>  <b>Example:</b> Router(config)# interface loopback 1	Configures an interface type and enters the interface configuration mode. <ul style="list-style-type: none"> <li>• <i>number</i>—Loopback interface number. The range is from 0 to 2147483647.</li> </ul>
Step 3	<b>ip address</b> <i>ip-address mask</i>  <b>Example:</b> Router(config-if)# ip address 10.1.1.1 255.255.255.255	Sets a primary IP address for an interface. <ul style="list-style-type: none"> <li>• <i>ip-address</i>—IP address.</li> <li>• <i>mask</i>—Mask for the associated IP subnet.</li> </ul>

	Command or Action	Purpose
Step 4	<b>exit</b>  <b>Example:</b> Router(config-if)# exit	Exits interface configuration mode.
Step 5	<b>interface fastethernet slot/port</b>  <b>Example:</b> Router(config)# interface fastethernet 0/0	(Optional if the <b>route</b> keyword is not used in the <b>multicast moh</b> command. See Step 9 and Step 13.) Configures an interface type and enters interface configuration mode.
Step 6	<b>ip address ip-address mask</b>  <b>Example:</b> Router(config-if)# ip-address 172.21.51.143 255.255.255.192	(Optional if the <b>route</b> keyword is not used in the <b>multicast moh</b> command. See Step 9 and Step 13.) Sets a primary IP address for an interface.
Step 7	<b>exit</b>  <b>Example:</b> Router(config-if)# exit	(Optional if the <b>route</b> keyword is not used in the <b>multicast moh</b> command. See Step 9 and Step 13.) Exits interface configuration mode.
Step 8	<b>call-manager-fallback</b>  <b>Example:</b> Router(config)# call-manager-fallback	Enters call-manager-fallback configuration mode.
Step 9	<b>ip source-address ip-address [port port]</b>  <b>Example:</b> Router(config-cm-fallback)# ip source-address 172.21.51.143 port 2000	(Optional if the <b>route</b> keyword is not used in the <b>multicast moh</b> command. See Step 13.) Enables a router to receive messages from Cisco Unified IP phones through the specified IP addresses and ports. <ul style="list-style-type: none"> <li>• <i>ip-address</i>—The preexisting router IP address, typically one of the addresses of the Ethernet port of the router.</li> <li>• <b>port port</b>—(Optional) The port to which the gateway router connects to receive messages from the Cisco Unified IP phones. The port number range is from 2000 to 9999. The default port number is 2000.</li> </ul>
Step 10	<b>max-ephones max-phones</b>  <b>Example:</b> Router(config-cm-fallback)# max-ephones 1	Configures the maximum number of Cisco Unified IP phones that can be supported by a router. <ul style="list-style-type: none"> <li>• <i>max-phones</i>—Maximum number of Cisco IP phones supported by the router. The maximum number is platform-dependent. The default is 0.</li> </ul>

	Command or Action	Purpose
Step 11	<p><b>max-dn</b> <i>max-directory-number</i></p> <p><b>Example:</b> Router(config-cm-fallback)# max-dn 1</p>	<p>Sets the maximum possible number of virtual voice ports that can be supported by a router.</p> <ul style="list-style-type: none"> <li><i>max-directory-number</i>—Maximum number of directory numbers or virtual voice ports supported by the router. The maximum possible number is platform-dependent. The default is 0.</li> </ul>
Step 12	<p><b>moh</b> <i>filename</i></p> <p><b>Example:</b> Router(config-cm-fallback)# moh music-on-hold.au</p>	<p>Enables use of an MOH file.</p> <ul style="list-style-type: none"> <li><i>filename</i>—Filename of the music file. The music file must reside in flash memory.</li> </ul>
Step 13	<p><b>multicasting-enabled</b></p>	<p>Selects the multicast-enabled MOH audio source in the User Hold MOH Audio Source field on the Phone Configuration page in Cisco Unified Communications Manager Administration GUI.</p>
Step 14	<p><b>multicast moh</b> <i>multicast-address</i> <b>port</b> <i>port</i> [<b>route</b> <i>ip-address-list</i>]</p> <p><b>Example:</b> Router(config-cm-fallback)# multicast moh 239.1.1.1 port 16386 route 239.1.1.2 239.1.1.3 239.1.1.4 239.1.1.5</p>	<p>Enables multicast of MOH from a branch office flash MOH file to IP phones in the branch office.</p> <ul style="list-style-type: none"> <li><i>multicast-address</i> and <b>port</b> <i>port</i>—Declares the IP address and port number of MOH packets that are to be multicast. The multicast IP address and port must match the IP address and the port number that Cisco Unified Communications Manager is configured to use for multicast MOH. If you are using different codecs for MOH, these might not be the base IP address and port, instead an incremented IP address or port number. See the <a href="#">“Configuring the MOH Audio Source to Enable Multicasting”</a> section on page 127. If you have multiple audio sources configured on Cisco Unified Communications Manager, ensure that you are using the audio sources’ correct IP address and port number.</li> <li><b>route</b> <i>ip-address-list</i>—(Optional) Declares the IP address or addresses from which the flash MOH packets can be transmitted. A maximum of four IP address entries are allowed. If a <b>route</b> keyword is not configured, the Cisco Unified SRST system uses the <b>ip source-address</b> command value configured for Cisco Unified SRST.</li> </ul>
Step 15	<p><b>exit</b></p> <p><b>Example:</b> Router(config-cm-fallback)# exit</p>	<p>Exits call-manager-fallback configuration mode.</p>

## Verifying Basic Cisco Unified SRST Multicast MOH Streaming

Use the following procedure to verify that multicast MOH packets are configured with the **multicast moh** command.

### SUMMARY STEPS

1. **debug ephone moh**
2. **show interfaces fastethernet**
3. **show ephone summary**

### DETAILED STEPS

---

#### Step 1 **debug ephone moh**

This command sets debugging for MOH. You can use this command to show that the Cisco Unified SRST gateway is multicasting MOH out of Loopback 0 and Fast Ethernet 0/0:

```
Router# debug ephone moh
!
MOH route If FastEthernet0/0 ETHERNET 172.21.51.143 via ARP
MOH route If Loopback0 46 172.21.51.98 via 172.21.51.98
!
```

#### Step 2 **show interfaces fastethernet**

Use this command to confirm that the interface output rates match one G.711 stream, which the **show interfaces fastethernet** output displays as 50 packets/sec and 80 kbps or more.

```
Router# show interfaces fastethernet 0/0
!
30 second output rate 86000 bits/sec, 50 packets/sec
!
```

#### Step 3 **show ephone summary**

Use this command to verify that the Cisco IOS software was able to read the MOH audio file successfully.

```
Router# show ephone summary
!
File music-on-hold.au type AU Media_Payload_G.711Ulaw64k 160 bytes
!
```

---

### Troubleshooting Tips

The **show ephone summary** output should show a file type as either .au or .wav. If INVALID appears, an error exists.

```
Router# show ephone summary
!
File music-on-hold.au type INVALID Media_Payload_G.711Ulaw64k 160 bytes651-
!
```

An invalid output might be caused by the order in which the Cisco Unified SRST configuration commands are entered. Use the **no call-manager-fallback** command and reenter the multicast MOH commands. Rebooting may also clear the error.

## Verifying Cisco Unified SRST MOH to PSTN

Use the following procedure to verify Cisco Unified Communications Manager control of MOH (the WAN link is up) and that multicast MOH packets transmit over a public switched telephone network (PSTN).



### Note

This feature does not apply when the Cisco Unified SRST router is in fallback mode.

## SUMMARY STEPS

1. Verify that a PSTN caller hears MOH when placed on hold by an IP phone caller.
2. **show ccm-manager music-on-hold**
3. **debug h245 asn**
4. **show call active voice**

## DETAILED STEPS

**Step 1** Verify that a PSTN caller hears MOH when placed on hold by an IP phone caller.

Use a Cisco Unified SRST gateway IP phone to call a PSTN phone, and put the PSTN caller on hold. The PSTN caller should hear MOH.

**Step 2** **show ccm-manager music-on-hold**

Use this command to verify that the MOH is multicast if you are using Windows and Cisco Unified Communications Manager version 4.3 or an earlier version. Note that the **show ccm-manager music-on-hold** command displays information about PSTN connections on hold only. It does not display information about multicast streams going to IP phones on hold. The following is an example of **show ccm-manager music-on-hold** command output.

```
Router# show ccm-manager music-on-hold
```

```
Current active multicast sessions : 1
Multicast      RTP port  Packets      Call   Codec   Incoming
Address        number    in/out       id     id      Interface
=====
239.1.1.1      16384    326/326     42    G.711ulaw  Lo0
```

If the PSTN caller hears MOH, and the **show ccm-manager music-on-hold** command displays no active multicast streams, the MOH is unicast. Confirm this by checking the MOH performance counters as discussed in the [“Verifying Cisco Unified Communications Manager Multicast MOH”](#) section on page 134.

**Step 3** **debug h245 asn**

Use this command if H.323 is being used and no multicast address appears in the **show ccm-manager music-on-hold** command output to verify the H.323 handshaking between Cisco Unified Communications Manager and the Cisco Unified SRST gateway. When a PSTN caller is placed on hold, Cisco Unified Communications Manager sends an H.245 closeLogicalChannel, followed by an openLogicalChannel. Verify that the final openLogicalChannelAck from Cisco Unified Communications Manager to the Cisco Unified SRST gateway contains the expected multicast IP address and port number. In the following example, the IP address is EF010101 (239.1.1.1) and the port number is 16384.

```
Router# debug h245 asn
```

```
*Mar 1 04:20:19.227: H245 MSC INCOMING PDU ::=
value MultimediaSystemControlMessage ::= response : openLogicalChannelAck :
{
  forwardLogicalChannelNumber 6
  forwardMultiplexAckParameters h2250LogicalChannelAckParameters :
  {
    sessionID 1
    mediaChannel unicastAddress : ipAddress :
    {
      network 'EF010101'H
      tsapIdentifier 16384
    }
    mediaControlChannel unicastAddress : ipAddress :
    {
      network 'EF010101'H
      tsapIdentifier 16385
    }
  }
}
```

**Step 4 show call active voice**

Use this command with the **debug h245 asn** command to further verify the H.323 handshaking between Cisco Unified Communications Manager and the Cisco Unified SRST gateway.

```
Router# show call active voice | include RemoteMedia
```

```
RemoteMediaIPAddress=239.1.1.1
RemoteMediaPort=16384
```

The IP address and port number displayed must match the IP address and port number displayed by the **debug h245 asn** command. If the RemoteMediaIPAddress field displays 0.0.0.0, you probably have encountered caveat CSCdz00697. For more information, see the Cisco [Bug ToolKit](#) and the [“Restrictions for Using Cisco Unified SRST Gateways as a Multicast MOH Resource”](#) section on page 120.

**Troubleshooting Tips**

- If the PSTN caller hears tone on hold (TOH) instead of MOH, two problems are probable:
  - Cisco Unified Communications Manager has failed to activate MOH and has used TOH as a fallback. To verify that this is the case, see the [“Verifying Cisco Unified Communications Manager Multicast MOH”](#) section on page 134.
  - Cisco Unified Communications Manager does not have the appropriate MOH resource available. Use the **show ccm-manager music-on-hold** command to find out if the MOH resource is the problem.



**Note** The **show ccm-manager music-on-hold** command displays information about PSTN connections on hold only. It does not display information about multicast streams going to IP phones on hold.

```
Router# show ccm-manager music-on-hold
```

```
Current active multicast sessions : 1
Multicast      RTP port  Packets      Call  Codec  Incoming
```

```

Address          number    in/out    id      Interface
=====
239.1.1.1        16384    326/326  42     G.711ulaw Lo0*

```

If no MOH streams are shown (that is, there are no rows of data beneath the columns), Cisco Unified Communications Manager was not correctly configured to provide the Cisco Unified SRST gateway with MOH. Configuration errors might include that the required codec has not been enabled on Cisco Unified Communications Manager (check the service parameters) and that no MRGL was assigned to the gateway, or, if one was assigned, it has insufficient resources. Check Cisco Intrusion Detection System (Cisco IDS) Event Viewer for error messages.

- If the POTS caller on hold does not hear a sound, Cisco Unified Communications Manager has successfully completed the multicast MOH handshaking with the Cisco Unified SRST gateway, and the gateway is failing to pick up the locally generated multicast RTP stream.

Use the **show ccm-manager music-on-hold** command to investigate.

```
Router# show ccm-manager music-on-hold
```

```

Current active multicast sessions : 1
Multicast      RTP port  Packets    Call   Codec   Incoming
Address        number    in/out     id     id      Interface
=====
239.1.1.1      16384    326/326    42     G.711ulaw Lo0 *

```

- If no MOH streams are shown, Cisco Unified Communications Manager was not correctly set up to provide the Cisco Unified SRST gateway with MOH. A typical error is that Cisco Unified Communications Manager was not configured with an appropriate MOH resource. The configuration error might be that the required codec has not been enabled on Cisco Unified Communications Manager (check the service parameters) or that no MRGL was assigned to the gateway, or, if one is assigned, it has insufficient resources. Check the IDS Event Viewer for error messages.
- Verify that the multicast address and RTP port number shown in the **show ccm-manager music-on-hold** command output match the *multicast-address* and *port* arguments in the **moh multicast** command configuration.
- Verify that the Packets in/out field shows a count that is incrementing. Repeat the **show ccm-manager music-on-hold** command to verify that the Packets in/out counters are incrementing.
- Verify that the codec field matches the codec type of the audio file stored in the Cisco Unified SRST gateway’s flash memory. If another codec value besides G.711 mu-law or G.711 a-law appears in the **show ccm-manager music-on-hold** command output, review the Cisco Unified Communications Manager region for incorrect codec configuration. See the [“Creating a Region for the MOH Server”](#) section on page 133.
- The Incoming Interface field shows where the Cisco Unified SRST gateway is to receive the multicast MOH packets. An interface must be listed, and it must be one of the interfaces included in the **multicast moh** command or the default IP source address, which is configured with the **ip source-address** command.

For more information, see [Step 9](#) in the [“Enabling Multicast MOH on the Cisco Unified SRST Gateway”](#) section on page 136.

## Verifying Cisco Unified SRST Multicast MOH to IP Phones

To verify that Cisco Unified Communications Manager is signaling the IP phone to receive Cisco Unified SRST multicast MOH correctly, perform the following steps.

### SUMMARY STEPS

1. Verify that an IP phone caller hears MOH when placed on hold by an IP phone caller.
2. Check the MOHMulticastResourceActive and MOHUnicastResourceActive counters.

### DETAILED STEPS

- 
- Step 1** Verify that an IP phone caller hears MOH when placed on hold by an IP phone caller.
- Use an IP phone to call a second IP phone, and put the second caller on hold. The second caller should hear MOH.
- Step 2** Check the MOHMulticastResourceActive and MOHUnicastResourceActive counters.
- Use the Performance window to check the MOHMulticastResourceActive and MOHUnicastResourceActive counters under the Cisco MOH Device performance object. See [Step 2](#) in the “[Verifying Cisco Unified Communications Manager Multicast MOH](#)” section on page 134. For Cisco Unified SRST multicasting MOH to work, the multicast counter must increment.
- 

## Troubleshooting Tips

If no MOH is heard and the Cisco Unified SRST MOH signaling is multicasting, connect a sniffer to the PC port on the back of IP phone. If the IP phone and Cisco Unified SRST gateway are connected to the same subnet, multicast RTP packets must be detected at all times, even when the IP phone was not placed on hold. If the IP phone and the Cisco Unified SRST gateway are not connected to the same subnet, multicast RTP packets are detected only when the IP phone is placed on hold and sends an Internet Group Management Protocol (IGMP) Join to the closest router.

## Configuring Cisco Unified SRST for MOH from a Live Feed

The following sections describe the configuration tasks for Cisco Unified SRST MOH live feed:

- [Prerequisites, page 144](#)
- [Restrictions, page 144](#)
- [Setting Up the Voice Port on the Cisco Unified SRST Gateway, page 145](#)
- [Setting Up the Directory Numbers on the Cisco Unified SRST Gateway, page 146](#)
- [Establishing the MOH Feed, page 147](#)
- [Verifying Cisco Unified SRST MOH Live Feed, page 149](#)

To configure MOH from a live feed, establish a voice port and dial peer for the call and then create a “dummy” phone or directory number. The dummy number allows for making and receiving calls, and the number is not assigned to a physical phone. It is that number that the MOH system autodial to establish the MOH feed.

The **moh-live** command allocates one of the virtual voice ports from the pool of virtual voice ports created by the **max-dn** command. The virtual voice port places an outgoing call to the dummy number; that is, the directory number specified in the **moh-live** command. The audio stream obtained from the MOH call provides the music-on-hold audio stream.

We recommend that the interface for live-feed MOH is an analog E&M port because it requires the minimum number of external components. Connect a line-level audio feed (standard audio jack) directly to pins 3 and 6 of an E&M RJ-45 connector. The E&M WAN interface card (WIC) has a built-in audio transformer that provides appropriate electrical isolation for the external audio source. (An audio connection on an E&M port does not require loop current.) The **signal immediate** and **auto-cut-through** commands disable E&M signaling on this voice port. A G.711 audio packet stream is generated by a digital signal processor (DSP) on the E&M port.

In Cisco IOS Release 12.4(15)T and later releases, you can directly connect a live-feed source to an FXO port if the **signal loop-start live-feed** command is configured on the voice port; otherwise, the port must connect through an external third-party adapter to provide a battery feed. An external adapter must supply normal telephone company (telco) battery voltage with the correct polarity to the tip and ring leads of the FXO port and it must provide transformer-based isolation between the external audio source and the tip and ring leads of the FXO port.

Music from a live feed is continuously fed into the MOH playout buffer instead of being read from a flash file, so there is typically a 2-second delay. An outbound call to an MOH live-feed source is attempted (or reattempted) every 30 seconds until the connection is made by the directory number that was configured for MOH. If the live-feed source is shut down for any reason, the flash memory source automatically activates.

A live-feed MOH connection is established as an automatically connected voice call that is made by the Cisco Unified SRST MOH system itself or by an external source directly calling in to the live-feed MOH port. An MOH call can be from or to the PSTN or can proceed via VoIP with voice activity detection (VAD) disabled. The call is assumed to be an incoming call unless the **out-call** keyword is used with the **moh-live** command during configuration.

The Cisco Unified SRST router uses the audio stream from the call as the source for the MOH stream, displacing any audio stream that is available from a flash file. An example of an MOH stream received over an incoming call is an external H.323-based server device that calls the directory number to deliver an audio stream to the Cisco Unified SRST router.

## Prerequisites

Cisco Unified SRST for multicast MOH, as described in [“Configuring Cisco Unified SRST for Multicast MOH from an Audio File” section on page 135](#), is not required for the MOH live-feed configuration. However, MOH live feed is designed to work in conjunction with multicast MOH.

## Restrictions

- An FXO port can be used for a live feed if the port is supplied with an external third-party adapter to provide a battery feed.
- An FXS port cannot be used for a live feed.
- For a live feed from VoIP, VAD must be disabled.

- MOH is supplied to PSTN and VoIP G.711 calls. Some versions of Cisco Unified SRST provide MOH to local phones. On Cisco Unified SRST that do not support MOH for local IP phones, callers hear a repeating tone on hold for reassurance that they are still connected.

## Setting Up the Voice Port on the Cisco Unified SRST Gateway

Use the following procedure to activate MOH from a live feed and to set up and connect the physical voice port.

### SUMMARY STEPS

1. **voice-port** *port*
2. **input gain** *decibels*
3. **auto-cut-through** (E&M only)
4. **operation 4-wire** (E&M only)
5. **signal immediate** (E&M only)
6. **no shutdown**
7. **exit**

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>voice-port</b> <i>port</i>  <b>Example:</b> Router(config)# voice-port 1/1/0	Enters voice-port configuration mode to set up the physical voice port. To find the correct definition of the <i>port</i> argument for your router, see the <a href="#">Cisco IOS Survivable Remote Site Telephony Version 3.2 Command Reference</a> .
Step 2	<b>input gain</b> <i>decibels</i>  <b>Example:</b> Router(config-voice-port)# input gain 0	Specifies, in decibels, the amount of gain to be inserted at the receiver side of the interface. Acceptable values are integers from -6 to 14.
Step 3	<b>auto-cut-through</b>  <b>Example:</b> Router(config-voiceport)# auto-cut-through	(E&M ports only) Enables call completion when a PBX does not provide an M-lead response. MOH requires that you use this command with E&M ports.
Step 4	<b>operation 4-wire</b>  <b>Example:</b> Router(config-voiceport)# operation 4-wire	(E&M ports only) Selects the 4-wire cabling scheme. MOH requires that you specify 4-wire operation with this command for E&M ports.
Step 5	<b>signal immediate</b>  <b>Example:</b> Router(config-voiceport)# signal immediate	(E&M ports only) For E&M tie trunk interfaces, directs the calling side to seize a line by going off-hook on its E-lead and to send address information as DTMF digits.

	Command or Action	Purpose
Step 6	<code>no shutdown</code>  <b>Example:</b> Router(config-voiceport)# no shutdown	Activates the voice port.
Step 7	<code>exit</code>  <b>Example:</b> Router(config-voiceport)# exit	Exits voice-port configuration mode.

## Setting Up the Directory Numbers on the Cisco Unified SRST Gateway

After setting up the voice port, create a dial peer and give the voice port a directory number with the **destination-pattern** command. The directory number is the number that the system uses to access the MOH.

### SUMMARY STEPS

1. `dial-peer voice tag pots`
2. `destination-pattern string`
3. `port port`
4. `exit`

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>dial-peer voice tag pots</code>  <b>Example:</b> Router(config)# dial-peer voice 7777 pots	Enters dial-peer configuration mode.
Step 2	<code>destination-pattern string</code>  <b>Example:</b> Router(config-dial-peer)# destination-pattern 7777	Specifies the directory number that the system uses to create music on hold. This command specifies either the prefix or the full E.164 telephone number to be used for a dial peer.
Step 3	<code>port port</code>  <b>Example:</b> Router(config-dial-peer)# port 1/1/0	Associates the dial peer with the voice port that was specified in the <a href="#">“Setting Up the Voice Port on the Cisco Unified SRST Gateway”</a> section on page 145.
Step 4	<code>exit</code>  <b>Example:</b> Router(config-dial-peer)# exit	Exits dial-peer configuration mode.

## Establishing the MOH Feed

Use the following procedure to establish the MOH feed and connect the music source, such as a CD player, to autodial the directory number.

### SUMMARY STEPS

1. **call-manager-fallback**
2. **max-dn** *max-directory-number*
3. **multicast moh** *multicast-address* **port** *port* [**route** *ip-address-list*]
4. **moh-live dn-number** *calling-number* **out-call** *outcall-number*
5. **exit**

### DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>call-manager-fallback</b>  <b>Example:</b> Router(config)# call-manager-fallback	Enters call-manager-fallback configuration mode.
Step 2	<b>max-dn</b> <i>max-directory-number</i>  <b>Example:</b> Router(config-cm-fallback)# max-dn 1	Sets the maximum possible number of virtual voice ports that can be supported by a router. <ul style="list-style-type: none"> <li>• <i>max-directory-number</i>—Maximum number of directory numbers or virtual voice ports supported by the router. The maximum possible number is platform-dependent. The default is 0.</li> </ul>

Command or Action	Purpose
<p><b>Step 3</b></p> <pre>multicast moh multicast-address port port [route ip-address-list]</pre> <p><b>Example:</b></p> <pre>Router(config-cm-fallback)# multicast moh 239.1.1.1 port 16386 route 239.1.1.2 239.1.1.3 239.1.1.4 239.1.1.5</pre>	<p>Enables multicast of MOH from a branch office flash MOH file to IP phones in the branch office.</p> <p><b>Note</b> This command must be used to source live feed MOH to multicast Cisco Unified Communications Manager mode. It is not required in strict SRST mode.</p> <ul style="list-style-type: none"> <li>• <i>multicast-address</i> and <b>port port</b>—Declares the IP address and port number of MOH packets that are to be multicast. The multicast IP address and port must match the IP address and the port number that Cisco Unified Communications Manager is configured to use for multicast MOH. If you are using different codecs for MOH, these might not be the base IP address and port, but an incremented IP address or port number. See the <a href="#">“Configuring the MOH Audio Source to Enable Multicasting”</a> section on page 127. If you have multiple audio sources configured on Cisco Unified Communications Manager, ensure that you are using the audio sources’ correct IP address and port number.</li> <li>• <b>route ip-address-list</b>—(Optional) Declares the IP address or addresses from which the flash MOH packets can be transmitted. A maximum of four IP address entries are allowed. If a <b>route</b> keyword is not configured, the Cisco Unified SRST system uses the <b>ip source-address</b> command value configured for Cisco Unified SRST.</li> </ul>
<p><b>Step 4</b></p> <pre>moh-live dn-number calling-number out-call outcall-number</pre> <p><b>Example:</b></p> <pre>Router(config-cm-fallback)# moh-live dn-number 3333 out-call 7777</pre>	<p>Specifies that this telephone number is to be used for an outgoing call that is to be the source for an MOH stream.</p> <ul style="list-style-type: none"> <li>• <b>dn-number calling-number</b>—Sets the MOH telephone number. The <i>calling-number</i> argument is a sequence of digits that represent a telephone number.</li> <li>• <b>out-call outcall-number</b>—Indicates that the router is calling out for a live feed that is to be used for MOH and specifies the number to be called. The <i>outcall-number</i> argument is a sequence of digits that represent a telephone number, typically of an E&amp;M port.</li> </ul> <p>The <b>outcall</b> keyword makes a connection to the local router voice port that was specified in the <a href="#">“Setting Up the Voice Port on the Cisco Unified SRST Gateway”</a> section on page 145.</p>
<p><b>Step 5</b></p> <pre>exit</pre> <p><b>Example:</b></p> <pre>Router(config-cm-fallback)# exit</pre>	<p>Exits call-manager-fallback configuration mode.</p>

## Verifying Cisco Unified SRST MOH Live Feed

To verify MOH live feed, use the **debug ephone moh** command and the other commands described in the “[Verifying Basic Cisco Unified SRST Multicast MOH Streaming](#)” section on page 139.

# Configurations Examples for Cisco Unified SRST Gateways

This section provides the following configuration examples for Cisco Unified SRST gateways:

- [MOH Routed to Two IP Addresses: Example, page 149](#)
- [MOH Live Feed: Example, page 149](#)

## MOH Routed to Two IP Addresses: Example

The following example declares the Cisco Unified Communications Manager multicast MOH IP address 239.1.1.1 and port number 16384 and streams music-on-hold.au audio file packets out the interfaces that are configured with the IP addresses 10.1.1.1 and 172.21.51.143.

```
ccm-manager music-on-hold
interface Loopback0
 ip address 10.1.1.1 255.255.255.255

interface FastEthernet0/0
 ip address 172.21.51.143 255.255.255.192

call-manager-fallback
 ip source-address 172.21.51.143 port 2000
 max-ephones 1
 max-dn 1
 moh music-on-hold.au
 multicast moh 239.1.1.1 port 16384 route 172.21.51.143 10.1.1.1
```



### Note

The multicast IP address and port must match the IP address and the port number that Cisco Unified Communications Manager is configured to use for multicast MOH. If you are using different codecs for MOH, these might not be the base IP address and port, but an incremented IP address or port number. See the “[Configuring the MOH Audio Source to Enable Multicasting](#)” section on page 127. If you have multiple audio sources configured on Cisco Unified Communications Manager, ensure that you are using the audio source’s correct IP address and port number.

## MOH Live Feed: Example

The following example configures MOH from a live feed. Note that the dial peer references the E&M port that was set with the **voice-port** command and that the dial peer number (7777) matches the outcall number configured with the **out-call** keyword of the **moh-live** command.

```
voice-port 1/0/0
 input gain 3
 auto-cut-through
 operation 4-wire
 signal immediate
!
dial-peer voice 7777 pots
 destination-pattern 7777
```

```

port 2/0/0
!
!
call-manager-fallback
max-conferences 8
max-dn 1
moh-live dn-number 3333 out-call 7777
!
.
.
.

```

## Feature Information for Cisco Unified SRST as a Multicast MOH Resource

Table 3 lists the enhancements to the Cisco Unified SRST as a Multicast MOH Resource feature by version.

To determine hardware and software compatibility, see the Cisco Unified Communications Manager Compatibility Information page at the following URL:

[http://www.cisco.com/en/US/products/sw/voicesw/ps556/products\\_device\\_support\\_tables\\_list.html](http://www.cisco.com/en/US/products/sw/voicesw/ps556/products_device_support_tables_list.html)

See also the Cisco Unified Communications Manager Documentation Roadmaps at the following URL:

[http://www.cisco.com/en/US/products/sw/voicesw/ps556/products\\_documentation\\_roadmaps\\_list.htm](http://www.cisco.com/en/US/products/sw/voicesw/ps556/products_documentation_roadmaps_list.htm)

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.



### Note

Table 3 lists the Cisco Unified SRST version that introduced support for a given feature. Unless noted otherwise, subsequent versions of Cisco Unified SRST software also support that feature.

**Table 3** Feature Information for Cisco Unified SRST as a Multicast MOH Resource

Feature Name	Releases	Feature Information
Cisco Unified SRST as a Multicast MOH Resource	3.0	The MOH-live feature was added.

## Where to Go Next

For information about monitoring and maintaining Cisco Unified SRST, see the “[Monitoring and Maintaining Cisco Unified SRST](#)” section on page 223.

For additional information, see the “[Additional References](#)” section on page 44 in the “[Overview of Cisco Unified SRST](#)” section on page 31.