



Configuring Enhanced Conferencing and Transcoding for Voice Gateway Routers

This chapter describes the steps for enabling conferencing and transcoding support on Cisco IOS voice gateways in a Cisco Unified Communications Manager network. This feature provides enhanced multiservice support by enabling audioconference and transcode functions in voice gateway routers. Locating conference resources in the branch reduces WAN utilization and using transcoding services reduces bandwidth needs resulting in tangible cost savings.

Digital signal processor (DSP) farms provide conferencing and transcoding services using DSP resources on high-density digital voice/fax network modules and motherboard PVDM slots.

Feature History for Out-of-Band to In-Band DTMF Relay for Voice Gateway Routers

Release	Modification
12.3(8)XY	This feature was introduced.
12.3(11)T	This feature was integrated into Cisco IOS Release 12.3(11)T.
12.3(14)T	Support was added for the PVDM2 on the Cisco 2800 series and Cisco 3800 series voice gateway routers.

Feature History for Enhanced Conferencing and Transcoding for Voice Gateway Routers

Release	Modification
12.3(8)T	This feature was introduced for the NM-HDV2, NM-HD-1V, NM-HD-2V, and NM-HD-2VE.
12.3(11)T	Support was added for the PVDM2 on the Cisco 2800 series and Cisco 3800 series voice gateway routers.

Feature History for Conferencing and Transcoding for Voice Gateway Routers

Release	Modification
12.1(5)YH	This feature was introduced for the NM-HDV-FARM on the Cisco VG200.
12.2(13)T	This feature was integrated into Cisco IOS Release 12.2(13)T and support was added for the NM-HDV on the Cisco 2600 series, Cisco 3600 series, Cisco 3700 series, and Cisco VG200.
12.3(2)XE	Support was added for the PVDM-256K on the Cisco 1751, Cisco 1751-V, and Cisco 1760.
12.3(8)T	Support for the PVDM-256K on the Cisco 1751, Cisco 1751-V, and Cisco 1760 was integrated into Cisco IOS Release 12.3(8)T.

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at <http://www.cisco.com/go/fn>. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

**Note**

For more information about this and related Cisco IOS voice features, see the following:

- “[Overview of Cisco Unified Communications Manager and Cisco IOS Interoperability](#)” on page 13.
- Entire Cisco IOS Voice Configuration Library—including library preface and glossary, other feature documents, and troubleshooting documentation—at http://www.cisco.com/univercd/cc/td/doc/product/software/ios123/123cgr/voice_c/vcl.htm.

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Prerequisites for Conferencing and Transcoding for Voice Gateway Routers

DSP Resources

The router must be equipped with one or more of the following network modules or voice DSP modules to provide DSP resources for conferencing, transcoding, and hardware MTP services:

- NM-HD-1V
- NM-HD-2V
- NM-HD-2VE
- NM-HDV2
- NM-HDV2-1T1/E1
- NM-HDV2-2T1/E1
- NM-HDV¹

- NM-HDV-FARM¹
- PVDM-256K¹
- PVDM2 on Cisco 2800 series or Cisco 3800 series

1. Does not support hardware MTP services.

Cisco Unified Communications Manager and Cisco IOS Release

- Minimum software requirements for type of network or voice module:

Module	Cisco Unified Communications Manager version	Cisco IOS Release
NM-HDV2, NM-HD-1V/2V/2VE	Cisco Unified Communications Manager 3.3(4) (formerly known as Cisco CallManager 3.3(4)) or later for conferencing and transcoding, Cisco Unified Communications Manager 4.0(1) (formerly known as Cisco CallManager 4.0(1)) or later for MTP	Cisco IOS Release 12.3(8)T or later
PVDM2 (Cisco 2800 series)	Cisco Unified Communications Manager 3.3(5) (formerly known as Cisco CallManager 3.3(5)) or later for conferencing and transcoding, Cisco Unified Communications Manager 4.0(2a) (formerly known as Cisco CallManager 4.0(2a)) or later for MTP	Cisco IOS Release 12.3(8)T4 or later
PVDM2 (Cisco 3800 series)	Cisco Unified Communications Manager 3.3(5) (formerly known as Cisco CallManager 3.3(5)) or later for conferencing and transcoding, Cisco Unified Communications Manager 4.0(2a) (formerly known as Cisco CallManager 4.0(2a)) or later for MTP	Cisco IOS Release 12.3(11)T or later
NM-HDV	Cisco Unified Communications Manager 3.2(2c) (formerly known as Cisco CallManager 3.2(2c)) or later	Cisco IOS Release 12.2(13)T or later

- Conference bridge, transcoder, and MTP services must be configured in Cisco Unified Communications Manager. See the following chapters in the [Cisco Unified Communications Manager Administration Guide](#):

Release 4.0(1):

- “[Conference Bridge Configuration](#)”
- “[Media Termination Point Configuration](#)”
- “[Transcoder Configuration](#)”

Release 3.3(4):

- [“Conference Bridge Configuration”](#)
- [“Transcoder Configuration”](#)

Codecs

End-user devices must be equipped with one of the following codecs:

Codec	Packetization Periods for Transcoding (ms)
G.711 a-law, G.711 u-law	10, 20, or 30
G.729, G.729A, G.729B, G.729AB	10, 20, 30, 40, 50, or 60

Restrictions for Conferencing and Transcoding for Voice Gateway Routers

- DSP farm services communicate with Cisco Unified Communications Manager using Skinny Client Control Protocol (SCCP); other protocols are not supported.
- DSP farm services are not supported for Cisco Survivable Remote Site Telephony (SRST) or Cisco Unified Communications Manager Express.
- DSP farm services cannot be enabled for a slot on the Cisco 1700 series so the **dsp services dspfarm** command is not supported and cannot be configured for a voice card on the Cisco 1700 series.
- Conferencing is not supported on a Cisco 3640 using the NM-HD-1V, NM-HD-2V, or NM-HD-2VE.
- Simultaneous use of DSP farm services on the NM-HDV and NM-HDV2 is not supported.
- Hardware MTPs are not supported on the NM-HDV or NM-HDV-FARM.
- Hardware MTPs support only G.711 a-law and G.711 u-law. If you configure a profile as a hardware MTP, and you want to change the codec to other than G.711, you must first remove the hardware MTP by using the **no maximum sessions hardware** command.
- Software MTPs are supported on the NM-HDV only if the **dsp services dspfarm** command is not enabled on the voice card.
- Only one codec is supported for each MTP profile. To support multiple codecs, you must define a separate MTP profile for each codec.
- If an MTP call is received but MTP is not configured, transcoding is used if resources are available.
- Dynamic conference and transcoding resource allocation is not supported.
- Fax is not supported for transcoding.

Information About Conferencing and Transcoding for Voice Gateway Routers

To configure Cisco conferencing and transcoding, you should understand the following concepts:

- [DSP Farms, page 71](#)
- [DSP Farm Profiles, page 71](#)

- [Conferencing, page 72](#)
- [Transcoding, page 72](#)
- [MTP, page 73](#)
- [Conferencing and Transcoding Features on the NM-HDV2 and NM-HD-1V/2V/2VE, page 74](#)
- [Conferencing and Transcoding Features on the NM-HDV, page 74](#)
- [Conferencing and Transcoding Features on the Cisco 1751 and Cisco 1760, page 74](#)
- [Allocation of DSP Resources, page 76](#)

DSP Farms

A DSP farm is the collection of DSP resources available for conferencing, transcoding, and MTP services. DSP farms are configured on the voice gateway and managed by Cisco Unified Communications Manager through Skinny Client Control Protocol (SCCP).

The DSP farm can support a combination of transcoding sessions, MTP sessions, and conferences simultaneously. The DSP farm maintains the DSP resource details locally. Cisco Unified Communications Manager requests conferencing or transcoding services from the gateway, which either grants or denies these requests, depending on resource availability. The details of whether DSP resources are used, and which DSP resources are used, are transparent to Cisco Unified Communications Manager.

The DSP farm uses the DSP resources in network modules on Cisco routers to provide voice-conferencing, transcoding, and hardware MTP services.



Note

Hardware MTP services are not supported on the NM-HDV.



Tip

To determine how many DSP resources your router supports, see the [“Allocation of DSP Resources” section on page 76](#).

DSP Farm Profiles

DSP-farm profiles are created to allocate DSP-farm resources. Under the profile you select the service type (conference, transcode, MTP), associate an application, and specify service-specific parameters such as codecs and maximum number of sessions. A DSP-farm profile allows you to group DSP resources based on the service type. Applications associated with the profile, such as SCCP, can use the resources allocated under the profile. You can configure multiple profiles for the same service, each of which can register with one Cisco Unified Communications Manager group. The profile ID and service type uniquely identify a profile, allowing the profile to uniquely map to a Cisco Unified Communications Manager group that contains a single pool of Cisco Unified Communications Manager servers.

Conferencing

Voice conferencing involves adding several parties to a phone conversation. In a traditional circuit-switched voice network, all voice traffic passes through a central device such as a PBX. Conference services are provided within this central device. In contrast, IP phones normally send voice signals directly between phones, without the need to go through a central device. Conference services, however, require a network-based conference bridge.

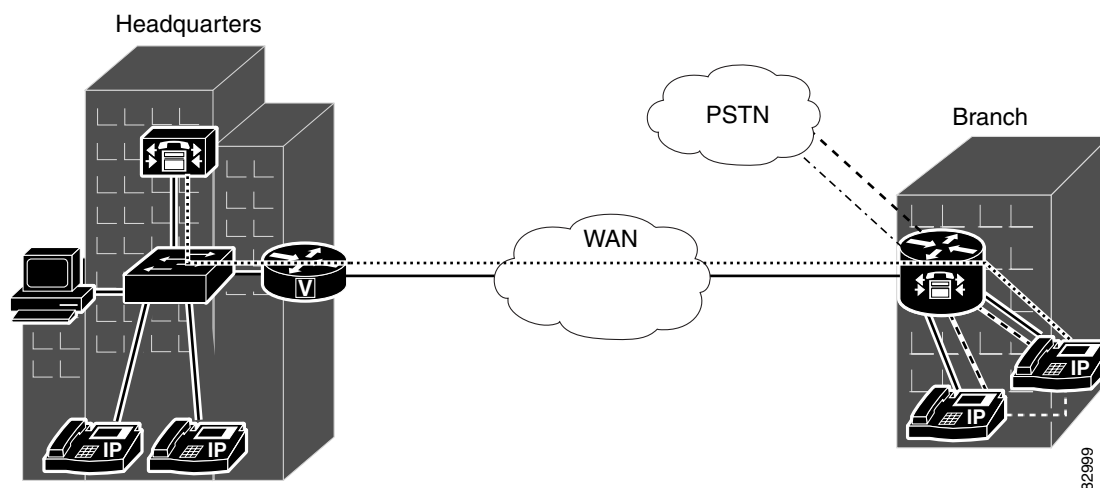
In an IP telephony network using Cisco Unified Communications Manager, the Conferencing and Transcoding for Voice Gateway Routers feature provides the conference-bridging service. Cisco Unified Communications Manager uses a DSP farm to mix voice streams from multiple participants into a single conference-call stream. The mixed stream is played out to all conference attendees, minus the voice of the receiving attendee.

The following conferencing features are supported:

- A conference can be either of the following types:
 - Ad hoc—The person controlling the conference presses the telephone conference button and adds callers one by one.
 - Meet me—Participants call in to a central number and are joined in a single conference.
- Participants whose end devices use different codec types are joined in a single conference; no additional transcoding resource is needed.

This feature provides voice conferencing at the remote site, without the need for access to the central site (see [Figure 5](#)).

Figure 5 Conferencing Service



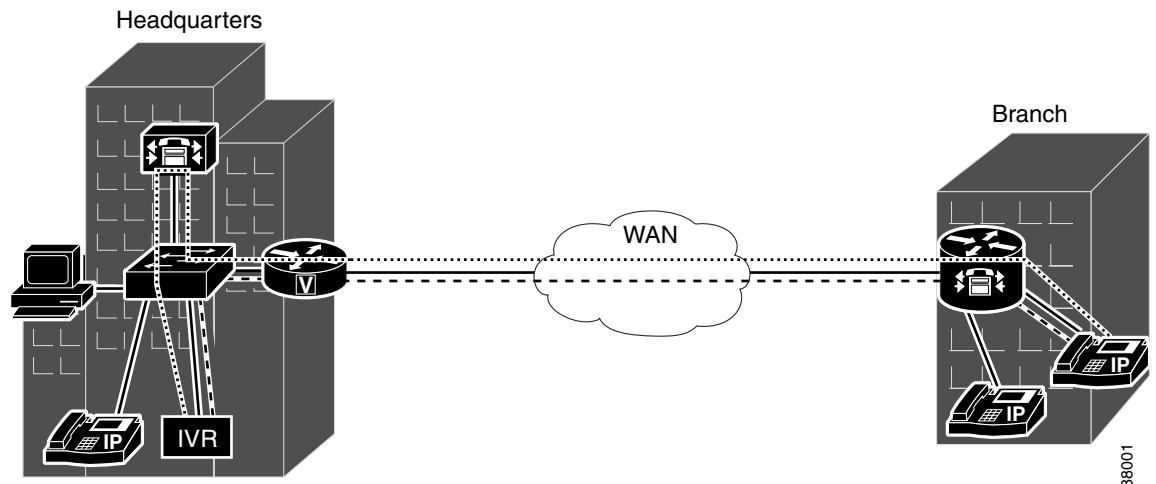
Transcoding

Transcoding compresses and decompresses voice streams to match endpoint-device capabilities. Transcoding is required when an incoming voice stream is digitized and compressed (by means of a codec) to save bandwidth, but the local device does not support that type of compression. Ideally, all IP telephony devices would support the same codecs, but this is not the case. Rather, different devices support different codecs.

Transcoding is processed by DSPs on the DSP farm; sessions are initiated and managed by Cisco Unified Communications Manager which also refers to transcoders as hardware MTPs.

This feature provides transcoding at the remote site, without the need for access to the central site (see [Figure 6](#)).

Figure 6 Transcoding Service



MTP

A Media Termination Point (MTP) bridges the media streams between two connections allowing Cisco Unified Communications Manager to relay calls that are routed through SIP or H.323 endpoints.

The following MTP resources are supported for Cisco Unified Communications Manager 4.0 (formerly known as Cisco CallManager 4.0) and later releases:

- **Software MTP**—Software-only implementation that does not use a DSP resource for endpoints using the same codec and the same packetization time.
- **Hardware MTP**—Hardware-only implementation that uses a DSP resource for endpoints using the same G.711 codec but a different packetization time. The repacketization requires a DSP resource so it cannot be done by software only. Cisco Unified Communications Manager also uses the term software MTP when referring to a hardware MTP.
- **Transcoder as MTP**—Implementation that uses a DSP resource for endpoints using the same G.711 codec (on both legs) or a mixture of different supported codecs. This functionality is used by Cisco Unified Communications Manager to view the transcoders as usable MTP resources (if they are available in the pool) and enables Cisco Unified Communications Manager to use MTP resources more effectively when a call is deemed to use a transcoder and an MTP resource at the same time.

For MTP and transcoding, the DSP farm supports only two IP streams connected to each other at a time. If more than two streams need connecting, the streams must be connected using conferencing.

Conferencing and Transcoding Features on the NM-HDV2 and NM-HD-1V/2V/2VE

Conferencing

- Cisco Unified Communications Manager meet-me and ad-hoc conferences with up to eight participants each
- Up to 50 eight-party conferences on a single NM-HDV2, up to 24 eight-party conferences on a single NM-HD-2VE, and up to 8 eight-party conferences on a single NM-HD-1V/2V
- Participants using G.711 and G.729 codecs joined in a single conference; no additional transcoding resources are needed to include the disparate codec types
- Easy deployment of conference resources in routers across the network, reducing WAN use and improving voice-network performance

Transcoding

- Transcoding between G.711 and G.729, G.729a, G.729b, G.729ab codecs
- Up to 128 transcoding sessions on a single NM-HDV2

MTP

- Software-only implementation that does not use a DSP resource for endpoints with the same codec and the same packetization time.
- Hardware-only implementation using a DSP resource for endpoints with the same G.711 codec but a different packetization time.

Conferencing and Transcoding Features on the NM-HDV

Conferencing

- Cisco Unified Communications Manager meet-me and ad-hoc conferences with up to six participants each
- Up to 15 six-party conferences on a single NM-HDV
- Participants using G.711 and G.729 codecs joined in a single conference; no additional transcoding resources are needed to include the disparate codec types
- Easy deployment of conference resources in routers across the network, reducing WAN use and improving voice-network performance

Transcoding

- Transcoding between G.711 and G.729, G.729a, G.729b, and G.729ab codecs
- Up to 60 transcoding sessions on a single NM-HDV

Conferencing and Transcoding Features on the Cisco 1751 and Cisco 1760

Conferencing

- Cisco Unified Communications Manager meet-me and ad-hoc conferences with up to six participants each

- Up to 5 six-party conferences
- One conference on a single DSP
- Participants using G.711 and G.729 codecs joined in a single conference; no additional transcoding resources are needed to include the disparate codec types
- Easy deployment of conference resources in routers across the network, reducing WAN use and improving voice-network performance

Transcoding

- Transcoding between G.711 and G.729, G.729a, G.729b, and G.729ab codecs
- Up to 16 transcoding sessions on the Cisco 1751
- Up to 20 transcoding sessions on the Cisco 1760
- Two transcoding sessions on a single DSP

Allocation of DSP Resources

You must allocate DSP resources on two levels:

- Within the voice network module, between the DSP farm and your voice trunk group that handles standard voice termination
- Within the DSP farm, between transcoding and voice-conferencing services

Allocation of DSP Resources Within the Voice Network Module

You allocate DSP resources either to voice termination of the voice trunk group or to the DSP farm. Occasionally these allocations can conflict.

If you previously allocated DSP resources to voice termination and you now try to configure a DSP farm, you might find that insufficient DSP resources are available. Conversely, if you previously allocated DSP resources to a DSP farm and you now try to configure a trunk group, you might find that insufficient DSP resources are available.

If your requested configuration is rejected, you have two options:

- Insert more DSPs on the voice network module (NM-HDV or NM-HDV2)
- Allocate a different voice network module for either the DSP farm or the trunk group

Allocation of DSP Resources Within the DSP Farm

You should know the following about your system:

- Number of DSPs required to handle your anticipated number of conference calls and transcoding sessions
- Number of DSPs that your system can support

DSP resources can reside in packet-voice DSP modules (PVDMs) installed in voice network modules, for example the NM-HDV2, or directly in the network module, for example the NM-HD-2V. Cisco 2800 series and 3800 series voice gateway routers have onboard DSP resources located on PVDM2s installed directly on the motherboard. Your router supports one or more voice network modules.

[Table 3](#) lists the total DSPs that are supported on a fully-loaded voice network module.

Table 3 Total DSPs Supported Per Voice Network Module

Network Module	Maximum DSPs per PVDM2/PVDM	Maximum PVDM2s/PVDMs per Network Module	Maximum DSPs
NM-HDV2	4	4	16
NM-HD-1V/2V	—	—	1

Table 3 Total DSPs Supported Per Voice Network Module (continued)

Network Module	Maximum DSPs per PVDM2/PVDM	Maximum PVDM2s/PVDMs per Network Module	Maximum DSPs
NM-HD-2VE	—	—	3
NM-HDV	3	5	15

Table 4 lists the total number of network modules that are supported per router.

Table 4 Maximum Voice Network Modules Supported Per Router

Router	NM-HDV2	NM-HD-1V, NM-HD-2V, NM-HD-2VE	NM-HDV
Cisco 2600 series	—	—	1
Cisco 2600 XM	1	1	1
Cisco 2691	1	1	1
Cisco 2801	—	—	—
Cisco 3620	—	—	1 ¹
Cisco 3640	—	—	3 ¹
Cisco 3660	—	6	6
Cisco 3725	2	2	2
Cisco 3745	4 ²	4 ²	4
Cisco VG200	—	—	1

1. Although the chassis has a slot for an additional module, it cannot operate with more than the specified number.
2. Provided processor resources are available.

Conferencing and Transcoding Session Capacities

Each DSP is individually configurable to support either conferencing or transcoding and standard voice termination. The total number of conferencing, transcoding, and voice termination sessions is limited by the capacity of the entire system, which includes the DSPs, hardware platform, physical voice interface, and Cisco Unified Communications Manager.

Table 5 and Table 6 list the maximum number of conference calls and transcoding sessions that DSPs can handle, in theory. Actual capacity may be less based on the total system design.

Table 5 DSP Theoretical Session Capacities

Application	NM-HD-1V/2V (1 DSP)	NM-HD-2VE (3 DSPs)	NM-HDV2 (16 DSPs)	2801/2811 (2 PVDM2-64)	2821/2851 (3 PVDM2-64)	3825, 3845 (4 PVDM2-64)
Conferencing						
G.711	8 sessions (64 conferees)	24 sessions (192 conferees)	50 sessions (400 conferees)	50 sessions (400 conferees)	50 sessions (400 conferees)	50 sessions (400 conferees)
G.729	2 sessions (16 conferees)	6 sessions (48 conferees)	32 sessions (256 conferees)	16 sessions (128 conferees)	24 sessions (192 conferees)	32 sessions (256 conferees)

Table 5 *DSP Theoretical Session Capacities (continued)*

Application	NM-HD-1V/2V (1 DSP)	NM-HD-2VE (3 DSPs)	NM-HDV2 (16 DSPs)	2801/2811 (2 PVDM2-64)	2821/2851 (3 PVDM2-64)	3825, 3845 (4 PVDM2-64)
Transcoding						
G.711 a-law/u-law <-> G.729a/G.729ab/	8 sessions	24 sessions	128 sessions	64 sessions	96 sessions	128 sessions
G.711 a-law/u-law <-> G.729/G.729b/	6 sessions	18 sessions	96 sessions	48 sessions	72 sessions	96 sessions
Voice Termination						
G.711 a-law/u-law	16 sessions	48 sessions	256 sessions	128 sessions	192 sessions	256 sessions
G.726, G.729a, G.729ab	8 sessions	24 sessions	128 sessions	64 sessions	96 sessions	128 sessions
G.729, G.729b, G.723.1, G.728	6 sessions	18 sessions	96 sessions	48 sessions	72 sessions	96 sessions

Table 6 *Theoretical System Capacities for One DSP*

Application	G.711 a-law/u-law	G729 a/ab	G.729, G.729b
Conferencing	8 sessions (8 x 8 = 64 conferees)	2 sessions (8 x 2 = 16 conferees)	2 sessions (8 x 2 = 16 conferees)
Conferencing on PVDM2-8	4 sessions (4 x 8 = 32 conferees)	1 session (1 x 8 = 8 conferees)	1 session (1 x 8 = 8 conferees)
Hardware MTP	16 sessions	—	—
Transcoding	8 sessions	8 sessions	6 sessions

NM-HDV System Capacities

Table 7 lists the number of transcoding sessions and conference calls supported on the NM-HDV.

Table 7 *NM-HDV Theoretical System Capacities*

Device	Capacity
A single DSP	4 transcoding sessions
	1 conference call with up to 6 participants
A single PVDM (3 DSPs)	12 transcoding sessions
	3 conference calls, each with up to 6 participants, for a total of up to 18 participants
A fully loaded NM-HDV (5 PVDMs holding 15 DSPs)	60 transcoding sessions
	15 concurrent conference calls, each with up to 6 participants, for a total of up to 90 participants

Use the following tables to determine the number of PVDMs required to support your DSP needs and whether your router is capable of holding enough NM-HDVs to accommodate these PVDMs:

- See [Table 8](#) if you use either of the following:
 - 20-, 30-, 40-, 50-, or 60-ms packetization
 - 10-ms packetization with voice-activity detection (VAD) enabled
- See [Table 9](#) if you use 10-ms packetization with VAD disabled

Table 8 *PVDM Requirements Using 20-, 30-, 40-, 50-, or 60-ms Packetization or 10-ms Packetization with VAD Enabled ¹*

Transcoding Sessions	Conference Calls															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	—	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5
1–4	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	—
5–8	1	1	2	2	2	3	3	3	4	4	4	5	5	5	—	—
9–12	1	2	2	2	3	3	3	4	4	4	5	5	5	—	—	—
13–16	2	2	2	3	3	3	4	4	4	5	5	5	—	—	—	—
17–20	2	2	3	3	3	4	4	4	5	5	5	—	—	—	—	—
21–24	2	3	3	3	4	4	4	5	5	5	—	—	—	—	—	—
25–28	3	3	3	4	4	4	5	5	5	—	—	—	—	—	—	—
29–32	3	3	4	4	4	5	5	5	—	—	—	—	—	—	—	—
33–36	3	4	4	4	5	5	5	—	—	—	—	—	—	—	—	—
37–40	4	4	4	5	5	5	—	—	—	—	—	—	—	—	—	—
41–44	4	4	5	5	5	—	—	—	—	—	—	—	—	—	—	—
45–48	4	5	5	5	—	—	—	—	—	—	—	—	—	—	—	—
49–52	5	5	5	—	—	—	—	—	—	—	—	—	—	—	—	—
53–56	5	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—
57–60	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

1. Numbers given represent the number of PVDMs required within a single NM-HDV or NM-HDV-FARM to support the desired configuration. Where numbers are not given, the configuration is not possible using a single NM-HDV.

Table 9 *PVDM Requirements Using 10-ms Packetization and with VAD Disabled ¹*

Transcoding Sessions	Conference Calls										
	0	1	2	3	4	5	6	7	8	9	10
0	—	1	1	1	2	2	2	3	3	3	4
1–4	1	1	1	2	2	2	3	3	3	—	—
5–8	1	1	2	2	2	3	3	3	—	—	—
9–12	1	2	2	2	3	3	3	—	—	—	—
13–16	2	2	2	3	3	—	—	—	—	—	—
17–20	2	2	3	3	—	—	—	—	—	—	—
21–24	2	3	3	—	—	—	—	—	—	—	—

Table 9 PVDM Requirements Using 10-ms Packetization and with VAD Disabled (continued)¹

Transcoding Sessions	Conference Calls										
	0	1	2	3	4	5	6	7	8	9	10
25–28	3	—	—	—	—	—	—	—	—	—	—
29–30	3	—	—	—	—	—	—	—	—	—	—

1. Numbers given represent the number of PVDMs required within a single NM-HDV to support the desired configuration. Where numbers are not given, the configuration is not possible using a single NM-HDV.

DSP Sharing

Voice interfaces, by default, use DSPs local to the interface. For interface cards resident in a network module, local DSPs are the DSPs located in PVDMs on the network module. For interface cards resident in HWIC slots on the router chassis, local DSPs are the DSPs located in PVDMs on the router motherboard. Sometimes, it is necessary for voice interfaces to use DSPs that are not local because all the local DSPs are busy with other tasks when a call arrives. When a DSP is used that is not local, it is known as DSP sharing. This means that an interface card in an HWIC slot uses a DSP on a network module, or an interface card in a network module uses a DSP on another network module or on the router motherboard.



Note

Conferencing and transcoding do not make use of DSP sharing. These operations use DSPs located anywhere in the voice gateway chassis that are allocated to the DSP farm.

DSP sharing is an optional configuration available on Cisco 2800 and 3800 series voice gateway routers. It can be enabled for T1/E1 voice ports only. Analog and BRI voice ports cannot use DSP sharing, but must use local DSPs only. DSP sharing can be configured for the following DSPs:

- DSPs on any NM-HDV2 network module in the voice gateway router
- DSPs on the motherboards of Cisco 2800 and 3800 series voice gateway routers.

When DSP sharing is enabled, local DSPs are allocated first for calls arriving on T1/E1 interface cards. If all local DSPs are in use, available DSPs configured for sharing and located elsewhere in the voice gateway router chassis will be allocated. When DSP sharing is disabled, which is the default condition, calls on any voice interface card can only access a local DSP.

How to Configure Conferencing and Transcoding for Voice Gateway Routers

This section contains the procedures for configuring conferencing and transcoding support on Cisco IOS voice gateways. The procedures that you perform depend on the type of voice network module you are using to allocate DSP resources:

- [Determining DSP Resource Requirements, page 81](#) (required)
- [Enabling SCCP on the Cisco Unified Communications Manager Interface, page 82](#) (required)
- [Configuring Enhanced Conferencing and Transcoding, page 83](#) (required)
- [Configuring Conferencing and Transcoding \(NM-HDV\), page 94](#) (required)
- [Configuring Conferencing and Transcoding \(PVDM-256K\), page 97](#) (required)

- [Configuring Out-of-Band to In-Band DTMF Relay, page 99](#) (optional)
- [Configuring DSP Sharing, page 101](#) (optional)

Determining DSP Resource Requirements

DSPs reside either directly on a voice network module, such as the NM-HD-2VE, on PVDM2s that are installed in a voice network module, such as the NM-HDV2, or on PVDM2s that are installed directly onto the motherboard, such as on the Cisco 2800 and 3800 series voice gateway routers. You must determine the number of PVDM2s or network modules that are required to support your conferencing and transcoding services and install the modules on your router.

SUMMARY STEPS

1. Determine performance requirements.
2. Determine the number of DSPs that are required.
3. Determine the number of network modules that are supportable.
4. Verify your solution.
5. Install hardware.

DETAILED STEPS

	Command or Action	Purpose
Step 1	Determine the number of transcoding sessions and conference calls that your router must support.	Establishes your performance requirements.
Step 2	Determine the number of DSPs that are required to support the transcoding sessions and conference calls (see Table 5 on page 77 and Table 6 on page 78). If voice termination is also required, determine the additional DSPs required. Example: 8 G.711 conferences and 32 transcoding sessions require 1 PVDM2-64 (4 DSPs) on the NM-HDV2.	Establishes your hardware requirements.
Step 3	Determine the maximum number of network modules that your router can support (see Table 4 on page 77). Example: A Cisco 3745 router can support up to 4 NM-HDV2s (provided processor resources are available).	Establishes your router capabilities.

	Command or Action	Purpose
Step 4	Ensure that your requirements fall within router capabilities, taking into account whether your router supports multiple network modules. If necessary, reassess performance requirements.	Verifies your proposed solution.
Step 5	Install PVDM2s and network modules, as needed (see the “ Connecting Voice Network Modules ” chapter in the <i>Cisco Network Modules Hardware Installation Guide</i> , and the <i>Cisco Network Modules and Interface Cards Regulatory Compliance and Safety Information</i>).	Prepares your system for DSP-farm configuration.

Enabling SCCP on the Cisco Unified Communications Manager Interface

Perform this task to enable SCCP on the local interface that the voice gateway uses to communicate with Cisco Unified Communications Manager.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **sccp ccm** {*ip-address* | *dns*} **identifier** *identifier-number* [**port** *port-number*] [**version** *version-number*]
or
sccp ccm {*ip-address* | *dns*} **priority** *priority* [**port** *port-number*] [**version** *version-number*]
4. **sccp local** *interface-type interface-number*
5. **sccp ip precedence** *value*
6. **sccp**
7. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.

	Command or Action	Purpose
Step 3	<p>NM-HDV2, NM-HD-1V, NM-HD-2V, NM-HD-2VE, or PVDM2</p> <pre> sccp ccm {<i>ip-address</i> <i>dns</i>} identifier <i>identifier-number</i> [port <i>port-number</i>] [version <i>version-number</i>] NM-HDV, Cisco 1751, or Cisco 1760 sccp ccm {<i>ip-address</i> <i>dns</i>} priority <i>priority</i> [port <i>port-number</i>] [version <i>version-number</i>] Example: Router(config)# sccp ccm 10.0.0.0 identifier 1 version 4.0 Example: Router(config)# sccp ccm 10.0.0.0 priority 1 version</pre>	<p>Adds a Cisco Unified Communications Manager server to the list of available servers to which the Cisco voice gateway can register.</p> <ul style="list-style-type: none"> Repeat this step for each Cisco Unified Communications Manager server that the gateway registers with.
Step 4	<pre> sccp local <i>interface-type</i> <i>interface-number</i> Example: Router(config)# sccp local Ethernet 1</pre>	<p>Selects the local interface that SCCP applications use to register with Cisco Unified Communications Manager.</p>
Step 5	<pre> sccp ip precedence <i>value</i> Example: Router(config)# sccp ip precedence 3</pre>	<p>(Optional) Sets the IP precedence value for SCCP.</p> <ul style="list-style-type: none"> This command enables you to increase the priority of voice packets over connections controlled by SCCP. <i>value</i>—Range is 1(highest) to 7 (lowest). Default is 5.
Step 6	<pre> sccp Example: Router(config)# sccp</pre>	<p>Enables SCCP and brings it up administratively.</p>
Step 7	<pre> exit Example: Router(config)# exit</pre>	<p>Exits global configuration mode.</p>

Configuring Enhanced Conferencing and Transcoding

Perform the following procedures to configure enhanced conferencing and transcoding on the NM-HDV2, NM-HD-1V, NM-HD-2V, NM-HD-2VE, or PVDM2:

- [Configuring a DSP Farm Profile, page 84](#) (required)
- [Associating a DSP Farm Profile to a Cisco Unified Communications Manager Group, page 86](#) (required)
- [Modifying Default Settings for SCCP Connection to Cisco Unified Communications Manager, page 88](#) (optional)
- [Verifying DSP Farm Configuration, page 90](#) (optional)
- [Troubleshooting DSP-Farm Services, page 94](#) (optional)

Configuring a DSP Farm Profile

Perform this procedure to define a DSP farm on the NM-HDV2, NM-HD-1V, NM-HD-2V, NM-HD-2VE, or PVDM2. You must configure each conferencing, transcoding, and MTP profile separately.



Note

Because a software-only MTP does not require DSP resources, you can configure a software-only MTP without a voice network module, or on the NM-HDV if you do not enable the **dsp services dspfarm** command for the voice card.

Prerequisites

Requires Cisco IOS Release 12.3(8)T or a later release.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **voice-card** *slot*
4. **dsp services dspfarm**
5. **exit**
6. **dspfarm profile** *profile-identifier* {**conference** | **mtp** | **transcode**}
7. **description** *text*
8. **codec** *codec-type*
9. **maximum sessions** *number*
or
maximum sessions {**hardware** | **software**} *number*
10. **associate application** **sccp**
11. **no shutdown**
12. **exit**
13. **gateway**
14. **timer receive-rtp** *seconds*
15. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<p>enable</p> <p>Example: Router> enable</p>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	<p>configure terminal</p> <p>Example: Router# configure terminal</p>	<p>Enters global configuration mode.</p>
Step 3	<p>voice-card slot</p> <p>Example: Router(config)# voice-card 1</p>	<p>Enters voice-card configuration mode for the network module on which you want to enable DSP-farm services.</p>
Step 4	<p>dsp services dspfarm</p> <p>Example: Router(config-voicecard)# dsp services dspfarm</p>	<p>Enables DSP-farm services for the voice card.</p>
Step 5	<p>exit</p> <p>Example: Router(config-voicecard)# exit</p>	<p>Exits voice-card configuration mode.</p>
Step 6	<p>dspfarm profile profile-identifier {conference mtp transcode}</p> <p>Example: Router(config)# dspfarm profile 20 conference</p>	<p>Enters DSP farm profile configuration mode to define a profile for DSP farm services.</p> <p>Note The <i>profile-identifier</i> and service type uniquely identifies a profile. If the service type and <i>profile-identifier</i> pair is not unique, you are prompted to choose a different <i>profile-identifier</i>.</p>
Step 7	<p>description text</p> <p>Example: Router(config-dspfarm-profile)# description art_dept</p>	<p>(Optional) Includes a specific description about the Cisco DSP farm profile.</p>
Step 8	<p>codec codec-type</p> <p>Example: Router(config-dspfarm-profile)# codec g729ar8</p>	<p>Specifies the codecs supported by a DSP farm profile.</p> <ul style="list-style-type: none"> Repeat this step for each codec supported by the profile. <p>Note Hardware MTPs support only G.711 a-law and G.711 u-law. If you configure a profile as a hardware MTP, and you want to change the codec to other than G.711, you must first remove the hardware MTP by using the no maximum sessions hardware command.</p> <p>Note Only one codec is supported for each MTP profile. To support multiple codecs, you must define a separate MTP profile for each codec.</p>

	Command or Action	Purpose
Step 9	<p><code>maximum sessions number</code> or <code>maximum sessions {hardware software} number</code></p> <p>Example: Router(config-dspfarm-profile)# maximum sessions 4</p>	<p>Specifies the maximum number of sessions that are supported by the profile.</p> <ul style="list-style-type: none"> <i>number</i>—Range is determined by the available registered DSP resources. Default is 0. <p>Note The hardware and software keywords apply only to MTP profiles.</p>
Step 10	<p><code>associate application sccp</code></p> <p>Example: Router(config-dspfarm-profile)# associate application sccp</p>	<p>Associates the SCCP protocol to the DSP farm profile.</p>
Step 11	<p><code>no shutdown</code></p> <p>Example: Router(config-dspfarm-profile)# no shutdown</p>	<p>Enables the profile, allocates DSP farm resources, and associates the application.</p>
Step 12	<p><code>exit</code></p> <p>Example: Router(config-dspfarm-profile)# exit</p>	<p>Exits DSP farm profile configuration mode.</p>
Step 13	<p><code>gateway</code></p> <p>Example: Router(config)# gateway</p>	<p>Enters gateway configuration mode.</p>
Step 14	<p><code>timer receive-rtp seconds</code></p> <p>Example: Router(config-gateway)# timer receive-rtp 600</p>	<p>Sets the Real-Time Transport Protocol (RTP) timeout interval to clear hanging connections.</p> <ul style="list-style-type: none"> <i>seconds</i>—Range is 180 to 1800. Default is 1200.
Step 15	<p><code>exit</code></p> <p>Example: Router(config-gateway)# exit</p>	<p>Exits to global configuration mode.</p>

Associating a DSP Farm Profile to a Cisco Unified Communications Manager Group

Perform this procedure to define a Cisco Unified Communications Manager group and to associate a DSP farm profile with the Cisco Unified Communications Manager group.

Prerequisites

This procedure requires Cisco IOS Release 12.3(8)T or later release.

SUMMARY STEPS

1. **enable**
2. **configure terminal**

3. **sccp ccm group** *group-number*
4. **associate ccm** *identifier-number* **priority** *priority-number*
5. **associate profile** *profile-identifier* **register** *device-name*
6. **bind interface** *interface-type* *interface-number*
7. **description** *string*
8. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<p>enable</p> <p>Example: Router> enable</p>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	<p>configure terminal</p> <p>Example: Router# configure terminal</p>	<p>Enters global configuration mode.</p>
Step 3	<p>sccp ccm group <i>group-number</i></p> <p>Example: Router(config)# sccp ccm group 118</p>	<p>Creates a Cisco Unified Communications Manager group and enters SCCP Cisco Unified Communications Manager configuration mode.</p>
Step 4	<p>associate ccm <i>identifier-number</i> priority <i>priority-number</i></p> <p>Example: Router(config-sccp-ccm)# associate ccm 125 priority 2</p>	<p>Adds a Cisco Unified Communications Manager server to the Cisco Unified Communications Manager group and establishes its priority within the group.</p> <ul style="list-style-type: none"> • Repeat this step for each Cisco Unified Communications Manager server that you want to add to the group.
Step 5	<p>associate profile <i>profile-identifier</i> register <i>device-name</i></p> <p>Example: Router(config-sccp-ccm)# associate profile register abgz12345</p>	<p>Associates a DSP farm profile to the Cisco Unified Communications Manager group.</p> <ul style="list-style-type: none"> • <i>device-name</i>—Must match the device name configured in Cisco Unified Communications Manager; otherwise profile is not registered to Cisco Unified Communications Manager. • Repeat this step for each DSP farm profile that you want to register with this Cisco Unified Communications Manager group.
Step 6	<p>bind interface <i>interface-type</i> <i>interface-number</i></p> <p>Example: Router(config-sccp-ccm)# bind interface fastethernet 2:1</p>	<p>Binds an interface to the Cisco Unified Communications Manager group.</p>

	Command or Action	Purpose
Step 7	description <i>text</i> Example: Router(config-sccp-ccm)# description boston office	(Optional) Includes a specific description of the Cisco Unified Communications Manager group.
Step 8	end Example: Router(config)# end	Exits to privileged EXEC mode.

Modifying Default Settings for SCCP Connection to Cisco Unified Communications Manager

Perform this task to tune the performance of the SCCP connection between the DSP farm and Cisco Unified Communications Manager.



Note

The optimum settings for these commands depend on your platform and individual network characteristics. Modify the defaults to meet your performance requirements.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **sccp ccm group** *group-number*
4. **connect interval** *seconds*
5. **connect retries** *number*
6. **keepalive retries** *number*
7. **keepalive timeout** *seconds*
8. **registration retries** *retry-attempts*
9. **registration timeout** *seconds*
10. **switchover method** {**graceful** | **immediate**}
11. **switchback method** {**graceful** | **guard** [*timeout-value*] | **immediate** | **uptime** *uptime-value*}
12. **switchback interval** *seconds*
13. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	sccp ccm group <i>group-number</i> Example: Router(config)# sccp ccm group 118	Enters SCCP Cisco Unified Communications Manager configuration mode. <ul style="list-style-type: none"> <i>group-number</i>—Range is 1 to 65535.
Step 4	connect interval <i>seconds</i> Example: Router(config-sccp-ccm)# connect interval 1200	(Optional) Specifies the amount of time that a DSP farm profile waits before attempting to connect to another Cisco Unified Communications Manager when the current Cisco Unified Communications Manager fails to connect. <ul style="list-style-type: none"> <i>seconds</i>—Range is 1 to 3600. Default is 60.
Step 5	connect retries <i>number</i> Example: Router(config-sccp-ccm)# connect retries 5	(Optional) Specifies the number of times that a DSP farm attempts to connect to a Cisco Unified Communications Manager when the current Cisco Unified Communications Manager connections fails. <ul style="list-style-type: none"> <i>number</i>—Range is 1 to 32. Default is 3.
Step 6	keepalive retries <i>number</i> Example: Router(config-sccp-ccm)# keepalive retries 7	(Optional) Sets the number of keepalive retries from SCCP to the Cisco Unified Communications Manager. <ul style="list-style-type: none"> <i>number</i>—Range is 1 to 32. Default is 3.
Step 7	keepalive timeout <i>seconds</i> Example: Router(config-sccp-ccm)# keepalive timeout 50	(Optional) Sets the number of seconds between keepalive messages from SCCP to the Cisco Unified Communications Manager. <ul style="list-style-type: none"> <i>seconds</i>—Range is 1 to 180. Default is 30.
Step 8	registration retries <i>retry-attempts</i> Example: Router(config-sccp-ccm)# registration retries 15	(Optional) Sets the number of registration retries that SCCP tries to register with the Cisco Unified Communications Manager. <ul style="list-style-type: none"> <i>retry-attempts</i>—Range is 1 to 32. Default is 3.
Step 9	registration timeout <i>seconds</i> Example: Router(config-sccp-ccm)# registration timeout 8	(Optional) Sets the number of seconds between registration messages sent from SCCP to the Cisco Unified Communications Manager. <ul style="list-style-type: none"> <i>seconds</i>—Range is 1 to 180. Default is 3.

	Command or Action	Purpose
Step 10	<p>switchover method {graceful immediate}</p> <p>Example: Router(config-sccp-ccm)# switchover method graceful</p>	<p>(Optional) Sets the switchover method that the SCCP client uses when the communication link to the active Cisco Unified Communications Manager fails.</p> <ul style="list-style-type: none"> • Default is graceful.
Step 11	<p>switchback method {graceful guard [<i>timeout-value</i>] immediate uptime [<i>uptime-value</i>]}</p> <p>Example: Router(config-sccp-ccm)# switchback method graceful</p>	<p>(Optional) Sets the switchback method to use when the primary or higher priority Cisco Unified Communications Manager becomes available again.</p> <ul style="list-style-type: none"> • Default is guard, with a timeout value of 7200 seconds.
Step 12	<p>switchback interval <i>seconds</i></p> <p>Example: Router(conf-sccp-ccm)# switchback interval 120</p>	<p>(Optional) Sets the number of seconds that the DSP farm waits before polling the primary Cisco Unified Communications Manager when the current Cisco Unified Communications Manager fails to connect.</p> <ul style="list-style-type: none"> • <i>seconds</i>—Range is 1 to 3600. Default is 60.
Step 13	<p>end</p> <p>Example: Router(config-sccp-ccm)# end</p>	<p>Exits to privileged EXEC mode.</p>

Verifying DSP Farm Configuration

To verify conferencing, transcoding, and MTP services, perform the following steps.

SUMMARY STEPS

1. **show running-config**
2. **show sccp ccm group** [*group-number*]
3. **show dspfarm profile** [*profile-number*]
4. **show dspfarm all**
5. **show sccp**
6. **show sccp connections**
7. **show media resource status**

DETAILED STEPS

- Step 1** Use the **show running-config** command to display the configuration of the MTP profile, for example:

```
Router# show running-config
...
sccp local FastEthernet0/0
sccp ccm 10.40.10.10 identifier 10 version 4.0
sccp
!
sccp ccm group 999
  associate ccm 10 priority 1
```

```

associate profile 12 register MTP123456789
associate profile 2 register XCODE123456
!
dspfarm profile 12 mtp
  codec g711ulaw
  maximum sessions hardware 4
  maximum sessions software 40
  associate application SCCP
!

```

Step 2 `show sccp ccm group [group-number]`

Use this command to verify the configuration of the Cisco Unified Communications Manager group, for example:

```
Router# show sccp ccm group 999
```

```

CCM Group Identifier: 999
Description: None
Associated CCM Id: 10, Priority in this CCM Group: 1
Associated Profile: 2, Registration Name: XCODE1234567
Associated Profile: 12, Registration Name: MTP123456789
Registration Retries: 3, Registration Timeout: 10 sec
Keepalive Retries: 3, Keepalive Timeout: 30 sec
CCM Connect Retries: 3, CCM Connect Interval: 10 sec
Switchover Method: GRACEFUL, Switchback Method: GRACEFUL_GUARD
Switchback Interval: 10 sec, Switchback Timeout: 7200 sec
Signaling DSCP value: default, Audio DSCP value: default

```

Step 3 `show dspfarm profile [profile-number]`

Use this command to verify the configured DSP farm profiles, for example:

```
Router# show dspfarm profile 12
```

```
Dspfarm Profile Configuration
```

```

Profile ID = 12, Service = MTP, Resource ID = 2
Profile Admin State : UP
Profile Operation State : ACTIVE
Application : SCCP Status : ASSOCIATED
Resource Provider : FLEX_DSPRM Status : UP
Number of Resource Configured : 14
Number of Resource Available : 14
Hardware Configured Resources 4
Hardware Available Resources 4
Software Resources 10
Codec Configuration
Codec : g711ulaw, sa

```

```
Router# show dspfarm profile 6
```

```
Dspfarm Profile Configuration
```

```

Profile ID = 6, Service = TRANSCODING, Resource ID = 1
Profile Admin State : UP
Profile Operation State : ACTIVE
Application : SCCP Status : ASSOCIATED
Resource Provider : FLEX_DSPRM Status : UP
Number of Resource Configured : 4
Number of Resource Available : 4
Codec Configuration
Codec : g711ulaw, Maximum Packetization Period : 30
Codec : g711alaw, Maximum Packetization Period : 30
Codec : g729ar8, Maximum Packetization Period : 60
Codec : g729abr8, Maximum Packetization Period : 60

```

Codec : g729br8, Maximum Packetization Period : 60



Note This command is not supported on the NM-HDV or Cisco 1700 series.

Step 4 show dspfarm all

Use this command to verify the status of the DSP farm, for example:

```
Router# show dspfarm all

DSPFARM Configuration Information:
Admin State: UP, Oper Status: ACTIVE - Cause code: NONE
Transcoding Sessions: 0(Avail: 0), Conferencing Sessions: 2 (Avail: 2)
Trans sessions for mixed-mode conf: 0 (Avail: 0), RTP Timeout: 600
Connection check interval 600 Codec G729 VAD: ENABLED

Total number of active session(s) 0, and connection(s) 0

SLOT  DSP   CHNL  STATUS  USE   TYPE  SESS-ID  CONN-ID  PKTS-RXED  PKTS-TXED
-----
0      0      1     UP     FREE  conf  -        -        -          -
0      0      2     UP     FREE  conf  -        -        -          -
0      0      3     UP     FREE  conf  -        -        -          -
0      0      4     UP     FREE  conf  -        -        -          -
0      0      5     UP     FREE  conf  -        -        -          -
0      0      6     UP     FREE  conf  -        -        -          -
```

Step 5 show sccp

Use the **show sccp** command to verify that the DSP farm is registered, for example:

```
Router# show sccp

SCCP Admin State: UP
Gateway IP Address: 10.10.100.29, Port Number: 0
IP Precedence: 5
User Masked Codec list:
Call Manager: 10.10.100.51, Port Number: 2000
                Priority: N/A, Version: 4.0, Identifier: 2
Call Manager: 10.10.100.50, Port Number: 2000
                Priority: N/A, Version: 4.0, Identifier: 1

Transcoding Oper State: ACTIVE - Cause Code: NONE
Active Call Manager: 10.10.100.51, Port Number: 2000
TCP Link Status: CONNECTED, Profile Identifier: 10
Reported Max Streams: 6, Reported Max OOS Streams: 0
Supported Codec: g711ulaw, Maximum Packetization Period: 30
Supported Codec: g711alaw, Maximum Packetization Period: 30
Supported Codec: g729ar8, Maximum Packetization Period: 60
Supported Codec: g729abr8, Maximum Packetization Period: 60
Supported Codec: g729br8, Maximum Packetization Period: 60
Supported Codec: rfc2833 dtmf, Maximum Packetization Period: 20

Software MTP Oper State: ACTIVE - Cause Code: NONE
Active Call Manager: 10.10.100.51, Port Number: 2000
TCP Link Status: CONNECTED, Profile Identifier: 20
Reported Max Streams: 176, Reported Max OOS Streams: 0
Supported Codec: g711ulaw, Maximum Packetization Period: 30
Supported Codec: rfc2833 dtmf, Maximum Packetization Period: 20
```

Step 6 show sccp connections

Use this command to verify the active SCCP connections, for example:

```
Router# show sccp connections

sess_id   conn_id   stype mode   codec   ripaddr   rport sport
-----
16777268  2164263392 mtp   recvonly g711u   0.0.0.0   0     17540

Total number of active session(s) 1, and connection(s) 1
```

Step 7 show media resource status

Use this command to verify the current media resource status, for example:

```
Router# show media resource status

Resource Providers:

Resource Provider ID :: FLEX_DSPRM Status :: REGISTERED
Service Profiles
MTP ::
TRANSCODING :: 6 11
CONFERENCING :: 10
Applications :
Application ID : SCCP, Status : REGISTERED
```

Troubleshooting Tips for Conferencing and Transcoding on Voice Gateway Routers

This section describes techniques for troubleshooting DSP-farm services.

Basic Troubleshooting Procedures

1. Verify the Cisco Unified Communications Manager 4.0 (formerly known as Cisco CallManager 4.0) or later.
2. Verify that Cisco Unified Communications Manager is properly configured to provision conferencing, transcoding, and MTP resources.
3. Organize your Cisco Unified Communications Manager group IDs, device IDs, and DSP farm profile names. Use the **show dsp** command to verify that the association between SCCP Cisco Unified Communications Manager and the DSP farm profiles match your organizational plan.
4. Verify that the VoIP dial peer application exists on the terminating gateway.
5. Collect relevant information from **debug** and **show** commands, and configuration files before contacting Cisco Technical Support for assistance.
6. You can clear any of the following by disabling the DSP farm or SCCP:
 - Active calls
 - DSPs
 - Active connection to a Cisco Unified Communications Manager

MTP Troubleshooting Tips

- MTP profiles can use only G.711 a-law or G.711 u-law. If you define a profile for a hardware MTP, and you want to change the codec to other than G.711, you must first remove the hardware MTP by using the **no maximum sessions hardware** command.
- Verify that only one codec is assigned for each MTP profile. To support multiple codecs, you must define a separate MTP profile for each codec.

Troubleshooting DSP-Farm Services

You can troubleshoot performance by performing any of the following steps.

SUMMARY STEPS

1. **debug sccp** {all | errors | events | packets | parser}
2. **debug dspfarm** {all | errors | events | packets}
3. **debug media resource provisioning** {all | errors | events}

DETAILED STEPS

	Command or Action	Purpose
Step 1	debug sccp {all errors events packets parser} Example: Router# debug sccp all	(Optional) Sets debugging levels for SCCP and its applications.
Step 2	debug dspfarm {all errors events packets} Example: Router# debug dspfarm all	(Optional) Sets debugging levels for DSP-farm service.
Step 3	debug media resource provisioning {all errors events} Example: Router# debug media resource provisioning all	(Optional) Sets debugging levels for media resource provisioning.

Configuring Conferencing and Transcoding (NM-HDV)

Perform the following procedures to configure enhanced conferencing and transcoding on the NM-HDV.

- [Configuring the DSP Farm on the NM-HDV, page 95](#)
- [Tuning DSP-Farm Performance on the NM-HDV, page 96](#)

Configuring the DSP Farm on the NM-HDV

Perform this task to configure a DSP farm on an NM-HDV.



Note

If you configured a DSP farm in Cisco IOS Release 12.1(5)YH and have now upgraded to Cisco IOS Release 12.2(13)T or later, you must reconfigure the DSP farm, including enabling DSP-farm services on the NM-HDV and specifying maximum session numbers in each category as appropriate. Your previous configuration no longer works.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **voice-card *slot***
4. **dsp services dspfarm**
5. **exit**
6. **dspfarm confbridge maximum sessions *number***
7. **dspfarm transcoder maximum sessions *number***
8. **dspfarm**
9. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none">• Enter your password when prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	voice-card <i>slot</i> Example: Router(config)# voice-card 1	Enters voice-card configuration mode for the network module on which you want to enable DSP-farm services.
Step 4	dsp services dspfarm Example: Router(config-voicecard)# dsp services dspfarm	Enables DSP-farm services on the voice card.
Step 5	exit Example: Router(config-voicecard)# exit	Returns to global configuration mode.

	Command or Action	Purpose
Step 6	dspfarm confbridge maximum sessions <i>number</i> Example: Router(config)# dspfarm confbridge maximum sessions 3	Specifies the maximum number of conferencing sessions to be supported by the DSP farm. A DSP can support 1 conference session with up to 6 participants. Note When you assign this value, take into account the number of DSPs allocated for transcoding services.
Step 7	dspfarm transcoder maximum sessions <i>number</i> Example: Router(config)# dspfarm transcoder maximum sessions 12	Specifies the maximum number of transcoding sessions to be supported by the DSP farm. A DSP can support up to 4 transcoding sessions. Note When you assign this value, take into account the number of DSPs allocated for conferencing services.
Step 8	dspfarm Example: Router(config)# dspfarm	Enables the DSP farm.
Step 9	exit Example: Router(config)# exit	Exits global configuration mode.

Tuning DSP-Farm Performance on the NM-HDV

Use the following optional commands to tune performance.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **sccp switchback timeout guard** *seconds*
4. **dspfarm rtp timeout** *seconds*
5. **dspfarm connection interval** *seconds*
6. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> Enter your password when prompted.
Step 2	<code>configure terminal</code> Example: Router# configure terminal	Enters global configuration mode.
Step 3	<code>sccp switchback timeout guard seconds</code> Example: Router(config)# sccp switchback timeout guard 180	(Optional) Sets the guard timer.
Step 4	<code>dspfarm rtp timeout seconds</code> Example: Router(config)# dspfarm rtp timeout 60	(Optional) Configures the Real-Time Transport Protocol (RTP) timeout interval for when the error condition “RTP port unreachable” occurs.
Step 5	<code>dspfarm connection interval seconds</code> Example: Router(config)# dspfarm connection interval 60	(Optional) Specifies how long to monitor RTP inactivity before deleting an RTP stream.
Step 6	<code>exit</code> Example: Router(config)# exit	Exits global configuration mode.

What to Do Next

- To verify the configuration of conferencing and transcoding services on the NM-HDV, see the [“Verifying DSP Farm Configuration”](#) section on page 90.
- For information on troubleshooting, see the [“Troubleshooting DSP-Farm Services”](#) section on page 94.

Configuring Conferencing and Transcoding (PVDM-256K)

Perform this task to configure a DSP farm for conferencing and transcoding services using the PVDM-256K on the Cisco 1751 or Cisco 1760.

Prerequisites for Conferencing and Transcoding on the Cisco 1751 or Cisco 1760

Determine that there are enough DSPs available for conferencing and transcoding services by using the `show voice dsp` command.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **dspfarm confbridge maximum sessions** *number*
4. **dspfarm transcoder maximum sessions** *number*
5. **dspfarm**
6. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password when prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	dspfarm confbridge maximum sessions <i>number</i> Example: Router(config)# dspfarm confbridge maximum sessions 3	Specifies the maximum number of conferencing sessions to be supported by the DSP farm. A DSP can support 1 conference session with up to 6 participants. Note When you assign this value, take into account the number of DSPs allocated for transcoding services.
Step 4	dspfarm transcoder maximum sessions <i>number</i> Example: Router(config)# dspfarm transcoder maximum sessions 12	Specifies the maximum number of transcoding sessions to be supported by the DSP farm. A DSP can support up to 4 transcoding sessions. Note When you assign this value, take into account the number of DSPs allocated for conferencing services.
Step 5	dspfarm Example: Router(config)# dspfarm	Enables the DSP farm.
Step 6	exit Example: Router(config)# exit	Exits global configuration mode.

What to Do Next

- To verify the configuration of conferencing and transcoding services on the NM-HDV, see the [“Verifying DSP Farm Configuration” section on page 90](#).
- For information on troubleshooting, see the [“Troubleshooting DSP-Farm Services” section on page 94](#).

Configuring Out-of-Band to In-Band DTMF Relay

There are no specific configuration tasks necessary to support the Out-of-Band to In-Band DTMF Relay for Cisco IOS Voice Gateways feature except those described in the following Prerequisites section.

Prerequisites

Hardware

- NM-HDV2, NM-HD-2VE, or onboard PVDM2 (Cisco 2800 series or Cisco 3800 series).
- WS-SVC-CMM-6T1 or WS-SVC-CMM-6E1 port adapter for Cisco Catalyst 6500 series and Cisco 7600 series Communication Media Module (CMM).

Software

- Enable SCCP on the local interface that the MTP resource uses to communicate with Cisco Unified Communications Manager. For instructions, see the [“Enabling SCCP on the Cisco Unified Communications Manager Interface” section on page 82](#).
- Configure a DSP farm profile for MTP resources. For instructions, see the [“Configuring a DSP Farm Profile” section on page 84](#).
- Associate the MTP profile with the Cisco Unified Communications Manager group. For instructions, see the [“Associating a DSP Farm Profile to a Cisco Unified Communications Manager Group” section on page 86](#).
- Configure DTMF relay in the SIP dial peers using the **dtmf-relay rtp-nte** command.
- Configure DTMF relay in Cisco Unified Communications Manager 4.0 (formerly known as Cisco CallManager 4.0) or later. For information, see the [Cisco Unified CallManager 4.0](#) documentation.
- Consider your system requirements when configuring DSP farms and SCCP because the defaults for some commands might not result in expected behavior. In particular, the correct settings for the following commands are platform-specific and depend on your individual network characteristics:
 - **connect interval**
 - **connect retries**
 - **keepalive retries**
 - **keepalive timeout**
 - **sccp registration retries**
 - **sccp registration timeout**
 - **switchback interval**

Restrictions

- Multifrequency is supported by MTPs but Cisco Unified Communications Manager does not support it.
- Software MTP supports G.711 codecs only.

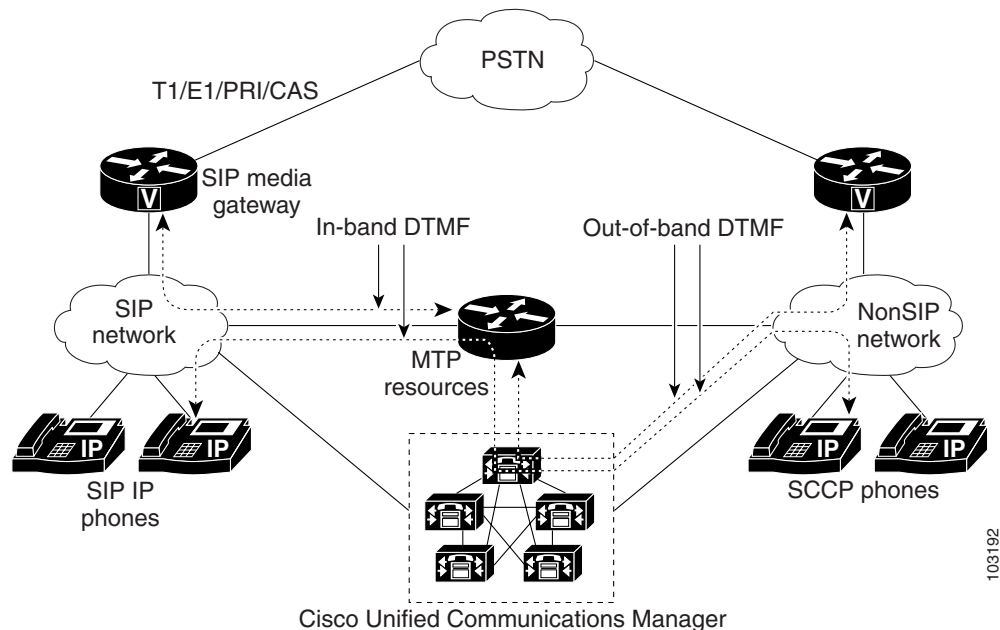
Out-of-Band to In-Band DTMF Relay for Cisco IOS Voice Gateways

The Out-of-Band to In-Band DTMF Relay for Cisco IOS Voice Gateways feature provides the event processing capability in RFC 2833 that enables DTMF relay communication between SIP devices and nonSIP endpoints using Cisco Unified Communications Manager. RFC 2833 defines a method of transporting tones and other telephony events over Real-Time Transport Protocol (RTP) to ensure DTMF digits are accurately transmitted in a packet environment. A single packet representing a DTMF tone as an event code is passed within an RTP audio stream instead of sending the DTMF tone in-band, where it could be corrupted because of packet loss. When the packet reaches the receiver, it re-creates a tone of the correct frequency and duration.

DTMF detection and generation capabilities are added to the hardware and software MTP. The MTP generates out-of-band SCCP events to Cisco Unified Communications Manager when it detects a DTMF tone. The MTP creates event packets for DTMF digits and inserts the packets into the outgoing RTP stream after receiving an SCCP request from Cisco Unified Communications Manager.

Figure 7 illustrates the media setup and DTMF tone flow between a SIP network and nonSIP network over a DSP farm MTP.

Figure 7 DTMF Tone Flow Between a SIP and NonSIP Network



This feature supports DTMF relay using the following MTP and transcoder resources for Cisco Unified Communications Manager 4.0 (formerly known as Cisco CallManager 4.0):

- Software MTP—Software-only implementation that does not use a DSP resource for endpoints using the same codec and the same packetization time.

- **Hardware MTP**—Hardware-only implementation that uses a DSP resource for endpoints using the same G.711 codec but a different packetization time. Cisco Unified Communications Manager refers to it also as a software MTP.
- **Transcoder**—Hardware-only implementation using a DSP resource for endpoints using different codecs. Cisco Unified Communications Manager also refers to it as a hardware MTP.

For MTP and transcoding, the DSP farm supports only two IP streams connected to each other at a time. If more than two streams need connecting, the streams must be connected using conferencing.

**Note**

For more information on MTPs and transcoders, see the [Cisco Unified Communications Manager System Guide Release 4.0\(1\)](#).

Configuring DSP Sharing

DSP sharing is configured on each participating voice card individually. Cards participate by using or providing DSPs to be shared, or both.

The clocks for all participating voice cards must be synchronized for DSP sharing. This is done by setting each card to **network-clock-participate** or to **network-clock-select**.

Each card providing DSPs to be shared must also be configured to **dspfarm**.

Steps to configure DSP sharing consist of the following:

1. Configure synchronized clocking for all voice cards participating in DSP sharing.
2. Configure **dspfarm** for all voice cards providing DSPs to be shared.

SUMMARY STEPS

1. **network-clock-participate** [slot *slot-number* | wic *wic-slot*]
2. **voice-card** *slot*
3. **dspfarm**

DETAILED STEPS

	Command or Action	Purpose
Step 1	network-clock-participate [slot <i>slot-number</i> wic <i>wic-slot</i>] Example: Router(config)# network-clock-participate wic 0	Configures synchronized clocking for the specified network module or wic. Repeat this command for each network module or wic that is taking part in DSP sharing.
Step 2	voice-card <i>slot</i> Example: Router(config)# voice-card 0	Enters voice-card configuration mode for the network module or motherboard which you want to provide DSPs in DSP sharing. voice-card 0 selects the motherboard of the voice gateway router.

	Command or Action	Purpose
Step 3	dspfarm Example: Router(config-voicecard)# dspfarm	Enables the selected network module or router motherboard to provide DSPs for DSP sharing.
Step 4	exit Example: Router(config-voicecard)# exit	Exits voice-card configuration mode. Repeat steps 2 through 4 for the router motherboard, if desired, and for each network module you want to provide DSPs in DSP sharing..

Example

The following example illustrates configuring the motherboard to provide DSPs for sharing, and for enabling the network module in slot 1 to import DSPs if a local DSP for a call in not available. The clocks of two T1/E1 interfaces are synchronized: in this example, the controllers in HWIC slot 0 and network module slot 1.

```
network-clock-participate wic 0
network-clock-participate slot 1
voice-card 0
  dspfarm
controller T1 1/0
  ds0-group 0 timeslots 1-24 type e&m-wink-start
```

Configuration Examples for Conferencing and Transcoding

This section provides the following configuration examples:

- [DSP-Farm Services on the NM-HDV2/PVDM2: Example, page 102](#)
- [DSP-Farm Services on the NM-HDV: Example, page 105](#)
- [Tuning DSP-Farm Services on the NM-HDV: Example, page 107](#)
- [DSP-Farm Services on the Cisco 1760: Example, page 107](#)
- [Dut-Band to In-Band DTMF Relay \(Cisco 2801\): Example, page 109](#)
- [Out-Band to In-Band DTMF Relay \(Cisco 3725\): Example, page 111](#)

DSP-Farm Services on the NM-HDV2/PVDM2: Example

The following example shows a configuration of conferencing and transcoding services on an NM-HDV2 or PVDM2. DSP farm profile 6, which supports transcoding, and profile 10, which supports conferencing are both assigned to Cisco Unified Communications Manager group 988.



Note

This configuration requires Cisco IOS Release 12.3(8)T or later.

```
Current configuration : 2661 bytes
!
version 12.3
```

```
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname sjl23
!
boot-start-marker
boot-end-marker
!
!
no aaa new-model
ip subnet-zero
!
!
!
ip host boating 223.255.254.254
no ftp-server write-enable
!
voice-card 1
  no dspfarm
  dsp services dspfarm
!
!
voice service voip
  h323
!
!
controller T1 4/1
  framing sf
  crc-threshold 0
  linecode ami
!
controller T1 4/2
  framing sf
  crc-threshold 0
  linecode ami
!
!
interface FastEthernet0/0
  ip address 10.4.20.7 255.255.255.0
  no ip mroute-cache
  speed auto
  half-duplex
  no cdp enable
!
interface FastEthernet0/1
  no ip address
  no ip mroute-cache
  shutdown
  duplex auto
  speed auto
  no cdp enable
!
ip default-gateway 10.4.0.1
ip classless
ip route 0.0.0.0 0.0.0.0 FastEthernet0/0
ip route 223.255.254.254 255.255.255.255 10.4.0.1
no ip http server
!
!
no cdp run
!
!
```

```

control-plane
!
!
voice-port 1/0/0
!
voice-port 1/0/1
!
!
sccp local FastEthernet0/0
sccp ccm 10.4.20.24 identifier 1 version 4.0
sccp ccm 10.4.20.25 identifier 2 version 4.0
sccp ccm 10.4.20.26 identifier 3 version 4.0
sccp ip precedence 3
sccp
!
sccp ccm group 988
  associate ccm 1 priority 1
  associate ccm 2 priority 2
  associate ccm 3 priority 3
  associate profile 10 register CFB123456789966
  associate profile 6 register MTP123456789988
  keepalive retries 5
  switchover method immediate
  switchback method immediate
  switchback interval 15
!
dspfarm profile 6 transcode
  codec g711ulaw
  codec g711alaw
  codec g729ar8
  codec g729abr8
  maximum sessions 4
  associate application SCCP
!
dspfarm profile 10 conference
  codec g711ulaw
  codec g711alaw
  codec g729ar8
  codec g729abr8
  codec g729r8
  codec g729br8
  maximum sessions 1
  associate application SCCP
!
dial-peer cor custom
!
!
dial-peer voice 200 voip
  destination-pattern 111...
  session target ipv4:10.4.205.24
!
dial-peer voice 2600 voip
  destination-pattern 666...
  session target ipv4:10.4.205.24
  codec g711ulaw
!
dial-peer voice 100 voip
  destination-pattern 5550...
  session target ipv4:10.4.205.24
  codec g711ulaw
!
dial-peer voice 10 pots
  destination-pattern 7770000
  forward-digits 0

```

```

!
dial-peer voice 11 pots
  destination-pattern 7771111
!
dial-peer voice 999 voip
  session target ipv4:10.4.205.8
!
gateway
  timer receive-rtp 1200
!
!
line con 0
  exec-timeout 0 0
line aux 0
line vty 0 4
  password test
  login
!
!
end

```

DSP-Farm Services on the NM-HDV: Example

The following sample configuration shows voice conferencing and transcoding are both configured on the same NM-HDV.

```

Current configuration : 1163 bytes
!
version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname router
!
voice-card 1
  dsp services dspfarm
!
ip subnet-zero
!
mta receive maximum-recipients 0
!
controller T1 1/0
  framing sf
  linecode ami
  no yellow generation
  no yellow detection
!
controller T1 1/1
  framing sf
  linecode ami
  no yellow generation
  no yellow detection
!
interface FastEthernet0/0
  ip address 10.10.10.11 255.255.255.0
  load-interval 30
  duplex auto
  speed auto
!
interface FastEthernet0/1
  ip address 10.3.150.139 255.0.0.0

```

```

load-interval 30
duplex auto
speed auto
!
ip classless
ip route 192.255.254.254 255.255.255.255 FastEthernet0/1
ip http server
!
call rsvp-sync
!
mgcp profile default
!
sccp local FastEthernet0/0
sccp
sccp ccm 10.10.10.1 priority 1
sccp ccm 10.10.10.2 priority 2
!
dspfarm transcoder maximum sessions 1
dspfarm confbridge maximum sessions 1
dspfarm
!
voice-port 1/0/0
!
voice-port 1/0/1
!
voice-port 1/1/0
!
voice-port 1/1/1
!
mgcp profile default
!
dial-peer cor custom
!
dial-peer voice 10 pots
destination-pattern 3140001
port 1/0/0
!
! Following dial peer is for calls to H.323 end-point 313.... for transcoding.
! Session target is IP address of Cisco Unified Communications Manager.
!
dial-peer voice 100 voip
destination-pattern 313....
session target ipv4:10.10.10.1
!
! Following dial peer is for calls to IP Phones for conferencing.
! Session target is IP address of Cisco Unified Communications Manager.
!
dial-peer voice 200 voip
destination-pattern 700....
session target ipv4:10.10.10.1
codec g711alaw
!
line con 0
line aux 0
line vty 0 4
login
!
end

```

Tuning DSP-Farm Services on the NM-HDV: Example

```

...
sccp local FastEthernet 0/0
sccp
sccp ccm 10.10.10.1 priority 1 version 3.1+
sccp ccm 10.10.10.2 priority 2
sccp ip precedence 5
sccp switchback timeout guard 180
!
dspfarm confbridge maximum sessions 3
dspfarm rtp timeout 60
dspfarm connection interval 60
dspfarm

```

DSP-Farm Services on the Cisco 1760: Example

```

Current configuration :1763 bytes
!
version 12.3
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname c1760
!
boot-start-marker
boot-end-marker
!
logging buffered 40960 debugging
no logging console
!
tdm clock E1 1/0 both export line
tdm clock bri-auto
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
voice-card 0
!
voice-card 1
!
no aaa new-model
ip subnet-zero
ip cef
!
!
no ip domain lookup
ip multicast-routing
no ftp-server write-enable
isdn switch-type basic-net3
!
!
ccm-manager music-on-hold
!
!
controller E1 1/0
!
!
interface FastEthernet0/0
ip address 10.1.1.34 255.255.0.0

```

```

ip igmp join-group 172.16.1.10
speed auto
no keepalive
!
interface BRI0/0
no ip address
isdn switch-type basic-net3
isdn incoming-voice voice
!
interface BRI0/1
no ip address
shutdown
isdn switch-type basic-net3
!
ip default-gateway 10.5.0.1
ip classless
no ip http server
ip rtcp report interval 2000
!
!
control-plane
!
!
!
voice-port 0/0
!
voice-port 0/1
!
!
sccp local FastEthernet0/0
sccp
sccp ccm 10.1.1.30 priority 1
sccp ccm 10.1.1.0 priority 2
sccp switchback timeout guard 180
!
dspfarm transcoder maximum sessions 4
dspfarm confbridge maximum sessions 1
dspfarm rtp timeout 60
dspfarm connection interval 60
dspfarm
!
!
dial-peer voice 500 pots
destination-pattern 241760....
incoming called-number 261760....
direct-inward-dial
port 0/0
prefix 241760
!
dial-peer voice 600 voip
destination-pattern 261760....
session target ipv4:10.1.1.30
incoming called-number 241760....
playout-delay minimum low
codec g711ulaw
no vad
!
gateway
timer receive-rtcp 5
timer receive-rtp 1200
!
!
line con 0
exec-timeout 0 0

```

```
line aux 0
line vty 0 4
  login
!
end
```

Dut-Band to In-Band DTMF Relay (Cisco 2801): Example

In the following configuration, the voice gateway acts as both a H.323 gateway and DSP farm.

Building configuration...

```
Current configuration :2091 bytes
!
version 12.3
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname 2801_router
!
boot-start-marker
boot-end-marker
!
no logging console
!
no network-clock-participate wic 1
network-clock-participate wic 2
no network-clock-participate wic 3
network-clock-participate wic 4
mmi polling-interval 60
no mmi auto-configure
no mmi pvc
mmi snmp-timeout 180
no aaa new-model
ip subnet-zero
ip cef
!
!
!
no ftp-server write-enable
isdn switch-type primary-net5
voice-card 0
  dsp services dspfarm
!
!
!
controller T1 2/0
  shutdown
  framing esf
  linecode b8zs
!
controller T1 2/1
  framing esf
  linecode b8zs
!
!
!
interface FastEthernet0/0
  ip address 192.168.12.21 255.255.255.0
  duplex auto
  speed auto
```

```

!
interface FastEthernet0/1
  no ip address
  shutdown
  duplex auto
  speed auto
!
interface BRI4/0
  no ip address
  isdn switch-type basic-net3
!
interface BRI4/1
  no ip address
  isdn switch-type basic-net3
!
ip classless
ip http server
!
!
!
control-plane
!
!
!
voice-port 3/0
!
voice-port 3/1
!
voice-port 4/0
!
voice-port 4/1
!
!
sccp local FastEthernet0/0
sccp ccm 192.168.12.131 identifier 1 version 4.0
sccp ip precedence 4
sccp
!
sccp ccm group 1
  bind interface FastEthernet0/0
  associate ccm 1 priority 1
  associate profile 2 register amalthea-mtp
  associate profile 1 register amalthea-xcode
  registration retries 20
  registration timeout 30
  keepalive retries 10
  connect retries 30
  connect interval 30
!
dspfarm profile 1 transcode
  description xcode func
  codec g711ulaw
  codec g711alaw
  codec g729ar8
  codec g729abr8
  codec g729r8
  maximum sessions 2
  associate application SCCP
!
dspfarm profile 2 mtp
  codec g711ulaw
  maximum sessions hardware 2
  maximum sessions software 2
  associate application SCCP

```

```

!
!
dial-peer voice 1 pots
 destination-pattern 4444
 port 3/0
!
dial-peer voice 2 voip
 destination-pattern 52..
 session target ipv4:192.168.12.131
 dtmf-relay h245-alphanumeric
!
gateway
 timer receive-rtp 1200
!
!
line con 0
line aux 0
line vty 0 4
 login
!
end

```

Out-Band to In-Band DTMF Relay (Cisco 3725): Example

The following running configuration example shows the MTP device configuration:

Building configuration...

```

Current configuration : 1435 bytes
!
version 12.3
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname router1
!
voice-card 1
 no dspfarm
 dsp services dspfarm
!
voice-card 2
 dspfarm
!
no aaa new-model
ip subnet-zero
!
ip host sample 10.10.10.5
mpls ldp logging neighbor-changes
no ftp-server write-enable
no scripting tcl init
no scripting tcl encdir
!
no voice hpi capture buffer
no voice hpi capture destination
!
interface FastEthernet0/0
 ip address 10.4.118.13 255.255.255.255
 duplex auto
 speed auto
!
interface FastEthernet0/1

```

```

no ip address
shutdown
duplex auto
speed auto
!
ip default-gateway 10.4.0.10
ip classless
ip route 10.0.0.0 255.255.255.255 FastEthernet0/0
ip route 223.255.255.255 255.255.255.255 FastEthernet0/0
!
ip http server
!
sccp local FastEthernet0/0
sccp ccm 10.40.10.10 identifier 10 version 4.0
sccp ccm 10.10.10.51 identifier 20 version 4.0
sccp
!
sccp ccm group 999
associate ccm 10 priority 1
associate ccm 20 priority 2
associate profile 12 register MTP123456789
associate profile 2 register XCODE123456
!
dspfarm profile 2 transcode
codec g711ulaw
codec g711alaw
codec g729ar8
codec g729abr8
maximum sessions 2
associate application SCCP
!
dspfarm profile 12 mtp
codec g711ulaw
maximum sessions hardware 4
maximum sessions software 40
associate application SCCP
!

```

SIP Gateway: Example

The following running configuration example shows the SIP gateway configuration for the Out-Band to In-Band DTMF Relay feature:

Building configuration...

```

Current configuration : 2051 bytes
!
version 12.3
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname cisco_sip_gw
!
logging buffered 6000000 debugging
!
voice-card 2
dspfarm
!
no aaa new-model
ip subnet-zero
!

```

```
!  
ip domain name cisco.com  
ip host sample 10.10.10.5  
ip host myhost 10.4.175.2  
mpls ldp logging neighbor-changes  
no ftp-server write-enable  
no scripting tcl init  
no scripting tcl encdir  
!  
!  
no voice hpi capture buffer  
no voice hpi capture destination  
!  
!  
ccm-manager mgcp  
ccm-manager music-on-hold  
ccm-manager config server 10.4.175.2  
ccm-manager config  
!  
!  
controller T1 2/0  
  framing esf  
  linecode b8zs  
  ds0-group 1 timeslots 1-24 type e&m-wink-start  
!  
controller T1 2/1  
  framing sf  
  linecode ami  
!  
!  
interface FastEthernet0/0  
  ip address 10.4.175.14 255.255.0.0  
  duplex auto  
  speed auto  
!  
interface FastEthernet0/1  
  no ip address  
  shutdown  
  duplex auto  
  speed auto  
!  
interface BRI1/0  
  no ip address  
!  
ip default-gateway 10.4.0.1  
ip classless  
ip route 0.0.0.0 255.255.0.0 FastEthernet0/0  
ip route 223.255.254.254 255.255.255.255 FastEthernet0/0  
!  
ip http server  
!  
!  
voice-port 1/0/0  
!  
voice-port 1/0/1  
!  
voice-port 1/1/0  
!  
voice-port 2/0:1  
!  
mgcp profile default  
!  
!
```

```
dial-peer voice 1 voip
 destination-pattern 2000
 session protocol sipv2
 session target ipv4:10.4.175.2
 dtmf-relay rtp-nte
 codec g711ulaw
!
dial-peer voice 3 pots
 application mgcpapp
 port 2/0:1
!
dial-peer voice 999201 pots
 application mgcpapp
 port 2/0:1
!
dial-peer voice 2 pots
 destination-pattern 2005
 port 1/0/0
!
dial-peer voice 5 pots
 destination-pattern 2001
 port 1/0/0
!
!
line con 0
line aux 0
line vty 0 4
 login
!
!
end
```

Where to Go Next

- To enable MGCP on a Cisco IOS gateway, see [Configuring MGCP Gateway Support for Cisco Unified Communications Manager, page 23](#).
- To enable MGCP PRI backhaul support, see [“Configuring MGCP PRI Backhaul and T1 CAS Support for Cisco Unified Communications Manager” on page 113](#).
- To enable MGCP BRI backhaul support, see [“Configuring MGCP-Controlled Backhaul of BRI Signaling in Conjunction with Cisco Unified Communications Manager” on page 129](#).
- To download region-specific tones and the associated frequencies, amplitudes, and cadences, see [“Configuring Tone Download to MGCP Gateways” on page 145](#).

Additional References

- [“Cisco Unified Communications Manager and Cisco IOS Interoperability Features Roadmap” on page 9](#)—Describes how to access Cisco Feature Navigator; also lists and describes, by Cisco IOS release, Cisco Unified Communications Manager and Cisco IOS interoperability features.
- [“Overview of Cisco Unified Communications Manager and Cisco IOS Interoperability” on page 13](#)—Describes basics of underlying technology and lists related documents.
- [“Conference Bridges” chapter in the *Cisco Unified CallManager System Guide*, Release 4.0\(1\)](#)—Overview of conference devices in Cisco Unified CallManager 4.0.

- [“Conference Bridge Configuration”](#) chapter in the *Cisco Unified CallManager Administration Guide*, Release 4.0(1)—Describes how to configure conference bridges in Cisco Unified CallManager 4.0.
- [“Transcoders”](#) chapter in the *Cisco Unified CallManager System Guide*—Overview of transcoder devices in Cisco Unified CallManager 4.0.
- [“Transcoder Configuration”](#) chapter in the *Cisco Unified CallManager Administration Guide*—Describes how to configure transcoders in Cisco Unified CallManager 4.0.
- [IP Communications High-Density Digital Voice/Fax Network Module](#) feature document—Describes how to configure support for the NM-HDV2 in Cisco IOS gateways.
- [“Connecting Voice Network Modules”](#) chapter in the *Cisco Network Modules Hardware Installation Guide*—Describes how to install the voice network modules.

■ Additional References