Using Cisco Unified Communications Manager to Configure Transcoding and Media Termination Point

This chapter describes the steps for enabling transcoding and media termination point (MTP) support on Cisco VGD 1T3 voice gateways in a Cisco Unified Communications Manager network. This feature provides enhanced multiservice support by enabling transcode functions and MTP in voice gateway routers. Using transcoding services reduces bandwidth needs resulting in tangible cost savings.

Digital signal processor (DSP) farms provide transcoding services using DSP resources on high-density digital voice/fax network modules. This chapter contains the following sections:

- Prerequisites for Transcoding and MTP for Cisco VGD 1T3 Voice Gateway, page 151
- Restrictions for Transcoding and MTP for the Cisco VGD 1T3 Voice Gateway, page 152
- Information About Transcoding and MTP for the Cisco VGD 1T3 Voice Gateway, page 152
- Configuring Transcoding and MTP for the Cisco VGD 1T3 Voice Gateway, page 156
- Configuration Examples for Transcoding and MTP, page 158

Prerequisites for Transcoding and MTP for Cisco VGD 1T3 Voice Gateway

The prerequisites defined in the sections below apply to the configuration of transcoding and MTP for the Cisco VGD 1T3 Voice Gateway:

- DSP Resources, page 152
- Codecs, page 152

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DSP Resources

The Cisco VGD 1T3 voice gateway uses PVDM2 modules to provide DSP resources for transcoding and hardware MTP services. Use Cisco Unified Communications Manager 5.0 (formerly known as Cisco CallManager 5.0) or later for transcoding and for MTP. You must have Cisco IOS Release 12.4(20)YA or later.

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 mu-law	10, 20, or 30
G.729, G.729A, G.729B, G.729AB	10, 20, 30, 40, 50, or 60

Restrictions for Transcoding and MTP for the Cisco VGD 1T3 Voice Gateway

- 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.
- 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.
- 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 Transcoding and MTP for the Cisco VGD 1T3 Voice Gateway

To configure transcoding, you should understand the following concepts:

- DSP Farms, page 153
- DSP Farm Profiles, page 153
- Transcoding and MTP, page 153
- Media Termination Point, page 154
- Allocation of DSP Resources, page 154
- Transcoding Session Capacities, page 155

DSP Farms

A DSP farm is the collection of DSP resources available for 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 and MTP sessions simultaneously. The DSP farm maintains the DSP resource details locally. Cisco Unified Communications Manager requests 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 transcoding and hardware MTP services.

Tip To determine how many DSP resources your router supports, see the "Allocation of DSP Resources" section on page 154.

DSP Farm Profiles

DSP-farm profiles are created to allocate DSP-farm resources. Under the profile you select the service type (transcode or 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.

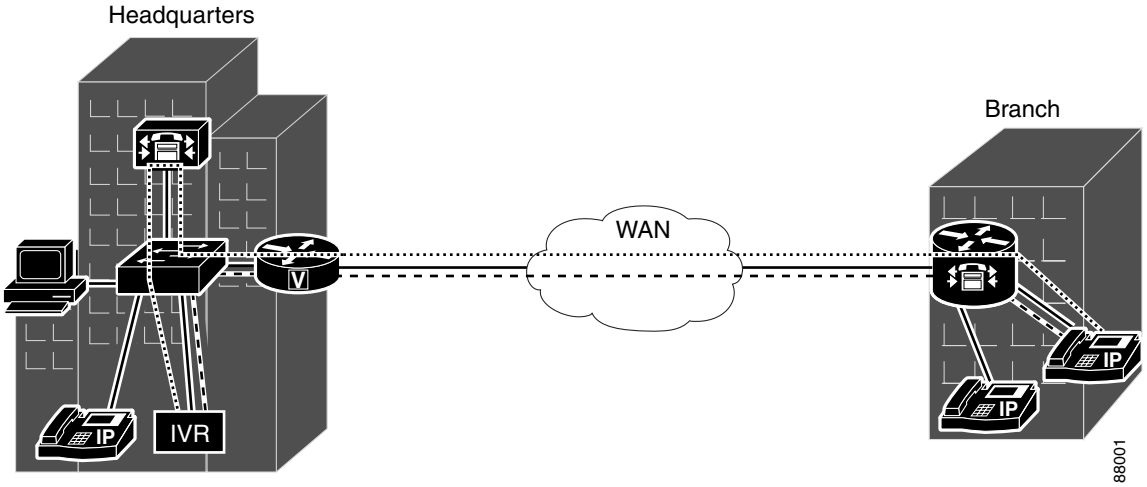
Transcoding and MTP

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 1).

Figure 1 Transcoding Service



Media Termination Point

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.

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.

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 (PVDM2s) installed in voice network modules or directly in the network module. Cisco VGD 1T3 voice gateway routers have onboard DSP resources located on PVDM2s installed directly on the motherboard. Your router supports up to six voice network modules.

Transcoding Session Capacities

Each DSP is individually configurable to support transcoding and standard voice termination. The total number of 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 1 and Table 2 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 1 DSP Theoretical Session Capacities

Application	2 PVDM2-64	3 PVDM2-64	4 PVDM2-64
Transcoding			
G.711 a-law/u-law <-> G.729a/G.729ab	64 sessions	96 sessions	128 sessions
G.711 a-law/u-law <-> G.729/G.729b	48 sessions	72 sessions	96 sessions
Voice Termination			
G.711 a-law/u-law	128 sessions	192 sessions	256 sessions
G.726, G.729a, G.729ab	64 sessions	96 sessions	128 sessions
G.729, G.729b, G.723.1, G.728	48 sessions	72 sessions	96 sessions

Table 2 Theoretical System Capacities for One DSP

Application	G.711 a-law/u-law	G729 a/ab	G.729, G.729b
Hardware MTP	16 sessions	—	—
Transcoding	8 sessions	8 sessions	6 sessions

Configuring Transcoding and MTP for the Cisco VGD 1T3 Voice Gateway

This section contains the procedures for configuring transcoding and MTP support on Cisco VGD 1T3 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 156 (required)
- Enabling SCCP on the Cisco Unified Communications Manager Interface, page 157 (required)
- Configuring Transcoding and MTP, page 158 (required)

Determining DSP Resource Requirements

DSPs reside on PVDM2s that are installed in a voice network module or on PVDM2s that are installed directly onto the motherboard. You must determine the number of PVDM2s or network modules that are required to support your 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. Verify your solution.
4. 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. 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).	Establishes your hardware requirements.

	Command or Action	Purpose
Step 3	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 4	Install PVDM2s and network modules, as needed (see the "Connecting Voice Network Modules" chapter in the *Cisco Network Modules Hardware Installation Guide*, and the *Cisco Network Modules and Interface Cards Regulatory Compliance and Safety Information*).	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*]
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. • Enter your password if prompted.
Step 2	**`configure terminal`** **Example:** `Router# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 3	**sccp ccm** {*ip-address* | *dns*} **identifier** *identifier-number* [**port** *port-number*] [**version** *version-number*] **Example:** `Router(config)# sccp ccm 10.0.0.0 identifier 1 version 4.0`	Adds a Cisco Unified Communications Manager server to the list of available servers to which the Cisco VGD 1T3 voice gateway can register. • Repeat this step for each Cisco Unified Communications Manager server that the gateway registers with.
Step 4	**sccp local** *interface-type interface-number* **Example:** `Router(config)# sccp local Ethernet 1`	Selects the local interface that SCCP applications use to register with Cisco Unified Communications Manager.
Step 5	**sccp ip precedence** *value* **Example:** `Router(config)# sccp ip precedence 3`	(Optional) Sets the IP precedence value for SCCP. • This command enables you to increase the priority of voice packets over connections controlled by SCCP. • *value*—Range is 1(highest) to 7 (lowest). Default is 5.
Step 6	**sccp** **Example:** `Router(config)# sccp`	Enables SCCP and brings it up administratively.
Step 7	**exit** **Example:** `Router(config)# exit`	Exits global configuration mode.

Configuring Transcoding and MTP

For detailed instructions on how to configure Transcoding on Cisco Unified Communications Manager, refer to the *Transcoder Configuration* section in the *Media Resource Configuration* chapter in the *Cisco Unified Communications Manager Administration Guide*.

For detailed instructions on how to configure MTP on Cisco Unified Communications Manager, refer to the *Media Termination Point Configuration* section in the *Media Resource Configuration* chapter in the *Cisco Unified Communications Manager Administration Guide*.

Configuration Examples for Transcoding and MTP

This section provides the following configuration examples:

- DSP-Farm Services on the Cisco VGD 1T3: Example, page 159
- Out-Band to In-Band DTMF Relay: Example, page 161
- Out-Band to In-Band DTMF Relay for MTP Device: Example, page 163
- SIP Gateway: Example, page 164

DSP-Farm Services on the Cisco VGD 1T3: Example

The following example shows a configuration of transcoding services on a PVDM2. DSP farm profile 6, which supports transcoding, is assigned to Cisco Unified Communications Manager group 988.

Note This configuration requires Cisco IOS Release 12.4(20)YA or later.

```
Current configuration : 2661 bytes
!
version 12.4
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
!
!
!
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
!
!
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 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
 codec gsmfr
 maximum sessions 4
 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
```

Out-Band to In-Band DTMF Relay: 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 12.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname vgd 1t3
!
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 2/0:1
 shutdown
 framing esf
 linecode b8zs
!
controller T1 3/0:1
 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 3/0:1
!
voice-port 3/1:1
!
voice-port 4/0:1
!
voice-port 4/1:1
!
!
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 gsmfr
 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 for MTP Device: 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 XCODT123456
!
dspfarm profile 2 transcode
 codec g711ulaw
 codec g711alaw
 codec g729ar8
 codec g729abr8
 codec gsmfr
 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 12.4
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 2/0:1
 framing esf
 linecode b8zs
 ds0-group 1 timeslots 1-24 type e&m-fgb
!
controller T1 2/0:2
 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
```

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