VXSM as a Transcoding Gateway

This chapter describes the VXSM application as a transcoding gateway in a Cisco MGX 8880 or Cisco MGX 8850.

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.

VXSM transcoding employs a general transcoding facility, where one supported codec is converted to another supported codec. This functionality interconnects a diverse array of topologies. VXSM transcoding works between two voice sessions that are encoded by using different codecs, different packetization periods, or a combination of the two. The VXSM transcoding channel operates only on IP terminations.

VXSM supports transcoding for an incoming voice stream with the following bearer properties:

- Codec
- Packetization period
- VAD
- DTMF relay

**Note**

If the bearer properties of an incoming voice stream is the same then the call is established in fast-routing, normal, or transparent mode.

Although VXSM transcoding allows interconnection between endpoints that encode voice by using different codec algorithms, it causes distortion of the voice and reduces the quality of the received signal. VXSM transcoding causes the voice signal to be encoded and decoded two times. Each time that a voice signal is encoded and decoded, distortion is added and the listening quality is reduced. Additionally, transcoding adds additional dejitter delays to the voice path.

**Considerations and Limitations**

The considerations and limitations in configuring VXSM transcoding are:

- For voice calls established in fast-routing mode, VBD in the non-NSE mode is not supported.
- For a voice calls established in the fast-routing mode, DTMF relay is supported, whereas DTMF detection is not supported.
- For a VBD call established in fast-routing mode, reverting the call to voice mode is not supported.
Information About VXSM Transcoding

To configure transcoding support, you should understand the following concepts:

- Transcoding Support, page 7-2
- Configuring Transcoding Resources, page 7-5

Transcoding Support

VXSM as a transcoding gateway supports the following bearer properties for an incoming voice stream:

- Codec Templates
- Voiceband Data Support
- T.38 Support
- Dual-tone Multifrequency Relay

Codec Templates

VXSM transcoding supports four codec templates. For more information, see VXSM Codec Templates, page 2-7.

Voiceband Data Support

VXSM supports Voiceband Data (VBD) calls on IP-IP connections. When a VBD call on IP-IP connections is created with the same codec, VAD, and packetization period at each end of the bearer leg, then the connection can be established in either fast-routing mode or normal mode. VXSM supports G.711 A, G.711 U, G.726-32, and Clear Channel codecs.

VXSMs that function as transcoding gateways can be configured to support VBD calls. The requirements include:

- VBD - T.38 Negotiations—VXSM supports NSE in conjunction with H.248 for VBD calls. For call negotiation, the mechanism for exchanging the NSE payload type is configured, which determines the payload type to be used for the NSEs. For more information, see H.248 Support for Named Signaling Events (NSEs), page 2-25.

  Table 7-1 describes scenarios under which VXSM switches to VBD or T.38 mode.

  When negotiating SDP parameters, VXSM ensures that the value of the NSE payload type is not the same as voice codecs or NTE. VXSM disables NSE functionality if NSE is not received in remote SDP.
Note VXSM uses dynamic payload type as the range for negotiating NSE.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Action</th>
<th>Switch to VBD or T.38 mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both legs support NSE</td>
<td>Call will switch to VBD/T.38</td>
<td>Yes</td>
</tr>
<tr>
<td>First leg supports NSE and the other does not.</td>
<td>SDP for the first call leg is acknowledged with support for NSE.</td>
<td>No</td>
</tr>
<tr>
<td>NSE is received from the first call leg.</td>
<td>SDP for the second call leg is acknowledged but does not contain NSE parameters.</td>
<td></td>
</tr>
<tr>
<td>First leg does not send NSE, and other IP leg sends NSE-related parameters.</td>
<td>SDPs for both the legs are acknowledged but do not contain NSE parameters.</td>
<td>No</td>
</tr>
</tbody>
</table>

- **VBD in NSE mode**—An IP-IP connection on detecting an NSE on one of the IP legs switches both the IP terminations to VBD codec in normal or fast-routing mode, depending on the codec configuration on the gateway.

- **VBD in non NSE mode**—An IP-IP connection relies on the IP side for tone detection. Voice calls set in this mode use low-complexity codecs such as G.711A, G.711U or G.726. On detecting a tone, the remote gateway switches to VBD mode and transfers the VBD packets to the IP leg. On detecting a tone from the IP side, the IP leg switches both the IP terminations to VBD codec in normal or fast-routing mode (depending on the codec configuration on the gateway).

  If bidirectional silence is detected, the terminating gateway switches to voice mode, but the VXSM transcoding gateway continues to be in VBD mode. The packets received at the IP leg are dropped due to payload type violation.

Note Bidirectional silence is detected only on the TDM side.

- **CA controlled VBD**—Upon detection of a CED tone, the remote gateway sends a notification message to the call agent and switches to VBD mode. The call agent sends a MODIFY message to the IP legs of the transcoding gateway to switch to the VBD codec.

**T.38 Support**

VXSM transcoding supports T.38 calls on the IP-IP terminations. The T.38 calls are supported on NSE and CA controlled mode. To support T.38 calls on the VXSM transcoding gateway, image type, transport type, and packetization period are considered.

If the bearer properties of the T.38 calls are same on both the legs of IP-IP connection, then the call is established as an IP-IP UDPTL T.38 fax call.

- **T.38 - NSE support**—VXSM supports NSE in conjunction with H.248 for T.38 calls. For call negotiation, the mechanism for exchanging the NSE payload type is configured, which determines the payload type to be used for the NSE events. For more information, see H.248 Support for Named Signaling Events (NSEs), page 2-25.
An IP-IP connection on detecting a NSE event on one of the IP leg, switches both the IP terminations to UDPTL T.38 in transparent mode. On completion of a fax transmission, terminating gateway switches to voice mode. The VXSM transcoding gateway continues to be in UDPTL transparent mode, resulting in voice packets being dropped at the terminating gateway.

- CA Controlled Fax SDP parameters—To support a fax call in UDPTL transparent mode, the SDP message should contain the same T.38 parameters on both the IP legs. CA negotiates T.38 parameters end to end, before transferring the T.38 parameters to the transcoding gateway.

If a transcoding call is established in voice or VBD mode, the terminating gateway, upon detecting a V.21 preamble, sends a notification message to the call agent. The CA sends a MODIFY message to the IP legs of the transcoding gateway and the terminating gateways to switch to T.38 mode.

V23-FSK Tone Detection

VXSM supports fast detector for V23-FSK tone detection. When you enable the fast detector for V23-FSK, the channel capacity for each DSP is reduced to 28 channels from 32 channels. When you disable the fast detector for V23-FSK, the capacity returns to 32 channels. By default, fast V23-FSK tone detection is disabled. In the following example, the user enables the V23-FSK tone detection:

unknown.2.VXSM.a > cnfv23mode 1

To disable V23-FSK detection, set the value to 0.

Note

With Release 5.6 and later versions, the channel capacity is increased to 30 channels when the V23 FSK detector is enabled. This enhancement is supported only on OC3/STM1 cards in E1 mode.

Dual-tone Multifrequency Relay

Dual tone multifrequency (DTMF) tones are generated, compressed, and transported to the other party, and then decompressed. If a low-bandwidth codec, such as G.729 or G.723, is used without a DTMF relay method, the tone may be distorted during compression and decompression.

In a transcoding gateway, if two networks have different ways of transmitting digits, the digits are translated to one kind.

Table 7-2 summarizes the DTMF interworking scenarios and the transcoding conversions.

<table>
<thead>
<tr>
<th>DTMF Interworking</th>
<th>Transcoding Conversions</th>
</tr>
</thead>
<tbody>
<tr>
<td>InBand - InBand</td>
<td>The RTP termination on the transcoding gateway receives the digit from the IP side. The digits are processed by the DSP. On the other RTP termination the digits are packetized and encoded with the configured codec before transferring to the terminating gateway.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong> If different codecs are configured on the gateways, then codec conversion takes place.</td>
</tr>
<tr>
<td></td>
<td><strong>Note</strong> If the IP leg uses a low bit-rate codec, then the digits may be distorted.</td>
</tr>
<tr>
<td>InBand - DTMF</td>
<td>The transcoding gateway receives the digit in the form of RTP voice packets from the IP side. The voice packets are converted into linear samples. They are transferred as NTE packets to the other end. For information on NTE, see H.248 Support for Named Telephone Events, page 2-25.</td>
</tr>
</tbody>
</table>
VXSM transcoding parameters are set as part of the default settings on the IP-IP terminations. The parameters are applied by specifying the particular profile when IP-IP connections are created using the `cnfdspparam` command (see Configuring H.248 Transparent RTP IP-IP Connections, page 3-31). When VXSM operates in the transcoding mode, the selected profile largely determines the processing that the DSPs perform on the voice payload.

VXSM transcoding configuration consists of:

- Configuring different Transcoding modes
- Configuring voice quality parameters for IP-IP terminations
- Configuring Fax and Modem Services
- Configuring voice connection
- Associating fax profile with RTP termination

To set up VXSM transcoding, use the following procedure.

**Step 1**

Use the `cnfdspparam` command to configure the voice connection. Use the `dspdspparam` command to display the default values.

The syntax of the `cnfdspparam` command is:

```
```

For `[-pip <IP-IP mode for voice calls>]`, enter 1 for normal(default) mode, 2 for fastRoute mode, or 3 for transparent mode.

**Step 2**

If any of the current values in the DSP profile for the IP-IP terminations on the transcoding gateway needs modification, use the `cnfgwdsp` command to make the changes. This command permits a set of values to be configured in the profile as follows:

- `cnfgwdsp -vad [-nm <NoiseMatching>] [-so <SidOptions>] [-itusmtr <SidMinTxRate>] [-smtr <SidMinTxRate>]`

### Table 7-2 DTMF Interworking Scenarios

<table>
<thead>
<tr>
<th>DTMF Interworking</th>
<th>Transcoding Conversions</th>
</tr>
</thead>
<tbody>
<tr>
<td>DTMF - InBand</td>
<td>The transcoding gateway receives the NTE packet. The digits are extracted from the NTE payload and passed on to the DSP channel associated with the second RTP termination. The digits are transferred as RTP packets to the other end.</td>
</tr>
<tr>
<td>DTMF - DTMF with different codecs</td>
<td>VXSM supports NTE negotiations for different codecs on the end gateway and the transcoding gateway. For information on NTE, see H.248 Support for Named Telephone Events, page 2-25. The digits extracted from the NTE packets are converted to linear samples and are transferred to the other end. The RTP termination converts the linear samples to NTE packet with negotiated NTE payload.</td>
</tr>
</tbody>
</table>
**Chapter 7      VXSM as a Transcoding Gateway**

**T38-VBD Interworking for Fax Over IP**

In an IP network, a fax can be transmitted either through the T.38 fax relay mode or through the T.30 fax pass-through mode. T.38 fax relay works only between two T.38 fax devices. These devices are called Internet Aware Fax (IAF) devices, and it is capable of initiating or completing a fax call in an IP network. When both the devices are non-IAF, then the fax can be transmitted only through the T.30 fax pass-through mode. In cases, where one device is IAF, and the other device is non-IAF, an intermediate node or transcoding gateway is required for transcoding the data streams between the IAF device and the non-IAF device. VXSM acts as a transcoding gateway to provide this interworking functionality.

**Restrictions and Usage Guidelines**

Follow these restrictions and guidelines when you configure the T38-VBD Interworking:

- VXSM supports T38-VBD interworking only in CA-controlled mode.
- VXSM supports T38-VBD transcoding in all the codec templates for H248.
- VXSM supports only three codecs for VBD (G711U, G711A, and CCD).
- VXSM supports T38-VBD transcoding only in the normal mode, not in the fast route or transparent mode.
- The maximum number of T38-VBD sessions is restricted to the supported DSP capacity for each template.
- VXSM supports T38-VBD transcoding for existing IP-IP call.
- VXSM does not support the journaling of T38-VBD transcoding calls to standby.

For configuration details, refer to Configuring Transcoding Resources, page 7-5