

# InnoMedia ESBC 9378/9578

## Transcoding Features

### Application Notes

The purpose of this application note is to describe the steps needed to configure FAX, DTMF and Voice Codec transcoding for proper operation in a SIP Trunking Application with the InnoMedia 9378/9578 ESBC.

#### Related Documents

Name of Document	Location
ESBC Administrator's Guide	<a href="http://www.innomedia.com/support_manuals.shtml">http://www.innomedia.com/support_manuals.shtml</a>

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## About This Document

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The InnoMedia ESBC Enterprise Session Border Controller is a device that provides SIP Trunking services and broadband Internet access. Designed for ease of installation and use, the InnoMedia ESBC will allow the operator to place SIP Trunking calls as well as receive regular telephone and fax calls.

The purpose of this guide is to provide an application note of a specific feature or application of the Enterprise Session Border Controller. This document will account for use cases, configuration and important notes. For detailed configuration of the ESBC, please refer to the Administrator's Manual.



## Table of Contents

About This Document .....	2
Table of Contents .....	3
Application Notes .....	4
1. Introduction .....	4
2. Required Hardware for Transcoding Feature.....	4
3. Configuring Transcoding Profile .....	4
3.1 Adding or Editing Profiles .....	5
3.2 DTMF Mode .....	6
3.3 Extended CODEC.....	6
4. Examples for Voice and DTMF Transcoding .....	7
4.1 VOICE CODEC Transcoding.....	7
4.2 DTMF Transcoding .....	8
5. ESBC FAX Transcoding: Egress FAX Setting .....	10
5.1 Definitions .....	10
5.2 ESBC Fax Transcoding Configurations.....	10
6. Suggested Configurations of ESBC transcoding modes for Desired and Typical Scenarios .....	14
7. Examples of FAX Call Flows .....	15
7.1 Case 1.1 .....	15
7.2 Case 1.2.....	16
7.3 Case 2.....	17
7.4 Case 3.....	18
7.5 Case 4.....	19
7.6 Case 5.....	20



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## Application Notes

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### 1. Introduction

The media transcoding feature offered in InnoMedia ESBC products provides a solution to the problem where the Service Provider supports different media capabilities to those of the end device located at the enterprise. The ESBC provides the ability to transcode between the following media capabilities: Fax (T.38 and G.711), Voice CODECs (G.711, G.729, G.726), and DTMF (RFC2833 and In-band). By configuring the ESBC, it is possible to allow different forms of SIP signaling negotiation between the Service Provider side and the Enterprise side before media transcoding takes place.

### 2. Required Hardware for Transcoding Feature

The transcoding feature is only enabled on the following ESBC Models: ESBC9378-4B and ESBC9578-4B. With these models, there are maximum capabilities for the number of transcoding sessions per device:

- 60 maximum DTMF/CODEC Transcoding sessions
- 24 maximum Fax Transcoding sessions.  
When “Allow calls even when transcoding resources are exhausted” is checked and the 24 FAX transcoding sessions are fully utilized, further FAX calls can still be made but without T.38-G.711 transcoding capability (see Figure 2 Transcoding Mode Selections).

NOTE: Simultaneous CODEC Transcoding sessions and FAX Transcoding sessions will reduce the maximum transcoding capability per device.

### 3. Configuring Transcoding Profile

The Transcoding Profile screen allows the profile list and the default profile to be managed. It also provides access to the Profile configuration screen, which allows the system administrator to configure Fax, CODEC or DTMF transcoding settings between the WAN and LAN side of the ESBC.

To configure the Transcoding Profile, follow these steps:

1. Login to the ESBC as “admin” through the web console
2. Go to the page at “Telephony → ADVANCED → Transcoding Profile”.

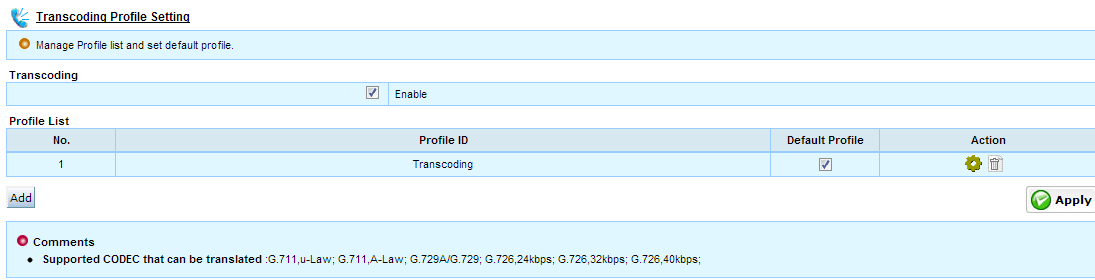



Figure 1 Enabling Transcoding Profile

### 3.1 Adding or Editing Profiles

To add a Transcoding Profile, click the <Add> button and then click the <Setting>  button to configure Transcoding parameters. Individual profiles can be created with different configurations for a specific SIP UA or a group of SIP UAs to use.

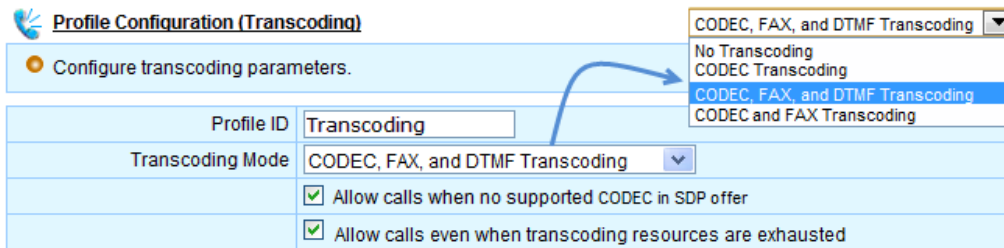


Figure 2 Transcoding Mode Selections

In the Profile Configuration screen, modify the Profile ID and select one Transcoding Mode option from the drop-down list that a SIP UA group can use:

Transcoding Mode	
Item Name	Description
Not Required	Transcoding is disabled on these UAs.
CODEC Transcoding	This setting only allows CODEC transcoding. CODEC transcoding only happens if there are no common CODECs between the caller and called UAs. Fax and DTMF transcoding will not be performed.
CODEC, FAX, and DTMF Transcoding	Fax, DTMF and CODEC transcoding for all calls.
CODEC, and FAX Transcoding	Fax, CODEC transcoding for all calls, but no DTMF transcoding.
Transcoding Option	
Item Name	Description
Allow calls when no supported CODEC in SDP	ESBC will allow SDP offer to pass through even if the codec is not in the Extended CODEC list (see section 3.3). In this case,



offer	no transcoding will take place, but this feature allows unsupported transcoding codecs (eg G.723.1) to be negotiated end-to-end between Enterprise and Service Provider SIP UA's.
Allow calls even when transcoding resources are exhausted	When selected, the ESBC will allow calls to be processed even if there may not be enough channels to process transcoding. The calls will go through but the media may not be transcoded.

## 3.2 DTMF Mode

Supported DTMF modes: RFC2833 and In-band DTMF.

DTMF transcoding can be activated only when “CODEC, FAX, and DTMF Transcoding” is selected. Select the appropriate “DTMF Mode” for the ESBC LAN side SIP UA and WAN side SIP UA as follows:

- If the SIP UA supports only in-band DTMF, then “In-band” should be selected towards this UA.
- If the SIP UA supports both in-band DTMF and RFC2833, then either “In-band” or “RFC2833” may be selected, depending on the desired result.

## 3.3 Extended CODEC

When configuring the ‘Extended CODEC’ list (see **Figure 3**), the selection is based on the supported CODEC for that side of the ESBC’s interface. The ESBC can be configured to add certain codec capabilities to transcoding profiles, and then perform transcoding in cases where the selected codec in the answer SDP is not available in the original offer.

### 3.3.1 Possible Deployment Scenario of Voice Codec Transcoding

- When the Service Provider network only supports G.711 u-law, then only that CODEC is configured for the ESBC WAN extended codec list.
- When the PBX on the ESBC LAN network only supports G.729, then only that CODEC is configured for the ESBC LAN extended codec list.

In this scenario, an outgoing call from the PBX advertises only G.729 in the SDP offer, then the ESBC will add G.711 u-law in the SDP offer when sending out SIP messages to the Service Provider.

An Incoming call from the Service Provider advertises only G.711 u-law in the SDP offer, then the ESBC will add G.729 in the SDP offer when sending out SIP messages to the PBX in the LAN direction.

Once the call is established, the ESBC will transcode the media in both directions with the supported CODECs.



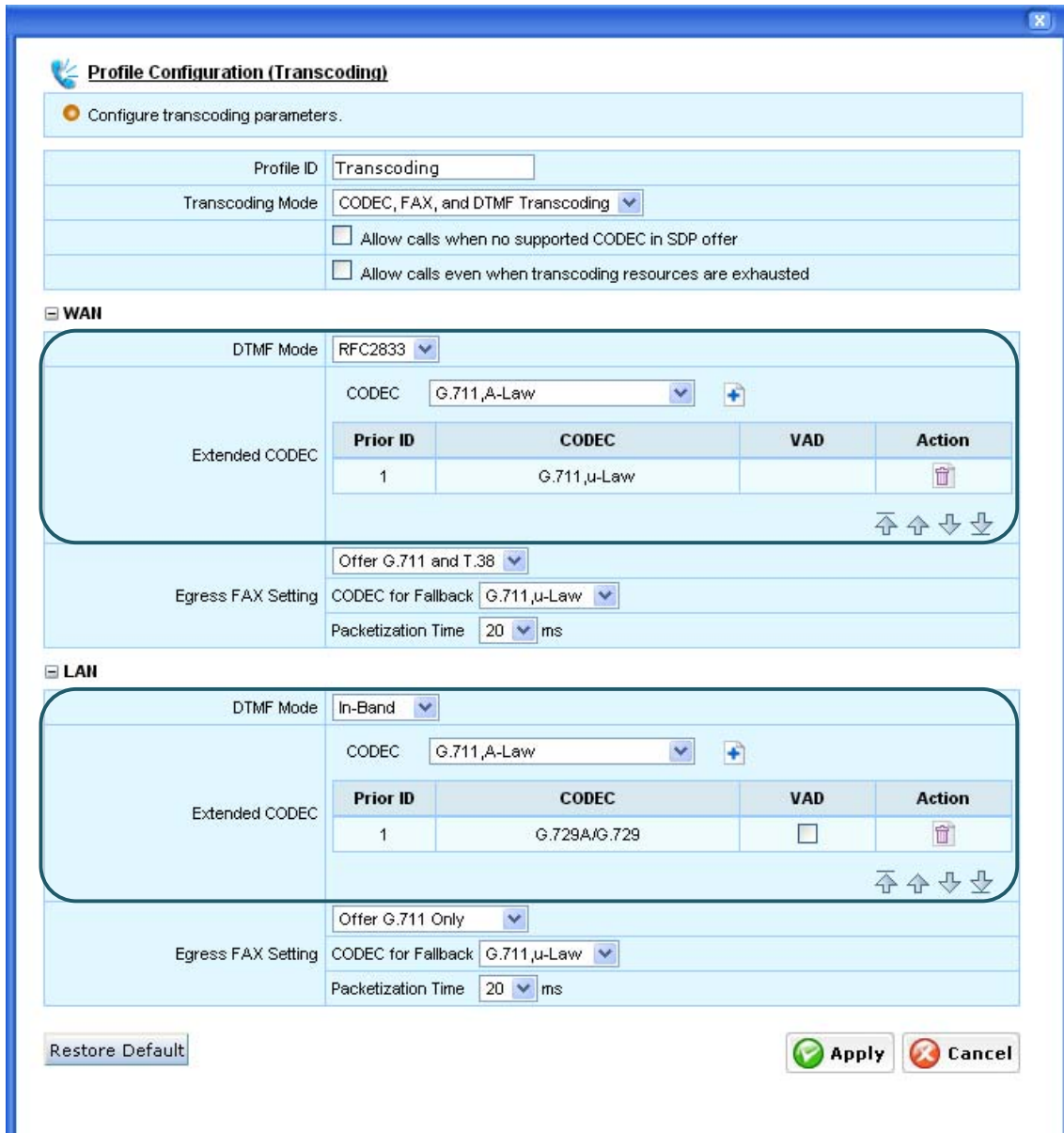


Figure 3. DTMF and Voice Transcoding (Extended CODEC) configurations

## 4. Examples for Voice and DTMF Transcoding

When Transcoding Mode is set to “CODEC, FAX, and DTMF Transcoding”, the ESBC will perform Fax, CODEC and DTMF transcoding between the WAN and LAN SIP UAs of the ESBC.

### 4.1 VOICE CODEC Transcoding

When two SIP user agents on the WAN and LAN sides have no common CODECs, the call cannot be established without transcoding. Using the transcoding feature, the ESBC can manipulate an

SDP message by adding codecs and perform transcoding in cases where the codec in the answer SDP does not appear in the original offer.

The ESBC uses the 'Extended CODEC' list and adds these CODECs into the SDP offer (if not already present) and sends the modified SDP offer to the terminating user agent (the called party). When the call is established, the ESBC will perform CODEC transcoding.

In the example above, only G.711 u-law is offered in the SDP from the Service Provider UA, then the ESBC will add G.729 to the SDP offer to the Enterprise UA. If the Enterprise UA selects G.729 in its SDP answer, then the ESBC will perform CODEC transcoding (G.711 u-law on the WAN and G.729 on the LAN).

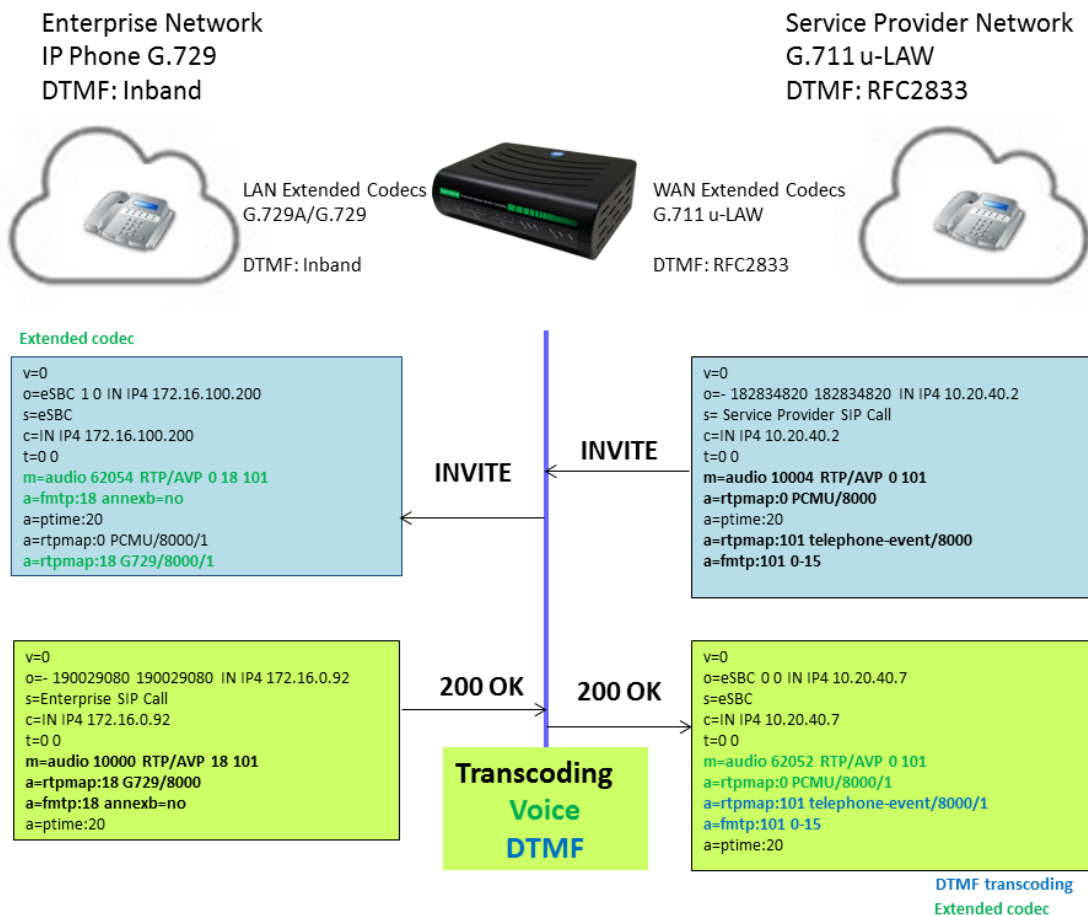


Figure 4 Voice and DTMF Transcoding SDP Negotiation

## 4.2 DTMF Transcoding

In addition to CODEC Transcoding, the ESBC is able to perform DTMF transcoding between the SIP UAs on both the WAN and LAN sides. The DTMF mode can be either 'In-band' or 'RFC2833'. In the example configuration above, the ESBC will perform RFC2833 (out of band) DTMF on the WAN side (Service Provider side), and in-band DTMF on the LAN side to the PBX.



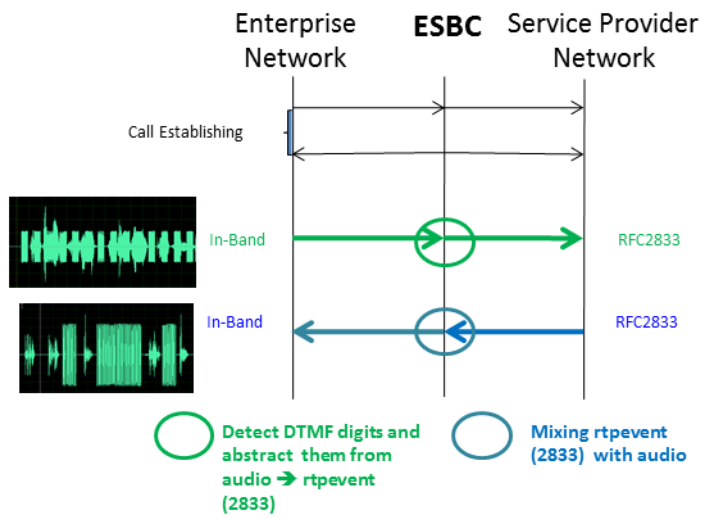


Figure 5 DTMF transcoding: G.711 in-band and RFC2833 processes

## 5. ESBC FAX Transcoding: Egress FAX Setting

### 5.1 Definitions

The two common ways to transport fax over IP are the T.38 standard and the G.711 voice codec. In G.711, fax signals are sent as tones whereas, in T.38, the fax tones are decoded and sent as packets and then recoded at the other end. The decoding and recoding will be done by FAX adaptors at either end of the fax transmission path. These fax adaptors can either be T.38-enabled SIP gateways connected to conventional fax machines, or the fax adaptors can be an inherent part of an IP-FAX device.

The ESBC performs FAX transcoding based on an SDP Offer-Answer negotiation. When configuring the Egress FAX Setting as shown in Figure 7, the ESBC can change its egress SDP signaling using the following three options:

Egress FAX Setting	Description
Passthrough	ESBC allows both LAN UA and WAN UA endpoints to negotiate SDP themselves
Offer G.711 Only	ESBC removes the T.38 codec from the egress SDP offer.
Offer G.711 and T.38	ESBC sends two "m=" lines in its egress SDP including both T.38 and G.711

Note: When offered two "m=" lines in SDP, some FAX adaptors will choose the first "m=" line, regardless of the content of the two lines.

### 5.2 ESBC Fax Transcoding Configurations

#### 5.2.1 Trunk SIP Profile Configurations

The Trunk SIP Profile page contains a couple of configuration items (see Figure 6) that affect the behavior of FAX transcoding:

1. When **"Allow T.38 on WAN side" is unchecked**, the ESBC will remove/disable any T.38 FAX related SDP on the WAN egress towards the Service Provider UA, no matter whether the T.38 request is initiated from the WAN or LAN interfaces. In this case, any T.38-only SDP offer received from the WAN side UA will be rejected, and the UA may re-INVITE again with G.711 only.
2. When **"Remove other media types when sending T.38 offer"** is checked, the ESBC will only offer T.38 on the WAN egress towards the Service Provider UA, even if 'Offer G.711 and T.38' is selected for the WAN Egress FAX Setting.

Note: These settings affect SDP that is sent on the WAN egress towards the Service Provider UA both for the initial INVITE and also any re-INVITE related to fax detection. This is in contrast to



the Egress FAX Setting settings discussed in section 5.1 which only affect the re-INVITE Offer SDP.

### 5.2.2 Transcoding Profile Configurations

To allow FAX Transcoding, the Egress FAX Setting must be selected for both WAN and LAN sides as shown in Figure 7. This will allow the following steps to take place:

1. The ESBC starts processing FAX transcoding flows only when FAX transmission is detected.
2. When FAX transmission is detected by the FAX adaptor on **ONE SIDE** of the fax transmission (usually the receiving side), this side initiates T.38 FAX requests by sending a reINVITE with T.38 information to the ESBC. The ESBC will attempt to honor the T.38 FAX offer from this FAX adaptor .
3. When the condition of item 2 occurs, the ESBC forwards the FAX transmission request to the fax adaptor on the **OTHER SIDE**, according to the ESBC **Egress FAX Setting Rules** given below:
  - If **Offer G.711 and T.38** is selected, then the ESBC offers two transmission modes (T.38 and G.711) and allows the FAX adaptor to choose which FAX mode to use.
  - If **Offer G.711 Only** is selected, then the ESBC offers only G.711 transmission mode to the FAX adaptor.
  - If **Passthrough** is selected on either side, then the ESBC will let the FAX Adaptors determine the final fax transmission mode by allowing both endpoints to negotiate SDP between them.

Note:

T.38 does not indicate which party (calling party or called party) is responsible for detecting that a FAX transmission is being attempted and initiating the switch from audio mode to T.38 mode by sending reINVITE carrying T.38 information. That is, either calling party or called party may initiates T.38 FAX requests.



Set From header for Outgoing calls	Use Alternate Identity
Set Identity header for Outgoing calls	NONE
Get Caller ID from SIP Header if exists	<input checked="" type="checkbox"/> P-Asserted-Identity
	<input checked="" type="checkbox"/> Remote-Party-ID
Forward SIP Header to SIP Server	<input checked="" type="checkbox"/> Alert-Info
	<input checked="" type="checkbox"/> History-Info
	<input checked="" type="checkbox"/> Diversion
	<input type="checkbox"/> Add "Allow-event: vq-rtcpxr" into REGISTER
	<input checked="" type="checkbox"/> Forward DTMF in SIP INFO to SIP Server
	<input checked="" type="checkbox"/> Strip ICE Attributes
	<input type="checkbox"/> Use RFC 2543 Hold
	<input type="checkbox"/> Remove Contact and Record-Route Headers in 180 Responses
	<input type="checkbox"/> Enable rinstance
	<input checked="" type="checkbox"/> Reuse TLS connection
	<input type="checkbox"/> Use "lr=true" for loose routing
	<input type="checkbox"/> Reject all received REFER
	<input type="checkbox"/> Force send REFER even if the peer not add REFER in the Allow header
	<input type="checkbox"/> Remove other media types when sending T.38 offer
	<input checked="" type="checkbox"/> Allow T.38 on WAN side
Order of sending Re-INVITES	Send re-INVITES all the way directly
Method of processing INVITE without SDP	Send INVITES without SDP
Method of processing re-INVITE without SDP	Send re-INVITES without SDP
	<input type="checkbox"/> Accept RTP/AVP with sdescriptions offer
SDP with Secure Descriptions	Transmit sdescription transparent
	<input type="checkbox"/> Use Main Public Identity in Contact Header
<input type="checkbox"/> Trunk Group Identifier	tgrp <input type="text"/>
	trunk-context <input type="text"/>
P-Access-Network-Info Header	<input type="text"/>

Figure 6. Processing T.38 FAX settings on ESBC Trunk SIP Profile page

Profile ID: Transcoding

Transcoding Mode: CODEC, FAX, and DTMF Transcoding

Allow calls when no supported CODEC in SDP offer

Allow calls even when transcoding resources are exhausted

**WAN**

DTMF Mode: RFC2833

CODEC: G.711,A-Law

Prior ID	CODEC	VAD	Action
1	G.711,µ-Law		

Offer G.711 and T.38

Egress FAX Setting: CODEC for Fallback: G.711,µ-Law

Packetization Time: 20 ms

**LAN**

DTMF Mode: In-Band

CODEC: G.711,A-Law

Prior ID	CODEC	VAD	Action
1	G.729A/G.729	<input type="checkbox"/>	

Offer G.711 Only

Egress FAX Setting: CODEC for Fallback: G.711,µ-Law

Packetization Time: 20 ms

Offer G.711 Only  
Passthrough  
Offer G.711 Only  
Offer G.711 and T.38

Restore Default

Apply Cancel

Figure 7 ESBC FAX Transcoding Configuration Page



## 6. Suggested Configurations of ESBC transcoding modes for Desired and Typical Scenarios

Desired transmission mode	Configuration Settings		
	Trunk SIP Profile setting "Allow T.38 on WAN side"	WAN side Egress FAX Setting	LAN side Egress FAX Setting
Only G.711 allowed on the WAN side	Unchecked	Any	NA
WAN side fax transmission based on capabilities of WAN side UA	Checked	Offer G.711 and T.38	NA
LAN side fax transmission based on capabilities of LAN side UA	NA	NA	Offer G.711 and T.38



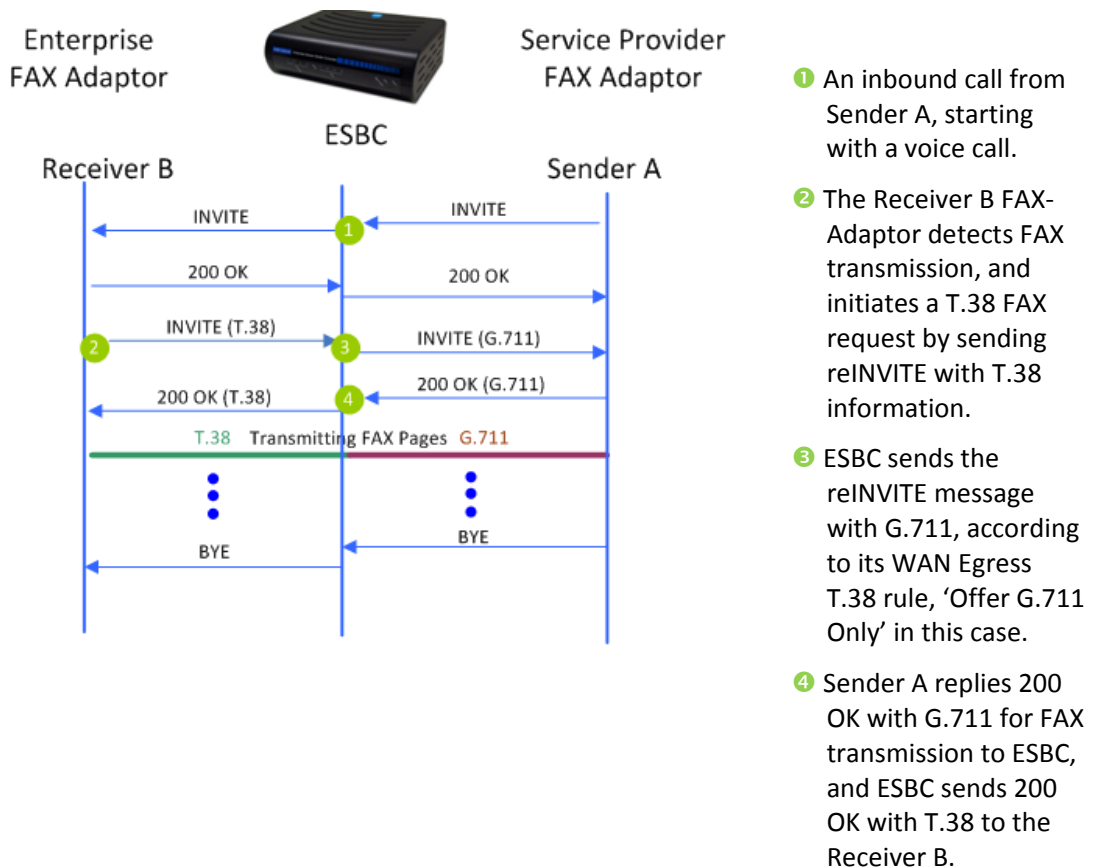
## 7. Examples of FAX Call Flows

When the ESBC detects transcoding is required, it determines the mode of the Fax Transcoding based on its configuration.

### 7.1 Case 1.1

Receiver initiates T.38 reINVITE

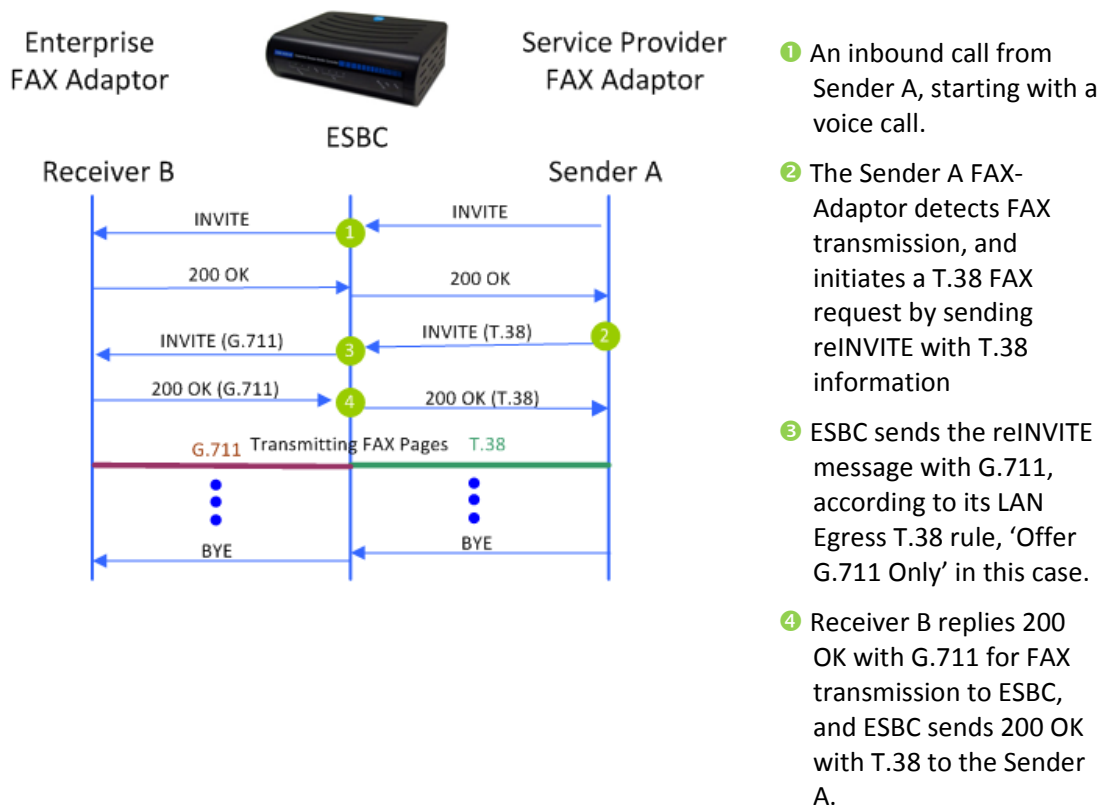
Allow T.38 on WAN Side	Checked	
Direction	Inbound	
	LAN	WAN
FAX Adaptor Capability	T.38 capable	T.38 capable
ESBC Egress FAX Setting	Offer G.711 and T.38	Offer G.711 Only
Results	T.38	G.711



## 7.2 Case 1.2

Sender initiates T.38 reINVITE

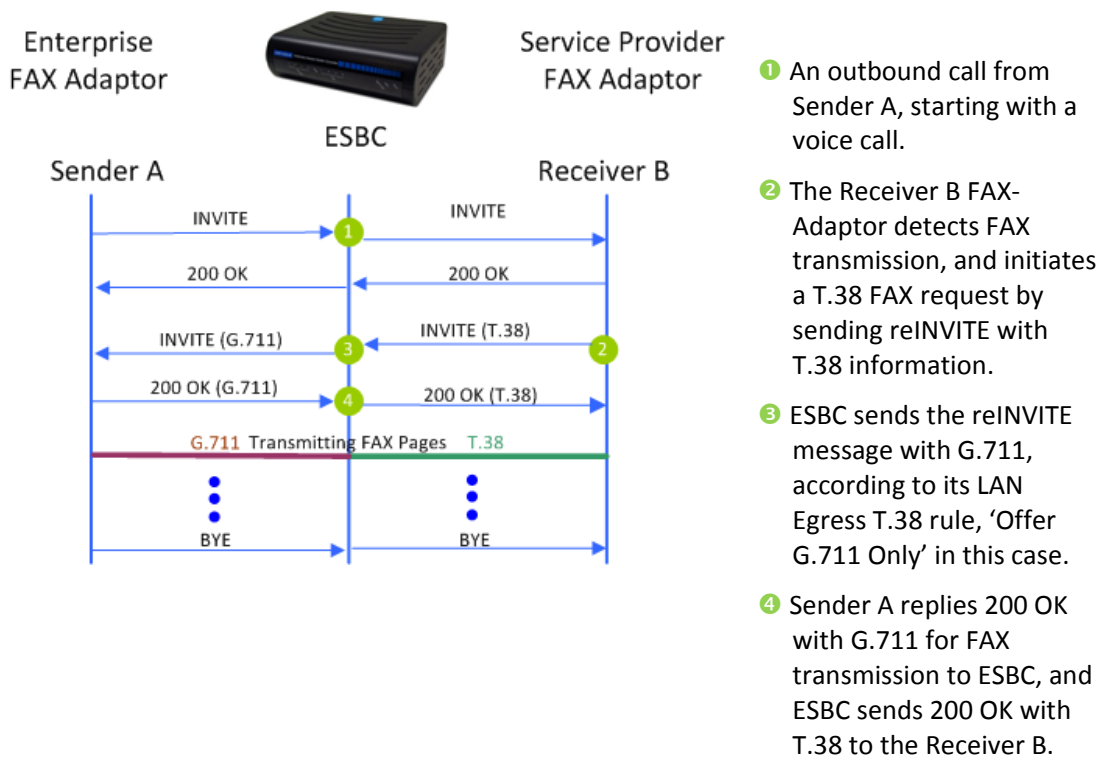
Allow T.38 on WAN Side	Checked	
Direction	Inbound	
	LAN	WAN
FAX Adaptor Capability	T.38 capable	T.38 capable
ESBC Egress FAX Setting	Offer G.711 Only	Offer G.711 Only
Results	G.711	T.38





### 7.3 Case 2

Allow T.38 on WAN Side	Checked	
Direction	Outbound	
	LAN	WAN
FAX Adaptor Capability	T.38 capable	T.38 capable
ESBC Egress FAX Setting	Offer G.711 Only	Offer G.711 and T.38
Results	G.711	T.38

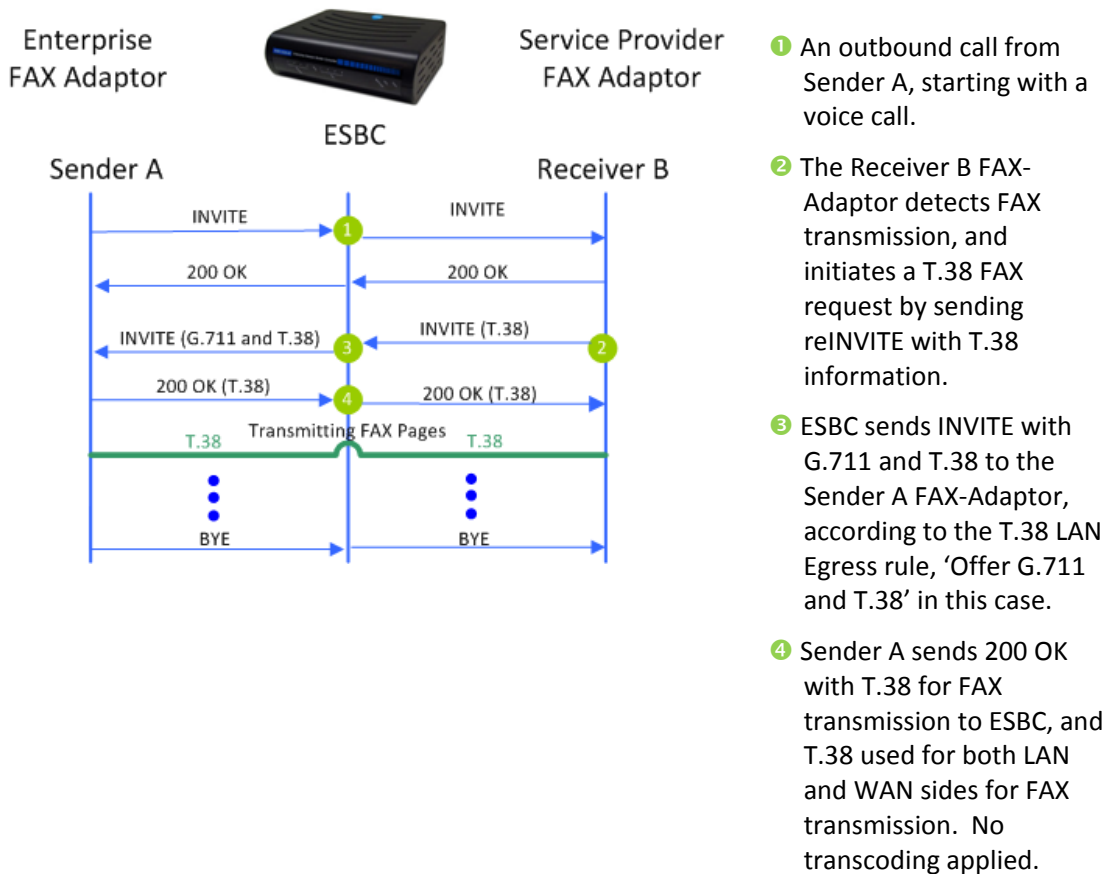


- 1 An outbound call from Sender A, starting with a voice call.
- 2 The Receiver B FAX-Adaptor detects FAX transmission, and initiates a T.38 FAX request by sending reINVITE with T.38 information.
- 3 ESBC sends the reINVITE message with G.711, according to its LAN Egress T.38 rule, 'Offer G.711 Only' in this case.
- 4 Sender A replies 200 OK with G.711 for FAX transmission to ESBC, and ESBC sends 200 OK with T.38 to the Receiver B.



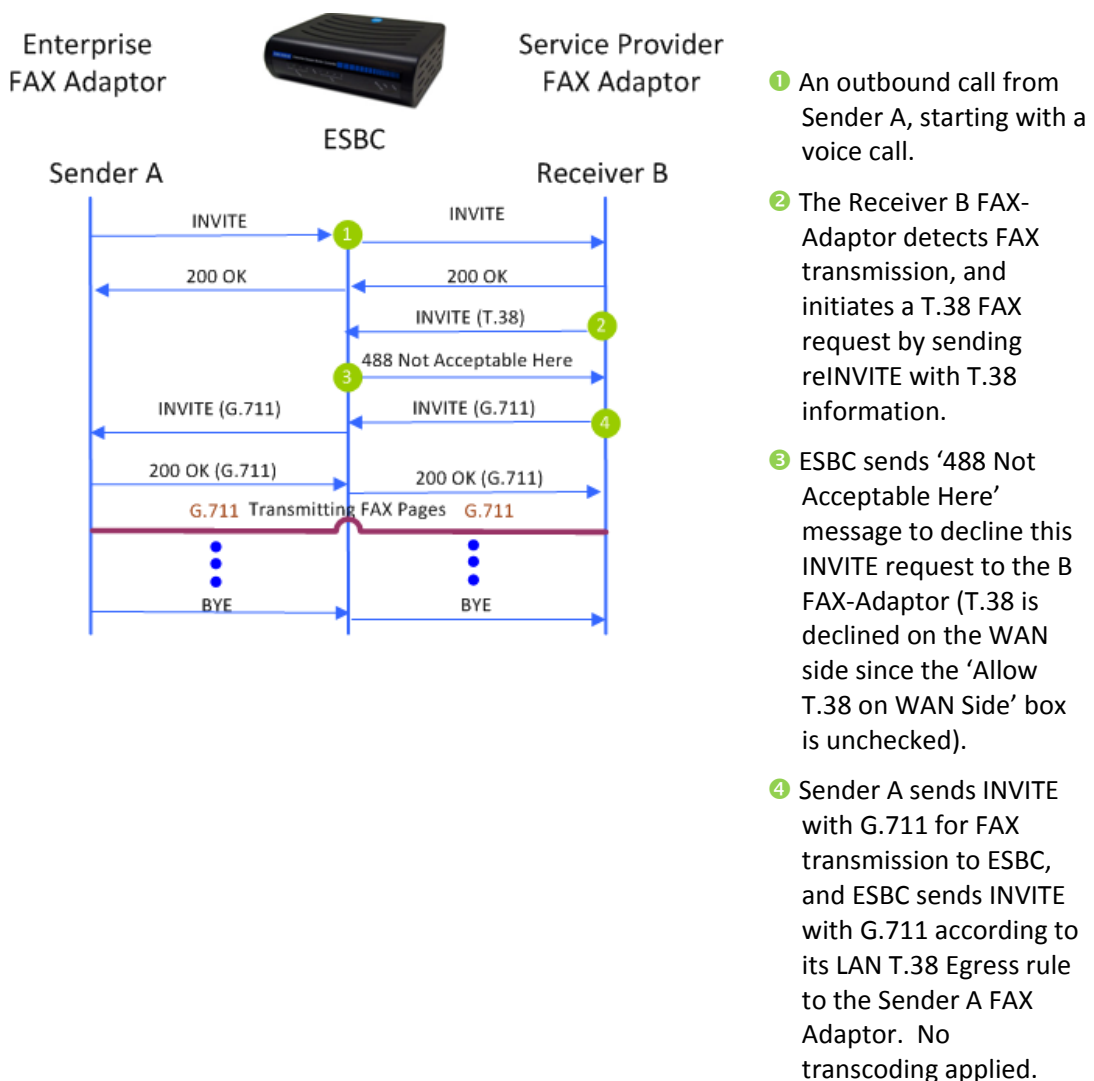
### 7.4 Case 3

Allow T.38 on WAN Side	Checked	
Direction	Outbound	
	LAN	WAN
FAX Adaptor Capability	T.38 capable	T.38 capable
ESBC Egress FAX Setting	Offer G.711 and T.38	Offer G.711 Only
Results	T.38	T.38



### 7.5 Case 4

Allow T.38 on WAN Side	Unchecked	
Direction	Outbound	
	LAN	WAN
FAX Adaptor Capability	T.38 capable	T.38 capable
ESBC Egress FAX Setting	Offer G.711 Only	Offer G.711 and T.38
Results	G.711	G.711



- 1 An outbound call from Sender A, starting with a voice call.
- 2 The Receiver B FAX-Adaptor detects FAX transmission, and initiates a T.38 FAX request by sending reINVITE with T.38 information.
- 3 ESBC sends '488 Not Acceptable Here' message to decline this INVITE request to the B FAX-Adaptor (T.38 is declined on the WAN side since the 'Allow T.38 on WAN Side' box is unchecked).
- 4 Sender A sends INVITE with G.711 for FAX transmission to ESBC, and ESBC sends INVITE with G.711 according to its LAN T.38 Egress rule to the Sender A FAX Adaptor. No transcoding applied.



### 7.6 Case 5

Allow T.38 on WAN Side	Unchecked	
Direction	Inbound	
	LAN	WAN
FAX Adaptor Capability	T.38 capable	T.38 capable
ESBC Egress FAX Setting	Offer G.711 and T.38	Offer G.711 and T.38
Results	T.38	G.711

