

Tones and Announcements

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Related articles:

- [DSP Channel Densities for SBC 5000 and 7000 Series](#)
- [Media Profile - CLI](#)
- [Tone Profile - CLI](#)
- [Tone and Announcement Profile - CLI](#)
- [Profile Management - Media Profiles \(EMA\)](#)
- [Tone And Announcement Profile - Tone And Announcement \(EMA\)](#)
- [Media Profiles - Tone Profile, Media - Tone Profile \(EMA\)](#)
- [PSX Manager User Guide](#)
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The SBC Core supports playing announcements, tones, and collecting digits.

Tone and Announcement Profile

Tones and announcements are configured by allocating a percentage of DSP cores to tones/announcements. If no transcoding is used, you may allocate up to 100% toward tones/announcements.

See [DSP Channel Densities for SBC 5000 and 7000 Series](#) for a comparison of different DSP card configurations for SBC 5000 series and SBC 7000 systems.

Announcements are customized by provisioning announcement packages using Media Profile on the SBC. An announcement package supports provisioning of up to 16 announcement names to segment ID mapping. For more information on configuring Media Profiles, see [Media Profile - CLI](#) or [Profile Management - Media Profiles](#).

When using an external PSX, the PSX returns the tones/announcement profile and announcement or tone to be played in policy/trigger response. The SBC plays out the specified announcement/tone using the specified profile.

Announcement files are stored in the directory: `/var/log/sonus/evlog/announcements`

For more information on configuring tones and announcements, see following:

- [CLI: Tone and Announcement Profile - CLI](#)
- [EMA: Tone And Announcement Profile - Tone And Announcement](#)



When the SBC is configured to use an external PSX, there may be instances when hunt groups, or Automatic Call Distribution (ACD) groups, do not always operate as expected when the Tone and Announcement profile is used. A call can remain on-hold even after answering the call. PSX 09.02.01R000 and later can be configured using the parameters `End To End Ack` and `No CDR Change In End To End Ack` to resolve this. `End To End Ack` must be enabled before enabling `No CDR Change In End To End Ack` flag. See [PSX Manager User Guide](#) for configuration details.

Tone Profile

The SBC supports a default tone package with a package ID of "1". The default package contains the following default tone profile definitions.

- defBusy
- defCallWaiting1
- defCallWaiting2
- defCallWaiting3
- defCallWaiting4
- defCpeAlerting
- defDial
- defReorder
- defRing
- defSit1
- defSit2
- defSit3
- fccBusy
- fccDial
- fccRingback

Tones are customized by provisioning tone packages and tone profiles. The tone profile feature supports tone generation methods as described in Table 1.

For details to configure tone profiles, see below:

- CLI: [Tone Profile - CLI](#)
- EMA: [Media Profiles - Tone Profile](#), [Media - Tone Profile](#)

Table 1: Tone Profile Generation Methods

Tone Type	Tones	Frequency	Power	Details
Single Tone	1	0-3999 Hertz	(-50 to +3) dBm	
Dual Tone	1, 2	0-3999 Hertz	(-50 to +3) dBm	
Composite Tone	1, 2, 3, 4	N/A	N/A	<ul style="list-style-type: none"> • Cadences to which each tone is applied • Decay time constant in milliseconds • Decay frequency delta in Hz/second • Decay tone bit map of tones against which decay/frequency rate change are applied
Modulated Tone	N/A	<ul style="list-style-type: none"> • Carrier Frequency • Signal Frequency • Carrier Power • Signal Modulation Index 	N/A	

Local Ring Back Tones (LRBT)

The SBC Core is configurable to support LRBT as described below:

The SBC generates LRBT in the following conditions:

- Start LRBT upon receipt of 180 without SDP, the SBC.
- Halt LRBT upon receipt of any18x with SDP or any final response.

- Stop LRBT without waiting for media packet arrival.

The SBC supports the following dynamic LRBT functionality related to RFC 3960:

- Do not generate local ringing unless a 180 ringing response with SDP is received.
- Generate local ringing if a 180 ringing is received but no incoming media packets are present from the UAS.
- If incoming media packets are received from the UAS, play incoming packets and stop playing the tone.

When configured to operate with an external PSX, local ring back tones are provisioned on the PSX on a per-trunk group basis. The PSX returns this information in a policy response.

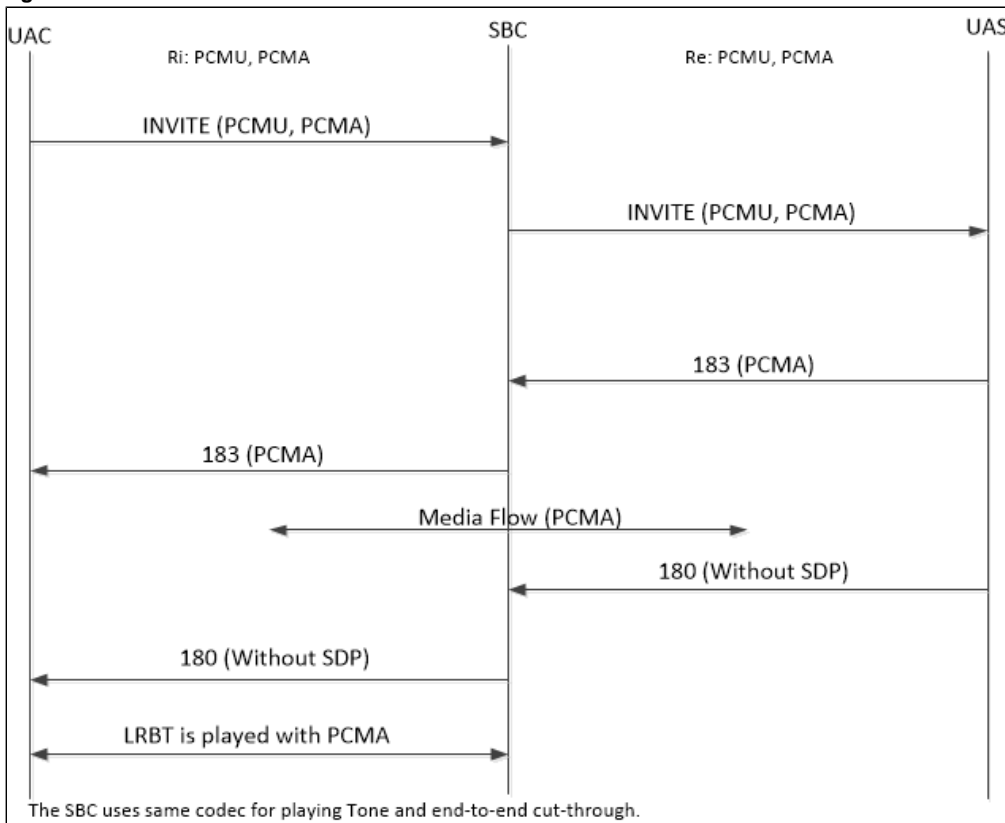
In a pass-through call scenario, the SBC is prevented from selecting the preferred codec of the ingress offer to play the LRBT. The ingress offer codec may differ from the early answer codec that is used for the end-to-end cut-through, and this change in codec can cause a media glitch to the ingress user. The SBC instead plays the LRBT with the same codec as the early answer codec that was received from egress (see the following call flow). The end-to-end cut-through also uses the codec that plays the LRBT. The codec used between early media and to play tones therefore remains consistent.

Note

The call flow has the following configurations:

- UAC and UAS supports PCMU and PCMA
- Honor Remote Precedence is Enabled
- LRBT is enabled

Figure 1: SBC LRBT Call Flow



Note

In a transcode call scenario, the SBC selects the preferred codec of the ingress offer to play the LRBT because there is no common codec between ingress and egress.

Playing Tones as Announcements

The SBC Core supports playing announcements that are stored in G.711ULaw format. The SBC Core is enhanced to support playing compressed tones directly without allocating DSP resources by playing the tones from the pre-encoded files with various combinations of tones and codec types. The tone files are created for the required tone types with different codec combinations and stored as .wav files in the SBC. All these tones are stored with a ptime of 20 milliseconds.


The SBC Core includes the media profile `tonesAsAnnouncement` which uses the following parameters to configure the announcement file to play LRBT for each codec entry:

- `toneType`
- `codecType`
- `segmentId`

The existing Tone Profile references the `toneType` in the `tonesAsAnnouncement` profile, whereas the new object `toneCodecEntry` references the `codecType`. With this enhancement, the user can associate default Tone Profile or can create a customized Tone Profile and assign it to the `toneType` of the `toneAsAnnouncementProfile`. The flag `announcementBasedTones` is included in `toneAndAnnouncementProfile` configuration to play LRBT without using DSP resources.

The SBC supports playing tones for seven groups of codecs. If the required tone playback falls under one of the following codecs and the flag `announcementBasedTones` is enabled, the SBC must avoid allocating DSP resources and play a tone as an announcement. If the required tone playback does not fall under one of the following codecs and the flag `announcementBasedTones` is enabled, the SBC does not fall back to the DSP mode and continues the call without playing the tones.

- G.711 (G.711ALaw and G.711ULaw)
- G.722
- EVRC (EVRC, EVRC0, EVRCB, and EVRCB0)
- `amrwbBandwidthEfficient` (AMR-WB-BWE, 9 variants)
- `amrwbOctetAligned` (AMR-WB-OA, 9 variants)
- `amrBandwidthEfficient` (AMR-NB-BWE, 8 variants)
- `amrOctetAligned` (AMR-NB-OA, 8 variants)

 The SBC supports playing default ringtones with 41 different types of codec variants.

The compressed tone files are stored in the standard .wav file format. The SBC uses the same naming convention for the compressed tone files as the announcement files. For example, in a `sDDDDD.wav` file, where DDDDD is a decimal number from 1 to 65,535, the decimal number represents the segment ID of the file.

The announcement and the tone files share the 5-bit segment ID space, and thus, every file name must have a unique segment ID. The compressed tone files are stored in the same directory path as the announcement files (`/var/log/sonus/sbx/announcements`). The tone file is played continuously until the tone is stopped due to a trigger.

The following table provides the .wav file mapping information for the application announcements:

Table 2: Application Announcements

File Name	Announcement ID	RBT	Audio Message
s20001.wav	20001	RBT_MULAW	US Ring Back Tone
s20002.wav	20002	RBT_ALAW	US Ring Back Tone
s20003.wav	20003	RBT_EVRC (interleaved mode)	US Ring Back Tone
s20004.wav	20004	RBT_EVRCB (interleaved mode)	US Ring Back Tone
s20005.wav	20005	RBT_AMRWBBE_6_6K	US Ring Back Tone
s20006.wav	20006	RBT_AMRWBBE_8_85K	US Ring Back Tone
s20007.wav	20007	RBT_AMRWBBE_12_65K	US Ring Back Tone
s20008.wav	20008	RBT_AMRWBBE_14_25K	US Ring Back Tone

s20009.wav	20009	RBT_AMRWBBE_15_85K	US Ring Back Tone
s20010.wav	20010	RBT_AMRWBBE_18_25K	US Ring Back Tone
s20011.wav	20011	RBT_AMRWBBE_19_85K	US Ring Back Tone
s20012.wav	20012	RBT_AMRWBBE_23_05K	US Ring Back Tone
s20013.wav	20013	RBT_AMRWBBE_23_85K	US Ring Back Tone
s20014.wav	20014	RBT_EVRC0 (Header free packet mode)	US Ring Back Tone
s20015.wav	20015	RBT_EVRCB0 (Header free packet mode)	US Ring Back Tone
s20016.wav	20016	RBT_AMRWBOA_6_6K	US Ring Back Tone
s20017.wav	20017	RBT_AMRWBOA_8_85K	US Ring Back Tone
s20018.wav	20018	RBT_AMRWBOA_12_65K	US Ring Back Tone
s20019.wav	20019	RBT_AMRWBOA_14_25K	US Ring Back Tone
s20020.wav	20020	RBT_AMRWBOA_15_85K	US Ring Back Tone
s20021.wav	20021	RBT_AMRWBOA_18_25K	US Ring Back Tone
s20022.wav	20022	RBT_AMRWBOA_19_85K	US Ring Back Tone
s20023.wav	20023	RBT_AMRWBOA_23_05K	US Ring Back Tone
s20024.wav	20024	RBT_AMRWBOA_23_85K	US Ring Back Tone
s20025.wav	20025	RBT_AMRNBBE_4_7K	US Ring Back Tone
s20026.wav	20026	RBT_AMRNBBE_5_9K	US Ring Back Tone
s20027.wav	20027	RBT_AMRNBBE_5_15K	US Ring Back Tone
s20028.wav	20028	RBT_AMRNBBE_6_7K	US Ring Back Tone
s20029.wav	20029	RBT_AMRNBBE_7_4K	US Ring Back Tone
s20030.wav	20030	RBT_AMRNBBE_7_95K	US Ring Back Tone
s20031.wav	20031	RBT_AMRNBBE_10_2K	US Ring Back Tone
s20032.wav	20032	RBT_AMRNBBE_12_2K	US Ring Back Tone
s20033.wav	20033	RBT_AMRNBOA_4_7K	US Ring Back Tone
s20034.wav	20034	RBT_AMRNBOA_5_9K	US Ring Back Tone
s20035.wav	20035	RBT_AMRNBOA_5_15K	US Ring Back Tone
s20036.wav	20036	RBT_AMRNBOA_6_7K	US Ring Back Tone
s20037.wav	20037	RBT_AMRNBOA_7_4K	US Ring Back Tone
s20038.wav	20038	RBT_AMRNBOA_7_95K	US Ring Back Tone
s20039.wav	20039	RBT_AMRNBOA_10_2K	US Ring Back Tone
s20040.wav	20040	RBT_AMRNBOA_12_2K	US Ring Back Tone
s20041.wav	20041	RBT_G722	US Ring Back Tone



The .wav files for tones other than g711 a and u law are in Sonus proprietary format.

LMSD - Tone Play Support

The SBC supports playing tones when an Alert-Info (AI) header is received in the Legacy Mobile Station Domain (LMSD) format (Alert-Info: <<http://LMSD/tone?sig-id=rt>>). The SBC is enhanced to play the LRBT without using DSP resources whenever it receives 180 with Session Description Protocol (SDP) answer with AI header (Alert-Info: <<http://LMSD/tone?sig-id=rt>>). The AI header, present in the 180 ringing with SDP, carries the tone package information required by the SBC to play LRBT. To support this feature, the existing LRBT framework is enhanced.

The SBC supports generating LRBT when:

- The flag `acceptAlertInfo` is enabled on the egress TG.
- The provisional response is 180 ringing with SDP and the tone flavor is normal.
- The P-Com.DropEarlyMedia header is not present in the original INVITE.
- The SDP answer is received in 180 or in a previous provisional response (183).
- The 180 contains an AI header having sig-id = "rt" only (bt/ct does not play tone).
- The flag `announcementBasedTone` in the `toneAndAnnouncementProfile` associated with the ingress TG is enabled.



Note

The SBC supports fallback to LMSD inter-working state, if the flag `acceptAlertInfo` is enabled and the playing tone is failed. If the flag `acceptAlertInfo` is not enabled, the SBC continues to process the call without playing a tone.

LMSD - Playing Tones Using Lock Down Preferred Codec

The SBC plays tones using the "lock down" preferred codec when the following flags are enabled:

- `sendOnlyPreferredCodec` (IPSP)
- `honorRemotePrecedence` (PSP)
- `announcementBasedTones`

The codec that is used for playing tone towards the ingress leg is based on whether the session is established as pass-through or transcoded. If the SBC receives SDP answer from the egress peer, the selected codec is the egress peer's preferred codec. However, the ingress peer's preferred codec is used to play the tone, if the session outcome is transcoding.



The SBC plays tones when it receives 180 responses with SDP for the egress peer preferred codec. When the 180 response is received without SDP from the egress peer, the SBC plays LRBT based on the existing LRBT implementation using the ingress peer preferred codec.

LMSD - Handling UPDATES for the Tones

The SBC is enhanced to stop playing LRBT upon receipt of any of the following messages:

- UPDATE message with different SDP
- subsequent 183 with SDP
- 200 OK with or without SDP

For more information on Tone and Announcement feature, refer to:

- [Tone and Announcement Alarm for SBC SWe Cloud](#).
- [Tone and Announcement Profile - CLI](#)

Alert-Info and P-Early Media Headers Interworking

The SBC supports the following AI to PEM interworking functionality using the flag `aiToPemInterworking`:

- Interworking between a network supporting AI header (based on the Legacy Mobile Station Domain (LMSD) format) to a network supporting PEM header. The SBC supports interworking irrespective of the existence of a provisioned tone on the SBC.
- Interworking between a network that does not support PEM header to a network that supports PEM header. For example, the ingress network supports PEM header; however, the egress network does not.

- Interworking between networks that support PEM headers.



Note

Tone playing is not dependent upon AI and PEM headers interworking.

When a tone is configured on the SBC,

- If the flag `aiToPemInterworking` is disabled, the SBC plays tone based on the LMSD format. For more information, refer to [Tones and Announcements](#).
- If the flag `aiToPemInterworking` is enabled, the SBC supports interworking between AI and PEM headers. The SBC plays tone when it receives AI header with `sig-id=rt` in the 180 provisioning response (either first 180 response or subsequent 180 response) from the Mobile Switching Center (MSC) (CDMA network).



Note

- When all the tone playing criteria are fulfilled, the SBC inserts PEM header as SENDRECV (PEM: SENDRECV) and sends it towards the ingress network.
- When the SBC fails to play tone, the SBC inserts PEM header as INACTIVE (PEM: INACTIVE) and sends it towards the ingress network.

When tone is not configured on the SBC; and the IPSP flag `acceptAlertInfo` is enabled on the egress TG, and the INVITE message is received with PEM: SUPPORTED,

- If the flag `aiToPemInterworking` is disabled, the SBC falls back to the existing LMSD interworking functionality. For more information, refer to [LMSD Interworking without Tones](#).
- If the flag `aiToPemInterworking` is enabled, the SBC supports interworking between AI header (received in the LMSD format) and PEM header.



Note

- When the User-Agent Server (UAS) plays tone, the SBC inserts PEM header as SENDRECV (PEM: SENDRECV) and sends it towards the ingress network.
- When the User-Agent Client (UAC) plays tone, the SBC inserts PEM header as INACTIVE (PEM: INACTIVE) and sends it towards the ingress network.

P-Early Media to Alert-Info Header Interworking

The SBC supports interworking between a network supporting PEM header to a network supporting AI header. To support this functionality, the flag `aiToPemInterworking` is used in the IP Signaling Profile. The SBC performs PEM to AI interworking once the 180 response is received with PEM header, while forwarding 180 response. If the peer does not explicitly provide early media authorization using a PEM header in 180 response with SDP answer, the SBC monitors the RTP traffic from the egress TG and performs a cut-through if RTP is received from the egress. To support this functionality, the flag `monitorRTP` is added to the SIP Trunk Group.



Note

In case of PEM to AI interworking, the PEM must be supported on the egress leg.

Interworking between PEM and AI Headers

The SBC supports PEM to AI interworking when PEM header is supported on the Trunk Group towards which 180 provisional response message is received and `acceptAlertInfo` flag is enabled on the Trunk Group towards which 180 provisional response message is sent.

- When the SBC receives 180 response with PEM header, while forwarding 180 response:
 - if PEM is inactive and the SBC does not play tone, the SBC inserts AI header with `sig-id=rt`.
 - if PEM is inactive and the SBC plays tone, the SBC inserts AI header with `sig-id=null`.
 - if PEM is `sendrecv` or `sendonly` independent of the SBC is configured to play tone or not, the SBC inserts AI header with `sig-id=null`.

- When the SBC receives 180 response with PEM header, while forwarding 180 response:
 - In case of first 180 response without SDP and PEM is inactive:
 - if the SBC does not play tone, the SBC inserts AI header with sig-id=rt.
 - if the SBC plays tone, the SBC inserts AI header with sig-id=null.
 - In case of subsequent 180 response without SDP and PEM header is not received in previous provisional response, the PEM is assumed to be inactive:
 - if the SBC does not play tone, the SBC inserts AI header with sig-id=rt.
 - if the SBC plays tone, the SBC inserts AI header with sig-id=null.
 - In case of subsequent 180 response with or without SDP and PEM header is received in previous provisional response:
 - if the SBC does not play tone and previous PEM is inactive, the SBC inserts AI header with sig-id=rt.
 - if the SBC does not play tone and previous PEM is sendonly or sendrecv, the SBC inserts AI header with sig-id=null.
 - if the SBC plays tone, the SBC inserts AI header with sig-id=null.

PEM to PEM Interworking

The SBC supports PEM to PEM interworking when PEM header is supported on the Trunk Group towards which 180 provisional response message is received and PEM is supported on the Trunk Group towards which 180 provisional response message is sent.

- When the SBC is not configured to play tone:
 - if the SBC receives 180 response with PEM header, while forwarding 180 response, the SBC relays the received PEM header towards ingress.
 - if the SBC does not receive PEM header, the SBC inserts PEM header based on the SDP direction in 180 provisional response while forwarding 180 response towards ingress.
 - if the SBC does not receive PEM header and the flag `monitorRTP` is enabled, the SBC forwards 180 response without PEM and monitors RTP.
- When the SBC is configured to play tone:
 - if the SBC receives an inactive PEM, the SBC inserts PEM sendrecv while forwarding 180 response towards ingress.
 - if the SBC does not receive PEM and the flag `monitorRTP` is enabled, the SBC inserts PEM sendrecv provided any of the previous provisional response did not receive PEM while sending 180 response towards ingress.
 - if the SBC receives PEM with sendrecv/sendonly, the SBC does not play tone and relays the received PEM header towards ingress.

Monitoring RTP

The SBC monitors the RTP packets when all or either of the following conditions are met.

- when the SBC sends an INVITE with PEM=supported and an early media SDP answer (in any 18x response) is received without PEM header.
- when the flag `defaultGatingMethod` is set as none. For more information on the flag `defaultGatingMethod`, refer to [SIP Trunk Group - Media - CLI](#).

Playing Tone Locally

The SBC is enhanced to play LRBT locally without considering PEM header. To achieve this functionality, the flag `withOrWithoutSdp` is added to the `toneAndAnnouncementProfile`.

The SBC plays tone locally when it receives:

- first 180 response without SDP and PEM header or with PEM=inactive.
- first 180 response with SDP and PEM=inactive.
- first 180 response with SDP is received without PEM header.
- subsequent 180 responses without SDP and PEM header and the previous provisional response does not contain PEM header (even during an RTP monitoring).
- subsequent 180 responses without SDP with PEM=inactive.
- subsequent 180 responses with SDP and without PEM header or PEM=inactive and the previous provisional response does not contain PEM header (even during an RTP monitoring).



Note

- The SBC does not play tone when 180 without SDP and PEM is received when a previous 18x response had PEM=sendrecv/sendonly.
- The flag `withOrWithoutSdp` is not available for Forced and Dynamic LRBT flavors.

SBC does not Stop Playing Tone when UPDATE is Received from the UAS

The SBC is enhanced to continue playing the ringback tone after receiving an UPDATE message from the User Agent Server (UAS), rather than stopping the tone. The SBC then monitors the egress leg, stops the tone, if it receives an RTP packet or 200 OK message and opening the audio path in both directions. The UAS sends an UPDATE message, a codec upgrade, or a media hold. If the UPDATE message is due to a codec upgrade, the SBC continues playing the ringback tone using the new codec. If the SBC is not configured to continue playing the ringback tone after UPDATE, the caller may hear a very short ringback tone followed by a long period of silence until the final response is received. To achieve this functionality, the flag `monitorRtpOnEgressUpdate` is added to the `egressIpAttributes` of the IP Signaling Profile.

The SBC supports early media authorization in UPDATE, 200 OK to UPDATE, and PRACK messages towards the Trunk Group that supports PEM.

- The SBC processes:
 - if PEM is received, the data path mode is set based on intersection of the SDP direction attribute and PEM header received.
 - if PEM is not received in the egress UPDATE, the SBC relays the UPDATE towards the ingress without PEM.
 - if PEM is not received in 200 OK (UPDATE), the SBC does not add PEM header. It only adds PEM header in the 200 OK if UPDATE is received from the ingress with PEM: inactive or without PEM and the SBC is configured to play the tone.
- The SBC receives and processes:
 - UPDATE without PEM and forwards UPDATE without PEM header, when SBC is not playing tone.
 - UPDATE without PEM and forwards UPDATE with PEM=sendrecv header, when SBC is playing tone (when RTP monitoring is configured).
 - if UPDATE is received on a leg, on which tone is being played, UPDATE is locally handled and tone is played with the new codec.
- The SBC receives and processes:
 - 200 OK to UPDATE with PEM and relays 200 OK to UPDATE with PEM header.
- The SBC processes the PEM header received in:
 - PRACK message and relays PRACK with PEM header.
 - PRACK message and if PRACK message is received without PEM header, the SBC relays PRACK without PEM header.
- The SBC is configured to play tone:
 - if UPDATE is received without PEM or PEM:inactive from egress, the SBC inserts UPDATE with PEM:sendrecv towards ingress.
 - if UPDATE is received with sendrecv/sendonly/recvonly, the SBC relays UPDATE with PEM towards ingress.

