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Ringtone Regardless of P-Early-Media Tag

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RINGTONE REGARDLESS OF P-EARLY-MEDIA TAG

Abstract

A user device placing a mobile originating call on a network using Real-time Transport Protocol (RTP) ignores P-Early-Media tags and session description protocol (SDP) in Session Initiation Protocol (SIP) packets received from the network after receiving a 180 Ringing alert packet indicating that the receiving device is ringing to minimize a delay in playing a ringback tone. The user device plays a local ringtone until the user device receives audio RTP packets containing Early Media. If the user device receives audio RTP packets containing Early Media before the call is connected, the user device plays the Early Media as a custom ringtone.

Background

When an originating user device (referred to as a SIP phone) places a mobile originating (MO) call to a destination user device on a network using RTP, a ringback tone plays for the SIP phone while the destination user device alerts the receiving party of the incoming call. To initiate a call for an RTP session with a receiving device, the SIP phone uses a signaling protocol, such as SIP, to define the specific format of messages exchanged and the sequence of communications for the cooperation of the participants.

Typically, the SIP phone dials an MO call and initiates sending a SIP invite. When the destination user device is ringing, the network sends a "180 Ringing" alert to notify the SIP phone that the destination user device is ringing. During ringing, the network sends silence insertion descriptor (SID) packets to the SIP phone.

Some users select custom ringback tones included in Early Media (that is, media exchanged before call setup) to be played at the SIP phone while the receiving party is being alerted to the incoming call. Because ringback tones are heard before call setup, Early Media

avails itself to ringback tones. However, the control protocol does not play the local ringback tone until RTP packets containing the Early Media are received from the network, and if the network does not send any audio RTP packets containing the Early Media for an extended period (e.g., five seconds or more), the user of the SIP phone will not hear the Early Media for a corresponding amount of time after the call state is changed to 180 Ringing (i.e., ringing). The result is that the ringback tone is only first heard by the user of the SIP phone 5-10 seconds after the call is placed, leaving too little time to answer the call.

Description

Delays in playing a ringback tone upon initiation of an MO call are minimized by applying a ringback tone that is locally generated at the SIP phone (referred to as a local ringtone) first, after a 180 Ringing alert has been received. The local ringtone continues playing while the SIP phone receives – and ignores – downlink RTP silence insertion descriptor (SID) packets from the network. SID packets are sent no more than once in every eight frames (i.e., every 160 milliseconds) and include low-rate parametric representation of the noise (i.e., 2.4 kilobits per second). The SIP phone plays the local ringtone upon receipt of the 180 Ringing alert. The SIP phone stops playing the local ringtone and begins playing the Early Media upon receipt of audio RTP packets containing the Early Media if the MO call has not already been connected. Once the MO call is connected, the SIP phone stops playing the local ringtone or Early Media. The delay in playing a ringback tone is therefore reduced without the use of a timer.

FIG. 1 illustrates a SIP phone in communication with a network during an MO call with a destination user device. The SIP phone initiates the MO call by sending a SIP invite to the network. The network signals to the SIP phone a "100 Trying" packet indicating that the network

is attempting to reach the destination user device. Once the destination user device has been alerted to the incoming call, the network sends a 180 Ringing alert to the SIP phone. Based on receipt of the 180 Ringing alert, the SIP phone is alerted that the destination user device is ringing and begins playing the local ringtone.

If the network sends RTP SID packets after sending the 180 Ringing alert, the SIP phone ignores RTP SID packets and continues playing the local ringtone. In some cases, if the network sends audio RTP packets, the SIP phone examines the contents of the audio RTP packets. If the audio RTP packets include SID frames or Comfort Noise frames, the SIP phone ignores the audio RTP packets, because SID frames or Comfort Noise frames convey information regarding the acoustic background noise or inform a decoder of the SIP phone that the decoder should start generating background noise, but silence or Comfort Noises cannot be heard by users. Likewise, the SIP phone ignores P-Early-Media tags and session description protocol (SDP) in any SIP 18x. An SDP is a format for describing multimedia communication sessions for announcement and invitation. A P-Early-Media header field may be included in any 18x provisional response to the SIP INVITE request for requesting the authorization of Early Media. However, in some cases, the 180 Ringing alert includes a P-Early Media tag but does not include Early Media. For example, based on 3GPP TS 29.163, including the P-Early-Media header is a network option for a speech call.

If the network sends RTP packets including Early Media before the MO voice/video call is connected, the SIP phone stops playing the local ringtone and begins playing the Early Media. Upon receiving a 200 OK (INVITE) alert from the network indicating that the MO voice/video call is connected, the SIP phone stops playing the local ringtone (if no RTP packets including

Early Media were received) or stops playing the Early Media (if RTP packets including Early Media were received).
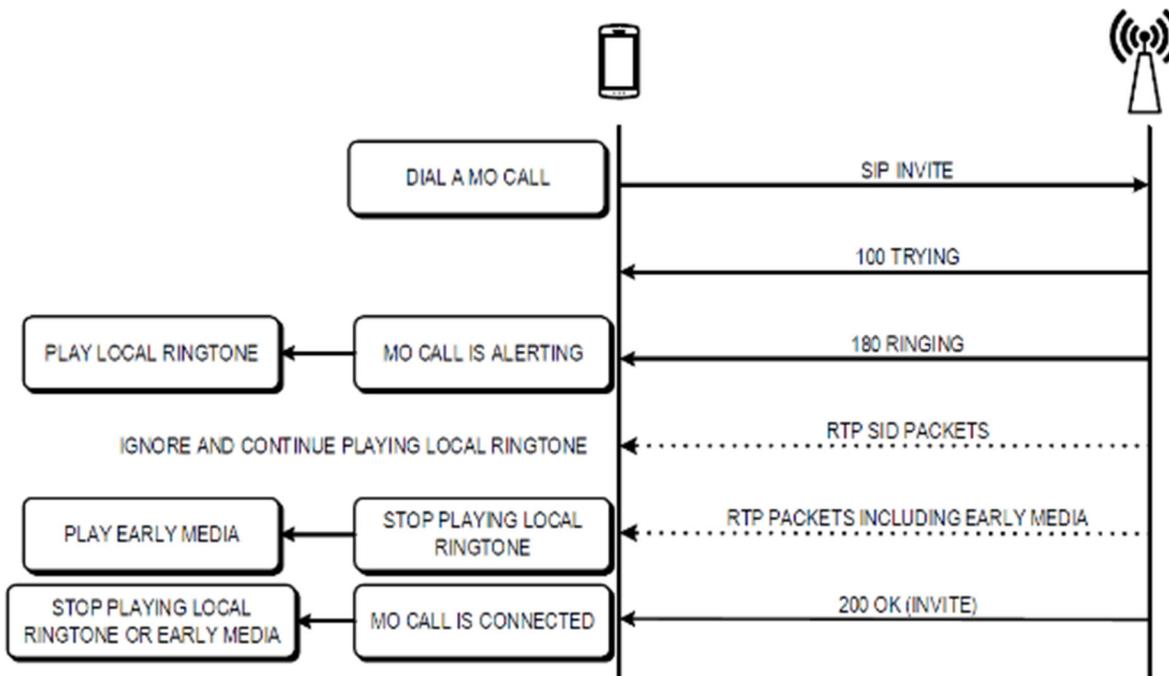

FIG. 1

Based on the foregoing, a user agent client (UAC) can develop a local policy regarding local ringtone generation. For example, in some cases, a Plain Old Telephone Service (POTS)-like SIP user agent (UA) implements the following local policy:

1. Unless a 180 Ringing alert is received, do not generate a local ringtone.

2. If a 180 Ringing alert has been received but there are no incoming Early Media packets, generate a local ringtone.

3. If a 180 Ringing alert has been received and there are incoming Early Media packets, play the Early Media and do not generate a local ringtone.

In a SIP network, backward Early Media flows from the user agent server (UAS) toward the UAC. Forward Early Media flows from the UAC toward the UAS. If the UAC is a trusted server within the network (such as a public switched telephone network (PSTN) gateway), then the UAC may optionally use the parameter(s) of the P-Early-Media header field in messages received from the UAS to determine whether to perform Early Media gating or cut-through. The UAC may further determine whether to render backward Early Media rather than generating a local ringtone based on receipt of the 180 Ringing alert.

References

1. U.S. Patent Application Publication No. 2016/0308915, entitled "Early media handling," and filed on April 20, 2015, the entirety of which is incorporated by reference.

2. U.S. Patent Application Publication No. 2009/0110171, entitled "Properly playing in-band tones before call establishment when performing protocol interworking," and filed on October 29, 2007, the entirety of which is incorporated by reference.