A Session Initiation Protocol (SIP) INFO Package for Dual-Tone Multi-Frequency (DTMF) Events

draft-kaplan-dispatch-info-dtmf-package-00

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Abstract

The SIP INFO request method now supports explicit indication and exchange of specified application information. Such usages are documented as an "INFO Package", following the requirements outlined in [info-packages]. This document specifies one such SIP INFO Package, for the purpose of indicating DTMF signals.

1. Introduction

Dual-Tone Multi-Frequency tones are used in numerous telephony applications, in multiple ways and for multiple purposes. From a SIP protocol perspective, they follow one or both of two paths: the RTP media path, and/or the SIP signaling path. DTMF in the media path is handled by [RFC4733], with a reasonable level of interoperability, if both ends of the session support it.

There are, however, numerous cases in which DTMF tones need to be sent in the signaling path. The most often cited use-case for such is calling-card applications, where the calling-card application server is not in the media path but needs to detect DTMF tones. There are many other use-cases, however, including SIP-to-H.323 Interworking Gateways, distributed IVR and voicemail-retrieval systems, and some IP-PBX systems.

Historically there have been multiple ways of exchanging DTMF in the SIP signaling path: INFO, NOTIFY and KPML [RFC4730]. KPML works by having the application server(s) create Subscriptions to the end User-Agent (UA), and the UA sends NOTIFY messages within the
SUBSCRIBE dialog to indicate the DTMF tones. To date, KPML has seen limited deployment. Another method, using non-KPML NOTIFY requests, has usually been implemented by sending NOTIFY messages in the INVITE-based dialog, without a SUBSCRIBE; but the use of NOTIFY as such is not very common.

Legacy INFO usage for DTMF is widely deployed, but has no documented standard and there are at least two known variants in use (although one is arguably far more popular). The two variants use different MIME bodies in the INFO message to indicate the DTMF: an "application/dtmf" and an "application/dtmf-relay" MIME body type, with dtmf-relay being the most commonly used one. Although no standard exists for dtmf-relay, it is documented on several websites and extremely simple, with a high level of interoperability. This document is intended to standardize such a mechanism, using the INFO Package model, for a "dtmf" INFO Package.

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119. The terminology in this document conforms to RFC 2828, "Internet Security Glossary".

3. The "dtmf" INFO Package

This document defines a new INFO Package called "dtmf", for the purpose of exchanging DTMF tone signals in the SIP signaling path.

3.1. Overall Description

The dtmf INFO Package is used to carry DTMF tone signals, indicating the specific tone and duration, in "application/dtmf-relay" type MIME bodies in INFO requests messages inside an INVITE-based dialog.

4. Overview of Operation

The general concept is that the UAC and UAS negotiate support for a "dtmf" INFO Package during the initial INVITE transaction, using the [info-package] mechanism. Including the "dtmf" INFO Package name in the Recv-Info header field means the UA sending the header supports receiving DTMF events using this mechanism. When the far-end has indicated that it supports receiving "dtmf", and the user presses a DTMF digit, the UA sends it in an INFO request. The digit pressed and the duration it was pressed for are encoded in an "application/dtmf-relay" MIME type attachment in the INFO, described later in this document.
If a SIP server in the signaling path between the calling UAC and answering UAS wants to receive DTMF indications following this mechanism, they must act as a B2BUA. Such behavior is out of scope of this document.

5. INFO Package Definition

5.1. INFO Package Name

This document defines a SIP INFO Package as defined in [info-packages]. The INFO Package token name for this package is "dtmf".

5.2. INFO Bodies

Applications using this INFO Package MUST include an "application/dtmf-relay" body in INFO requests to indicate which digit was pressed by the user. The body contains exactly two lines: one of the button pushed, the other of the duration. The body is described in ABNF form as follows:

Dtmf-relay-body = digit-line CRLF duration-line
digit-line = "Signal" EQUAL SP button
duration-line = "Duration" EQUAL SP msecs
button = DIGIT / "A" / "B" / "C" / "D" / "*" / "+"

msecs = 1*4(DIGIT) ;100-5000 millisecs

5.3. UA Behavior

A UA supporting this draft MUST indicate the user-pressed button through INFO if the remote UA indicated it supports receiving the "dtmf" INFO Package, per the rules in [info-packages]. If [RFC4733] (i.e., RTP-based DTMF events) was also indicated by the far-end in SDP, and the local UA supports sending such, it MUST send the event indication through both means simultaneously. If the UA also supports [KPML] and some entity subscribed for the "kpml" package for the same call, the UA still MUST send dtmf indication through the INFO, and MUST also send such through a [KPML] Notify assuming it would have done so otherwise. (i.e., assuming the regex matched and so on)

The UA MUST populate the "application/dtmf-relay" body, as defined earlier, with the button pressed and the duration it was pressed for. Technically, this actually requires the INFO to be generated when the user "releases" the button, however if the user has still not released a button after 5 seconds, which is the maximum duration
supported by this mechanism, the UA should generate the INFO at that time.

6. Example Exchange

In the following example, Alice initiates a call to Bob. Alice can support sending or receiving "dtmf" events.

Alice generates the following: (note: much has been left out for simplicity)

```
INVITE sip:bob@example.com SIP/2.0
Via: SIP/2.0/UDP 192.0.2.1:5060;branch=z9hG4bKnashds10
To: Bob <sip:bob@example.com>
From: Alice <sip:alice@example.net>;tag=1234567
Call-Id: 123456mcmxcix
CSeq: 1 INVITE
Accept: application/sdp, application/dtmf-relay
Recv-Info: dtmf
```

Bob checks the headers, and can support receiving "dtmf".

```
SIP/2.0 180 Ringing
Via: SIP/2.0/UDP 192.0.2.1:5060;branch=z9hG4bKnashds10
To: Bob <sip:bob@example.com>;tag=abcdefg
From: Alice <sip:alice@example.net>;tag=1234567
Call-Id: 123456mcmxcix
CSeq: 1 INVITE
Accept: application/sdp, application/dtmf-relay
Recv-Info: dtmf
```

Since he sent the Recv-Info header in the 180, Bob also sends it in the 200.

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP 192.0.2.1:5060;branch=z9hG4bKnashds10
To: Bob <sip:bob@example.com>;tag=abcdefg
From: Alice <sip:alice@example.net>;tag=1234567
Call-Id: 123456mcmxcix
CSeq: 1 INVITE
Contact: <sip:alice@192.0.2.1>
Accept: application/sdp, application/dtmf-relay
Recv-Info: dtmf
```
At some later time, AlicePresses number 6 on her keypad, for 100ms. She sends the following:

```
INFO sip:bob@192.0.2.2 SIP/2.0
Via: SIP/2.0/UDP 192.0.2.1:5060;branch=z9hG4bKnabcdef
From: Alice <sip:alice@example.net>;tag=1234567
To: Bob <sip:bob@example.com>;tag=abcdefg
Call-Id: 123456mcmxcix
CSeq: 2 INFO
Contact: <sip:alice@192.0.2.1>
Info-Package: dtmf
Content-Disposition: Info-Package
Content-Type: application/dtmf-relay
Content-Length: 26

Signal= 6
Duration= 100
```

7. Security Considerations

There are no specific security issues for this mechanism, beyond those already applicable to SIP-based session signaling and [info-packages].

8. IANA Considerations

This document will presumably register the INFO Package name "dtmf" and "application/dtmf-relay" MIME type, if it moves forward.

9. References

9.1. Normative References


9.2. Informative References


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