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ISDN User Part (ISUP) Cause Location Parameter
for the SIP Reason Header Field

Abstract

The SIP Reason header field is defined to carry ISUP (ISDN User Part) cause values as well as SIP response codes. Some services in SIP networks may need to know the ISUP location where the call was released in the PSTN (Public Switched Telephone Network) to correctly interpret the reason of release. This document updates RFC 3326 by adding a location parameter for this purpose.

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1. Introduction

Section 3.4 of [RFC3326] describes a SIP message flow for canceling an INVITE request when a REL (release) message is received from the ISUP side. That document specifies the SIP Reason header field [RFC3326] that is used to indicate the reason of release. The reason of release indicates why a SIP Dialog or a PSTN call, in cases where the call was interworked to the PSTN, was terminated. The termination may be normal, based on a failure within an entity (e.g. temporary failure) or caused by other factors (e.g., congestion). The reason may be a SIP response or an ISUP release cause as specified within [Q.850]. [RFC6432] specifies that an ISUP [Q.850] cause code can be carried within a SIP response, but not the Q.850 location information. The [Q.850] location information identifies the part of the ISUP network where the call was released.

This document adds a location value parameter to the reason-extension parameter defined in [RFC3326] so that the [Q.850] location value can be interworked from the PSTN. The interworking from the PSTN needs only to include the location received by the interworking gateway. [Q.850] describes the definitions of the cause code values and the locations used in ISDN and DSS1 (Digital Subscriber Signalling System No. 1) environments. The cause code is used for identifying the reason of release of a call, and the location identifies where the call was released.

2. Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

3. Rationale

The primary intent of the parameter defined in this specification is for use in IMS (IP Multimedia Subsystem) networks defined by 3GPP, but it is also open to be used by any other networks that include ISUP interworking gateways and use Q.850 reason codes. The purpose of this parameter is to hold the location of the call release so that it can be transported from the originating PSTN entity to the SIP entity via a response or BYE message. The ISDN location is defined in [Q.850].

4. Mechanism

As defined by [RFC6432], any SIP Response message, with the exception of 100 (Trying), MAY contain a Reason header field with a Q.850 [Q.850] cause code.

This specification adds a parameter with the ISUP location value defined in [Q.850] to the Reason header field that identifies the location of the call release in ISUP. The location is a 4-bit value that reflects the possible locations where an ISUP call is released. Some values are spare or reserved for national use. The Augmented BNF (ABNF) [RFC5234] for this parameter is shown in Figure 1.

```

reason-extension      =/ isup-cause-location
isup-cause-location = "location" EQUAL isup-location-value

isup-location-value =
  "U" /           ; for 0 0 0 0 user
  "LPN" /         ; for 0 0 0 1 private network serving the local user
  "LN" /          ; for 0 0 1 0 public network serving the local user
  "TN" /          ; for 0 0 1 1 transit network
  "RLN" /         ; for 0 1 0 0 public network serving the remote user
  "RPN" /         ; for 0 1 0 1 private network serving the remote user
  "LOC-6" /       ; for 0 1 1 0 spare
  "INTL" /        ; for 0 1 1 1 international network
  "LOC-8" /       ; for 1 0 0 0 spare
  "LOC-9" /       ; for 1 0 0 1 spare
  "BI" /          ; for 1 0 1 0 network beyond interworking point
  "LOC-11" /      ; for 1 0 1 1 spare
  "LOC-12" /      ; for 1 1 0 0 reserved for national use
  "LOC-13" /      ; for 1 1 0 1 reserved for national use
  "LOC-14" /      ; for 1 1 1 0 reserved for national use
  "LOC-15" /      ; for 1 1 1 1 reserved for national use

```

Figure 1: ABNF for isup-cause-location

Note: These are the location values defined within [Q.850]. The 'LOC-*' names are the wire codepoints for the values currently left as 'spare' or 'reserved' in [Q.850]; these will continue to be the wire codepoints in the case of future allocation or national usage of the such values.

The UAC or UAS SHALL include the location parameter in a request or response when setting up the Reason header field with a [Q.850] cause when the ISUP [Q.850] location is available.

The use of the location parameter is restricted to Q.850 cause values. Other values MUST be ignored if present.

5. Example

The following example shows a SIP 404 response message containing a Reason header field with a [Q.850] cause value and an isup-cause-location value. The 404 Response will be sent when a gateway receives an ISUP release with a [Q.850] cause set to 1, meaning Unallocated (unassigned) number, i.e., the number is not known in the PSTN.

```
SIP/2.0 404 Not Found
Via: SIP/2.0/TCP proxy.example.com:5060;branch=z9hG4bKx5st
Via: SIP/2.0/TCP 192.0.2.3:5060;branch=z9hG4bK4321
From: Alice <sips:alice@atlanta.example.com>;tag=1234567
To: Bob <sips:bob@biloxi.example.com>;tag=765432
Call-ID: 12345600@atlanta.example.com
CSeq: 1 INVITE
Reason: Q.850;cause=1;text="Unallocated (unassigned) number";
       location=LN
Content-Length: 0
```

Figure 2: Example of a Location in the Reason Header Field

6. Privacy Considerations

While the addition of the location parameter provides an indicator of the entity that added the location in the signaling path, it provides little more exposure than the [Q.850] cause itself. The ISUP location value itself will not reveal the identity of the originating or terminating party of the call. It shows only the ISUP network location of the device that released the call. The ISUP location does not show the physical location of the caller or callee.

7. Security Considerations

This document doesn't change any of the security considerations described in [RFC3326]. The addition of the location parameter provides an indicator of the [Q.850] location where the call was released within the PSTN. This information may be used for specific location-driven services but does not create any additional security constraints. Because the [Q.850] location is very imprecise, the [Q.850] location value itself will not add any major security constraints. The use of this parameter is not restricted to a specific architecture.

[RFC3398] describes detailed security considerations due to interworking between ISUP and SIP. Beyond these considerations, the addition of the location does not introduce new security concerns. The location shows the network part where the call was released. Knowing this does not increase the possibilities of extended fraud scenarios.

8. IANA Considerations

8.1. Registration of the Location Parameter for the Reason Header Field

IANA has registered a new SIP header parameter in the "Header Field Parameters and Parameter Values" subregistry of the "Session Initiation Protocol (SIP) Parameters" registry <<https://www.iana.org/assignments/sip-parameters>>, per the guidelines in [RFC3968]:

Header Field: Reason

Parameter Name: location

Predefined Values: Yes

Reference: RFC 8606

9. Normative References

- [Q.850] ITU-T, "Usage of cause and location in the Digital Subscriber Signalling System No. 1 and the Signalling System No. 7 ISDN user part", Recommendation ITU-T Q.850, October 2018, <<https://www.itu.int/rec/T-REC-Q.850>>.
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