                  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.

Status of This Memo

   This is an Internet Standards Track document.

   This document is a product of the Internet Engineering Task Force
   (IETF).  It represents the consensus of the IETF community.  It has
   received public review and has been approved for publication by the
   Internet Engineering Steering Group (IESG).  Further information on
   Internet Standards is available in Section 2 of RFC 7841.

   Information about the current status of this document, any errata,
   and how to provide feedback on it may be obtained at
   https://www.rfc-editor.org/info/rfc8606.

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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,
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           <https://www.rfc-editor.org/info/rfc2119>.

[RFC3326]  Schulzrinne, H., Oran, D., and G. Camarillo, "The Reason
           Header Field for the Session Initiation Protocol (SIP)",
           RFC 3326, DOI 10.17487/RFC3326, December 2002,
           <https://www.rfc-editor.org/info/rfc3326>.

[RFC3398]  Camarillo, G., Roach, A., Peterson, J., and L. Ong,
           "Integrated Services Digital Network (ISDN) User Part
           (ISUP) to Session Initiation Protocol (SIP) Mapping",
           RFC 3398, DOI 10.17487/RFC3398, December 2002,
           <https://www.rfc-editor.org/info/rfc3398>.

[RFC3968]  Camarillo, G., "The Internet Assigned Number Authority
           (IANA) Header Field Parameter Registry for the Session
           Initiation Protocol (SIP)", BCP 98, RFC 3968,
           DOI 10.17487/RFC3968, December 2004,
           <https://www.rfc-editor.org/info/rfc3968>.

   [RFC5234]  Crocker, D., Ed. and P. Overell, "Augmented BNF for Syntax
              Specifications: ABNF", STD 68, RFC 5234,
              DOI 10.17487/RFC5234, January 2008,
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              Header Fields in SIP (Session Initiation Protocol)
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   [RFC8174]  Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC
              2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174,
              May 2017, <https://www.rfc-editor.org/info/rfc8174>.

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