**Requirements for a Location-by-Reference Mechanism used in Location
Configuration and Conveyance
draft-marshall-geopriv-lbyr-requirements-00**

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Abstract

   This document defines terminology and enumerates requirements for a
   location-by-reference approach to location configuration and
   conveyance interactions useful for emergency call routing for voice-
   over-IP (VoIP) and general Internet multimedia systems, where
   Internet protocols are used end-to-end.

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[1](#). Introduction

A mechanism for either (or both) location configuration and location conveyance may rely on either a location-by-value approach, containing and transporting location information along every leg of the signaling path, or alternatively, a different approach, using a location-by-reference technique, which may be used to reference a location with some identifier, and to de-reference the location when needed for a location-based decision.

This document uses as a baseline condition, the primary example of an emergency call, which includes a request for emergency services via a SIP-enabled end device, connecting through the Internet to an IP-enabled PSAP (Public Service Answering Point).

We first define terminology in [Section 3](#). The document then outlines baseline requirements ([Section 5](#)), around the referencing and dereferencing of location via some location identifier in lieu of the emergency caller's actual location.

Identification of the caller, as associated information to location or location reference, either in conveyance or configuration, is out of scope in this document.

Location-by-reference is a mechanism which is in use in VoIP 9-1-1 systems at the time of this writing, and justified based on the requirements listed in this document.

2. Requirements Terminology

In this document, the key words "MUST", "MUST NOT", "REQUIRED",
"SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY",
and "OPTIONAL" are to be interpreted as described in RFC 2119 [1],
with the qualification that unless otherwise stated these words apply
to the design of the location-by-reference mechanism, and not its
implementation or application.

3. Terminology

3.1. Terms

   Location Reference Identifier (LRI): An identifier (could be of the
      form of any URI) which is designed to represent a location object.

   Location Server (LS): A network host which is designed to store
      location and to provide that same location to appropriate location
      client requests.

   Location-to Mapping Server (LMS): A network host which provides a
      URI mapping service based on an input location and service
      identifier.

   Call Server/Proxy (CS/P): A network host which plays the role of a
      SIP Proxy.

3.2. Actors

   de-reference protocol client: The term to describe the entity
      requesting a Location Object in exchange for a Location Reference
      Identifier provided.

   de-reference protocol server: The term to describe the entity
      providing a Location Object as an output based on a Location
      Reference Identifier input.

3.3. Location

   Location: A geographic identification assigned to a region or
      feature based on a specific coordinate system, or by other precise
      information such as a street number and name. It can be either a
      civic or geographic location.

   Civic location: A described location based on some reference system,
      such a jurisdictions or postal delivery. A street address is a
      common example.

   Geographic location: A reference to a point which is able to be
      located as described by a set of defined coordinates within a
      geographic coordinate system, such as latitude and longitude
      within the WGS-84 datum. For example, 2-D geographic location is
      defined as an (x,y) coordinate value pair according to the
      distance north or south of the equator and east or west of the
      prime meridian.

   Location-by-Value: The mechanism of representing location either in
      conveyance protocols or configuration protocols as fully
      specified, (i.e., including the actual location value itself).

   Location-by-Reference: The mechanism of representing location either
      in conveyance protocols or configuration protocols as an
      identifier which refers to a fully specified location, (i.e.,
      including a pointer to the actual location value itself).

4. Basic Actors

   To support the referencing or de-referencing of a location, it is
   appropriate to describe a diagram consisting of network elements
   around which this might be done. These elements include, the UA
   (User Agent), CS/P (Call Server/Proxy), a LS (Location Server), and a
   PSAP UA.

   This section outlines which entities will be considered in the
   referernce de-reference scenarios discussed.


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   |       |   |--------------------------------
   |   LMS |---|----------------               \
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   +-------+       +-------+        +-------+        +-------+
   |       |       |       |        |       |        |       |
   |   UA1 |------|   P1  |------|   P2  |------|   UA2 |
   |       |       |       |        |       |        |       |
   +-------+       +-------+        +-------+        +-------+
       |               /                /                /
       |              /                /                /
       |             /                /                /
   +-------+        /                /                /
   |       |   |--              /                /
   |   LS  |---|----------------                /
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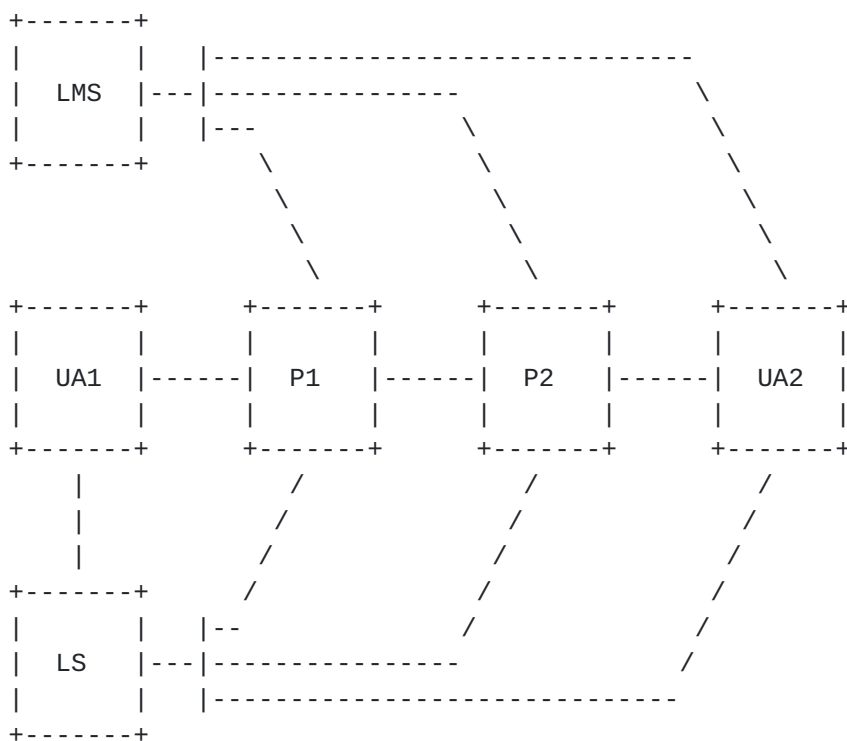   Figure 1: Framework for referencing or de-referencing location in a
                                SIP session.

   Figure 1 shows the interaction between the entities involved in the
   call, as to how location is referenced and subsequently de-
   referenced. The figure proposes that location reference is conveyed
   from the endpoint-to-endpoint via each middlebox (SIP Proxy), and
   undergoes a de-referencing operation at each step. The figure also
   depicts a LMS (Location-to-Mapping Server) element which is used to
   determine the next target destination, based on the de-referenced
   location.

At the PSAP, the end device also receives a location reference, (as
indicated in this figure), and executes a de-reference quiery.

Various potential interactions between the entities depicted in
Figure 1 are described below:

1. Location information might be generated by the end host itself,
    in which case it may then request reference identifier based on
    the location that it generated and provided to the LS.

2. Alternately, location information might be either generated,
    provisioned, or stored by the LS (Location Server), and
    represented to the end device as a location reference, via a
    location configuration protocol (e.g., using DHCP or some L7LCP
    (Layer 7 Location Configuration Protocol).

3. The location reference is only useful to mask the actual
    location, but must be de-referenced in order to be useful for
    location-based routing. Once the location is de-referenced at
    the LS and returned to the requestor, it can then be used as
    input to a location-to-mapping service (e.g., LoST). The mapping
    server returns a URI which can be used to establish the signaling
    to the next target destination. This returned target identifier
    may be the URI of the next SIP Proxy (or any other element along
    the routing path), or may be the URI of the appropriate IP-based
    PSAP.

4. The PSAP, consistent with the figure, may choose to de-reference
    the location identifier, once it is received, in order to view
    the location, and to request subsequent location-based actions.

5. **High-Level Requirements**

   Below, we summarize high-level design requirements needed for a
   location-by-reference mechanism.

   Rq1. Location Conveyance By Value (LbyV): The conveyance protocol
      MUST support the conveyance of location information in its fully-
      contained form, i.e., a PIDF-LO. (I know this isn't a requirement
      for LbyR, but is included for balance.)

   Rq2. Location Conveyance By Reference (LbyR): The conveyance
      protocol MAY support the conveyance of a location information
      reference identifier, in the form of 'any URI', which can be used
      to de-reference the location into its fully-contained form, (e.g.,
      a PIDF-LO).

   Rq3. Location Conveyance Duality: The location conveyance protocol
      MAY support both location value and location reference identifier
      in the same message.

   Rq4. Private Location Reference Id.: The dereferencing protocol
      MUST support the encryption of a location reference identifier.

   Rq5. Public Location Reference Id.: The dereferencing protocol MAY
      convey a location reference identifier in plaintext.

   Rq6. Location Reference Expiry: There MUST exist, a location
      reference uri format that includes a specified, finite period of
      validity.

      Motivation: Location references are not intended to represent a
      location forever, and the identifier eventually may need to be
      recycled, or may be subject to a specific window of validity,
      after which the location reference fails to yield a location, or
      the location is determined to be kept confidential. An expiry
      timer for a location reference ensures that the location reference
      becomes invalid based on configuration.

   Rq7. de-reference Protocol Transport: The de-reference protocol MUST
      support TCP/IP and MAY support UDP/IP.

   Rq8. LRI Distribution: The location reference standard MUST allow
      construction of location references that can be distributed to and
      de-referenced by multiple parties, and MAY support references that
      are restricted to a single de-referencer"

   Rq9''. de-reference Protocol Authentication: The dereferencing
      protocol MUST support both client-side and server-side
      authentication.

      Motivation: It is reasonable to expect implementations of
      authentication to vary. Some implementations may choose to
      support both client-side and server-side authentication, might
      support one only, or may support neither.

   Rq10. Location Privacy: The de-reference protocol MUST support the
      application of privacy rules to the dissemination of a requested
      location object. The entity that receives requests through the
      de-reference protocol MUST obey all privacy rules that apply to a
      requested location object.

   Rq11. De-referenced PIDF-LO Result: The dereferencing of an LRI
      MUST result in a well-formed PIDF-LO.

      Motivation: This is in order to ensure adequate privacy rules can
      be adhered to, since the PIDF-LO format comprises the necessary
      structures to maintain location privacy.

   Rq12. Expiry of de-referenced Location: The de-referenced location,
      in PIDF-LO format, MUST include a configurable expiry timer to
      signal the point after which the PIDF-LO contained location is no
      longer considered usable.

      Motivation: Once the location is de-referenced, it would be
      difficult to keep it from being passed around further 'as a plain
      old PIDF-LO', hence a timer expiry is specified. (This technique
      does not prevent would-be 'black-hats' from reusing the PIDF-LO,
      but provides some additional functionality within a proper use
      context.

   Rq13. De-reference Protocol Selection: Location by reference
      systems MUST support at least one, and MAY support multiple
      dereferencing protocols.

6. Security Considerations

Threats and security requirements are discussed in a separate
document document [11].

7. IANA Considerations

This document does not require actions by the IANA.

8. Contributors

   [TBD]

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9. Acknowledgments

   [TBD]

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