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Requirements for a Location-by-Reference Mechanism used in Location Configuration and Conveyance
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Status of this Memo

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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

This document identifies the individual requirements underlying how a Location-by-Reference (LbyR) mechanism is to be used over the Internet, applied to either a Conveyance protocol or to a Configuration protocol. The LbyR approach is in contrast to the Location-by-Value (LbyV) model, which uses a "location object" (e.g., PIDF-LO) exclusively. Examples using the Location-by-Value method are beyond the scope of this document.

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.

[http://www.ietf.org/internet-drafts/draft-ietf-sip-location-conveyance-07.txt] For an application of LbyR Conveyance, we choose to use the example of SIP signaling within an emergency services context, though we also talk about LbyR in a more general sense. In this case, a SIP user agent, or SIP proxy server acting on behalf of a user agent, to another user agent via the SIP protocol [RFC3261]. In place of the actual value for a "Location", a Location Reference ID (LRI) is used to represent the "value" of the location, stored in some Internet-connected host, which we call a location server.

For a LbyR Configuration protocol mechanism, even for the emergency service context mentioned, many different protocol choices exist. These include DHCP, LLDP-MED, and several Layer 7 protocols being considered for standardization. Regardless of the variety of choices, the general concept of how LbyR is used for configuration, is not specific to any particular protocol choice.

A Location which is referenced can be either Geographic location [RFC 3693] (e.g., lat/lon), or a Civic location (e.g., street address).

We reintroduce a few basic entities [RFC3693] into the Location-by-Reference discussion. These include a "target" as the entity whose location is being transmitted, (e.g., a user agent's (UA) location. A "using protocol", defined as how a "location server" transmits a "location reference identifier" to a "location recipient". Privacy of a target's location, with repect to identity is important to protect, hence all examples shown assume that any user identity associated with the target is not included with location.

Location can be pushed from one host to another, as part of a signaling protocol, in order to be used for location-based routing (or other purposes, outside the scope here), or it can alternatively be queried via a client request to a server which provides location [ref. drafft-sip-conveyance- TBD]. In the case of LbyR Conveyance, the actual location (i.e., location object) never gets pushed along, but is replaced by a Location Reference Identifier. In the case of a client which queries a server for location, the query is either to obtain a Location Reference Identifier, or to obtain an actual Location (e.g., location object) based the input of an LRI in the query.

The draft-sip-conveyance- document details how SIP proxies treat LbyV or LbyR scenarios for conveying location via the SIP protocol.

Whereas location objects are readily consumable by the hosts that using protocols deliver to, a Location Reference ID must first go through a dereference step in order to be useful.

In our SIP example, for LbyR, instead of having a content identifier (cid:) pointing to a location object within a SIP body, the LRI is carried in the Geolocation header of a SIP message which is used to get a location via a dereference.

A common example use case is the "emergency services call" case, where an request for emergency services is initiated over the Internet via the SIP protocol (i.e., a '9-1-1' or '1-1-2' call). In order to route the call to the appropriate PSAP, the UA client location is required.

This document uses as a baseline scenario, the example of an emergency call, where an request for emergency services is initiated over the Internet using the SIP protocol (e.g., a '9-1-1' or '1-1-2' call). In order to route the call to the appropriate PSAP, since PSAPs are divided regionally, the UA client location is required.

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" in this document are to be interpreted as described in RFC 2119 [RFC2119].

3. Terminology

3.1. Terms

Several of the terms presented below are based on RFC3693, and in some cases, extended to include additional language to support the Location-by-Reference model.

Dereference Protocol: A protocol which is used to query a Location server based on an LRI as input.

Location Reference Identifier (LRI): An identifier (e.g., URI) which is a pointer to a target's location record on a remote host (e.g., location server), and is used by a dereferencing protocol for retrieval of that specific location.

Location Server (LS): A network host which is designed to store location and to provide that same location to appropriate location client requests. May also be referred to as a Location Information Server (LIS).

LoST Mapping Server (LMS): A network host which provides a URI response based on input of a location and service identifier [ref. draft-ecrit-lost-].

Using Protocol: A protocol that carries a Location Object or an Location Reference Identifier (i.e., LRI).

Target: A person or other entity whose location is communicated by a Geopriv Location Object.

Location Recipient (LR): The entity that receives location information. It may have asked for this location explicitly (by sending a query containing an LRI to a location server), or it may receive this location asynchronously. Also may be referred to as a Dereference client within this document, in the context of the Location-by-Reference model.

Location Server (LS): The entity to which a LG publishes location objects, the recipient of queries from location receivers, and the entity that applies rules designed by the rule maker. Also may be referred to as a Dereference server within this document, in the context of the Location-by-Reference model.

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. Examples of various LRI Model

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), P (Proxy), LS (Location Server), and a UA at the PSAP (UA2).

This section outlines which entities will be considered in the referernce/dereference scenarios discussed.

<t>
<figure anchor="LRI Indirection" title="LRI query/response - where Target = Location Recipient.">
<artwork><![CDATA[

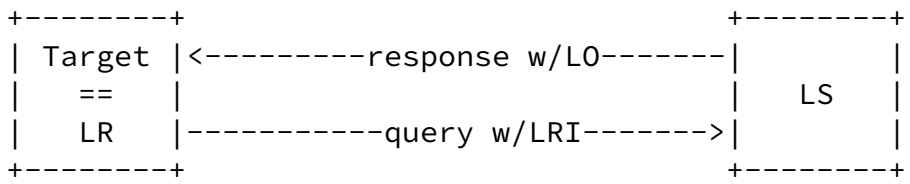

Figure 1: Framework for referencing or de-referencing location in a SIP session.

Above figure shows simplest LRI interaction, when target happens to also be the Location Recipient [ref. RFC3693 terms]

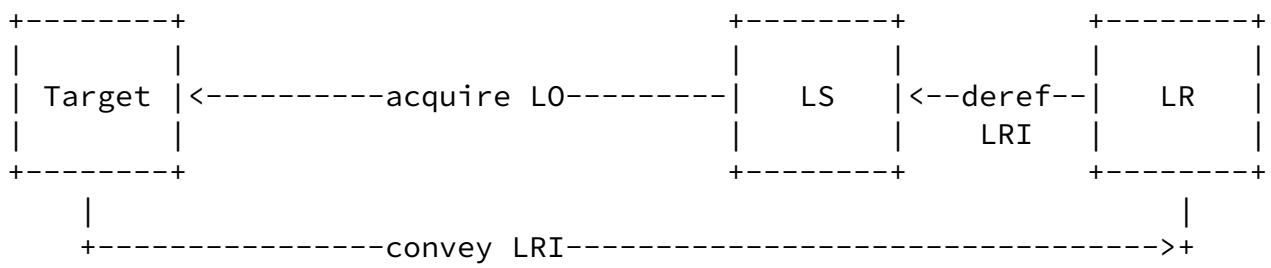

Figure 2: Setup showing LRI indirection.

The above interaction reduces to two basic interactions: 1. Location provision from LS/LIS to target by reference (LRI). 2. Location indirection by the LS/LIS, at the request of the Target. Location

updates, are possible in either case.

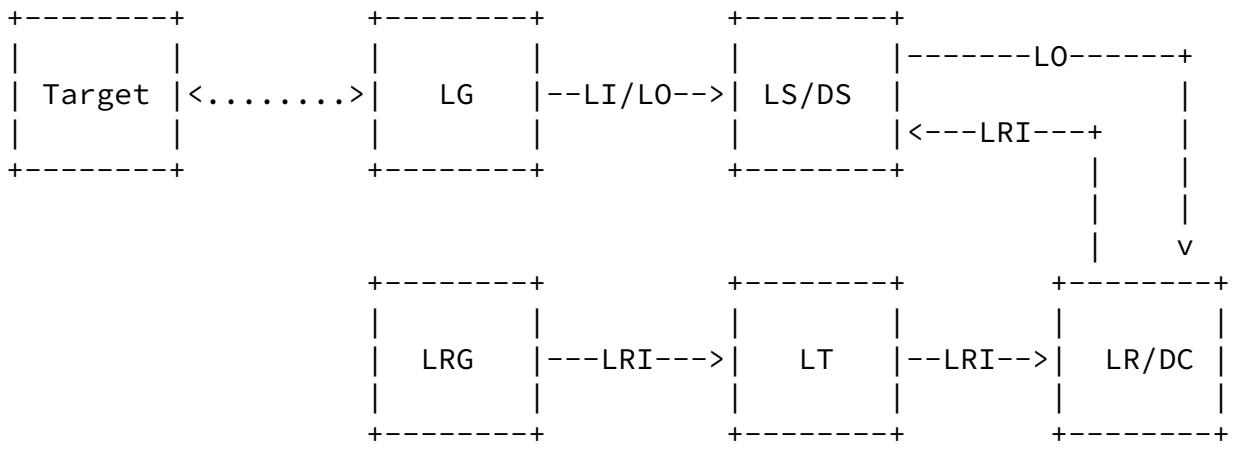

Figure 3: General Setup - LG interaction.

Definitions: Target, LG, LR, LI, LO as in RFC 3693. LRG = Location Reference Generator (creates reference) LT = Location Transmitter (one party to Conveyance Protocol) DS/DC = Dereference Server / Client Protocols: Dereference Protocol is between DS and DC Conveyance Protocol is between LT and LR

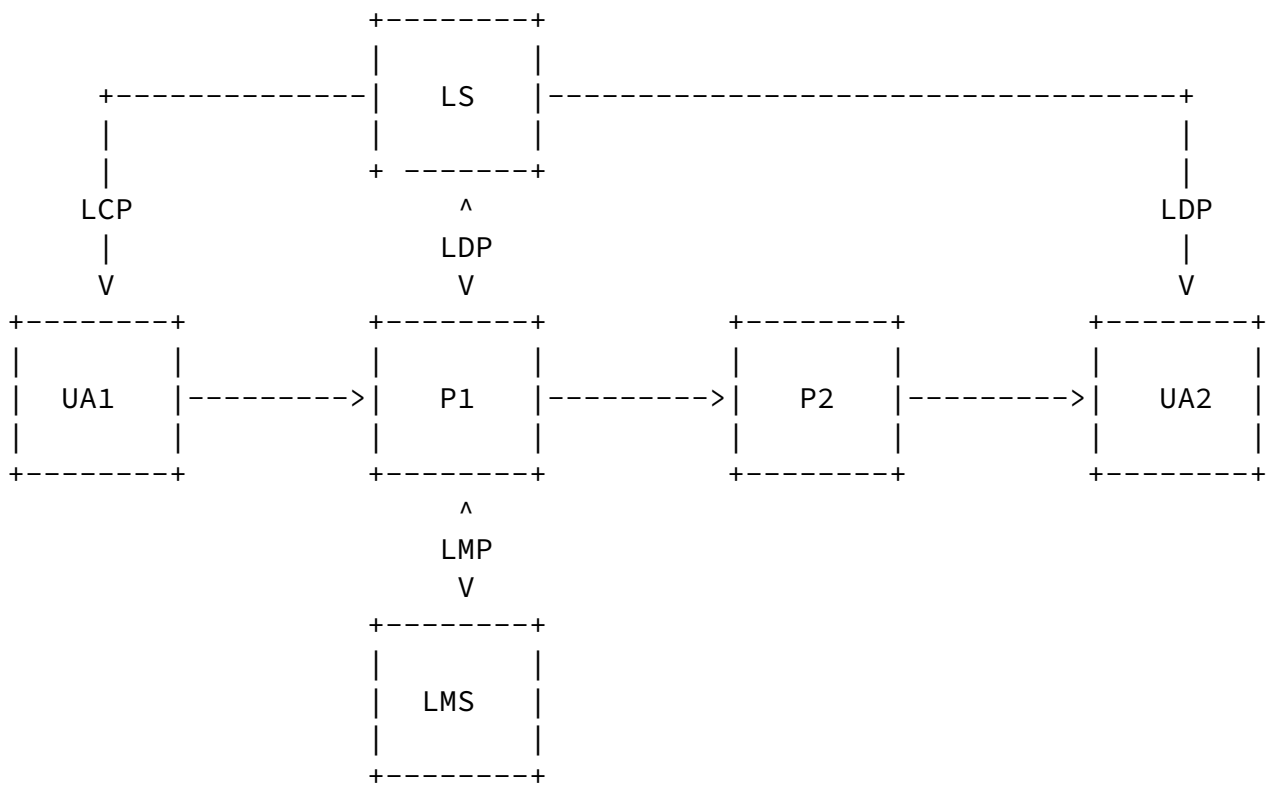

Figure 4: Example of a SIP call.

Definitions: LS = Location Server (as in RFC 3693) LCP = Location Configuration Protocol LDP = Location Dereference Protocol LMP = Location Mapping Protocol Sequence: 1. UA1 acquires LRI from its LS (acting as LRG) 2. UA1 sends an INVITE to a service URN via P1 3. P1 dereferences the LRI and uses it to get a URI from the LMS 4. UA2 may also wish to dereference the LRI, e.g., to get the current location of UA1.

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 Reference Identifier as a URI: The dereferencing protocol MUST support an LRI in URI form, and may support other non-URI forms.

Rq2. Dereference Protocol Confidentiality: The dereferencing protocol MUST support mechanisms for encrypting messages sent between client (Location recipient) and server (Location server).

Rq3. Dereference Protocol Transparancy: The dereferencing protocol MUST support the exchange of messages without encryption (i.e., in plaintext).

Motivation: In the case where encrypted message exchange is unsuccessful, there must be a way to try to dereference a location reference identifier with less restriction (e..g., in the emergency service case, where every call always needs answered).

Rq4. Location Reference Expiry: The dereference protocol MUST support specification of a finite period of validity for the LRI.

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.

Rq5. Dereference Protocol Transport: The de-reference protocol MUST support TCP/IP and MAY support UDP/IP.

Motivation: Practical, near-term deployment issues may make TCP/IP implementations unachievable.

Rq6''. Dereference 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.

Rq7. Location Privacy: The dereference protocol MUST support the application of privacy rules to the dissemination of a requested location object.

Rq8. Dereferenced 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.

6. Security Considerations

Considerations for security to a Location-by-Reference model for the dereference protocol, include, 1. Privacy Privacy of the LRI itself Privacy of the dereferenced location object 2. Expiry Expiry of the LRI. Expiry of the dereferenced location object. 3. Theft Theft of a LRI. Theft of a dereferenced location object. 4. Replay/Reuse Replay of a stolen LRI to perform a dereference operation. Reuse using the dereference location object. 5. Impact of the two forms of location reference. Location provision from LIS by reference. Location indirection by the LIS, at the request of the Target. May

also reference security considerations found within document [I-D.ietf-geopriv-l7-lcp-ps].

7. IANA Considerations

This document does not require actions by the IANA.

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9. Acknowledgments

[TBD]

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