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A Routing Request Extension for the HTTP-Enabled Location Delivery (HELD) Protocol

Abstract

For cases where location servers have access to emergency routing information, they are able to return routing information with the location information if the location request includes a request for the desired routing information. This document specifies an extension to the HTTP-Enabled Location Delivery (HELD) protocol that updates RFC 5985 to support this function. Allowing location and routing information to be acquired in a single request response exchange updates RFC 6881, as current location acquisition and route determination procedures are separate operations.

Status of This Memo

This is an Internet Standards Track document.

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Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at http://www.rfc-editor.org/info/rfc7840.

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1. Introduction

The general Emergency Context Resolution with Internet Technology (ECRIT) calling models described in [RFC6443] and [RFC6881] require a local Location-to-Service Translation (LoST) server or network of forest guides in order to determine the address of the Public Safety Answering Point (PSAP) in the best position to handle a call. Networks of forest guides have not materialized and while PSAPs are moving towards IP networks, LoST server deployment is not ubiquitous. Some regions and countries have expressed reluctance to deploy LoST servers making aspects of the current ECRIT architecture hard to realize.

To address regulatory requirements, such as [M493], evolving architectures in Europe couple location and routing information in the access network while using a softswitch-centric approach to emergency call processing. This document describes an extension to the HELD protocol [RFC5985], so that a location information server can provide emergency routing information in the absence of a LoST server or network of forest guides.

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 [RFC2119].

The terms "Location Information Server (LIS)", "Emergency Services Routing Proxy (ESRP)", "Voice Service Provider (VSP)", and "Public Safety Answering Point (PSAP)" are used as defined in [RFC6443].

The term "Access Network Provider" is used as defined in [RFC5687] and encompasses both the Internet Access Provider (IAP) and Internet Service Provider (ISP).

The term "forest guide" is used as defined in [RFC5582].

3. Motivation

The Internet emergency calling architecture specified in [RFC6881] describes two main models for emergency call processing. The first is a device-centric model, where a device obtains location information using a location configuration protocol, such as HELD [RFC5985], and then proceeds to determine the address of the next hop closer to the local PSAP using LoST [RFC5222]. Figure 1 shows this model in a simplified form.

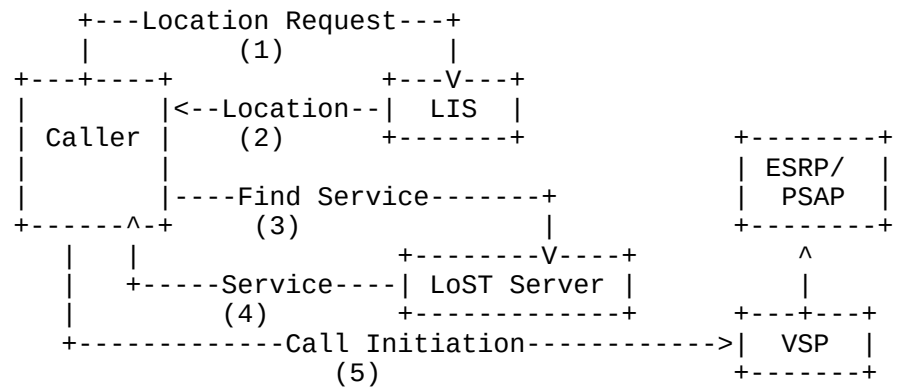

Figure 1: Device-Centric Emergency Services Model

The second approach is a softswitch-centric model, where a device initiates an emergency call, and the serving softswitch detects that the call is an emergency and initiates retrieving the caller's location from a LIS using HELD [RFC5985] with identity extensions [RFC6155] [RFC6915] and then determines the route to the local PSAP using LoST [RFC5222]. Figure 2 shows the high-level protocol interactions.

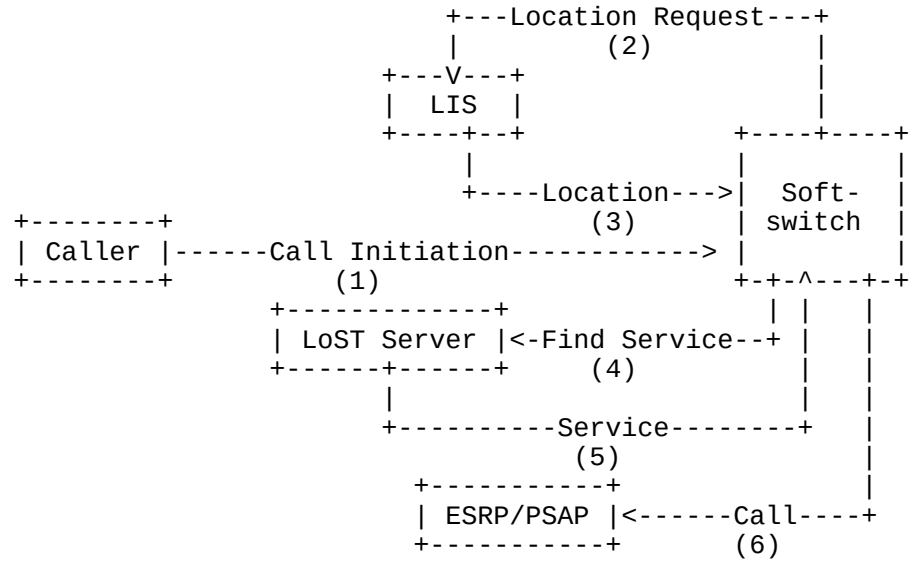

Figure 2: Softswitch-Centric Calling Model

In the softswitch-centric model, when a VSP receives an emergency call, it performs two tasks. The first task is to determine the correct LIS to ask for location information; this is done using a combination of reverse DNS lookup described in [RFC7216] to acquire the serving domain name and then using [RFC5986] to determine the LIS URI. Once the location is obtained from the LIS, the VSP determines the LoST server associated with the domain serving the caller and queries it for the correct PSAP address.

LoST server discovery is a domain-based activity, similar to the LIS discovery technique. However, unlike the LIS that is a domain-bound service, a LoST server is a geographically bound service. This means that for a domain that spans multiple geographic regions, the LoST server determined may not be able to provide a route to the necessary PSAP. When this occurs, the contacted LoST server invokes the help of other LoST servers, and this requires the deployment of forest guides.

At the time of writing, several countries have expressed a reluctance to deploy public LoST servers. In countries amenable to the use of LoST and forest guides, no public forest guides have been deployed. There appears to be little interest from the public sector in establishing a global forest-guide network. These issues pose threats to the ability of both the device-centric and the softswitch-centric calling approaches to operate everywhere.

The device-centric and softswitch-centric calling models both involve the notion of a LIS bound to the serving access network. In many cases, the LIS already knows the destination PSAP URI for any given location. In [RFC6881], for example, the LIS validates civic locations using a location validation procedure based on the LoST protocol [RFC5222]. The LoST validation request is similar to a LoST routing request and provides the LIS with the same PSAP routing information that a routing request would. In other cases, the LIS knows the correct PSAP for a given location at provisioning time, or the access network might always route to the same emergency provider. Irrespective of the way in which the LIS learns the PSAP URI for a location, the LIS will, in a great many cases, already have this information.

This document specifies an extension to the HELD protocol, so that emergency routing information can be requested from the LIS at the same time that location information is requested. This document updates [RFC6881] by requiring devices and softswitches that understand this specification to always request routing information to avoid the risk of query failure where no LoST server or forest-guide network is deployed.

3.1. LoST Reuse Considerations

The LoST protocol [RFC5222] defines a <mapping> element that describes a service region and associated service URLs. Reusing this element from LoST to provide the routing URIs was considered. However, this would have meant that several of the mandatory components in the <mapping> element would have had to contain ambiguous or misleading values. Specifically, the "source" attribute is required to contain a LoST application-unique string for the authoritative server. However, in the situations described in this specification, there may not be an authoritative LoST server, so any value put into this attribute would be misleading. In addition to this, routing information received in the manner described in this specification should not be cached by the receiver, so detailing when the routing information expires or was last updated is irrelevant.

4. Mechanism

The mechanism consists of adding an element to the HELD locationRequest and an element to the locationResponse.

The request element indicates that the requestor wants the LIS to provide routing information based on the location of the end device. If the routing request is sent with no attribute, then URIs for urn:service:sos are returned. If the requestor wants routing information for a specific service, then they may include an optional service URN. This service MUST exist in the IANA "Service URN Labels" repository created by [RFC5031]. If a service is specified, and the LIS does not understand the requested service, then URIs for urn:service:sos are returned.

If the LIS understands the routing request and has routing information for the location, then it includes the information in a routingInformation element returned in the locationResponse. How the LIS obtains this information is left to implementation. Possibilities are described in Section 3.

A LIS that does not understand the routing request element ignores it and returns the location information in the normal manner.

A LIS that does support the routing request element MUST support returning URIs for urn:service:sos and any regionally defined sub-services while following the URN traversal rules defined in [RFC5031].

A LIS that does understand the routing request element but can’t obtain any routing information for the end-device’s location MUST set the defaultRoute attribute to "true" and return a default PSAP or gateway URI along with the determined location information in the locationResponse.

A LIS that understands the routing request element but not the specified service URN MUST follow the URN traversal rules defined in [RFC5031].

A LIS that receives a request for emergency routing information that it understands MUST return the correct emergency routing information if it has or is able to acquire the routing information for the location of the target device.

The routing information in the location response consists of a service element identified by a service name. The service name is a URN and might contain a general emergency service URN such as urn:service:sos or a specific service URN depending on what was requested and what the LIS is able to provide. A list of one or more service destinations is provided for the service name. Each destination is expressed as a URI, and each URI scheme should only appear once in this list. The routing URIs are intended to be used at the time they are received. To avoid any risks of using stale routing URIs, the values MUST NOT be cached by the receiving entity.

5. Modification to Phone BCP

This section describes the normative updates to Phone BCP [RFC6881].

It is important for devices and intermediaries to take all steps possible to ensure that emergency calls are routed to the correct PSAP. An alternative to providing routing information via global forest guides or local LoST servers is for local networks to configure the PSAP address information in the network location server. This specification updates Phone BCP [RFC6881] to provide this option. The update requires devices and intermediaries using the HELD protocol to always include the HELD routing extension. If the LIS is configured with the routing information, it can provide it; if it is not, then the device or intermediary tries LoST to acquire the PSAP URI.

Section 6.5 of [RFC6881] defines "End System Location Configuration". Requirement ED-23/INT-18/SP-14 is updated when HELD is used as the Location Configuration Protocol (LCP) such that "the request MUST include the requestRoutingInformation element." The remainder of the requirement remains unchanged.

This document adds a new requirement to Section 7 of [RFC6881].

"ED-51a : Endpoints MUST support the HELD requestRoutingInformation element and be able to interpret and use any routing information returned in the locationResponse."

This document adds two new requirements to Section 8 of [RFC6881].

"ED-52a : Endpoints that acquire routing information in a HELD locationResponse SHOULD use this routing information but MAY perform a LoST findService request if they have a location value."

"ED-52b : Endpoints that acquire routing information in a HELD locationResponse with a defaultRoute attribute of "true" MUST perform a LoST findService request if they have a location value. If a route is provided by the LoST server, then this route MUST be used, otherwise the routing information provided in the HELD response SHOULD be used."

This document amends SP-26 from Section 8 of [RFC6881] such that a LoST mapping need not be requested if non-default routing information is provided in the HELD locationResponse.

6. HELD Schema Extension

This section describes the schema extension to HELD.

```
<?xml version="1.0"?>
<xs:schema
  targetNamespace="urn:ietf:params:xml:ns:geopriv:held:ri"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  xmlns:ri="urn:ietf:params:xml:ns:geopriv:held:ri"
  xmlns:xml="http://www.w3.org/XML/1998/namespace"
  elementFormDefault="qualified" attributeFormDefault="unqualified">

  <xs:element name="requestRoutingInformation">
     <xs:complexType name="empty">
        <xs:attribute name="service" type="xs:anyUri"
            use="optional" default="urn:service:sos"/>
     </xs:complexType>
  </xs:element>

  <xs:complexType name="service">
     <xs:complexContent>
       <xs:restriction base="xs:anyType">
```

```
            <xs:sequence>
               <xs:element name="dest" type="xs:anyURI"
                    maxOccurs="unbounded"/>
               <xs:any namespace="##other" processContents="lax"
                      minOccurs="0" maxOccurs="unbounded"/>
            </xs:sequence>
            <xs:attribute name="defaultRoute" type="xs:boolean"
                          use="optional" default="false"/>
            <xs:attribute name="serviceUri" type="xs:anyURI"
                          use="required"/>
            <xs:anyAttribute namespace="##any" processContents="lax"/>
         </xs:restriction>
       </xs:complexContent>
    </xs:complexType>

    <xs:element name="routingInformation" type="ri:riType"/>

    <xs:complexType name="riType">
      <xs:complexContent>
        <xs:restriction base="xs:anyType">
          <xs:sequence>
            <xs:element name="service" type="ri:service"/>
            <xs:any namespace="##other" processContents="lax"
                    minOccurs="0" maxOccurs="unbounded"/>
          </xs:sequence>
          <xs:anyAttribute namespace="##any" processContents="lax"/>
        </xs:restriction>
      </xs:complexContent>
    </xs:complexType>

  </xs:schema>
```

7. Examples

Figure 3 illustrates a <locationRequest> example that contains IP flow information in the request.

```
<locationRequest xmlns="urn:ietf:params:xml:ns:geopriv:held"
                 responseTime="emergencyRouting">

  <requestRoutingInformation
     xmlns="urn:ietf:params:xml:ns:geopriv:held:ri"/>

  <flow xmlns="urn:ietf:params:xml:ns:geopriv:held:flow"
            layer4="tcp" layer3="ipv4">
    <src>
      <address>192.0.2.12</address>
      <port>1024</port>
    </src>
    <dst>
      <address>192.0.2.195</address>
      <port>80</port>
    </dst>
  </flow>
</locationRequest>
```

Figure 3: Example Location Request

Figure 4 illustrates the <locationResponse> message containing two location URIs: an HTTPS and a SIP URI. Additionally, the response contains routing information.

```
<locationResponse xmlns="urn:ietf:params:xml:ns:geopriv:held">
  <locationUriSet expires="2006-01-01T13:00:00.0Z">
    <locationURI>
                https://ls.example.com:9768/357yc6s64ceyoiuy5ax3o
        </locationURI>
    <locationURI>
                sip:9769+357yc6s64ceyoiuy5ax3o@ls.example.com
    </locationURI>
  </locationUriSet>

  <routingInformation
      xmlns="urn:ietf:params:xml:ns:geopriv:held:ri">
    <service serviceUri="urn:service:sos">
      <dest>sip:112@example.com</dest>
      <dest>sips:112@example.com</dest>
      <dest>xmpp:112@example.com</dest>
    </service>
  </routingInformation>

</locationResponse>
```

Figure 4: Example Location Response

Figure 5 illustrates the <locationResponse> message containing default routing information and an HTTPS location URI.

```
<locationResponse xmlns="urn:ietf:params:xml:ns:geopriv:held">
   <locationUriSet expires="2016-01-01T13:00:00.0Z">
      <locationURI>
             https://ls.example.com:9768/357yc6s64ceyoiuy5ax3o
         </locationURI>
   </locationUriSet>

   <routingInformation
          xmlns="urn:ietf:params:xml:ns:geopriv:held:ri">
      <service defaultRoute="true" serviceUri="urn:service:sos">
         <dest>sip:112@example.com</dest>
         <dest>sips:112@example.com</dest>
         <dest>xmpp:112@example.com</dest>
      </service>
   </routingInformation>

</locationResponse>
```

Figure 5: Example Location Response with Default Routing Information

8. Privacy Considerations

This document makes no changes that require privacy considerations beyond those already described in [RFC5985]. It does, however, extend those described in [RFC6155].

[RFC5985] describes the privacy considerations surrounding the HELD location configuration protocol, and this document makes no specific changes to these considerations.

[RFC6155] extends HELD beyond a simple LCP by enabling authorized third parties to acquire location information and describing the issues in Section 4. The HELD routing extension supports returning URIs that represent specific services operating in the Target's vicinity. This represents additional information about the Target; as a consequence, it is recommended that this option only be used when the LIS returns a location URI, not a location value.

9. Security Considerations

This document imposes no additional security considerations beyond those already described in [RFC5985] and [RFC6155].

10. IANA Considerations

10.1. URN Sub-Namespace Registration for 'urn:ietf:params:xml:ns:geopriv:held:ri'

Per this document, IANA has registered a new XML namespace, following the guidelines in [RFC3688].

URI: urn:ietf:params:xml:ns:geopriv:held:ri

Registrant Contact: IETF ECRIT working group (ecrit@ietf.org), James Winterbottom (a.james.winterbottom@gmail.com).

XML:

BEGIN

```
<?xml version="1.0"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
 "http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en">
 <head>
   <title>HELD Routing Information Extensions</title>
 </head>
 <body>
  <h1>Additional Element for HELD Routing Information</h1>
  <h2>urn:ietf:params:xml:ns:geopriv:held:ri</h2>
  <p>See <a href="http://www.rfc-editor.org/rfc/rfc7840.txt">
     RFC 7840</a>.</p>
 </body>
</html>
```

END

10.2. XML Schema Registration

This section registers an XML schema as per the procedures in [RFC3688].

URI: urn:ietf:params:xml:schema:geopriv:held:ri

Registrant Contact: IETF ECRIT working group (ecrit@ietf.org), James Winterbottom (a.james.winterbottom@gmail.com).

XML: The XML for this schema can be found as the entirety of Section 6 of this document.

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11.1. Normative References

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