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A Routing Request Extension for the HELD Protocol
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Abstract

In many circumstances public LoST servers or a distributed network of forest guides linking public LoST servers is not available. The general ECRIT calling models breakdown without publically accessible LoST servers. Sometimes location servers may have access to emergency routing information. This document defines an extension to the HELD protocol so a location request can include a request for routing information and allowing the subsequent location response to include routing information.

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1. Introduction

The general ECRIT calling models described in [RFC6443] and [RFC6881]require a local LoST server or network of forest guides in order to determine the address of the PSAP in the best position to handle a call. Networks of forest guides have not eventuated 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.

Evolving architectures in Europe to address regulatory requirements, such as [M493], couple location and routing information in the access network whilst using a softswitch-centric approach to emergency call processing. This document describes adding 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 LIS, ESRP, VSP and PSAP are used as defined in [RFC6443].

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

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 a 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.

```
        +---Location Request---+
        |         (1)          |
    +---+----+             +---V---+
    |        |<--Location--|  LIS  |
    | Caller |    (2)      +-------+             +---------+
    |        |                                   | ESRP/   |
    |        |----Find Service-------+           |  PSAP   |
    +------^-+     (3)               |           +---------+
       |   |                +--------V-----+          ^
       |   +-----Service----| LoST Server  |          |
       |         (4)        +--------------+      +---+---+
       +-------------Call Initiation----------->|  VSP  |
                        (5)                       +-------+
```

Figure 1: Device-Centric Emergency Services Model

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


```
                               +---Location Request---+
                               |         (2)          |
                           +---V---+                  |
                           |  LIS  |                  |
                           +----+--+             +----+----+
                                |                |         |
                                +----Location--->|  Soft   |
    +--------+                          (3)      | Switch  |
    | Caller |------Call Initiation------------> |         |
    +--------+          (1)                      +-+-^---+-+
                    +-------------+                | |   |
                    | LoST Server |<-Find Service--+ |   |
                    +------+------+     (4)          |   |
                           |                         |   |
                           +----------Service--------+   |
                                       (5)               |
                             +-----------+               |
                             | ESRP/PSAP |<------Call----+
                             +-----------+       (6)
```

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 little interest from the public sector in establishing a global forest guide network. These issues pose threats to both the device-centric and the softswitch-centric calling approaches in terms of them operating 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. The 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.

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. 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, one possible option is that the LIS acquires it from a LoST server, other possibilities are described in Section 3.

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

A LIS that does support the routing request element SHALL support

returning URIs for urn:service:sos

A LIS that does understand the routing request element but can't obtain any routing information for the end-device's location SHALL only return location information.

A LIS that understands the routing request element but not the specified service URN, returns the routing URIs for the urn:service:sos service.

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 might contain 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.

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.

5. 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="serviceUri" type="xs:anyURI"
                        use="required"/>
       </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>
```

6. 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>192.168.1.1</address>
              <port>1024</port>
           </src>
           <dst>
              <address>10.0.0.1</address>
              <port>80</port>
           </dst>
        </flow>
</locationRequest>
```

Figure 3: Example Location Request.

Figure 4 illustrates the <locationResponse> message containing two location URIs: a 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

7. Privacy Considerations

This document makes no changes that require privacy considerations beyond those already described in [RFC5985] and [RFC6155].

8. Security Considerations

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

9. IANA Considerations

9.1. URN sub-namespace registration for 'urn:ietf:params:xml:ns:geopriv:held:ri'

This document calls for IANA to register a new XML namespace, as per 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>
   [[NOTE TO IANA/RFC-EDITOR: Please update RFC URL and replace XXXX
     with the RFC number for this specification.]]
   <p>See <a href="[[RFC URL]]">RFCXXXX</a>.</p>
  </body>
 </html>
END
```

9.2. 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).

The XML for this schema can be found as the entirety of Section 5 of this document.

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