Workgroup: ECRIT
Internet-Draft:
draft-ietf-ecrit-similar-location-12
Updates: 5222 (if approved)
Published: 11 October 2021
Intended Status: Standards Track
Expires: 14 April 2022
Authors: B. Rosen   R. Marshall   J. Martin
                     Comtech TCS   Comtech TCS

A LoST extension to return complete and similar location info

Abstract

This document introduces a new way to provide returned location
information in LoST responses that is either of a completed or
similar form to the original input civic location, based on whether
valid or invalid civic address elements are returned within the
<findServiceResponse> message. This document defines a new extension
to the <findServiceResponse> message within the LoST protocol
[RFC5222] that enables the LoST protocol to return in a response a
completed civic address element set for a valid location response,
and one or more suggested sets of similar location information for
an invalid location. These two types of civic addresses are referred
to as either "complete location" or "similar location", and are
included as a compilation of CAtype xml elements within the existing
LoST <findServiceResponse> message structure.

Status of This Memo

This Internet-Draft is submitted in full conformance with the
provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering
Task Force (IETF). Note that other groups may also distribute
working documents as Internet-Drafts. The list of current Internet-
Drafts is at https://datatracker.ietf.org/drafts/current/.

Internet-Drafts are draft documents valid for a maximum of six
months and may be updated, replaced, or obsoleted by other documents
at any time. It is inappropriate to use Internet-Drafts as reference
material or to cite them other than as "work in progress."

This Internet-Draft will expire on 14 April 2022.

Copyright Notice

Table of Contents

1. Introduction

The LoST protcol [RFC5222] supports the validation of civic location
information sent in a <findService> request, by providing a set of
validation result status indicators in the response. The current
usefulness of the supported xml elements <valid>, <invalid>, and
<unchecked> is limited. They each provide an indication of validity
for any one location element as a part of the whole civic address,
but this is insufficient in providing either the complete set of
civic address elements that the LoST server contains, or of
providing alternate suggestions (hints) as to which civic address is
intended for use.

Whether the queried civic location is valid but missing information,
or invalid due to missing or wrong information, this document
provides a mechanism to return a complete set of civic address
elements.

This enhancement to the validation feature within LoST is required
by systems that rely on accurate location for processing. Use of

this enhancement increases the likelihood that the correct and/or complete form of a civic location becomes known in those cases where it is incomplete or incorrect. One such use case is that of location-based emergency calling. The use of this protocol extension facilitates the timely correction of errors, and allows location servers to be more easily provisioned with complete address information.

The structure of this document includes terminology, Section 2, followed by a discussion of the basic elements involved in location validation. The use of these elements, by way of example, is discussed in an overview section, Section 3, with accompanying rationale, and a brief discussion of the impacts to LoST, and its current schema.

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 RFC 2119 [RFC2119].

The following terms are defined in this document:

Location: The term Location is in general used to refer to either a civic location or a geodetic location. In the context of this document, location is restricted to civic locations.

Geodetic Location: a geographic coordinate set of values that describes a point within a defined geographic datum. For example, a WGS84 referenced latitude, longitude coordinate pair (2D), or latitude, longitude, and altitude (3D). Note: geodetic location is defined here for context, but is not used elsewhere within this document.

Civic Location: The term Civic Location applies to a set of one or more Civic Address Elements that are used in conjunction with each other, and in accordance with a known ruleset to designate a specific place within a region of geography, or a region of geography by itself as defined in [RFC5139].

Civic Address: The term Civic Address is used interchangeably with the term Civic Location within this document.

Civic Address Element: The term Civic Address Element is used within this document to indicate any individual XML element used within the <civicAddress> type defined in [RFC5139], including elements used at the extension point therein such as those defined in [RFC6848] and elsewhere. This term also includes the reference to such elements by qualified name as defined within the <locationValidation> element in [RFC5222].

Invalid Location:
             A Civic Location that, when included in a LoST
   query with 'validateLocation' set, will receive a response having
   one or more Civic Address Elements in the <invalid> list. Note
   that It is also possible that the location information submitted
   is so inaccurate that location validation cannot be performed,
   and the LoST server may return a <notFound> or <locationInvalid>
   error. In this document, the term Invalid Location only refers to
   a case where the LoST server returns one or more elements in the
   <invalid> list; the error conditions are not considered.

Valid Location: A Civic Location, when included in a LoST query
   with 'validateLocation' set, will receive a response having all
   Civic Address Elements in the <valid> or <unchecked> lists.

Complete Location: An expanded civic location that includes other
   Civic Address Elements in addition to the existing validated
   Civic Address Elements provided as input to a LoST server.
   Complete Location may be returned when the input location is
   valid but incomplete

Similar Location: A suggested civic location that is similar to an
   Invalid Location which was used in a LoST query, but which has
   one or more elements added, modified, or removed such that the
   suggested location is a Valid Location. Similar Location may be
   returned when the input location is invalid

Returned Location Information: A set of civic locations returned in
   a LoST response.

3. Overview of Returned Location Information

This document describes an extension to LoST [RFC5222] that allows
additional location information to be returned in the
<locationValidation> element of a <findServiceResponse>. This
extension is applicable when the location information in the
<findService> request is in the Basic Civic profile as described in
[RFC5222] or in another profile whose definition provides
instructions concerning its use with this extension. As of this
document, no such additional location profiles have been defined, so
this document describes the returned location extension primarily in
terms of how it is used with the Basic Civic profile. In addition,
the following restriction is imposed: A server MUST NOT include
Returned Location Information using a location profile that differs
from the profile of the location used to answer the query and, by
extension, MUST NOT include Returned Location Information using a
location profile that was not used by the client in the request.
This extension has two different use cases: First, when the input
location is incomplete but the LoST server can identify the intended

unique address, and second, when the input location is invalid and the LoST server can identify one or more likely intended locations.

When a LoST server is asked to validate a civic location, its goal is to take the set of Civic Address Elements provided as the location information in the LoST request, and find a unique location in its database that matches the information in the request. Uniqueness might not require values for all possible elements in the Civic Address that the database might hold. Further, the input location information might not represent the form of location the users of the LoST service prefer to have. As an example, there are LoST Civic Address Elements that could be used to define a postal location, suitable for delivery of mail as well as a municipal location suitable for responding to an emergency call. While the LoST server might be able to determine the location from the postal elements provided, the emergency services would prefer that the municipal location be used for any subsequent emergency call. Since validation is often performed well in advance of an end-user placing an emergency call, if the LoST server could return the preferred form of location (or more properly in this example, the municipal elements in addition to the postal elements), those elements could be stored in a client application such as a Location Information Server (LIS) and used in a later emergency call.

In addition, this document describes the reuse of the same mechanism, but for a different purpose: to supply similar location information in the case where a LoST server response includes one or more Civic Address Elements marked as invalid, indicating an Invalid Location used in the query. In this case, the response contains one or more suggested alternative Valid Locations.

In a LoST findServiceResponse indicating a Valid Location i.e., containing a <locationValidation> element with no elements listed as invalid, the LoST server can use this extension to include additional location information in a <locationValidation> element. As an example, the query might contain <HNO> (house number), <RD> (road name) <A3> (city), <A1> (state/province) and a few more CAtype elements, but might not contain <POD> (Post-Directional) or <PC> (Postal Code) CAtype elements. In this example, there is no street with just the streetname, all streets have a post-directional. The civic location in the request might contain <HNO>, <RD>, <STS>, <A3> and <A1> Civic Address Elements that are sufficient enough for the LoST server to uniquely locate the address specified in the request and thus be considered Valid, meaning there was only one street with the house street name and house number in the city that it could be. Yet, other entities involved in a subsequent emergency call might find it helpful to have additional Civic Address Elements such as <A2> (county) and <PC> (Postal Code) included as part of a complete civic location. Since [RFC5222] currently does not have a way for

this additional location information to be returned in the <findServiceResponse>, this document extends the LoST protocol so that it can include a <completeLocation> element within the <locationValidation> element of the <findServiceResponse> message, allowing for the representation of complete location information.

An example showing complete location information supplied:

Input address: 6000 15th Avenue Seattle, WA US

Complete Location: 6000 15th Avenue Northwest Seattle, WA 98105 US

The information provided in the request may be enough to identify a unique location in the LoST server, but that may not be the location intended by the user. The <completeLocation> information may alert the user to a mismatch between the provided location information and the unique location the server interpreted that information to identify.

The other use case for this extension is when the <findService> request contains Invalid Location. When a LoST server returns a response to a <findService> request that contains a set of Civic Address Elements with one or more listed as invalid, this extension allows the server to include in the <locationValidation> element one or more locations that might be the intended location.

In the example cited above, policy at the LoST server might deem a missing <A3> element as being invalid, even if the location information in the request was sufficient to identify a unique address. In that case, the missing element would be listed in the <invalid> list, and a <similarLocation> element could be returned in the response showing a complete civic location that includes the missing <A3> element, just as in the above example.

As another example of the use of <similarLocation>, consider the results based on a similar data set as used above, where the <HNO>, <RD>, <STS>, <A1>, and <A3> Civic Address Elements are not sufficient to locate a unique address, which leads to an invalid location result because the LoST server contains additional civic address elements which would have resulted in a uniquely identifiable location if these additional elements had been included in the location sent in the query. Since [RFC5222] currently does not have a way for this additional location information to be returned in the <findServiceResponse>, this document extends [RFC5222] so that the LoST <locationValidation> element of the <findServiceResponse> message can include one or more <similarLocation> elements representing similar civic locations.

To show this, suppose that a slightly modified version of the above address is sent within a Lost findService request:

Input address: 6000 15th Avenue North Seattle, WA US

This time we make the assumption that the address is deemed invalid by the LoST server because there is no such thing as "15th Ave North within the LoST server's data for the city of Seattle. However, we also happen to know for this example that there are two addresses within the address dataset that are "similar", when all parts of the address are taken as a whole. These similar addresses that could be returned to the client are as follows:

Similar address #1: 6000 15th Avenue Northwest Seattle, WA 98107 US

Similar address #2: 6000 15th Avenue Northeast Seattle, WA 98105 US

This extension allows the LoST server to include the above similar addresses in the response to a <findService> request with 'validateLocaton' set to true. The next section shows examples of the LoST request and response XML message fragments for the above valid and invalid scenarios, returning the complete or similar addresses respectively.

4. **Returned Location Information**

A LoST server implementing this extension MAY include <completeLocation> or <similarLocation> elements within the <locationValidation> portion of the <findServiceResponse>. The <completeLocation> and <similarLocation> elements are of type "locationInformation" as defined by the LoST schema in [RFC5222], and contain location information in the same profile of the location used to answer the query. These elements MAY contain location information either in the Basic Civic profile defined in RFC5222 or in another profile derived from the Basic Civic profile whose definition provides instructions concerning its use with this extension. When used with the Basic Civic profile, these elements contain a <civicAddressgt; element as defined in [RFC5139].

The LoST server MAY include more than one <similarLocation> element in the response. If there are too many possible locations, the server MAY return none, or it MAY return a subset considered most likely. How many to return is left to the implementation of the LoST server. The server is unable to know what the intended location information was supposed to be; it is guessing. Therefore the correct location may or may not be one of the <similarLocation> elements the server provides, and the client cannot assume that any one of them is the correct location.

Where a LoST server contains additional location information relating to the Civic Address used in a <findService> request, the <findServiceResponse> message MAY include a <completeLocation> element containing additional location information along with the

original validated Civic Address Elements; the additional Civic
Address Elements may be deemed by local policy as necessary to form
a Complete Location. The <completeLocation> element MUST NOT be
returned in response messages where any Civic Address Elements occur
in the invalid list of the response, or where the set of Civic
Address Elements in the request do not identify a unique location.
The Complete Location MUST NOT contain any elements that would be
marked as invalid, or cause an error, if a recipient of that
location performs a subsequent <findService> request using the
Complete Location. However, if a subsequent request includes the
Complete Location, the corresponding response MAY include elements
in the unchecked list.

Clients can control the return of additional location information by
including the optional 'returnAdditionalLocation' attribute with
possible values 'none', 'similar', 'complete' or 'any'. The value
'none' means to not return additional location information,
'similar' and 'complete' mean to only return the respective type of
additional location information (if the server could send any) and
'any' means to include Similar and/or Complete Location (if the
server could send any). If the request includes this attribute, the
server MUST NOT send location information contravening the client's
request. Omitting this attribute in the request is equivalent to
including it with the value 'none'.

The server may determine that there are many possible Similar
Locations and decide not to send them all. The number of Similar
Locations sent is entirely up to the server. The server MAY include
a 'similarLocationsLimited' attribute which contains a non-zero
integer indicating the minimum number of Similar Locations not
included in the response. There may be more than the indicated
similar locations available in the data held by the server.

Clients MAY ignore the location information this extension defines.
The information is optional to send, and optional to use. In the
case where the location information in the request was valid, this
extension does not change the validity. In the case where the
location information in the request is invalid, but alternate
location information is returned, the original location remains
invalid, and the LoST server does not change the mapping response
other than optionally including the information defined by this
extension.

The <completeLocation> and <similarLocation> elements use the
<locationInformation> element from [RFC5222] updated by [I-D.ietf-
ecrit-lost-planned-changes], including the 'profile' attribute,
which is useful if the request contains location information in a
profile derived from the 'civic' profile. The 'profile' attribute

MUST be included in both the request and the response and MUST be the same profile in both.

5. Examples

5.1. Complete Location returned for Valid Location response

Based on the example input request above, Returned Location Information is provided in a <findServiceResponse> message since the original input address is considered valid but is missing some additional data that the LoST server has.

```
<!-- =====Request================================= -->


<findService xmlns="urn:ietf:params:xml:ns:lost1"
  xmlns:rli="urn:ietf:params:xml:ns:lost-rli1"
  validateLocation="true" rli:returnAdditionalLocation="any">

  <location id="587cd3880" profile="civic">
    <civicAddress
      xmlns="urn:ietf:params:mxl:ns:pidf:geopriv10:civicAddr">

      <country>US</country>
      <A1>WA</A1>
      <A3>Seattle</A3>
      <RD>15th</RD>
      <STS>Avenue</STS>
      <POD>Northwest</POD>
      <HNO>6000</HNO>

    </civicAddress>
  </location>

  <service>urn:service:sos</service>

</findService>


<!-- =====Response================================= -->


<findServiceResponse >
  xmlns="urn:ietf:params:xml:ns:lost1"
  xmlns:rli="urn:ietf:params:xml:ns:lost-rli1">
  xmlns:ca="urn:ietf:params:xml:ns:pidf:geopriv10:civicAddr">

  <mapping
    expires="NO-CACHE"
    lastUpdated="2006-11-01T01:00:00Z"
    source="authoritative.example"
    sourceId="8799e346000098aa3e">

    <displayName xml:lang="en">Seattle 911</displayName>
    <service>urn:service:sos</service>
    <uri>sip:seattle-911@example.com</uri>
    <serviceNumber>911</serviceNumber>

  </mapping>

  <locationValidation>
```

```xml
      <valid>ca:country ca:A1 ca:A3 ca:RD ca:STS ca:POD ca:HNO
      </valid>
      <invalid></invalid>
      <unchecked></unchecked>

      <rli:completeLocation profile="civic"><!--completed address-->
        <ca:civicAddress>
          <ca:country>US</ca:country>
          <ca:A1>WA</ca:A1>
          <ca:A2>KING COUNTY</ca:A2>
          <ca:A3>SEATTLE</ca:A3>
          <ca:RD>15TH</ca:RD>
          <ca:STS>AVENUE</ca:STS>
          <ca:POD>NORTHWEST</ca:POD>
          <ca:HNO>6000</ca:HNO>
          <ca:PC>98106</ca:PC>
          <ca:PCN>SEATTLE</ca:PCN>
        </ca:civicAddress>

    </rli:completeLocation>

</locationValidation>

  <path>
    <via source="authoritative.example"/>
  </path>

  <locationUsed id="587cd3880"/>

</findServiceResponse>


<!-- ============================================= -->
```

5.2. Similar Location returned for Invalid Location response

The following example shows two returned Similar Locations in a
<findServiceResponse> message when the original input address is
considered invalid, in this example because the LoST server needed
the omitted POD data to match a unique address.

```
<!-- =====Request================================= -->


   <findService xmlns="urn:ietf:params:xml:ns:lost1"
     xmlns:rli="urn:ietf:params:xml:ns:lost-rli1"
     validateLocation="true"
     rli:returnAdditionalLocation="any">

     <location id="587cd3880" profile="civic">
        <civicAddress
         xmlns="urn:ietf:params:xml:ns:pidf:geopriv10:civicAddr">

           <country>US</country>
           <A1>WA</A1>
           <A2>KING COUNTY</A2>
           <A3>SEATTLE</A3>
           <RD>15TH</RD>
           <STS>AVENUE</STS>
           <HNO>6000</HNO>
           <PC>98106</PC>
           <PCN>SEATTLE</PCN>

        </civicAddress>
     </location>

     <service>urn:service:sos</service>

   </findService>

   <!-- =====Response================================= -->


   <findServiceResponse>
     xmlns="urn:ietf:params:xml:ns:lost1"
     xmlns:rli="urn:ietf:params:xml:ns:lost-rli1">
     xmlns:ca="urn:ietf:params:xml:ns:pidf:geopriv10:civicAddr">

     <mapping
       expires="NO-CACHE"
       lastUpdated="2006-11-01T01:00:00Z"
       source="authoritative.example"
       sourceId="8799e346000098aa3e">

       <displayName xml:lang="en">Seattle 911</displayName>
       <service>urn:service:sos</service>
       <uri>sip:seattle-911@example.com</uri>
       <serviceNumber>911</serviceNumber>

     </mapping>
```

```xml
  <locationValidation similarLocationsLimited="5">

    <valid>ca:country ca:A1 ca:A3 ca:STS ca:RD</valid>
    <invalid>ca:POD</invalid>
    <unchecked>ca:HNO</unchecked>

    <rli:similarLocation profile="civic"><!--similar location-->
      <ca:civicAddress>  <!-- similar address #1 -->
        <ca:country>US</ca:country>
        <ca:A1>WA</ca:A1>
        <ca:A2>KING COUNTY</ca:A2>
        <ca:A3>SEATTLE</ca:A3>
        <ca:RD>15TH</ca:RD>
        <ca:STS>AVENUE</ca:STS>
        <ca:POD>NORTHWEST</ca:POD>
        <ca:HNO>6000</ca:HNO>
        <ca:PC>98106</ca:PC>
        <ca:PCN>SEATTLE</ca:PCN>
      </ca:civicAddress>
    </rli:similarLocation>
    <rli:similarLocation profile="civic" >
      <ca:civicAddress>  <!-- similar address #2 -->
        <ca:country>US</ca:country>
        <ca:A1>WA</ca:A1>
        <ca:A2>KING COUNTY</ca:A2>
        <ca:A3>SEATTLE</ca:A3>
        <ca:RD>15TH</ca:RD>
        <ca:STS>AVENUE</ca:STS>
        <ca:POD>NORTHEAST</ca:POD>
        <ca:HNO>6000</ca:HNO>
        <ca:PC>98105</ca:PC>
        <ca:PCN>SEATTLE</ca:PCN>
      </ca:civicAddress>
    </rli:similarLocation>

  </locationValidation>

  <path>
    <via source="authoritative.example"/>
  </path>

  <locationUsed id="587cd3880"/>

</findServiceResponse>


<!-- ============================================= -->
```

6. XML Schema

This section provides the schema of the LoST extensions, based on
the schema in [I-D.ietf-ecrit-lost-planned-changes]

```xml
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
           xmlns:lost1="urn:ietf:params:xml:ns:lost1"
           xmlns="urn:ietf:params:xml:ns:lost-rli1"
           targetNamespace="urn:ietf:params:xml:ns:lost-rli1"
           elementFormDefault="qualified">
    <!-- Import base Lost -->
    <xs:import namespace="urn:ietf:params:xml:ns:lost1"/>
<!-- extend findService by placing the following
    at the extensionPoint
    in the included commonRequestPattern: -->
      <xs:attribute name="returnAdditionalLocation" use="optional">
       <xs:simpleType>
          <xs:restriction base="xs:token">
            <xs:enumeration value="none"/>
            <xs:enumeration value="similar"/>
            <xs:enumeration value="complete"/>
            <xs:enumeration value="any"/>
          </xs:restriction>
        </xs:simpleType>
      </xs:attribute>


      <!-- extend locationValidation by placing the following
              at the extensionPoint -->
      <xs:group>
        <xs:choice minOccurs="0">
          <xs:element name="similarLocation"
                    type="lost1:locationInformation"
                    minOccurs="1" maxOccurs="unbounded" />
          <xs:element name="completeLocation"
                    type="lost1:locationInformation"/>
        </xs:choice>
      </group>

      <!-- and also at the locationValidation extensionPoint -->
      <xs:attribute name="similarLocationsLimited" use="optional">
        <xs:simpleType>
          <xs:restriction base="xs:integer">
              <xs:minInclusive value="1">
              </xs:restriction>
        </xs:simpleType>
      </xs:attribute>

</xs:schema>
```

7. Security Considerations

   Whether the input to the LoST server is a Valid or Invalid Location,
   the LoST server ultimately determines what it considers to be a
   Valid Location. Even in the case where the input location is valid,
   the requester still might not actually understand where that
   location is. For this kind of Valid Location use case, this
   extension will typically return more location information than what
   the requester started with, which might reveal to the requester
   additional information (additional CAtypes) about the location.
   While this is very desirable in some scenarios such as supporting an
   emergency call, it might not be as desirable for other services.
   Individual LoST server implementations SHOULD consider the risk of
   releasing more detail versus the value in doing so. Generally,
   supplying more information (CAtypes) is not considered to be a
   significant problem because the requester has to already have enough
   information for the location to be considered valid, which in most
   cases is enough to uniquely locate the address. Providing more
   CAtypes generally doesn't actually reveal anything more. When
   Invalid Locations are submitted, this extension allows the LoST
   response to include locations that are similar to what was input,
   again resulting in more information provided in the response than
   was sent in the request. LoST server implementations SHOULD evaluate
   the particular use cases where this extension is supported, and
   weigh the risks around its use. Many services available today via
   the Internet offer similar features, such as "did you mean" or
   address completion, so this capability is not introducing any
   fundamentally new threat.

8. IANA Considerations

8.1. XML Schema Registration

   URI: urn:ietf:params:xml:schema:lost-rli1

   Registrant Contact: IETF ECRIT Working Group, Brian Rosen
      (br@brianrosen.net).

   XML Schema: The XML schema to be registered is contained
      in Section 7.

8.2. LoST-RLI Namespace Registration

   URI: urn:ietf:params:xml:ns:lost-rli1

   Registrant Contact: IETF ECRIT Working Group, Brian Rosen
       (br@brianrosen.net).

   XML:

```
BEGIN
<?xml version="2.0"?>
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML Basic 1.0//EN"
   "http://www.w3.org/TR/xhtml-basic/xhtml-basic10.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
  <meta http-equiv="content-type"
        content="text/html;charset=iso-8859-1"/>
  <title>LoST Returned Location Information Namespace</title>
</head>
<body>
  <h1>Namespace for LoST Returned Location Information extension</h1>
  <h2>urn:ietf:params:xml:ns:lost-rli1</h2>
<p>See <a href="http://www.rfc-editor.org/rfc/rfc????.txt">
   RFC????</a>.</p>
</body>
</html>
END
```

9. References

9.1. Normative References

   [I-D.ietf-ecrit-lost-planned-changes]
               Rosen, B., "Validation of Locations Around a Planned
               Change", Work in Progress, Internet-Draft, draft-ietf-
               ecrit-lost-planned-changes-04, 19 August 2021, <https://
               www.ietf.org/archive/id/draft-ietf-ecrit-lost-planned-
               changes-04.txt>.

   [RFC2119]   Bradner, S., "Key words for use in RFCs to Indicate
               Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/
               RFC2119, March 1997, <https://www.rfc-editor.org/info/
               rfc2119>.

   [RFC5222]   Hardie, T., Newton, A., Schulzrinne, H., and H.
               Tschofenig, "LoST: A Location-to-Service Translation
               Protocol", RFC 5222, DOI 10.17487/RFC5222, August 2008,
               <https://www.rfc-editor.org/info/rfc5222>.

9.2. Informative References

[RFC5139]   Thomson, M. and J. Winterbottom, "Revised Civic Location
            Format for Presence Information Data Format Location
            Object (PIDF-LO)", RFC 5139, DOI 10.17487/RFC5139,
            February 2008, <https://www.rfc-editor.org/info/rfc5139>.

[RFC6848]   Winterbottom, J., Thomson, M., Barnes, R., Rosen, B.,
            and R. George, "Specifying Civic Address Extensions in
            the Presence Information Data Format Location Object
            (PIDF-LO)", RFC 6848, DOI 10.17487/RFC6848, January 2013,
            <https://www.rfc-editor.org/info/rfc6848>.

Authors' Addresses

Brian Rosen
470 Conrad Dr
Mars, PA 16046
United States of America

Email: br@brianrosen.net

Roger Marshall
Comtech TCS
2401 Elliott Avenue
2nd Floor
Seattle, WA 98121
United States of America

Email: roger.marshall@comtechtel.com

Jeff Martin
Comtech TCS
2401 Elliott Avenue
2nd Floor
Seattle, WA 98121
United States of America

Email: jeff.martin@comtechtel.com