XEP-0080: User Location

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This specification defines an XMPP protocol extension for communicating information about the current geographical or physical location of an entity.

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1 Introduction

This document defines a format for capturing data about an entity's geographical location (geoloc). The format defined herein can describe most earthbound geographical locations, especially locations that may change fairly frequently. Potential uses for this approach include:

- Publishing location information to a set of subscribers.
- Querying another entity for its location.
- Sending location information to another entity.
- Attaching location information to presence.

Geographical location is captured in terms of Global Positioning System (GPS) coordinates as well as civil location (city, street, building, etc.).

2 Requirements

The format defined herein was designed to address the following requirements:

- It shall be possible to encapsulate location in terms of Global Positioning System (GPS) coordinates as well as civil location (city, street, building, etc.).
- The GPS encoding mechanism shall have a single set of units, so that receivers do not need to use heuristics to determine an entity's position.
- It shall be possible to specify the known amount of error in the GPS coordinates.
- It shall be possible to include a natural-language description of the location.

3 Data Format

Information about the entity's location is provided by the entity and propagated on the network by the entity's associated application (usually a client). The information is structured by means of a <geoloc/> element that is qualified by the 'http://jabber.org/protocol/geoloc' namespace; the location information itself is provided as the XML character data of the following child elements:

Element Name	Datatype	Definition	Example
accuracy	xs:decimal	Horizontal GPS error in meters; this element obsoletes the <error/> element	10
alt	xs:decimal	Altitude in meters above or below sea level	1609
area	xs:string	A named area such as a campus or neighborhood	Central Park
bearing	xs:decimal	GPS bearing (direction in which the entity is heading to reach its next waypoint), measured in decimal degrees relative to true north It is the responsibility of the receiver to translate bearing into decimal degrees relative to magnetic north, if desired.	
building	xs:string	A specific building on a street or in an area	The Empire State Building
country	xs:string	The nation where the user is located	United States
countrycode	xs:string	The ISO 3166 two-letter country code	US
datum	xs:string	GPS datum If datum is not included, receiver MUST assume WGS84; receivers MUST implement WGS84; senders MAY use another datum, but it is not recommended.	
description	xs:string	A natural-language name for or description of the location	Bill's house
error	xs:decimal	Horizontal GPS error in arc minutes; this element is deprecated in favor of <accuracy/>	290.8882087
floor	xs:string	A particular floor in a building	102
lat	xs:decimal	Latitude in decimal degrees North	39.75
locality	xs:string	A locality within the administrative region, such as a town or city	New York City
lon	xs:decimal	Longitude in decimal degrees East	-104.99
postalcode	xs:string	A code used for postal delivery	10027

NOTE: The datatypes specified above are defined in XML Schema Part 2 [1].

4 Recommended Transport

Location information about human users SHOULD be communicated and transported by means of Publish-Subscribe [2] or the subset thereof specified in Personal Eventing Protocol [3] (the examples below assume that the user's XMPP server supports PEP, thus the publish request lacks a 'to' address and the notification message has a 'from' address of the user's bare JID).
Although the XMPP publish-subscribe extension is the preferred means for transporting location information about human users, applications that do not involve human users (e.g., device tracking) MAY use other transport methods; however, because location information is not pure presence information and can change independently of network availability, it SHOULD NOT be provided as an extension to <presence/>.

4.1 Entity publishes location via PEP

Listing 1: Entity publishes location

```
<iq type='set' from='portia@merchantofvenice.lit/pda' id='publish1'>
  <pubsub xmlns='http://jabber.org/protocol/pubsub'>
    <publish node='http://jabber.org/protocol/geoloc'>
      <item>
        <geoloc xmlns='http://jabber.org/protocol/geoloc' xml:lang='en
            '>
          <country>Italy</country>
          <lat>45.44</lat>
          <locality>Venice</locality>
          <lon>12.33</lon>
          <accuracy>20</accuracy>
        </geoloc>
      </item>
    </publish>
  </pubsub>
</iq>
```

Listing 2: Subscriber receives event with payload

```
<message from='portia@merchantofvenice.lit'
         to='bassanio@merchantofvenice.lit'>
  <event xmlns='http://jabber.org/protocol/pubsub#event'>
```

[1] XML Schema Part 2: Datatypes <http://www.w3.org/TR/xmlschema-2/>.
[2] XEP-0060: Publish-Subscribe <http://xmpp.org/extensions/xep-0060.html>.
[3] XEP-0163: Personal Eventing Protocol <http://xmpp.org/extensions/xep-0163.html>.

```
    <items node='http://jabber.org/protocol/geoloc'>
      <item id='d81a52b8-0f9c-11dc-9bc8-001143d5d5db'>
        <geoloc xmlns='http://jabber.org/protocol/geoloc' xml:lang='en
            '>
          <country>Italy</country>
          <lat>45.44</lat>
          <locality>Venice</locality>
          <lon>12.33</lon>
          <accuracy>20</accuracy>
        </geoloc>
      </item>
    </items>
  </event>
</message>
```

In order to indicate that the user is no longer publishing any location information, the user's client shall send an empty <geoloc/> element, which can be considered a "stop command" for geolocation:

Listing 3: User stops publishing geolocation information

```
<iq from='portia@merchantofvenice.lit/pda'
    id='publish2'
    type='set'>
  <pubsub xmlns='http://jabber.org/protocol/pubsub'>
    <publish node='http://jabber.org/protocol/geoloc'>
      <item>
        <geoloc xmlns='http://jabber.org/protocol/geoloc'/>
      </item>
    </publish>
  </pubsub>
</iq>
```

Listing 4: Subscriber receives empty event

```
<message from='portia@merchantofvenice.lit'
         to='bassanio@merchantofvenice.lit'>
  <event xmlns='http://jabber.org/protocol/pubsub#event'>
    <items node='http://jabber.org/protocol/geoloc'>
      <item id='d81a52b8-0f9c-11dc-9bc8-001143d5d5db'>
        <geoloc xmlns='http://jabber.org/protocol/geoloc'/>
      </item>
    </items>
  </event>
</message>
```

5 Implementation Notes

Avoid "Mars probe" issues: as specified in Table 1, the units for <lat/> and <lon/> MUST be decimal degrees (where South and West are negative, North and East are positive), the units for <alt/> MUST be meters above or below sea level, and the units for <accuracy/> MUST be meters. [4]
In applications where updates are sent whenever there is a certain distance change in location, those applications SHOULD account for time as well, to avoid rate-limiting when the user is (for example) on a jet plane. One possible way to do this would be to send updates at most once per minute of time (every time 60 seconds have elapsed).
Inferences SHOULD NOT be made about accuracy from the number of digits specified in the location or altitude.
Why the datum madness? See <http://www.xmpp.org/extensions/gps_datum.html> for an example.
An entity can provide a GPS path by publishing a series of items (i.e., multiple pubsub events) with appropriate values of the <timestamp/> element.

6 Mapping to Other Formats

There are many XML data formats for physical location or address information. It is beyond the scope of this document to provide a mapping from the extension defined herein to every such format. However, it would be valuable to provide a mapping from the XMPP format to the formats used in other presence or extended presence protocols. The two main protocols of interest are:

1. The Wireless Village (now "IMPS") specifications for mobile instant messaging; these specifications define a presence attribute for address information as encapsulated in the IMPS "Address" element [5].

2. The SIP-based SIMPLE specifications; in particular, the IETF's GEOPRIV Working Group has defined an extension to the IETF's Presence Information Data Format (PIDF) [6] for location information, as specified in RFC 4119 [7] (also known as "PIDF-LO").

The following table also maps the format defined herein to the vCard XML format specified in vcard-temp [8].

[4] The <accuracy/> element obsoletes the older <error/> element, which specified units of arc minutes intead of meters.
[5] The Wireless Village Initiative: Presence Attributes v1.1 (WV-029); for further information, visit <http://www.openmobilealliance.org/tech/affiliates/wv/wvindex.html>.
[6] RFC 3863: Presence Information Data Format (PIDF) <http://tools.ietf.org/html/rfc3863>.
[7] RFC 4119: A Presence-based GEOPRIV Location Object Format <http://tools.ietf.org/html/rfc4119>.
[8] XEP-0054: vcard-temp <http://xmpp.org/extensions/xep-0054.html>.

XMPP	Wireless Village / IMPS	SIMPLE (PIDF-LO)	vCard XML
<country/>	<Country/>	<country/>	<CTRY/> As noted in XEP-0054, the XML vCard format defined in draft-dawson-vcard-xml-dtd-01 specified a <COUNTRY/> element rather than a <CTRY/> element; refer to XEP-0054 for details.
<region/>	--	<A1/> and/or <A2/>	<REGION/>
<locality/>	<City/>	<A3/>	<LOCALITY/>
<area/>	<NamedArea/>	<A4/> and/or <A5/>	--
<street/>	<Street/> The IMPS specification also enables one to define an intersection (e.g., "Broadway and 34th Street") as the combination of a <Crossing1/> element (e.g., "Broadway") and a <Crossing2/> element (e.g., "34th Street"). To map from IMPS to XMPP, an application SHOULD map such a combination to one XMPP <street/> element.	<A6/> The PIDF-LO format provides information elements for much more granular control over a traditional street address; in PIDF-LO the <A6/> element is the street name only, and further information is provided in distinct elements for a leading street direction (e.g., "N"), trailing street suffix (e.g., "SW"), street suffix (e.g., "Avenue"), house number (e.g., "909"), and house number suffix (e.g., "1/2"). To map from PIDF-LO to XMPP, an application SHOULD construct the complete street address from the PIDF-LO elements (<A6/>, <PRD/>, <POD/>, <STS/>, <HNO/>, and <HNS/>) and map the result to one XMPP <street/> element.	<STREET/>
<building/>	<Building/>	<LMK/>	--
<floor/>	--	<FLR/>	--
<room/>	--	--	--
<postalcode/>	--	<PC/>	<PCODE/>
<text/>	<FreeTextLocation/>	<LOC/>	<EXTADR/>
<accuracy/>	<Accuracy/> This element specifies accuracy in meters. When mapping from IMPS to XMPP, the	--	--

7 Internationalization Considerations

Because the character data contained in <geoloc/> child elements of type 'xs:string' is intended to be readable by humans, the <geoloc/> element SHOULD possess an 'xml:lang' attribute specifying the natural language of such character data.

8 Security Considerations

It is imperative to control access to location information, at least by default. Imagine that a stalker got unauthorized access to this information, with enough accuracy and timeliness to be able to find the target person. This scenario could lead to loss of life, so please take access control checks seriously. If an error is deliberately added to a location, the error SHOULD be the same for all receivers, to minimize the likelihood of triangulation. In the case of deliberate error, the <accuracy/> element SHOULD NOT be included.

9 IANA Considerations

This document requires no interaction with the Internet Assigned Numbers Authority (IANA) [9].

10 XMPP Registrar Considerations

10.1 Protocol Namespaces

The XMPP Registrar [10] includes 'http://jabber.org/protocol/geoloc' to its registry of protocol namespaces.

11 XML Schema

```
<?xml version='1.0' encoding='UTF-8'?>

<xs:schema
    xmlns:xs='http://www.w3.org/2001/XMLSchema'
    targetNamespace='http://jabber.org/protocol/geoloc'
```

[9] The Internet Assigned Numbers Authority (IANA) is the central coordinator for the assignment of unique parameter values for Internet protocols, such as port numbers and URI schemes. For further information, see <http://www.iana.org/>.

[10] The XMPP Registrar maintains a list of reserved protocol namespaces as well as registries of parameters used in the context of XMPP extension protocols approved by the XMPP Standards Foundation. For further information, see <http://xmpp.org/registrar/>.

```
    xmlns='http://jabber.org/protocol/geoloc'
    elementFormDefault='qualified'>

  <xs:annotation>
    <xs:documentation>
      The protocol documented by this schema is defined in
      XEP-0080: http://www.xmpp.org/extensions/xep-0080.html
    </xs:documentation>
  </xs:annotation>

  <xs:element name='geoloc'>
    <xs:complexType>
      <xs:sequence minOccurs='0'>
        <xs:element name='accuracy' minOccurs='0' type='xs:decimal'/>
        <xs:element name='alt' minOccurs='0' type='xs:decimal'/>
        <xs:element name='area' minOccurs='0' type='xs:string'/>
        <xs:element name='bearing' minOccurs='0' type='xs:decimal'/>
        <xs:element name='building' minOccurs='0' type='xs:string'/>
        <xs:element name='country' minOccurs='0' type='xs:string'/>
        <xs:element name='countrycode' minOccurs='0' type='xs:string'/
            >
        <xs:element name='datum' minOccurs='0' type='xs:string'/>
        <xs:element name='description' minOccurs='0' type='xs:string'/
            >
        <xs:element name='error' minOccurs='0' type='xs:decimal'/>
        <xs:element name='floor' minOccurs='0' type='xs:string'/>
        <xs:element name='lat' minOccurs='0' type='xs:decimal'/>
        <xs:element name='locality' minOccurs='0' type='xs:string'/>
        <xs:element name='lon' minOccurs='0' type='xs:decimal'/>
        <xs:element name='postalcode' minOccurs='0' type='xs:string'/>
        <xs:element name='region' minOccurs='0' type='xs:string'/>
        <xs:element name='room' minOccurs='0' type='xs:string'/>
        <xs:element name='speed' minOccurs='0' type='xs:decimal'/>
        <xs:element name='street' minOccurs='0' type='xs:string'/>
        <xs:element name='text' minOccurs='0' type='xs:string'/>
        <xs:element name='timestamp' minOccurs='0' type='xs:dateTime'/
            >
        <xs:element name='uri' minOccurs='0' type='xs:anyURI'/>
      </xs:sequence>
    </xs:complexType>
  </xs:element>

</xs:schema>
```