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Dynamic Extensions to the Presence Information Data Format Location
Object (PIDF-LO)

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Internet-Draft

Dynamic Extensions to PIDF-LO

August 2009

Abstract

The Geopriv Location Object introduced by the Presence Information Data Format - Location Object (PIDF-LO), [RFC 4119](#), defines a basic XML format for carrying geographical information of a presentity. This document defines PIDF-LO extensions that are intended to convey information about moving objects. Elements are defined that enable expression of spatial orientation, speed, heading, and acceleration of the presentity.

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1. Introduction

The Presence Information Data Format - Location Object (PIDF-LO) (see [RFC 4119](#) [[RFC4119](#)]) provides geographical location of a presentity. This corresponds to a physical location at a given instance of time. With the extensions defined in [[RFC5491](#)] more guidelines to implementers are being provided with respect to the expression location information in PIDF-LO.

The addition of rate of change information to the PIDF-LO enables a range of use cases. These use cases either directly use dynamic information, or use that information for smoother tracking of a position over time. For example, an application that continuously tracks a presentity could use velocity information to extrapolate positions in between times location information is measured. A shipping company could directly use speed to monitor delivery truck speed to ensure speed limits are observed.

2. Terminology

In this document, the key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

3. Dynamic Elements

This document defines a new element, <Dynamic>, for the conveyance of dynamic information.

Dynamic information MAY be included without any other location information being present. When dynamic information is associated with information about the instantaneous position of the presentity, the <Dynamic> element MUST be included in the same <location-info>

element as the corresponding geodetic (or civic) location information.

Dynamic information can be safely ignored by a recipient that does not support this specification.

The <Dynamic> element contains the following components:
orientation:

The <orientation> element describes the spatial orientation of the presentity; the direction that the object is pointing. For a device, this orientation might depend on the type of device. See

[Section 3.1](#) for details.

speed:

Speed is the time rate of change in position of a presentity without regard for direction; the scalar component of velocity. The value for the <speed> element is a measure that is defined in meters per second.

heading:

Heading is directional component of velocity. See [Section 3.1](#) for details.

acceleration:

Acceleration is the time rate of change of velocity. This element contains the scalar component of velocity, measured in meters per second per second.

Each element can be omitted if no information is available. In the following example the presentity is approximately oriented to the North at a slightly elevated angle. The presentity is travelling 24 meters per second to the West:

```
<?xml version="1.0" encoding="UTF-8"?>
<presence
  xmlns="urn:ietf:params:xml:ns:pidf"
  xmlns:dm="urn:ietf:params:xml:ns:pidf:data-model"
```

```

xmlns:gp="urn:ietf:params:xml:ns:pidf:geopriv10"
xmlns:dyn="urn:ietf:params:xml:ns:pidf:dynamic"
xmlns:gml="http://www.opengis.net/gml"
entity="pres:alice@example.com">
<dm:device id="abc123">
  <gp:geopriv>
    <gp:location-info>
      <dyn:Dynamic>
        <dyn:orientation>-3 12</dyn:orientation>
        <dyn:speed>24</dyn:speed>
        <dyn:heading>278</dyn:heading>
      </dyn:Dynamic>
    </gp:location-info>
    <gp:usage-rules/>
    <method>gps</method>
  </gp:geopriv>
  <timestamp>2009-06-22T20:57:29Z</timestamp>
  <dm:deviceID>mac:1234567890ab</dm:deviceID>
</dm:device>

```

</presence>

Another example shows a PIDF-L0 document of the presentity alice@example.com on a bike traveling 12 meters per second and with an acceleration of 2 meters per second. Her position is indicated as a circle. The values for speed and acceleration might be used by a receiver to adjust the uncertainty over time.

```

<?xml version="1.0" encoding="UTF-8"?>
<presence
  xmlns="urn:ietf:params:xml:ns:pidf"
  xmlns:dm="urn:ietf:params:xml:ns:pidf:data-model"
  xmlns:gp="urn:ietf:params:xml:ns:pidf:geopriv10"
  xmlns:dyn="urn:ietf:params:xml:ns:pidf:dynamic"
  xmlns:gml="http://www.opengis.net/gml"
  xmlns:gs="http://www.opengis.net/pidflo/1.0"
  entity="pres:alice@example.com">
  <dm:device id="abc123">
    <gp:geopriv>
      <gp:location-info>
        <gs:Circle srsName="urn:ogc:def:crs:EPSG::4326">
          <gml:pos>42.5463 -73.2512</gml:pos>

```

```

        <gs:radius uom="urn:ogc:def:uom:EPSG::9001">
            100
        </gs:radius>
    </gs:Circle>
    <dyn:Dynamic>
        <dyn:speed>12</dyn:speed>
        <dyn:acceleration>2</dyn:acceleration>
    </dyn:Dynamic>
    </gp:location-info>
    <gp:usage-rules/>
    <method>gps</method>
</gp:geopriv>
<timestamp>2009-06-22T20:57:29Z</timestamp>
<dm:deviceID>mac:1234567890ab</dm:deviceID>
</dm:device>
</presence>

```

3.1. Angular Measures and Coordinate Reference Systems

[RFC5491] constrains the coordinate reference system (CRS) used in PIDF-LO to World Geodetic System 1984 (WGS 84) using either the two-dimensional (latitude, longitude) CRS identified by "urn:ogc:def:crs:EPSG::4326" or the two-dimensional (latitude, longitude, altitude) CRS identified by "urn:ogc:def:crs:EPSG::4979". Dynamic locations similarly assume that either of these coordinate reference systems are used.

The <orientation> and <heading> establish a direction. Both measures contain one or two angular values that are expressed relative to the current position of the presentity (see [Appendix A](#)). Angular measures are expressed in degrees and values MAY be negative. If two measures are present, the values MUST be separated by whitespace.

The first measure specifies the horizontal direction from the current position of the presentity to a point that it either pointing towards or travelling towards. Horizontal angles are measured from Northing to Easting. Horizontal angles start from zero when pointing to or travelling towards the North and increase towards the East.

The second measure, if present, specifies the vertical component of this angle. This angle is the elevation from the local horizontal plane. If the second angle value is omitted, the vertical component

is unknown and the speed measure MAY be assumed to only contain the horizontal component of speed.

[4.](#) Dynamic Feature XML Schema

```
<?xml version="1.0"?>
<xs:schema
  targetNamespace="urn:ietf:params:xml:ns:pidf:dynamic"
  xmlns:dyn="urn:ietf:params:xml:ns:pidf:dynamic"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified"
```

```

    attributeFormDefault="unqualified">

<xs:element name="Dynamic" type="dyn:dynamicType"/>

<xs:complexType name="dynamicType">
  <xs:complexContent>
    <xs:restriction base="xs:anyType">
      <xs:sequence>
        <xs:element name="orientation" minOccurs="0"
          type="dyn:directionType"/>
        <xs:element name="speed" minOccurs="0"
          type="xs:double"/>
        <xs:element name="heading" minOccurs="0"
          type="dyn:directionType"/>
        <xs:element name="acceleration" minOccurs="0"
          type="xs:double"/>
        <xs:any namespace="##other" processContents="lax"
          minOccurs="0" maxOccurs="unbounded"/>
      </xs:sequence>
      <xs:anyAttribute namespace="##other" processContents="lax"/>
    </xs:restriction>
  </xs:complexContent>
</xs:complexType>

<xs:simpleType name="directionType">
  <xs:restriction base="dyn:doubleListType">
    <xs:minLength value="1"/>
    <xs:maxLength value="2"/>
  </xs:restriction>
</xs:simpleType>

<xs:simpleType name="doubleListType">
  <xs:list itemType="xs:double"/>
</xs:simpleType>

</xs:schema>

```


This document defines additional location elements carried by PIDF-L0. No additional security considerations beyond those described in [RFC 4119](#) [[RFC4119](#)] are applicable to this document.

6. IANA Considerations

This section registers a new XML namespace (as described in [[RFC3688](#)]) and a new XML schema.

6.1. Dynamic Feature Extensions Namespace Registration

URI: urn:ietf:params:xml:ns:pidf:dynamic"

Registrant Contact: IETF Geopriv Working Group, Hannes Tschofenig (hannes.tschofenig@gmx.net).

XML:

```
BEGIN
<?xml version="1.0"?>
<!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>
  <title>Dynamic Feature Extensions Namespace</title>
</head>
<body>
  <h1>Namespace for Dynamic Feature Extensions to PIDF-L0</h1>
  <h2>urn:ietf:params:xml:ns:pidf:dynamic</h2>
<p>See <a href="[URL of published RFC]">RFCXXXX
  [NOTE TO IANA/RFC-EDITOR:
    Please replace XXXX with the RFC number of this
    specification.]</a>.</p>
</body>
</html>
END
```

6.2. Dynamic Feature Extensions Schema Registration

URI: urn:ietf:params:xml:schema:pidf:dynamic

Registrant Contact: IETF Geopriv Working Group, Hannes Tschofenig
(hannes.tschofenig@gmx.net)

XML: The XML schema to be registered is contained in [Section 4](#). Its first line is

```
<?xml version="1.0"?>
```

and its last line is

```
</xs:schema>
```

[7](#). Acknowledgements

We would like to thank Klaus Darilion, Cullen Jennings, Rohan Mahy, Carl Reed, and Brian Rosen for their comments.

[8](#). References

[8.1](#). Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC3688] Mealling, M., "The IETF XML Registry", [BCP 81](#), [RFC 3688](#), January 2004.
- [RFC4119] Peterson, J., "A Presence-based GEOPRIV Location Object Format", [RFC 4119](#), December 2005.

[8.2](#). Informative References

- [GeoShape] Thomson, M. and C. Reed, "GML 3.1.1 PIDF-LO Shape Application Schema for use by the Internet Engineering Task Force (IETF)", Candidate OpenGIS Implementation Specification 06-142, Version: 0.0.9, December 2006.
- [RFC5491] Winterbottom, J., Thomson, M., and H. Tschofenig, "GEOPRIV Presence Information Data Format Location Object (PIDF-LO) Usage Clarification, Considerations, and Recommendations", [RFC 5491](#), March 2009.

[Appendix A](#). Earth Centered, Earth Fixed Direction Vectors

The absolute orientation or heading of a presentity depends on its latitude and longitude. The following vectors can be used to determine the absolute direction in the WGS 84 Earth Centered, Earth Fixed (X, Y, Z) coordinate space.

The direction of North as a unit vector in ECEF coordinates is:

$$\text{North} = [\begin{array}{l} -1 * \sin(\text{latitude}) * \cos(\text{longitude}), \\ -1 * \sin(\text{latitude}) * \sin(\text{longitude}), \\ \cos(\text{latitude}) \end{array}]$$

The direction of "up" (the upward normal of the horizontal plane) as a unit vector in ECEF coordinates is:

$$\text{Up} = [\begin{array}{l} \cos(\text{latitude}) * \cos(\text{longitude}), \\ \cos(\text{latitude}) * \sin(\text{longitude}), \\ \sin(\text{latitude}) \end{array}]$$

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