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Dynamic Feature Extensions to the Presence Information Data Format
Location Object (PIDF-LO)
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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 extends the <location> element specified in [RFC 4119](#) to carry temporal feature elements useful for tracking moving objects. It defines five elements, namely speed, bearing, acceleration elevation and directionOfObject. The document also specifies mechanisms to carry multiple moving object's status elements and

proposes a mechanism to indicate the type of the PIDF-LO content.

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1. Introduction

The Presence Information Data Format - Location Object (PIDF-LO) (see [RFC 4119](#) [[1](#)]) provides geographical location of the presentity. This corresponds to a physical location at a given instance of time. However, a number of applications, described below, can benefit from having access to information about changes in location. Location change information is likely to be useful for logistics and public safety. For example, shipping companies or dispatch centers can use it to track whether vehicles are deviating from an established path or exceeding speed limits.

This document defines a location vector by extending the the <location>, introduced by [RFC 4119](#), to carry temporal feature elements:

speed:

Speed is the rate of motion. (The terms speed and velocity are often used interchangeably, but speed is a scalar, having magnitude only, while velocity is a vector quantity, having both magnitude and direction.)

This element contains a 'uom' (Units Of Measure) attribute, which is a reference to a reference system for the amount. The 'uom' attribute uses a URI to refer to a unit of measure definition. The GML document defines a set of convenience measure types described in ISO 19103. This is further explained in [Section 3.3](#).

bearing:

Bearing is defined as the horizontal direction of one terrestrial point from another, expressed as the angular distance from a reference direction. It is usually measured from 000 degrees at the reference direction clockwise through 360 degrees.

The <bearing> element is of type gml:DirectionPropertyType and contains a gml:DirectionVector, gml:CompassPoint, DirectionKeyword, or a DirectionString element. This document profiles the usage of this GML element and suggests the usage of the <DirectionVector> element.

acceleration:

This element specifies the rate (usually rapid) at which something happens. The <acceleration> element also contains a 'uom' attribute.

directionOfObject:

The <directionOfObject> describes the instantaneous horizontal of the front of the object relative to true north and the vertical angle relative to the earth's spheroid. It uses the GML <directionVector> element.

[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](#) [2].

This document uses the terminology from [3].

[3.](#) Protocol Behavior

The document describes the protocol requirements for dynamic feature extensions, so that it can be transmitted by the Location Server or the Location Information Server and understood correctly by Location Recipients. Location Recipients should be able to indicate to the server that they can handle the dynamic feature elements. The server should also indicate to the clients that the type of location object is PIDF-LO including the dynamic feature extension. Also, the unit of measurements should be communicated by server and understood by the clients.

[3.1.](#) Indicating Use of Dynamic Feature PIDF-LO using SIP

The watcher can indicate its capability using the SIP Accept header. This document proposes to add a 'supported' parameter for the application/pidf+xml media type. It enumerates the non default namespaces supported by the UAS. An example is given below:

```
Accept: application/pidf+xml; supported="geopriv-temporal-features"
```

The server can specify the type of content using Content-Type header. The specific PIDF-LO type can be obtained by looking inside the XML content.

```
Content-Type: application/pidf+xml;
```

[3.2.](#) Indicating Use of Dynamic Feature PIDF-LO using HELD

There are two areas where it is useful to provide feature indication; the HELD context draft [\[6\]](#)" allows a Target (or an entity acting on

behalf of the Target) to constraint the dereferencing procedure. Hence, it is useful to indicate whether dynamic features should or should not presented to the Location Recipient when a location URI is dereferenced.

Furthermore, when a dereferencing protocol based on HTTP is used then the Location Recipient might want to express the desire to receive a specific response, for example a PIDF-LO that contains a trace.

In a future version of this document the above-described functionality will be added.

[3.3.](#) Units of Measure

GML permits a range of units of measure for the uom attribute. This document restricts this set to the #m/s

[Editor's Note: Need to find the URN for #m/s]

[3.4.](#) GML DynamicFeature Schema Usage

This document does not define a new schema but instead re-uses a

subset of the dynamicFeature.xsd schema available with GML 3.1.1, namely <speed>, <bearing>, <acceleration>, and <directionOfObject>.

These four elements are conveyed inside the <location-info> element defined by [RFC 4119](#) [1].

4. Transferring Multiple Location Objects

Multiple location vector objects may be required to be transported simultaneously. This can be achieved using <timed-presence> defined in [RFC 4481](#) [4].

Typically, the watcher applications can reconstruct the path as well as dynamic behavior (speed, acceleration etc.) along the path by storing the received location vector objects. However, a new Location Recipient may be interested in past location-vectors or may choose to receive notifications at a slower rate without losing valuable information. In other words, it can request to receive multiple location vector objects together. For example, it may want to get one NOTIFY every 15 minutes with multiple location objects aggregated.

The structure of the document which can be used for tracking moving objects using timed-status extension is shown below. An example is given in [Section 5](#).

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

  <device>

    <gp:geopriv>
      .....
    </gp:geopriv>

    <timestamp>.....</timestamp>

    <timed-status from="start-time" until="end-time">
      <gp:geopriv>
        .....
      </gp:geopriv>
    </timed-status>
  </device>
</presence>
```

```

        <gp:geopriv>
        .....
        </gp:geopriv>

    </timed-status>
</device>

<tuple>
.....
</tuple>

<person>
.....
</person>
</presence>

```

5. Example

The following example shows a PIDF-LO indicating geospatial location information using the `gml:Point` structure. Outside the `<gml:location/>` element the additional fields related to temporal characteristics are included.

```

<?xml version="1.0" encoding="UTF-8"?>
<presence xmlns="urn:ietf:params:xml:ns:pidf"
  xmlns:gp="urn:ietf:params:xml:ns:pidf:geopriv10"
  xmlns:gml="http://www.opengis.net/gml"
  entity="pres:geotarget@example.com">

  <device id="sg89ae">
    <gp:geopriv>

```

```

    <gp:location-info>
      <gml:location>
        <gml:Point srsName="urn:ogc:def:crs:EPSG::4326">
          <gml:pos>-34.407 150.883</gml:pos>
        </gml:Point>
      </gml:location>
      <gml:speed uom="#m/s">12</gml:speed>
      <gml:bearing>
        <gml:DirectionVector>
          <gml:vector> 270.0 -60.0</gml:vector>
        </gml:DirectionVector>
      </gml:bearing>
    </gp:location-info>
    <gp:usage-rules>
      <gp:retransmission-allowed>no</gp:retransmission-allowed>
      <gp:retention-expiry>2003-06-23T04:57:29Z
      </gp:retention-expiry>
    </gp:usage-rules>
  </gp:geopriv>
  <timestamp>2008-06-22T20:57:29Z</timestamp>
</device>

</presence>

```

Figure 1: Example of a PIDF-LO with Speed Information

The following example shows multiple PIDF-LO using <timed-status>.

```

<?xml version="1.0" encoding="UTF-8"?>
<presence xmlns="urn:ietf:params:xml:ns:pidf"
  xmlns:gp="urn:ietf:params:xml:ns:pidf:geopriv10"
  xmlns:gml="urn:opengis:specification:gml:schema-xsd:feature:v3.0"
  entity="pres:geotarget@example.com">
  <device id="sg89ae">
    <gp:geopriv>
      <gp:location-info>
        <gml:location>
          <gml:Point>
            <gml:pos>140. -35.</gml:pos>

```



```

        </gml:location>
        <gml:speed uom="#m/s">12</gml:speed>
    </gp:location-info>
    <gp:usage-rules>
        <gp:retransmission-allowed>no</gp:retransmission-allowed>
        <gp:retention-expiry>2003-06-23T04:57:29Z
        </gp:retention-expiry>
    </gp:usage-rules>
</gp:geopriv>
<timestamp>2003-06-22T20:57:29Z</timestamp>

<timed-statusfrom="2005-08-15T10:20:00.000-05:00"
    until="2005-08-22T19:30:00.000-05:00">>
    <gp:geopriv>
        <gp:location-info>
            <gml:location>
                <gml:Point>
                    <gml:pos>110. -35.</gml:pos>
                </gml:Point>
            </gml:location>
            <gml:speed uom="#m/s">10</gml:speed>
        </gp:location-info>
        <gp:usage-rules>
            <gp:retransmission-allowed>yes</gp:retransmission-allowed>
            <gp:retention-expiry>2003-06-23T04:55:29Z
            </gp:retention-expiry>
        </gp:usage-rules>
    </gp:geopriv>
    <gp:geopriv>
        <gp:location-info>
            <gml:location>
                <gml:Point>
                    <gml:pos>114. -35.</gml:pos>
                </gml:Point>
            </gml:location>
            <gml:speed uom="#m/s">18</gml:speed>
        </gp:location-info>
        <gp:usage-rules>
            <gp:retransmission-allowed>yes</gp:retransmission-allowed>
            <gp:retention-expiry>2003-06-23T04:53:29Z
            </gp:retention-expiry>
        </gp:usage-rules>
    </gp:geopriv>
</timed-status>

</device>
</presence>

```

Figure 2: Example showing multiple Location Vectors transmitted simultaneously.

6. Security Considerations

This document defines additional location elements carried by PIDF-LO (see [1]). The security considerations of [RFC 4119](#) [1] are applicable to this document.

7. IANA Considerations

[Editor's Note: This section needs to register a token for indicating the dynamic feature capability, see [Section 3.1.](#)]

8. Acknowledgements

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

9. References

9.1. Normative References

- [1] Peterson, J., "A Presence-based GEOPRIV Location Object Format", [RFC 4119](#), December 2005.
- [2] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [RFC 2119](#), [BCP 14](#), March 1997.
- [3] Cuellar, J., Morris, J., Mulligan, D., Peterson, J., and J. Polk, "Geopriv Requirements", [RFC 3693](#), February 2004.
- [4] Schulzrinne, H., "Timed Presence Extensions to the Presence Information Data Format (PIDF) to Indicate Status Information for Past and Future Time Intervals", [RFC 4481](#), July 2006.
- [5] "Geographic information - Geography Markup Language (GML), OpenGIS 03-105r1, available at: http://portal.opengeospatial.org/files/?artifact_id=4700", April 2004.

[9.2.](#) Informative References

- [6] Winterbottom, J., Tschofenig, H., and M. Thomson, "HELD Protocol Context Management Extensions", [draft-winterbottom-geopriv-held-context-02](#) (work in progress), February 2008.

[Appendix A.](#) Alternatives Considered

During the work on this document we encountered alternative approaches. These approaches make use of the `MovingObjectStatus` or its parent element `track` of `dynamicFeature.xsd`. `MovingObjectStatus` contains child elements where no use cases are currently known, e.g., `validTime` and contains elements that are already defined with PIDF-LO, such as `<location>`. Since it might not be known whether a Location Recipient understands the location extension defined in this document a PIDF-LO with a `<location>` element inside the `<MovingObjectStatus>` will likely create problems. Including the `<location>` element twice, once as defined with [RFC 4119](#) (PIDF-LO) and again in `<MovingObjectStatus>`, is unnecessary. The `<track>` element allows multiple `<MovingObjectStatus>` to be used. Figure 3 shows such an instance document carrying the `<track>` element.

```
<?xml version="1.0" encoding="UTF-8"?>
<presence xmlns="urn:ietf:params:xml:ns:pidf"
  xmlns:gp="urn:ietf:params:xml:ns:pidf:geopriv10"
  xmlns:gml="http://www.opengis.net/gml"
  entity="pres:geotarget@example.com">
  <device id="sg89ae">
    <gp:geopriv>
      <gp:location-info>
        <gml:track>
          <gml:MovingObjectStatus>
            <gml:validTime>
              <gml:TimeInstant>
                <gml:timePosition>2005-11-28T13:00:00
              </gml:timePosition>
            </gml:validTime>
          </gml:MovingObjectStatus>
        </gml:track>
      </gp:location-info>
    </gp:geopriv>
  </device>
</presence>
```

```
    </gml:TimeInstant>
  </gml:validTime>
  <gml:location>
    <gml:Point>
      <gml:pos>140. -35.</gml:pos>
    </gml:Point>
  </gml:location>
  <gml:speed uom="#kph">12</gml:speed>
  <gml:bearing>
```

```
    <gml:CompassPoint>SE</gml:CompassPoint>
  </gml:bearing>
</gml:MovingObjectStatus>
<gml:MovingObjectStatus>
  <gml:validTime>
    <gml:TimeInstant>
      <gml:timePosition>2005-11-28T14:00:00
    </gml:timePosition>
    </gml:TimeInstant>
  </gml:validTime>
  <gml:location>
    <gml:Point>
      <gml:pos>140.1 -34.9</gml:pos>
    </gml:Point>
  </gml:location>
  <gml:speed uom="#kph">23.</gml:speed>
  <gml:bearing>
    <gml:CompassPoint>ESE</gml:CompassPoint>
  </gml:bearing>
</gml:MovingObjectStatus>
</gml:track>
</gp:location-info>
<gp:usage-rules>
  <gp:retransmission-allowed>no</gp:retransmission-allowed>
  <gp:retention-expiry>2003-06-23T04:57:29Z
</gp:retention-expiry>
</gp:usage-rules>
</gp:geopriv>
  <timestamp>2003-06-22T20:57:29Z</timestamp>
</device>
</presence>
```

Figure 3: Example of a PIDF-LO with a track Element

The authors decided to pick the simplest version.

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