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Geopriv Location Object Markup Language

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Abstract

This draft presents and illustrates a foundational version of an markup language suitable for representing the Geopriv Location Object. This language is defined by means of an XML schema. In addition, we compile a list of open issues that the Geopriv Working Group must solve in order to allow for precise definitions of Location Object data formats.

Conventions used in this document

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](#) [2].

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[1.](#) Introduction

This draft aims at providing a foundation of a markup language suitable for representing all data fields of the Geopriv Location Object (LO) as required in [\[3\]](#). We present and illustrate an XML schema defining such a markup language. Up to now, we have concentrated on the question of how to represent the required data by means of an XML language, only touching the security and privacy issues concerning the Location Object.

Even at this early stage of developing a suitable Geopriv Location Object (LO) data format, it has become very clear that the Geopriv Working Group has to arrive at more explicit descriptions of the content of required data fields in order to allow for precise definitions of appropriate LO data formats. To give just one example, the Geopriv Working Group should explicitly determine which types of Location Recipient (LR) Credentials are to be supported. Therefore,

we shall also utilize this draft to compile a list of general open issues that must be solved by the Geopriv Working Group in order to be able to complete its work successfully. These general open issues are entirely independent of a particular LO data format (such as XML

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in case of this draft), but their solution is simply a prerequisite to any sensible definition of such a data format. Additionally, we shall collect some open issues that are related to the definition of an XML LO.

Based on the solutions of the general and XML related open issues, future versions of this draft will make the Location Object (LO) markup language introduced in this draft more precise in terms of representing identity, privacy policy and location information. We will investigate how security and privacy requirements on the Location Object can be satisfied by means of, for instance, the XML Signature and XML Encryption languages, the XML Access Control Markup Language (XACML) and the XML Key Management Specification (XKMS). In addition, we will make proposals how this XML LO can be bound to different Using Protocols.

[2.](#) Geopriv LO Markup Language

[2.1.](#) Overview

The XML schema listed completely in chapter 3 specifies an XML language that allows for the following top-level XML elements:

- LO (Location Object):
comprises all of the subsequent elements, the only mandatory of which is the Target element while all other elements are optional.
- Target:
contains an identifier for the Target which can be of non-anonymous, anonymous or of indeterminate type.
- Device:
contains an identifier for the Device which can be a phone number, an IP address, or of anonymous or indeterminate type.
- RM (Rule Maker):
contains an identifier for the Rule Maker (RM) which can be of non-anonymous, anonymous or of indeterminate type.
- LR (Location Recipient):
contains an identifier for the LR which can be of non-anonymous, anonymous or of indeterminate type; can also provide the information whether this identifier is a single or multi cast identifier.
- LR Credential (Location Recipient Credential):

- contains credentials of the Location Recipient.
- LR PoP (Location Recipient Proof of Possession of Credential):
contains the data that allows for verifying that the LR is in fact in possession of a certain credential.
- Rule:
contains an URI of an Applicable Rule, a Limited Rule or both.
- Location:
contains one or more Location Information child elements each of which can be composed of one or more Location Representation child elements and a Sighting Time element. Motion and Direction Vector as well as Precision and Confidence elements are also included here.

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- Time to Live:
contains the point of time until when Location Information can be considered current.

Subsequent paragraphs illustrate the corresponding LO markup language in greater detail.

[2.2.](#) Schema Element Start Tag

As usual, the schema element start tag defines basic properties of the corresponding XML language (the line numbers are, of course, not part of the XML schema, but merely for easier referencing):

```

1: <xs:schema
2:   targetNamespace="urn:ietf:geopriv:lo:0.0.4"
3:   xmlns:gplo="urn:ietf:geopriv:lo:0.0.4"
4:   xmlns:xs="http://www.w3.org/2001/XMLSchema"
5:   elementFormDefault="qualified"
6:   attributeFormDefault="unqualified"
7:   version="0.0.4">

```

In line 4, the W3C schema language namespace `http://www.w3.org/2001/XMLSchema` is linked to the prefix `xs`. In line 3, the prefix `gplo`, which stands for `geopriv LO`, is associated to the namespace `urn:ietf:geopriv:lo:0.0.4`. This URI also defines the target namespace of this schema (line 2). The value of the attribute `version` indicates a (up to now, fictive) version number of this schema and the corresponding XML language.

[2.3.](#) LO Element

The LO element is the element of highest level within the LO markup

language. It is defined as follows:

```
8:  <xs:element name="LocationObject"
      type="gplo:LocationObjectType"/>

9:  <xs:complexType name="LocationObjectType">
10:    <xs:all>
11:      <xs:element ref="gplo:Target"/>
12:      <xs:element ref="gplo:Device" minOccurs="0"/>
13:      <xs:element ref="gplo:RuleMaker" minOccurs="0"/>
14:      <xs:element ref="gplo:LocationRecipient" minOccurs="0"/>
15:      <xs:element ref="gplo:LocationRecipientCredential"
        minOccurs="0"/>
16:      <xs:element ref="gplo:LocationRecipientPoPofCredential"
        minOccurs="0"/>
17:      <xs:element ref="gplo:Rule" minOccurs="0"/>
18:      <xs:element ref="gplo:Location" minOccurs="0"/>
19:      <xs:element ref="gplo:TimeToLive" minOccurs="0"/>
20:    </xs:all>
21:  </xs:complexType>
```

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Thus, each valid LocationObject element can be composed of the child elements `Target` (line 11), ..., and `TimeToLive` (line 19). The Target element is the only child element of the LocationObject element that is mandatory. Each other child element is optional and can occur at most once; the order of occurrence is arbitrary (xs:all, line 10).

Open Issue 1 (general):

Which of the required LO data fields listed in [3] shall be mandatory to the LO?

2.4. Target Element

In line 11, the definition of the Target element is referenced to the one given below. In essence, the Target element has a child element TargetIdentity and a grandchild element TargetIdentifier whose content is of type `xs:string`, and which can be equipped with the optional attributes `IdentifierType` and `NameSpace`. Permitted values of the IdentifierType attribute are `NonAnonymous`, `Anonymous` and `Any`. The latter attribute value might indicate an indeterminate or unknown or concealed type of Target identifier.

```
22:  <xs:element name="Target" type="gplo:TargetType"/>
```

```

23: <xs:complexType name="TargetType">
24:   <xs:sequence>
25:     <xs:element name="TargetIdentity">
26:       <xs:complexType>
27:         <xs:choice>
28:           <xs:element name="TargetIdentifier"
29:             type="gplo:TargetIdentifierType"/>
30:           <xs:any namespace="##other" processContents="lax"/>
31:         </xs:choice>
32:       </xs:complexType>
33:     </xs:sequence>
34:   </xs:complexType>

35: <xs:complexType name="TargetIdentifierType">
36:   <xs:simpleContent>
37:     <xs:extension base="xs:string">
38:       <xs:attributeGroup ref="gplo:TargetIdentifierAttribute"/>
39:     </xs:extension>
40:   </xs:simpleContent>
41: </xs:complexType>

42: <xs:attributeGroup name="TargetIdentifierAttribute">
43:   <xs:attribute name="IdentifierType" use="optional">
44:     <xs:simpleType>
45:       <xs:restriction base="xs:string">
46:         <xs:enumeration value="NonAnonymymous"/>
47:         <xs:enumeration value="Anonymous"/>

```

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```

48:       <xs:enumeration value="Any"/>
49:     </xs:restriction>
50:   </xs:simpleType>
51: </xs:attribute>
52: <xs:attribute name="NameSpace" type="xs:anyURI"
53:   use="optional"/>
54: <xs:anyAttribute processContents="lax"/>
55: </xs:attributeGroup>

```

A simple instance of the Target element definition could look like as follows:

```

<Target>
  <TargetIdentity>
    <TargetIdentifier IdentifierType="Anonymous">
      ginefohcsT sennaH
    </TargetIdentifier>

```

```
    </TargetIdentity>
  </Target>
```

Line 52 defines the attribute `Namespace` which is optional to the `TargetIdentifier` element, and whose value must be an URI. In conjunction with an `IdentifierType` attribute value `Anonymous`, this attribute could be used to point to a set of identifiers from which the anonymous `Target` identifier, i.e. the content of the `TargetIdentifier` element, had been taken.

Open Issue 2 (XML):

Pointing to a set of identifiers by means of an URI – is this an appropriate mechanism for handling anonymous identifiers?

Line 29 in combination with line 27 allows the `TargetIdentifier` element to be substituted by any other element defined within a namespace different from the namespace of this schema. The purpose of this mechanism is to support other identity providing data formats such as specified by the Liberty Alliance Project, for example.

Open Issue 3 (general):

Which identity providing data formats shall be supported by the Geopriv L0?

[2.5.](#) Device Element

The definition of the `Device` element is quite similar to the definition of the `Target` element – of course with the exception that the `IdentifierType` attribute of the `DeviceIdentifier` element can have the values `PhoneNumber`, `IPAddress`, `Anonymous` and `Any`:

```
55: <xs:element name="Device" type="gplo:DeviceType"/>
```

```
56: <xs:complexType name="DeviceType">
```

```
57:   <xs:sequence>
```

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```
58:   <xs:element name="DeviceIdentity">
```

```
59:     <xs:complexType>
```

```
60:       <xs:choice>
```

```
61:         <xs:element name="DeviceIdentifier"
                      type="gplo:DeviceIdentifierType"/>
```

```
62:         <xs:any namespace="##other" processContents="lax"/>
```

```
63:       </xs:choice>
```

```
64:     </xs:complexType>
```

```
65:   </xs:element>
```

```

66:     </xs:sequence>
67: </xs:complexType>

68: <xs:complexType name="DeviceIdentifierType">
69:     <xs:simpleContent>
70:         <xs:extension base="xs:string">
71:             <xs:attributeGroup ref="gplo:DeviceIdentifierAttribute"/>
72:         </xs:extension>
73:     </xs:simpleContent>
74: </xs:complexType>

75: <xs:attributeGroup name="DeviceIdentifierAttribute">
76:     <xs:attribute name="IdentifierType" use="optional">
77:         <xs:simpleType>
78:             <xs:restriction base="xs:string">
79:                 <xs:enumeration value="PhoneNumber"/>
80:                 <xs:enumeration value="IPAddress"/>
81:                 <xs:enumeration value="Anonymous"/>
82:                 <xs:enumeration value="Any"/>
83:             </xs:restriction>
84:         </xs:simpleType>
85:     </xs:attribute>
86:     <xs:attribute name="Namespace" type="xs:anyURI"
87:                   use="optional"/>
87:     <xs:anyAttribute processContents="lax"/>
88: </xs:attributeGroup>

```

An example of an Device element complying with this syntax is:

```

<Device>
  <DeviceIdentity>
    <DeviceIdentifier IdentifierType="PhoneNumber">
      017167239870
    </DeviceIdentifier>
  </DeviceIdentity>
</Device>

```

Open Issue 4 (general):

Which types of Devices and Device identifiers shall be supported by the L0? (phone numbers, IP addresses, anonymous ones and ...?)

Up to now, the RM element is defined in a way that allows for representing a non-anonymous, anonymous or indeterminate RM identifier, similar to the Target element. This, of course, will not be sufficient in a final version of this markup language: additional features will have to be specified in order to be able to satisfy the privacy requirements on the LO.

```
89:  <xs:element name="RuleMaker" type="gplo:RuleMakerType"/>

90:  <xs:complexType name="RuleMakerType">
91:    <xs:sequence>
92:      <xs:element name="RuleMakerIdentity">
93:        <xs:complexType>
94:          <xs:choice>
95:            <xs:element name="RuleMakerIdentifier"
                        type="gplo:RuleMakerIdentifierType"/>
96:            <xs:any namespace="##other" processContents="lax"/>
97:          </xs:choice>
98:        </xs:complexType>
99:      </xs:element>
100:    </xs:sequence>
101:  </xs:complexType>

102: <xs:complexType name="RuleMakerIdentifierType">
103:   <xs:simpleContent>
104:     <xs:extension base="xs:string">
105:       <xs:attributeGroup
           ref="gplo:RuleMakerIdentifierAttribute"/>
106:     </xs:extension>
107:   </xs:simpleContent>
108: </xs:complexType>

109: <xs:attributeGroup name="RuleMakerIdentifierAttribute">
110:   <xs:attribute name="IdentifierType" use="optional">
111:     <xs:simpleType>
112:       <xs:restriction base="xs:string">
113:         <xs:enumeration value="NonAnonymous"/>
114:         <xs:enumeration value="Anonymous"/>
115:         <xs:enumeration value="Any"/>
116:       </xs:restriction>
117:     </xs:simpleType>
118:   </xs:attribute>
119:   <xs:attribute name="NameSpace" type="xs:anyURI"
                 use="optional"/>
120:   <xs:anyAttribute processContents="lax"/>
121: </xs:attributeGroup>
```

An example of a RuleMaker element could be:

```
<RuleMaker>
```

<RuleMakerIdentity>

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```
<RuleMakerIdentifier IdentifierType="NonAnonymous">
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</RuleMakerIdentifier>
</RuleMakerIdentity>
</RuleMaker>
```

[2.7.](#) LR Element

The LR element is the last of the identifier storing child elements of the Location Object element. Its definition is modeled on the syntax of the Target, Device and RM elements. Its LocationRecipientIdentifier grandchild element can be of type `NonAnonymous`, `Anonymous` and `Any`. The optional attribute `CastType` of the LocationRecipientIdentifier element can indicate whether the identifier is a single or a multi cast identifier:

```
122: <xs:element name="LocationRecipient"
           type="gplo:LocationRecipientType"/>

123: <xs:complexType name="LocationRecipientType">
124:   <xs:sequence>
125:     <xs:element name="LocationRecipientIdentity">
126:       <xs:complexType>
127:         <xs:choice>
128:           <xs:element name="LocationRecipientIdentifier"
                        type="gplo:LocationRecipientIdentifierType"/>
129:           <xs:any namespace="##other" processContents="lax"/>
130:         </xs:choice>
131:       </xs:complexType>
132:     </xs:element>
133:   </xs:sequence>
134: </xs:complexType>

135: <xs:complexType name="LocationRecipientIdentifierType">
136:   <xs:simpleContent>
137:     <xs:extension base="xs:string">
138:       <xs:attributeGroup
           ref="gplo:LocationRecipientIdentifierAttribute"/>
139:     </xs:extension>
140:   </xs:simpleContent>
141: </xs:complexType>

142: <xs:attributeGroup name="LocationRecipientIdentifierAttribute">
```

```

143:    <xs:attribute name="IdentifierType" use="optional">
144:      <xs:simpleType>
145:        <xs:restriction base="xs:string">
146:          <xs:enumeration value="NonAnonymous"/>
147:          <xs:enumeration value="Anonymous"/>
148:          <xs:enumeration value="Any"/>
149:        </xs:restriction>
150:      </xs:simpleType>
151:    </xs:attribute>

```

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```

152:    <xs:attribute name="CastType" use="optional">
153:      <xs:simpleType>
154:        <xs:restriction base="xs:string">
155:          <xs:enumeration value="SingleCast"/>
156:          <xs:enumeration value="MultiCast"/>
157:        </xs:restriction>
158:      </xs:simpleType>
159:    </xs:attribute>
160:    <xs:attribute name="NameSpace" type="xs:anyURI"
161:                  use="optional"/>
162:  </xs:attributeGroup>

```

Example:

```

<LocationRecipient>
  <LocationRecipientIdentity>
    <LocationRecipientIdentifier
      IdentifierType="NonAnonymous"
      CastType="MultiCast">
      CT IC 3 Mobile Security Team
    </LocationRecipientIdentifier>
  </LocationRecipientIdentity>
</LocationRecipient>

```

Open Issue 5 (general):

Which types of data sub-fields shall the LR data field support? (For example, data sub-fields for phone numbers or IP addresses of LRs?)

[2.8.](#) LR Credential Element

Up to now, the Geopriv Working Group has not determined which types of Credentials are to be supported by the LR Credential data field. Thus, for now, we have specified in the definition of the

LocationRecipientCredential element that credentials are of unspecified type `xs:string` (line 166-170). The element names `PKIXCertificate`, ..., `IDandSharedSecret` indicate some credential types that could be supported by the LR Credential data field. Line 165 (`maxOccurs=unbounded`) allows several credentials to be included in the LocationRecipientCredential element:

```

163: <xs:element name="LocationRecipientCredential"
      type="gplo:LocationRecipientCredentialType"/>

164: <xs:complexType name="LocationRecipientCredentialType">
165:   <xs:choice maxOccurs="unbounded">
166:     <xs:element name="PKIXCertificate" type="xs:string"/>
167:     <xs:element name="IDandPublicKey" type="xs:string"/>
168:     <xs:element name="HashandURIofPKIXCertificate"
      type="xs:string"/>
169:     <xs:element name="PKIXKeyIdentifier" type="xs:string"/>

```

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```

170:   <xs:element name="IDandSharedSecret" type="xs:string"/>
171: </xs:choice>
172: </xs:complexType>

```

A vacuous example of a LocationRecipientCredential element:

```

<LocationRecipientCredential>
  <PKIXCertificate>...</PKIXCertificate>
</LocationRecipientCredential>

```

Open Issue 6 (general):

Which credential types shall be supported by the LR Credential data field?

[2.9.](#) LR PoP Element

The Geopriv Working Group should define explicitly the types of PoP (Proof of Possession of Credential) that shall be supported in the corresponding data field. The simplest way of providing such a PoP may be signing an appropriate statement on the result of a successfully executed challenge-response procedure. We indicate this possibility rudimentarily in the current definition of the LocationRecipientPoPofCredential element:

```

173: <xs:element name="LocationRecipientPoPofCredential">
174:   <xs:complexType>
175:     <xs:choice>
176:       <xs:element name="ChallengeResponse" type="xs:string"/>

```

```

177:      </xs:choice>
178:    </xs:complexType>
179:  </xs:element>

```

For adding an XML digital signature to the statement contained in line 176, the schema definition could be modified as follows:

```

M01:  <xs:schema
M02:    targetNamespace="urn:ietf:geopriv:lo:0.0.4"
M03:    xmlns:geopriv="urn:ietf:geopriv:lo:0.0.4"
M04:    xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
M05:    xmlns:xs="http://www.w3.org/2001/XMLSchema"
M06:    elementFormDefault="qualified"
M07:    attributeFormDefault="unqualified"
M08:    version="0.0.4">

M09:    <xs:import
      namespace="http://www.w3.org/2000/09/xmldsig#"
      schemaLocation="http://www.w3.org/TR/xml-dsig-core/
        xmldsig-core-schema.xsd"/>

M10:    .....

M11:    <xs:element name="LocationRecipientPoPofCredential">
M12:      <xs:complexType>

```

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```

M13:      <xs:sequence>
M14:        <xs:element name="ChallengeResponse"
M15:          type="xs:string"/>
M16:        <xs:element ref="ds:Signature"/>
M17:      </xs:sequence>
M18:    </xs:complexType>
M19:  </xs:element>

M19:    .....

```

In line M04, the W3C XML Signature namespace is assigned to the prefix `ds`. The place at which an XML validator can find the XML Signature language definitions is identified in line M09. Finally, line M15 makes a `ds:Signature` element mandatory.

Open Issue 7 (general):

Which types of LR PoP data fields shall be supported?
 (Signatures on Challenge-Response procedures? However, we also need ...?)

2.10. Rule Element

As described in the Geopriv Requirements draft [3], the Rule Field of the LO MAY be a referral to an applicable Rule (for instance, an URI to a full Rule), or it MAY contain a Limited Rule, or both. In the current version of the LO markup language, this requirement is implemented as follows:

```
180: <xs:element name="Rule" type="gplo:RuleType"/>

181: <xs:complexType name="RuleType">
182:   <xs:choice>
183:     <xs:element name="ApplicableRule"
184:                 type="gplo:ApplicableRuleType"/>
185:     <xs:element name="LimitedRule"
186:                 type="gplo:LimitedRuleType"/>
187:     <xs:element name="ApplicableAndLimitedRule">
188:       <xs:complexType>
189:         <xs:all>
190:           <xs:element name="ApplicableRule"
191:                       type="gplo:ApplicableRuleType"
192:                       minOccurs="1"/>
193:           <xs:element name="LimitedRule"
194:                       type="gplo:LimitedRuleType"
195:                       minOccurs="1"/>
196:         </xs:all>
197:       </xs:complexType>
198:     </xs:choice>
199:   </xs:complexType>

200: <xs:complexType name="ApplicableRuleType">
201:   <xs:choice>
```

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```
201:   <xs:element name="ApplicableRuleURI" type="xs:anyURI"/>
202: </xs:choice>
203: </xs:complexType>

204: <xs:complexType name="LimitedRuleType">
205:   <xs:choice>
206:     <xs:element name="LimitedRuleLanguage1" type="xs:string"/>
207:   </xs:choice>
208: </xs:complexType>
```

A Rule element could therefore look like as follows:

```

<Rule>
  <LimitedRule>
    <LimitedRuleLanguage1>
      Dirk Kroeselberg has no permission to see my location.
    </LimitedRuleLanguage1>
  </LimitedRule>
</Rule>

```

(And this is a Rule language that is in fact "limited" ...)

Open Issue 8 (general and XML):

Geopriv must specify or adopt at least one Rule language. Furthermore, the mechanism of pointing to an applicable Rule must be described explicitly. In case of an XML LO data format, the XML Access Control Markup Language (XACML) seems to be a natural Rule language candidate – at least with respect to a full Rule language. – With regard to what exactly is a Limited Rule language supposed to be "limited"?

[2.11.](#) Location Element

The Location element carries the actual location information. It consists of an unbounded number of LocationInformation elements; the number of these elements can be zero (line 212). Each LocationInformation element allows for arbitrarily many LocationRepresentation child elements, and optional child elements "SightingTime", "MotionVector" and "DirectionVector" (line 217-220). The LocationRepresentation elements can contain representations of location information that are of type "LatLonAlt" (Altitude is optional), "Civil", or "TimeZone" (lines 226-228), as well as of a type defined outside the namespace of the LO markup language (for instance, developed by OpenGIS), see line 229. In addition, the LocationRepresentation element has an optional child element "Confidence" (line 231), whose content is a decimal number between 0.0 and 100.0 indicating a level of reliability associated with a given Location Representation:

```
209: <xs:element name="Location" type="gplo:LocationType"/>
```

```
210: <xs:complexType name="LocationType">
```

```
211:   <xs:sequence>
```

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```

212:   <xs:element name="LocationInformation"
              type="gplo:LocationInformationType"
              minOccurs="0"
              maxOccurs="unbounded"/>

```

```

213:     </xs:sequence>
214: </xs:complexType>

215: <xs:complexType name="LocationInformationType">
216:     <xs:sequence>
217:         <xs:element name="LocationRepresentation"
218:             type="gplo:LocationRepresentationType"
219:             minOccurs="0"
220:             maxOccurs="unbounded"/>
221:         <xs:element name="SightingTime" type="xs:dateTime"
222:             minOccurs="0"/>
223:         <xs:element name="MotionVector" type="xs:string"
224:             minOccurs="0"/>
225:         <xs:element name="DirectionVector" type="xs:string"
226:             minOccurs="0"/>
227:     </xs:sequence>
228: </xs:complexType>

229: <xs:complexType name="LocationRepresentationType">
230:     <xs:sequence>
231:         <xs:choice>
232:             <xs:element name="LatLonAlt" type="gplo:LatLonAltType"/>
233:             <xs:element name="Civil" type="gplo:CivilType"/>
234:             <xs:element name="TimeZone" type="gplo:TimeZoneType"/>
235:             <xs:any namespace="##other" processContents="lax"/>
236:         </xs:choice>
237:         <xs:element name="Confidence" type="gplo:ConfidenceType"
238:             minOccurs="0"/>
239:     </xs:sequence>
240: </xs:complexType>

```

The overall structure of an instance of the Location element can be seen from the following example, which uses the `LatLonAlt`, `Civil` and `TimeZone` types of location representations:

```

<Location>
  <LocationInformation>
    <LocationRepresentation>
      <LatLonAlt>.....</LatLonAlt>
      <Confidence>.....</Confidence>
    </LocationRepresentation>
    <LocationRepresentation>
      <Civil>.....</Civil>
    </LocationRepresentation>
    <LocationRepresentation>
      <TimeZone>.....</TimeZone>
    </LocationRepresentation>
    <SightingTime>.....</SightingTime>
    <MotionVector>.....</MotionVector>
  </LocationInformation>
</Location>

```



```

        <DirectionVector>.....</DirectionVector>
    </LocationInformation>
    <LocationInformation>.....</LocationInformation>
</Location>

```

[2.11.1.](#) Latitude, Longitude, Altitude and Precision

Line 226 above points to the following definition of the `LatLonAlt` type of location representation: The `LatLonAlt` element consists of the mandatory Latitude and Longitude elements, an optional Altitude element and an optional Precision element:

```

234: <xs:complexType name="LatLonAltType">
235:   <xs:sequence>
236:     <xs:element name="Latitude" type="gplo:LatitudeType"
237:               minOccurs="1"/>
238:     <xs:element name="Longitude" type="gplo:LongitudeType"
239:               minOccurs="1"/>
240:     <xs:element name="Altitude" type="gplo:AltitudeType"
241:               minOccurs="0"/>
242:     <xs:element name="Precision"
243:               type="gplo:LatLonAltPrecisionType"
244:               minOccurs="0"/>
245:   </xs:sequence>
246: </xs:complexType>

```

Real-world latitude and longitude representations come in (at least) three different styles:

- Example: - 11⁰⁰ 13⁰⁰ 57⁰⁰:
This means: degree, minute and second are represented separately by integers contained in certain intervals. We have introduced an equivalent XML representation which is abbreviated by `DegIntMinIntSecInt`.
- Example: 48.1234⁰⁰:
This means: degree, minute and second are represented by one decimal number contained in a certain interval. We have specified an equivalent XML representation abbreviated by `DegMinSecDec`.
- Example: - 19⁰⁰ 21.123⁰⁰:
This means: the degree is represented by an integer, while minute and second are represented by one decimal number. We have also introduced an equivalent XML representation which is abbreviated by `DegIntMinSecDec`.

The optional Altitude element whose type is referenced in line 238

above consists of a positive or negative decimal number representing the altitude value with respect to a unit that must be indicated by the value of the attribute Unit. The permitted values of the Unit attribute are `öMeterö`, `öKilometerö`, `öFootö`, `öYardö` and `öMileö`.

The content of the optional element Precision (see line 239) is a positive decimal number indicating an area within which the Target is located. The Precision element has two mandatory attributes at its disposal: Area and Unit. The permitted values of the Area attribute are `öCircleö`, `öSphereö`, `öRectangleö` and `öCuboidö` indicating the shape of area, while the permitted values of the Unit attribute are as described above. In case the Altitude element is present, the semantics of a Precision element of the form

```
<Precision Area=öSphereö Unit=öMeterö>58.3</Precision>
```

for instance, could be that the location of the Target is known to be contained in a sphere of 58.3 cubic meters around the position specified by means of the content of the Latitude, Longitude and Altitude elements. There are, of course, many other ways of indicating precision, which immediately leads to

Open Issue 9 (general):

Which types of precision indications shall be supported within the Location Field? Which is the exact semantics of these precision indications?

Instead of listing the schema definitions illustrated in this paragraph, we give an example of a full LatLonAlt element:

```
<LatLonAlt>
  <Latitude>
    <DegIntMinIntSecInt>
      <Degree>-48</Degree>
      <Minute>8</Minute>
      <Second>23</Second>
    </DegIntMinIntSecInt>
  </Latitude>
  <Longitude>
    <DegIntMinSecDec>
      <Degree>11</Degree>
      <MinuteSecond>34.4667</MinuteSecond>
    </DegIntMinSecDec>
  </Longitude>
</LatLonAlt>
```

```

    </Longitude>
    <Altitude Unit="Meter">521.27</Altitude>
    <Precision Area="Sphere" Unit="Meter">58.3</Precision>
  </LatLonAlt>

```

[2.11.2.](#) Civil

There has been a long discussion within Geopriv on how the civil type of location representation should look like. Location domains such as `state` and `district` are not appropriate for all countries. Since we are not sure whether that discussion can be seen as finished, we include this problem in the list of open issues:

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Open Issue 10 (general):

How exactly should civil location representations look like?

In order to circumvent some of the problems, we have defined the civil type of location representation as follows:

```

242: <xs:complexType name="CivilType">
243:   <xs:sequence>
244:     <xs:element name="Domain" maxOccurs="unbounded">
245:       <xs:complexType>
246:         <xs:simpleContent>
247:           <xs:extension base="xs:string">
248:             <xs:attribute name="Type" type="xs:string"/>
249:             <xs:anyAttribute processContents="lax"/>
250:           </xs:extension>
251:         </xs:simpleContent>
252:       </xs:complexType>
253:     </xs:element>
254:   </xs:sequence>
255: </xs:complexType>

```

Thus, the Civil element introduced in line 227 above consists of an unbounded sequence of Domain elements, whose content is of type `xs:string`, and which are equipped with a mandatory but not explicitly specified attribute. The intention here is to allow for a type of civil location representation that is universal as far as possible: The Civil element

```

<Civil>
  <Domain Type="Country">Germany</Domain>
  <Domain Type="State">Bavaria</Domain>

```

```

    <Domain Type="City">Munich</Domain>
    <Domain Type="Street">Leopoldstrasse</Domain>
    <Domain Type="Number">6</Domain>
  </Civil>

```

complies with its schema definition as well as

```

<Civil>
  <Domain d1="shi">...</Domain>
  <Domain d2="chome">...</Domain>
  <Domain d3="ban">...</Domain>
</Civil>

```

does.

[2.11.3.](#) Time Zone

Time zones are a further type of location representation supported by the schema definition:

```

256: <xs:simpleType name="TimeZoneType">
257:   <xs:restriction base="xs:string">

```

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```

258:   <xs:pattern value="Z|[\+|-]?([0-9]|1[0-2]):[0-5][0-9]"/>
259: </xs:restriction>
260: </xs:simpleType>

```

Therefore, -08:00, +11:36 and Z (standing for Zulu, i.e. Greenwich Mean Time) are valid content of TimeZone elements which have been introduced in line 228 above.

[2.11.4.](#) Sighting Time

The W3C schema language specifications provide the data type `xs:dateTime` which is suitable for indicating when the location information was accurate. So

```
<SightingTime>2003-07-14T20:12:34+01:00</SightingTime>
```

is a valid SightingTime child element of the LocationInformation element.

[2.11.5.](#) Motion and Direction Vectors

The MotionVector and DirectionVector elements are optional child elements of the LocationInformation element and are defined in lines

219 and 220 as follows:

```
<xs:element name="MotionVector" type="xs:string"
            minOccurs="0"/>
<xs:element name="DirectionVector" type="xs:string"
            minOccurs="0"/>
```

These definitions are nothing else than place holders since we have the following

Open Issue 11 (general):

How exactly shall the motion and direction vectors look like and what is their semantics?

[2.12.](#) Time to Live Element

The data type `xs:dateTime` is also suitable for indicating until when location information can be considered current:

```
261: <xs:element name="TimeToLive" type="xs:dateTime"/>
```

Example: `<TimeToLive>2003-07-14T20:17:34+01:00</TimeToLive>`.

[3.](#) XML Schema Listing

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This section contains a complete listing of the XML schema that has been illustrated in previous sections. The next section provides a simple XML LO instance document that is valid with respect to this schema.

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema
  targetNamespace="urn:ietf:geopriv:lo:0.0.4"
  xmlns:gplo="urn:ietf:geopriv:lo:0.0.4"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified"
  attributeFormDefault="unqualified"
  version="0.0.4">
```

<!-- Start: L0 -->

<xs:element name="LocationObject" type="gplo:LocationObjectType"/>

<xs:complexType name="LocationObjectType">

<xs:all>

<xs:element ref="gplo:Target"/>

<xs:element ref="gplo:Device" minOccurs="0"/>

<xs:element ref="gplo:RuleMaker" minOccurs="0"/>

<xs:element ref="gplo:LocationRecipient" minOccurs="0"/>

<xs:element ref="gplo:LocationRecipientCredential"
minOccurs="0"/>

<xs:element ref="gplo:LocationRecipientPoPofCredential"
minOccurs="0"/>

<xs:element ref="gplo:Rule" minOccurs="0"/>

<xs:element ref="gplo:Location" minOccurs="0"/>

<xs:element ref="gplo:TimeToLive" minOccurs="0"/>

</xs:all>

</xs:complexType>

<!-- End: L0 -->

<!-- Start: Target -->

<xs:element name="Target" type="gplo:TargetType"/>

<xs:complexType name="TargetType">

<xs:sequence>

<xs:element name="TargetIdentity">

<xs:complexType>

<xs:choice>

<xs:element name="TargetIdentifier"

type="gplo:TargetIdentifierType"/>

<xs:any namespace="##other" processContents="lax"/>

</xs:choice>

</xs:complexType>

</xs:element>

</xs:sequence>

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</xs:complexType>

<xs:complexType name="TargetIdentifierType">

<xs:simpleContent>

<xs:extension base="xs:string">

<xs:attributeGroup ref="gplo:TargetIdentifierAttribute"/>

</xs:extension>

```

    </xs:simpleContent>
</xs:complexType>

<xs:attributeGroup name="TargetIdentifierAttribute">
  <xs:attribute name="IdentifierType" use="optional">
    <xs:simpleType>
      <xs:restriction base="xs:string">
        <xs:enumeration value="NonAnonmymous"/>
        <xs:enumeration value="Anonymous"/>
        <xs:enumeration value="Any"/>
      </xs:restriction>
    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="NameSpace" type="xs:anyURI" use="optional"/>
  <xs:anyAttribute processContents="lax"/>
</xs:attributeGroup>

<!-- End: Target -->

<!-- Start: Device -->

<xs:element name="Device" type="gplo:DeviceType"/>

<xs:complexType name="DeviceType">
  <xs:sequence>
    <xs:element name="DeviceIdentity">
      <xs:complexType>
        <xs:choice>
          <xs:element name="DeviceIdentifier"
            type="gplo:DeviceIdentifierType"/>
          <xs:any namespace="##other" processContents="lax"/>
        </xs:choice>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="DeviceIdentifierType">
  <xs:simpleContent>
    <xs:extension base="xs:string">
      <xs:attributeGroup ref="gplo:DeviceIdentifierAttribute"/>
    </xs:extension>
  </xs:simpleContent>
</xs:complexType>

<xs:attributeGroup name="DeviceIdentifierAttribute">

```

```

    <xs:attribute name="IdentifierType" use="optional">
      <xs:simpleType>
        <xs:restriction base="xs:string">
          <xs:enumeration value="PhoneNumber"/>
          <xs:enumeration value="IPAddress"/>
          <xs:enumeration value="Anonymous"/>
          <xs:enumeration value="Any"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
    <xs:attribute name="Namespace" type="xs:anyURI" use="optional"/>
    <xs:anyAttribute processContents="lax"/>
  </xs:attributeGroup>

<!-- End: Device -->

<!-- Start: RM -->

  <xs:element name="RuleMaker" type="gplo:RuleMakerType"/>

  <xs:complexType name="RuleMakerType">
    <xs:sequence>
      <xs:element name="RuleMakerIdentity">
        <xs:complexType>
          <xs:choice>
            <xs:element name="RuleMakerIdentifier"
              type="gplo:RuleMakerIdentifierType"/>
            <xs:any namespace="##other" processContents="lax"/>
          </xs:choice>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="RuleMakerIdentifierType">
    <xs:simpleContent>
      <xs:extension base="xs:string">
        <xs:attributeGroup ref="gplo:RuleMakerIdentifierAttribute"/>
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>

  <xs:attributeGroup name="RuleMakerIdentifierAttribute">
    <xs:attribute name="IdentifierType" use="optional">
      <xs:simpleType>
        <xs:restriction base="xs:string">
          <xs:enumeration value="NonAnonymous"/>
          <xs:enumeration value="Anonymous"/>
          <xs:enumeration value="Any"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:attributeGroup>

```



```

    </xs:simpleType>
  </xs:attribute>
  <xs:attribute name="NameSpace" type="xs:anyURI" use="optional"/>

```

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```

    <xs:anyAttribute processContents="lax"/>
  </xs:attributeGroup>

<!-- End: RM -->

<!-- Start: LR -->

  <xs:element name="LocationRecipient"
    type="gplo:LocationRecipientType"/>

  <xs:complexType name="LocationRecipientType">
    <xs:sequence>
      <xs:element name="LocationRecipientIdentity">
        <xs:complexType>
          <xs:choice>
            <xs:element name="LocationRecipientIdentifier"
              type="gplo:LocationRecipientIdentifierType"/>
            <xs:any namespace="##other" processContents="lax"/>
          </xs:choice>
        </xs:complexType>
      </xs:element>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="LocationRecipientIdentifierType">
    <xs:simpleContent>
      <xs:extension base="xs:string">
        <xs:attributeGroup
          ref="gplo:LocationRecipientIdentifierAttribute"/>
      </xs:extension>
    </xs:simpleContent>
  </xs:complexType>

  <xs:attributeGroup name="LocationRecipientIdentifierAttribute">
    <xs:attribute name="IdentifierType" use="optional">
      <xs:simpleType>
        <xs:restriction base="xs:string">
          <xs:enumeration value="NonAnonymous"/>
          <xs:enumeration value="Anonymous"/>
          <xs:enumeration value="Any"/>
        </xs:restriction>
      </xs:simpleType>
    </xs:attribute>
  </xs:attributeGroup>

```

```

</xs:attribute>
<xs:attribute name="CastType" use="optional">
  <xs:simpleType>
    <xs:restriction base="xs:string">
      <xs:enumeration value="SingleCast"/>
      <xs:enumeration value="MultiCast"/>
    </xs:restriction>
  </xs:simpleType>
</xs:attribute>
<xs:attribute name="NameSpace" type="xs:anyURI" use="optional"/>
<xs:anyAttribute processContents="lax"/>

```

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```

</xs:attributeGroup>

<!-- End: LR -->

<!-- Start: LR Credential -->

<xs:element name="LocationRecipientCredential"
  type="gplo:LocationRecipientCredentialType"/>

<xs:complexType name="LocationRecipientCredentialType">
  <xs:choice maxOccurs="unbounded">
    <xs:element name="PKIXCertificate" type="xs:string"/>
    <xs:element name="IDandPublicKey" type="xs:string"/>
    <xs:element name="HashandURIofPKIXCertificate"
      type="xs:string"/>
    <xs:element name="PKIXKeyIdentifier" type="xs:string"/>
    <xs:element name="IDandSharedSecret" type="xs:string"/>
  </xs:choice>
</xs:complexType>

<!-- End: LR Credential -->

<!-- Start: LR PoP -->

<xs:element name="LocationRecipientPoPofCredential">
  <xs:complexType>
    <xs:choice>
      <xs:element name="ChallengeResponse" type="xs:string"/>
    </xs:choice>
  </xs:complexType>
</xs:element>

<!-- End: LR PoP -->

```

<!-- Start: Rule -->

```
<xs:element name="Rule" type="gplo:RuleType"/>
```

```
<xs:complexType name="RuleType">
```

```
  <xs:choice>
```

```
    <xs:element name="ApplicableRule"
      type="gplo:ApplicableRuleType"/>
```

```
    <xs:element name="LimitedRule" type="gplo:LimitedRuleType"/>
```

```
    <xs:element name="ApplicableAndLimitedRule">
```

```
      <xs:complexType>
```

```
        <xs:all>
```

```
          <xs:element name="ApplicableRule"
            type="gplo:ApplicableRuleType"
            minOccurs="1"/>
```

```
          <xs:element name="LimitedRule"
            type="gplo:LimitedRuleType"
            minOccurs="1"/>
```

```
        </xs:all>
```

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```
  </xs:complexType>
```

```
</xs:element>
```

```
</xs:choice>
```

```
</xs:complexType>
```

```
<xs:complexType name="ApplicableRuleType">
```

```
  <xs:choice>
```

```
    <xs:element name="ApplicableRuleURI" type="xs:anyURI"/>
```

```
  </xs:choice>
```

```
</xs:complexType>
```

```
<xs:complexType name="LimitedRuleType">
```

```
  <xs:choice>
```

```
    <xs:element name="LimitedRuleLanguage1" type="xs:string"/>
```

```
  </xs:choice>
```

```
</xs:complexType>
```

<!-- End: Rule -->

<!-- Start: Location -->

```
<xs:element name="Location" type="gplo:LocationType"/>
```

```
<xs:complexType name="LocationType">
```

```
  <xs:sequence>
```

```
    <xs:element name="LocationInformation"
```

```

        type="gplo:LocationInformationType"
        minOccurs="0"
        maxOccurs="unbounded"/>
    </xs:sequence>
</xs:complexType>

<xs:complexType name="LocationInformationType">
    <xs:sequence>
        <xs:element name="LocationRepresentation"
            type="gplo:LocationRepresentationType"
            minOccurs="0"
            maxOccurs="unbounded"/>
        <xs:element name="SightingTime" type="xs:dateTime"
            minOccurs="0"/>
        <xs:element name="MotionVector" type="xs:string"
            minOccurs="0"/>
        <xs:element name="DirectionVector" type="xs:string"
            minOccurs="0"/>
    </xs:sequence>
</xs:complexType>

```

```

<xs:complexType name="LocationRepresentationType">
    <xs:sequence>
        <xs:choice>
            <xs:element name="LatLonAlt" type="gplo:LatLonAltType"/>
            <xs:element name="Civil" type="gplo:CivilType"/>
            <xs:element name="TimeZone" type="gplo:TimeZoneType"/>

```

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```

        <xs:any namespace="##other" processContents="lax"/>
    </xs:choice>
    <xs:element name="Confidence" type="gplo:ConfidenceType"
        minOccurs="0"/>
</xs:sequence>
</xs:complexType>

```

```

<xs:simpleType name="ConfidenceType">
    <xs:restriction base="xs:decimal">
        <xs:minInclusive value="0.0"/>
        <xs:maxInclusive value="100.0"/>
    </xs:restriction>
</xs:simpleType>

```

```

<!-- Start: Location: Latitude, Longitude, Altitude -->

```

```

<xs:complexType name="LatLonAltType">
    <xs:sequence>

```

```

    <xs:element name="Latitude" type="gplo:LatitudeType"
        minOccurs="1"/>
    <xs:element name="Longitude" type="gplo:LongitudeType"
        minOccurs="1"/>
    <xs:element name="Altitude" type="gplo:AltitudeType"
        minOccurs="0"/>
    <xs:element name="Precision"
        type="gplo:LatLonAltPrecisionType"
        minOccurs="0"/>
</xs:sequence>
</xs:complexType>

```

```

<xs:complexType name="LatitudeType">
    <xs:choice>
        <xs:element name="DegIntMinIntSecInt"
            type="gplo:LatDegIntMinIntSecIntType"/>
        <xs:element name="DegMinSecDec"
            type="gplo:LatDegMinSecDecType"/>
        <xs:element name="DegIntMinSecDec"
            type="gplo:LatDegIntMinSecDecType"/>
    </xs:choice>
</xs:complexType>

```

```

<xs:complexType name="LongitudeType">
    <xs:choice>
        <xs:element name="DegIntMinIntSecInt"
            type="gplo:LonDegIntMinIntSecIntType"/>
        <xs:element name="DegMinSecDec"
            type="gplo:LonDegMinSecDecType"/>
        <xs:element name="DegIntMinSecDec"
            type="gplo:LonDegIntMinSecDecType"/>
    </xs:choice>
</xs:complexType>

```

```

<xs:complexType name="AltitudeType">

```

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```

    <xs:simpleContent>
        <xs:extension base="xs:decimal">
            <xs:attribute name="Unit" type="gplo:Units" use="required"/>
        </xs:extension>
    </xs:simpleContent>
</xs:complexType>

<xs:complexType name="LatLonAltPrecisionType">
    <xs:simpleContent>
        <xs:extension base="gplo:PositiveDecimal">

```

```

        <xs:attribute name="Area" type="gplo:Areas" use="required"/>
        <xs:attribute name="Unit" type="gplo:Units" use="required"/>
    </xs:extension>
</xs:simpleContent>
</xs:complexType>

<xs:complexType name="LatDegIntMinIntSecIntType">
    <xs:sequence>
        <xs:element name="Degree" type="gplo:LatDegIntType"/>
        <xs:element name="Minute" type="gplo:MinSecIntType"/>
        <xs:element name="Second" type="gplo:MinSecIntType"/>
    </xs:sequence>
</xs:complexType>

<xs:complexType name="LonDegIntMinIntSecIntType">
    <xs:sequence>
        <xs:element name="Degree" type="gplo:LonDegIntType"/>
        <xs:element name="Minute" type="gplo:MinSecIntType"/>
        <xs:element name="Second" type="gplo:MinSecIntType"/>
    </xs:sequence>
</xs:complexType>

<xs:simpleType name="LatDegMinSecDecType">
    <xs:restriction base="xs:decimal">
        <xs:minInclusive value="-90.0"/>
        <xs:maxInclusive value="90.0"/>
    </xs:restriction>
</xs:simpleType>

<xs:simpleType name="LonDegMinSecDecType">
    <xs:restriction base="xs:decimal">
        <xs:minInclusive value="-180.0"/>
        <xs:maxInclusive value="180.0"/>
    </xs:restriction>
</xs:simpleType>

<xs:complexType name="LatDegIntMinSecDecType">
    <xs:sequence>
        <xs:element name="Degree" type="gplo:LatDegIntType"/>
        <xs:element name="MinuteSecond" type="gplo:MinSecDecType"/>
    </xs:sequence>
</xs:complexType>

```

```

<xs:complexType name="LonDegIntMinSecDecType">
    <xs:sequence>

```

```

        <xs:element name="Degree" type="gplo:LonDegIntType"/>
        <xs:element name="MinuteSecond" type="gplo:MinSecDecType"/>
    </xs:sequence>
</xs:complexType>

<xs:simpleType name="LatDegIntType">
    <xs:restriction base="xs:byte">
        <xs:minInclusive value="-90"/>
        <xs:maxInclusive value="90"/>
    </xs:restriction>
</xs:simpleType>

<xs:simpleType name="LonDegIntType">
    <xs:restriction base="xs:short">
        <xs:minInclusive value="-180"/>
        <xs:maxInclusive value="180"/>
    </xs:restriction>
</xs:simpleType>

<xs:simpleType name="MinSecIntType">
    <xs:restriction base="xs:unsignedByte">
        <xs:maxInclusive value="59"/>
    </xs:restriction>
</xs:simpleType>

<xs:simpleType name="MinSecDecType">
    <xs:restriction base="xs:decimal">
        <xs:minInclusive value="0.0"/>
        <xs:maxExclusive value="60.0"/>
    </xs:restriction>
</xs:simpleType>

<xs:simpleType name="Areas">
    <xs:restriction base="xs:string">
        <xs:enumeration value="Circle"/>
        <xs:enumeration value="Sphere"/>
        <xs:enumeration value="Rectangle"/>
        <xs:enumeration value="Cuboid"/>
    </xs:restriction>
</xs:simpleType>

<xs:simpleType name="Units">
    <xs:restriction base="xs:string">
        <xs:enumeration value="Meter"/>
        <xs:enumeration value="Kilometer"/>
        <xs:enumeration value="Foot"/>
        <xs:enumeration value="Yard"/>
        <xs:enumeration value="Mile"/>
    </xs:restriction>
</xs:simpleType>

```

```
<xs:simpleType name="PositiveDecimal">
  <xs:restriction base="xs:decimal">
    <xs:minInclusive value="0.0"/>
  </xs:restriction>
</xs:simpleType>

<!-- End: Location: Latitude, Longitude, Altitude -->

<!-- Start: Location: Civil -->

<xs:complexType name="CivilType">
  <xs:sequence>
    <xs:element name="Domain" maxOccurs="unbounded">
      <xs:complexType>
        <xs:simpleContent>
          <xs:extension base="xs:string">
            <xs:attribute name="Type" type="xs:string"/>
            <xs:anyAttribute processContents="lax"/>
          </xs:extension>
        </xs:simpleContent>
      </xs:complexType>
    </xs:element>
  </xs:sequence>
</xs:complexType>

<!-- End: Location: Civil -->

<!-- Start: Location: Time Zone -->

<xs:simpleType name="TimeZoneType">
  <xs:restriction base="xs:string">
    <xs:pattern value="Z|[\+|-]?(0[0-9]|1[0-2]):[0-5][0-9]"/>
  </xs:restriction>
</xs:simpleType>

<!-- End: Location: Time Zone -->

<!-- End: Location -->

<!-- Start: Time to Live -->

  <xs:element name="TimeToLive" type="xs:dateTime"/>

<!-- End: Time to Live -->
```


</xs:schema>

4. XML LO Instance

To give a preliminary impression of how an XML LO complying with the schema listed in [section 3](#) could look like, this section provides

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such an XML instance document. It can be validated against this schema (see [section 5](#)).

```
<?xml version="1.0" encoding="UTF-8"?>
<LocationObject
  xmlns="urn:ietf:geopriv:lo:0.0.4"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="urn:ietf:geopriv:lo:0.0.4 gploml004.xsd">

  <Target>
    <TargetIdentity>
      <TargetIdentifier IdentifierType="Anonymous">
        ginefohcsT sennaH
      </TargetIdentifier>
    </TargetIdentity>
  </Target>

  <Device>
    <DeviceIdentity>
      <DeviceIdentifier IdentifierType="PhoneNumber">
        017167239870
      </DeviceIdentifier>
    </DeviceIdentity>
  </Device>

  <RuleMaker>
    <RuleMakerIdentity>
      <RuleMakerIdentifier IdentifierType="NonAnonymous">
        Siemens AG
      </RuleMakerIdentifier>
    </RuleMakerIdentity>
  </RuleMaker>

  <LocationRecipient>
    <LocationRecipientIdentity>
      <LocationRecipientIdentifier
```

```

        IdentifierType="NonAnonymous"
        CastType="MultiCast">
    CT IC 3 Mobile Security Team
</LocationRecipientIdentifier>
</LocationRecipientIdentity>
</LocationRecipient>

<LocationRecipientCredential>
    <PKIXCertificate>...</PKIXCertificate>
</LocationRecipientCredential>

<LocationRecipientPoPofCredential>
    <ChallengeResponse>
        Challenge-Response executed successfully
    </ChallengeResponse>
</LocationRecipientPoPofCredential>

```

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```

<Rule>
  <LimitedRule>
    <LimitedRuleLanguage1>
      Dirk Kroeselberg has no permission to see my location.
      (Limited Rule Language needs to be defined.)
    </LimitedRuleLanguage1>
  </LimitedRule>
</Rule>

<Location>
  <LocationInformation>
    <LocationRepresentation>
      <LatLonAlt>
        <Latitude>
          <DegIntMinIntSecInt>
            <Degree>-48</Degree>
            <Minute>8</Minute>
            <Second>23</Second>
          </DegIntMinIntSecInt>
        </Latitude>
        <Longitude>
          <DegIntMinSecDec>
            <Degree>11</Degree>
            <MinuteSecond>34.4667</MinuteSecond>
          </DegIntMinSecDec>
        </Longitude>
        <Altitude Unit="Meter">521.27</Altitude>
        <Precision Area="Sphere" Unit="Meter">58.3</Precision>
      </LatLonAlt>
    </LocationRepresentation>
  </LocationInformation>
</Location>

```

```

    </LatLonAlt>
    <Confidence>95.0</Confidence>
  </LocationRepresentation>
  <LocationRepresentation>
    <Civil>
      <Domain Type="Country">Germany</Domain>
      <Domain Type="State">Bavaria</Domain>
      <Domain Type="City">Munich</Domain>
      <Domain Type="Street">Leopoldstrasse</Domain>
      <Domain Type="Number">6</Domain>
    </Civil>
  </LocationRepresentation>
  <LocationRepresentation>
    <TimeZone>+01:00</TimeZone>
  </LocationRepresentation>
  <SightingTime>2003-07-14T20:12:34+01:00</SightingTime>
  <MotionVector>...</MotionVector>
  <DirectionVector>...</DirectionVector>
</LocationInformation>
</Location>

<TimeToLive>2003-07-14T20:17:34+01:00</TimeToLive>

</LocationObject>

```

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5. Note on Validation

We have validated the XML LO listed in [section 4](#) and other instance documents against the schema listed in [section 3](#) using the XML Schema Validator (XSV) and the Apache XML project's Xerces2-J parser. XSV and Xerces2-J are available at

<http://www.ltg.ed.ac.uk/~ht/xsv-status.html>

and

<http://xml.apache.org/xerces2-j/index.html>,

respectively. If you store the schema as `gploml004.xsd` and the XML LO as (say) `gploml004.xml` in the same directory, then the commands

```
xsv gploml004.xml gploml004.xsd
```

and

java dom.Writer ûv ûs gploml004.xml,
respectively, should not produce any error messages.

6. References

- [1] Bradner, S., "The Internet Standards Process -- Revision 3", [BCP 9](#), [RFC 2026](#), October 1996.
- [2] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997
- [3] Cuellar, J., Morris, J.B., Mulligan D., Peterson, J., Polk, J., "Geopriv requirements", Internet Draft, [draft-ietf-geopriv-reqs-03.txt](#), March 2003.

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