# Open Geospatial Consortium Inc.

Date: 2007-11-16

Reference number of this OGC® project document: **OGC 07-098r1**

Version: 1.0

Category: OGC® Implementation Specification

Editor: Andreas Matheus

# Geospatial eXtensible Access Control Markup Language (GeoXACML)

# Extension A – GML2 Encoding

# Version 1.0

## Copyright notice



Document type: OGC® Publicly Available Standard
Document subtype: Encoding
Document stage: Approved
Document language: English

## Disclaimer

Issues of absolute or relative accuracy of feature geometry and positioning data and the computational stability of finite precision arithmetic as used in all computers will affect results where distance measure, geometry or positional values are compared. For this reason, and the variety of statistically valid but different implementation approaches to these issues, Boolean criteria as used in XACML or GeoXACML policy statements will not always produce uniform results across geographic implementations. For these reasons, users of this technology should not ask for fine gradations of measures that their data or coordinate transformation cannot support, but should alternately allow a "tolerant" approach where feasible which might give access to slightly more data than would be given in a perfect computational, but impossible to implement, environment.

# Contents

# i. Preface

This document defines the normative encoding of geometries to be used in GeoXACML based on the Geography Markup Language (GML) version 2.1.2

# ii. Submitting organizations

The following organizations submitted this Implementation Specification to the Open Geospatial Consortium Inc. as a Request For Comment (RFC):

Universität der Bundeswehr München
Andreas Matheus
Werner-Heisenberg-Weg 39
D-85579 Neubiberg
Germany
andreas.matheus(at)unibw.de

Galdos Systems Inc.
Ron Lake
1300-409 Granville St
Vancouver V6C 1T2
Canada
Rlake(at)galdosinc.com

# iii. Submission and contribution contact points

All questions regarding this submission should be directed to the editor or the submitters:

| CONTACT | COMPANY | EMAIL |
|---|---|---|
| Andreas Matheus | Universität der Bundeswehr München | Andreas.Matheus(at)unibw.de |
| Jan Herrmann | Ludwig-Maximilians-Universität München | jan.herrmann(at)lmu.de |
| Martin Kyle | Sierra Systems Group, Inc. | MartinKyle(at)SierraSystems.com |

## iv. Revision history

| Date | Release | Author | Paragraph modified | Description |
|---|---|---|---|---|
| 2007-08-12 | 0.1.0 | Andreas Matheus | All | Initial Writing |
| 2007-08-20 | 0.2.0 | Andreas Matheus | 4, Annex A | Insert Null geometry and make all definitions mandatory |
| 2007-08-22 | 0.3.0 | Andreas Matheus | 4, A.1 | As suggested by Jan, GML geometry encoding shall be version aware |
| 2007-08-24 | 0.4.0 | Andreas Matheus | Annex C, D | Restructuring of examples |
| 2007-09-07 | 0.5.0 | Martin Kyle | All | Editorial corrections |
| 2007-10-25 | 0.6.0 | Andreas Matheus | throughout | Incorporation of comments and decisions from the TC meeting 17.-21.9.2007 |
| 2007-11-16 | 0.7.0 | Andreas Matheus | p. 2<br>throughout<br>throughout | Insert of disclaimer<br>GeoXACML URN corrections<br>final formatting |

## v. Changes to the OGC® Abstract Specification

The OpenGIS® Abstract Specification does not require changes to accommodate this standard.

## Foreword

Normative Annex A provides the GeoXACML conformance tables.

Informative Annex B provides GML2 encoding examples.

Informative Annex C provides GeoXACML Policy construct examples.

Informative Annex D provides the GML2 specific encoding of the <Condition> element, used in the example of the core specification in Annex C.

# Introduction

This specification is a normative extension to the GeoXACML core Implementation Specification ([2]). It defines the GML2 encoding for geometric data types.

# OpenGIS® Geospatial eXtensible Access Control Markup Language (GeoXACML)
# Implementation Specification – Version 1.0

## Extension A – GML2 Encoding

### 1 Scope

This document defines an extension to the GeoXACML Implementation Specification, Verison 1.0 ([2]) for the GML2 geometry encoding as specified in the GML2 standard ([3]).

### 2 Conformance

In order to claim conformance with this extension of the GeoXACML specification, an implementation of a **PDP** MUST conform with

(i) the XACML specification as stated in [1], section 10 AND

(ii) the GeoXACML specification as stated in [2], section 2 AND

(iii) the data type encoding as provided in section 4 AND

(iv) the conformance table provided in Annex A of this specification.

## 3 Normative references

[1] OASIS, *eXtensible Access Control Markup Language (XACML) Version 2.0, 1 Feb 2005*, http://docs.oasis-open.org/xacml/2.0/access_control-xacml-2.0-core-spec-os.pdf

[2] OGC, *OpenGIS® GeoXACML Implementation Specification, Version 1.0, 2007-11-16*

[3] OGC, *OpenGIS® Geography Markup Language(GML) Implementation Specification, Version 2.1.2, 2002-09-17*, http://portal.opengeospatial.org/files/?artifact_id=11339

## 4 GeoXACML Data Type for GML2 Encoding (normative)

The Geography Markup Language GML of Version 2 as specified in [3] defines – beside other aspects – the XML encoding for geometric data types.

In order to use GML2 geometric data type attribute values, this extension to the GeoXACML core specification supports the following GML2 data type URIs:

| GML URI |
| --- |
| http://www.opengis.net/gml#Point |
| http://www.opengis.net/gml#LineString |
| http://www.opengis.net/gml#Polygon |
| http://www.opengis.net/gml#LinearRing |
| http://www.opengis.net/gml#Box |
| http://www.opengis.net/gml#MultiPoint |
| http://www.opengis.net/gml#MultiLineString |
| http://www.opengis.net/gml#MultiPolygon |

**Table 1 — GML2 data type URIs**

# Annex A GeoXACML Conformance Table (normative)

This Annex defines which GML data type definitions are mandatory to be implemented toward BASIC conformance.

In order to pass the BASIC conformance level, an implementation SHALL process ALL attribute URIs marked "I" for ALL test cases defined in [2], Annex B.4, B.5 and B.6.

| GML URI | Conformance Class |
|---|---|
| http://www.opengis.net/gml#Point | **I** |
| http://www.opengis.net/gml#LineString | **I** |
| http://www.opengis.net/gml#Polygon | **I** |
| http://www.opengis.net/gml#LinearRing | **I** |
| http://www.opengis.net/gml#Box | **I** |
| http://www.opengis.net/gml#MultiPoint | **I** |
| http://www.opengis.net/gml#MultiLineString | **I** |
| http://www.opengis.net/gml#MultiPolygon | **I** |

# Annex B GML2 Geometry Encoding Examples (informative)

## B.1 Point Geometry

```
<gml:Point srsName="http://www.opengis.net/gml/srs/epsg.xml#4326">
   <gml:coord>45.256,-110.45</gml:coord>
 </gml:Point>
```

**Figure B.1 — GML2 Point Example**

## B.2 LineString Geometry

```
<gml:LineString srsName="
http://www.opengis.net/gml/srs/epsg.xml#4326">
   <gml:coordinates>45.256,-110.45 50.4,-100.3</gml:coordinates>
 </gml:LineString>
```

**Figure B.2 — GML2 LineString Example**

## B.3 Polygon Geometry

```
<gml:Polygon gid="P2" srsName="
http://www.opengis.net/gml/srs/epsg.xml#4326">
    <gml:outerBoundaryIs>
       <gml:LinearRing>
         <gml:coordinates cs="," ts=" ">
          -11,55 -10,35 -5.5,36 -1,36 1,38 5,38 11,38 14,36 26,33 29,36
          26,39 29,46 39,47 40,49 27,56 27,60 25,60 20,58 21,56 19,55
          11,55 10,57 7,57 8,54 3,53 -2,60 -8,58 -11,55 -11,55
         </gml:coordinates>
      </gml:LinearRing>
    </gml:outerBoundaryIs>
</gml:Polygon>
```

**Figure B.3 — GML2 Polygon Example**

# Annex C GeoXACML Policy Construct Examples (informative)

The following examples are based on the GML2 encoding for geometry types as specified in this part (Extension A – GML2 Encoding), according to the underlying geometric model as introduced in the core specification of GeoXACML (see [2]).

## C.1 Polygon Geometry Attribute Value

```
<AttributeValue DataType="urn:ogc:def:dataType:geoxacml:1.0:geometry">
 <gml:Polygon gid="P2" srsName="
http://www.opengis.net/gml/srs/epsg.xml#4326">
   <gml:outerBoundaryIs>
      <gml:LinearRing>
        <gml:coordinates cs="," ts=" ">
         -11,55 -10,35 -5.5,36 -1,36 1,38 5,38 11,38 14,36 26,33 29,36
         26,39 29,46 39,47 40,49 27,56 27,60 25,60 20,58 21,56 19,55
         11,55 10,57 7,57 8,54 3,53 -2,60 -8,58 -11,55 -11,55
        </gml:coordinates>
      </gml:LinearRing>
   </gml:outerBoundaryIs>
</gml:Polygon>
</AttributeValue>
```

**Figure C.1 — GeoXACML Polygon <AttributeValue> Example**

## C.2 MultiPoint Attribute Value

```
<AttributeValue DataType="urn:ogc:def:dataType:geoxacml:1.0:geometry">
   <gml:MultiPoint xmlns:gml="http://www.opengis.net/gml"
srsName="urn:EPSG:geographicCRS:4326">
      <geometryMember>
         <gml:Point gid="P1" xmlns:gml="http://www.opengis.net/gml"
srsName="urn:EPSG:geographicCRS:4326">
            <gml:coord>
               <gml:X>0.0</gml:X><gml:Y>0.0</gml:Y>
            </gml:coord>
         </gml:Point>
      </geometryMember>
      <geometryMember>
         <gml:Point gid="P2" xmlns:gml="http://www.opengis.net/gml"
srsName="urn:EPSG:geographicCRS:4326">
            <gml:coord>
               <gml:X>1.0</gml:X><gml:Y>1.0</gml:Y>
            </gml:coord>
         </gml:Point>
      </geometryMember>
   </gml:MultiPoint>
</AttributeValue>
```

**Figure C.2 — GeoXACML MultiPoint <AttributeValue> Example**

### C.3 Creating a Bag of Geometries

```
<Function FunctionId="urn:ogc:def:function:geoxacml:1.0:geometry-bag"/>
<AttributeValue DataType="urn:ogc:def:dataType:geoxacml:1.0:geometry">
   <gml:Point gid="P1" xmlns:gml="http://www.opengis.net/gml"
srsName="urn:EPSG:geographicCRS:4326">
      <gml:coord>
         <gml:X>0.0</gml:X><gml:Y>0.0</gml:Y>
      </gml:coord>
   </gml:Point>
</AttributeValue>
<AttributeValue DataType="urn:ogc:def:dataType:geoxacml:1.0:geometry">
   <gml:Point gid="P2" xmlns:gml="http://www.opengis.net/gml"
srsName="urn:EPSG:geographicCRS:4326">
      <gml:coord>
         <gml:X>1.0</gml:X><gml:Y>1.0</gml:Y>
      </gml:coord>
   </gml:Point>
</AttributeValue>
```

**Figure C.3 — GeoXACML GeometryBag Example**

### C.4 Function

```
<Function FunctionId="urn:ogc:def:function:geoxacml:1.0:geometry-
within"/>
```

**Figure C.4 — GeoXACML Function Example**

### C.5 Condition

```
<Condition FunctionId="urn:oasis:names:tc:xacml:1.0:function:all-of">
  <Function FunctionId="urn:ogc:def:function:geoxacml:1.0:geometry-
contains"/>
  <AttributeValue
DataType="urn:ogc:def:dataType:geoxacml:1.0:geometry">
    <gml:Polygon gid="P2" srsName="
http://www.opengis.net/gml/srs/epsg.xml#4326">
      <gml:outerBoundaryIs>
          <gml:LinearRing><gml:coordinates cs="," ts=" ">
           -11,55 -10,35 -5.5,36 -1,36 1,38 5,38 11,38 14,36 26,33
           29,36 26,39 29,46 39,47 40,49 27,56 27,60 25,60 20,58 21,56
           19,55 11,55 10,57 7,57 8,54 3,53 -2,60 -8,58 -11,55 -11,55
            </gml:coordinates></gml:LinearRing>
       </gml:outerBoundaryIs>
      </gml:Polygon>
  </AttributeValue>
  <AttributeSelector DataType=
urn:ogc:def:dataType:geoxacml:1.0:geometry
RequestContextPath="//ogc:BBOX/gml:Box"/>
</Condition>
```

**Figure C.5 — GeoXACML Condition Example**

# Annex D Example for protecting a OWS using GeoXACML (informative)

This Annex contains the encodings of GeoXACML condition elements to be used for the WMS and WFS protection example, presented in Annex C of the core specification.

## D.1 Condition encoding for the WMS example

For the full example see [2], Annex C.

```
<Condition>
    <Apply FunctionId="urn:oasis:names:tc:xacml:1.0:function:and">
        <Apply FunctionId="urn:oasis:names:tc:xacml:1.0:function:all-of">
            <Function FunctionId="urn:oasis:names:tc:xacml:1.0:function:string-
equal"/>
            <AttributeValue
DataType="http://www.w3.org/2001/XMLSchema#string">Capitals</AttributeValue>
            <AttributeSelector
RequestContextPath="//wms:GetMap/*/sld:NamedLayer/sld:Name"
DataType="http://www.w3.org/2001/XMLSchema#string"/>
        </Apply>
        <Apply FunctionId="urn:oasis:names:tc:xacml:1.0:function:not">
            <Apply FunctionId="urn:oasis:names:tc:xacml:1.0:function:any-of">
                <Function
FunctionId="urn:ogc:def:function:geoxacml:1.0:geometry-contains"/>
                <AttributeValue
DataType="urn:ogc:def:dataType:geoxacml:1.0:geometry">
                    <gml:Polygon gid="North and South America" srsName="
http://www.opengis.net/gml/srs/epsg.xml#4326"
xmlns:gml="http://www.opengis.net/gml">
                        <gml:outerBoundaryIs>
                            <gml:LinearRing>
                                <gml:coordinates cs="," ts=" ">-180,60 -180,47 -
137,55 -125,35 -110,17 -80,5 -87,-5 -74,2 -78,-53 -67,-58 -60,-48 -35,-23 -
27,-3 -55,12 -60,22 -75,30 -67,42 -50,45 -60,85 -60,85 -85,85 -120,80 -130,75
-160,75 -168,70 -180,60</gml:coordinates>
                            </gml:LinearRing>
                        </gml:outerBoundaryIs >
                    </gml:Polygon>
                </AttributeValue>
                <AttributeSelector RequestContextPath="//gml:boundedBy/gml:Box"
DataType="urn:ogc:def:dataType:geoxacml:1.0:geometry"/>
            </Apply>
        </Apply>
        <Apply FunctionId="urn:oasis:names:tc:xacml:1.0:function:all-of">
            <Function FunctionId="urn:ogc:def:function:geoxacml:1.0:geometry-
disjoint"/>
            <AttributeValue DataType="
urn:ogc:def:dataType:geoxacml:1.0:geometry">
                    <gml:Polygon gid="North and South America" srsName="
http://www.opengis.net/gml/srs/epsg.xml#4326"
xmlns:gml="http://www.opengis.net/gml">
                        <gml:outerBoundaryIs>
                            <gml:LinearRing>
                                <gml:coordinates cs="," ts=" ">-180,60 -180,47 -
137,55 -125,35 -110,17 -80,5 -87,-5 -74,2 -78,-53 -67,-58 -60,-48 -35,-23 -
27,-3 -55,12 -60,22 -75,30 -67,42 -50,45 -60,85 -60,85 -85,85 -120,80 -130,75
-160,75 -168,70 -180,60</gml:coordinates>
                            </gml:LinearRing>
```

```
                    </gml:outerBoundaryIs >
                </gml:Polygon>
            </AttributeValue>
            <AttributeSelector RequestContextPath="//gml:boundedBy/gml:Box"
DataType=" urn:ogc:def:dataType:geoxacml:1.0:geometry"/>
        </Apply>
    </Apply>
</Condition>
```

**Figure D.1 — GeoXACML Condition using GML2 geometry encoding**

```
<Condition>
    <Apply FunctionId="urn:oasis:names:tc:xacml:1.0:function:and">
        <Apply FunctionId="urn:oasis:names:tc:xacml:1.0:function:all-of">
            <Function FunctionId="urn:oasis:names:tc:xacml:1.0:function:string-
equal"/>
            <AttributeValue
DataType="http://www.w3.org/2001/XMLSchema#string">Capitals</AttributeValue>
            <AttributeSelector
RequestContextPath="//wms:GetMap/*/sld:NamedLayer/sld:Name"
DataType="http://www.w3.org/2001/XMLSchema#string"/>
        </Apply>
        <Apply FunctionId="urn:oasis:names:tc:xacml:1.0:function:all-of">
            <Function FunctionId="urn:ogc:def:function:geoxacml:1.0:geometry-
contains"/>
            <AttributeValue DataType="
urn:ogc:def:dataType:geoxacml:1.0:geometry">
                <gml:Polygon gid="Europe" srsName="
http://www.opengis.net/gml/srs/epsg.xml#4326"
xmlns:gml="http://www.opengis.net/gml">
                    <gml:outerboundaryIs>
                        <gml:LinearRing>
                            <gml:coordinates cs="," ts=" ">-11,55 -10,35 -5.5,36
-1,36 1,38 5,38 11 38 14 36 26 33 29,36 26,39 29,46 39 47 40 49 27,56 27,60
25,60 20,58 21,56 19,55 11,55 10,57 7,57 8,54 3,53 -2,60 -8,58 -11,55 -11,55
                            </gml:coordinates>
                        </gml:LinearRing>
                    </gml:outerboundaryIs >
                </gml:Polygon>
            </AttributeValue>
            <AttributeSelector RequestContextPath="//gml:boundedBy/gml:Box"
DataType="urn:ogc:def:dataType:geoxacml:1.0:geometry"/>
        </Apply>
    </Apply>
</Condition>
```

**Figure D.2 — GeoXACML Condition using GML2 geometry encoding**

### D.2 Condition encoding for the WFS example

For the full example see [2], Annex C.

```
<Condition>
    <Apply FunctionId="urn:oasis:names:tc:xacml:1.0:function:all-of">
        <Function FunctionId="urn:ogc:def:function:geoxacml:1.0:contains"/>
        <AttributeValue DataType="urn:ogc:def:dataType:geoxacml:1.0:geometry">
            <gml:Polygon gid="P" srsName="EPSG:4326"
xmlns:gml="http://www.opengis.net/gml">
                <gml:outerBoundaryIs>
                    <gml:LinearRing>
                        <gml:coordinates cs="," ts=" ">-
74.28798767828596,40.72400955310945 -74.12552621736093,40.722605998371435 -
74.12552621736093,40.614883172228936 -74.28939123302396,40.61558494959794 -
74.28798767828596,40.72400955310945 -74.28798767828596,40.72400955310945 -
74.28798767828596,40.72400955310945</gml:coordinates>
                    </gml:LinearRing>
                </gml:outerBoundaryIs>
            </gml:Polygon>
        </AttributeValue>
        <AttributeSelector
DataType="urn:ogc:def:dataType:geoxacml:1.0:geometry"
RequestContextPath="//wfs:Transaction/wfs:Insert/ows4:HeliPad_P2/ows4:the_geom/
gml:Point" />
    </Apply>
</Condition>
```

**Figure D.3 — GeoXACML Condition using GML2 geometry encoding**

# Bibliography

[4] OASIS, *Core and hierarchical role based access control (RBAC) profile of XACML v2.0*, 2005-02-01, http://docs.oasis-open.org/xacml/2.0/access_control-xacml-2.0-rbac-profile1-spec-os.pdf

[5] OASIS, *SAML 2.0 profile of XACML v2.0*, 2005-02-01, http://docs.oasis-open.org/xacml/2.0/access_control-xacml-2.0-saml-profile-spec-os.pdf

[6] Cover Pages, Extensible Access Control Markup Language (XACML), http://xml.coverpages.org/xacml.html

[7] OGC, *The OpenGIS® Abstract Specification Topic 18: Geospatial Digital Rights Management Reference Model (GeoDRM RM), Version: 1.0.0, 2006-12-29*, http://portal.opengeospatial.org/files/?artifact_id=17802

[8] Vivid Solutions, *JTS Topology Suite Technical Specifications, Version 1.4*, http://www.vividsolutions.com/JTS/bin/JTS%20Technical%20Specs.pdf

[9] OGC, *OpenGIS® Web Service Common Implementation Specification, Version 1.0.0, 2005-11-22*, http://portal.opengeospatial.org/files/?artifact_id=8798

[10] OGC, *OpenGIS® Web Map Service Implementation Specification, Version 1.3.0, 2004-01-20*, http://portal.opengeospatial.org/files/?artifact_id=4756

[11] OGC, *OpenGIS® Web Feature Service Implementation Specification, Version 1.1.0, 2005-05-03*, http://portal.opengeospatial.org/files/?artifact_id=8339