Open Geospatial Consortium

Date: May 11, 2011

External identifier of this OGC® document: <http://www.opengis.net/doc/gml>

Internal reference number of this OGC® document: 11-044

Version: 2.0

Category: OGC® Implementation Standard Technical Note

Editor: **Linda van den Brink, Clemens Portele, Panagiotis (Peter) A. Vretanos**

OGC Geography Markup Language (GML) simple features profile Technical Note

Warning

This document is a Technical Note for an existing OGC Standard.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

i.   Abstract

This technical note enhances the OGC GML simple features profile to include circles, circular arc, and corrects the annex numbering, and clarifies how to specify conformance classes.

ii.   Keywords

The following are keywords to be used by search engines and document catalogues

Ogcdoc, gml, simple features

iii.   Preface

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The Open Geospatial Consortium shall not be held responsible for identifying any or all such patent rights.

Recipients of this document are requested to submit, with their comments, notification of any relevant patent claims or other intellectual property rights of which they may be aware that might be infringed by any implementation of the standard set forth in this document, and to provide supporting documentation when possible.

iv.   Submitting organizations

The following organizations submitted this Document to the Open Geospatial Consortium Inc.

See 10-100r3: Geography Markup Language (GML) simple features profile

v.   Submitters

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

Name	Company
Linda van den Brink	GeoNovum
Clemens Portele	Interactive Instruments
Peter Vretanos	CubeWerx

1. Scope

The OpenGIS® GML simple features profile defines a simplified profile of GML 3.2 that supports GML features and a limited set of geometric types. A set of application schema encoding rules is defined that allow features to be encoded using GML application schemas. This document provides a technical note for that standard. The technical note includes circular arcs, circle by center point, and removes ambiguous text regarding specification of the compliance level.

2. Conformance

Please see 10-100r3: Geography Markup Language (GML) simple features profile.

3. References

The following normative documents contain provisions that, through reference in this text, constitute provisions of this document. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the normative document referred to applies.

10-100r3: Geography Markup Language (GML) simple features profile.

4. Terms and Definitions

This document uses the terms defined in Sub-clause 5.3 of [OGC 06-121r8], which is based on the ISO/IEC Directives, Part 2, Rules for the structure and drafting of International Standards. In particular, the word "shall" (not "must") is the verb form used to indicate a requirement to be strictly followed to conform to this standard.

Not applicable

5. Conventions

This sections provides details and examples for any conventions used in the document. Examples of conventions are symbols, abbreviations, use of XML schema, or special notes regarding how to read the document.

Not applicable

6. Description of changes provided in this technical note

6.1 Change to Section 1: Scope

Replace the first sentence:

This OpenGIS® specification defines a simplified profile of GML 3.2 that supports GML features and a limited set of linearly interpolated geometric types.

With:

This OpenGIS® standard defines a simplified profile of GML 3.2 that supports GML features and a limited set of geometric types.

6.2 Change to Section 2.1: Introduction

In the first paragraph, sentence 3 replace:

Spatial properties are limited to being of type: point, linearly interpolated curve, planar surface, or aggregates thereof.

With:

Spatial properties are limited to being of type: point, curve with linear and/or circular arc interpolation, planar surface, or aggregates thereof.

6.3 Changes to Section 2.2: Compliance levels

Replace the entire section with:

Table 2 lists the compliance levels defined in this document. The table specifies a numeric identifier for each compliance level, the relevant sub-clauses in clauses 7 and 8 and 10 that apply to the compliance level, and the compliance tests in Annex A that shall be satisfied by each level.

Table 2 — Compliance levels

Compliance level Identifier	Relevant sub-clauses	Compliance tests
SF-0	7, 8	A.1, A.2, A.3, A.4, A.5, A.6, A.7, A.8, A.9, A.10.1, A.10.2, A.10.3, A.10.4, A.10.5, A.10.6, A.10.7, A.10.8, A.10.9, A.10.10, A.10.11, A.10.12. A.10.13
SF-1	7, 9	All compliance tests defined in Annex A.
SF-2	7, 10	A.1, A.2, A.3, A.4, A.5, A.6, A.7, A.9, A.10.8

NOTE   Some sub-clauses and compliance tests listed above contain provisions that depend on the compliance level.

Compliance with this profile shall be checked using all the relevant tests in Annex A, as specified in Table 2 for each compliance level.

6.4 Changes to Section 7.4: Identifying the Compliance Level

Replace the following schema fragment:

```
1 <xsd:annotation>
2    <xsd:appinfo
source="http://schemas.opengis.net/gml/3.2.1/profiles/gmlsfProfile/2.0/gmlsfLevels.xsd">
3       <gmlsf:ComplianceLevel>0|1|2</gmlsf:ComplianceLevel>
4
<gmlsf:GMLProfileSchema>http://schemas.opengis.net/gml/3.2.1/profiles/gmlsfProfile/2.0/gm
lsf[2].xsd</gmlsf:GMLProfileSchema>5    </xsd:appinfo>
6 </xsd:annotation>
```

With:

```
1 <xsd:annotation>
2    <xsd:appinfo  source="http://schemas.opengis.net/gmlsfProfile/2.0/gmlsfLevels.xsd">
3       <gmlsf:ComplianceLevel>0|1|2</gmlsf:ComplianceLevel>

4    </xsd:appinfo>
5 </xsd:annotation>
```

and completely delete the paragraph beginning, "Line 4 uses . . .".

6.5 Changes to section 8.2: Root element encoding

6.5.1 Change 1 for Section 8.2

In the note for the paragraph beginning "Line 4 declares the prefix . . ."

Replace

Annex D

With

Annex C

6.5.2 Change 2 for Section 8.2

In the paragraph beginning "Line 6 declares the mandatory . . ." sentence two replace:

. . . the **ComplianceLevel** and the **GMLProfileSchema** elements . . .

With

. . . the **ComplianceLevel** element . . .

6.6 Changes to Section 8.3.1 Importing the GML Schema

From the third paragraph beginning "The schema to be . . ." remove the sentence

The XML Schema describing the GML Profile (i.e. *gmlsf.xsd*) shall be provided in an **appinfo** annotation as specified in clause 7.4.

6.7 Changes to Section 8.4.4.11.2 Supported geometric property types

Replace table 6 and the following additional requirements with:

GML geometric property type	Defined in GML schema document	Restrictions
gml:PointPropertyType	geometryBasic0d1d.xsd	None
gml:CurvePropertyType	geometryBasic0d1d.xsd geometryPrimitives.xsd	Supported property values are gml:LineString or gml:Curve with gml:LineStringSegment, gml:Arc, gml:Circle or gml:CircleByCenterPoint segments[1].
gml:SurfacePropertyType	geometryBasic2d.xsd	Supported property values are gml:Polygon or gml:Surface with gml:PolygonPatch patches. Surface boundaries may be described using gml:LinearRing or using gml:Ring with a single gml:Curve with gml:LineStringSegment, gml:Arc, gml:Circle or gml:CircleByCenterPoint segments[1].
gml:GeometryPropertyType	geometryBasic0d1d.xsd	Supported property values are gml:Point,gml:LineString, gml:Curve, gml:Polygon, gml:Surface, gml:MultiPoint, gml:MultiCurve, gml:MultiSurface
gml:MultiPointPropertyType	geometryAggregates.xsd	None
gml:MultiCurvePropertyType	geometryAggregates.xsd	Supported members are same as CurvePropertyType
gml:MultiSurfacePropertyType	geometryAggregates.xsd	Supported members are same as SurfacePropertyType

1) Non-linearly interpolated curves are not included in the OpenGIS® Implementation Specification for Geographic information - Simple feature access - Part 1: Common architecture [OGC 06-103r3] specification. However, this specification allows the use of gml:Arc, gml:Circle and gml:CircleByCenterPoint because of their general utility for the compact expression of circles and arcs which would otherwise be approximated using line strings and/or polygons.

Additional requirements for Geometry include:

a) in all cases, geometry coordinates shall only be specified using the **gml:pos** element for **gml:Point** and gml:CircleByCenterPoint, or the **gml:posList** element for all other types

b) features may have any number of geometric properties

c) coordinate reference systems may have 1, 2 or 3 dimensions

The response feature collection may include the **gml:boundedBy** property with the appropriate **srsName**. In this case, all geometries in the feature collection shall be in the same **srsName** unless otherwise indicated within a particular feature or geometry instance.

6.8 Section 10.2 Changes from compliance levels SF-0 and SF-1

In the first paragraph remove:

"with one exception. In sub-clause 8.3.1, instead of importing the gmlsf.xsd schema document in line 2 of the schema fragment, the gmlsf2.xsd schema document must be imported."

6.9 Annex A.5 Identifying the compliance level (Level SF-0, SF-1, SF-2)

Replace the first schema fragment:

```
1 <xsd:annotation>
2    <xsd:appinfo source="…SOME URI…/gmlsfLevels.xsd">
3        <gmlsf:ComplianceLevel>0|1|2<gmlsf:ComplianceLevel>
4
<gmlsf:GMLProfileSchema>http://schemas.opengis.net/gml/3.2.1/profiles/gmlsfProfile/2.0/gm
lsf[2].xsd</gmlsf:GMLProfileSchema>5    </xsd:appinfo>
6 </xsd:annotation>
```

With:

```
1 <xsd:annotation>
2    <xsd:appinfo source="…SOME URI…/gmlsfLevels.xsd">
3        <gmlsf:ComplianceLevel>0|1|2<gmlsf:ComplianceLevel>

4    </xsd:appinfo>
5 </xsd:annotation>
```

And remove the following from "Compliance Rules":

.iv. the element gmlsf:GMLProfileSchema shall be present (line 4)

1. its value shall be a valid URL reference to *gmlsf.xsd* for application schemas that comply with levels 0 and 1

2. its value shall be a valid URL reference to *gmlsf2.xsd* for application schemas that comply with level 2 (line 4)

6.10 Annex A.6 Importing the profile schema (Level SF-0, SF-1, SF-2)

Replace the entire section with:

All features in a compliant application schema shall be substitutable for gml:AbstractFeature and their definition shall be derived from gml:AbstractFeatureType.

This implies that a compliant application schema shall import the entire GML schema (i.e. gml.xsd). The following element shall appear in a compliant application schema document:

```
1 <xsd:import
2    namespace="http://www.opengis.net/gml/3.2"
3    schemaLocation="http://… SOME URI…/gml/3.2.1/gml.xsd"/>
```

Compliance rules:

1) an **xsd:import** element shall be present (line 1)

a)   the attribute **namespace** shall be present (line 2)

i)   its value shall he 'http://www.opengis.net/gml/3.2'

b)   the attribute **schemaLocation** shall be present (line 3)

i)   its value shall be a valid URL to the complete GML Schema

6.11 Annex A.10.7 Geometry valued properties (Level SF-0, SF-1)

Add Compliance element "g" as follows

In an instance document, the allowed values for each of the geometric property types is defined in Table 6.

6.12 Insert new Annex B

Annex B
(normative)

Schema file gmlsfLevels.xsd

The following schema file, called gmlsfLevels.xsd declares the gmlsf:ComplianceLevel element used in application schemas to declare the level of conformance to this profile.

```
<?xml version="1.0" ?>
<schema
    targetNamespace="http://www.opengis.net/gmlsf/2.0"
    xmlns:gmlsf="http://www.opengis.net/gmlsf/2.0"
    xmlns="http://www.w3.org/2001/XMLSchema"
    elementFormDefault="qualified">
    <annotation>
        <documentation>
            Compliance levels schema for Simple features GML 3.2 Profile
            Copyright (c) 2011 Open Geospatial Consortium, Inc.
            All Rights Reserved.
        </documentation>
    </annotation>
    <!-- ============================================================ -->
    <element name="ComplianceLevel">
        <annotation>
            <documentation>
                Level 0 = no complex-valued properties and minOccurs,maxOccurs
                          have a value domain of 0 or 1
                Level 1 = complex-valued properties with no restriction on
                          minOccurs and maxOccurs
                Level 2 = no restrictions on type of non-spatial scalar properties
                          but must only support spatial properties declared in
                          clause 8
            </documentation>
        </annotation>
        <simpleType>
            <restriction base="integer">
                <enumeration value="0"/>
                <enumeration value="1"/>
                <enumeration value="2"/>
            </restriction>
        </simpleType>
    </element>
</schema>
```

6.13 Old Annex C (D in the Technical note)

6.13.1 The News Example

Replace the "appinfo" section in the example with:

```
<appinfo source="http://schemas.opengis.net/gmlsfProfile/2.0/gmlsfLevels.xsd">
        <gmlsf:ComplianceLevel>0</gmlsf:ComplianceLevel>
    </appinfo>
```

and the import for "gmlsf" and schemaLocation elements with

```
<import namespace="http://www.opengis.net/gmlsf/2.0"
schemaLocation="http://schemas.opengis.net/gmlsfProfile/2.0/gmlsfLevels.xsd"/>
```

6.13.2 The Roads Example

Replace the "appinfo" section in the example with:

```
<appinfo source="http://schemas.opengis.net/gmlsfProfile/2.0/gmlsfLevels.xsd">
        <gmlsf:ComplianceLevel>0</gmlsf:ComplianceLevel>
    </appinfo>
```

and the import for "gmlsf" and schemaLocation elements with

```
<import namespace="http://www.opengis.net/gmlsf/2.0"
schemaLocation="http://schemas.opengis.net/gmlsfProfile/2.0/gmlsfLevels.xsd"/>
```

6.13.3 The Hydrology example

Replace the "appinfo" section in the example with:

```
<appinfo source="http://schemas.opengis.net/gmlsfProfile/2.0/gmlsfLevels.xsd">
        <gmlsf:ComplianceLevel>0</gmlsf:ComplianceLevel>
    </appinfo>
```

and the import for "gmlsf" and schemaLocation elements with

```
<import namespace="http://www.opengis.net/gmlsf/2.0"
schemaLocation="http://schemas.opengis.net/gmlsfProfile/2.0/gmlsfLevels.xsd"/>
```

6.13.4 The Internationalized string example

Replace the "appinfo" section in the example with:

```
<appinfo source="http://schemas.opengis.net/gmlsfProfile/2.0/gmlsfLevels.xsd">
        <gmlsf:ComplianceLevel>0</gmlsf:ComplianceLevel>
    </appinfo>
```

and the import for "gmlsf" and schemaLocation elements with

```
<import namespace="http://www.opengis.net/gmlsf/2.0"
schemaLocation="http://schemas.opengis.net/gmlsfProfile/2.0/gmlsfLevels.xsd"/>
```

6.13.5 New example for Circle by center point for Annex

Circle-by-center-point Example

The following example illustrates a schema that declares one geometric property whose value is a circle.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<xsd:schema
    targetNamespace="http://www.someserver.com/rz"
    xmlns:myns="http://www.someserver.com/rz"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:gml="http://www.opengis.net/gml/3.2"
    elementFormDefault="qualified"
    xmlns:gmlsf="http://www.opengis.net/gmlsf/2.0"
    version="myns:2003">

    <xsd:annotation>
       <xsd:appinfo source="http://schemas.opengis.net/gmlsfProfile/2.0/gmlsfLevels.xsd">
          <gmlsf:ComplianceLevel>0</gmlsf:ComplianceLevel>
       </xsd:appinfo>
    </xsd:annotation>

    <!-- ============================================================ -->
    <!-- === includes and imports                               === -->
    <!-- ============================================================ -->
    <xsd:import namespace="http://www.w3.org/XML/1998/namespace"
                schemaLocation="http://www.w3.org/2001/xml.xsd"/>
    <xsd:import namespace="http://www.opengis.net/gml/3.2"
                schemaLocation="http://schemas.opengis.net/gml/3.2.1/gml.xsd"/>

    <xsd:import namespace="http://www.opengis.net/gmlsf/2.0"

schemaLocation="http://schemas.opengis.net/gmlsfProfile/2.0/gmlsfLevels.xsd"/>

    <xsd:element name="RadZones"
                 type="myns:RadZonesType"
                 substitutionGroup="gml:AbstractFeature"/>
    <xsd:complexType name="RadZonesType">
       <xsd:complexContent>
          <xsd:extension base="gml:AbstractFeatureType">
             <xsd:sequence>
                <xsd:element name="title" type="xsd:string"/>
                <xsd:element name="abstract" type="xsd:string" minOccurs="0"/>
                <xsd:element name="rems" type="gml:MeasureType"/>
                <xsd:element name="where"
                             type="gml:SurfacePropertyType"
                             maxOccurs="unbounded"/>
             </xsd:sequence>
          </xsd:extension>
       </xsd:complexContent>
    </xsd:complexType>
</xsd:schema>
```

An instance document might be:

```xml
<?xml version="1.0" encoding="UTF-8"?>
<rz:RadZones
   gml:id="RZ001"
   xmlns:rz="http://www.someserver.com/rz"
   xmlns:gml="http://www.opengis.net/gml/3.2"
   xmlns:xlink="http://www.w3.org/1999/xlink"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xsi:schemaLocation="http://www.someserver.com/rz
                       http://www.someserver.com/schemas/RadZones.xsd
                       http://www.opengis.net/gml/3.2
                       http://schemas.opengis.net/gml/3.2.1/gml.xsd">
   <rz:title>Radiation Hot Spots</rz:title>
```

```
    <rz:abstract>Radiation hot spots in the vicinity of the AnyTown nuclear reactor. Only
readings that exceed the background radiation of 100 millirems per hour.</rz:abstract>
    <rz:rems uom="REM">170</rz:rems>
    <rz:where>
        <gml:Surface
            gml:id="RZ001_1"
            srsName="http://www.opengis.net/def/crs/EPSG/0/4326">
            <gml:patches>
                <gml:PolygonPatch>
                    <gml:exterior>
                        <gml:Ring>
                            <gml:curveMember>
                                <gml:Curve gml:id="C01">
                                    <gml:segments>
                                        <gml:CircleByCenterPoint numArc="1">
                                            <gml:pos>51.389 30.099</gml:pos>
                                            <gml:radius uom="m">20000</gml:radius>
                                        </gml:CircleByCenterPoint>
                                    </gml:segments>
                                </gml:Curve>
                            </gml:curveMember>
                        </gml:Ring>
                    </gml:exterior>
                </gml:PolygonPatch>
            </gml:patches>
        </gml:Surface>
    </rz:where>
</rz:RadZones>
```

6.14 New Annex E (Informative)

Annex E

(informative)

Schematron rules

This profile does not recommend subsetting the full GML schema because of issues that may arise with caching XML parsers. Instead, a Schematron schema document can be used to ascertain whether a GML document instance complies to the rules specified in this profile. As an example, this annex contains an informative Schematron implementation of the SF2 rules as applied to GML document instances.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<sch:schema xmlns:sch="http://purl.oclc.org/dsdl/schematron">
   <sch:ns prefix="gml" uri="http://www.opengis.net/gml/3.2"/>
   <!-- Linda van den Brink, Geonovum, 2011
     - The schematron file implements the validation of the restricted
     - subset of GML 3.2 defined in the GML simple features profile
     - compliance level SF2. The scope of the validation consists of
     - GML document instances. Validation of the restricted subset of
     - XML Schema, defined in the same profile document, is not
     - implemented by this schematron file.-->
   <sch:pattern>
     <sch:rule context="/*/*/*">
         <!-- Rule to exclude metadataProperty -->
         <sch:assert test="not(gml:metaDataProperty)">
            This profile prohibits use of gml:metaDataProperty
            elements for referencing metadata in instance documents.
         </sch:assert>
     </sch:rule>
     <sch:rule context="/*//*">
         <!-- Rule to exclude spatial topology types -->
         <sch:assert
test="not(self::gml:Node|self::gml:Edge|self::gml:Face|self::gml:TopoSolid|self::gml:Topo
Point|self::gml:TopoCurve|self::gml:TopoSurface|self::gml:TopoVolume|self::gml:TopoComple
x)">
            Spatial properties are limited to the set of geometric
            types consisting of point, curve with linear and/or
            circular arc interpolation, planar surface, or aggregates
            thereof. Spatial topology is excluded.
         </sch:assert>
         <!-- Rule for content of curves -->
         <sch:assert test="not(self::gml:Curve) or
self::gml:Curve/gml:segments[gml:LineStringSegment|gml:Arc|gml:Circle|gml:CircleByCenterP
oint]">
            Curves (standalone or within surfaces) must have linear
            and/or circular arc interpolation (LineString, Curve with
            Arc, Circle or CircleByCenterpoint segments)
         </sch:assert>
         <!-- Rule for constraints on planar surfaces -->
         <sch:assert
test="not(self::gml:OrientableSurface|self::gml:CompositeSurface|self::gml:PolyhedralSurf
ace|self::gml:Tin|self::gml:TriangulatedSurface)">
            Planar surface types are restricted to Polygon or Surface
            elements.
         </sch:assert>
         <!-- Rule for constraints on GeometryPropertyType -->
         <sch:assert
test="not(self::gml:Solid|self::gml:MultiSolid|self::gml:CompositeSolid|self::gml:Composi
teCurve|self::gml:Grid)">
            Supported geometry types are restricted to point, curve with
```

```
              linear and/or circular arc interpolation, planar surface,
              or aggregates thereof.
          </sch:assert>
          <!-- Rule for geometry coordinates of points and circles by
              centerpoint -->
          <sch:assert test="count(self::gml:Point/gml:pos) = count(self::gml:Point/*)">
              Geometry coordinates shall only be specified using the gml:pos element for
gml:Point.
          </sch:assert>
          <sch:assert
test="count(self::gml:CircleByCenterPoint/gml:pos|self::gml:CircleByCenterPoint/gml:radiu
s) = count(self::gml:CircleByCenterPoint/*)">
              Geometry coordinates shall only be specified using the gml:pos
              element for gml:CircleByCenterPoint.
          </sch:assert>
          <!-- Rules for geometry coordinates in geometries other than points -->
          <sch:assert test="count(self::gml:LineStringSegment/gml:posList) =
count(self::gml:LineStringSegment/*)">
              Geometry coordinates shall only be specified using the gml:posList
              element for gml:LineStringSegment.
          </sch:assert>
          <sch:assert test="count(self::gml:LinearRing/gml:posList) =
count(self::gml:LinearRing/*)">
              Geometry coordinates shall only be specified using the gml:posList
              element for gml:LinearRing.
          </sch:assert>
          <sch:assert test="count(self::gml:Arc/gml:posList) =  count(self::gml:Arc/*)">
              Geometry coordinates shall only be specified using the gml:posList
              element for gml:Arc.
          </sch:assert>
          <sch:assert test="count(self::gml:Circle/gml:posList) =
count(self::gml:Circle/*)">
              Geometry coordinates shall only be specified using the gml:posList
              element for gml:Circle.
          </sch:assert>
          <!-- Rules for aggregate geometry types -->
          <sch:assert test="not(self::gml:MultiPoint/gml:pointMembers)">
             This profile restricts instance documents to using the property
             container gml:pointMember for the MultiPoint geometry type.
          </sch:assert>
          <sch:assert test="not(self::gml:MultiCurve/gml:curveMembers)">
             This profile restricts instance documents to using the property
             container gml:curveMember for the MultiCurve geometry type.
          </sch:assert>
          <sch:assert test="not(self::gml:MultiSurface/gml:surfaceMembers)">
             This profile restricts instance documents to using the property
             container gml:surfaceMember for the MultiSurface geometry type.
          </sch:assert>
          <sch:assert test="not(self::gml:MultiGeometry/gml:geometryMembers)">
             This profile restricts instance documents to using the property
             container gml:geometryMember for the MultiGeometry geometry type.
          </sch:assert>
          <!-- Rule for content of surfaces -->
          <sch:assert test="count(self::gml:Surface/gml:patches/gml:PolygonPatch) =
count(self::gml:Surface/gml:patches/*)">
              The content of gml:Surface elements is restricted to
              gml:PolygonPatch patches.
          </sch:assert>
          <sch:assert test="not(self::*/@srsDimension &gt; 3)">
              Coordinate reference systems may have 1, 2 or 3 dimensions.
          </sch:assert>
      </sch:rule>
    </sch:pattern>
</sch:schema>
```

This Schematron schema can also be found at:
http://schemas.opengis.net/gmlsfProfile/2.0/gmlsfL2.sch