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OGC GeoSciML-Lite GML 3.2 encoding

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Abstract

GeosciML (OGC 16-008) specifies a GML 3.2 for all packages accepts for GeoSciML-Lite. At the time of developing the model, GML 3.2 support from WFS servers was not ubiquitous and several high profile infrastructures projects, such as INSPIRE, OneGeology and USGIN, adopted an early version of GeoSciML-Lite encoded using GML 3.1. To avoid disruption of existing implementations, OGC 16-008 provides a GML 3.1 encoding.

Support for GML 3.2 is now common and communities demand an upgrade of GeoSciML-Lite encoding. This document thus provides a GeoSciML-Lite GML 3.2 encoding for communities wanting to use WFS 2.0.

Keywords

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

Ogc doc, OGC document, geology, geoscience, stratigraphy, borehole, geochemistry, geophysics, rock, fault, contact, fold, fossil, UML, GML, XML.

Preface

The primary goal of this document is to provide a new encoding for GeoSciML-Lite, described in OGC 16-008. It does not alter or extend the conceptual or logical models described in the original specification. The only artefacts provided with this new encoding are a W3C XSD document and an ISO schematron file. Compliant XML document are almost identical, except for the namespace.

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.

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Submitting organizations

The following organizations submitted this Document to the Open Geospatial Consortium (OGC):

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* British Geological Survey (NERC-BGS), UK
* Bureau de Recherches Géologiques et Minières (BRGM), France
* Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia
* Columbia University, U.S.A
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* Geoscience Australia (GA), Australia
* Institute of Geological and Nuclear Sciences (GNS), New Zealand
* Landcare Research, New Zealand
* Natural Resources Canada (NRCan), Geological Survey of Canada, Canada

Submitters

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

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| Sylvain Grellet | Bureau de recherches géologiques et minières, France |
|  |  |

# Scope

<Insert Scope text here. Give the subject of the document and the aspects of that scope covered by the document. >

# Conformance

This standard defines an XML encoding encoding which conform to OGC GML 3.2 encoding rules as defined in ISO 19136 (2007).

Requirements for a single standardization target type is considered:

* Data instance.

Conformance with this standard shall be checked using all the relevant tests specified in Annex A (normative) of this document. The framework, concepts, and methodology for testing, and the criteria to be achieved to claim conformance are specified in the OGC Compliance Testing Policies and Procedures and the OGC Compliance Testing web site[[1]](#footnote-1).

In order to conform to this OGC™interface standard, a software implementation shall choose to implement:

1. Any one of the conformance levels specified in Annex B (normative).
2. Any one of the Distributed Computing Platform profiles specified in Annexes TBD through TBD (normative).

All requirements-classes and conformance-classes described in this document are owned by the standard(s) identified.

# References

The following normative documents are referenced in the text or provide significant context for the development of GeoSciML-Lite GML 3.2 encoding. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this document are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document applies.

* OGC 06-121r9, OGC® Web Services Common Standard
* OGC 16-008 OGC Geoscience Markup Language 4.1 (GeoSciML)
* ISO 19103:2005 - Conceptual Schema Language
* ISO 19107:2003 - Spatial Schema
* ISO 19108:2006 - Temporal Schema
* ISO 8601- Data elements and interchange formats – Information interchange – Representation of dates and times
* ISO 19136:2007 Geographic information -- Geography Markup Language (GML)
* OGC Abstract Specification Topic 2 – Spatial Referencing by Coordinates (also ISO 19111:2007)
* OGC 07-036 Geography Markup Language (also ISO 19136:2007)
* RFC 3986 - Uniform Resource Identifier (URI): Generic Syntax, 2005. (http://www.rfc-base.org/rfc-3986.html)
* Schematron: ISO/IEC 19757-3, Information technology - Document Schema Definition Languages (DSDL) - Part 3: Rule-based validation - Schematron (http://standards.iso.org/ittf/PubliclyAvailableStandards/c040833\_ISO\_IEC\_19757-3\_2006(E).zip)
* The Specification Model - A Standard for Modular specifications OGC Document 08-131r3.
* Unified Code for Units of Measure (UCUM) - Version 2.0.1, 2014. (http://unitsofmeasure.org/ucum.html)
* Unified Modeling Language (UML). Version 2.3. May 2010.
* Extensible Markup Language (XML) - Version 1.0 (Fourth Edition), August 2006
* XML Schema - Version 1.0 (Second Edition), October 2004
* INSPIRE Data Specification for the spatial data theme Geology Version 3.0

# 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.

For the purposes of this document, the following additional terms and definitions apply.



classifier

A classifier is an abstract UML metaclass which describes (classifies) a set of instances having common features (not to be confused with the “Feature” stereotype from the OGC Feature Model). A feature declares a structural or behavioral characteristic of instances of classifiers. (http://www.uml-diagrams.org/classifier.html). Classes, Interfaces, Association, and Types are kinds of classifiers.

domain feature

Feature of a type defined within a particular application domain.

NOTE: This may be contrasted with observations and sampling features, which are features of types defined for cross-domain purposes.

[ISO 19156, definition 4.4]

element <XML>

Basic information item of an XML document containing child elements, attributes and character data.

NOTE: From the XML Information Set ― each XML document contains one or more elements, the boundaries of which are either delimited by start-tags and end-tags, or, for empty elements, by an empty-element tag. Each element has a type, identified by name, sometimes called its ‘generic identifier’ (GI), and may have a set of attribute specifications. Each attribute specification has a name and a value.

[ISO 19136:2007]

feature

Abstraction of a real-world phenomenon.

[ISO 19101:2002, definition 4.11]

GML application schema

Application schema written in XML Schema in accordance with the rules specified in OGC GML 3.3

[ISO 19136:2007]

GML document

XML document with a root element that is one of the elements AbstractFeature, Dictionary or TopoComplex, specified in the GML schema or any element of a substitution group of any of these elements.

[ISO 19136:2007]



GML schema

Schema components in the XML namespace ― as specified in OGC GML 3.3

[ISO 19136:2007]



measurement

Set of operations having the objective of determining the value of a quantity.

[ISO/TS 19101-2:2008, definition 4.20]



observation

Act of observing a property.

NOTE: The goal of an observation may be to measure or otherwise determine the value of a property.

[ISO 19156:2011 definition 4.10]



observation procedure

Method, algorithm or instrument, or system which may be used in making an observation.

[ISO19156, definition 4.11]



observation result

Estimate of the value of a property determined through a known procedure.

[ISO 19156:2011]



property <General Feature Model>

Facet or attribute of an object referenced by a name.

EXAMPLE: Abby's car has the colour red, where "colour red" is a property of the car instance.



sampled feature

The real-world domain feature of interest, such as a geological unit or structure which is observed.

[ISO 19156:2011]



sampling feature

Feature, such as a station, outcrop, borehole, section or specimen, which is involved in making observations of a domain feature.

NOTE: A sampling feature is purely an artefact of the observational strategy, and has no significance independent of the observational campaign.

[ISO 19156:2011, definition 4.16]



schema <XML Schema>

XML document containing a collection of schema component definitions and declarations within the same target namespace.

Example Schema components of W3C XML Schema are types, elements, attributes, groups, etc.

NOTE: The W3C XML Schema provides an XML interchange format for schema information. A single schema document provides descriptions of components associated with a single XML namespace, but several documents may describe components in the same schema, i.e. the same target namespace.

[ISO 19136:2007]

# Conventions

## Requirement class

Each normative statement (requirement or recommendation) in this specification is a member of a requirements class. Each requirements class is described in a discrete clause or sub-clause, and summarized using the following template:

|  |  |
| --- | --- |
| **Requirements class** | **/req/{classM}** |
| **Target type** | [artefact or technology type] |
| **Dependency** | [identifier for another requirements class] |
| **Requirement** | /req/{classM}/{reqN} |
| **Recommendation** | /req/{classM}/{recO} |
| **Requirement** | /req/{classM}/{reqP} |
| **Requirement /Recommendation** | [repeat as necessary] |

All requirements in a requirements class must be satisfied. Hence, the requirements class is the unit of re-use and dependency, and the value of a dependency requirement is another requirements class. All requirements in a dependency must also be satisfied by a conforming implementation. A requirements class may consist only of dependencies and introduce no new requirements.

## Requirement and Recommendation

All requirements and recommendations are normative, and each is presented using the following template:

|  |  |
| --- | --- |
| **/req/[classM]/[reqN]** | [Normative statement] |

where /req/[classM]/[reqN] identifies the requirement or recommendation. The use of this layout convention allows the normative provisions of this specification to be easily located by implementers.

## Conformance class

Conformance to this specification is possible at a number of levels, specified by conformance classes (Annex A). Each conformance class is summarized using the following template:

|  |  |
| --- | --- |
| **Conformance class** | **/conf/{classM}** |
| **Dependency** | [identifier for another conformance class] |
| **Requirements** | /req/{classA} |
| **Tests** | [reference to clause(s) containing tests] |

All tests in a class must be passed. Each conformance class tests conformance to a set of requirements packaged in a requirements class.

W3C Schema (XSD) and ISO Schematron (SCH) files are considered as part of this specification, although available online only, due to concerns about document size. Many requirements are expressed in a single XSD or SCH file, although tests are listed individually in the conformance annex (one test for XSD and one test for SCH).

Schematron files explicitly specify which requirements are being tested in the title of the schematron pattern.

<pattern id="unit-of-measure">

<title>Test requirement: /req/gsmll-lite-xsd/unit-of-measure</title>

<rule context="SWE::Quantity">

<assert test="SWE::Quantity">Quantity must have a UOM</assert>

</rule>

</pattern>

## Identifiers

The normative provisions in this specification are denoted by a URI constructed using this pattern:

http://www.opengis.net/spec/{standard}/{m.n}

All requirements and conformance tests that appear in this document are denoted by a partial URI which is relative to this base. The identifier supports cross-referencing of class membership, dependencies, and links from each conformance test to the requirements tested. In this specification identifiers are expressed as partial URIs or paths, which can be appended to a base URI that identifies the specification as a whole in order to construct a complete URI for identification in an external context.

The URI for each requirements class has the form:

http://www.opengis.net/spec/gsml-lite/1.0/req/[classM].

The URI for each requirement or recommendation has the form:

http://www.opengis.net/spec/gsml-lite/1.0/req/[classM]/[reqN].

The URI for each conformance class has the form:

http://www.opengis.net/spec/gsml-lite/1.0/conf/[classM].

The URI for each conformance test has the form:

http://www.opengis.net/spec/gsml-lite/1.0/conf/[classM]/[testN].

## Classifiers

This document contains a large number of references to classifiers that might sometimes be ambiguous. Classes and packages are simply referred by their name formed using “CamelCase” name in mono space type. Duplicate names do exist and the scope (the package of a class or the class a property belongs to) must be made explicit.

OCL syntax will be used to identify a logical model classifier from the UML model.

Package::{…}Package::Classifier::Property:Type

Package names are not formal in UML and can change from one implementation to another. The reference model used by GeoSciML, and several other domain models, is HollowWorld. For example, a complete path for a SF\_SamplingPoint in HollowWorld (from HollowWorld root) is

ISO TC211::ISO 19156 All::ISO 19156:2011 Observations and Measurements::Sampling Features::samplingPoint::SF\_SamplingPoint

For the sake of readability, and also because some HollowWorld package names do not have OCL friendly names (e.g. some package names contain ‘:’, as shown in the previous example), this document will use shortcuts to identify packages. For example, for OM::SF\_SamplingPoint, OM acts as a shortcut for (ISO TC211::ISO 19156 All::ISO 19156:2011 Observations and Measurements::\*) that includes all classifiers in all sub packages and avoids creating a shortcut for all sub packages. The list of shortcuts is provided in Section [8.1.2](#_Package_shortcuts). GeoSciML also uses the recently published ISO19115-3 model which has numerous classifier name overlaps with ISO19115 from HollowWorld.

W3C XPath will be used in XML instances. XML entities will be identified using their full qualified name (namespace, identified by its prefix, and entity name).

* gsmlb:GeologicUnit refers to an instance of GeologicUnit, from namespace xmlns:gsmlb="http://www.opengis.net/gsml/4.1/GeoSciML-Basic"
* gsmlb:GeologicUnit/gml:name refers to the name property of GeologicUnit
* gsmlb:GeologicUnit/gml:name/@codeName refers to the codeName attribute of the name property of GeologicUnit

# Clauses not Containing Normative Material

Paragraph

## Clauses not containing normative material sub-clause 1

Paragraph

### Clauses not containing normative material sub-clause 2

# Clause containing normative material

# XML Encoding Requirement classes (Normative)

XSD schemas were derived from the UML model following GML 3.3 encoding (OGC ISO19136-2, OGC 10-129r1) that extends and supersedes some of ISO 19136-2007, specifically clauses 11 (CodeType encoding) and 12.3 (Association encoding)



Figure 107 - XML Encoding requirements classes dependencies (external dependencies not show)

The normative artefacts for XML encoding are the W3C XSD documents and W3C schematron SCH documents provided online with this specification. Those documents explicitly provide the requirements that must be met by any XML instance claiming compliance to this specification. Any requirements that cannot be expressed in XSD or SCH are described in the relevant XML encoding section of this document. Therefore, compliant XML instances shall

* 1. validate with XSD schemas,
  2. pass schematron rules and then
  3. pass compliance tests listed in relevant compliance sections.

## Prefixes used in examples

For brevity in XML examples, namespace declarations might be omitted. Throughout this document, the following namespace mappings will be assumed:

Table 16 : Default prefix mapping for xml snippets

|  |  |
| --- | --- |
| **Prefix** | **Namespace URI** |
| **gml** | <http://www.opengis.net/gml/3.2> |
| **gsmlp** | <http://www.opengis.net/gsml/4.1/Geosciml-Lite> |
| **xlink** | <http://www.w3.org/1999/xlink> |

## GeoSciML Lite GML 3.2 profile (Normative)

|  |  |
| --- | --- |
| **Requirements Class** | |
| /req/gsml4xsd-lite-32 | |
| **Target type** | Data instance |
| **Dependency** | /req/gsml4-lite |
| **Dependency** | /req/gsml4xsd-lite |
| **Requirement** | /req/gsml4xsd-lite-32/xsd  An XML instance document shall validate with schema located at http://schemas.opengis.net/gsml/4.1/geosciml-lite.xsd. |
| **Requirement** | /req/gsml4xsd-lite-32/sch  An XML instance document shall pass schematron rules defined in schematron file located at http://schemas.opengis.net/gsml/4.1/geosciml-lite.sch. |

Because of the limited availability of WFS 2.0 compliant servers and clients, GeoSciML SWG officially supports WFS 1.1.0 and GML 3.1.1 for delivery of Lite features.

All the elements from the GeoSciML Lite package must be schema valid according to the XSD document provided at http://schemas.opengis.net/gsml/4.1/geosciml-lite.xsd.

|  |  |
| --- | --- |
| /req/gsml4xsd-lite-32/xsd | An XML instance document shall validate with schema located at http://schemas.opengis.net/gsml/4.1/geosciml-portrayal.xsd. |

All the elements from the GeoSciML Lite package must pass the schematron rules defined in the schematron file located at [http://schemas.opengis.net/gsml/4.1/geosciml-lite.sch](http://schemas.opengis.net/gsml/4.0/geosciml-lite.sch).

|  |  |
| --- | --- |
| /req/gsml4xsd-lite-32/sch | An XML instance document shall pass schematron rules defined in schematron file located at http://schemas.opengis.net/gsml/4.1/geosciml-lite.sch. |

# Media Types for any data encoding(s)

A section describing the MIME-types to be used is mandatory for any standard involving data encodings. If no suitable MIME type exists in http://www.iana.org/assignments/media-types/index.html then this section may be used to define a new MIME type for registration with IANA.

Annex A: Conformance Class Abstract Test Suite (Normative)

* 1. Conformance class: GeoSciML Lite XML Encoding for GML

|  |  |  |
| --- | --- | --- |
| **Conformance Class** | /conf/gsml4xsd-lite-31 | |
| **Requirements** | /req/gsml4xsd-lite-31 | |
| **Dependency** | /req/gsml4xsd-lite | |
| **Test** | /conf/gsml4xsd-lite-31/xsd | |
|  | **Requirement** | /req/gsml4xsd-lite-31/xsd |
| **Test purpose** | Ensure that GeoSciML Portrayal XML documents are valid |
| **Test method** | Perform a XSD validation on a XML instance document. Test succeeds if the validation does not report any error. |
| **Test type** |  |
| **Test** | /conf/gsml4xsd-lite-31/sch | |
|  | **Requirement** | /req/gsml4xsd-lite-31/sch |
| **Test purpose** | Ensure that encoding rules defined in the specification are met |
| **Test method** | Perform a schematron validation on the XML instance. Test succeeds if the validation does not report any failed rules. |
| **Test type** |  |

Annex B: Revision history

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date | Release | Author | Paragraph modified | Description |
| 2017-07-02 | 1.0.0 | Eric Boisvert | All | Initial creation of document from 16-008 |
|  |  |  |  |  |
|  |  |  |  |  |

Annex <insert annex number>: Bibliography

<A Bibliography, if present, shall appear as the last annex. >

1. [www.opengeospatial.org/cite](http://www.opengeospatial.org/cite) [↑](#footnote-ref-1)