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Geographic information — Geography Markup Language (GML) —

Part 1: **Fundamentals**

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*.

This first edition of ISO 19136-1 cancels and replaces ISO 19136:2007 which has been technically revised.

The main changes compared to the previous edition are as follows:

— The Geography Markup Language (GML) was originally developed within the Open Geospatial Consortium, Inc. (OGC). ISO 19136 was prepared by ISO/TC 211 jointly with the OGC. This edition of this document is a revision to GML 3.2.1 (ISO 19136:2007). It addresses the OGC Change Request 12-092 (gml:id attribute on LinearRing) by applying the following changes:

  — the XML attribute gml:id in gml:AbstractGMLType has been made optional;

  — the elements gml:AbstractRing and gml:Shell have been added to the substitutionGroups gml:AbstractCurve and gml:AbstractSurface respectively;

  — the types gml:AbstractRingType and gml:ShellType are now extended from base types gml:AbstractCurveType and gml:AbstractSurfaceType respectively;

These changes correct inconsistencies with ISO 19107 without breaking the validity of instance documents created using the GML 3.2.1 schema. i.e. all GML 3.2 instance documents that are valid against the GML 3.2.1 schema are also valid against the GML 3.2.2 schema.

The corrected GML 3.2 schema is available at http://schemas.opengis.net/gml/3.2.1/. Note that the use of "3.2.1" in the URL is unchanged since this version (3.2.2) replaces the GML 3.2.1 schema. Previous versions of the GML 3.2.1 schema are available at http://schemas.opengis.net/gml/gml-3_2_1.zip.

The change to the gml:id attribute reverts a change that has been made between GML 3.1.1 and GML 3.2.1. Reverting this change also addresses comments raised by several communities since the release of GML 3.2.1 / ISO 19136:2007.

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As the correction relaxes a constraint in the XML schema, not all instance documents created based on the GML 3.2.2 schema will be valid against the GML 3.2.1 schema:

— all GML 3.2 instance documents that include a gml:id attribute on a ring or shell element are not valid against the GML 3.2.1 schema;

— all GML 3.2 instance documents that include a feature, a spatial object or a temporal object without a gml:id attribute are not valid against the GML 3.2.1 schema.

Local copies of the GML 3.2.1 schema documents have to be replaced by the GML 3.2.2 schema documents – or be replaced by links to http://schemas.opengis.net/gml/3.2.1/gml.xsd.

— URIs have been updated, mainly in examples, where OGC policies have changed since the release of GML 3.2.1 (location of the Xlink schema document, use of OGC HTTP URIs for coordinate reference systems).

— The reference to the normative schema documents in Annex C now refers to the OGC schema repository. Previously, copies of the GML schema were also published on ISO servers, but the schema documents were not always synchronized. Going forward, all references to the normative GML schema document should go to http://schemas.opengis.net/gml/.

A list of all parts in the ISO 19136 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Geography Markup Language (GML) is an XML grammar written in XML Schema for the description of application schemas as well as the transport and storage of geographic information.

The key concepts used by GML to model the world are drawn from the ISO 19100 series of International Standards and the OpenGIS Abstract Specification.

A feature is an "abstraction of real world phenomena" (ISO 19101); it is a geographic feature if it is associated with a location relative to the Earth so a digital representation of the real world may be thought of as a set of features. The state of a feature is defined by a set of properties, where each property may be thought of as a {name, type, value} triple.

The number of properties a feature may have, together with their names and types, is determined by its type definition. Geographic features with geometry are those with properties that may be geometry-valued. A feature collection is a collection of features that may itself be regarded as a feature; as a consequence a feature collection has a feature type and thus may have distinct properties of its own, in addition to the features it contains.

Following ISO 19109, the feature types of an application or application domain is usually captured in an application schema. A GML application schema is specified in XML Schema and can be constructed in two different and alternative ways:

— by adhering to the rules specified in ISO 19109 for application schemas in UML, and conforming to both the constraints on such schemas and the rules for mapping them to GML application schemas specified in this document;

— by adhering to the rules for GML application schemas specified in this document for creating a GML application schema directly in XML Schema.

Both ways are supported by this document. To ensure proper use of the conceptual modelling framework of the ISO 19100 series of International Standards, all application schemas are expected to be modelled in accordance with the General Feature Model as specified in ISO 19109. Within the ISO 19100 series, UML is the preferred language by which to model conceptual schemas.

GML specifies XML encodings, conformant with ISO 19118, of several of the conceptual classes defined in the ISO 19100 series of International Standards and the OpenGIS Abstract Specification. These conceptual models include those defined in:

— ISO/TS 19103 — Conceptual schema language (units of measure, basic types);

— ISO 19107 — Spatial schema (geometry and topology objects);

— ISO 19108 — Temporal schema (temporal geometry and topology objects, temporal reference systems);

— ISO 19109 — Rules for application schemas (features);

— ISO 19111 — Spatial referencing by coordinates (coordinate reference systems);

— ISO 19123 — Schema for coverage geometry and functions.

The aim is to provide a standardized encoding (i.e. a standardized implementation in XML) of types specified in the conceptual models specified by the International Standards listed above. If every application schema were encoded independently and the encoding process included the types from, for example, ISO 19108, then, without unambiguous and completely fixed encoding rules, the XML encodings would be different. Also, since every implementation platform has specific strengths and weaknesses, it is helpful to standardize XML encodings for core geographic information concepts modelled in the ISO 19100 series of International Standards and commonly used in application schemas.

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In many cases, the mapping from the conceptual classes is straightforward, while in some cases the mapping is more complex (a detailed description of the mapping is part of this document).

In addition, GML provides XML encodings for additional concepts not yet modelled in the ISO 19100 series of International Standards or the OpenGIS Abstract Specification, for example, dynamic features, simple observations or value objects.

Predefined types of geographic features in GML include coverages and simple observations.

A coverage is a subtype of feature that has a coverage function with a spatiotemporal domain and a value set range of homogeneous 1- to *n*-dimensional tuples. A coverage may represent one feature or a collection of features "to model and make visible spatial relationships between, and the spatial distribution of, Earth phenomena" (OGC Abstract Specification Topic 6[18]) and a coverage "acts as a function to return values from its range for any direct position within its spatiotemporal domain" (ISO 19123).

An observation models the act of observing, often with a camera or some other procedure, a person or some form of instrument (Merriam-Webster Dictionary: "an act of recognizing and noting a fact or occurrence often involving measurement with instruments"). An observation is considered to be a GML feature with a time at which the observation took place, and with a value for the observation.

A reference system provides a scale of measurement for assigning values to a position, time or other descriptive quantity or quality.

A coordinate reference system consists of a set of coordinate system axes that is related to the Earth through a datum that defines the size and shape of the Earth.

A temporal reference system provides standard units for measuring time and describing temporal length or duration.

A reference system dictionary provides definitions of reference systems used in spatial or temporal geometries.

Spatial geometries are the values of spatial feature properties. They indicate the coordinate reference system in which their measurements have been made. The "parent" geometry element of a geometric complex or geometric aggregate makes this indication for its constituent geometries.

Temporal geometries are the values of temporal feature properties. Like their spatial counterparts, temporal geometries indicate the temporal reference system in which their measurements have been made.

Spatial or temporal topologies are used to express the different topological relationships between features.

A units of measure dictionary provides definitions of numerical measures of physical quantities, e.g. length, temperature and pressure, and of conversions between units.

NOTE This document makes reference to ISO 19107:2003 and ISO 19111:2007 (withdrawn standards, replaced by 2019 versions) because this edition of ISO 19136-1 is still an XML implementation of the previous edition of ISO 19107 and other standards.

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Geographic information — Geography Markup Language (GML) —

Part 1: Fundamentals

1 Scope

The Geography Markup Language (GML) is an XML encoding in accordance with ISO 19118 for the transport and storage of geographic information modelled in accordance with the conceptual modelling framework used in the ISO 19100 series of International Standards and including both the spatial and non-spatial properties of geographic features.

This document defines the XML Schema syntax, mechanisms and conventions that:

— provide an open, vendor-neutral framework for the description of geospatial application schemas for the transport and storage of geographic information in XML;

— allow profiles that support proper subsets of GML framework descriptive capabilities;

— support the description of geospatial application schemas for specialized domains and information communities;

— enable the creation and maintenance of linked geographic application schemas and datasets;

— support the storage and transport of application schemas and datasets;

— increase the ability of organizations to share geographic application schemas and the information they describe.

Implementers can decide to store geographic application schemas and information in GML, or they can decide to convert from some other storage format on demand and use GML only for schema and data transport.

NOTE If an ISO 19109 conformant application schema described in UML is used as the basis for the storage and transportation of geographic information, this document provides normative rules for the mapping of such an application schema to a GML application schema in XML Schema and, as such, to an XML encoding for data with a logical structure in accordance with the ISO 19109 conformant application schema.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8601-1, *Date and time — Representations for information interchange — Part 1: Basic rules*

ISO/IEC 11404:2007, *Information technology — General-Purpose Datatypes (GPD)*

ISO 19108:2002, *Geographic information — Temporal schema*

ISO 19123:2005, *Geographic information — Schema for coverage geometry and functions*

ISO/IEC 19757-3, *Information technology — Document Schema Definition Languages (DSDL) — Part 3: Rule-based validation — Schematron*

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ISO 80000-3, *Quantities and units — Part 3: Space and time*

IETF RFC 2396, *Uniform Resource Identifiers (URI): Generic Syntax (August 1998)*

W3C XLink, XML Linking Language (XLink) Version 1.1, W3C Recommendation (6 May 2010)

W3C XML, Extensible Markup Language (XML) 1.0 (Fith Edition), W3C Recommendation (26 November 2008)

W3C XML Namespaces, Namespaces in XML 1.0 (Third Edition), W3C Recommendation (8 December 2009)

W3C XML Schema Part 1, XML Schema Part 1: Structures, W3C Recommendation (28 October 2004)

W3C XML Schema Part 2, XML Schema Part 2: Datatypes, W3C Recommendation (28 October 2004)

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1.1
application schema
conceptual *schema* (3.1.52) for data required by one or more applications

[SOURCE: ISO 19101-1:2014, 4.1.2]

3.1.2
association
<UML> semantic relationship that can occur between typed instances

[SOURCE: ISO 19103:2015, 4.4, modified — Note 1 to entry has been deleted.]

3.1.3
attribute
<XML> name-value pair contained in an *element* (3.1.23)

Note 1 to entry: In this document an attribute is an XML attribute unless otherwise specified. The syntax of an XML attribute is “Attribute::= Name = AttValue”. An attribute typically acts as an XML element modifier (e.g. <Road gml:id = “r1” />; here gml:id is an attribute).

3.1.4
boundary
set that represents the limit of an entity

[SOURCE: ISO 19107:2019, 3.6, modified — Note 1 to entry has been deleted.]

3.1.5
child element
<XML> immediate descendant *element* of an *element* (3.1.23)

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3.1.6
closure
union of the *interior* (3.1.39) and *boundary* (3.1.4) of a *topological object* (3.1.59) or *geometric object* (3.1.30)

[SOURCE: ISO 19107:2019, 3.8]

3.1.7
codelist
value domain including a code for each permissible value

3.1.8
codespace
rule or authority for a code, name, term or category

EXAMPLE Dictionaries, authorities, codelists, etc.

3.1.9
composite curve
sequence of *curves* (3.1.17) such that each curve (except the first) starts at the end point of the previous curve in the sequence

Note 1 to entry: A composite curve, as a set of direct positions, has all the properties of a curve.

3.1.10
composite solid
connected set of solids adjoining one another along shared *boundary* (3.1.4) surfaces

Note 1 to entry: A composite solid, as a set of direct positions, has all the properties of a solid.

3.1.11
composite surface
connected set of *surfaces* (3.1.57) adjoining one another along shared *boundary* (3.1.4) curves

Note 1 to entry: A composite surface, as a set of direct positions, has all the properties of a surface.

3.1.12
coordinate
one of a sequence of numbers designating the position of a *point* (3.1.47)

Note 1 to entry: In a spatial coordinate reference system, the coordinate numbers are qualified by units.

[SOURCE: ISO 19111:2019, 3.1.5]

3.1.13
coordinate reference system
coordinate system (3.1.14) that is related to an object by a *datum* (3.1.19)

[SOURCE: ISO 19111:2019, 3.1.9, modified — Note 1 to entry has been deleted.]

3.1.14
coordinate system
set of mathematical rules for specifying how *coordinates* (3.1.12) are to be assigned to *points* (3.1.47)

[SOURCE: ISO 19111:2019, 3.1.11]

3.1.15
coordinate tuple
tuple (3.1.60) composed of *coordinates* (3.1.12)

[SOURCE: ISO 19111:2019, 3.1.13, modified — Note 1 to entry has been deleted.]

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3.1.16
coverage
feature (3.1.26) that acts as a *function* (3.1.28) to return values from its *range* (3.1.50) for any *direct position* (3.1.20) within its spatial, temporal or spatiotemporal *domain* (3.1.21)

[SOURCE: ISO 19123:2005, 4.1.7, modified —Example and Note to entry have been deleted.]

3.1.17
curve
1-dimensional *geometric primitive* (3.1.31), representing the continuous image of a line

Note 1 to entry: The boundary of a curve is the set of points at either end of the curve. If the curve is a cycle, the two ends are identical, and the curve (if topologically closed) is considered to not have a boundary. The first point is called the start point, and the last is the end point. Connectivity of the curve is guaranteed by the "continuous image of a line" clause. A topological theorem states that a continuous image of a connected set is connected.

3.1.18
data type
specification of a value *domain* (3.1.21) with operations allowed on values in this domain

EXAMPLE Integer, Real, Boolean, String, Date (conversion of data into a series of codes).

Note 1 to entry: Data types include primitive predefined types and user-definable types. All instances of a data type lack identity.

[SOURCE: ISO 19103:2015, 4.14, modified — Supplementary information has been added to Example and Note 1 to entry.]

3.1.19
datum
parameter or set of parameters that realize the position of the origin, the scale, and the orientation of a *coordinate system* (3.1.14)

[SOURCE: ISO 19111:2019, 3.1.15]

3.1.20
direct position
position described by a single set of *coordinates* (3.1.12) within a *coordinate reference system* (3.1.13)

3.1.21
domain
well-defined set

Note 1 to entry: A mathematical *function* (3.1.28) may be defined on this set, i.e. in a function f:A→B, A is the domain of the function f.

Note 2 to entry: A domain as in domain of discourse refers to a subject or area of interest.

[SOURCE: ISO 19109:2015, 4.8]

3.1.22
edge
<topology> 1-dimensional topological primitive

Note 1 to entry: The geometric realization of an edge is a curve. The boundary of an edge is the set of one or two nodes associated with the edge within a topological complex.

[SOURCE: ISO 19107:2019, 3.29]

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3.1.23
element
<XML> basic information item of an XML document containing *child elements* (3.1.5), *attributes* (3.1.3) and character data

Note 1 to entry: The Extensible Markup Language (XML) 1.0 (Fifth Edition), Clause 3, uses the following definition: "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."

3.1.24
exterior
<geometry, topology> difference between the universe and the *closure* (3.1.6)

Note 1 to entry: The concept of exterior is applicable to both topological object and geometric object.

[SOURCE: ISO 19107:2019, 3.37]

3.1.25
face
<topology> 2-dimensional topological primitive

Note 1 to entry: The geometric realization of a face is a surface. The boundary of a face is the set of directed edges within the same topology complex that are associated with the face via the boundary relations. These can be organized as rings.

[SOURCE: ISO 19107:2019, 3.38]

3.1.26
feature
abstraction of real world phenomena

Note 1 to entry: A feature may occur as a type or an instance. Feature type or feature instance will be used when only one is meant.

[SOURCE: ISO 19101-1:2014, 4.1.11]

3.1.27
feature association
relationship that links instances of one *feature* (3.1.26) type with instances of the same or a different feature type

[SOURCE: ISO 19110:2016, 3.3]

3.1.28
function
<mathematics, programming> rule that associates each *element* (3.1.23) from a *domain* (3.1.21) ("source domain," or "domain" of the function) to a unique element in another domain ("target domain," "co-domain," or "*range*" (3.1.50) of the function)

[SOURCE: ISO 19107:2019, 3.41]

3.1.29
geodetic datum
datum (3.1.19) describing the relationship of a 2- or 3-dimensional *coordinate system* (3.1.14) to the Earth

[SOURCE: ISO 19111:2007, 4.24]

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3.1.30
geometric object
<geometry> *spatial object* (3.1.56) representing a *geometric set* (3.1.32)

[SOURCE: ISO 19107:2019, 3.49, modified — Note 1 to entry has been deleted.]

3.1.31
geometric primitive
<geometry> *geometric object* (3.1.30) representing a single, connected, homogeneous (isotropic) element of space

[SOURCE: ISO 19107:2019, 3.50, modified — Note 1 to entry has been deleted.]

3.1.32
geometric set
set of *direct positions* (3.1.20)

Note 1 to entry: This definition is taken from the definition in ISO 19107:2003 rather than ISO 19107:2019 since the 2019 version uses the term "point" with a broader meaning than in this document.

[SOURCE: ISO 19107:2003, 4.50]

3.1.33
geometry property
<GML> *property* (3.1.49) of a GML *feature* (3.1.26) that describes some aspect of the geometry of the feature

Note 1 to entry: The geometry property name is the role of the geometry in relation to the feature.

3.1.34
GML application schema
application schema (3.1.1) written in XML Schema in accordance with the rules specified in this document

3.1.35
GML document
XML document with a root element that is one of the elements AbstractFeature, Dictionary or TopoComplex specified in the *GML schema* (3.1.37) or any element of a substitution group of any of these elements

3.1.36
GML profile
subset of the *GML schema* (3.1.37)

3.1.37
GML schema
schema (3.1.52) components in the *XML namespace* (3.1.43) "http://www.opengis.net/gml/3.2" as specified in this document

3.1.38
grid
network composed of two or more sets of *curves* (3.1.17) in which the members of each set intersect the members of the other sets in an algorithmic way

Note 1 to entry: The curves partition a space into grid cells.

[SOURCE: ISO 19123:2005, 4.1.23]

3.1.39
interior
set of all *direct positions* (3.1.20) that are on a *geometric object* (3.1.30) but which are not on its *boundary* (3.1.4)

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3.1.40
line string
curve (3.1.17) composed of straight-line segments

3.1.41
measure
<GML> value described using a numeric amount with a scale or using a scalar reference system

Note 1 to entry: When used as a noun, measure is a synonym for physical quantity.

3.1.42
measurand
particular quantity subject to measurement

[SOURCE: VIM:1993, 2.6]

3.1.43
namespace
<XML> collection of names, identified by a *URI* (3.1.62) reference, which are used in XML documents as element names and attribute names (W3C XML Namespaces)

3.1.44
node
<topology> 0-dimensional topological primitive

Note 1 to entry: The boundary of a node is the empty set.

[SOURCE: ISO 19107:2019, 3.69]

3.1.45
observable type
data type (3.1.18) to indicate the *physical quantity* (3.1.46) as a result of an observation

3.1.46
physical quantity
quantity used for the quantitative description of physical phenomena

Note 1 to entry: In GML, a physical quantity is always a value described using a numeric amount with a scale or using a scalar reference system. Physical quantity is a synonym for measure when the latter is used as a noun.

3.1.47
point
0-dimensional *geometric primitive* (3.1.31), representing a position

Note 1 to entry: The boundary of a point is the empty set.

3.1.48
polygon
planar *surface* (3.1.57) defined by 1 *exterior* (3.1.24) *boundary* (3.1.4) and 0 or more *interior* (3.1.39) *boundaries* (3.1.4)

3.1.49
property
<GML> *child element* (3.1.5) of a GML object

Note 1 to entry: It corresponds to feature attribute and feature association role in ISO 19109. If a GML property of a feature has an xlink:href attribute that references a feature, the property represents a feature association role.

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3.1.50
range
co-domain
<mathematics> acceptable target values of a *function* (3.1.28)

[SOURCE: ISO 19107:2019, 3.80]

3.1.51
rectified grid
grid (3.1.38) for which there is an affine transformation between the grid coordinates and the *coordinates* (3.1.12) of an external *coordinate reference system* (3.1.13)

[SOURCE: ISO 19123:2005, 4.1.32, modified — The NOTE has been deleted.]

3.1.52
schema
formal description of a model

Note 1 to entry: In general, a schema is an abstract representation of an object's characteristics and relationship to other objects. An XML schema represents the relationship between the attributes and elements of an XML object.

EXAMPLE A document or a portion of a document.

[SOURCE: ISO 19101-1:2014, 4.1.34, modified — Note 1 to entry and EXAMPLE have been added.]

3.1.53
schema
<XML> collection of *schema* (3.1.52) components within the same target *namespace* (3.1.43)

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

3.1.54
schema document
<XML> XML document containing *schema* (3.1.52) component definitions and declarations

Note 1 to entry: 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.

3.1.55
semantic type
category of objects that share some common characteristics and are thus given an identifying type name in a particular domain of discourse

3.1.56
spatial object
<topology, geometry> object used for representing a spatial characteristic of a *feature* (3.1.26)

[SOURCE: ISO 19107:2019, 3.87]

3.1.57
surface
2-dimensional *geometric primitive* (3.1.31), locally representing a continuous image of a region of a plane

Note 1 to entry: The boundary of a surface is the set of oriented, closed curves that delineate the limits of the surface. Surfaces that are isomorphic to a sphere, or to an *n*-torus (a topological sphere with *n* "handles") have no boundary. Such surfaces are called cycles.

3.1.58
tag
<XML> markup in an XML document delimiting the content of an *element* (3.1.23)

EXAMPLE <Road>

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Note 1 to entry: A tag with no forward slash (e.g. <Road>) is called a start-tag (also opening tag), and one with a forward slash (e.g. </Road> is called an end-tag (also closing tag).

3.1.59
topological object
spatial object (3.1.56) representing spatial characteristics that are invariant under continuous transformations

[SOURCE: ISO 19107:2019, 3.99, modified — Note 1 to entry has been deleted.]

3.1.60
tuple
ordered list of values

Note 1 to entry: The number of values in a tuple is immutable.

3.1.61
UML application schema
application schema (3.1.1) written in UML in accordance with ISO 19109

3.1.62
Uniform Resource Identifier
URI
unique identifier for a resource, structured in conformance with IETF RFC 2396

Note 1 to entry: The general syntax is <scheme>::<scheme-specific-part>. The hierarchical syntax with a namespace is <scheme>://<authority><path>?<query> — see RFC 2396.

3.2 Abbreviated terms

CRS	Coordinate Reference System
CS	Coordinate System
CSV	Comma Separated Values
CT	Coordinate Transformation
DTD	Document Type Definition
EPSG	European Petroleum Survey Group
GIS	Geographic Information System
GML	Geography Markup Language
	NOTE The abbreviated term GML was previously used also as Generalized Markup Language (which led to SGML, Standard Generalized Markup Language, ISO 8879).
HTTP	Hypertext Transfer Protocol
IETF	Internet Engineering Task Force
ISO	International Organization for Standardization
OGC	Open Geospatial Consortium
RDF	Resource Description Framework
RFC	Request for Comments

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SMIL	Synchronized Multimedia Integration Language
SOAP	Simple Object Access Protocol
SVG	Scalable Vector Graphics
UML	Unified Modeling Language
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
URN	Uniform Resource Name
W3C	World Wide Web Consortium
WFS	Web Feature Service
XML	eXtensible Markup Language
XSLT	eXtensible Stylesheet Language — Transformations
0D	zero-dimensional
1D	one-dimensional
2D	two-dimensional
3D	three-dimensional

4 Conformance

4.1 Conformance requirements

Clauses 7 to 19 of this document specify XML Schema components, i.e. the GML schema, which shall be used in GML application schemas in accordance with Clause 21. Clause 20 specifies rules for the specification of a GML profile that may be defined for use in a GML application schema.

Few applications will require the full range of capabilities described by the GML schema. This clause, therefore, defines a set of conformance classes that will support applications whose requirements range from the minimum necessary to define simple feature types to full use of the GML schema.

Most of the schema components specified in this document implement concepts defined in the ISO 19100 series of International Standards. In these cases, the conformance classes defined in this document are based on the conformance classes defined in the corresponding standard.

Any GML application schema, GML profile or software implementation claiming conformance with one of the conformance classes shall pass all test cases of the corresponding abstract test suite.

Any software implementation claiming conformance to this document shall document the GML profile supported by the implementation. The GML profile shall pass all mandatory test cases of the abstract test suite corresponding to GML profiles.

4.2 Conformance classes related to GML application schemas

GML application schemas claiming conformance to this document shall conform to the rules specified in Clauses 7 to 21 and pass all relevant test cases of the abstract test suite in A.1.

Depending on the characteristics of a GML application schema, 12 conformance classes are distinguished. Table 1 lists these classes and the corresponding subclause of the abstract test suite.

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