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Open Geospatial Consortium

OGC (POINTS OF INTEREST)

STANDARD
Implementation

DRAFT

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I ABSTRACT

The OGC Points of Interest (POI) conceptual model is an open data model for representing information about POI. It is defined through a Unified Modeling Language (UML) object model. This UML model extends the ISO Technical Committee 211 (TC211) conceptual model standards for spatial and temporal data. Building on the ISO foundation assures that the features described in the POI Models share the same spatial-temporal universe as described by related standards (e.g., CityGML).

The aim of developing the OGC POI conceptual model is to reach a common definition of the basic entities, attributes, and relations of “points of interest.” In the broadest terms, a point of interest is a location about which information of general interest is available. A POI can be as simple as a set of coordinates and an identifier, or more complex such as a three-dimensional model of a building with names in various languages, information about open and closed hours, and a civic address.

II KEYWORDS

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

ogcdoc, OGC document, API, openapi, html

III PREFACE

NOTE: Insert Preface Text here. Give OGC specific commentary: describe the technical content, reason for document, history of the document and precursors, and plans for future work.

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IV SECURITY CONSIDERATIONS

No security considerations have been made for this document.

V SUBMITTING ORGANIZATIONS

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

- Digital Flancers
- Google
- HeazelTec
- Pangaea Innovations
- PEREY Research Consulting
- US Army Geospatial Center

1

SCOPE

1 SCOPE

This document describes a conceptual model for representing information about points of interest (POI).

In the broadest terms, a “point of interest” is a location about which information of general interest is available. A POI can be as simple as a set of coordinates and an identifier, or more complex such as a three-dimensional model of a building with names in various languages, information about open and closed hours, and a civic address.

POI data has many uses including navigation systems, mapping, geocaching, location-based social networking games, and augmented reality browsers.

POI data has traditionally been exchanged in proprietary formats by various transport mechanisms. This specification defines a flexible, lightweight, extensible POI data model. This will enable content publishers to effectively describe and efficiently serve and exchange POI data.

To achieve these goals, this document describes a generic data model that may be instantiated in a variety of serializations, including XML, JSON and RDF. The data model is designed to be extended with POI information specific to the geospatial data it represents.

2

CONFORMANCE

2 CONFORMANCE

This standard defines a Conceptual Model which is independent of any encoding or formatting techniques. The Standardization Targets for this standard are:

1. Conceptual Models (extended versions of this conceptual model)
2. Implementation Specifications (encodings of this conceptual model)

2.1. Conceptual Models

A Conceptual Model standardization target is a version of the POI Conceptual Model (CM) tailored for a specific user community. This tailoring can include:

1. Reduction of the multiplicity for an attribute or association
2. Restriction on the valid values for an attribute
3. Additional optional POI properties

Of these options, actions #1 and #2 can be performed when creating an implementation specification. Only action #3 requires an extension of the POI conceptual model.

2.2. Implementation Specifications

Implementation Specifications define how a Conceptual Model should be implemented using a specific technology. Conformant Implementation Specifications provide evidence that they are an accurate representation of the Conceptual Model. This evidence should include implementations of the abstract tests specified in Annex A (normative) of this document.

Since this standard is agnostic to the implementing technologies, the specific techniques to be used for conformance testing cannot be specified. Implementation Specifications need to provide evidence of conformance which is appropriate for the implementing technologies. This evidence should be provided as an annex to the Implementation Specification document.

2.3. Implementations

POI implementations will typically be a simplified representation of a more complex dataset. Implementors may want to extend the POI model to include properties specific to that dataset. These extensions are accomplished using the POI Payload mechanism described in POI Payload. Since the POI Payload has its own definition of syntax and semantics, conformance with the POI Standard cannot ensure payload conformance.

2.4. Conformance Classes

This standard identifies one “Core” conformance class. This conformance class defines the conformance criteria for the requirements defined in one “Core” requirements class. The tests this conformance class are documented in Annex A. These tests are organized by Requirements Class. So an implementation of the Core conformance class must pass all tests specified in Annex A for the Core Requirements Class.

The POI Conceptual Model is defined by the POI UML model. This standard is a representation of that UML model in document form. In the case of a discrepancy between the UML model and this document, the UML model takes precedence.

3

NORMATIVE REFERENCES

3 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: ISO 19101-1:2014, *Geographic information — Reference model — Part 1: Fundamentals*. International Organization for Standardization, Geneva (2014). https://www.iso.org/standard/59164.html.

ISO: ISO 19103, *Geographic information — Conceptual schema language*. International Organization for Standardization, Geneva https://www.iso.org/standard/56734.html.

ISO: ISO 19107:2003, *Geographic information — Spatial schema*. International Organization for Standardization, Geneva (2003). https://www.iso.org/standard/26012.html.

ISO: ISO 19109:2015, *Geographic information — Rules for application schema*. International Organization for Standardization, Geneva (2015). https://www.iso.org/standard/59193.html.

ISO: ISO 19115-1:2014, *Geographic information — Metadata — Part 1: Fundamentals*. International Organization for Standardization, Geneva (2014). https://www.iso.org/standard/53798.html.

ISO: ISO 19507:2012, ISO (2012).

Arliss Whiteside Jim Greenwood: OGC 06-121r9, *OGC Web Service Common Implementation Specification*. Open Geospatial Consortium (2010).

Policy SWG: OGC 08-131r3, *The Specification Model — Standard for Modular specifications*. Open Geospatial Consortium (2009). https://portal.ogc.org/files/?artifact_id=34762&version=2.

OMG: Object Management Group (OMG) *Unified Modeling Language (UML)*, Version 2.5.1, December 2017, https://www.omg.org/spec/UML/2.5.1 — not in expected format

4

TERMS AND DEFINITIONS

4 TERMS AND DEFINITIONS

This document uses the terms defined in OGC Policy Directive 49, 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 document and OGC documents do not use the equivalent phrases in the ISO/IEC Directives, Part 2.

This document also uses terms defined in the OGC Standard for Modular specifications (OGC 08-131r3), also known as the 'ModSpec'. The definitions of terms such as standard, specification, requirement, and conformance test are provided in the ModSpec.

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

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

4.1. application schema::

conceptual schema (Clause 4.8) for data required by one or more applications.

Note 1 to entry: An *application schema* (Clause 4.1) contains selected parts of the base schemas presented in the ORM Information Viewpoint.

Note 2 to entry: Designers of *application schemas* (Clause 4.1) may extend or restrict the types defined in the base schemas to define appropriate types for an application *domain* (Clause 4.16).

Note 3 to entry: *Application schemas* (Clause 4.1) are information models for a specific information community.

[**SOURCE:** ISO 19101-1:2014, Clause 4.1.2, modified – OGC Definitions Register at http://www.opengis.net/def/glossary/term/ApplicationSchema]

4.2. attribute::

named *property* (Clause 4.43) of an entity

Note 1 to entry: Describes a geometrical, topological, thematic, or other characteristic of an entity.

[**SOURCE:** ISO/IEC 2382, Clause 2121440]

4.3. class::

description of a set of *objects* (Clause 4.33) that share the same *attributes* (Clause 4.2), *operations* (Clause 4.35), methods, relationships, and semantics

Note 1 to entry: A *class* (Clause 4.3) may use a set of interfaces to specify collections of *operations* (Clause 4.35) it provides to its environment. The term was first used in this way in the general theory of object-oriented programming, and later adopted for use in this same sense in UML.

[**SOURCE:** ISO 19103, Clause 4.27, modified – Note 1 to entry has been added from ISO 19117:2012, 4.2]

4.4. code::

representation of a label according to a specified scheme

[**SOURCE:** ISO 19118, Clause 4.3]

4.5. codelist::

value *domain* (Clause 4.16) including a *code* (Clause 4.4) for each permissible value.

[**SOURCE:** ISO 19136-1, Clause 3.1.7]

4.6. concept::

unit of knowledge created by a unique combination of characteristics

Note 1 to entry: *Concepts* (Clause 4.6) are not necessarily bound to particular languages. They are, however, influenced by the social or cultural background which often leads to different categorizations.

[**SOURCE:** ISO 1087-1, Clause 3.2.1]

4.7. conceptual model::

model that defines *concepts* (Clause 4.6) of a universe of discourse

[**SOURCE:** ISO 19101-1:2014, Clause 4.1.5]

4.8. conceptual schema::

1. formal description of a *conceptual model* (Clause 4.7) [ISO 19101-1:2014, 4.1.6]
2. base schema. Formal description of the model of any geospatial information. *Application schemas* (Clause 4.1) are built from *conceptual schemas* (Clause 4.8).

[**SOURCE:** OGC Definitions Register]

4.9. conformance class::

a class of conformance tests. A conformant implementation must pass all the tests in the class.

[**SOURCE:** OGC Definitions Register]

4.10. coordinate::

one of a sequence of numbers designating the *position* (Clause 4.42) of a *point* (Clause 4.40)

Note 1 to entry: In a spatial *coordinate reference system* (Clause 4.11), the *coordinate* (Clause 4.10) numbers are qualified by units.

[**SOURCE:** ISO 19111:2019, Clause 3.1.5]

4.11. coordinate reference system::

coordinate system that is related to an *object* (Clause 4.33) by a *datum* (Clause 4.14)

Note 1 to entry: For geodetic and vertical *datums* (Clause 4.14), the *object* (Clause 4.33) will be the Earth.

[**SOURCE:** ISO 19111:2019, Clause 3.1.9]

4.12. coordinate system::

set of mathematical rules for specifying how *coordinates* (Clause 4.10) are to be assigned to *points*

[**SOURCE:** ISO 19111:2019, Clause 3.1.11]

4.13. data type::

specification of a value *domain* (Clause 4.16) with *operations* (Clause 4.35) allowed on values in this *domain* (Clause 4.16)

Note 1 to entry: Data types include primitive predefined types and user-definable types.

Example Integer, Real, Boolean, String, Date and SG Point (conversion of data into a series of *codes*).

[**SOURCE:** ISO 19103, Clause 4.14]

4.14. datum::

parameter or set of parameters that realize the *position* (Clause 4.42) of the origin, the scale, and the orientation of a *coordinate system* (Clause 4.12)

[**SOURCE:** ISO 19111:2019, Clause 3.1.15]

4.15. **direct position::**

position (Clause 4.42) described by a single set of *coordinates* (Clause 4.10) within a *coordinate reference system* (Clause 4.11)

[**SOURCE:** ISO 19136-1, Clause 3.1.20]

4.16. **domain::**

well-defined set

Note 1 to entry: *Domains* (Clause 4.16) are used to define the *domain* (Clause 4.16) set and range set of *attributes* (Clause 4.2), operators and functions.

[**SOURCE:** ISO 19109:2015, Clause 4.8]

4.17. **domain <general vocabulary>::**

distinct area of human knowledge to which a terminological entry is assigned

Note 1 to entry: Within a database or other terminology collection, a set of *domains* (Clause 4.16) will generally be defined. More than one *domain* (Clause 4.16) can be associated with a given *concept* (Clause 4.6).

[**SOURCE:** ISO 19104, Clause 4.11]

4.18. **domain <ontology>::**

restriction to constrain the subject *class* (Clause 4.3) which participates in a subject-predicate-object triple

[**SOURCE:** ISO 19150-4, Clause 3.1.12]

4.19. domain <postal address>::

an area in which a set of specific postal address types and postal address renderings is prescribed by postal operators

Example The most typical example of a postal address *domain* (Clause 4.16) is a country where a designated postal operator provides postal delivery services.

[**SOURCE:** ISO 19160-4, Clause 3.14]

4.20. feature::

abstraction of real-world phenomena

Note 1 to entry: A *feature* (Clause 4.20) may occur as a type or an instance. In this document, *feature* (Clause 4.20) instance is meant unless otherwise specified.

[**SOURCE:** ISO 19101-1:2014, Clause 4.1.11, modified – Note 1 to entry has been added from ISO 19156, 4.6]

4.21. feature type::

class (Clause 4.3) of *features* (Clause 4.20) having common characteristics

[**SOURCE:** ISO 19156:2011, Clause 4.7]

4.22. geometric aggregate::

collection of *geometric objects* (Clause 4.26) that has no internal structure

Note 1 to entry: No assumptions about the spatial relationships between the elements can be made.

[**SOURCE:** ISO 19107:2003, Clause 3.45]

4.23. geometric boundary::

boundary represented by a set of *geometric primitives* (Clause 4.27) that limits the extent of a *geometric object* (Clause 4.26)

[**SOURCE:** ISO 19107:2003, Clause 3.46]

4.24. geometric complex::

set of disjoint *geometric primitives* (Clause 4.27) where the boundary of each *geometric primitive* (Clause 4.27) can be represented as the union of other *geometric primitives* (Clause 4.27) of smaller dimensions within the same set

Note 1 to entry: The *geometric primitives* (Clause 4.27) in the set are disjoint in the sense that no *direct position* (Clause 4.15) is interior to more than one *geometric primitive* (Clause 4.27). The set is closed under boundary *operations* (Clause 4.35), meaning that for each element in the *geometric complex* (Clause 4.24), there is a collection (also a *geometric complex* (Clause 4.24)) of *geometric primitives* (Clause 4.27) that represents the boundary of that element. Recall that the boundary of a *point* (the only 0D primitive *object* (Clause 4.33) type in geometry) is empty. Thus, if the largest dimension *geometric primitive* (Clause 4.27) is a solid (3D), the composition of the boundary operator in this definition terminates after at most three steps. It is also the case that the boundary of any *object* (Clause 4.33) is a cycle.

[**SOURCE:** ISO 19107:2003, Clause 3.47]

4.25. geometric dimension::

lagest number n such that each *point* in a set of *points* can be associated with a subset that has that point in its interior and is topologically isomporphic to $\mathbb{E}n$, Euclidean n-space

[**SOURCE:** ISO 19107:2003, Clause 3.48]

4.26. geometric object::

spatial *object* (Clause 4.33) representing a *geometric set* (Clause 4.28)

Note 1 to entry: A *geometric object* (Clause 4.26) consists of a *geometric primitive* (Clause 4.27), a collection of *geometric primitives* (Clause 4.27), or a *geometric complex* (Clause 4.24) treated as a single entity. A *geometric object* (Clause 4.26) may be the spatial representation of an *object* (Clause 4.33) such as a *feature* (Clause 4.20) or a significant part of a *feature* (Clause 4.20).

[**SOURCE:** ISO 19107:2003, Clause 3.49]

4.27. geometric primitive (geometry)::

geometric object (Clause 4.26) representing a single, connected, homogeneous (isotopic) element of space

Note 1 to entry: *Geometric primitives* (Clause 4.27) are non-decomposed *objects* (Clause 4.33) that present information about geometric configuration. They include *points*, curves, surfaces, and solids. Many *geometric objects* (Clause 4.26) behave like primitives (supporting the same interfaces defined for geometric primitives) but are actually composites composed of some number of other primitives. General collections may be aggregates and incapable of acting like a primitive (such as the lines of a complex network, which is not connected and thus incapable of being traceable as a single line). By this definition, a *geometric primitive* (Clause 4.27) is topological open, since the boundary *points* are not isotropic to the interior *points*. Geometry is assumed to be closed. For *points*, the boundary is empty.

[**SOURCE:** ISO 19107:2003, Clause 3.50]

4.28. geometric set::

set of *points*

[**SOURCE:** ISO 19107:2003, Clause 3.53]

4.29. implementation specification::

guidance for software engineers that is so specific that any two independent software implementations of the specification can “plug and play” for each other.

[**SOURCE:** OGC Definitions Register]

4.30. **location::**

particular *place* (Clause 4.36) or *position* (Clause 4.42)

Note 1 to entry: A *location* (Clause 4.30) identifies a geographic *place*.

Note 2 to entry: *Locations* (Clause 4.30) are physically fixed *points*, typically on the surface of the Earth, although *locations* (Clause 4.30) can be relative to other, non-earth centric coordinate reference systems.

Note 3 to entry: *Locations* (Clause 4.30) can be a single *point*, a centroid, a minimum bounding rectangle, or a set of vectors.

Note 4 to entry: A *location* (Clause 4.30) should be persistent over time and does not change.

Note 5 to entry: Multiple *POIs* (Clause 4.41) may share the same *location* (Clause 4.30).

Note 6 to entry: When a *POI* (Clause 4.41) physically moves it is understood to have acquired a new *location* (Clause 4.30).

[**SOURCE:** ISO 19112, Clause 3.1.3]

4.31. **metaclass::**

a *class* (Clause 4.3) whose instances are also *classes* (Clause 4.3)

4.32. **method::**

implementation of an *operation* (Clause 4.35)

Note 1 to entry: It specifies the algorithm or procedure associated with an *operation* (Clause 4.35).

[**SOURCE:** ISO/IEC 19501]

4.33. **object::**

entity with a well defined boundary and identity that encapsulates state and behaviour

Note 1 to entry: This term was first used in this way in the general theory of object oriented programming, and later adopted for use in this same sense in UML. An *object* (Clause 4.33) is an instance of a *class* (Clause 4.3). *Attributes* (Clause 4.2) and relationships represent state. *Operations* (Clause 4.35), methods, and state machines represent behavior.

[**SOURCE:** version 1.3, 1997.]

4.34. **OGC implementation specification::**

OGC implementation specification (Clause 4.34) document type defined on the OGC Document Types Register

4.35. **operation::**

specification of a transformation or query that an *object* (Clause 4.33) may be called to execute

Note 1 to entry: An *operation* (Clause 4.35) has a name and a list of parameters.

Note 2 to entry: See ISO 19119:2016, Clause 7.2 for a discussion of *operation* (Clause 4.35)

[**SOURCE:** ISO 19119:2016, Clause 4.1.10]

4.36. **place::**

identifiable part of any space

[**SOURCE:** ISO 19155, Clause 4.8]

4.37. Platform (Model Driven Architecture)::

the set of resources on which a system is realized.

[**SOURCE:** OMG Model Driven Architecture Guide, modified – Object Management Group, Model Driven Architecture Guide rev. 2.0]

4.38. Platform Independent Model:

a model that is independent of a specific *platform* (Clause 4.37)

[**SOURCE:** OMG Model Driven Architecture Guide, modified – Object Management Group, Model Driven Architecture Guide rev. 2.0]

4.39. Platform Specific Model:

a model of a system that is defined in terms of a specific *platform* (Clause 4.37)

[**SOURCE:** OMG Model Driven Architecture Guide, modified – Object Management Group, Model Driven Architecture Guide rev. 2.0]

4.40. point::

0-dimensional geometric primitive, representing a *position* (Clause 4.42)

[**SOURCE:** ISO 19136-1, Clause 3.1.47]

4.41. point of interest::
POI ADMITTED ADMITTED

location (Clause 4.30) where one can find a *place*, product or service

Note 1 to entry: A *POI* (Clause 4.41) is typically identified by *name* rather than by an *address*.

Note 2 to entry: A *POI* (Clause 4.41) is characterized by *type*, which may be used as a reference *point* or a target in a *location* (Clause 4.30) based service request.

Note 3 to entry: A *POI* (Clause 4.41) does not exclude the labeling, identification, and tracking of persons and other physical *objects* (Clause 4.33) that have no permanent *location* (Clause 4.30).

Example destination of a route; such as, Boston

4.42. position::

data type that describes a *point* or *geometry* potentially occupied by an *object* (Clause 4.33) or person

Note 1 to entry: A *direct position* (Clause 4.15) is a semantic subtype of *position* (Clause 4.42). *Direct positions* (Clause 4.15) as described can only define a *point*, and therefore not all *positions* (Clause 4.42) can be represented by a *direct position* (Clause 4.15). That is consistent with the is type of relation. An ISO 19107 geometry is also a *position* (Clause 4.42), but not a *direct position* (Clause 4.15)

[**SOURCE:** ISO 19133]

4.43. property::

facet or *attribute* (Clause 4.2) of an *object* (Clause 4.33) referenced by a name

Example Abby's car has the colour red, where "colour red" is a *property* (Clause 4.43) of the car.

[**SOURCE:** ISO 19143, Clause 4.21, modified – Note 1 to entry has been added from ISO 19156, 4.15]

4.44. requirements class::

a class of requirements, comprising a logical grouping of normative statements that shall be satisfied as a group in conformant implementations. May have dependencies on other

requirements classes (Clause 4.44) , but there should be no circular dependencies else the classes must always be satisfied together so are functionally one class.

[**SOURCE:** OGC Definitions Register]

4.45. standardization target::

standardization target (Clause 4.45)

[**SOURCE:** OGC Definitions Register]

4.46. stereotype::

extension of an existing *metaclass* (Clause 4.31) that enables the use of *platform* (Clause 4.37) or *domain* (Clause 4.16) specific terminology or notation in place of, or in addition to, the ones used for the extended *metaclass* (Clause 4.31)

[**SOURCE:** ISO 19150-2, Clause 4.1.35]

5

CONVENTIONS

5 CONVENTIONS

5.1. Identifiers

The normative provisions in this document are denoted by the URI

`http://www.opengis.net/spec/POI/1.0`

All requirements and conformance tests that appear in this document are denoted by partial URIs relative to this base.

5.2. UML Notation

The POI Conceptual Model (CM) Standard is defined in a Unified Modeling Language (UML) model. It is presented in this document through diagrams using the UML static structure diagram. The UML notations used in this standard are described in the diagram in Figure 1.

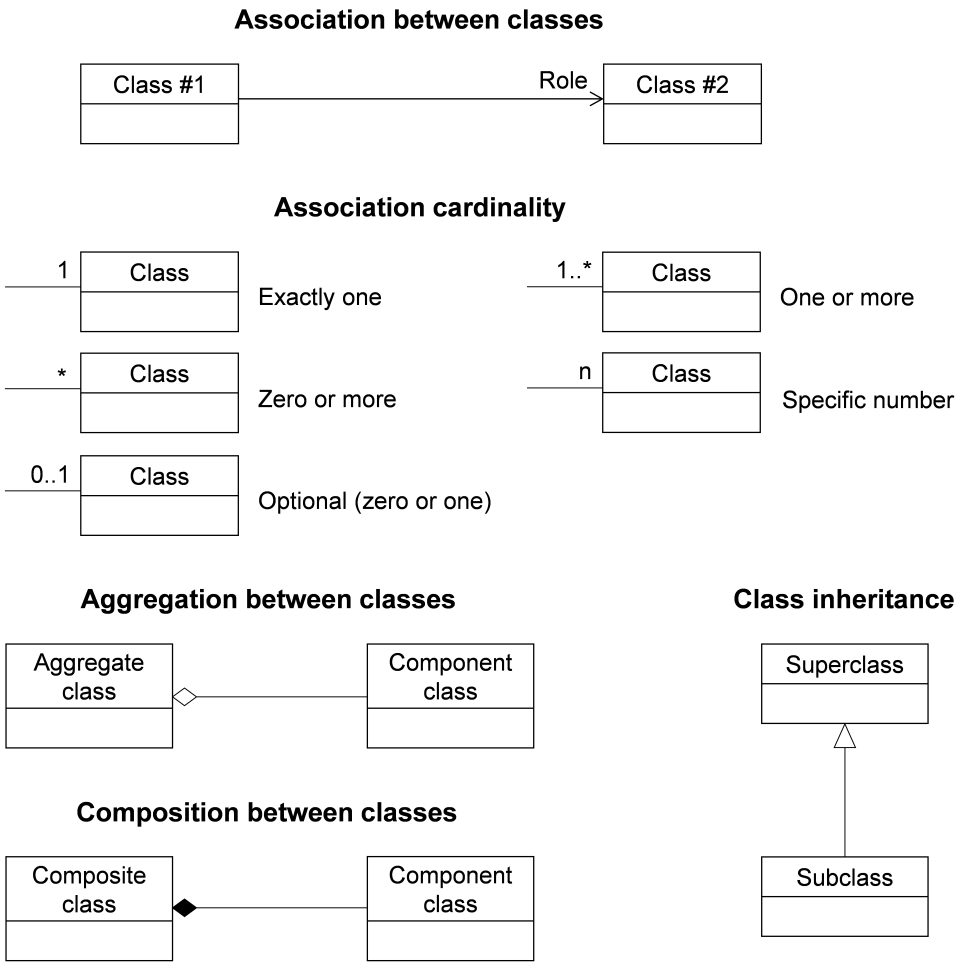


Figure 1 — UML notation (see ISO TS 19103, Geographic information - Conceptual schema language).

All associations between model elements in the POI Conceptual Model are uni-directional. Thus, associations in the model are navigable in only one direction. The direction of navigation is depicted by an arrowhead. In general, the context an element takes within the association is indicated by its role. The role is displayed near the target of the association. If the graphical representation is ambiguous though, the position of the role has to be drawn to the element the association points to.

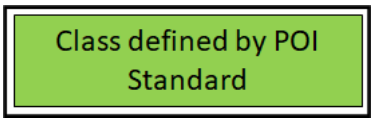
Aggregations are a form of association where the Component Class is treated as an attribute of the Aggregate Class. However, the Component Class is not an integral part of the Aggregate Class. A Component Class can be aggregated by more than one Aggregate Class.

Compositions are a form of association where the Component Class is treated as an attribute of the Composit Class. Component Classes are an integral part of the Composit Class and cannot be sharred by multiple Composit Classes. No Compositions are used in this Standard.

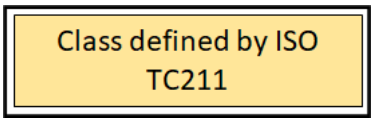
The following stereotypes are used in this model:

- «*Abstract*» a classes that doesn't include a complete implementation. Therefore, abstract classes can't be directly instantiated; they have to be specialized (inherited).
- «*DataType*» defines a set of properties that lack identity. A data type is a classifier with no operations, whose primary purpose is to hold information.
- «*FeatureType*» represents features that are similar and exhibit common characteristics. Features are abstractions of real-world phenomena and have an identity.
- «*Metaclass*» (Optional) a profile class and packageable element which may be extended through one or more stereotypes, which defines how an existing metaclass may be extended as part of a profile.
- «*Property*» denotes attributes and association roles. This stereotype does not add further semantics to the conceptual model but is required to be able to add tagged values to the attributes and association roles that are relevant for the encoding.
- «*Type*» denotes classes that are not directly instantiable, but are used as an abstract collection of operation, attribute and relation signatures. The stereotype is used in the POI Conceptual Model only for classes that are imported from the ISO standards 19103, 19107, 19109, and 19115.

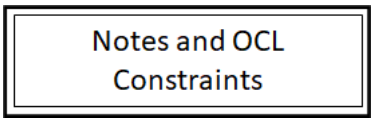
To enhance the readability of the POI UML diagrams, classes are depicted in different colors. The following coloring scheme is applied:



Classes painted in green belong to the POI Requirements Class.



Classes painted in tan are defined in the ISO standards 19107, 19109, or 19115. Class names are preceded by the UML package name in which the class is defined.



The color white is used for notes and Object Constraint Language (OCL) constraints that are provided in the UML diagrams.

The example UML diagram in Figure 2 demonstrates the UML notation and coloring scheme used throughout this standard. The generalization, link, and instance associations are also illustrated.

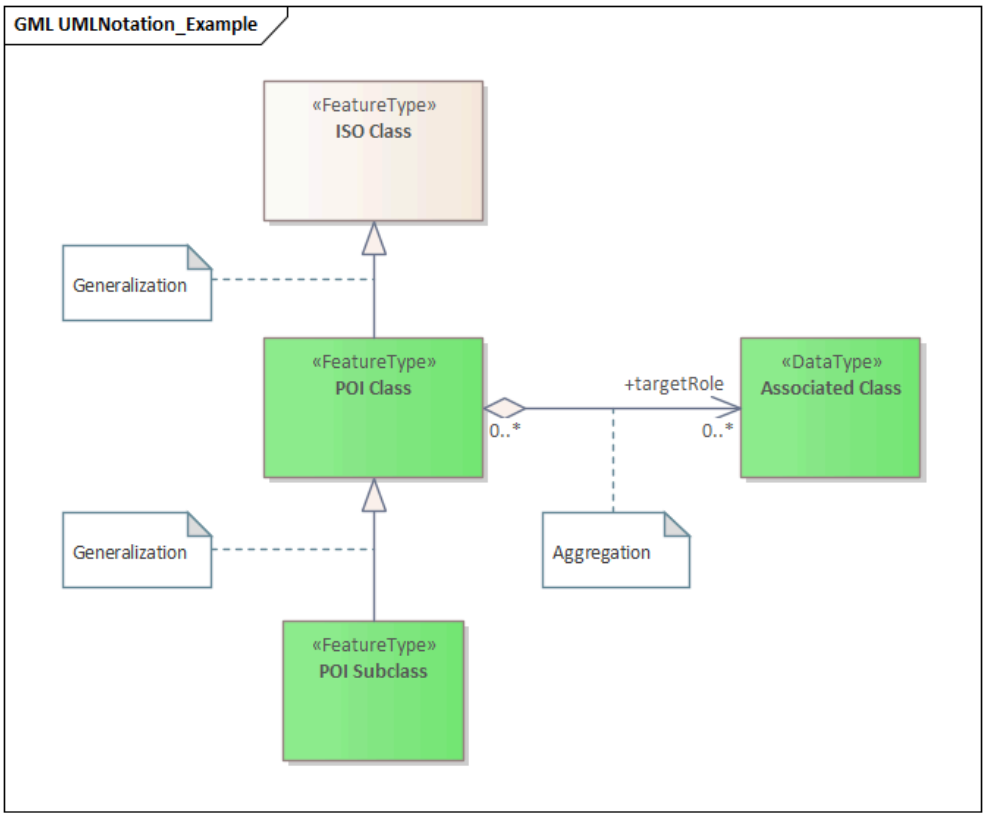


Figure 2 — Example UML diagram demonstrating the UML notation and coloring scheme used throughout the POI Standard.

6

POI CORE REQUIREMENTS

6 POI CORE REQUIREMENTS

Unresolved directive in sections/clause_7_normative_text.adoc — include::requirements/Req_Core.adoc[]

6.1. Feature Model

A Point of Interest (POI) is a Feature. Therefore, it is important to understand what a POI inherits from the OGC Feature model.

The OGC Feature Model is defined in ISO 19109:2015. A UML model showing applicable portions of the OGC Feature Model is provided in Figure 3.

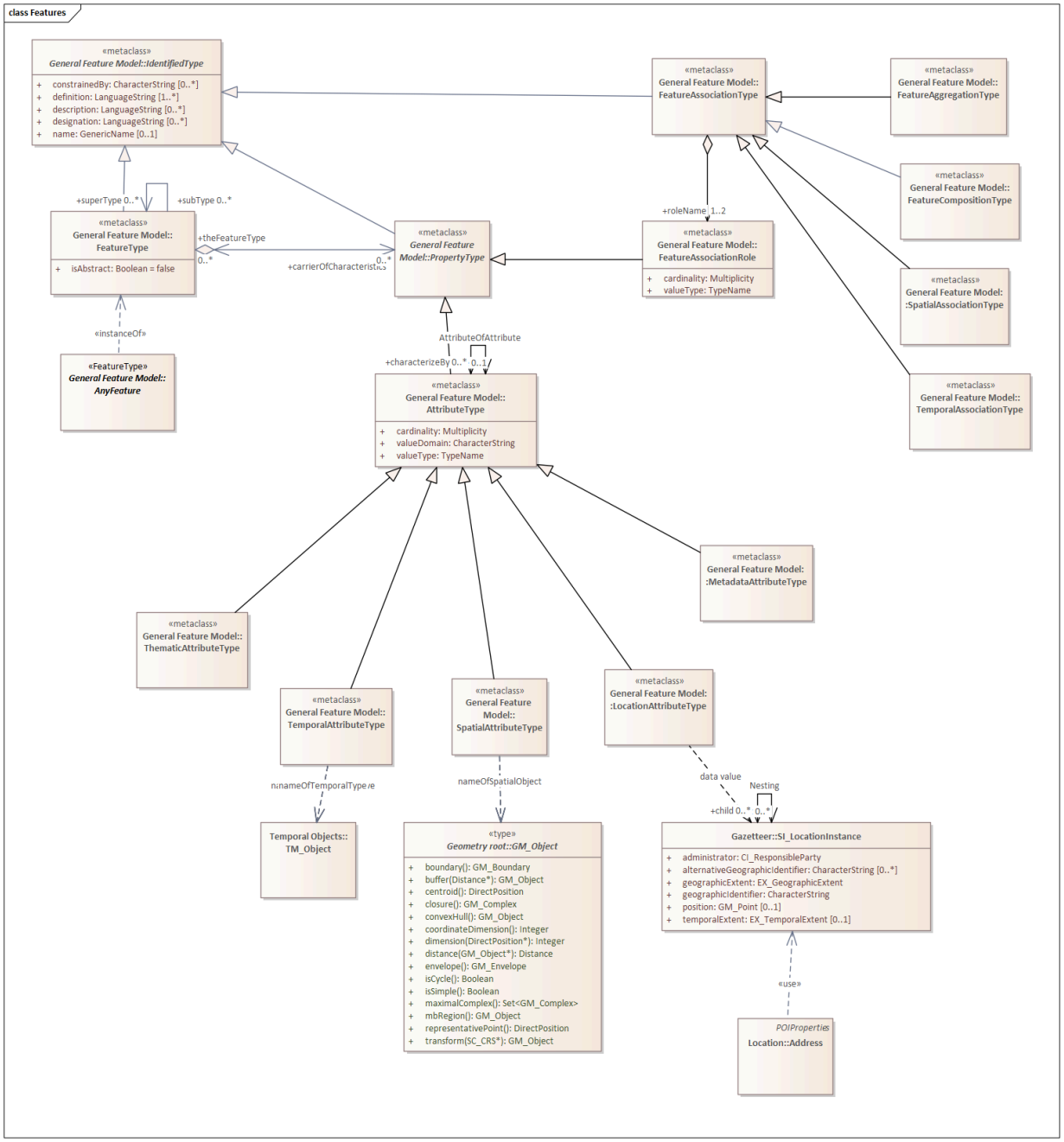


Figure 3 — Feature Model

The most relevant classes defined by this model are described below:

FeatureType: This class describes how a feature class shall be constructed in an Application Schema. In accordance with the conformance clause of the standard, instances of this class are instantiated as feature classes in an Application Schema

AnyFeature: The class AnyFeature is an instance of the «metaclass» FeatureType. It represents the set of all classes which are feature types.

In an implementation, this abstract class shall be substituted by a concrete class representing a feature type from an application schema associated with a domain of discourse.

REQUIREMENT 1: REQUIREMENT — GENERAL FEATURE MODEL	
LABEL	/req/core/req-generalfeaturemodel
STATEMENT	An encoding of the POI Conceptual Model SHALL be compliant with the General Feature Model defined in ISO 19109.

6.2. Geometry

The OGC Geometry model is defined in ISO 19107:2003. While there is a new version of this standard, it has not been widely implemented. Therefore, the 2003 version has been used in this Standard.

The OGC Geometry Model can represent very complex geometries. Much more complex than are needed for a POI. Therefore, POI geometries are restricted to Points, lines, and Polygons. Figure 4 provides a UML model of the classes from ISO 19107 which are applicable to POIs.

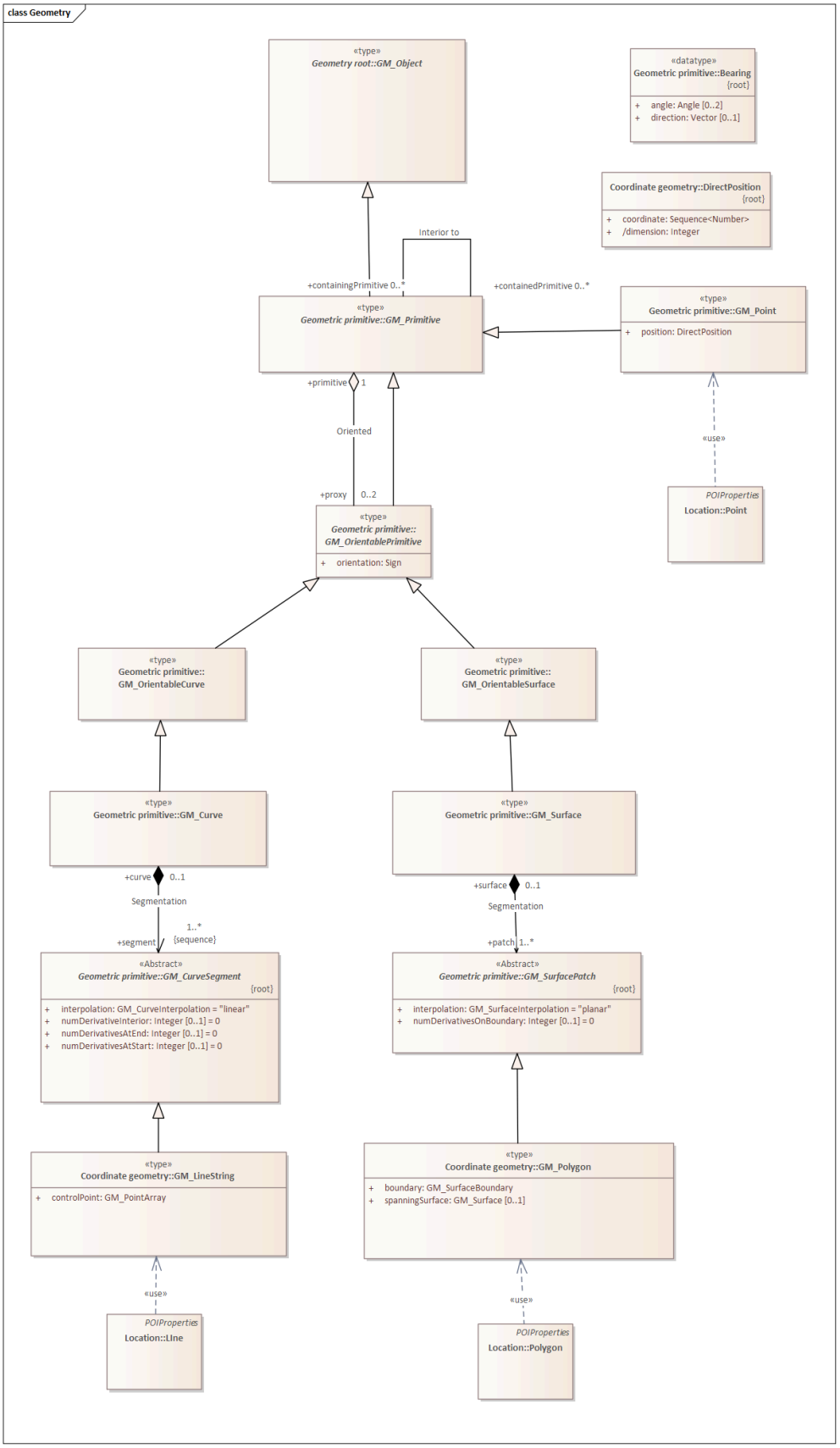


Figure 4 — Geometry Model

The key classes described in this figure are:

GM_Object: Root class for all OGC geometries.

GM_Point: The geometric primitive for Points

GM_LineString: The geometric primitive for line strings.

GM_Polygon: The geometric primitive for areas.

REQUIREMENT 2: REQUIREMENT — GEOMETRY	
LABEL	/req/core/req-geometry
STATEMENT	The POI Conceptual Model spatial geometry properties SHALL be compliant with the Geometry Model defined in ISO 19107.
A	A POI instance SHALL include a spatial geometry property using the SpatialAttributeType attribute type.
B	The spatial geometry properties of all POI instances SHALL be defined using one or more of the following classes: 1. GM_Point 2. GM_LineString 3. GM_Polygon

6.3. POI ISO Extensions

This Standard extends the OGC Feature Model to support the concept of a Point of Interest. These extensions are illustrated in Figure 5.

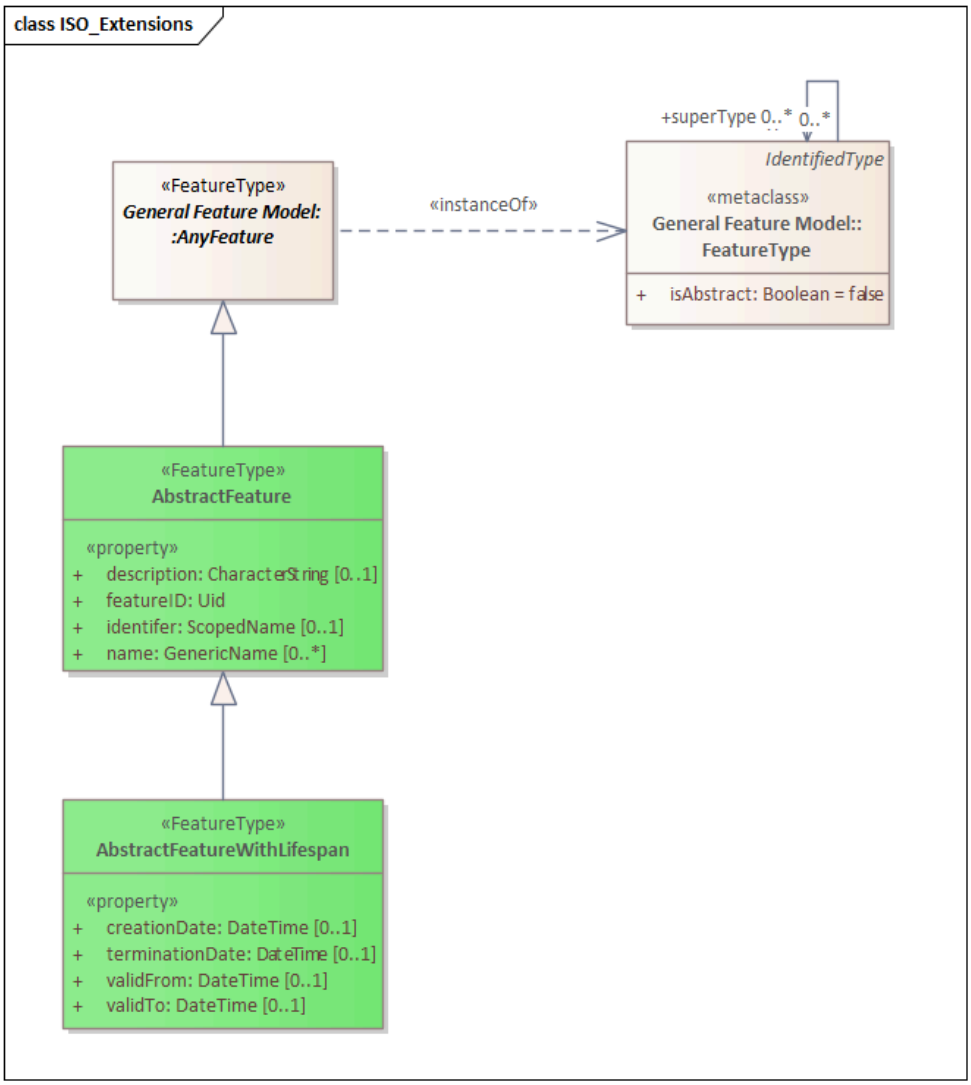


Figure 5 — POI UML Model - ISO Extensions

These extensions include further refinement of the *AnyFeature* class through the addition of identification and temporal validity attributes.

AbstractFeature: The root Feature class for this standard. This class has been borrowed from the CityGML 3.0 Conceptual Model. *AbstractFeature* adds descriptive and identifying properties to *AnyFeature*. **AbstractFeatureWithLifespan:** Adds temporality to *AbstractFeature*. This class was borrowed from the CityGML 3.0 Conceptual Model.

6.3.1. Abstract Feature

REQUIREMENT 3: REQUIREMENT — ABSTRACT FEATURE	
LABEL	/req/core/abstractfeature

REQUIREMENT 3: REQUIREMENT — ABSTRACT FEATURE	
STATEMENT	An encoding of the AbstractFeature class SHALL be a compliant extension of the Any Feature class defined in ISO 19109.
A	An encoding of the AbstractFeature class SHALL comply with requirement /req/core/abstractfeature-description.
B	An encoding of the AbstractFeature class SHALL comply with requirement /req/core/abstractfeature-featureid.
C	An encoding of the AbstractFeature class SHALL comply with requirement /req/core/abstractfeature-identifier.
D	An encoding of the AbstractFeature class SHALL comply with requirement /req/core/abstractfeature-name.

REQUIREMENT 4: REQUIREMENT — ABSTRACT FEATURE DESCRIPTION	
LABEL	/req/core/abstractfeature-description
STATEMENT	An encoding of the AbstractFeature class SHALL include zero or one `description` attributes.
A	Encodings of the `description` attribute SHALL be a valid implementation of the CharacterString class from ISO 19103.

REQUIREMENT 5: REQUIREMENT — ABSTRACT FEATURE FEATURE ID	
LABEL	/req/core/abstractfeature-featureid
STATEMENT	An encoding of the AbstractFeature class SHALL include one `featureID` attributes.
A	Encodings of the `featureID` attribute SHALL be a valid implementation of the ID class from ISO 19103.

REQUIREMENT 6: REQUIREMENT — ABSTRACT FEATURE IDENTIFIER	
LABEL	/req/core/abstractfeature-identifier
STATEMENT	An encoding of the AbstractFeature class SHALL include zero or one `identifier` attributes.
A	Encodings of the `identifier` attribute SHALL be a valid implementation of the ScopedName class from ISO 19103.

REQUIREMENT 7: REQUIREMENT — ABSTRACT FEATURE NAME	
LABEL	/req/core/abstractfeature-name
STATEMENT	An encoding of the AbstractFeature class SHALL include zero or more `name` attributes.
A	Encodings of the `name` attribute SHALL be a valid implementation of the Generic Name class from ISO 19103.

6.3.2. Abstract Feature with Lifespan

REQUIREMENT 8: REQUIREMENT — FEATURE WITH LIFESPAN	
LABEL	
STATEMENT	
A	

REQUIREMENT 8: REQUIREMENT — FEATURE WITH LIFESPAN

B

C

D

REQUIREMENT 8: REQUIREMENT — FEATURE WITH LIFESPAN

REQUIREMENT 9: REQUIREMENT — FEATURE WITH LIFESPAN CREATION DATE

LABEL	/req/core/featurewithlifespan-creationdate
STATEMENT	An encoding of the AbstractFeatureWithLifespan class SHALL include zero or one `creationDate` attributes.
A	Encodings of the `creationDate` attribute SHALL be a valid implementation of the DateTime class from ISO 19103.

REQUIREMENT 10: REQUIREMENT — FEATURE WITH LIFESPAN TERMINATION DATE

LABEL	/req/core/featurewithlifespan-terminationdate
STATEMENT	An encoding of the AbstractFeatureWithLifespan class SHALL include zero or one `terminationDate` attributes.
A	Encodings of the `terminationDate` attribute SHALL be a valid implementation of the DateTime class from ISO 19103.

REQUIREMENT 11: REQUIREMENT — FEATURE WITH LIFESPAN VALID FROM

LABEL	/req/core/featurewithlifespan-validfrom
STATEMENT	An encoding of the AbstractFeatureWithLifespan class SHALL include zero or one `validFrom` attributes.

REQUIREMENT 11: REQUIREMENT — FEATURE WITH LIFESPAN VALID FROM	
A	Encodings of the `validFrom` attribute SHALL be a valid implementation of the DateTime class from ISO 19103.

REQUIREMENT 12: REQUIREMENT — FEATURE WITH LIFESPAN VALID TO	
LABEL	/req/core/featurewithlifespan-validto
STATEMENT	An encoding of the AbstractFeatureWithLifespan class SHALL include zero or one `validTo` attributes.
A	Encodings of the `validTo` attribute SHALL be a valid implementation of the Date Time class from ISO 19103.

6.4. POI Class Model

The following classes form the core of the POI model. These classes are the same for all POIs.

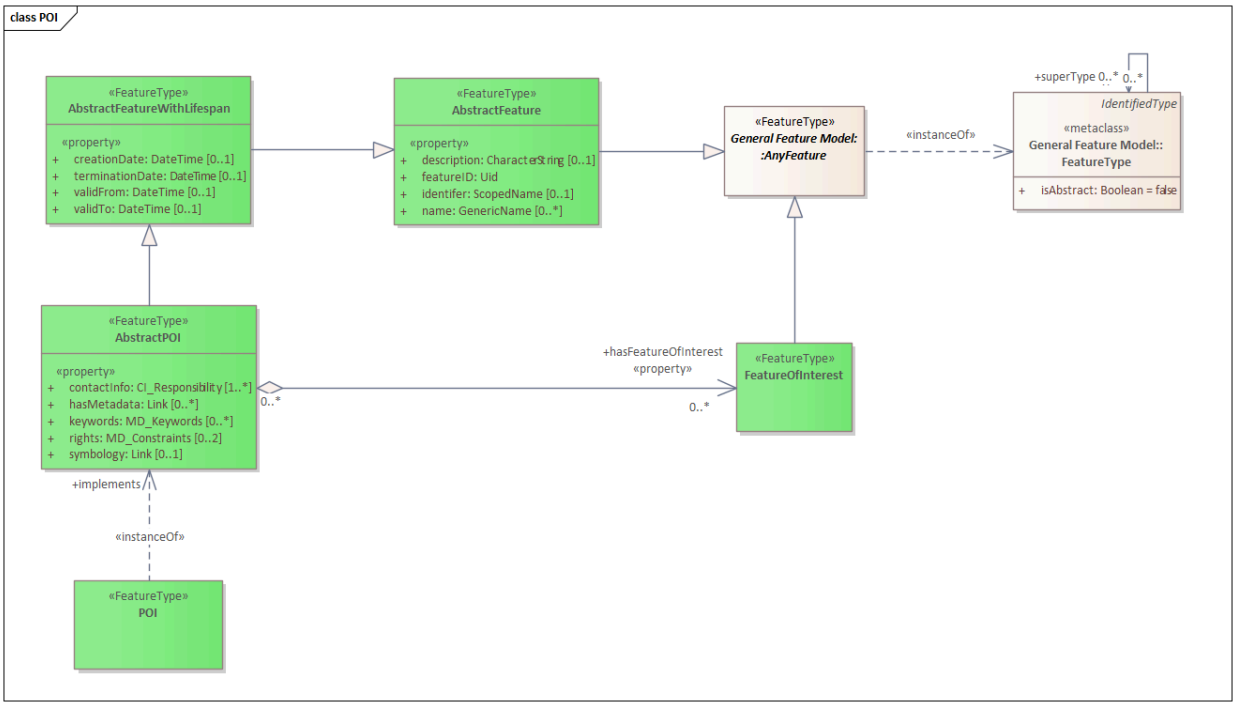


Figure 6 — POI UML Model - Core

AbstractPOI: The abstract model for a Point of Interest. All POI instances will contain these attributes. **POI:** A POI instance. **FeatureOfInterest:** This is an OGC Feature which has been

defined independently from the POI. Conceptually, the purpose of the POI is to provide a user friendly synopsis of this Feature.

6.4.1. Abstract POI

REQUIREMENT 13: REQUIREMENT — ABSTRACT POI	
LABEL	/req/core/abstract-poi
STATEMENT	An instantiation of the Abstract POI class SHALL comply with requirement /req/core/poi-feature-with-lifespan.
A	An instantiation of the Abstract POI class SHALL comply with requirement /req/core/poi-contactInfo.
B	An instantiation of the Abstract POI class SHALL comply with requirement /req/core/poi-featureOfInterest.
C	An instantiation of the Abstract POI class SHALL comply with requirement /req/core/poi-metadata.
D	An instantiation of the Abstract POI class SHALL comply with requirement /req/core/poi-keywords.
E	An instantiation of the Abstract POI class SHALL comply with requirement /req/core/poi-rights.
F	An instantiation of the Abstract POI class SHALL comply with requirement /req/core/poi-symbology.
G	An instantiation of the Abstract POI class SHALL comply with requirement /req/core/poi-payload.

REQUIREMENT 14: REQUIREMENT — POI CONTACT INFORMATION	
LABEL	/req/core/poi-contactInfo
STATEMENT	An encoding of the Abstract POI class SHALL include one or more `contactInfo` attributes.
A	Encodings of the `contactInfo` attribute SHALL be a valid implementation of the CI_Responsibility class from ISO 19115-1:2014

REQUIREMENT 15: REQUIREMENT — POI FEATURE OF INTEREST	
LABEL	/req/core/poi-featureOfInterest

REQUIREMENT 15: REQUIREMENT — POI FEATURE OF INTEREST	
STATEMENT	An encoding of the Abstract POI class SHALL include zero or more associated instances of the `FeatureOfInterest` class.

REQUIREMENT 16: REQUIREMENT — POI METADATA	
LABEL	/req/core/poi-metadata
STATEMENT	An encoding of the Abstract POI class SHALL include zero or more `metadata` attributes.
A	Encodings of the `metadata` attribute SHALL be a resolvable reference to a Metadata resource.
B	Encodings of a `metadata` attribute SHALL comply with requirement /req/core/link.

REQUIREMENT 17: REQUIREMENT — POI PAYLOAD	
LABEL	/req/core/poi-payload
STATEMENT	An encoding of the Abstract POI class SHALL include zero or more associated instances of the `POI_Payload` class.
A	An encoding of the Abstract POI class SHALL comply with requirement /req/core/poi-payload.

REQUIREMENT 18: REQUIREMENT — POI KEYWORDS	
LABEL	/req/core/poi-keywords
STATEMENT	An encoding of the Abstract POI class SHALL include zero or more `keyword` attributes.
A	Encodings of the `keyword` attribute SHALL be a valid implementation of the MD_Keyword class from ISO 19115-1:2014

REQUIREMENT 19: REQUIREMENT — POI RIGHTS	
LABEL	/req/core/poi-rights
STATEMENT	An encoding of the Abstract POI class SHALL include zero, one, or two `rights` attributes.

REQUIREMENT 19: REQUIREMENT — POI RIGHTS	
A	Encodings of the `rights` attribute SHALL be a valid implementation of the MD_Constraints class from ISO 19115-1:2014

REQUIREMENT 20: REQUIREMENT — POI SYMBOLOGY	
LABEL	/req/core/poi-symbology
STATEMENT	An encoding of the Abstract POI class SHALL include zero or one `symbology` attributes.
A	Encodings of the `symbology` attribute SHALL be a resolvable reference to a symbology resource.
B	Encodings of a `symbology` attribute SHALL comply with requirement /req/core/link.

REQUIREMENT 21: REQUIREMENT — LINK CLASS	
LABEL	/req/core/poi-link
STATEMENT	TBD.

6.4.2. POI

REQUIREMENT 22: REQUIREMENT — POI CLASS	
LABEL	/req/core/req-poi
STATEMENT	An encoding of the POI class SHALL comply with requirement /req/core/req-poi-abstract-poi.

6.4.3. Feature of Interest

REQUIREMENT 23: REQUIREMENT FEATURE OF INTEREST	
LABEL	/req/core/req-feature-of-interest

REQUIREMENT 23: REQUIREMENT FEATURE OF INTEREST	
STATEMENT	An encoding of the FeatureOfInterest class SHALL be a compliant extension of the Any Feature class defined in ISO 19109.

6.5. POI Payload

A POI is a representation of a Feature. The POI class provides a standard way to identify and manage a POI. However, it does not provide any information about the Feature it is representing. This information is difficult to standardize since it is dependent on the data model of the Feature store being described.

Therefore, the POI model is designed to be extended with properties specific to a Feature or a Feature Collection. The POI Payload is a container for representations of Feature properties. The syntax of those representations is provided by the Payload Schema class. Where appropriate, the semantics can also be provided through the Payload Definition class. Since the schema and definitions may be the same for a large number of Features, these classes should be instantiated as referenceable resources, allowing one instance to be used by a number of POIs.

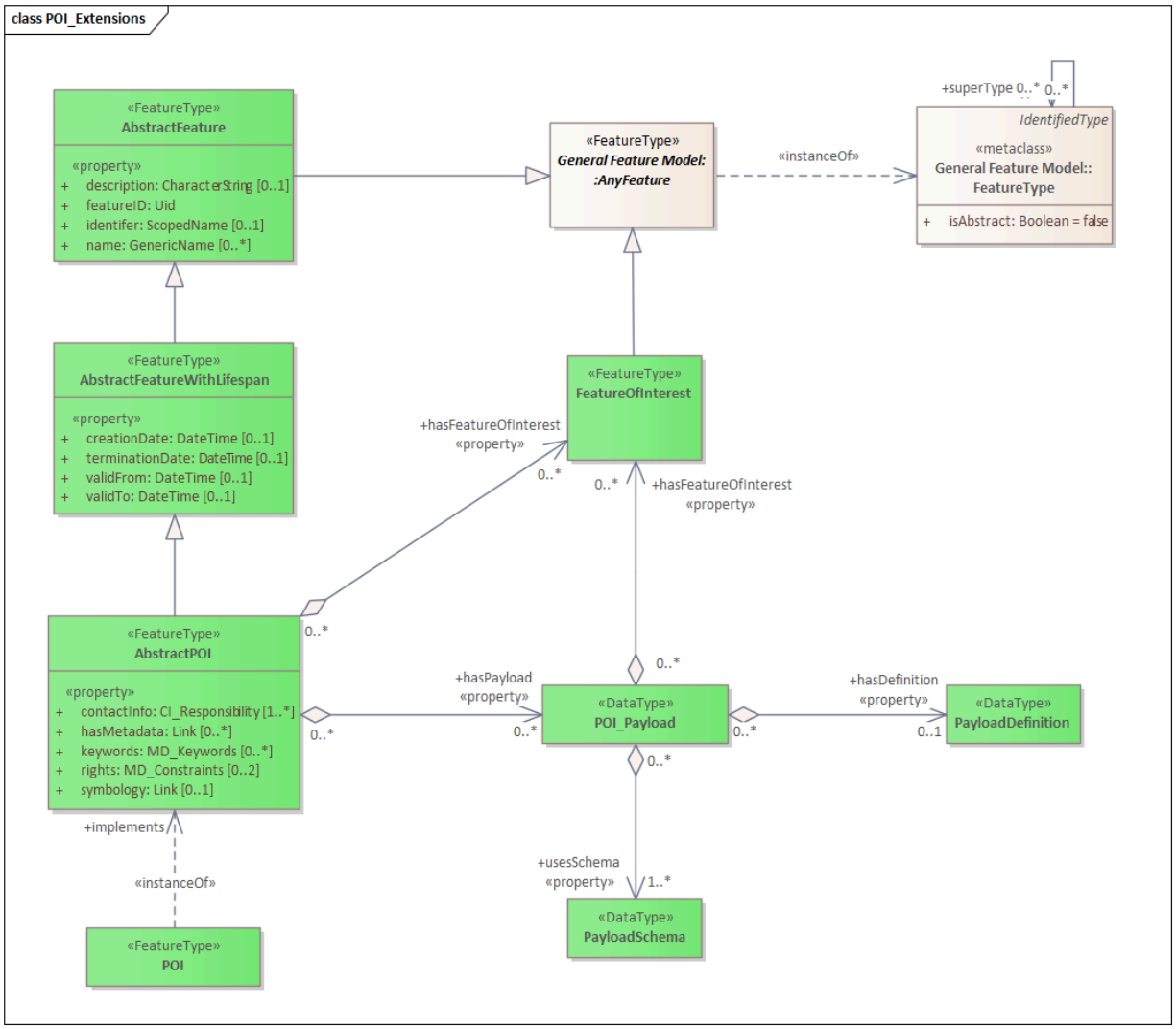


Figure 7 — POI UML Model - Payload

POI_Payload: The abstract model for a Point of Interest. All POI instances will contain these attributes. **PayloadSchema:** The Payload Schema Class represents a syntactic model (schema) for a POI payload. **PayloadDefinition:** The Payload Definition Class represents a semantic model (ontology) for a POI payload.

In the interest of interoperability, the POI Payload should be constructed using data types and concepts which are already in wide use by the Geospatial community. A collection of data types and concepts defined by the ISO 19103, ISO 19107, ISO 19109, and ISO 19115 Standards is provided in Annex B.

REQUIREMENT 24: REQUIREMENT — POI-PAYLOAD	
LABEL	/req/core/poi-payload

REQUIREMENT 24: REQUIREMENT — POI-PAYLOAD	
STATEMENT	An encoding of the POI_Payload class SHALL comply with requirement /req/core/req-poi-featureOfInterest.
A	An encoding of the POI_Payload class SHALL represent zero or more `Properties` from the Feature of Interest that it represents.
B	The syntax of a POI_Payload class SHALL be provided in an associated instance of the `PayloadSechema` class.
C	If the semantics of a POI_Payload class is provided, it SHALL be provided in no more than one associated instance of the `PayloadDefinition` class.

6.6. POI Data Dictionary

The POI UML model is the normative definition of the POI Conceptual Model. The Data Dictionary tables in this section were software generated from the UML model. As such, this section provides a normative representation of the POI Conceptual Model.

Table 1

AbstractFeature

Definition:	AbstractFeature is the abstract superclass of all feature types within the PoI Model.
Subclass of:	AnyFeature
Stereotype:	«FeatureType»

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
description «property»	CharacterString [0..1]	Provides further information on the feature.
featureID «property»	Uid [1..1]	Specifies the unique identifier of the feature that is valid in the instance document within which it occurs.
identifer «property»	ScopedName [0..1]	Specifies the unique identifier of the feature that is valid globally.
name «property»	GenericName [0..*]	Specifies the name of the feature.

Table 2

AbstractFeatureWithLifespan

Definition:	AbstractFeatureWithLifespan is the base class for all PoI features. This class allows the optional specification of the real-world and database times for the existence of each feature.
Subclass of:	AbstractFeature
Stereotype:	«FeatureType»

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
creationDate «property»	DateTime [0..1]	Indicates the date at which a POI feature was added to the containing model.
terminationDate «property»	DateTime [0..1]	Indicates the date at which a POI feature was removed from the containing model.
validFrom «property»	DateTime [0..1]	Indicates the date at which a POI feature started to exist in the real world.
validTo «property»	DateTime [0..1]	Indicates the date at which a POI feature ceased to exist in the real world.

Table 3

AbstractPOI

Definition:	A Point of Interest (POI) is a Feature which provides a concise summary of one or more associated Features. Its purpose is to provide easy access to key information about one or more real-world objects without the need to access or understand the underlying Feature data set.
Subclass of:	AbstractFeatureWithLifespan
Stereotype:	«FeatureType»

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
hasPayload	POI_Payload [0..*]	Indicates a payload associated with this POI.

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
hasFeature OfInterest	FeatureOfInterest [0..*]	One or more Features which are represented by this POI.

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
contactInfo «property»	CI_Responsibility [1..*]	Contact information for the creators and maintainers of this POI.
hasMetadata «property»	Link [0..*]	An association with zero or more metadata records providing additional information about this POI and/or the associated Features of Interest.
keywords «property»	MD_Keywords [0..*]	Keywords used to aid in discovery of POIs of interest.
rights «property»	MD_Constraints [0..2]	Legal and security constraints applicable to this POI.
symbology «property»	Link [0..1]	A reference to information about rendering this POI.

Table 4

FeatureOfInterest

Definition:	The thing whose property is being estimated or calculated in the course of an Observation to arrive at a Result, or whose property is being manipulated by an Actuator, or which is being sampled or transformed in an act of Sampling. (SOSA)
Subclass of:	AnyFeature
Stereotype:	«FeatureType»

Table 5

PayloadDefinition

Definition:	The semantic model (ontology) for a POI payload.
Subclass of:	none
Stereotype:	«DataType»

Table 6

PayloadSchema

Definition:	A model of the syntax of the POI payload.
Subclass of:	none
Stereotype:	«DataType»

Table 7

POI

Definition:	An instance of a POI. Implements the AbstractPOI class.
Subclass of:	none
Stereotype:	«FeatureType»

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
implements	AbstractPOI []	Identifies the abstract POI implemented by this POI

Table 8

POI_Payload

Definition:	A representation of properties of the FoI which are to be included in the POI.
Subclass of:	none
Stereotype:	«DataType»

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
hasDefinition	PayloadDefinition [0..1]	A reference to the semantic model of this POI payload.
representsFoI	FeatureOfInterest [1..1]	Indicates the Feature of Interest which is being summarized in this payload.
usesSchema	PayloadSchema [1..*]	A reference to the schema for this POI payload.

6.6.1. POI Data Types

The following data types are used in the POI UML model.

Table 9

CharacterString	
Definition:	Characterstring is a family of datatypes which represent strings of symbols from standard character-sets. The semantics of CharacterString is in accordance with ISO/IEC 11404:2007 clause 10.1.5. (ISO 19103)
Subclass of:	none
Stereotype:	«Type»

Table 10

Integer	
Definition:	An exact integer value, with no fractional part. (ISO 19103)
Subclass of:	none
Stereotype:	«Type»

Table 11

Link

Definition:	A data type which allows elements to be inserted into a document in order to create and describe links between resources. (derived from XML Linking Language (XLink) Version 1.1)
Subclass of:	none
Stereotype:	«Type»

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
href	CharacterString	Supplies the URI to a remote resource (or resource fragment).
hreflang	CharacterString [0..1]	A hint indicating what the language of the result of dereferencing the link should be.
rel	CharacterString	The type or semantics of the relation.
title	CharacterString [0..1]	Used to label the destination of a link such that it can be used as a human-readable identifier.
type	CharacterString [0..1]	A hint indicating what the media type of the result of dereferencing the link should be.

Table 12

Uid

Definition:	Uid is a basic type that represents a unique identifier.
Subclass of:	none
Stereotype:	«Type»

A

ANNEX A (INFORMATIVE) CONFORMANCE CLASS ABSTRACT TEST SUITE (NORMATIVE)

A

ANNEX A (INFORMATIVE) CONFORMANCE CLASS ABSTRACT TEST SUITE (NORMATIVE)

Example

identifier	http://www.opengis.net/spec/poi/1.0/conf/core
target	Requirements Class core
classification	Target Type: Implementation Specification

A.1. General Feature Model

ABSTRACT TEST A.1	
IDENTIFIER	`/conf/core/generalfeaturemodel`
REQUIREMENT	/req/core/generalfeaturemodel
TARGET TYPE	Implementation Specification
TEST PURPOSE	Validate that the POI Implementation Specification is conformant with the ISO 19109 General Feature Model.
TEST-METHOD-TYPE	Manual Inspection
DESCRIPTION	For a statisitcally meaningful set
A	Validate that the Implementation Specification includes an Abstract Test Suite (Annex A).
B	Validate that the Abstract Test Suite tests for conformance with ISO 19109 using the OGC Team Engine and an Executable Test Suite appropriate for the implementing technology.

A.2. Geometry

ABSTRACT TEST A.2	
IDENTIFIER	`/conf/core/geometry`
REQUIREMENT	/req/core/geometry
TARGET TYPE	Implementation Specification
DESCRIPTION	To validate that the POI Implementation Specification is conformant with the ISO 19107 Geometry Model.
TEST-METHOD-TYPE	Manual Inspection
A	Validate that the Implementation Specification includes an Abstract Test Suite (Annex A).
B	Validate that the Abstract Test Suite tests for conformance with ISO 19107 using the OGC Team Engine and an Executable Test Suite appropriate for the implementing technology.
C	Validate that the Abstract Test Suite tests each POI Feature for the presence of a `SpatialAttributeType` property of type GM_Point, GM_LineString, or GM_Polygon.

A.3. Abstract Feature

ABSTRACT TEST A.3	
IDENTIFIER	`/conf/core/abstractfeature`
REQUIREMENT	/req/core/abstractfeature
PREREQUISITES	Abstract test A.1: `/conf/core/generalfeaturemodel` Abstract test A.2: `/conf/core/geometry`
TARGET TYPE	Implementation Specification
TEST PURPOSE	Validate that the Implementation Specification implements the AbstractFeature Class as defined in the POI Conceptual Model.
TEST-METHOD-TYPE	Manual Inspection

ABSTRACT TEST A.3	
DESCRIPTION	Validate that the AbstractFeature class is properly implemented in the Implementation Specification.
A	For every AbstractFeature class that includes a `description` attribute, validate that attribute using test /conf/core/abstractfeature-description.
B	For every AbstractFeature class that includes an `featureId` attribute, validate that attribute using test /conf/core/abstractfeature-featureid.
C	For every AbstractFeature, verify that the class includes an `identifier` attribute, then validate that attribute using test /conf/core/abstractfeature-identifier.
D	For every AbstractFeature class that includes a `name` attribute, validate that attribute using test /conf/core/abstractfeature-name.

A.3.1. Abstract Feature-Description

ABSTRACT TEST A.4	
IDENTIFIER	`/conf/core/abstractfeature-description`
REQUIREMENT	/req/core/abstractfeature-description
TARGET TYPE	Implementation Specification
TEST PURPOSE	Validate that the Implementation Specification implements the `description` attribute as defined in the POI Conceptual Model.
TEST-METHOD-TYPE	Manual Inspection
DESCRIPTION	Validate that the `description` attribute is a valid implementation of the CharacterString class from ISO 19103 using the OGC Team Engine and an Executable Test Suite appropriate for the implementing technology.

A.3.2. Abstract Feature-FeatureId

ABSTRACT TEST A.5	
IDENTIFIER	`/conf/core/abstractfeature-featureid`
REQUIREMENT	/req/core/abstractfeature-featureid

ABSTRACT TEST A.5	
TARGET TYPE	Implementation Specification
TEST PURPOSE	Validate that the Implementation Specification implements the `featureId` attribute as defined in the POI Conceptual Model.
TEST-METHOD-TYPE	Manual Inspection
DESCRIPTION	Validate that the `featureId` attribute is a valid implementation of the Uid class from this Conceptual Model.

A.3.3. Abstract Feature-Identifier

ABSTRACT TEST A.6	
IDENTIFIER	`/conf/core/abstractfeature-identifier`
REQUIREMENT	/req/core/abstractfeature-identifier
TARGET TYPE	Implementation Specification
TEST PURPOSE	Validate that the Implementation Specification implements the `identifier` attribute as defined in the POI Conceptual Model.
TEST-METHOD-TYPE	Manual Inspection
DESCRIPTION	Validate that the `identifier` attribute is a valid implementation of the ScopedName class from ISO 19103 using the OGC Team Engine and an Executable Test Suite appropriate for the implementing technology.

A.3.4. Abstract Feature-Name

ABSTRACT TEST A.7	
IDENTIFIER	`/conf/core/abstractfeature-name`
REQUIREMENT	/req/core/abstractfeature-name
TARGET TYPE	Implementation Specification

ABSTRACT TEST A.7	
TEST PURPOSE	Validate that the Implementation Specification implements the `name` attribute as defined in the POI Conceptual Model.
TEST-METHOD-TYPE	Manual Inspection
DESCRIPTION	Validate that the `name` attribute is a valid implementation of the GenericName class from ISO 19103 using the OGC Team Engine and an Executable Test Suite appropriate for the implementing technology.

A.4. Abstract Feature with Lifespan

ABSTRACT TEST A.8	
IDENTIFIER	`/conf/core/featurewithlifespan`
REQUIREMENT	/req/core/featurewithlifespan
PREREQUISITE	Abstract test A.3: `/conf/core/abstractfeature`
TARGET TYPE	Implementation Specification
TEST PURPOSE	Validate that the Implementation Specification implements the AbstractFeaturewithLifespan Class as defined in the POI Conceptual Model.
TEST-METHOD-TYPE	Manual Inspection
DESCRIPTION	Validate that the AbstractFeatureWithLifespan class is properly implemented in the Implementation Specification.
A	For every AbstractFeatureWithLifespan class that includes a `creationDate` attribute, validate that attribute using test /conf/core/abstractfeature-datetime.
B	For every AbstractFeatureWithLifespan class that includes a `terminationDate` attribute, validate that attribute using test /conf/core/abstractfeature-datetime.
C	For every AbstractFeatureWithLifespan class that includes a `validFrom` attribute, validate that attribute using test /conf/core/abstractfeature-datetime.
D	For every AbstractFeatureWithLifespan class that includes a `validTo` attribute, validate that attribute using test /conf/core/abstractfeature-datetime.

A.4.1. Date-Time

ABSTRACT TEST A.9	
IDENTIFIER	`/conf/core/abstractfeature-datetime`
REQUIREMENT	/req/core/abstractfeature-datetime
TARGET TYPE	Implementation Specification
TEST PURPOSE	Validate that the Implementation Specification implements the attribute being tested as defined in ISO 19103.
TEST-METHOD-TYPE	Manual Inspection
DESCRIPTION	Validate that the attribute being tested is a valid implementation of the DateTime type from ISO 19103 using the OGC Team Engine and an Executable Test Suite appropriate for the implementing technology.

A.5. Abstract POI

ABSTRACT TEST A.10	
IDENTIFIER	`/conf/core/astract-poi`
REQUIREMENT	/req/core/abstract-poi
PREREQUISITE	Abstract test A.8: `/conf/core/featurewithlifespan`
TARGET TYPE	Implementation Specification
TEST PURPOSE	To validate that the Implementation Specification implements the AbstractPOI class as defined in the POI Conceptual Model.
TEST-METHOD-TYPE	Manual Inspection
DESCRIPTION	Do For every AbstractPOI class:
A	Verify that the class includes a `contactInfo` attribute, then validate that attribute using test /conf/core/poi-contactinfo

ABSTRACT TEST A.10	
B	If the class includes a `hasFeatureOfInterest` aggregation, validate that aggregation using test /conf/core/poi-featureOfInterest.
C	IF the class includes a `hasMetadata` association, validate that association using test /conf/core/link.
D	IF the class includes a `hasPayload` aggregation, validate that aggregation using test /conf/core/poi-payload.
E	If the class includes a `keywords` attribute, validate that attribute using test /conf/core/poi-keywords.
F	IF the class includes a `rights` attribute, validate that attribute using test /conf/core/poi-rights.
G	IF the class includes a `symbology` association, validate that association using test /conf/core/link.

A.5.1. Abstract POI ContactInfo

ABSTRACT TEST A.11	
IDENTIFIER	`/conf/core/poi-contactinfo`
REQUIREMENT	/req/core/poi-contactInfo
TARGET TYPE	Implementation Specification
TEST PURPOSE	Validate that the Implementation Specification implements the `contactInfo` attribute as defined in the POI Conceptual Model.
DESCRIPTION	Validate that the `contactInfo` attribute is a valid implementation of the CI_Responsibility class from ISO 19115-1:2014 using the OGC Team Engine and an Executable Test Suite appropriate for the implementing technology.

A.5.2. Abstract POI Keywords

ABSTRACT TEST A.12	
IDENTIFIER	`/conf/core/poi-keywords`
REQUIREMENT	/req/core/poi-keywords

ABSTRACT TEST A.12	
TARGET TYPE	Implementation Specification
TEST PURPOSE	Validate that the Implementation Specification implements the `keywords` attribute as defined in the POI Conceptual Model.
DESCRIPTION	Validate that the `keywords` attribute is a valid implementation of the MD_Keyword class from ISO 19115-1:2014 using the OGC Team Engine and an Executable Test Suite appropriate for the implementing technology.

A.5.3. Abstract POI Rights

ABSTRACT TEST A.13	
IDENTIFIER	`/conf/core/poi-rights`
REQUIREMENT	/req/core/poi-rights
TARGET TYPE	Implementation Specification
TEST PURPOSE	Validate that the Implementation Specification implements the `rights` attribute as defined in the POI Conceptual Model.
DESCRIPTION	Validate that the `contactInfo` attribute is a valid implementation of the MD_Constraints class from ISO 19115-1:2014 using the OGC Team Engine and an Executable Test Suite appropriate for the implementing technology.

A.5.4. Link

ABSTRACT TEST A.14	
IDENTIFIER	`/conf/core/link`
REQUIREMENT	/req/core/link
TARGET TYPE	Implementation Specification
TEST PURPOSE	Validate that the Implementation Specification implements the `contactInfo` attribute as defined in the POI Conceptual Model.
DESCRIPTION	Validate that the `contactInfo` attribute is a valid implementation of the CI_Responsibility class from ISO 19115-1:2014 using the OGC Team Engine and an Executable Test Suite appropriate for the implementing technology.

A.6. POI Payload

ABSTRACT TEST A.15	
IDENTIFIER	`/conf/core/poi-payload`
REQUIREMENT	/req/core/poi-payload
TARGET TYPE	Implementation Specification
TEST PURPOSE	To validate that the Implementation Specification implements the POI_Payload Class as defined in the POI Conceptual Model.
TEST-METHOD-TYPE	Manual Inspection
DESCRIPTION	Do For every POI_Payload class:
A	Validate that the class includes at lease one `usesSchema` aggregation and that the target of the aggregation is a valid schema for the implementing technology.
B	If the class includes a `hasDefinition` aggregation, validate that the target of the aggregation is a valid ontology for the implementing technology.
C	If the class includes a `hasFeatureOfInterest` aggregation, validate that the target of the aggregation is a valid Feature for the implementing technology.

B

ANNEX B (INFORMATIVE) ISO DATA DICTIONARY

B

ANNEX B (INFORMATIVE) ISO DATA DICTIONARY

ISO Technical Committee 211 maintains a harmonized UML model which covers many of their standards. All of the TC211 Standards which are relevant to the POI Standard are included. Therefore the full UML model for POI consists of the classes defined in the POI UML model as well as those which referenced from the TC211 Hamonized UML model.

The Data Dictionary tables in this section were software generated from the TC211 Hamonized UML model. As such, this section provides a normative representation of the TC211 classes which are leveraged by the POI Conceptual Model.

Note that some of the properties in the ISO model are not populated. Since the model is normative, the missing information cannot be included in this document until it is first included in the ISO model by TC211.

B.1. General Feature Model

The following classes are defined in (ISO 19109:2015)

Table B.1 — Any Feature Class

AnyFeature	
Definition:	The class AnyFeature is an instance of the «metaclass» FeatureType (ISO 19109). It represents the set of all classes which are feature types. + In an implementation this abstract class shall be substituted by a concrete class representing a feature type from an application schema associated with a domain of discourse (ISO 19109, ISO 19101).
StereoType:	«FeatureType»

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
	FeatureType [1..1]	

Table B.2 — Feature Type Class

FeatureType	
Definition:	feature: abstraction of real world phenomena NOTE: A feature may occur as a type or an instance. Feature type or feature instance should be used when only one is meant. This class describes how a feature class shall be constructed in an Application Schema. In accordance with the conformance clause of the standard, instances of this class are instanciated as feature classes in an Application Schema
Subclass Of:	IdentifiedType
StereoType:	«Metaclass»
Constraint:	name is mandatory (Invariant):

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
	NS_AvoidList [0..*]	
superType	FeatureType [0..*]	
featureType Metadata	MD_Metadata [0..*]	
carrier OfCharacteristics	PropertyType [0..*]	

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
isAbstract	Boolean	

B.2. Geometry

The following classes are defined in ISO 19107:2003

Table B.3 — GM_Object Class

GM_Object	
Definition:	GM_Object is the root class of the geometric object taxonomy and supports interfaces common to all geographically referenced geometric objects. GM_Object instances are sets of direct positions in a particular coordinate reference system. A GM_Object can be regarded as an infinite set of points that satisfies the set operation interfaces for a set of direct positions, TransfiniteSet<DirectPosition>. Since an infinite collection class cannot be implemented directly, a Boolean test for inclusion shall be provided by the GM_Object interface. This international standard concentrates on vector geometry classes, but future work may use GM_Object as a root class without modification. NOTE As a type, GM_Object does not have a well-defined default state or value representation as a data type. Instantiated subclasses of GM_Object will.
Subclass Of:	none
StereoType:	«type»
Constraint:	dimension() > boundary().dimension (Invariant):
Constraint:	boundary().notEmpty() implies boundary().dimension() = dimension() -1 (Invariant):
Constraint:	boundary().isEmpty() = isCycle() (Invariant):

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
	Geometry [1..1]	
	TransfiniteSet<Direct Position> [1..1]	
	CV_DomainObject [1. .1]	
CRS	CRS [0..1]	
CRS	SC_CRS [0..1]	

Table B.4 — GM_Point Class

GM_Point	
Definition:	GM_Point is the basic data type for a geometric object consisting of one and only one point.
Subclass Of:	GM_Primitive
StereoType:	«type»

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
	Point [1..1]	
composite	GM_CompositePoint [0..*]	

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
position	DirectPosition [1..1]	The attribute “position” shall be the DirectPosition of this GM_Point. GM_Point::position [1] : DirectPosition NOTE In most cases, the state of a GM_Point is fully determined by its position attribute. The only exception to this is if the GM_Point has been subclassed to provide additional non-geometric information such as symbology.

Table B.5 — GM_LineString Class

GM_LineString	
Definition:	A GM_LineString (Figure 16) consists of sequence of line segments, each having a parameterization like the one for GM_LineSegment (See 6.4.11). The class essentially combines a Sequence<GM_LineSegments> into a single object, with the obvious savings of storage space.
Subclass Of:	GM_Primitive
StereoType:	«type»

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
controlPoint	GM_PointArray [1..1]	

Table B.6 — GM_Polygon Class

GM_Polygon	
Definition:	A GM_Polygon (Figure 21) is a surface patch that is defined by a set of boundary curves and an underlying surface to which these curves adhere. The default is that the curves are coplanar and the polygon uses planar interpolation in its interior.
Subclass Of:	GM_Primitive
StereoType:	«type»

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
surface	GM_PolyhedralSurface [0..1]	

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
boundary	GM_SurfaceBoundary	
spanningSurface	GM_Surface [0..1]	

B.3. Citation and responsible party information

The following classes are defined in (ISO 19115-1 Edition 1)

Table B.7 — CI_Contact Class

CI_Contact

Definition:	information required to enable contact with the responsible person and/or organisation
StereoType:	None

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
address	CI_Address [0..*]	physical and email address at which the organisation or individual may be contacted
contact Instructions	CharacterString [0..1]	supplemental instructions on how or when to contact the individual or organisation
contactType	CharacterString [0..1]	type of contact
hoursOfService	CharacterString [0..*]	time period (including time zone) when individuals can contact the organisation or individual
onlineResource	CI_OnlineResource [0..*]	on-line information that can be used to contact the individual or organisation
phone	CI_Telephone [0..*]	telephone numbers at which the organisation or individual may be contacted

Table B.8 — CI_Individual Class

CI_Individual

Definition:	information about the party if the party is an individual
Subclass Of:	CI_Party
StereoType:	None
Constraint:	count (name + positionName) > 0 (Invariant):

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
	CI_Organisation [1..1]	

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
positionName	CharacterString [0..1]	position of the individual in an organisation

Table B.9 — CI_Organisation Class

CI_Organisation

Definition:	information about the party if the party is an organisation
Subclass Of:	CI_Party
StereoType:	None
Constraint:	count (name + logo) > 0 (Invariant):

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
individual	CI_Individual [0..*]	an individual in the named organisation

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
logo	MD_BrowseGraphic [0..*]	Graphic identifying organization

Table B.10 — CI_Party Class

CI_Party

Definition:	information about the individual and/or organisation of the party
StereoType:	«abstract»

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
	CI_Responsibility []	

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
contactInfo	CI_Contact [0..*]	contact information for the party
name	CharacterString [0..1]	name of the party (individual or organization)

Table B.11 — CI_Responsibility Class

CI_Responsibility

Definition:	information about the party and their role
StereoType:	None

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
party	CI_Party [1..*]	information about the party

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
extent	EX_Extent [0..*]	spatial or temporal extent of the role
role	CI_RoleCode [1..1]	function performed by the responsible party

B.4. Constraint information

The following classes are defined in (ISO 19115-1 Edition 1)

Table B.12

MD_Constraints

Definition:	restrictions on the access and use of a resource or metadata
Subclass Of:	None
StereoType:	

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
	MD_Identification []	
	MD_Metadata []	

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
constraint Application Scope	MD_Scope [0..1]	Spatial and temporal extent of the application of the constraint restrictions
graphic	MD_BrowseGraphic [0..*]	graphic /symbol indicating the constraint
reference	CI_Citation [0..*]	citation/URL for the limitation or constraint, eg. copyright statement, license agreement, etc
releasability	MD_Releasability [0. .1]	information concerning the parties to whom the resource can or cannot be released
responsibleParty	CI_Responsibility [0..*]	party responsible for the resource constraints
useLimitation	CharacterString [0..*]	limitation affecting the fitness for use of the resource or metadata. Example, “not to be used for navigation”

Table B.13

MD_LegalConstraints

Definition:	restrictions and legal prerequisites for accessing and using the resource or metadata

Subclass Of:	None
StereoType:	
Constraint:	otherConstraints: only documented if accessConstraints or useConstraints = “other Restrictions” (Invariant):
Constraint:	If MD_LegalConstraints used then count of (accessConstraints + useConstraints + other Constraints + useLimitation + releasability) > 0 (Invariant):

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
access Constraints	MD_RestrictionCode [0..*]	access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on obtaining the resource or metadata
otherConstraints	CharacterString [0..*]	other restrictions and legal prerequisites for accessing and using the resource or metadata
useConstraints	MD_RestrictionCode [0..*]	constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations or warnings on using the resource or metadata

Table B.14

MD_Releasability

Definition:	information about resource release constraints
Subclass Of:	None
StereoType:	
Constraint:	count (addressee + statement) > 0 (Invariant):

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
addressee	CI_Responsibility [0..*]	party to which the release statement applies
dissemination Constraints	MD_RestrictionCode [0..*]	component in determining releasability
statement	CharacterString [0..1]	release statement

Table B.15

MD_SecurityConstraints	
Definition:	handling restrictions imposed on the resource or metadata for national security or similar security concerns
Subclass Of:	None
StereoType:	

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
classification	MD_Classification Code	name of the handling restrictions on the resource or metadata
classification System	CharacterString [0..1]	name of the classification system
handling Description	CharacterString [0..1]	additional information about the restrictions on handling the resource or metadata.
userNote	CharacterString [0..1]	explanation of the application of the legal constraints or other restrictions and legal prerequisites for obtaining and using the resource or metadata

B.5. Identification information

The following classes are defined in (ISO 19115-1 Edition 1)

Table B.16 — MD_KeywordClass Class

MD_KeywordClass	
Definition:	specification of a class to categorize keywords in a domain-specific vocabulary that has a binding to a formal ontology
StereoType:	None

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
	MD_Keywords []	

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
className	CharacterString [1..1]	character string to label the keyword category in natural language
concept Identifier	URI [0..1]	URI of concept in ontology specified by the ontology attribute; this concept is labeled by the className: CharacterString.
ontology	CI_Citation [1..1]	a reference that binds the keyword class to a formal conceptualization of a knowledge domain for use in semantic processingNOTE: Keywords in the associated MD_Keywords keyword list must be within the scope of this ontology

Table B.17 — MD_Keywords Class

MD_Keywords	
Definition:	keywords, their type and reference source NOTE: When the resource described is a service, one instance of MD_Keyword shall refer to the service taxonomy defined in ISO 19119, 8.3)
StereoType:	None
Constraint:	When the resource described is a service, one instance of MD_Keyword shall refer to the service taxonomy defined in ISO 19119 (Invariant):

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
	MD_Identification []	
keywordClass	MD_KeywordClass [0..1]	association of a MD_Keywords instance with a MD_KeywordClass to provide user-defined categorization of groups of keywords that extend or are orthogonal to the standardized KeywordTypeCodes and are associated with an ontology that allows additional semantic query processing

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
keyword	CharacterString [1..*]	commonly used word(s) or formalised word(s) or phrase(s) used to describe the subject
thesaurusName	CI_Citation [0..1]	name of the formally registered thesaurus or a similar authoritative source of keywords
type	MD_KeywordType Code [0..1]	subject matter used to group similar keywords

B.6. Name types

The following classes are defined in (ISO 19103:2015)

Table B.18 — Generic Name Class

GenericName	
Definition:	Generic Name is the abstract class for all names in a NameSpace. Each instance of a GenericName is either a LocalName or a ScopedName. A LocalName references a local object directly accessible from the NameSpace. A ScopedName is a composite of a Local Name for locating another NameSpace and a GenericName valid in that NameSpace.
StereoType:	interface

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
scope	NameSpace [1..1]	

Table B.19 — Local Name Class

LocalName	
Definition:	A LocalName references a local object directly accessible from the NameSpace.
Subclass Of:	GenericName

StereoType:	interface

Table B.20 — Member Name Class

MemberName

Definition:	A MemberName is a LocalName that references either an attribute slot in a record or record Type or an attribute, operation, or association role in an object instance or type description in some form of schema.
Subclass Of:	LocalName
StereoType:	interface

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
aName	CharacterString [1..1]	The stored value “aName” is the returned value for the “aName()” operation.
attributeType	TypeName [1..1]	The allowable type for this member.

Table B.21 — Namespace Class

NameSpace

Definition:	A Name Space is a domain in which “names” given by character strings (possibly under local constrains constraints enforced by the Name Space) can be mapped to objects via a get Obejct operation. Examples include objects which form a Name Space for their attributes, operations and associations, or Schemas that form Name Spaces for their included data types or classes. Not all methods for NameSpaces need to be made publicly accessible.
StereoType:	interface

ROLE NAME	TARGET CLASS AND MULTIPLICITY	DEFINITION
name	GenericName [0..*]	

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
acceptableClass List	TypeName [1..1]	
isGlobal	Boolean [1..1]	

Table B.22 — Scoped Name Class

ScopedName	
Definition:	ScopedName is a composite of a LocalName for locating another NameSpace and a Generic Name valid in that NameSpace. ScopedName contains a LocalName as head and a Generic Name, which might be a LocalName or a ScopedName, as tail.
Subclass Of:	GenericName
StereoType:	interface

Table B.23 — Type Name Class

TypeName	
Definition:	A TypeName is a LocalName that references either a recordType or object type in some form of schema. The stored value “aName” is the returned value for the “aName()” operation. This is the types name.
Subclass Of:	LocalName
StereoType:	interface

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
aName	CharacterString [1..1]	The stored value “aName” is the returned value for the “aName()” operation.

B.7. Primitive types

The following classes are defined in (ISO 19103:2015)

B.7.1. Date and Time

Table B.24 — Date Class

Date	
Definition:	
StereoType:	interface

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
century	CharacterString [1..1]	
day	CharacterString [1..1]	
month	CharacterString [1..1]	
year	CharacterString [1..1]	

Table B.25 — DateTime Class

DateTime	
Definition:	
Subclass Of:	Date and Time
StereoType:	interface

Table B.26 — Time Class

Time		
Definition:		
StereoType:	interface	

ATTRIBUTE	VALUE TYPE AND MULTIPLICITY	DEFINITION
hour	CharacterString [1..1]	
minute	CharacterString [1..1]	
second	CharacterString [1..1]	
timeZone	CharacterString [1..1]	

C

ANNEX C (INFORMATIVE) REVISION HISTORY

C

ANNEX C (INFORMATIVE) REVISION HISTORY

Table C.1

DATE	RELEASE	EDITOR	PRIMARY CLAUSES MODIFIED	DESCRIPTION
2021-06-17	0.0.1	Matthew Purss	all	initial version
2021-07-08	0.0.1	Matthew Purss	Clause 1	initial scope text inserted from original POI draft standard
2021-07-09	0.0.1	Matthew Purss	Clause 4	initial terms inserted from original POI draft standard (and reformatted to meet formal definition requirements)

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