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International Standard

ISO/FDIS 19109

Geographic information — General feature model and rules for application schema

Information géographique — Modèle général des entités et règles relatives au schéma d'application

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Foreword

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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).

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This document was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 287, *Geographic Information*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 19109:2015), which has been technically revised.

The main changes are as follows:

— Changes in the title and scope

— New sub-clauses discussing the concept of the General Feature Model

— Re-organization of Clause 7 to include only concepts of the General Feature Model and moving the general rules for application schema to Clause 8

— Updating the references to other ISO/TC 211 standards in applicable cases to reflect classes in respective latest versions

— Removing the dependencies to other ICO/TC 211 standards related to attributes of features

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.

Introduction

Any description of reality is always an abstraction, always partial, and always just one of many possible "views", depending on the application field.

The widespread application of computers and geographic information systems (GIS) has led to an increased use of geographic data within multiple disciplines. With current technology as an enabler, society's reliance on such data is growing. Geographic datasets are increasingly being shared and exchanged. They are also used for purposes other than those for which they were produced.

To ensure that data will be understood by both computer systems and users, it is necessary to fully document the data structures for data access and exchange. The interfaces between systems, therefore, need to be defined with respect to data and operations, using the methods standardized in this document. For the construction of internal software and data storage within proprietary systems, any method is acceptable provided it supports the standardized interfaces.

An application schema provides the formal description of the data structure and content required by one or more applications. An application schema contains the descriptions of both geographic data and other related data. A fundamental concept of geographic data is the feature.

This document aims to express the importance of continuing the modelling of geospatial information according to the concepts contained in this document.

Geographic information — General feature model and rules for application schema

1 Scope

This document defines the General Feature Model (GFM) as the metamodel for creating application schemas in the context of geo-information modelling. The GFM is explained and implemented as rules for creating and documenting application schemas, including principles for the definition of features.

This document is applicable to:

— conceptual modelling of features and their properties from a universe of discourse;

— definition of application schemas;

— general rules for using a conceptual schema language for application schemas;

— rules for application schemas using UML as the conceptual schema language;

— transition from the concepts in the conceptual model to the data types in the application schema;

— integration of standardized schemas from other ISO geographic information standards with the application schema.

This document does not apply to:

— choice of one particular conceptual schema language for application schemas;

— definition of any particular application schemas;

— representation of feature types and their properties in a feature catalogue;

— representation of metadata;

— rules for mapping one application schema to another;

— implementation of the application schema in a computer environment;

— computer system and application software design;

— programming.

2 Normative references

There are no normative references in this document.

3 Terms, definitions, and abbreviated terms

3.1 Terms and definitions

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

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

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

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

3.1.1
application
manipulation and processing of data in support of user requirements

[SOURCE: ISO 19101-1:2014, 4.1.1]

3.1.2
application schema
conceptual schema (3.1.5) for data required by one or more *applications* (3.1.1)

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

3.1.3
complex feature
feature (3.1.9) composed of other features

3.1.4
conceptual model
model (3.1.15) that defines concepts of a *universe of discourse* (3.1.19)

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

3.1.5
conceptual schema
formal description of a *conceptual model* (3.1.4)

[SOURCE: ISO 19101-1:2014, 4.1.6]

3.1.6
coverage
function which returns values from its range for any direct position within its *domain* (3.1.8)

[SOURCE: ISO 19123-1:2023, 3.1.9]

3.1.7
dataset
identifiable collection of data

[SOURCE: ISO 19115-1:2014, 4.3]

3.1.8
domain
well-defined set

Note 1 to entry: Well-defined means that the definition is both necessary and sufficient, as everything that satisfies the definition is in the set and everything that does not satisfy the definition is necessarily outside the set.

3.1.9
feature
abstraction of real-world phenomena

Note 1 to entry: A feature can 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]

3.1.10
feature association
relationship that links instances of one *feature* (3.1.9) type with instances of the same or a different feature type

[SOURCE: ISO 19110:2016, 3.3]

3.1.11
feature attribute
characteristic of a *feature* (3.1.9)

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

Note 2 to entry: A feature attribute type has a name, a data type and a domain associated with it. A feature attribute instance has an attribute value taken from the domain of the feature attribute type.

[SOURCE: ISO 19101-1:2014, 4.1.12, modified — EXAMPLES and Notes have been removed and two new Notes to entry have been added.]

3.1.12
geographic data
data with implicit or explicit reference to a location relative to the Earth

Note 1 to entry: Geographic information is also used as a term for information concerning phenomena implicitly or explicitly associated with a location relative to the Earth.

3.1.13
general feature model
metamodel that classifies real-world phenomena and defines their respective attributes and relationships

3.1.14
metadata
information about a resource

[SOURCE: ISO 19115-1:2014, 4.10]

3.1.15
model
abstraction of some aspects of reality

3.1.16
observation
act carried out by an observer to determine the value of an observable *property* (3.1.17) of an object (feature-of-interest) by using a procedure, with the value is provided as the result

[SOURCE: ISO 19156:2023, 3.13]

3.1.17
property
facet or attribute of an object referenced by a name

[SOURCE: ISO 19143:2010, 4.21]

3.1.18
quality
degree to which a set of inherent characteristics of an object fulfils requirements

[SOURCE: ISO 9000:2015, 3.6.2, modified — Note 1 and Note 2 to entry have been removed]

3.1.19
universe of discourse
view of the real or hypothetical world that includes everything of interest

[SOURCE: ISO 19101-1:2014, 4.1.38]

3.2 Abbreviated terms

CSL Conceptual Schema Language

GFM General Feature Model

MOF Meta-Object Facility

OCL Object Constraint Language

OWL Web Ontology Language

UML Unified Modeling Language

URI Uniform Resource Identifier

4 Conformance

4.1 General

This document defines 8 conformance classes shown in Tables 1 to 8, matching the 8 requirements classes described in Clause 8. Any application schema claiming conformance to any requirements class in this document shall pass all of the tests listed in the corresponding conformance class, which are described in detail in the abstract test suites in Annex A. Each test relates to one or more specific requirements, which are explicitly indicated in the description of the test.

4.2 Meta-Model

Table 1 — Meta-model conformance class

Conformance class	/conf/general
Requirements class	/req/general (8.2, Table 11)
Tests	All tests in Clause A.2

4.3 Spatial

Table 2 — Spatial conformance class

Conformance class	/conf/general-spatial
Dependency	/conf/general (4.2)
Requirements class	/req/general-spatial (8.3, Table 12)
Tests	All tests in Clause A.3

4.4 Temporal

Table 3 — Temporal conformance class

Conformance class	/conf/general-temporal
Dependency	/conf/general (4.2)
Requirements class	/req/general-temporal (8.4, Table 14)
Tests	All tests in Clause A.4

4.5 Quality

Table 4 — Quality conformance class

Conformance class	/conf/general-quality
Dependency	/conf/general (4.2)
Requirements class	/req/general-quality (8.5, Table 16)
Tests	All tests in Clause A.5

4.6 Spatial referencing by identifiers

Table 5 — Spatial referencing by identifiers conformance class

Conformance class	/conf/general-identifier
Dependency	/conf/general (4.2)
Requirements class	/req/general-identifier (8.6, Table 17)
Tests	All tests in Clause A.6

4.7 Coverages

Table 6 — Coverages conformance class

Conformance class	/conf/general-coverage
Dependency	/conf/general (4.2)
Requirements class	/req/general-coverage (8.8, Table 18)
Tests	All tests in Clause A.7

4.8 UML application schema

Table 7 — UML application schema conformance class

Conformance class	/conf/uml
Dependency	/conf/general (4.2)
Requirements class	/req/uml (8.10.1, Table 20)
Tests	All tests in Clause A.8

4.9 Profile existing conceptual schema

Table 8 — Profile existing conceptual schema conformance class

Conformance class	/conf/uml-profile
Dependency	/conf/uml (4.8)
Requirements class	/req/uml-profile (8.11, Table 22)
Tests	All tests in Clause A.9

5 Presentation and abbreviations

5.1 Presentation

5.1.1 General

This document describes how to create an application schema that integrates conceptual schemas defined in the ISO geographic information standards. In addition to stating the rules for creating application schemas, this document provides guidance through examples.

5.1.2 Conformance class

Conformance to this document is possible at a number of levels, specified by conformance classes (Clause 4). Each conformance class is summarized using the template shown as Table 9.

Table 9 — Conformance class template

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

All tests in a class shall be passed, so dependencies are recorded with respect to other conformance classes rather than individual tests. Each conformance class tests conformance to a set of requirements packaged in a requirements class (Clause 8).

5.1.3 Requirements class

Each requirement or recommendation in this document is a member of a requirements class. In this document each requirements class is described in a discrete clause or subclause and summarized using the template shown as Table 10.

Table 10 — Requirements class template

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

All requirements in a class shall be satisfied, so the requirements class is the unit of re-use and dependency, rather than individual requirements. Hence, the value of a dependency requirement is another requirements class.

5.1.4 Provisions

All requirements are normative, while recommendations convey a possible course of action deemed suitable without necessarily prohibiting others. Each provision is presented using the following template:

Name # /re(c|q)/[classM]/[re(c|q)(N|O)]

[Normative statement]