



# FINAL DRAFT 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*

ISO/TC 211

Secretariat: **SIS**

Voting begins on:  
**2025-03-24**

Voting terminates on:  
**2025-05-19**

[\(https://standards.iteh.ai/\)](https://standards.iteh.ai/)  
Document Preview

ISO/FDIS 19109

<https://standards.iteh.ai/catalog/standards/iso/a4410137-6a92-4599-af95-b74672fe18ba/iso-fdis-19109>

**ISO/CEN PARALLEL PROCESSING**

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

iTeh Standards  
(<https://standards.iteh.ai>)  
Document Preview

ISO/FDIS 19109

<https://standards.iteh.ai/catalog/standards/iso/a4410137-6a92-4599-af95-b74672fe18ba/iso-fdis-19109>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2025

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

<b>Foreword</b>	<b>vi</b>
<b>Introduction</b>	<b>vii</b>
<b>1 Scope</b>	<b>1</b>
<b>2 Normative references</b>	<b>1</b>
<b>3 Terms, definitions, and abbreviated terms</b>	<b>1</b>
3.1 Terms and definitions	1
3.2 Abbreviated terms	4
<b>4 Conformance</b>	<b>4</b>
4.1 General	4
4.2 Meta-Model	4
4.3 Spatial	4
4.4 Temporal	4
4.5 Quality	5
4.6 Spatial referencing by identifiers	5
4.7 Coverages	5
4.8 UML application schema	5
4.9 Profile existing conceptual schema	5
<b>5 Presentation and abbreviations</b>	<b>6</b>
5.1 Presentation	6
5.1.1 General	6
5.1.2 Conformance class	6
5.1.3 Requirements class	6
5.1.4 Provisions	6
5.1.5 Identifiers	7
5.1.6 Conceptual schemas	7
5.1.7 Descriptions of concepts	7
5.2 Package abbreviations	7
<b>6 Context</b>	<b>8</b>
6.1 Purpose of an application schema	8
6.2 Rationale for defining the rules for application schemas	8
6.3 Application schemas supporting data interchange	9
<b>7 General feature model</b>	<b>10</b>
7.1 Principle for defining features	10
7.1.1 Features, coverages and properties	10
7.1.2 Essential Properties of Features	11
7.2 The Concept of the General Feature Model	12
7.2.1 Introduction	12
7.2.2 The purpose of the GFM	12
7.3 Conceptual Schema of the General Feature Model	13
7.3.1 The structure of the GFM	13
7.3.2 The main part of the GFM	14
7.3.3 Metaclass IdentifiedType	15
7.3.4 Metaclass FeatureType	16
7.3.5 Metaclass PropertyType	16
7.3.6 Metaclass AttributeType	16
7.3.7 Metaclass FeatureAssociationRole	17
7.3.8 Metaclass ValueAssignment	17
7.3.9 Metaclass FeatureAssociationType	18
7.3.10 Metaclass InheritanceRelation	18
7.4 Attributes of feature types	18
7.4.1 Introduction	18
7.4.2 Metaclass SpatialAttributeType	19

7.4.3	Metaclass TemporalAttributeType.....	19
7.4.4	Metaclass QualityAttributeType.....	19
7.4.5	Metaclass LocationAttributeType.....	19
7.4.6	Metaclass MetadataAttributeType.....	20
7.4.7	Metaclass ThematicAttributeType.....	20
7.4.8	Metaclass CoverageFunctionAttributeType.....	20
7.5	Relationships between feature types.....	20
7.5.1	Introduction.....	20
7.5.2	Metaclass InheritanceRelation.....	20
7.5.3	Metaclass FeatureAssociationType.....	21
7.6	Constraints.....	21
<b>8</b>	<b>Rules for application schemas.....</b>	<b>22</b>
8.1	The application modelling process.....	22
8.1.1	Introduction.....	22
8.1.2	Features and the application schema.....	22
8.2	General rules for application schemas.....	23
8.2.1	Rule for using CSLs.....	24
8.2.2	Rule for integration.....	24
8.2.3	Rules for modelling features.....	24
8.2.4	Rule for property names.....	25
8.2.5	Rule for attributes.....	25
8.2.6	Rule for association roles.....	25
8.2.7	Rule for value assignments.....	26
8.2.8	Rule for feature associations.....	26
8.2.9	Rule for inheritance relations.....	26
8.3	Rules for use of spatial schemas.....	26
8.3.1	Rules for modelling applications with spatial properties.....	26
8.3.2	Use of standard spatial schemas.....	26
8.3.3	Rule for spatial attributes.....	27
8.3.4	Use of geometric collections and spatial complexes to represent the values of spatial attributes of features.....	28
8.3.5	Spatial associations between features.....	28
8.3.6	Features sharing geometry.....	29
8.3.7	Point features, line features and area features.....	30
8.3.8	Defining interpolation methods.....	30
8.3.9	Independent spatial complexes.....	31
8.4	Rules for use of temporal schemas.....	33
8.4.1	Rules for modelling applications with temporal properties.....	33
8.4.2	Use of temporal conceptual schema.....	34
8.4.3	Rule for temporal attributes.....	34
8.4.4	Temporal associations between features.....	34
8.5	Rules for use of quality schemas.....	35
8.5.1	Introduction.....	35
8.5.2	Data quality rules.....	35
8.6	Rule for use of geographic identifiers.....	37
8.7	Use of metadata.....	39
8.7.1	Introduction.....	39
8.8	Rule for use of coverage functions.....	39
8.9	Use of observations.....	41
8.10	Rules for application schemas in UML.....	44
8.10.1	General.....	44
8.10.2	Rules for conceptual schema language for application schemas.....	44
8.10.3	Rule for packaging and identification of an application schema.....	47
8.10.4	Documentation of an application schema.....	48
8.10.5	Rules for integration of application schemas and abstract schemas.....	48
8.10.6	Rules for modelling structures in UML.....	50
8.10.7	Linguistic adaptation.....	52
8.11	Rules for domain profiles of existing conceptual schemas in UML.....	53

## ISO/FDIS 19109:2025(en)

8.11.1	Introduction .....	53
8.11.2	Rule for adding information to an existing conceptual schema.....	54
8.11.3	Rule for tailored use of an existing conceptual schema.....	55
<b>Annex A</b>	<b>(normative) Abstract test suite.....</b>	<b>57</b>
<b>Annex B</b>	<b>(informative) The modelling approach and the General Feature Model.....</b>	<b>63</b>
<b>Annex C</b>	<b>(informative) Application schema examples .....</b>	<b>66</b>
<b>Annex D</b>	<b>(informative) Backward compatibility .....</b>	<b>71</b>
<b>Bibliography</b>	<b>.....</b>	<b>76</b>

# iTeh Standards (<https://standards.iteh.ai>) Document Preview

### ISO/FDIS 19109

<https://standards.iteh.ai/catalog/standards/iso/a4410137-6a92-4599-af95-b74672fe18ba/iso-fdis-19109>

## 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](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

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](http://www.iso.org/iso/foreword.html).

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 ISO/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](http://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.

iTeh Standards  
(<https://standards.iteh.ai>)  
Document Preview

ISO/FDIS 19109

<https://standards.iteh.ai/catalog/standards/iso/a4410137-6a92-4599-af95-b74672fe18ba/iso-fdis-19109>





# 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 ( <a href="#">8.2</a> , <a href="#">Table 11</a> )
Tests	All tests in <a href="#">Clause A.2</a>

### 4.3 Spatial

**Table 2 — Spatial conformance class**

Conformance class	/conf/general-spatial
Dependency	/conf/general ( <a href="#">4.2</a> )
Requirements class	/req/general-spatial ( <a href="#">8.3</a> , <a href="#">Table 12</a> )
Tests	All tests in <a href="#">Clause A.3</a>

### 4.4 Temporal

**Table 3 — Temporal conformance class**

Conformance class	/conf/general-temporal
Dependency	/conf/general ( <a href="#">4.2</a> )
Requirements class	/req/general-temporal ( <a href="#">8.4</a> , <a href="#">Table 14</a> )
Tests	All tests in <a href="#">Clause A.4</a>

## 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 <a href="#">Clause A.5</a>

## 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 <a href="#">Clause A.6</a>

## 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 <a href="#">Clause A.7</a>

## 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 <a href="#">Clause A.8</a>

## 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 <a href="#">Clause A.9</a>

## 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]