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Geografisk information – Regler för applikationsschema (ISO 19109:2015)

Geographic information – Rules for application schema (ISO 19109:2015)

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Denna standard ersätter SS-EN ISO 19109:2006, utgåva 1.

The European Standard EN ISO 19109:2015 has the status of a Swedish Standard. This document contains the official English version of EN ISO 19109:2015.

This standard supersedes the Swedish Standard SS-EN ISO 19109:2006, edition 1.

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EUROPEAN STANDARD
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Geographic information - Rules for application schema (ISO 19109:2015)

Information géographique - Règles de schéma d'application (ISO 19109:2015)

Geoinformation - Regeln zur Erstellung von Anwendungsschemata (ISO 19109:2015)

This European Standard was approved by CEN on 20 November 2015.

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Ref. No. EN ISO 19109:2015 E

Contents

Page

European foreword

This document (EN ISO 19109:2015) has been prepared by Technical Committee ISO/TC 211 "Geographic information/Geomatics" in collaboration with Technical Committee CEN/TC 287 “Geographic Information” the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2016, and conflicting national standards shall be withdrawn at the latest by June 2016.

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Endorsement notice

The text of ISO 19109:2015 has been approved by CEN as EN ISO 19109:2015 without any modification.

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, the data structures for data access and exchange must be fully documented. The interfaces between systems, therefore, need to be defined with respect to data and operations, using the methods standardized in this International Standard. For the construction of internal software and data storage within proprietary systems, any method may be used that enables the standardized interfaces to be supported.

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.

Geographic information — Rules for application schema

1 Scope

This International Standard defines rules for creating and documenting application schemas, including principles for the definition of features.

The scope of this International Standard includes the following:

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

— definition of application schemas;

— use of the conceptual schema language for application schemas;

— 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.

The following are outside the scope:

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

— definition of any particular application schema;

— 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 Conformance

2.1 General

This International Standard defines 12 conformance classes shown in Tables 1 to 12, matching the 12 requirements classes described in Clauses 7 and 8. Any application schema claiming conformance to any requirements class in this International Standard 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.

2.2 Meta-model

Table 1 — Meta-model conformance class

Conformance class	/conf/general
Requirements	/req/general (Clause 7, Table 15)
Tests	All tests in A.2

2.3 UML application schema

Table 2 — UML application schema conformance class

Conformance class	/conf/uml
Dependency	/conf/general (2.2)
Requirements	/req/uml (8.2, Table 16)
Tests	All tests in A.3

2.4 Profiling standard schema

Table 3 — Profiling standard schema conformance class

Conformance class	/conf/profile
Dependency	/conf/uml (2.3)
Requirements	/req/profile (8.3, Table 19)
Tests	All tests in A.4

2.5 Metadata

Table 4 — Metadata conformance class

Conformance class	/conf/metadata
Dependency	/conf/uml (2.3)
Requirements	/req/metadata (8.4, Table 20)
Tests	All tests in A.5

2.6 Quality

Table 5 — Quality conformance class

Conformance class	/conf/quality
Dependency	/conf/uml (2.3)
Requirements	/req/quality (8.5, Table 21)
Tests	All tests in A.6

2.7 Temporal

Table 6 — Temporal conformance class

Conformance class	/conf/temporal
Dependency	/conf/uml (2.3)
Requirements	/req/temporal (8.6, Table 23)
Tests	All tests in A.7

2.8 Spatial

Table 7 — Spatial conformance class

Conformance class	/conf/spatial
Dependency	/conf/uml (2.3)
Requirements	/req/spatial (8.7, Table 25)
Tests	All tests in A.8

2.9 Coverages

Table 8 — Coverages conformance class

Conformance class	/conf/coverage
Dependency	/conf/uml (2.3)
Requirements	/req/coverage (8.8, Table 27)
Tests	All tests in A.9

2.10 Observations

Table 9 — Observations conformance class

Conformance class	/conf/observation
Dependency	/conf/uml (2.3)
Requirements	/req/observation (8.9, Table 29)
Tests	All tests in A.10

2.11 Spatial referencing by identifiers

Table 10 — Spatial referencing by identifiers conformance class

Conformance class	/conf/identifier
Dependency	/conf/uml (2.3)
Requirements	/req/identifier (8.10, Table 30)
Tests	All tests in A.11

2.12 Code list

Table 11 — Code list conformance class

Conformance class	/conf/codeList
Dependency	/conf/uml (2.3)
Requirements	/req/codeList (8.11, Table 31)
Tests	All tests in A.12

2.13 Multi-lingual support

Table 12 — Multi-lingual support conformance class

Conformance class	/conf/multi-lingual
Dependency	/conf/uml (2.3)
Requirements	/req/multi-lingual (8.12, Table 32)
Tests	All tests in A.13

3 Normative references

The following referenced documents are indispensable for the application 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.

IETF RFC 5646 (2009), *Tags for Identifying Languages, available at <https://www.rfc-editor.org/info/rfc5646>*

ISO 19103:2015, *Geographic information — Conceptual schema language*

ISO 19107:2003, *Geographic information — Spatial schema*

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

ISO 19112:2003, *Geographic information — Spatial referencing by geographic identifiers*

ISO 19115-1:2014, *Geographic information — Metadata — Part 1: Fundamentals*

ISO 19115-2:2009, *Geographic information — Metadata — Part 2: Extensions for imagery and gridded data*

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

ISO 19156:2011, *Geographic information — Observations and measurements*

ISO 19157:2013, *Geographic information — Data quality*

ISO/IEC 19505-2:2012, *Information technology — Object Management Group Unified Modeling Language (OMG UML) — Part 2: Superstructure*

4 Terms and definitions

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

4.1
application
manipulation and processing of data in support of user requirements

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

4.2
application schema
conceptual schema (4.5) for data required by one or more *applications* (4.1)

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

4.3
complex feature
feature (4.9) composed of other features

4.4
conceptual model
model (4.15) that defines concepts of a *universe of discourse* (4.19)

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

4.5
conceptual schema
formal description of a *conceptual model* (4.4)

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

4.6
coverage
feature (4.9) that acts as a function to return *values* (4.20) from its range for any direct position within its spatial, temporal or spatiotemporal *domain* (4.8)

[SOURCE: ISO 19123:2005, 4.1.7]

4.7
dataset
identifiable collection of data

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

4.8
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.

4.9
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 should be used when only one is meant.

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

4.10
feature association
relationship that links instances of one *feature* (4.9) type with instances of the same or a different feature type

[SOURCE: ISO 19110:2005, 4.2]

4.11
feature attribute
characteristic of a *feature* (4.9)

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

Note 2 to entry: A feature attribute type has a name, a data type and a *domain* (4.8) associated with it. A feature attribute instance has an attribute *value* (4.20) taken from the domain of the feature attribute type.

[SOURCE: ISO 19101-1:2014, 4.1.12, modified – Notes and examples in 19101-1 have been omitted and other notes have been added.]

4.12
feature operation
operation that every instance of a *feature* (4.9) type may perform

EXAMPLE 1 A feature operation upon the feature type "dam" is to raise the dam. The results of this operation are to raise the height of the "dam" and the level of water in a "reservoir".

EXAMPLE 2 A feature operation by the feature type "dam" might be to block vessels from navigating along a watercourse.

[SOURCE: ISO 19110:2005, 4.5, modified - The note given in ISO 19110:2005 for this entry has been omitted. A second example has been added.]

4.13
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.

4.14
metadata
information about a resource

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

4.15
model
abstraction of some aspects of reality

4.16
observation
act of measuring or otherwise determining the *value* (4.20) of a *property* (4.17)

[SOURCE: ISO 19156:2011, 4.11]

4.17
property
facet or attribute of an object referenced by a name

[SOURCE: ISO 19143:2010, 4.21]

4.18
quality
degree to which a set of inherent characteristics fulfils requirements

[SOURCE: ISO 9000:2005, 3.1.1]

4.19
universe of discourse
view of the real or hypothetical world that includes everything of interest

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

4.20
value
element of a type *domain* (4.8)

[SOURCE: ISO/IEC 19501:2005, 0000_5]

5 Presentation and abbreviations

5.1 Presentation

5.1.1 General

This International Standard 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 International Standard provides guidance through examples.

5.1.2 Conformance class

Conformance to this International Standard is possible at a number of levels, specified by conformance classes (Clause 2). Each conformance class is summarized using the template shown as Table 13.

Table 13 — Conformance class template

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

All tests in a class must be passed, 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 (Clauses 7 and 8).

5.1.3 Requirements class

Each normative statement (requirement or recommendation) in this International Standard is a member of a requirements class. In this International Standard each requirements class is described in a discrete clause or subclause, and summarized using the template shown as Table 14.

Table 14 — 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	/req/{classM}/{reqP}
Requirement/Recommendation	[repeat as necessary]

All requirements in a class must 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 Rules

All rules are normative, and each rule is presented using the following template:

/re(c|q)/[classM]/[reqN]	[Normative statement]

where /re(c|q)/[classM]/[reqN] identifies the requirement or recommendation. The use of this layout convention allows the normative provisions of this International Standard to be easily located by implementers.

5.1.5 Identifiers

Each requirements class, requirement and recommendation has an identifier in the form of a path or partial URI. The identifier supports cross-referencing of class membership, dependencies, and links from each conformance test to requirements tested. The identifier can be appended to a URI that identifies the standard as a whole in order to construct an absolute URI which identifies the requirements class, requirement or recommendation. For example, a URI scheme following the approach described in 2.8 of [IETF RFC 5141] would result in

— http://standards.iso.org/iso/19109/ed-2

Hence, the absolute URI for each requirements class would have the form

— http://standards.iso.org/iso/19109/ed-2/req/[classM]

and the absolute URI for each requirement or recommendation would have the form

— http://standards.iso.org/iso/19109/ed-2/req/[classM]/[reqN]

5.1.6 Conceptual schemas

Conceptual schemas in the normative part of this International Standard are presented in the Unified Modeling Language (UML) in conformance with ISO 19103. UML diagrams are presented in compliance with ISO/IEC 19505-2.

5.1.7 Descriptions of concepts

Concepts from UML are presented in all capitals – e.g. CLASS, PACKAGE, ROLE, ATTRIBUTE, ASSOCIATION.

5.2 Abbreviations

CSL Conceptual Schema Language

GFM General Feature Model

OCL Object Constraint Language

OWL Web Ontology Language

UML Unified Modeling Language

5.3 Package abbreviations

Concepts from schemas defined in some other International Standards are designated with names that start with two-letter codes as follow:

CV ISO 19123:2005 Schema for Coverage Geometry and Functions

DQ ISO 19157:2013 Data Quality

GM ISO 19107:2003 Spatial Schema

LI ISO 19115-2:2009 Metadata extensions for imagery

MD ISO 19115-1:2014 Metadata fundamentals

MI ISO 19115-2:2009 Metadata extensions for imagery

OM ISO 19156:2011 Observations and Measurements

SF ISO 19156:2011 Observations and Measurements

SI ISO 19112:2003 Spatial referencing by geographic identifiers

TM ISO 19108:2002 Temporal Schema, Temporal Objects

TP ISO 19108:2002 Temporal Schema, Temporal Topology

6 Context

6.1 Purpose of an application schema

An application schema is a conceptual schema for data required by one or more applications. An application schema shall define

— the content and structure of data;

and may define

— operations for manipulating and processing data;

— constraints to ensure the integrity of the data.

The purpose of an application schema is twofold:

— to provide a computer-readable data description defining the data structure, which makes it possible to apply automated mechanisms for data management;

— to achieve a common and correct understanding of the data, by documenting the data content of the particular application field, thereby making it possible to unambiguously retrieve information from the data.

6.2 Rules for application schema

This International Standard does not standardize any application schemas; it only defines rules for creating application schemas in a consistent manner (including the consistent definition of features) to facilitate the acquiring, processing, analysing, accessing, presenting and transferring of geographic data between different users, systems and locations. The rules in this International Standard are, in the case of data transfer or interchange, used by suppliers and users of geographic data to

— build a transfer application schema for data interchange;

— interpret the semantics of the transferred dataset with respect to user's local data and content and structure of data;

— determine the necessary transformations between the two datasets.

The rules in this International Standard will assist the users of applications with similar data requirements in creating a common application schema for the interface between their systems and data. This includes an agreement about the elements from the universe of discourse. This is described in more detail in 6.3.

The mapping from one application schema to another application schema may be difficult and even impossible if the two schemas are too divergent. The mapping is facilitated if the application schema used within a system is designed considering also the requirements for the data interchange. The rules