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Geografske informacije - Jezik za konceptualno shemo

Geographic information -- Conceptual schema language

Information géographique -- Langage de schéma conceptuel

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ICS:

07.040	Astronomija. Geodezija. Geografija	Astronomy. Geodesy. Geography
35.060	Jeziki, ki se uporabljajo v informacijski tehniki in tehnologiji	Languages used in information technology
35.240.70	Uporabniške rešitve IT v znanosti	IT applications in science

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INTERNATIONAL STANDARD

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Geographic information — Conceptual schema language

Information géographique — Langage de schéma conceptuel

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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. www.iso.org/directives

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 211, *Geographic information/Geomatics*.

This first edition of ISO 19103:2015 cancels and replaces the first edition (ISO/TS 19103:2005).

Introduction

This International Standard of the ISO geographic information suite of standards is concerned with the adoption and use of a conceptual schema language (CSL) for developing computer interpretable models, or schemas, of geographic information. Standardization of geographic information requires the use of a formal CSL to specify unambiguous schemas that can serve as a basis for data interchange and the definition of interoperable services. An important goal of the ISO geographic information suite of standards is to create a framework in which data interchange and service interoperability can be realized across multiple implementation environments. The adoption and consistent use of a CSL to specify geographic information is of fundamental importance in achieving this goal.

There are two aspects to this International Standard. First, a CSL is selected that meets the requirements for rigorous representation of geographic information. This International Standard identifies the combination of the Unified Modeling Language (UML) static structure diagram with its associated Object Constraint Language (OCL) and a set of basic type definitions as the conceptual schema language for specification of geographic information. Secondly, this International Standard provides guidelines on how UML should be used to create geographic information models that are a basis for achieving the goal of interoperability.

One goal of the ISO geographic information suite of standards using UML models is that they will provide a basis for model based mapping to encoding schemas like the ones defined in ISO 19118, as well as a basis for creating implementation specifications for implementation profiles for various other environments.

This International Standard describes the general metamodel for use of UML in the context of the ISO geographic information series of standards. Aspects specifically dealing with the modelling of application schemas are described in ISO 19109.

This International Standard is a revision of a previous version from 2005. Changes are documented in Clause 5.

Geographic information — Conceptual schema language

1 Scope

This International Standard provides rules and guidelines for the use of a conceptual schema language within the context of geographic information. The chosen conceptual schema language is the Unified Modeling Language (UML).

This International Standard provides a profile of the Unified Modelling Language (UML).

The standardization target type of this standard is UML schemas describing geographic information.

2 Conformance

2.1 Introduction

This International Standard defines three levels of conformance classes:

— UML version

— Data types

— Model documentation

To conform to this International Standard, the usage of a conceptual schema language shall satisfy all of the requirements specified in one of the three levels of conformance described below, with the corresponding abstract test suite in Annex A.

2.2 UML version conformance

2.2.1 UML 2 conformance class

Table 1 describes the conformance class for UML 2.

Table 1 — UML 2 conformance class

Conformance class identifier	UML2
Standardization target type	UML2 schemas for geographic information
Dependency	ISO/IEC 19505-2:2012, Clause 2 OCL 2.3.1
Requirements	All requirements in 6.2 to 6.12 except Requirement 2, and including Requirement 26.
Tests	All tests in A.1.2

2.2.2 UML 1 to UML2 mapping conformance class

Table 2 describes the conformance class for mapping from UML 1.

Table 2 — UML 1 to UML 2 mapping conformance class

Conformance class identifier	UML1
Standardization target type	UML1 schemas for geographic information
Dependency	UML2 ConformantSchema ISO/IEC 19501:2005, Clause 2
Requirements	All requirements in Annex B
Tests	All tests in A.1.3

2.2.3 Conformant schema conformance class

Table 3 describes the conformance class for non-UML schemas.

NOTE Non-UML schemas are considered conformant if there is a well-defined mapping from a model in the source language into an equivalent model in UML and that this model in UML is conformant.

Table 3 — Conformant schema conformance class

Conformance class identifier	ConformantSchema
Standardization target type	Schemas for geographic information
Dependency	UML2
Requirements	Requirement 2 in 6.2.
Tests	All tests in A.1.4

2.3 Data types conformance

2.3.1 Introduction

Conceptual schemas that claim conformance with this International Standard may also state that they conform to a named subset of the concepts in the standard. These subsets may be used to document different levels of capabilities or complexities. This International Standard describes two levels of capabilities for the use of data types which are defined in Table 4 and 5.

2.3.2 Core types conformance class

Table 4 describes the conformance class for core data types.

Table 4 — Core types conformance class

Conformance class identifier	CoreTypes
Standardization target type	Core types for geographic information
Dependency	UML2 ISO/IEC 11404:2007 ISO 8601:2004
Requirements	All requirements in Clause 7
Tests	All tests in A.2.1

2.3.3 Core and extension types conformance class

Table 5 describes the conformance class for core and extension data types.

Table 5 — Core and extension types conformance class

Conformance class identifier	CoreExtendedTypes
Standardization target type	Core and extension types for geographic information
Dependency	CoreTypes ISO 639 ISO 3166 RFC 3986
Requirements	All requirements in Annex C
Tests	All tests in A.2.2

2.4 Model documentation conformance

2.4.1 Introduction

The UML diagrams and textual description of model elements in a model are most often presented in a document. The specific requirements in this International Standard for presentation of geographic information is an extension of the requirements imposed by UML 2. A separate conformance class is defined for this in Table 6.

2.4.2 Model documentation conformance class

Table 6 describes the conformance class for model documentation.

Table 6 — Model documentation conformance class

Conformance class identifier	ModelDocumentation
Standardization target type	Documentation of UML schemas for geographic information
Dependency	UML2
Requirements	All requirements in 6.16
Tests	All tests in A.3

3 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 639 (all parts), *Codes for the representation of names and languages*

ISO 3166 (all parts), *Codes for the representation of names of countries and their subdivisions*

ISO 8601:2004, *Data elements and interchange formats — Information interchange — Representation of dates and times*

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

ISO/IEC 19501:2005, *Information technology — Open Distributed Processing — Unified Modeling Language (UML) Version 1.4.2*

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

NOTE Unified Modeling Language (UML), *version 2.4.1*, available at http://www.omg.org/spec/UML/

OCL 2.3.1, OMG *Object Constraint Language (OCL), version 2.3.1*, available at <http://www.omg.org/spec/OCL/>

RFC 3986 dated January 2005 on URI Syntax, available at <http://www.ietf.org/rfc/rfc3986.txt>

4 Terms and definitions

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

4.1
aggregation
<UML> special form of *association* (4.4) that specifies a whole-part *relationship* (4.30) between the aggregate (whole) and a *component* (4.9) part

Note 1 to entry: See <UML> *composition* (4.10).

[SOURCE: UML 1]

4.2
application
manipulation and processing of data in support of user requirements

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

4.3
application schema
conceptual schema (4.12) for data required by one or more *applications* (4.2)

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

4.4
association
<UML> semantic *relationship* (4.30) that can occur between typed *instances* (4.20)

Note 1 to entry: A binary association is an association among exactly two classifiers (4.8) (including the possibility of an association from a classifier to itself).

[SOURCE: UML 2]

4.5
attribute
<UML> *feature* (4.17) within a *classifier* (4.8) that describes a range of values that *instances* (4.20) of the classifier may hold

[SOURCE: UML 1]

4.6
cardinality
<UML> number of elements in a set

Note 1 to entry: Contrast with *multiplicity* (4.24), which is the range of possible cardinalities a set can hold.

[SOURCE: UML 1]

4.7
class
description of a set of *objects* (4.25) that share the same *attributes* (4.5), *operations* (4.26), methods, *relationships* (4.30), and semantics

[SOURCE: UML 1]

4.8
classifier
<UML> mechanism that describes behavioural and structural *features* (4.17) in any combination

[SOURCE: UML 1]

4.9
component
<UML> representation of a modular part of a system that encapsulates its contents and whose manifestation is replaceable within its environment

[SOURCE: UML 2]

4.10
composition
<UML> *aggregation* (4.1) where the composite *object* (4.25) (whole) has responsibility for the existence and storage of the composed objects (parts)

[SOURCE: UML 2]

4.11
conceptual model
model (4.23) that defines concepts of a universe of discourse

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

4.12
conceptual schema
formal description of a *conceptual model* (4.11)

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

4.13
constraint
<UML> condition or restriction expressed in natural language text or in a machine readable language for the purpose of declaring some of the semantics of an element

[SOURCE: UML 2]

4.14
data type
specification of a *value domain* (4.37) with *operations* (4.26) allowed on values in this domain

EXAMPLE Integer, Real, Boolean, String and Date.

Note 1 to entry: Data types include primitive predefined *types* (4.36) and user definable types.

4.15
dependency
<UML> *relationship* (4.30) that signifies that a single or a set of model elements requires other model elements for their specification or implementation

Note 1 to entry: This means that the complete semantics of the depending elements is either semantically or structurally dependent on the definition of the supplier element(s).

[SOURCE: UML 2]

4.16
feature
abstraction of real world phenomena

Note 1 to entry: A feature can occur as a *class* (4.7) or an *instance* (4.20). The full term feature type or feature instance can be used when only one is meant.

Note 2 to entry: In UML 2 the term feature is used for a property, such as *operation* (4.26) or *attribute* (4.5), which is encapsulated as part of a list within a *classifier* (4.8), such as *interface* (4.21), class or *data type* (4.14).

Note 3 to entry: See Annex D.2.

[SOURCE: ISO 19101-1:2014, 4.1.11 modified — Notes 1-3 have been added.]

4.17
feature
<UML> property of a *classifier* (4.8)

[SOURCE: UML 2]

4.18
generalization
<UML> taxonomic *relationship* (4.30) between a more general element and a more specific element of the same element type

Note 1 to entry: An *instance* (4.20) of the more specific element can be used where the more general element is allowed. See: *inheritance* (4.19).

[SOURCE: UML 2]

4.19
inheritance
mechanism by which more specific *classifiers* (4.8) incorporate structure and behaviour defined by more general classifiers

Note 1 to entry: See *generalization* (4.18).

4.20
instance
<UML> individual entity having its own value and possibly its own identity

Note 1 to entry: A *classifier* (4.8) specifies the form and behaviour of a set of instances with similar properties.

4.21
interface
<UML> *classifier* (4.8) that represents a declaration of a set of coherent public <UML> *features* (4.17) and obligations

Note 1 to entry: An interface specifies a contract; any classifier that realizes the interface must fulfil that contract. The obligations that can be associated with an interface are in the form of various kinds of *constraints* (4.13) (such as pre- and post-conditions) or protocol specifications, which can impose ordering restrictions on interactions through the interface.

[SOURCE: UML 2]

4.22
metamodel
model (4.23) that defines the language for expressing other models

Note 1 to entry: A model is an *instance* (4.20) of a metamodel, and a metamodel is an instance of a meta-metamodel.

[SOURCE: UML 2]

4.23
model
abstraction of some aspects of reality

[SOURCE: ISO 19109:2015, 4.15]

4.24
multiplicity
<UML> specification of the range of allowable *cardinalities* (4.6) that a set may assume

4.25
object
entity with a well defined boundary and identity that encapsulates state and behaviour

[SOURCE: UML 1]

4.26
operation
<UML> behavioural <UML> *feature* (4.17) of a *classifier* (4.8) that specifies the name, *type* (4.36), parameters, and *constraints* (4.13) for invoking an associated behaviour

[SOURCE: UML 2]

4.27
package
<UML> general purpose mechanism for organizing elements into groups

[SOURCE: UML 2]

4.28
profile
<UML> definition of a limited extension to a reference *metamodel* (4.22) with the purpose of adapting the metamodel to a specific platform or domain

[SOURCE: UML 2]

4.29
realization
<UML> specialized abstraction *relationship* (4.30) between two sets of model elements, one representing a specification (the supplier) and the other representing an implementation of the latter (the client)

Note 1 to entry: Realization indicates *inheritance* (4.19) of behaviour without inheritance of structure.

[SOURCE: UML 2]

4.30
relationship
<UML> semantic connection among model elements

[SOURCE: UML 1]

4.31
schema
formal description of a *model* (4.23)

[SOURCE: ISO 19101-1:2014, 4.1.34]

4.32
service
distinct part of the functionality that is provided by an entity through *interfaces* (4.21)

[SOURCE: ISO 19119:2005, 4.1]

4.33
stereotype
<UML> extension of an existing metaclass that enables the use of platform or domain specific terminology or notation in place of, or in addition to, the ones used for the extended metaclass

[SOURCE: UML 2]