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Information technology — Metadata registries (MDR) —

Part 32:
Metamodel for concept system registration

Technologies de l'information — Registres de métadonnées (RM) — Partie 32: Métamodèle pour l'enregistrement de systèmes de concepts

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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 document 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 or www.iec.ch/members_experts/refdocs).

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This document was prepared by Joint Technical Committee ISO/IEC/JTC 1, *Information technology*, Subcommittee SC 32, *Data management and interchange*.

A list of all parts in the ISO/IEC 11179 series can be found on the ISO and IEC websites.

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 and www.iec.ch/national-committees.

Introduction

ISO/IEC 11179-3 specifies the structure of a Metadata Registry (MDR) and provides a metamodel for registry common facilities. That metamodel is intended to be extended by other parts of ISO/IEC 11179 for specific purposes.

This first edition of ISO/IEC 11179-32, is part of a restructuring of ISO/IEC 11179-3:2013, which has now been broken into multiple parts. This document provides a metamodel for registering metadata about concept systems and binary relations in a Metadata Registry (MDR), as extensions to the registry metamodel specified in ISO/IEC 11179-3.

In Clauses 7 and 8, this document uses:

— **bold** font to highlight terms which represent metadata objects specified by the metamodel;

— normal text for terms which represent concepts defined in Clause 3.

EXAMPLE **Concept** (7.2.2.1) is a class each instance of which models a concept.

Information technology — Metadata registries (MDR) —

Part 32: Metamodel for concept system registration

1 Scope

This document provides a specification for an extension to a metadata registry (MDR), as specified in ISO/IEC 11179-3:2023, in which metadata that describes concept systems can be registered.

The specification in this document, together with the relevant clauses of the specification in ISO/IEC 11179-3, provides the ability to record the following metadata:

— concept systems and associated concepts;

— relations among concepts in a concept system;

— assertions about concepts in a concept system.

The metamodel in this document is intended to support the full description of a concept system, including ontologies.

Where there is a requirement to register an ontology where the details are defined elsewhere, consider using ISO/IEC 19763-3[8] instead.

2 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/IEC 11179-3:2023, *Information technology — Metadata registries (MDR) — Part 3: Metamodel for registry common facilities*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 11179-3 and the following 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
concept
unit of knowledge created by a unique combination of characteristics

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

Note 2 to entry: This is the concept “concept” as used and designated by the term “concept” in terminology work. It is a very different concept from that designated by other domains such as industrial automation or marketing.

Note 3 to entry: A concept is independent of its representation.

[SOURCE: ISO 1087:2019, 3.2.7, modified — Reference to definition of *characteristics* removed. Note 3 to entry added.]

3.2
concept system
system of concepts
set of *concepts* (3.1) structured in one or more related domains according to the *concept relations* (3.3) among its concepts

[SOURCE: ISO 1087:2019, 3.2.28]

3.3
relation
concept relation
sense in which *concepts* (3.1) may be connected, via constituent *relation roles* (3.4)

EXAMPLE Causality is a relation with two constituent roles: cause and effect.

Note 1 to entry: The related concepts may be general or individual concepts.

3.4
relation role
role (3.5) that a *concept* (3.1) plays in a *relation* (3.3)

3.5
role
specified responsibilities

3.6
link
member of a *relation* (3.3)

3.7
link end
end of a *link* (3.6), identifying the *relation role* (3.4) played by a *concept* (3.1) in the link

3.8
binary relation
relation (3.3) with *arity* (3.9) equal to 2 (i.e. whose members all have two ends)

Note 1 to entry: Most common semantic relations are binary, e.g. "equals", "less than", "greater than", "is part of", etc. An example of a relation which is not binary is "betweenness" (e.g. A is between B and C.).

3.9
arity
number of arguments that a function takes

3.10
reflexivity
characterization of a *binary relation* (3.8) as reflexive, irreflexive or antireflexive

Note 1 to entry: A binary relation, R, is reflexive if for all x, R(x,x) is true. Equality is an example of a reflexive relation.

Note 2 to entry: A binary relation, R, is irreflexive if it is not reflexive. i.e., R(x,x) is not necessarily true for all x.

Note 3 to entry: A binary relation, R, is antireflexive if for all x, R(x,x) is false. Inequality is an example of an antireflexive relation. An antireflexive relation is also irreflexive, but antireflexive is a more specific characterization.

3.11
symmetry
characterization of a *binary relation* (3.8) as symmetric, asymmetric or antisymmetric

Note 1 to entry: A binary relation, R, is symmetric if for all x, y: R(x,y) implies R(y,x).

EXAMPLE 1 Symmetric relations include: “equals”, “not equals”, “within-2-miles-of”, etc.

Note 2 to entry: Symmetry does not imply *reflexivity* (3.18).

EXAMPLE 2 the “inequality” relation is symmetric, but antireflexive.

Note 3 to entry: A binary relation, R, is asymmetric if for all x,y: R(x,y) does not imply R(y,x).

EXAMPLE 3 Asymmetric relations include: “less than”, “likes”, “father of”, etc.

Note 4 to entry: A binary relation, R, is anti-symmetric if for all x,y: R(x,y) implies not R(y,x). An antisymmetric relation is also asymmetric, but antisymmetric is a more specific characterization.

EXAMPLE 4 “less than” is an antisymmetric relation.

Note 5 to entry: An asymmetric relation is not necessarily antisymmetric.

EXAMPLE 5 Less than or equals.

3.12
transitivity
characterization of a *binary relation* (3.8) as: transitive, intransitive or antitransitive

Note 1 to entry: A binary relation, R, is transitive, if for all x,y,z: R(x,y) and R(y,z) implies R(x,z). Examples of transitive relations include equality, less than and less than or equals.

Note 2 to entry: A binary relation, R, is intransitive if it is not transitive i.e. R(x,y) and R(y,z) does not imply R(x,z).

Note 3 to entry: A binary relation, R, is antitransitive if for all x,y,z: R(x,y) and R(y,z) implies not R(x,z).

Note 4 to entry: An antitransitive relation is also intransitive, but antitransitive is a more specific characterization.

3.13
object
anything perceivable or conceivable

Note 1 to entry: Objects can be material (e.g. “engine”, “sheet of paper”, “diamond”), immaterial (e.g. “conversion ratio”, “project plan”) or imagined (e.g. “unicorn”, “scientific hypothesis”).

[SOURCE: ISO 1087:2019, 3.1.1]

3.14
property
feature of an *object* (3.13)

EXAMPLE 1 “Being made of wood” as a property of a given “table”.

EXAMPLE 2 “Belonging to person A” as a property of a given “pet”.

EXAMPLE 3 “Having been formulated by Einstein” as a property of the equation “$E = mc^2$”.

EXAMPLE 4 “Being compassionate” as a property of a given “person”.

EXAMPLE 5 “Having a given cable” as a property of a given “computer mouse”.

Note 1 to entry: One or more objects can have the same property.

[SOURCE: ISO 1087:2019, 3.1.3]

3.15
characteristic
abstraction of a *property* (3.14)

EXAMPLE “Having a cable for connecting with a computer” as a characteristic of the concept “cord mouse”.

Note 1 to entry: Characteristics are used for describing *concepts* (3.6).

[SOURCE: ISO 1087:2019, 3.2.1]

3.16
notation
formal syntax and associated semantics for the representation of information

EXAMPLE UML,[5],[6],[7] MOF, OCL, OWL[11]/RDF,[12] SKOS,[13] CGIF,[9] XCL,[9] XTM[17] or ISO/IEC 11404[4]

Note 1 to entry: A formal syntax consists of a set of symbols and the rules for their use.

Note 2 to entry: Formal syntax is often intended for machine processing.

[SOURCE: ISO/IEC 11179-3:2023, 3.2.36]

3.17
assertion
sentence or proposition in logic which is asserted (or assumed) to be true

3.18
cardinality
number of elements in a set

Note 1 to entry: cf. *multiplicity* (3.19)

Note 2 to entry: Adapted from ISO/IEC 19501:2005,[5] Glossary.

3.19
multiplicity
specification of the range of allowable *cardinalities* (3.18) that a set may assume

Note 1 to entry: Multiplicity specifications may be given for roles within *associations* (ISO/IEC 11179-3:2023, 3.1.5)

Note 2 to entry: A multiplicity is a (possibly infinite) subset of the nonnegative integers

Note 3 to entry: Adapted from ISO/IEC 19501:2005,[5] Glossary.

3.20
taxonomy
type of hierarchy which deals with generalization/specialization relationships

Note 1 to entry: cf. *meronomy* (3.21)

3.21
meronomy
type of hierarchy which deals with part-whole relationships

Note 1 to entry: cf. *taxonomy* (3.20)

4 Abbreviated terms

CD	Conceptual Domain
CL[9]	Common Logic

CLIF[9]	Common Logic Interchange Format
OWL[11]	Web Ontology Language
OWL-DL	OWL Description Logic
RDF[12]	Resource Description Framework
SKOS[13]	Simple Knowledge Organization System
UML[5][6][7]	Unified Modeling Language
URI	Uniform Resource Identifier
W3C[15]	World Wide Web Consortium
XCL[9]	eXtended Common Logic markup language
XML[16]	eXtensible Markup Language
XTM[17]	XML Topic Maps

5 Conformance

5.1 Overview of conformance

Conformance rules for a Metadata Registry are specified in ISO/IEC 11179-3:2023, Clause 4. The clause "Degree of Conformance" is repeated here for convenience. The subsequent subclauses extend the rules from ISO/IEC 11179-3.

5.2 Degree of conformance

5.2.1 General

The distinction between "strictly conforming" and "conforming" implementations is necessary to address the simultaneous needs for interoperability and extensions. This document describes specifications that promote interoperability. Extensions are motivated by needs of users, vendors, institutions and industries, and:

a) are not directly specified by this document;

b) are specified and agreed to outside this document;

c) may serve as trial usage for future editions of this document.

A strictly conforming implementation can be limited in usefulness but is maximally interoperable with respect to this document. A conforming implementation can be more useful but can be less interoperable with respect to this document.

5.2.2 Strictly conforming implementations

A strictly conforming implementation:

a) shall support all mandatory, optional and conditional classes, attributes, datatypes and associations;

b) shall not use, test, access or probe for any extension features nor extensions to classes, attributes, datatypes, associations or any combination thereof;

c) shall not recognize, nor act on, nor allow the production of classes, attributes, datatypes, associations or any combination thereof that are dependent on any unspecified, undefined or implementation-defined behaviour.

NOTE The use of extensions to the metamodel can cause undefined behaviour.

5.2.3 Conforming implementations

A conforming implementation:

a) shall support all mandatory, optional and conditional classes, attributes, datatypes and associations;

b) as permitted by the implementation, may use, test, access or probe for extension features or extensions to classes, attributes, datatypes, associations or any combination thereof;

c) may recognize, act on or allow the production of classes, attributes, datatypes, associations or any combination thereof that are dependent on implementation-defined behaviour.

NOTE 1 All strictly conforming implementations are also conforming implementations.

NOTE 2 The use of extensions to the metamodel can cause undefined behaviour.

5.3 Conformance by feature

Conformance claims may be made to Clause 7 and optionally Clause 8, or to specific features within these clauses. Those clauses are also dependent upon one or more other clauses of ISO/IEC 11179-3, so conformance to all or part of those clauses shall be understood to imply conformance also to relevant provisions specified in one or more of the clauses in ISO/IEC 11179-3.

A conformance statement shall specify exactly the features supported and not supported.

5.4 Registry conformance

5.4.1 Standard registry profiles

This document specifies the following standard profiles in addition to those specified in ISO/IEC 11179-3:2023, 4.4.2.

— **Concept System Registry**: Implements Clause 7 in addition to all provisions of the “Basic Registry” profile of ISO/IEC 11179-3:2023, 4.4.2;

— **Concept System and Binary Relations Registry**: Implements Clauses 7 and 8 in addition to all provisions of the “Basic Registry” profile of ISO/IEC 11179-3:2023, 4.4.2;

— **Concept System Registry with mapping**: Implements Clause 7 in addition to all provisions of the “Basic Registry with mapping” profile of ISO/IEC 11179-3:2023, 4.4.2;

— **Concept System and Binary Relations Registry with mapping**: Implements Clauses 7 and 8 in addition to all provisions of the “Basic Registry with mapping” profile of ISO/IEC 11179-3:2023, 4.4.2.

5.4.2 Conformance labels

Conformance to the profiles specified in 5.4.1 may be claimed using the following labels, respectively:

— ISO/IEC 11179-32:2023 Concept System Registry;

— ISO/IEC 11179-32:2023 Concept System and Binary Relations Registry;

— ISO/IEC 11179-32:2023 Concept System Registry with mapping;

— ISO/IEC 11179-32:2023 Concept System Registry and Binary Relations with mapping.

5.5 Implementation conformance statement (ICS)

An implementation claiming conformance to this document shall include an Implementation Conformance Statement stating:

a) whether it conforms or strictly conforms;

b) which clauses are or are not supported;

c) what extensions, if any, are supported or used.

A standard profile may be referenced, if applicable.

EXAMPLE Product Z strictly conforms to ISO/IEC 11179-32:2023 Concept System Registry with Mapping.

5.6 Obligation

Properties and relationships specified in this document are one of: Mandatory, Conditional or Optional. The obligation is not explicitly stated but is to be inferred from the multiplicity of the property or relationship, and the presence or absence of a condition. In addition, a Registration Authority can specify additional constraints to be applied to particular **Administered_Items** (see ISO/IEC 11179-3:2023, 9.4.2), using **Constraint_Sets** (see ISO/IEC 11179-3:2023, 9.4.6). See 6.5.

For the purpose of conformance:

a) Mandatory properties and relationships shall exist and shall conform to the provisions of this document.

b) Anything specified as Conditional within this document shall be treated as Mandatory if the associated condition is satisfied and shall otherwise be not present.

c) Optional properties and relationships are not required to exist, but if they do exist, they shall conform to the provisions of this document.

Such obligation is enforced if and only if the Registration Status of the associated registry items is Recorded or higher (see ISO/IEC 11179-3:2023, 9.4.6.3 and ISO/IEC 11179-6:2023,[3] 4.4).

6 Relationship to ISO/IEC 11179-3

6.1 Metamodel for a metadata registry

A metamodel is a model that describes other models. A metamodel provides a mechanism for understanding the precise structure and components of the specified models, which are needed for the successful sharing of the models by users, software facilities or both.

ISO/IEC 11179-3 uses a metamodel to describe the information model of a metadata registry. The registry in turn will be used to describe and model other data, for example about enterprise, public administration or business applications. The registry metamodel is specified as a conceptual data model, i.e., one that describes how relevant information is structured in the natural world. In other words, it is how the human mind is accustomed to thinking of the information.

6.2 Specification of the metamodel

The conventions used in specifying the metamodel are described in ISO/IEC 11179-3:2023, 5.3. Many of the classes specified in this document inherit from **Item**, which is specified in ISO/IEC 11179-3:2023, 6.4.2.1. As **Items**, instances of these classes may be identified, registered, administered, named, defined and classified.