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Information technology — Concepts and usage of metadata —

Part 26: XML for representation of ISO/IEC 11179-3:2013 content

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Foreword

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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 19583 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

The ISO/IEC 11179 series addresses the semantics of data, the representation of data, and the registration of the descriptions of that data. At the time of the publication of ISO/IEC 11179-3:2013 to which this document refers, ISO/IEC 11179 was a six-part series of standards, whose conceptual model was specified in ISO/IEC 11179-3. Since this time, part three has continued to be refined, developed and factorized.

ISO/IEC 11179-3:2013 does not define a physical implementation and thus need not be implemented as specified, which makes exchanging content between even compliant registries difficult. A common physical implementation is required if automatic content exchange is to be achieved.

ISO/IEC 11179-3:2013 representation in W3C XML Schema is such a physical representation. It also provides a potential model for its implementation as an XML database focused on units of content that are readily created and maintained – particularly if reasoning over the 'meaning' of that content can be delegated to an accompanying RDF database as described in ISO/IEC TR 19583-24.

As the adoption of 11179 MDRs expands, metadata registries will need to reuse and extend definitions from other MDRs, together with definitions reflecting local information types. The schema allows metadata registry content to be exchanged in a standard format regardless of the kind of registry software in use.

The schema is presented in 'Venetian Blind' style, where each of the components of the model are rendered as reusable types. These types are assembled into discrete documents suitable for creation and exchange. The main body of the document describes the schema together with the principles and conventions that were followed to map classes, attributes, and associations of the conceptual model into an acyclic, directed graph suitable for an unambiguous document-based representation. The schema is specified in three parts in Annex B, C and D. Additionally, Annex A describes the relationship between the 2013 and current editions of ISO/IEC 11179-3, ISO/IEC 11179-31 and ISO/IEC 11179-32; Annex E suggests a schema derived from Annex B and C to support a XML database system holding ISO/IEC 11179 content; Annex F contains a compliant, example message communicating data elements between two registries.

Where direct reference is made to class, attribute and relationship names from models described in parts of ISO/IEC 11179, class names are emboldened with initial capital letters and have spaces replaced by underscore characters, attribute names are enboldened in lower case and have spaces replaced by underscore characters, and relationship names are italicised in lower case with spaces replaced by underscore characters.

Information technology — Concepts and usage of metadata —

Part 26:
XML for representation of ISO/IEC 11179-3:2013 content

1 Scope

This document specifies the structure of ISO/IEC 11179-3:2013 representation in W3C XML Schema suitable for communication of content between compliant registries. The schema described in this document will implement a class and attribute vocabulary that matches the conceptual model presented in ISO/IEC 11179-3:2013 in W3C XML Schema format. The purpose of the schema is for the exchange of compliant metadata, and to support the validation of messages exchanged between registries. It is not intended for the communication of data element metadata alongside the data to which the metadata refers.

The document specifes the schema and the principles and conventions that were followed to map classes, attributes, and associations of the conceptual model into an acyclic, directed graph suitable for an unambiguous document-based representation.

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 11179-3:2013[1)], *Information technology — Metadata registries (MDR) Part 3: Registry metamodel and basic attributes*

ISO/IEC 11179-6:2015[2)], *Information technology — Metadata registries (MDR) Part 6: Registration*

W3C XML Schema https://www.w3.org/XML/Schema

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 11179-3:2013, ISO/IEC 11179-6:2015 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 General computing terms

3.1.1
extension
feature not defined by this document

1) Withdrawn and replaced by ISO/IEC 11179-3:2023.

2) Withdrawn and replaced by ISO/IEC 11179-6:2023.

3.1.2
namespace
classification scheme that permits a given name to identify multiple objects that are distinguished by context

[SOURCE: ISO/IEC 39075:2024, 3.6.5]

3.1.3
namespace prefix
short name to uniquely identify the namespace

[SOURCE: ISO 24531:2013, 4.40]

3.1.4
schema
formal definition of a model

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

3.2 Terms relating to XML Schema and RDF

3.2.1
internationalized resource identifier
IRI
sequence of characters that conforms to the syntax defined in RFC 3987

[SOURCE: ISO/IEC 19788-7:2019, 3.7, modified – domain and Note to entry deleted.]

3.2.2
World Wide Web Consortium
W3C
international community that develops open standards to ensure the long-term growth of the Web

[SOURCE: ISO 8:2019, 3.5.6]

3.2.3
XML schema
language for describing the structure and constraining the contents of XML documents

[SOURCE: ISO 25720:2009, 4.32]

3.2.4
resource
element from a universe of discourse denoted by an *IRI* (3.2.2)

3.2.5
Resource Description Framework
RDF
W3C (3.2.2) standard defining a formal syntax and semantics for expressing descriptions of *resources* (3.2.4) that can be represented as a directed data graph

[SOURCE: ISO/IEC TR 19583-24:2025, 3.3.6, modified – references made local to this document and Note to entry deleted.]

4 Conformance

4.1 Overview of conformance

Conformance claims shall specify a degree of conformance. Where the schemas are used to validate a message, the degree of conformance shall be defined as described in 4.2. Where these schemas are used as part of a data model for an XML implementation of a registry, conformance may additionally be claimed

against ISO/IEC 11179-3:2013. While such conformance must be established on a case-by-case basis, it is to be expected that such a registry will be able to claim to be 'conforming'.

4.2 Degree of conformance

4.2.1 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.

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.

4.2.2 Strictly conforming implementations

A strictly conforming registry shall emit XML documents that validate against the schema described in this document without error when using a validator that is fully conformant with the W3C XSD 1.1 Recommendation of 5 April 2013.

4.2.3 Conforming implementations

A conforming registry shall emit XML documents that use the namespace, document, element and attribute names together with the containment hierarchy described in this document. It need not meet the explicit cardinality requirements of the schema; it may include extra elements and attributes in other namespaces where extension elements are allowed. Mandatory elements and attributes may be omitted entirely, or repeated in greater numbers than the schema allows.

5 Use cases, modelling principles and mapping conventions

5.1 General

The contained schema is intended principally for the exchange of Data Element and Value Domain content between registries and modelling environments and for the use of such content in the configuration of information systems. It may also be used – in part or as a whole – as a foundation of a compliant XML database implementation of ISO/IEC 11179-3:2013.

There are three broad use cases for information exchange between registries:

a) detailed replication of large amounts of content between ISO/IEC 11179-3:2013 compliant registries whose audiences are in agreement on the conceptualisation of the data elements exchanged;

b) smaller scale exchange of data elements between registries in partly overlapping domains that have different conceptual models;

c) exchange of data element content between configurable information systems or local data dictionaries and registries that have no published conceptual models and registries in their domain.

The first use case requires a sophisticated way of exchanging a broad range of content and its interrelationships. ISO/IEC TR 19583-24 describes a resource description framework schema (RDFS) for ISO/IEC 11179-3:2013, which is capable of faithfully representing the ISO/IEC 11179-3:2013 conceptual model with few compromises, and this is recommended here.

For the second, while understanding the original context of data element and value domain content is important, imported content will be relocated in the conceptual model of the target registry. An example here is the reuse of specific data element content for the Identification of Medicinal Products (ISO 11615; ISO 11616; ISO 11238) in registries whose audiences run pharmacies and prescribe and administer drugs. It is not necessarily the case that the Conceptual Domains, Object Classes, Properties and Data Element

Concepts that support such data elements for regulatory purposes translate directly to ones that help people reuse product identification information in patient care.

For the last use case content will be partial – data element names, units of measure, datatypes, valid values and meanings, and versioning information will be present, but rigorous notions corresponding to the upper half of ISO/IEC 11179-3:2013, Figure 11 (i.e. data element concept and conceptual domain) will not. Examples include survey systems – such as Google Forms, SurveyMonkey, RedCap OpenClinica – and more generally from information systems where user-facing forms or data elements may be configured within the product as part of its deployment.

Where the schema is intended to support the development of an XML database, the design fits in with an overall approach where the model is factored into units that map to content creation workflows, and for each identified item there is one (or a small number) of related content creation forms. In such an implementation, XQuery would be used to navigate from shared leaf classes, and to hide administrative metadata from summary views such as content maps, tree browsers, alphabetic listings and search forms. Implementers will need to provide simple additional schemas that declare XML elements for the types they wish to offer to the users as content creation points, or alternatively they could include these element definitions in a choice element in a single schema.

The goal of ISO/IEC 11179-3 Representation in XML Schema is to provide a near complete and faithful mapping of all classes, attributes, and associations of the ISO/IEC 11179-3:2013 conceptual model to a schema based on W3C XML Schema language in a more deterministic, fixed model that can be easily deployed, focused on creating, managing and exchanging Data Element and Value Domain content. The assumptions made in the translation of the conceptual model into a physical representation are outlined in general within this clause, and in specific in the narrative in Clause 6.

5.2 Directionality and indirection of relationships

In ISO/IEC 11179-3:2013, relationship directionality and end point visibility are not specified, and there are many points in the model where it is possible to create content that indirectly references itself either immediately or as part of larger cyclic structures. While direct implementation of such models is possible in XML Schema, additional code – Schematron rules or an XForm/XQuery API – is required to ensure documents that validate against the schema make sense. To avoid this problem, the schemas specified here assert directionality, and implement certain important relationships as references.

The default directionality can be generally stated as having Data Element, Value Domain, Data Element Concept and Conceptual Domains as the base units of content and exchange, with reference relationships between these classes. It is assumed that these items will be 'identified items' according to the definition of ISO/IEC 11179-3:2013, and thus the reference is to the item identifier for that item. Within each of these units, dependent content is represented as a hierarchy of nodes. An exception to this principle is made for value meanings where a choice between referring to the meaning in a separate Conceptual Domain definition, or including the meaning directly in the Value Domain is offered to implementers who have the third use case in 5.1.

The model additionally defines many shared classifiers including Context, Object Class, Property, and Units of Measure. To avoid duplication of this content at every point of reference in the XML document, these are also required to be identified items. However, for the sake of brevity these classifiers are strictly leaves, without explicit navigability back to the related classes: for example each Data Element Concept instance that is classified by a particular Object Class instance is not enumerated in that Object Class instance. Reverse links can be computed using XQuery inside an XML database representation. Additionally it is possible to separately specify Organisations, Individuals and Contacts for large exchanges of content between registries.

5.3 Schema documents

Three normative schema documents are presented in Annexes B, C and D:

a) iso11179-3_common_facilities.xsd presents the types described as common facilities in ISO/IEC 11179-3:2013. This schema document is widely applicable to standards from the 11179 and 19763 families (Annex B) and is declared in the ISO/IEC 11179-3 namespace.

b) iso11179-3_four_corners.xsd assembles the common facilities into the main content types of an ISO/IEC 11179-3:2013 compliant registry (Annex C) and is declared in the ISO/IEC 11179-3 namespace.

c) iso11197-3_message.xsd imports the previous schema in the ISO/IEC 11179-3 namespace to define a document structure for exchanging content between compliant registries (Annex D), new message elements are declared in the ISO/IEC 19583-26 namespace.

A further, informative schema demonstrating how schemas (a) and (b) can be used to implement an XML database is presented in Annex E, imported types are in the ISO/IEC 11179-3 namespace, root elements for database content are declared in the the ISO/IEC 19583-26 namespace.

An account of differences between ISO/IEC 11179-3:2013 and the current 2023 versions is presented in Annex A (informative), and a list of any class or attribute names that have been added or changed in these schemas is presented in Annex F.

All four schemas are available in file form for download at https://standards.iso.org/iso-iec/19583/-26/ed-1/en

5.4 Schema style

The style of the schema is to define a large number of global type definitions at various levels of complexity and integration and to make these specific with local element definitions that tightly specify the kinds of elements that can be used to compose documents. As such, a Postal_Address type is defined without presumption that a root element of type Postal_Address will actually appear as a stand-alone XML document, it being left to the user as to how these types are presented as a collection of documents.

The schema is presented in three parts: a 'common facilities' schema containing global base type definitions for use in all implementations; a 'four corners' schema that assembles these common facilities into a selection of types most useful for the creation of content interchange messages, and an overarching 'message' schema that assembles these types into an XML document that is used to exchange content.

It is expected that the underlying implementations of ISO/IEC 11179-3 that registry users will interact with to create content will be most often relational, with XML representations used for content exchange and RDF representations used for computation. Therefore, these schemas do not make use of specific XML capabilities such as ID/IDREF for the reuse of content by reference, or any of the proposed mechanisms for content inclusion such as XInclude. XML database implementers may wish to modify elements of the schemas to utilise such features in their implementation platform.

5.5 Schema conventions

The following conventions have been used for mapping the ISO/IEC 11179-3:2013 model elements to W3C XML Schema.

Every model element is represented in W3C XML Schema in the namespace http://standards.iso.org/iso-iec/11179/-3/ed-3/en/ and is abbreviated with the namespace prefix iso-11179, except for those model elements introduced by this document, which are in the https://standards.iso.org/iso-iec/19583/-26/ed-1/en/ namespace.

Every class of ISO/IEC 11179-3:2013 is represented by a simple or complex type. Names maintain the capitalization and underscores as specified in the parent standard.

6 Overview of ISO/IEC 11179-3:2013 Representation in XML Schema

6.1 General

ISO/IEC 11179-3:2013 specifies 'item types' such that later classes can be typed by one or more of these types. Each of these item types is rendered as an xsd:group since W3C XML Schema does not support multiple inheritance. e.g. Identified_Item; Designatable_Item.

Certain relationships between classes have been replaced by reference to their scoped identifier rather than by inclusion of content, e.g. Namespace from Scoped_Identifier, designation_context from Designation.

6.2 Basic Types metamodel region (ISO/IEC 11179-3:2013, 6.2)

Basic types defined in ISO/IEC 11179-3:2013 are declared as simple types, indirected from the corresponding XML base datatypes. It is expected that the base datatypes will function correctly in interchange and database use cases, but indirection allows users of the schema components to further restrict the base types if required, such as disallowing symbols in a datatype expected to hold a filename.

6.3 Basic Classes metamodel region (ISO/IEC 11179-3:2013, 6.3)

Basic classes are faithfully represented from the standard.

6.4 Identification metamodel region (ISO/IEC 11179-3:2013, 7.2)

It is at this point that the model in ISO/IEC 11179-3:2013 becomes more conceptual with the implementer invited to decide what items to identify, name and define, together with some structures that have the potential to be recursive. This implementation has made the following assumptions:

— Namespaces are required to be identified and referenced by identifier when used. To avoid the recursive relationship, attributes for identifier and version have been directly included in the type.

— Scoped identifiers exist as part of an identified item that refers to their namespace by reference, rather than existing within a namespace node, as implied by a simple reading of the class diagram.

Identified_Item is rendered from the standard as a schema group for inclusion in later classes. It is assumed in this schema that Scoped_Identifier will not exist separately of an Identified_Item.

6.5 Designation and Definition metamodel region (ISO/IEC 11179-3:2013, Clause 7)

This implementation has made the following assumptions:

— Naming Conventions are identified items, instances are referenced by their scoped identifiers.

— Context is set to be both an identified item and a designatable item. The recursive relationships to designation and definition contexts have been removed by localising appropriate attributes from the definition and designation classes within the Context type.

— Relationships between designations have been supported in the following way: it is possible to include a specific definition local to a designation, and a designation may be listed as a designation_heading, assuming that the specific definition only has context alongside its designation, and that designations are unique.

6.6 Registration metamodel region (ISO/IEC 11179-3:2013, Clause 8)

Implementation of the registration and administration classes is mostly as described in the standard except for the implementation of relationships between registered item, administered item and attached item. The combination of the inheritance relationship between registered, administered and attached item and the composition relationship between administered and attached item creates errors in later parts of the schema if both the administered and attached item types contain registered item attributes. Implementation of the inheritance relationship is deferred until the introduction of the 'Metadata_Item' type to encapsulate the notions of identification, naming, classification, registration, administration and attachment.

6.7 Concepts package (ISO/IEC 11179-3:2013, Clause 9), Binary Relations package (ISO/IEC 11179-3:2013, Clause 10)

As modelled, the concepts and binary relations packages contain the greatest scope for recursion and repetition of content when implementing the conceptual model as a hierarchical structure. Since it is best

practice for every concept in a concept system to be explicitly identified and named, this implementation has taken the opportunity to replace many of the relationships between classes in this part of the model with scoped identifier references, with attributes at both endpoints of the relationship.

It is also best practice to administer/publish a concept system as a complete entity, rather than in pieces. Thus administration and attachment are reserved for the Concept_System type, rather than being applied to its components.

6.8 Metadata Item Type

The overall approach of the modelling in ISO/IEC 11179-3:2013 is to define a number of conceptual 'types' that may be applied to content classes. Thus identification, classification, designation, registration, administration and attachment all have associated types that are applied by the implementer according to the policies specified by the registrar. This allows the standard to support a wide variety of registries from those that create and maintain content in detail to ones that aggregate content that is registered elsewhere.

W3C XML schema does not support multiple inheritance. The approach taken has been to declare an abstract class of 'Metadata_Item' – which can optionally be identified, named, classified, registered and either administered or attached – and for the classes in the data description class to inherit from this. This simplifies the definition of types in the data description package, and provides a basis for further work developing schemas for other parts of ISO/IEC 11179 together with the ISO/IEC 19763 family that share these notions.

6.9 Data Description package (ISO/IEC 11179-3:2013, Clause 11)

6.9.1 General

The approach taken to the data description package is to broadly support content kinds according to the 'four corners' high level conceptual model for the data description package (ISO/IEC 11179-3:2013, Figure 11) – a complex type is defined for each concrete class at the four corners. Implementers of XML databases can find this causes performance issues with enumerated conceptual and value domains and may wish to factorize these classes differently.

One issue with an XML schema implementation of the data description package is in the choice of class to inherit from. Object Class, Property, Data Element Concept, Conceptual Domain and Value Meaning are all kinds of Concept, but unlike concepts in a concept system – which are administered as a system – they often require individual administration. This implementation treats these objects as being distinct from any general concept system – i.e. either designatable or metadata items – with an additional, optional relationship to a concept in a concept system. This is semantically safest – an *assertion of association* from one of these objects to a concept cannot dislocate the target concept from its proper place in the concept system, whereas stating equivalence between – say – a value meaning and a concept introduces to the concept system associations with the other value meanings and the containing conceptual domain that risks changing the concept's meaning.

6.9.2 Measurement metamodel region (ISO/IEC 11179-3:2013, 11.4)

Since value domains measured with comparable/convertible units will usually fall naturally into the same conceptual domain, a registry may simply maintain a flat list of units of measure and exchange these as required when they exchange value domains. If more order is desired, since conceptually different units of measure may share the same dimension (e.g. frequency, angular velocity), Measure_Class is the natural containing class of this region, the compromise being that this prevents units of measure belonging to more than one measure class.

6.9.3 Data Element Concept metamodel region (ISO/IEC 11179-3:2013, 11.2)

Data element concepts, object classes and properties are all set to be kinds of Metadata_Item, with an additional concept reference to represent the assertion of association/equivalence with a concept in a registered concept system.

6.9.4 Conceptual and Value Domain metamodel region (ISO/IEC 11179-3:2013, 11.3)

Conceptual and Value Domains are set to be kinds of Metadata_Item, with an additional concept reference to represent the assertion of association/equivalence with a concept in a registered concept system. Value Meanings include groups for identification and designation, and additionally also have a concept reference. It is assumed that the set of Value Meanings are part of the Conceptual Domain and thus share their administration record, the same assumption applies to Permissible Values and Value Domains. However, the option is available to exchange meanings within a Value Domain where Conceptual Domains are unavailable.

6.9.5 Data_Element metamodel region (ISO/IEC 11179-3:2013, 11.5)

Data Elements, their derivations, and derivation rules themselves each are set to be Metadata Items with their own administration records.

6.10 ISO/IEC 11179-3:2013 Message and Database Schema

Finally, the types defined in 6.9 are brought together into a 'metadata bundle', a simple sequence of nodes of the main content kinds in an ISO/IEC 11179-3:2013 registry, together with the registry specification and the date and time of export (see Annex C). An example database schema is also offered in Annex D, although it is anticipated that the basic components of ISO/IEC 11179-3:2013, and the schema elements suggested here, could be brought together in many different ways.

Annex A
(informative)

Summary of differences between ISO/IEC 11179-3:2013 and ISO/IEC 11179-3:2023, ISO/IEC 11179-31:2023 and ISO/IEC 11179-32:2023

A.1 Overview

This document is targeted at ISO/IEC 11179-3:2013, which has been superseded by ISO/IEC 11179-3:2023 and other parts of the ISO/IEC 11179 series, such as ISO/IEC 11179-31:2023 and ISO/IEC 11179-32:2023. This annex provides an overview of the differences.

A.2 Modularization of ISO/IEC 11179-3:2013

In the 2023 edition, ISO/IEC 11179-3:2013 has been split into multiple parts to make it more manageable. The following are the new parts:

— ISO/IEC 11179-30 Basic attributes of metadata;

— ISO/IEC 11179-31 Metamodel for data specification registration;

— ISO/IEC 11179-32 Metamodel for concept system registration.

A.3 Simplification of the UML metamodel

Some changes were made in the 2023 edition to simplify the UML model:

— elimination of the use of UML stereotypes;

— addition of an explicit 'Item' class as the superclass of all types of registry items;

— removal of role names on associations;

— removal of redundant specification of attributes and associations in the text.

A.4 Refactoring of some of the packages to reduce dependencies

Some changes were made in the 2023 edition to reduce dependencies among packages:

— moving the Concept class to the Basic and Core package where it is referenced from multiple metamodel regions, including: the Data Specification package in ISO/IEC 11179-31, the Concept System package in ISO/IEC 11179-32, the Data Set package in ISO/IEC 11179-33 and the Model package in ISO/IEC 11179-35;

— moving the Context class to the Basic and Core package where it is referenced from the Designation and Definition package in ISO/IEC 11179-3:2023, the Data Specification package in ISO/IEC 11179-31 and the Data Set package in ISO/IEC 11179-33;

— moving the Slot class to the Basic and Core package, a more appropriate location than the Identification package;

— restoring a Classification region, based on the style of ISO/IEC 11179-3:2003, to remove dependency on the Concept System region for classification.