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First edition
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Geographic information — Metadata —

Part 3:
XML schema implementation for fundamental concepts

Information géographique — Métadonnées —
Partie 3: Mise en oeuvre par des schémas XML

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Contents

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ISO 19115-3:2023
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bbf18ad19b65/iso-19115-3-2023

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 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).

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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 first edition cancels and replaces the first edition (ISO/TS 19115-3:2016), which has been technically revised.

The main changes are as follows:

— cross-references to other documents have been updated; in particular, ISO 19139:2007 has been updated to ISO/TS 19139-1:2019;

— components have been reallocated to the relevant primary International Standards, notably ISO 19115-1:2014, ISO 19115-2:2019 and ISO 19103:2015;

— additional packages and namespaces derived by the aggregation of packages defined in ISO 19115-1:2014 and ISO 19115-2:2009[1] have been removed;

— tables have been consolidated in order to reduce repetition of information and to collocate information concerning requirements, conformance tests and the clauses to which they refer;

— elements in the XML schemas for ISO 19115-1:2014 and ISO 19115-2:2019 have been reordered in order to align with the order of attributes in the associated data dictionaries. Appropriate XML stylesheets (XSLT) have been generated to assist in the transformation of XML records from records conforming to previous versions of the schemas. The conceptual models in the HMMG have been

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1) Cancelled and replaced by ISO 19115-2:2019.

augmented to include the attribute ordering as set out in the data dictionaries in ISO 19115-1:2014 plus ISO 19115-1:2014/Amd 1:2018 and ISO 19115-1:2014/Amd 2:2020 and ISO 19115-2:2019.

A list of all parts in the ISO 19115 series can be found on the ISO website.

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.

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Introduction

0.1 Metadata models for geographic information resources

ISO 19115-1 and ISO 19115-2 collectively provide conceptual models that describe geographic information resources. These models represent metadata of geographic information resources.

ISO 19115-1 explains the importance of metadata, specifies a model for describing geographic information resources by defining metadata entities, elements and terminology, and establishing an extension procedure for additional metadata content. It also incorporates metadata elements describing web services defined in ISO 19119:2005[2] and ISO 19119:2005/Amd 1:2008[3], where those elements are no longer included in ISO 19119:2016 as they have been supplanted by more detailed metadata elements for geographic data types and data quality defined in other ISO geographic information standards (e.g. ISO 19110:2016 and ISO 19157:2013).

NOTE   ISO 19115-1:2014, Annex G describes the revisions from ISO 19115:2003[4].

ISO 19115-2 extends ISO 19115-1 by adding models for acquisition information and extending the models for metadata (MD_Metadata), data quality (DQ_DataQuality, now in ISO 19157:2013), spatial representation (MD_SpatialRepresentation), and content information (MD_ContentInformation).

0.2 XML encoding of metadata models

As ISO 19115-1 and ISO 19115-2 define conceptual models for metadata content, these models are independent of any particular encoding scheme. To use these models in XML requires the development of an XML encoding that implements the conceptual models.

In the past, ISO 19115:2003, the predecessor of ISO 19115-1 and ISO 19115-2, has been provided with an XML encoding defined by ISO/TS 19139:2007[5] and ISO/TS 19139-2:2012[6], called "gmd".

With the advent of ISO 19115-1 and ISO 19115-2, a new XML encoding is needed. This document fulfils that role by providing integrated XML schemas for ISO 19115-1 and ISO 19115-2 metadata content, effectively replacing ISO/TS 19139:2007 and ISO/TS 19139-2:2012.

0.3 Integrated schemas

The integrated schemas provided by this document make it possible to use concepts from ISO 19115-1:2014 and ISO 19115-2:2019 together in metadata instance documents, and enable automated validation and interchange of metadata content using standard software tools.

The integrated schemas have been derived from ISO 19115-1 and ISO 19115-2 conceptual models using the rules defined in ISO/TS 19139-1:2019 applied to an adapted implementation-ready UML version of the conceptual models as described in Clause 10. The implementation approach enables modularization and eases reuse of elements of the conceptual models.

Abstract classes were added to the ISO geographic information harmonized model, without altering the semantics, to create an implementation model that was used for this XML implementation (see Clause 10 for details).

0.4 Intent and usage

The primary use case envisioned for this XML implementation is the exchange of geographic metadata in a client-server environment exemplified by the World Wide Web, in which the internal management

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2) Cancelled and replaced by ISO 19119:2016.

3) Cancelled and replaced by ISO 19119:2016.

4) Cancelled and replaced by ISO 19115-1:2014.

5) Cancelled and replaced by ISO/TS 19139-1:2019.

6) Withdrawn.

vii

and structure of metadata content is independent of the encoding used for the exchange of metadata information.

Adoption of this geographic metadata XML schema within an information-sharing community will garner the benefits of standardization for resource discovery, access, use and understanding.

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bbf18ad19b65/iso-19115-3-2023

Geographic information — Metadata —

Part 3:
XML schema implementation for fundamental concepts

1 Scope

This document defines an integrated XML implementation of ISO 19115-1 and ISO 19115-2 by defining the following artefacts:

— a set of XML schema required to validate metadata instance documents conforming to conceptual model elements defined in ISO 19115-1 and ISO 19115-2; and

— a set of ISO/IEC 19757-3 (Schematron) rules that implement validation constraints in the ISO 19115-1 and ISO 19115-2 UML models that are not validated by the XML schema.

This document describes the procedure used to generate XML schemas from ISO geographic information conceptual models related to metadata. The XML schemas are generated directly from the conceptual UML model (8.5).

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

ISO 19110:2016, *Geographic information — Methodology for feature cataloguing*

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

ISO 19115-1:2014/Amd 1:2018, *Geographic information — Metadata — Part 1: Fundamentals — Amendment 1*

ISO 19115-1:2014/Amd 2:2020, *Geographic information — Metadata — Part 1: Fundamentals — Amendment 2*

ISO 19115-2:2019, *Geographic information — Metadata — Part 2: Extensions for acquisition and processing*

ISO 19136-1:2020, *Geographic information — Geography Markup Language (GML) — Part 1: Fundamentals*

ISO/TS 19139-1:2019, *Geographic information — XML schema implementation — Part 1: Encoding rules*

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
namespace

<XML> collection of names, identified by a URI reference, which are used in XML documents as element names and attribute names

Note 1 to entry: The combination of a namespace URI and element or attribute name are intended to be a globally unique identifier for that model element.

Note 2 to entry: See Reference [18].

3.1.2
package

<UML> general purpose mechanism for organizing elements into groups

EXAMPLE   Identification information package, metadata entity set information package, constraint information package.

Note 1 to entry: Packages may be nested within other packages. Both model elements and diagrams may appear in a package.

Note 2 to entry: A package provides a *namespace* (3.1.1) for the grouped elements.

[SOURCE: ISO 19103:2015, 4.27, modified — Examples and notes to entry have been added.]

3.1.3
polymorphism

capability of expression in alternative forms that also allows extensions to semantics, structure and behaviour

Note 1 to entry: Polymorphism is commonly applied to data in order to support different usages and contexts.

3.2   Abbreviated terms

GML   Geography Markup Language

HTML   HyperText Markup Language

MA   maintenance agency

UML   Unified Modeling Language

URI   Uniform Resource Identifier

URL   Uniform Resource Locator

XML   Extensible Markup Language

XPath   XML Path Language

XSD   XML Schema Definition

XSL   Extensible Style Language

XSLT   Extensible Stylesheet Language Transformation

4 Conventions

4.1 Availability of ISO/TC 211 resources

4.1.1 Maintenance agency for ISO/TC 211 resources

ISO/TC 211 harmonized resources are resources published by ISO/TC 211 with the intention of assisting developers, implementers and users of ISO/TC 211 standards, including UML models, XML schemas and ontologies.

Such resources, including those provided by this document, are managed by a maintenance agency. The name and contact information of the maintenance agency for this document can be found at www.iso .org/maintenance_agencies.

4.1.2 Resources provided by this document

This document provides the following types of ISO/TC 211 harmonized resources:

— XML schemas;

— normative statement classes and normative statements;

— conformance class and tests.

4.2 Presentation of ISO/TC 211 resources

4.2.1 General

Conformance to ISO/TC 211 documents depends on the satisfaction of all mandatory provision classes and conformance classes provided in the document.

This clause describes how these information resources are presented in this document.

4.2.2 Provision classes and provisions

Provision classes are collections of provisions grouped together according to a common theme or a coherent need, such as for the implementation of a particular feature.

Provision classes can be mandatory or optional if explicitly specified.

A provision class is rendered as shown in Table 1.

NOTE   The title of a table denotes the number and title of the provision class, for example: Requirements class 1: Metadata core (ISO 19115-1).

Table 1 — Example 1: Requirement class *X*: Example title

Identifier	The ISO/TC 211 URI of the provision class.
Implements	Any provision class that this provision is an implementation of.
Target type	Type of subject of which the provision class applies.
Prerequisites	List of provision classes that this provision class depends on.
Included in	List of provision classes that this provision class is included in.
Provisions	List of provisions contained in this provision class.
Description	The description of the provision class.
Guidance	Informative information provided as guidance for implementation.

Provisions are statements that describe conformance conditions for this document.

The following types of provision are specified in ISO/TC 211 documents:

— Requirement: conformance to the statement is mandatory;

— Recommendation: conformance to the statement is recommended;

— Permission: conformance to the statement is permitted.

A provision is rendered as shown in Table 2.

NOTE   The table title denotes the number and title of the provision, for example: Requirement 104: Character set code from IANA charset register.

Table 2 — Example 2: Requirement *X*: Example title

Identifier	*The ISO/TC 211 URI of the provision.*
Target type	*Type of subject for which the provision applies.*
Implements	*Any provision of which this provision is an implementation.*
Prerequisites	*List of provisions on which this provision depends.*
Included in	*List of provision classes in which this provision is included.*
Statement	*The statement to be satisfied.*
Guidance	*Informative information provided as guidance for implementation.*

4.2.3   Conformance classes and conformance tests

Satisfaction of ISO/TC 211 provision classes and provisions is determined by the validation of corresponding conformance classes and conformance tests.

A conformance class contains at least one conformance test that validates a target meeting all provisions described in a provision class.

A conformance class is rendered as shown in Table 3.

NOTE   The table title denotes the number and title of the conformance class, for example: Conformance class A.1: Metadata core (ISO 19115-1).

Table 3 — Example 3: Conformance class *X*: Example title

Identifier	*The ISO/TC 211 URI of the conformance class.*
Target type	*Type of subject for which the conformance class applies.*
Satisfies	*List of requirements classes that this conformance class satisfies.*
Prerequisites	*List of conformance classes on which this conformance class depends..*
Included in	*List of conformance classes in which this conformance class is included.*
Includes	*List of conformance tests contained in this conformance class.*
Description	*The description of the conformance class.*
Guidance	*Informative information provided as guidance for testing.*

A conformance test provides test methods that validate a target meeting at least one provision.

A conformance test is rendered as shown in Table 4.

NOTE   The table title denotes the number and title of the conformance test for example: Conformance test A.25: Valid root class of the metadata minimal instance.

Table 4 — Example 4: Conformance test *X*: Example title

Identifier	*The ISO/TC 211 URI of the conformance test.*
Target type	*Type of subject for which the conformance test applies.*
Satisfies	*List of requirements that this conformance test satisfies.*
Prerequisites	*List of conformance tests on which this conformance test depends.*
Included in	*List of conformance classes in which this conformance test is included.*
Test purpose	*The purpose of this conformance test.*
Test method	*The method and steps for executing this conformance test.*
Test type	(Optional) *The type of conformance test.*
Guidance	*Informative information provided as guidance for testing.*

4.3   Structure of URIs in ISO/TC 211 resources for implementation

4.3.1   General

The implementation of ISO/TC 211 documents requires the provision of access to official and unique identification of resources provided by those documents.

ISO/TC 211 defines a set of rules for constructing URIs to be used in all documents published by ISO/TC 211. These rules are approved documented in Reference [28].

4.3.2   Identified resources

The following types of resources provided in this document are assigned unique and persistent identifiers:

— XML schemas (Reference [28], described in 4.3.4)

— normative statement classes and normative statements (Reference [28], described in 4.3.5)

— conformance class and tests (Reference [28], described in 4.3.6)

The relevant URI structures are reproduced in the following subclauses for reference.

4.3.3   Basic elements used in URI templates

Elements used in URI templates include:

standardNumber   The main document number of the International Standard.

   EXAMPLE 1   `19115` for a document in the ISO 19115 series.

partNumber   For a series with several parts. If there are no additional parts, the string – is used.

   EXAMPLE 2 `-3` for part 3.

editionNumber   Official ISO edition number.

   EXAMPLE 3 `1` for edition 1.

4.3.4   XML schema namespace and location

URI template for XML namespace:

— `https://schemas.isotc211.org/standardNumber/-[partNumber]/namespace/editionNumber.
majorSchemaReleaseNo`

URL template for XML schema location:

— `https://schemas.isotc211.org/standardNumber/-[partNumber]/namespace/editionNumber.majorSchemaReleaseNo.minorSchemaRevisionNo/namespace.xsd`

where:

`namespace`	is the XML namespace prefix for the schema;
	EXAMPLE 1 `mda` for the XML namespace for metadata application.
`majorSchemaReleaseNo`	is the major schema release number of the schema, which changes if a new a namespace is used;
`minorSchemaRevisionNo`	is the minor schema revision number of the schema, which is added to the schema location to enable minor fixes while keeping the namespace stable.

NOTE 1   Refer to 4.3.3 for an explanation of the basic elements in the URI template.

NOTE 2   The edition number is appended to the end of the template to facilitate upgrading in implementations.

EXAMPLE 2   The namespace prefix and schema location for the `mcc` namespace of ISO 19115-1, edition 1, major schema release number 3, minor schema revision number 0 is represented by:

— namespace `https://schemas.isotc211.org/19115/-1/mcc/1.3`

— schema location `https://schemas.isotc211.org/19115/-1/mcc/1.3.0/mcc.xsd`

Dereferencing the namespace URI as a resource locator (as a URL) will retrieve a description of the namespace, links to description of the content of the namespace and links to the base specification the namespace implements and to the normative XML schema location.

As the full URI is cumbersome for reading, writing, and in human discussion, the common prefix of the URI is typically omitted. However, since this document involves URIs spanning multiple documents, the usage of the full URI for clarity is preferred when used in this document.

4.3.5   Normative statements

URI template for normative statement class:

— `https://standards.isotc211.org/standardNumber/-[partNumber]/editionNumber/statementType/nsClassId`

URI template for normative statement:

— `https://standards.isotc211.org/standardNumber/-[partNumber]/editionNumber/statementType/nsClassId/nsId`

where:

`statementType`	is the type of the normative statement, which is one of `req` (requirement), `rec` (recommendation) or `per` (permission);
`nsClassId`	is the internal identifier of the normative statement class;
`nsID`	is the internal identifier for the normative statement within the normative statement class.

NOTE 1   Refer to 4.3.3 for an explanation of the basic elements in the URI template.

NOTE 2   The edition number of the document is placed before the statement type to enable there to be one main URI for all statements in one edition. The statements are expected to require inspection for each edition.

EXAMPLE   The URI for requirement `extent` in the requirement class `content` in ISO 19131 (edition 2) is identified by the URI:

— `https://standards.isotc211.org/19131/-/2/req/content/extent`

4.3.6   Conformance classes and tests

URI template for conformance class:

— `https://standards.isotc211.org/standardNumber/-[partNumber]/editionNumber/conf/classId`

URI template for conformance test:

— `https://standards.isotc211.org/standardNumber/-[partNumber]/editionNumber/conf/classId/TestId`

where:

`classId`   is the internal identifier of the conformance class;

`testID`   is the internal identifier for the conformance test within the conformance class.

NOTE 1   Refer to [4.3.3](#) for an explanation of the basic elements in the URI template.

NOTE 2   The edition number of the document is placed before "conf" to enable there to be one main URI for all conformance classes in one edition. The tests are expected to require inspection for each edition.

EXAMPLE   The URI for the conformance test `allContent` in the conformance class `content` in ISO 19131 (edition 2) is identified by the URI:

— `https://standards.isotc211.org/19131/-/2/conf/content/allContent`

4.4   Presentation of information resources in this document

4.4.1   General

This document provides descriptions of multiple types of information resources from different sources, including:

— normative statement classes and conformance classes that link to UML models described in ISO 19115-1 and ISO 19115-2;

— XML schemas that implement the UML models described in ISO 19115-1 and ISO 19115-2, as well as ISO 19103:2015 and ISO 19136-1:2020;

— normative statement classes and conformance classes that apply to the XML schemas described in this document;

— machine-executable supporting resources that implement the conformance tests that apply to the XML schemas described in this document.

The following subclauses describe how these information resources relate to each other as provided in this document.

4.4.2   Relations between information resources

The types of information resources provided in this document and their relationships are described in [Figure 1](#).