TECHNICAL SPECIFICATION

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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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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

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 (see 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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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

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

Introduction

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. ISO 19115-1:2014, Annex G describes the revisions from ISO 19115:2003. The revised content model also incorporates metadata elements defined in ISO 19119:2005 and ISO 19119:2005/Amd 1:2008 for metadata describing web services. More detailed metadata for geographic data types and data quality are defined in other ISO geographic information standards (e.g. ISO 19110 and ISO 19157). Where necessary, interpretations of some other ISO geographic information standards are incorporated for this implementation.

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), spatial representation (MD_SpatialRepresentation), and content information (MD_ContentInformation).

ISO 19115-1 and ISO 19115-2 define conceptual models for metadata content that are independent of any particular encoding scheme. ISO/TS 19139 and ISO/TS 19139-2 define eXtensible Markup Language (XML) schemas for encoding that content. This document defines XML encodings for ISO 19115-1 and ISO 19115-2 metadata content. This integrated schema makes it possible to use concepts from ISO 19115-1 and ISO 19115-2 together in metadata instance documents, effectively replacing ISO/TS 19139 and ISO/TS 19139-2 and enables automated validation and interchange of ISO 19115-1 and ISO 19115-2, metadata content using standard software tools.

The integrated schema were derived from ISO 19115-1 and ISO 19115-2 conceptual models using the rules defined in ISO 19118:2011, Annex A, ISO/TS 19139 applied to an adopted implementation-ready UML version of the conceptual models as described in Clause 8. 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 8 for details).

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

Geographic information — Metadata —

Part 3: XML schema implementation for fundamental concepts

1 Scope

This document defines an integrated XML implementation of ISO 19115-1, ISO 19115-2, and concepts from ISO/TS 19139 by defining the following artefacts:

a) a set of XML schema required to validate metadata instance documents conforming to conceptual model elements defined in ISO 19115-1, ISO 19115-2, and ISO/TS 19139;

b) 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;

c) an Extensible Stylesheet Language Transformation (XSLT) for transforming ISO 19115-1 metadata encoded using the ISO/TS 19139 XML schema and ISO 19115-2 metadata encoded using the ISO/TS 19139-2 XML schema into an equivalent document that is valid against the XML schema defined in this document.

This document describes the procedure used to generate XML schema from ISO geographic information conceptual models related to metadata. The procedure includes creation of an UML model for XML implementation derived from the conceptual UML model.

This implementation model does not alter the semantics of the target conceptual model, but adds abstract classes that remove dependencies between model packages, tagged values and stereotypes required by the UML to XML transformation software, and refactors the packaging of a few elements into XML namespaces. The XML schema has been generated systematically from the UML model for XML implementation according to the rules defined in ISO/TS 19139 or ISO 19118.

2 Conformance

2.1 General

In order to claim conformance to a conformance class defined in this document, an XML instance shall validate against the test procedures specified in Annex A. These tests include validation using a specific XML schema document, as well as Schematron rule documents that test conformance with constraints specified by the base conceptual model that are not tested by XML schema validation. Each namespace module and interchange document schema defined by the implementation carries with it an implicit conformance class for xml instance documents. This conformance class tests the requirement that xml element and attribute instances from the namespace shall be well-formed and valid. The test is validation with a specific XML schema and Schematron rule set if necessary. The framework, concepts, and methodology for testing, and the criteria to be achieved to claim conformance are specified in ISO 19105.

Implementers may choose to define other "information exchange" document schemas that import normative XML schemas not specified here to identify and validate interchange documents. The design of these schemas will be contingent on the requirements of the user community for the particular information exchange. These information exchange schema should be documented in a technical note.

2.2 Conformance classes for metadata modules

This document defines a set of conformance classes for various content modules defined by ISO 19115-1 and ISO 19115-2 to allow these to be used as components in other interchange document implementations. Each module is packaged in a separate XML namespace. Table 1 lists the module defined in this document.

Table 1 — Conformance classes defined for metadata modules

Namespace[a]	Conformance class URI[b]	Conformance class name (implemented clause)
/mcc/1.0	/conf/common-classes-xml	Valid XML instance of common classes namespace (this document)
/cit/1.0	/conf/citation-xml	Valid XML instance of citation namespace (ISO 19115-1:2014, 6.6.2)
/lan/1.0	/conf/language-localisation-xml	Valid XML instance of language localization namespace (ISO 19115-1:2014, 6.7)
/mas/1.0	/conf/application-schema-xml	Valid XML instance of application schema namespace (ISO 19115-1:2014, 6.5.13)
/mac/1.0	/conf/ acquisition-xml	Valid XML instance of metadata for acquisition namespace (ISO 19115-2:2009, A.2.5)
/mco/1.0	/conf/constraints-xml	Valid XML instance of constraints namespace (ISO 19115-1:2014, 6.5.4)
/gex/1.0	/conf/geospatial-extent-xml	Valid XML instance of geospatial extent namespace (ISO 19115-1:2014, 6.6.1)
/mdb/1.0	/conf/metadata-base-xml	Valid XML instance of metadata base namespace (ISO 19115-1:2014, 6.5.2)
/mmi/1.0	/conf/maintenance-information-xml	Valid XML instance of maintenance information namespace (ISO 19115-1:2014, 6.5.6)
/mpc/1.0	/conf/portrayal-catalogue-xml	Valid XML instance of portrayal catalogue namespace (ISO 19115-1:2014, 6.5.10)
/mrc/1.0	/conf/resource-content-xml	Valid XML instance of resource content namespace (ISO 19115-1:2014, 6.5.9, ISO 19115-2)
/mrd/1.0	/conf/resource-distribution-xml	Valid XML instance of resource distribution namespace (ISO 19115-1:2014, 6.5.11)
/mri/1.0	/conf/resource-identification-xml	Valid XML instance of resource identification namespace (ISO 19115-1:2014, 6.5.6)
/mrl/1.0	/conf/lineage-xml	Valid XML instance of resource lineage namespace (ISO 19115-1:2014, 6.5.5, ISO 19115-2)
/mrs/1.0	/conf/reference-system-xml	Valid XML instance of reference system namespace (ISO 19115-1:2014, 6.5.8)
/msr/1.0	/conf/spatial-representation-xml	Valid XML instance of spatial representation (ISO 19115-1:2014, 6.5.7, ISO 19115-2)
/msr/1.0	/conf/spatial-representation-xml	Valid XML instance of spatial representation (ISO 19115-1:2014, 6.5.7, ISO 19115-2)
/srv/2.0	/conf/service-metadata-xml	Valid XML instance of service metadata namespace (ISO 19115-1:2014, 6.5.14)
/mex/1.0	/conf/metadata-extension-xml	Valid XML instance of metadata extension namespace (ISO 19115-1:2014, 6.5.12)
/gcx/1.0	/conf/extended-types-xml	XML implementation of geospatial common extended types (ISO/TS 19139:2007, 7.2)

[a] For complete namespace URIs, prefix "http://standards.iso.org/iso/19115/-3".

[b] All Conformance Class URIs are HTTP URIs, prefix "http://standards.iso.org/iso/19115/-3" to the paths in the table cell to get the complete URI.

2.3 Conformance classes for metadata interchange documents

This document defines a set of XML schema that import various modular namespace components to define useful metadata interchange documents. Each of these document schema has an associated requirements and conformance class, and a namespace URI to identify the document type. Table 2 lists these interchange document schemes.

Table 2 — Conformance classes for metadata interchange

Namespace[a]	Conformance class URI[b]	Conformance class name
mdb/1.0	/conf/metadata-minimal-instance	Minimum XML metadata instance document
mds/1.0	/conf/metadata-data-or-service-instance	Complete valid XML metadata instance document
md1/1.0	/conf/metadata-extended-types-instance	Valid XML metadata instance document with extended types
/md2/1.0	/conf/extended-metadata-instance	Valid XML metadata instance document with extended content model
/cat/1.0	/conf/catalogue-instance	Valid XML catalogue instance document
/mda/1.0	/conf/metadata-application-instance	Valid XML instance of metadata application namespace
/mdt/1.0	/conf/metadata-data-transfer-instance	Valid XML instance of metadata for data transfer namespace

[a] For complete namespace URIs, prefix "http://standards.iso.org/iso/19115/-3".

[b] All conformance class URIs are HTTP URIs, prefix "http://standards.iso.org/iso/19115/-3" to the paths in the table cell to get the complete URI.

3 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 19110, *Geographic information — Methodology for feature cataloguing*

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 19136, *Geographic information — Geography Markup Language (GML)*

ISO 19157, *Geographic information — Data quality*

ISO/TS 19139:2007, *Geographic information — Metadata — XML schema implementation*

4 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

4.1
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

[SOURCE: W3C XML Namespaces:1999]

4.2
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* (4.1) for the grouped elements.

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

4.3
realization
semantic relationship between classifiers, wherein one classifier specifies a contract that another classifier guarantees to carry out

[SOURCE: ISO/TS 19139:2007, 4.3]

4.4
polymorphism
characteristic of being able to assign a different meaning or usage to something in different contexts – specifically, to allow an entity such as a variable, a function, or an object to have more than one form

Note 1 to entry: *Realization* (4.3) indicates inheritance of behaviour without inheritance of structure.

[SOURCE: ISO/TS 19139:2007, 4.4, modified — Note 1 to entry has been added.]

5 Symbols and abbreviated terms

5.1 Acronyms

GML	Geography Markup Language
HTML	HyperText Markup Language
UML	Unified Modeling Language
URI	Universal Resource Identifier
XML	Extensible Markup Language
XPath	XML Path Language
XSD	XML Schema Definition
XSL	Extensible Style Language
XSLT	Extensible Stylesheet Language Transformation

5.2 Namespaces

XML namespaces defined in this document are identified by URIs that follow the pattern: http://standards.iso.org/iso/19115/-3/xxx/N.M, where xxx is a three-alphanumeric-character namespace abbreviation, N is the major version number, and M is the minor version number. Dereferencing the namespace URI as a resource locator 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.

Because the full URI is cumbersome for reading, writing, and in human discussion, this document will refer to the namespaces using abbreviations. Table 3 lists namespaces from other specifications imported by this implementation, and the short string in the left column of Table 3 is the associated abbreviation used to reference the namespace and to associate an XML element with the namespace URI in a fully qualified name. The second column contains an English-language description of the namespace, and the string in the right column is the URI that identifies the namespace. Tables 4 and 5 list abbreviations and other information for namespaces used for UML packages defined in ISO 19115-1 and for namespaces defined in this document that import multiple XML namespaces to define interchange document types.

Table 3 — External namespace URIs and namespace abbreviation conventions used in this document

Namespace abbreviation convention	Name	Namespace URI
dqc	Data quality common	http://standards.iso.org/iso/19157/-2/dqc/1.0
fcc	Feature catalogue common	http://standards.iso.org/19110/fcc/1.0
gml	Geography markup language	http://www.opengis.net/gml/3.2
xlink	XML linking language	http://www.w3.org/1999/xlink
xs	W3C XML schema definition schema	http://www.w3.org/2001/XMLSchema

Table 4 — Namespace URIs and namespace abbreviation conventions defined and used in this document for packages defined in ISO 19115-1

Namespace abbreviation convention	Namespace name	Scope	Namespace URI	UML package[a]
Cat	CATalogue	elements for codelist catalogues, and example catalogues from ISO/TS 19139 updated for compatibility with new schema	http://standards.iso.org/iso/19115/-3/cat/1.0	Catalogues (ISO/TS 19139)
cit	CITation	Utility elements for citation, identification, and web linkage of resources	http://standards.iso.org/iso/19115/-3/cit/1.0	Citation and responsible party information
gco	Metadata core	Basic data types	http://standards.iso.org/iso/19115/-3/gco/1.0	From ISO/TS 19139
gcx	Geospatial Common eXtension	Elements for xml implementation, from ISO/TS 19139 updated for compatibility with new schema	http://standards.iso.org/iso/19115/-3/gcx/1.0	Web environment (ISO/TS 19139)

[a] UML packages are defined in ISO 19115-1 unless noted otherwise.

Table 4 *(continued)*

Namespace abbreviation convention	Namespace name	Scope	Namespace URI	UML package[a]
gex	Geospatial EXtent	Elements for specifying geospatial properties of a resource, including extent and spatial reference systems	http://standards.iso.org/iso/19115/-3/gex/1.0	Extent information
gmw	GML wrapper	Namespace that implements properties with values specified by GML classes	http://standards.iso.org/iso/19115/-3/gmw/1.0	From ISO/TS 19139
lan	LANguage localization	Elements for cultural and linguistic adaptability	http://standards.iso.org/iso/19115/-3/lan/1.0	Language-characterset localization information
mas	Metadata for application schema	Application schema used to build a dataset	http://standards.iso.org/iso/19115/-3/mas/1.0	Application schema information
mcc	Metadata for common classes	Elements used by all other packages	http://standards.iso.org/iso/19115/-3/mcc/1.0	Common classes
mco	Metadata for constraints	Specify constraints on access and use	http://standards.iso.org/iso/19115/-3/mco/1.0	Constraint information
mdb	Metadata base	Define metadata root element and properties with abstract implementation. This namespace is intended to support profile development.	http://standards.iso.org/iso/19115/-3/mdb/1.0	Metadata information
mex	Metadata for extension	Extensions to metadata content	http://standards.iso.org/iso/19115/-3/mex/1.0	Metadata extension information
mmi	Metadata for maintenance information	Maintenance of resources and metadata	http://standards.iso.org/iso/19115/-3/mmi/1.0	Maintenance information
mpc	Metadata for portrayal catalogue	Portrayal of described resource	http://standards.iso.org/iso/19115/-3/mpc/1.0	Portrayal catalogue information
mrc	Metadata for resource content	Resource data structure and content	http://standards.iso.org/iso/19115/-3/mrc/1.0	Content information
mrd	Metadata for resource distribution	How a resource is accessed	http://standards.iso.org/iso/19115/-3/mrd/1.0	Distribution information
mri	Metadata for resource identification	Identifying resources	http://standards.iso.org/iso/19115/-3/mri/1.0	Identification information
mrl	Metadata for resource lineage	Resource provenance	http://standards.iso.org/iso/19115/-3/mrl/1.0	Lineage information

[a] UML packages are defined in ISO 19115-1 unless noted otherwise.

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