PD ISO/TS 19115-3:2016

BSI Standards Publication

Geographic information — Metadata

Part 3: XML schema implementation for fundamental concepts

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Full document details: PD ISO/TS 19115-3:2016

National foreword

This Published Document is the UK implementation of ISO/TS 19115-3:2016.

The UK participation in its preparation was entrusted to Technical Committee IST/36, Geographic information.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Published by BSI Standards Limited 2016

ISBN 978 0 580 86174 1
ICS 35.240.70

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This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 August 2016.

Amendments/corrigenda issued since publication

Date	Text affected

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TECHNICAL SPECIFICATION

ISO/TS 19115-3

First edition
2016-08-15

Geographic information — Metadata —

Part 3: XML schema implementation for fundamental concepts

Information géographique — Métadonnées —

Partie 3: Mise en oeuvre par des schémas XML

Reference number
ISO/TS 19115-3:2016(E)

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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 (see www.iso.org/directives).

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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.

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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.

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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.

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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.

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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

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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

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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.

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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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Table 4 *(continued)*

Namespace abbreviation convention	Namespace name	Scope	Namespace URI	UML package[a]
mrs	Metadata for reference system	Spatial reference system for resource content	http://standards.iso.org/iso/19115/-3/mrs/1.0	Reference system information
msr	Metadata for spatial representation	Encoding of location information in resource content	http://standards.iso.org/iso/19115/-3/msr/1.0	Spatial representation information
srv	SeRVice metadata	Information specific to service resources, inherited from ISO 19119 into ISO 19115-1	http://standards.iso.org/iso/19115/-3/srv/2.0	Service metadata information

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

Table 5 — Namespace URIs and namespace abbreviation conventions to identify metadata interchange document types that aggregate multiple namespaces

Namespace abbreviation convention	Namespace name	Scope	Namespace URI	UML package[a]
mdb	Metadata base	Implement elements and properties for minimal metadata properties required by ISO 19115-1.	http://standards.iso.org/iso/19115/-3/mdb/1.0	
mds	Metadata for data and services	Implement all the optional metadata properties associated with the base MD_Metadata and MI_Metadata (from ISO 19115-2) element. This namespace is intended to support catalogue services.	http://standards.iso.org/iso/19115/-3/mds/1.0	Metadata information
md1	Metadata for data and services with geospatial common extensions	Implement all the optional metadata properties associated with the base MD_Metadata element and geospatial common extensions.	http://standards.iso.org/iso/19115/-3/md1/1.0	
mda	Metadata application	Includes classes for describing resource collections with hierarchical metadata.	http://standards.iso.org/iso/19115/-3/mda/1.0	Metadata application information
mdt	Metadata for data transfer	Includes classes for describing packages of data for transfer.	http://standards.iso.org/iso/19115/-3/mdt/1.0	Metadata-based data transfers (ISO/TS 19139)
md2	Metadata with extensions	Extends metadata by including classes that allow metadata extensions to be described.	http://standards.iso.org/iso/19115/-3/md2/1.0	Metadata extension information

NOTE Namespaces are arranged from simplest to most complex.

[a] Blank cells indicate that no equivalent package is defined in ISO 19115-1 or ISO/TS 19139.

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6 Requirements

6.1 Automated generation of XML schema

A major design objective for ISO geographic information standards information models is to enable production of XML schema following standard rules and implementation patterns such that machine processing of UML models can generate the XML schema. The intention is to promote predictability, extensibility, reuse of schema, and interoperability with other ISO geographic information standards implementations. The resulting XML schemas are algorithmically derived from the normative UML models for ISO geographic information standards, which promotes consistency in the resulting schema. The resulting schemas are predictable since UML classes, attributes, associations, etc. are encoded following consistent rules and patterns.

Another requirement of this implementation is to modularize the encoding of ISO 19115-1 content by defining XML elements in several namespaces, with a minimum of dependencies between them (see 6.4). The purpose of grouping XML elements into namespaces is to define loosely coupled units of information representation capability that facilitate reuse in other applications. The contents of several XML namespaces are defined in this document, which may be reused by importing into other XML schema. Use of an existing XML schema is advantageous because it reduces the amount of new schema development required, and because existing software may be available that can process model elements conforming to an existing XML schema.

The ISO 19115-1 metadata conceptual schema is designed to support transfer of resource documentation (metadata) among and within user communities. A third objective of the implementation for this document is to define standard document types that include elements from multiple namespace modules, designed for specific information exchange scenarios. Six “aggregation” namespaces are defined that import multiple modules to meet various requirements (see 6.5).

6.2 Multilingual adaptability and polymorphism

Cultural and linguistic adaptability is a requirement for metadata elements with text content. In ISO 19115-1:2014, Annex F, there is an informative discussion of multilingual textual metadata elements. In order to enable the interoperability of multilingual instance documents, the XML implementation for this document follows the implementation specified in ISO/TS 19139. The property type encodings described in ISO/TS 19139:2007, 8.4, enable extensions to the XML schema that implement property values using element types not included in the base XML schema. Such polymorphism (see definition in 4.4) allows user communities to modify geographic metadata to meet their organizational needs. This pattern is used to provide cultural and linguistic adaptability support through metadata instance documents containing content in one or more languages that do not violate cardinality rules defined in ISO 19115-1. The lan namespace defines a CharacterString property type that includes a CharacterString value, and zero to many PT_FreeText elements, each of which is a language-localized character string that may be included inline or by reference. Using this extension, a single metadata document may include content strings in a variety of languages, but clients that are not programmed for multilingual content will still work because the standard CharacterString element is present.

Another example of polymorphism is the name attribute of type CharacterString in the CI_Individual class in ISO 19115-1; if a more structured representation is required (e.g. first, middle, and last name elements), polymorphism allows extension of the name element implementation in a user-defined namespace that may be substituted for CharacterString within a metadata instance. These extensions will be understandable to users who recognize the extension namespace, but in general such extensions will not interoperate with client software not designed to work with them.

6.3 Introduction to requirements classes

The requirements to create valid XML metadata instances for the conceptual model presented in ISO 19115-1 are defined in 6.4 through 6.7. In Tables 6 through 10, HTTP URIs are used to identify clauses in corresponding normative ISO standards that do not define and assign identifiers to requirements and conformance classes that can be referenced in this document. These are constructed using http://

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standards.iso.org/iso as the base, with the source project ID, edition number, and "spec#N.N.N" as the final token where the "N.N.N" part identifies the source clause in the standards document. Each implemented package sets requirements for validating XML instances that use elements in the package. The requirements are grouped into core requirements that apply to all instance validation, requirements for metadata modules that define the various components of metadata content, and requirements for actual metadata interchange documents that are assembled by importing collections of modules. The metadata modules are designed to minimize dependencies between modules to facilitate their reuse in other application schema.

6.4 Core Requirements

The requirements class specified in Table 6 defines requirements that shall be met by any XML instance document based on this document.

Table 6 — Requirements for metadata core

Requirements class	
http://standards.iso.org/iso/19115/-3/req/metadata-core	
Target type	XML instance document
Name	Core requirements for metadata properties
Dependency	http://standards.iso.org/iso/19139/spec#8.4.1
Requirement	**/req/metadata-core/property-type-content** A property element instance SHALL have exactly one of inline content (by-value) that is a schema-valid XML Class instance, a xlink:href attribute (by-reference value), or a gco:nilReason attribute (nil value).
Requirement	**/req/metadata-core/instance-validation** XML instance documents SHALL be well formed and valid. A conformance class is defined on this requirement for each namespace that specifies the normative XML schema and Schematron rule (if applicable) files that are used to test conformance.
Requirement	**/req/metadata-core/base-data-types** Base data types SHALL be implemented according to rules set forth in ISO/TS 19139.

6.5 Requirements for metadata modules

A collection of modular XML namespaces are used to implement the various content packages defined in ISO 19115-1 and ISO 19115-2. The modules are summarized in Table 7, and the requirements for XML instances of each module are defined and assigned identifiers in Table 8. These identifiers are referenced in the definition of conformance classes and tests in Annex A.

Table 7 — Summary of metadata modules defined by this document

Namespace	Name	Clauses implemented
http://standards.iso.org/iso/19115/-3/cat/1.0	Catalogue	http://standards.iso.org/iso/19139/spec#7.4.4
http://standards.iso.org/iso/19115/-3/cit/1.0	Citation and responsible party information	http://standards.iso.org/iso/19115/-1/spec#6.6.3[a]
http://standards.iso.org/iso/19115/-3/gco/1.0	Metadata core	http://standards.iso.org/iso/19139/spec#9.7
http://standards.iso.org/iso/19115/-3/gcx/1.0	Geospatial common extended types	http://standards.iso.org/iso/19139/spec#7.2

[a] There is a circular dependency between the citation and common classes packages, but because of the policy that the implementation package should match the base abstract schema (ISO 19115-1) packaging, these are implemented as separate namespaces.

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Table 7 *(continued)*

Namespace	Name	Clauses implemented
http://standards.iso.org/iso/19115/-3/gex/1.0	Metadata for geospatial extent	http://standards.iso.org/iso/19115/-1/spec#6.6.1
http://standards.iso.org/iso/19115/-3/gmw/1.0	GML wrapper	http://standards.iso.org/iso/19139/spec#9.4; http://standards.iso.org/iso/19139/spec#9.5; http://standards.iso.org/iso/19139/spec#9.6
http://standards.iso.org/iso/19115/-3/lan/1.0	Language localization	http://standards.iso.org/iso/19139/spec#7.3; http://standards.iso.org/iso/19115/-1/spec#6.7.2
http://standards.iso.org/iso/19115/-3/mac/1.0	Metadata for acquisition	http://standards.iso.org/iso/19115/-2/spec#A.2.5
http://standards.iso.org/iso/19115/-3/mas/1.0	Metadata for application schema	http://standards.iso.org/iso/19115/-1/spec#6.5.13
http://standards.iso.org/iso/19115/-3/mcc/1.0	Metadata common classes	http://standards.iso.org/iso/19115/-1/spec#6.6.4, including abstract classes necessary for encoding optional class property types defined in ISO 19115-1 according to the implementation approach described in Clause 8[a]
http://standards.iso.org/iso/19115/-3/mco/1.0	Metadata for constraints	http://standards.iso.org/iso/19115/-1/spec#6.5.4
http://standards.iso.org/iso/19115/-3/mdb/1.0	Metadata base	http://standards.iso.org/iso/19115/-1/spec#6.5.2
http://standards.iso.org/iso/19115/-3/mex/1.0	Metadata for metadata extension	http://standards.iso.org/iso/19115/-1/spec#6.5.12
http://standards.iso.org/iso/19115/-3/mmi/1.0	Metadata for maintenance information	http://standards.iso.org/iso/19115/-1/spec#6.5.6
http://standards.iso.org/iso/19115/-3/mpc/1.0	Metadata for portrayal catalogue	http://standards.iso.org/iso/19115/-1/spec#6.5.10
http://standards.iso.org/iso/19115/-3/mrc/1.0	Metadata for resource content	http://standards.iso.org/iso/19115/-1/spec#6.5.9
http://standards.iso.org/iso/19115/-3/mrd/1.0	Metadata for resource distribution	http://standards.iso.org/iso/19115/-1/spec#6.5.11
http://standards.iso.org/iso/19115/-3/mri/1.0	Metadata for resource identification	http://standards.iso.org/iso/19115/-1/spec#6.5.3
http://standards.iso.org/iso/19115/-3/mrl/1.0	Metadata for resource lineage	http://standards.iso.org/iso/19115/-1/spec#6.5.5
http://standards.iso.org/iso/19115/-3/mrs/1.0	Metadata for reference system	http://standards.iso.org/iso/19115/-1/spec#6.5.8
http://standards.iso.org/iso/19115/-3/msr/1.0	Metadata for spatial representation	http://standards.iso.org/iso/19115/-1/spec#6.5.7
http://standards.iso.org/iso/19115/-3/srv/2.0	Metadata for services	http://standards.iso.org/iso/19115/-1/spec#6.5.14

[a] There is a circular dependency between the citation and common classes packages, but because of the policy that the implementation package should match the base abstract schema (ISO 19115-1) packaging, these are implemented as separate namespaces.

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Table 8 — Requirements classes for XML instance documents for each namespace module

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Requirements[b]
/cat/1.0	/req/catalogue-instance	/req/metadata-core, /req/language-localisation-instance	/req/catalogue-instance/validation[c]
/cit/1.0	/req/citation-instance	/req/metadata-core /req/common-classes-instance	/req/citation-instance/validation[c]
			/req/citation/individual-name Any instance of CI_Individual SHALL have either a "name" property value or a "positionName" property value.
			/req/citation/organisation-name Any instance of CI_Organisation SHALL have either a "name" property value or a "logo" property value.
/gcx/1.0	/req/extended-types-instance	/req/metadata-core /req/common-classes-instance	/req/extended-types-instance/validation[c]
/gex/1.0	/req/geospatial-extent-instance	/req/metadata-core /req/common-classes-instance /req/gml-wrapper	/req/geospatial-extent-instance/validation[c]
			/req/geospatial-extent-instance/value-required If an EX_Extent element is instantiated, then a value for either "description", "geographic-Element", "temporalElement" or "verticalElement" SHALL be present.
			/req/geospatial-extent-instance/vertical-crs If an EX_VerticalExtent element is instantiated, then a value for either verticalCRSid or verticalCRS SHALL be present.
/gmw/1.0	/req/gml-wrapper	/req/metadata-core http://standards.iso.org/iso/19139/spec#9.4; http://standards.iso.org/iso/19139/spec#9.5; http://standards.iso.org/iso/19139/spec#9.6	/req/gml-wrapper/implementation Property types implemented by GML (ISO 19136) SHALL be implemented as property types as specified in ISO/TS 19139:2007.
			/req/gml-wrapper/validation

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

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

[c] Validation requirements are all the same. Each module has a validation requirement that reflects the validation requirement of the core requirements, and is associated with a conformance class that defines the XML schema and Schematron rule set used to test validation.

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Table 8 *(continued)*

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Requirements[b]
/lan/1.0	/req/language-localisation-instance	http://standards.iso.org/iso/19139/spec#7.3 /req/metadata-core /req/citation-instance	/req/language-localisation-instance/validation[c]
			Recommendations: Codelist values for LanguageCode should be from the ISO 639-2 list. Codelist values for CountryCode should be from the ISO 3166-1 list. Codelist values for CharacterSetCode should be from the IANA character set register (http://www.iana.org/assignments/character-sets).
/mac/1.0	/req/acquisition-instance	/req/metadata-core /req/gml-wrapper	/req/acquisition-instance/validation
/mas/1.0	/req/application-schema-instance	/req/metadata-core /req/common-classes-instance/req/citation-instance	/req/application-instance/validation
/mcc/1.0	/req/common-classes-instance	/req/metadata-core	/req/common-classes-instance/validation[c]
/mco/1.0	/req/constraints-instance	/req/metadata-core /req/common-classes-instance/req/citation-instance	/req/constraints-instance/validation[c]
			/req/constraints-instance/legal-constraints If a MD_LegalConstraint element is instantianted, then it SHALL have a property value for at least one of accessConstraints, useConstraints, otherConstraints, useLimitation, or releasability.
			/req/constraints-instance/other-restrictions A value may be provided for the otherConstraints property ONLY if the code value of an accessConstraints or useConstraints property is equal to "otherRestrictions".
			/req/constraints-instance/releasability If a MD_Releasability element is instantiated, then it SHALL have a property value for at least one of "addressee" or "statement".

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Table 8 *(continued)*

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Requirements[b]
/mdb/1.0	/req/metadata-base-instance	/req/metadata-core /req/common-classes-instance/req/language-localisation-instance	/req/metadata-base-instance/validation[c]
			/req/metadata-base-instance/ root-element A metadata element conforming to this document SHALL have mdb:MD_Metadata as its root element.
			/req/metadata-base-instance/identification A metadata instance SHALL have an identification element that is in the XML substitution group for abstract mcc:_ResourceDescription.
			/req/metadata-base-instance/language If the language of the metadata content is not the defined default value (English, see 8.3), then a value shall be provided for "defaultLocale.PT_Locale.language" property consistent with the language content of the metadata instance.
			/req/metadata-base-instance/ character-encoding If the character encoding of the metadata content is not the defined default value (UTF-8, see 8.3), then a value shall be provided for defaultLocale.PT_Locale.character-Encoding property consistent with the character encoding of the metadata instance.
			/req/metadata-base-instance/ metadata-scope-name If a MD_MetadataScope element is present, the name property SHALL have a value if resource-Scope is not equal to "dataset".

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Table 8 *(continued)*

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Requirements[b]
/mex/1.0	/req/metadata-extension-instance	/req/metadata-core /req/common-classes-instance/req/citation-instance	/req/metadata-extension-instance/validation[c]
			/req/metadata-extension-instance/cardinality Values for the obligation, maximumOccurrence and domainValue properties in instances of MD_Extended-ElementInformation SHALL be provided, EXCEPT when the dataType property code value is one of (codelist, enumeration, codelistElement).
			/req/metadata-extension-instance/conditional-condition A value for the condition property SHALL be provided when the code value of the obligation property is equal to "conditional".
			/req/metadata-extension-instance/code-mandatory If the code value of the 'dataType' property is one of (codelist, enumeration, codelistElement), then a value SHALL be provided for the "code" property.
			/req/metadata-extension-instance/conceptname-mandatory If the code value of the dataType property is one of (codelist, enumeration, codelistElement), then a value SHALL be provided for the conceptName property.
			/req/metadata-extension-instance/name-proscribed If the code value of the dataType property is one of (codelist, enumeration, codelistElement) the name property shall be a nil value with a nilReason = "notApplicable" attribute value.
/mmi/1.0	/req/maintenance-information-instance	/req/metadata-core	/req/maintenance-information-instance/validation[c]
			/req/maintenance-information-instance/frequency: If a MD_MaintenanceInformation element is instantiated, then a value for either the maintenanceAndUpdateFrequency or userDefinedMaintenanceFrequency property shall be present.

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Table 8 *(continued)*

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Requirements[b]
/mpc/1.0	/req/portrayal-catalogue-instance	/req/metadata-core /req/common-classes-instance/req/citation-instance	/req/portrayal-catalogue-instance/validation[c]
/mrc/1.0	/req/resource-content-instance	/req/metadata-core /req/common-classes-instance/req/citation-instance/req/language-localisation-instance/req/gml-wrapper	/req/resource-content-instance/validation[c]
			/req/resource-content-instance/feature-catalogue If a MD_FeatureCatalogueDescription is instantiated, then either the value for includedWithDataset SHALL be "true", or a well formed and valid MD_FeatureCatalogue instance SHALL be included in the metadata record, or a value SHALL be provided for the "MD_FeatureCatalogueDescription. feature-CatalogueCitation" property.
			/req/resource-content-instance/inline-feature-catalogue If a MD_FeatureCatalogue instance is included with inline "featureCatalogue" property content, the namespace for the XML schema that implements an ISO 19110 feature catalogue shall be declared in the instance document. A valid xsi:schemaLocation SHOULD be provided that will retrieve an xml schema to validate the feature catalogue instance.
			/req/resource-content-instance/dimension-units If a MD_SampleDimension element is instantiated and at least one of the "maxValue", "minValue", or "meanValue" properties has a value, then a value SHALL be provided for the "units" property.
			/req/resource-content-instance/band-dimension-units If a MD_Band element is instantiated, then the value of the "units" property SHALL be a unit of length.

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

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Table 8 *(continued)*

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Requirements[b]
/mrd/1.0	/req/resource-distribution-instance	/req/metadata-core /req/common-classes-instance/req/citation-instance	/req/resource-distribution-instance/validation[c]
			/req/resource-distribution/medium-density If a MD_Medium element is instantiated and a value for the "density" property is present, then a value for the 'densityUnits' property SHALL be provided.
/mri/1.0	/req/resource-identification-instance	/req/metadata-core /req/common-classes-instance/req/citation-instance/req/geospatial-extent-instance/req/gml-wrapper	/req/resource-identification-instance/validation[c]
			/req/resource-identification-instance/title A resource identification instance SHALL provide a "title" property value that is a character string.
			/req/resource-identification-instance/abstract A resource identification instance SHALL provide an "abstract" property value that is a character string.
			/req/resource-identification-instance/topic-category If no value for the MD_Metadata.metadata-Scope property is provided, or if the value of MD_Metadata.metadataScope.MD_Metadata-Scope.ResourceScope property is equal to "dataset" or equal to "series", then a value for topicCategory SHALL be provided.
			/req/resource-identification-instance/associated-resource If a MD_AssociatedResource element is instantiated, then a value for either the "name" or "metadataReference" property SHALL be provided.
			Recommendation: If the resource described by a metadata instance contains textual information, then a value should be provided for MD_DataIdentification defaultLocale.

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