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Geographic information — Metadata

Part 3: XML schema implementation for fundamental concepts

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National foreword

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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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.

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.

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://

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.

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.

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.

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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[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.

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.characterEncoding 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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[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.

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.

[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.

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.

[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.

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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[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.

Table 8 *(continued)*

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Requirements[b]
/mrl/1.0	/req/lineage-instance	/req/metadata-core /req/common-classes-instance/req/citation-instance/req/gml-wrapper	/req/lineage-instance/validation[c]
			/req/lineage-instance/lineage-content If a LI_Lineage element is instantiated and no value is provided for the LI_Lineage.statement property, then at least one of "processStep" or "source" SHALL have a value.
			/req/lineage-instance/source If an LI_Source element is instantiated, then either the "description" or "scope" property SHALL have a value.
/mrs/1.0	/req/reference-system-instance	/req/metadata-core /req/common-classes-instance	/req/reference-system-instance/validation[c]
/msr/1.0	/req/spatial-representation-instance	/req/metadata-core /req/common-classes-instance/req/citation-instance/req/gml-wrapper	/req/spatial-representation-instance/validation
			Recommendation: If the "checkPointAvailability" property has a value of "true" (1), then a value should be provided for the 'checkPointDescription' property.
/srv/2.0	/req/service-metadata-instance	/req/metadata-core /req/common-classes-instance/req/citation-instance /req/resource-identification-instance/ req/resource-distribution-instance	/req/service-metadata-instance/validation[c]
			/req/service-metadata-instance/ chain-or-operation A SV_ServiceIdentification instance SHALL have a value for either the "containsChain" or the "containsOperation" property.
			/req/service-metadata-instance/ coupled-resource-exists If the "coupledResource" property has a value, then the "couplingType" property SHALL have a value.
			/req/service-metadata-instance/ operated-or-operates-on A SV_ServiceIdentification instance SHALL NOT contain values for both the "operatesOn" and "operatedDataset" properties.

[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.

Table 8 *(continued)*

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Requirements[b]
			/req/service-metadata-instance/ coupled-resource-defined If a SV_CoupledResource element is instantiated, then either the "resourceReference" or the "resource" property SHALL have a value.
			/req/service-metadata-instance/ coupled-resource-linkage A SV_CoupledResource instance SHALL NOT contain values for both the "resource" and "resourceReference" properties.
			Recommendation: If the value of MD_Metadata.metadataScope. -MD_MetadataScope.resourceScope property is equal to "service", then one instance of MD_Keyword should have a "keyword" property value that is a term from the service taxonomy defined in ISO 19119.

[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.

6.6 Requirements for metadata interchange documents

In order to foster metadata interoperability, this document defines conformance classes for 6 metadata instance document types that implement progressively more capability for describing resources and their relationships (see Table 9). The simplest is the Minimal-Metadata-Instance requirements class, which defines a metadata document that uses elements in namespaces defined by this document that are required to meet the minimum mandatory content requirements specified by the ISO 19115-1 model for dataset metadata.

The metadata for data or services requirements class defines a document type that uses namespace modules defined in this document to implement all properties defined for a metadata record specified by ISO 19115-1 and ISO 19115-2 models, excluding type extensions (gcx) and metadata extensions (mex). This document type enables a complete metadata record describing any type of geospatial resource or service, including the acquisition information defined in ISO 19115-2.

The metadata with extended types requirements class specifies a document type that extends the metadata for data or services requirements by allowing substitutions for character strings from the geospatial common extension (gcx) namespace (originally defined by ISO/TS 19139).

The metadata with extended content requirements class specifies a document type that extends the metadata for data or services requirements by allowing both substitutions for character strings from the geospatial common extension (gcx) namespace, and for extensions of the metadata scheme defined by ISO 19115-1 and ISO 19115-2 using the metadata extension namespace and procedure defined in ISO 19115-1:2014, 6.5.12. User profiles and extensions are described for metadata in ISO 19115-1:2014, Annex C, with rules related to the proper analysis of the requirement for the extension and the resulting documentation to describe the extension. Rules specifying requirements for implementation of different types of extension described in ISO 19115-1:2014, C.2 are enumerated in ISO/TS 19139:2007, A.3 and A.4. Those rules have been used to define requirements listed in Table 9.

The metadata application instance requirements class specifies a document type that implements the metadata application model defined in ISO 19115-1:2014, 6.2. This model is designed to support metadata that describes hierarchical data aggregations or collections by defining several classes to represent various kinds of aggregations, all subtyped from an abstract DS_Resource class. The conceptual model specifies a bi-directional association between DS_Resource and the Metadata Information::MD_Metadata element. Implementation of the bi-directional association makes modularization of the metadata model impossible because of circular dependencies it introduces. This document, thus, only implements the association from DS_Resource to MD_Metadata, but not the reverse association from MD_Metadata to DS_Resource. This is based on the analysis that in actual applications, the desired scenario is to link from a resource to the metadata describing the resource, and that the associatedResource property on MD_Identification can be used to implement linkage from a metadata record to described resource instances when necessary.

The metadata for data transfer instance requirements class specifies a document type that implements the metadata for data transfer model defined in ISO/TS 19139. This model is implemented in this document for compatibility with ISO 19115-1. It provides a catalogue (defined in the cat namespace) that lists the contents of a dataset aggregation described by a metadata record, and allows supporting files to be associated with the aggregate or with component datasets.

Table 9 — Requirements classes for document types used for metadata interchange and related information

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Requirements[b]
/mdb/1.0	/req/metadata-minimal-instance	/req/metadata-base-instance/req/resource-identification-instance /req/citation-instance Conditional: /req/geospatial-extent-instance	/req/metadata-minimal-instance/validation A minimal metadata XML instance document SHALL be well formed and valid.
			/req/ metadata-minimal-instance/ resource-identification A metadata instance document conforming to this document SHALL have a concrete element that provides the MD_Metadata.dataIdentification property value that is either mri:MD_DataIdentification or srv:SV_ServiceIdentification.
			/req/metadata-minimal-instance/ dataset-extent If no value for the MD_Metadata.metadataScope property is provided, or if the value of MD_Metadata.metadataScope.MD_ Metadat-Scope.resourceScope property is equal to “dataset”, then a resource identification instance SHALL provide at least one “extent” property value that is either an EX_GeographicBoundingBox or an EX_GeographicDescription.
			/req/metadata-minimal-instance/ allowed-namespaces A minimal metadata XML instance document SHALL include inline elements to instantiate abstract property value data types that are defined in the cit and mri namespaces, and conditionally, in the srv or gex namespaces.
			/req/metadata-minimal-instance/ metadata-creation-date A “dateInfo” property value with date type = “creation” SHALL be present in every MD_Metadata instance.

[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.

Table 9 *(continued)*

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Requirements[b]
/mds/1.0	/req/metadata-data-or-service-instance	/req/metadata-minimal-instance, /req/application-schema-instance, /req/constraint-instance, /req/lineage-instance, /req/geospatial-extent-instance, /req/resource-content-instance, /req/resource-distribution-instance, /req/maintenance-information-instance, /req/portrayal-catalogue-instance, /req/reference-system-instance, /req/service-metadata-instance, /req/spatial-representation-instance	/req/metadata-data-or-service-instance/validation A metadata XML instance document SHALL be well formed and valid.
			/req/metadata-data-or-service-instance/allowed-namespace A data or service XML instance document element SHALL only contain elements that are defined in one of these namespaces: mdb, mcc, cit, lan, mri, gco, mas, mco, mrl, gex, mrc, mrd, mpc, mrs, msr, or srv, or a namespace that implements one of the abstract base classes from dqc or fcc namespaces in the implementation of ISO 19157 or ISO 19110.
/md1/1.0	/req/metadata-extended-types-instance	/req/metadata-data-or-service-instance	/req/metadata-extended-types-instance/validation A metadata extended types XML instance document SHALL be well formed and valid.

[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.

Table 9 *(continued)*

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Requirements[b]
/md2/1.0	/req/metadata-extension-instance	/req/metadata-extended-types-instance	/req/extended-metadata-instance/validation If a XML instance document contains metadata XML elements that are children of MD_Metadata and are not defined in this document, then the document SHALL define the schema location for the namespace that includes the extension elements such that the document can be tested to determine that is it well formed and valid.
			/req/extended-metadata-instance/extension-information If a XML instance document contains metadata XML elements that are children of MD_Metadata and are not defined in this document, then the document SHALL include at least one MD_MetadataExtensionInformation element from the http://standards.iso.org/iso/19115/-3/mex/1.0 namespace that is well formed and valid that documents the extension elements.
			/req/extended-metadata-instance/new-section Any new metadata sections, elements, or entities SHALL be added in their own namespace following the encoding rules described in ISO/TS 19139:2007, Clause 8.
			/req/extended-metadata-instance/new-codelist New codelists SHALL be implemented by following the encoding rules described in ISO/TS 19139:2007, 8.5.5.
			/req/extended-metadata-instance/new-element New metadata elements SHALL be added via sub-classing existing ISO geographic information standards classes following the guidelines in ISO/TS 19139;2007, 8.5.3 for encoding sub-classes.

[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.

Table 9 *(continued)*

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Requirements[b]
			/req/extended-metadata-instance/iso-type The XML class type (XCT) of any new metadata element SHALL include a mandatory XML attribute named isoType that is expected to contain the name of the ISO class it derives from directly or indirectly. The namespace for the isoType attribute will be the same as the namespace of the new metadata element.
			/req/extended-metadata-instance/extension-by-restriction Restriction of XML element or attribute cardinality or domain defined in this document SHALL be enforced via a tool other than an XML Schema validator.
			Recommendation: New codelist elements (expanding a codelist) SHOULD be added in the codelist registry as described in ISO/TS 19139:2007, 9.8.7.
/mda/1.0	/req/metadata-application-instance	/req/metadata-extension-instance	/req/metadata-application-instance/validation A metadata XML instance document SHALL be well formed and valid.
			/req/metadata-application-instance/root-element A metadata aggregate conforming to this document SHALL have as its root element an element in the substitution group for mda:DS_Aggregate.
/mdt/1.0	/req/data-transfer-instance	/req/metadata-application-instance /req/catalogue-instance	/req/data-transfer-instance/validation A metadata XML instance document SHALL be well formed and valid.

[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.

Table 10 summarizes the elements defined by ISO 19115-1 to be mandatory in every metadata instance document that does not describe a service.

Table 10 — Summary of mandatory elements for the minimal instance document conformance class as defined by ISO 19115-1

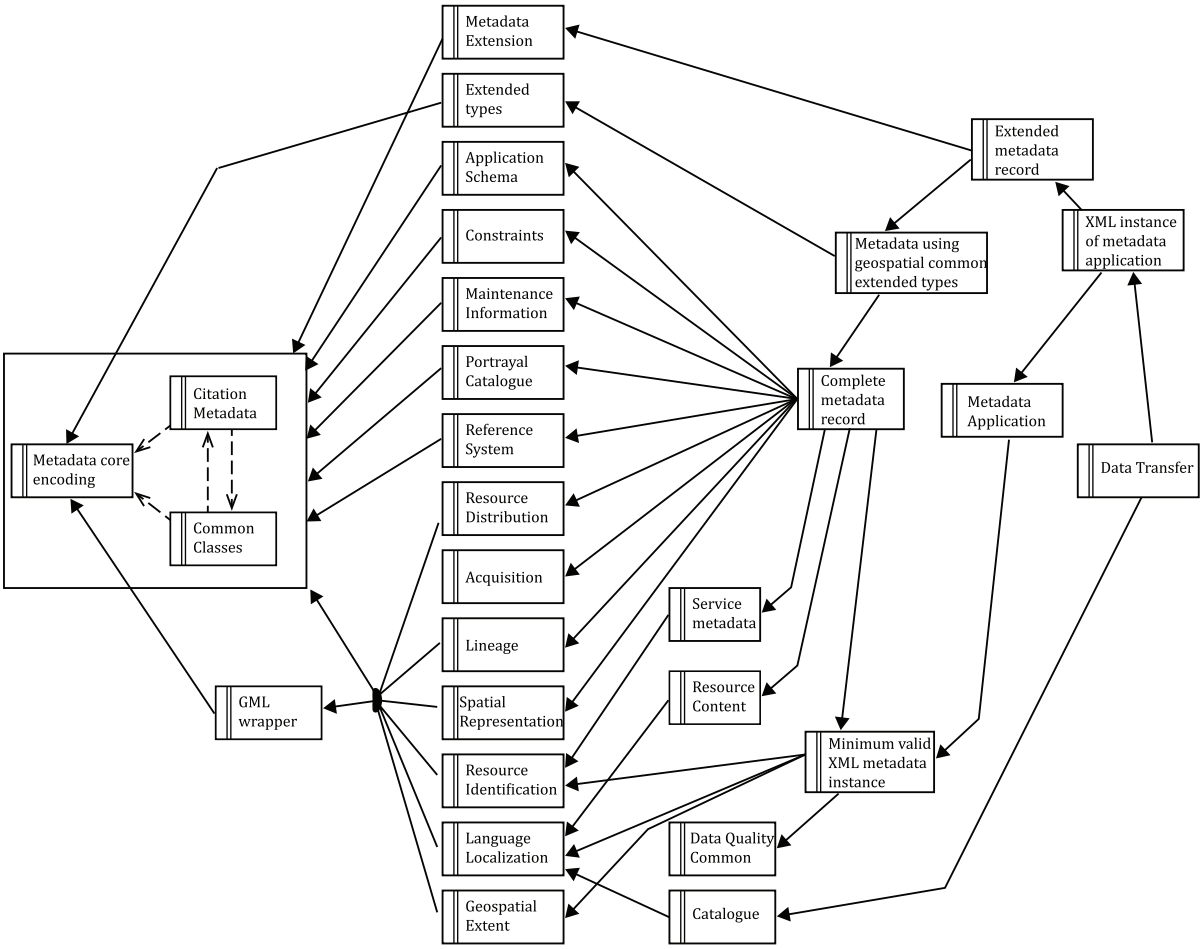
Required XML namespace	Container class	Dependency path
Metadata entity (mdb)	MD_Metadata	root class for metadata record, contains MD_Metadata element.
Metadata common classes (mcc)	MD_Metadata	Definition of abstract classes necessary to construct XML schema according to implementation rule in 8.2. Data types required for properties on various mandatory elements: _ResourceDescription, _Extent, _TypedDate, and _Responsibility. These classes do not appear in instance documents, but the namespace schema shall be imported to validate documents.
Metadata common classes (mcc)	MD_Metadata-Scope	Definition of shared class necessary to construct XML schema according to ISO/TS 19139 implementation rules. MD_MetadataScope.resourceScope.MD_ScopeCode.
Language localization (lan)	MD_Metadata	Optional property MD_Metadata .defaultLocale. PT_Locale; Namespace schema shall be imported to validate documents.
Citation (cit)	MD_Metadata	Mandatory property: MD_Metadata.contact.CI_Responsibility; import is required to provide concrete element to substitute for mcc:_Responsibility.
Metadata for resource identification (mri) or service metadata (srv)	MD_Metadata	Mandatory property: MD_Metadata.identificationInfo. -MD_Identification.abstract; the abstract _ResourceDescription.MD_Identification may be implemented by mri:MD_DataIdentification or srv:SV_ServiceIdentification.
Citation (cit)	MD_Identification	Mandatory property: MD_Identification.citation.CI_Citation.title; import is required to provide concrete element to substitute for mcc:_Citation.
Geographic common (gco)	MD_Identification, CI_Citation	Data type for various mandatory properties: CharacterString
Geographic common (gco)	CI_Date	Data type for mandatory property: date.DateTime
Geospatial extent (gex)	MD_Identification	If no value for the MD_Metadata.metadataScope property is provided, or if the value of MD_Metadata.metadataScope. -MD_MetadataScope.resourceScope property is equal to ”dataset”, then a MD_Identification instance SHALL provide at least one “extent”property value that is either an EX_GeographicBoundingBox or an EX_GeographicDescription.
Geographic common (gco)	SV_Service-Identification	If MD_Identification is implemented by srv:SV_ServiceIdentification, then serviceType.GenericName is mandatory.
NOTE The required XML namespace column indicates a namespace required to implement the conformance class. The container class column indicates a class in the package that introduces a dependency. The dependency path column is an explanation of the path to a required element from a namespace that shall be imported.		

6.7 Requirements dependency diagrams

Figure 1 shows dependencies between requirements classes for XML documents that instantiate elements from the namespaces defined in this document. The dependencies between requirements classes in the implementation model indicate that a dependent class (the source of the association) inherits all requirements from the class that is the target of the dependency relationship (the arrow points to the target class). Thus all requirements classes inherit the core requirements.

Each of these requirements classes is associated with a conformance class that defines tests to determine that instance documents meet requirements specified. Note the addition of requirements classes that specify metadata records incorporating all the optional metadata content modules (full metadata record instance), the geospatial common extended types from ISO/TS 19139 (metadata with geospatial common extended types), and extensions to the metadata content model following the

provisions of ISO 19115-1 and ISO/TS 19139 (extended content metadata instance). These requirements classes do not require implementation of any new metadata elements. Conformance classes for these requirements classes are implemented via XML schemas that have the same MD_Metadata root element, and import the necessary XML schema defined in the metadata module conformance classes (and external schema in some cases). The namespace URIs associated with these requirements classes are simply used as target namespace attribute values in the schema and instance documents to indicate conformance to that requirements class. The URI schema locations point to the XML schema used to validate conformance with a particular conformance class.



NOTE Arrows in the diagram imply that the requirements for a class at the source end of the arrow include all requirements included in the class at the target end of the arrow.

Figure 1 — Dependencies between encoding requirements classes

7 Extensions to the UML models in the ISO geographic information series of International Standards for this schema

This implementation includes the model extensions defined in ISO/TS 19139 for web environment (geospatial common extended types), cultural and linguistic adaptability, and catalogues. Because some of the ISO/TS 19139 extensions import elements from the http://www.isotc211.org/2005/gmd namespace, new XML implementations of these extensions are included in this document for compatibility. These new implementations are bundled in the language (lan), metadata common extension (gcx), and catalogue (cat) namespaces. The implementation model also includes a package of abstract classes used to implement optional class property types (see 8.2), and packages for the aggregating namespaces listed in A.2.3.

8 Encoding approach and rules

8.1 UML packages and XML namespaces

The procedure used to encode concepts from ISO 19115 into XML, described in ISO/TS 19139, combined concepts from many UML packages into a single XML namespace (gmd). This approach simplified the resulting XML instance documents, but made it difficult to independently reuse concepts from specific UML packages. An important goal of this document is to define relationships between UML packages and XML namespaces in a way that facilitates modularization and reuse. Rules controlling the relationship between packages and namespaces used in this document are the following:

a) the XML implementation will include a minimum of one namespace per UML package in the conceptual model, i.e. multiple UML packages should not be combined into single namespaces;

b) UML packages can be split into multiple namespaces if necessary to ease the implementation and management of the life-cycles of various components;

c) exceptions to Rule 1 may be required to minimize dependencies between namespaces, and eliminate circular dependencies.

8.2 UML model for XML implementation

ISO 19115-1 defines a number of UML packages and relationships between them. These relationships result in dependencies between packages that make it impossible to reuse them without including the entire model. In order to facilitate modularization and automated schema generation, an XML-specific implementation layer was added to the UML model without affecting the semantics. This layer includes abstract classes that allow decoupling of model packages, addition of tagged values and stereotypes required by the UML to XML transformation software, and refactoring of some model element packages where required to eliminate circular dependencies between XML namespaces. Abstract classes have also been created to define substitution groups for classes that are or might be used by XML implementations of other ISO models. Abstract classes for linkage between namespaces are all packaged in a single package. The modified UML model is called an implementation model, and the XML schema was generated automatically from this implementation model according to rules defined in ISO 19118 and ISO/TS 19139.

8.3 Implementation approach for decoupling XML packages

8.3.1 General

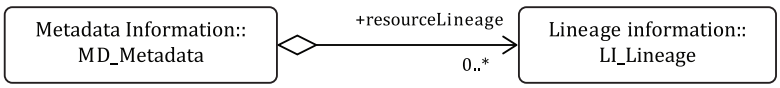
The implementation approach uses abstract classes in property values that require elements from imported namespaces. Interchange documents import the base scheme, the abstract class package (which does not change between versions) and the schema that implements a concrete element in the substitution group for an abstract element. New versions of a particular namespace can derive new element definitions from that abstract class, allowing the new model to be used by importing the new namespace in instance documents. This requires no modification to the implementation of the base schema. This approach is explained in more detail in this subclause.

Associations between UML classes may be modelled as attribute values or association ends. The implementation approach defined here is required in cases where an optional attribute or association has a property type that is a class from a different package than the containing element. XML instance documents need to validate with or without importing the namespace that implements the optional property type class. This is accomplished by using an abstract class for the property value type in the schema for the parent element (MD_Metadata in Figure 2) and a concrete substitute for that abstract class in the schema for the child (LI_Lineage in Figure 2) that provides the actual implementation of the property value class.

The pattern is illustrated in more detail in Figure 3; XML implementation is shown in examples 1, 2, and 3. The MD_Metadata class is included in the metadata base (mdb) namespace, which imports

the abstract _LineageInformation class from the Metadata for common classes (mcc) namespace. The mcc namespace is included in all conformance classes. The concrete implementation of the _LineageInformation class is the LI_Lineage class defined in the metadata for resource lineage (mrl) namespace. Conforming instance documents do not need to import the mrl namespace unless they actually include lineage information. Metadata for resource lineage (mrl) namespace does not need to import the metadata base (mdb) namespace to validate, allowing it to be used as a standalone module in other application schema that wish to associate provenance with some model element.

EXAMPLE 1 Association from base metadata class to abstract property type. In the base class namespace (mdb), define the base metadata element that has optional property to various metadata detail classes (see Figure 2). The base class imports the namespace that contains the shared abstract element definitions.



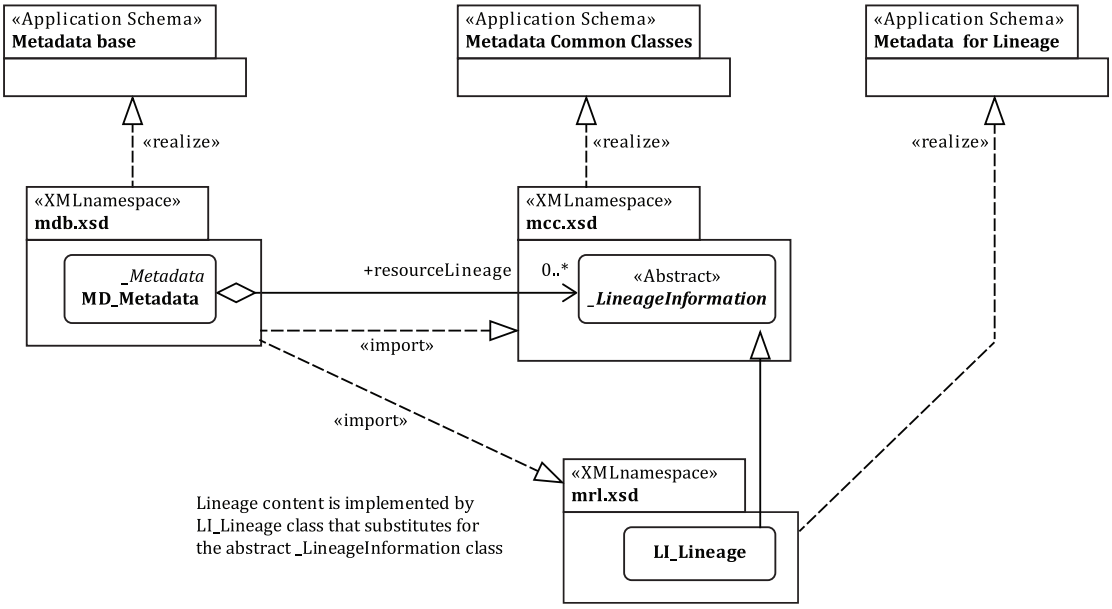
NOTE Package names are the prefix names followed by "::" in the diagram. The metadata information package only requires the lineage information package in cases for which a LI_Lineage instance will be populated.

Figure 2 — Example of an optional property with a data type class that is defined in a package different from the property container class

```
<import namespace="http://standards.iso.org/iso/19115/-3/mcc/1.0/"
    =http://standards.iso.org/iso/19115/-3/mcc/1.0/
    schemaLocation="../../mcc/1.0/mcc.xsd"/>
<!-- schema elements omitted -->
<!-- root entity which defines metadata about a resource or resources  -->
<element name="MD_Metadata" substitutionGroup="gco:AbstractObject"
    type="mdb:MD_Metadata_Type"/>
<!-- type definition for root element, complex content is a sequence of properties -->
<complexType name="MD_Metadata_Type">
  <complexContent>
    <extension base="gco:AbstractObject_Type">
      <sequence>
        <!-- elements omitted… -->
         <element maxOccurs="unbounded" minOccurs="0" name="resourceLineage"
              type= "mcc:Abstract_LineageInformation_PropertyType"/>
         <!-- type for resourceLineage is an abstract class from mcc -->
       <!-- elements omitted… -->
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

EXAMPLE 2 Definition of abstract element in abstract classes package (mcc); this package is the nexus for using modularized packages. The abstract elements have no content.

The XML class global element corresponding to the class (LI_Lineage) that is the property type for the optional attribute (resourceLineage) in the base class (see Figure 3).



NOTE An abstract class is implemented in the metadata common classes namespace, and used as the target of the optional property. In order to instantiate the property in an XML instance, the namespace that contains a concrete class in the substitution group for the abstract class shall be imported (mrl.xsd in this diagram).

Figure 3 — Implementation pattern for optional properties with a data type class in a different package

```
<element abstract="true" name="Abstract_LineageInformation"
    substitutionGroup="gco:AbstractObject" type="mcc:Abstract_LineageInformation_Type"/>
```

The XML Class Type for the abstract class:

```
<complexType abstract="true" name="Abstract_LineageInformation_Type">
  <complexContent>
    <extension base="gco:AbstractObject_Type">
      <sequence/>  <!-- no content -->
    </extension>
  </complexContent>
</complexType>
```

Standard XML Class Property Type encoding for abstract class property type:

```
<complexType name="Abstract_LineageInformation_PropertyType">
  <sequence minOccurs="0">
    <element ref="mcc:Abstract_LineageInformation"/>
  </sequence>
  <attributeGroup ref="gco:ObjectReference"/>
  <attribute ref="gco:nilReason"/>
</complexType>
```

EXAMPLE 3 Definition of the concrete class in the substitution group for the abstract class, in a separate namespace (mrl).

```
<element name="LI_Lineage" substitutionGroup="mcc:Abstract_LineageInformation"
     type="mrl:LI_Lineage_Type"/>
<!-- the complex type extends the type for the abstract class -->
<complexType name="LI_Lineage_Type">
  <complexContent>
    <extension base="mcc:Abstract_LineageInformation_Type">
      <sequence>
        <!--definition of elements in concrete instance…  -->
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

A metadata implementation that will use the LI_Lineage element shall import the mrl namespace.

8.3.2 Implementation approach to decouple optional classes

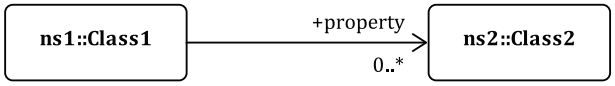
The UML model for XML implementation uses the following pattern for classes that are the data type for property values: when the property value type is a class that is implemented in the same UML package as the owning class, no change is made. When a property value type is a class that is implemented in a different UML package also in this document (abstract pattern shown in Figure 4), the namespaces are decoupled by introducing an abstract class in the abstract classes package in the implementation UML model. The concrete class that realizes the abstract class is defined in the package for the implementation namespace, as a specialization of the abstract class, creating a dependency between the implementation package containing the class and the abstract classes package. This UML pattern is then implemented using ISO/TS 19139:2007, 8.5.2 encoding rules for abstract classes. Introduction of the abstract class does not change the semantics of the model being implemented, but allows for definition of new versions of the concrete implementing class without impacting the schema that uses the abstract class. Table 6 is a list of the ISO 19115-1 classes in this document's UML for XML implementation that use this pattern.

The following list details the steps for encoding and abstract class to allow decoupling of XML namespace schema.

a) An abstract class and property type are defined in the abstract common classes XML namespace package, which is identifier here by the namespace abbreviation "acn". This namespace defines all abstract classes that are used to link modules that are intended for standalone use. Note that the abstract class package is introduced in the implementation UML model, and is purely an implementation artefact. XML instance documents will never contain elements from this package.

EXAMPLE 1 Step a) defines an abstract class (named acn:AbstractClass2 in this example) following ISO/TS 19139:2007, 8.5.2.

```
<schema xmlns:acn=http://standards.iso.org/iso/19115/-3/acn/1.0
... />
  <element abstract="true" name="AbstractClass2"
    substitutionGroup="gco:AbstractObject" type="acn:AbstractClass2_Type"/>
  <complexType abstract="true" name="AbstractClass2_Type">
    <complexContent>
      <extension base="gco:AbstractObject_Type">
        <sequence/>  <!-- no content -->
      </extension>
    </complexContent>
  </complexType>
```



NOTE Properties inside of Class 2 are not shown.

Figure 4 — Example of optional property that has a class property type

EXAMPLE 2 Step a) implementation of a property type with a value specified by the abstract class from example 1 following ISO/TS 19139:2007, 8.5.2.

```
<complexType name=" AbstractClass2_PropertyType">
  <sequence minOccurs="0">
    <element ref=" acn:AbstractClass2"/>
  </sequence>
  <attributeGroup ref="gco:ObjectReference"/>
  <attribute ref="gco:nilReason"/>
</complexType>
```

b) Another namespace (identified with the abbreviation “ns1” in example 3) contains a class that has an optional property (cardinality 0..1 or 0..*) that is specified by the abstract class defined above. The XML namespace implementing this class shall import the namespace that contains the shared abstract element definitions [abbreviation “can” (see examples 1 and 2, above)].

EXAMPLE 3 Step b) implementation of XML schema for a namespace (“ns1”) that defines a class (Class1) with a property that has a data type specified by the abstract class from examples 1 and 2.

```
<schema xmlns:ns1=http://standards.iso.org/iso/19115/-3/ns1/1.0
    .../>
```

Import the abstract-classes xml namespace:

```
<import namespace="http://standards.iso.org/iso/19115/-3/acn/1.0/"
    schemaLocation="../../acn/1.0/acn.xsd"/>
 <!-- root entity -->
  <element name="Class1" substitutionGroup= "gco:AbstractObject"
    type= "ns1:Class1_Type">
  </element>
```

The class type definition for Class1, with a property (named “property”) whose value is specified by AbstractClass2 property type:

```
<complexType name="Class1_Type">
  <complexContent>
    <extension base="gco:AbstractObject_Type">
      <sequence>
             (….)
        <element maxOccurs="unbounded" minOccurs="0" name="property"
             type= "acn:AbstractClass2_PropertyType "/>
             (….)
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

c) A third namespace (identified by the abbreviation “ns2”) defines a concrete XML element (Class2, Figure 4) that is a member of the substitution group for the abstract class (AbstractClass2). XML instances of Class1 shall import both the “acn” and a namespace that includes a concrete class that

substitutes for AbstractClass2 (for example, Class2 in example 3) in order to provide instances of the "property" property (see Figure 4).

EXAMPLE 4 Step c) implementation of XML schema for a namespace ("ns2") that defines a concrete class (Class2) in the substitution group for AbstractClass2.

```
<element name="Class2" substitutionGroup="acn:AbstractClass2"
 type="ns2:Class2_Type"/>
  <!-- the complex type extends the type for the abstract class -->
    <complexType name="Class2_Type">
      <complexContent>
        <extension base="acn:AbstractClass2_Type">
          <sequence>
            <!--definition of elements in concrete instance…  -->
          </sequence>
        </extension>
      </complexContent>
    </complexType>
```

8.4 XML encoding rules

The namespace http://standards.iso.org/iso/19115/-3/mcc/1.0 includes elements that implement abstract classes necessary for encoding optional class property types defined in ISO 19115-1 according to the implementation rule in Clause 8. Table 11 summarizes the required classes.

ISO/TS 19139:2007, Clauses 7 to 9 describe the details of encoding the UML conceptual schema into a set of XML schemas. The XML schema implementation for this document follows the rules and patterns described in those clauses, applying them to the UML model for XML implementation. One additional rule was required in order to support the implementation model described in 8.2 and to improve modularization of the XML schema implementation. Table 12 lists the encoding rules used for each UML class.

Table 11 — Summary of properties implemented with an abstract element as their data type

Abstract class	Namespace defining concrete implementation
_AcquisitionInformation	Metadata for acquisition
_ApplicationSchemaInformation	Metadata for application schema
_Citation	Citation
_Constraints	Metadata for constraints
_ContentInformation	Metadata for resource content
_DataQuality	ISO 19157
_Distribution	Metadata for distribution
_Extent	Geospatial extent
_FeatureCatalogue	ISO 19110
_Format	Metadata for distribution
_LineageInformation	Metadata for lineage
_MaintenanceInformation	Metadata for maintenance information
_Metadata	Metadata base
_MetadataExtension	Metadata for metadata extension
_OnlineResource	Citation
_Platform	Metadata for acquisition
_PortrayalCatalogueInformation	Metadata for portrayal catalogue
_QualityElement	ISO 19157
_ReferenceSystem	Metadata for spatial reference system
_ResourceDescription	Metadata for resources
_Responsibility	Citation

Table 11 *(continued)*

Abstract class	Namespace defining concrete implementation
_SpatialRepresentation	Metadata for spatial representation
_SpatialResolution	Metadata for resources
_StandardOrderProcess	Citation
_TypedDate	Citation

8.5 Default values

For metadata encoding using this document, the following default values are defined:

— defaultLocale language = “en”, for both metadata and data identification;

— defaultLocale character set code = “UTF-8”, for both metadata and data identification;

— MD_Metadata.metadataScope.MD_MetadataScope.resourceScope code = “dataset”.

Table 12 — Encoding rules used to generate XML schema for this document

UML classifier	Encoding rule
GM_Object, GM_Point	http://standards.iso.org/iso/19139/spec#9.4
TM_Object, TM_Primitive and TM_PeriodDuration	http://standards.iso.org/iso/19139/spec#9.5
SC_CRS	http://standards.iso.org/iso/19139/spec#9.6
AbstractObject_Type, ObjectIdentification, ObjectReference, CodeListValue_Type, nilReason, Multiplicity, MultiplicityRange, MemberName, TypeName, CharacterString, Integer, UnlimitedInteger, Decimal, Real, Boolean, Binary_Type, GenericName, LocalName, ScopedName, Measure type and its subtypes, UnitOfMeasure type and its subtypes, Number_PropertyType, Date, DateTime, Record and RecordType	http://standards.iso.org/iso/19139/spec#9.7
Properties listed in Table 10	8.2
UML classes, attributes, and properties not explicitly assigned an encoding rule by other core-encoding requirements	http://standards.iso.org/iso/19139/spec#6 http://standards.iso.org/iso/19139/spec#7 http://standards.iso.org/iso/19139/spec#8

Annex A
(normative)

Abstract test suite

A.1 Overview

A.1.1 Conformance test tools

Various conformance tests for this document require that metadata instance (XML) documents can be validated without error against the XML schemas defined in this document. While many tools are available to test validation of XML instance documents against provided XML schemas, it is important to understand that not all validation tools implement the full W3C XML schema recommendation and not all validation tools interpret the W3C XML schema recommendation in the same manner. It is recommended that a tool that implements a strict interpretation of and full support for the W3C XML schema recommendation be used when validating XML instance documents to test conformance.

The normative XML schema and Schematron documents are available in a directory at http://standards.iso.org/iso/19115/-3/ with a directory structure described in Annex B. Annex C provides additional details about the encoding scheme, and Annex D provides two example instance documents conforming to the implementation scheme.

A.1.2 Conformance requirements — Limits of XML schema validation

Because XML schema validation is insufficient to test all of the constraints declared in ISO 19115-1, some conformance tests require other validation procedures. For instance, as stated in ISO/TS 19139:2007, 8.4, a property element following the default XML class property type (XCPT) pattern may have exactly one of inline content (by-value) that is an XML Class, an xlink:href attribute (by-reference value), or a gco:nilReason attribute (nil value). Because XML schema cannot constrain the co-occurrence of content or attributes, some mechanism in addition to XML schema validation shall be used to restrict a property to be exclusively by-value or by-reference or a nil value. As another example, XML schema validation does not support the enforcement of co-constraints such as the requirement that an "extent" in the form of an "EX_GeographicBoundingBox" or "EX_GeographicDescription" be used in the "MD_Identification" object when the "hierarchyLevel" of "MD_Metadata" is equal to "dataset".

Rules implementing these constraints are included in the appropriate requirements class for the XML document instances. This document's package includes a Schematron rule set for testing conformance with these requirements. If a tool for Schematron validation is not available, conformance to these requirements may need to be tested by inspection.

A.2 Conformance classes

A.2.1 General

Conformance classes for requirements related to XML instance documents (the conformance target) are tested by XML schema validation, the use of Schematron rule sets, and by inspection of instance documents. Conformance class requirements and tests are presented in Tables A.1 through A.9.

A.2.2 Base conformance class

This conformance class tests for conformance with the metadata core property-encoding requirement. Conformance target is an XML instance document.

Table A.1 — Conformance class: XML metadata core

Identifier	http://standards.iso.org/iso/19115/-3/1.0/conf/metadata-core-xml	
Requirements	http://standards.iso.org/iso/19115/-3/1.0/req/metadata-core	
Test	Identifier	/conf/metadata-core-xml/property-type-content
	Requirement	/req/metadata-core/property-type-content
	Test purpose	Verify that property values have consistent content as defined in the requirement.
	Test method	Verify that document validates with Schematron rule set metadata-core.sch.
	Test type	Conformance
Test	Identifier	/conf/metadata-core-xml/instance-validation
	Requirement	/req/metadata-core/instance-validation
	Test purpose	Verify that instance documents are well formed and valid.
	Test method	Each metadata module has a module-specific validation requirement that is tested by the specified XML schema document and if necessary an associated Schematron rule document.
	Test type	Conformance
Test	Identifier	/conf/metadata-core-xml/base-data-types
	Requirement	/req/metadata-core/property-type-content
	Test purpose	Verify that base data types in instance documents are implemented according to rules set forth in ISO/TS 19139.
	Test method	XML schema associated with each metadata module shall import the gco.xsd schema; modules that utilize gml elements shall import the gmw.xsd schema. Inspect that all leaf elements with inline content are from either the gco or gml namespace.
	Test type	Conformance

A.2.3 Conformance classes for metadata modules

Table A.2 — Conformance classes for XML module instances

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Test[b]
/cit/1.0	/conf/citation-xml	/conf/metadata-core-xml /conf/common-classes-xml	Test URI: /conf/citation-xml/schema-valid; Tests: /req/citation-instance/validation. Procedure: Validate with cit.xsd[c]
			Test URI: /conf/citation-xml/schematron-rules; Tests: /req/citation-instance/individual-name, /req/citation-instance/organisation-name Procedure: Validate with cit.sch
/gcx/1.0	/conf/extended-types-xml	/conf/common-classes-xml	Test URI: /conf/extended-types-xml/schema-valid; Tests: /req/extended-types-instance/validation Procedure: Validate with gcx.xsd[c]
/gex/1.0	/conf/geospatial-extent -xml	/conf/common-classes-xml /conf/gml-wrapper-xml	Test URI: /conf/ geospatial-extent -xml/schema-valid; Tests: /req/geospatial-extent -instance/validation Procedure: Validate with gex.xsd[c]
			Test URI: /conf/geospatial-extent -xml/schematron-rules; Tests: /req/geospatial-extent-instance/value-required /req/geospatial-extent-instance/vertical-crs Procedure: Validate with gex.sch
/gmw/1.0	/conf/gml-wrapper-xml	/conf/metadata-core-xml	Test URI: /conf/gml-wrapper-xml/schema-valid; Tests: /req/gml-wrapper/implementation, /req/gml-wrapper/validation. Procedure: Validate with gmw.xsd[c]
/lan/1.0	/conf/language-localisation-xml	/conf/citation-xml	Test URI: /conf/language-localisation-xml/schema-valid; Tests: /req/language-localisation-instance/validation Procedure: Validate with lan.xsd[c]
/mac/1.0	/conf/acquisition-xml	/conf/citation-xml /conf/common-classes-xml /conf/gml-wrapper-xml	Test URI: /conf/acquisition-xml/schema-valid; Tests: /req/acquisition-instance/validation Procedure: Validate with mac.xsd[c]

Table A.2 *(continued)*

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Test[b]
/mas/1.0	/conf/application-schema-xml	/conf/citation-xml /conf/common-classes-xml	Test URI: /conf/application-schema-xml /schema-valid; Tests: /req/application-schema -instance/validation Procedure: Validate with mas.xsd[c]
/mcc/1.0	/conf/common-classes-xml	/conf/metadata-core-xml /conf/citation-xml	Test URI: /conf/common-classes-xml/schema-valid; Tests: /req/common-classes-instance/validation. Procedure: Validate with mcc.xsd[c]
/mco/1.0	/conf/constraints-xml	/conf/citation-xml /conf/common-classes-xml	Test URI: /conf/constraints-xml/ schema-valid; Tests: /req/constraints-instance/validation Procedure: Validate with mco.xsd[c]
			Test URI: /conf/constraints-xml/schematron-rules; Tests: /req/constraints-instance/ legal-constraints /req/constraints-instance/ other-restrictions /req/constraints-instance/releasability Procedure: Validate with mco.sch
/mdb/1.0	/conf/metadata-base-xml	/conf/metadata-core-xml /conf/common-classes-xml /conf/language-localisation-xml	Test URI: /conf/metadata-base- xml/schema-valid; Tests: /req/metadata-base-instance/ -validation Procedure: Validate with metadataBase.xsd[c]
			Test: /conf/metadata-base-xml/ root-element Tests: /req/metadata-base -instance/root-element Procedure: Inspect XML instance document to identify the root element
			Test URI: /conf/metadata-base -xml/identification Tests: /req/metadata-base -instance/identification Procedure: Inspection to determine that the element populating the "identification" property is defined in the substitution group for *_ResourceDescription*

Table A.2 *(continued)*

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Test[b]
			Test URI: /conf/metadata-base-xml/language Tests: /req/metadata-base-instance/language Procedure: Inspection of XML document to determine if language content is the default language (English) if no defaultLocale value is provided, or that the language content matches the language specified in the defaultLocale language property
			Test URI: /conf/metadata-base-xml/character-encoding Tests: /req/metadata-base-instance/character-encoding Procedure: Inspection of XML document to determine if character encoding is the default encoding (UTF-8) if no defaultLocale language value is provided, or that the character encoding matches the encoding specified in the defaultLocale characterEncoding property
			Test URI: /conf/metadata-base-xml/metadata-scope-name Tests: /req/ metadata-base-instance-/metadata-scope-name Procedure: Verify that document validates with Schematron rule set metadata-base.sch
/mex/1.0	/conf/metadata-extension-xml	/conf/citation-xml /conf/common-classes-xml	Test URI: /conf/metadata-extension-xml/schema-valid; Tests: /req/metadata-extension-instance/validation Procedure: Validate with mex.xsd[c]
			Test URI: /conf/metadata-extension-xml/schematron-rules; Tests: /req/metadata-extension-instance/cardinality /req/metadata-extension-instance/conditional-condition /req/metadata-extension-instance/code-mandatory /req/metadata-extension-instance/conceptname-mandatory /req/metadata-extension-instance/name-proscribed Procedure: Validate with mex.sch

Table A.2 *(continued)*

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Test[b]
/mmi/1.0	/conf/maintenance-information-xml	/conf/citation-xml /conf/common-classes-xml	Test URI: /conf/maintenance-information-xml/schema-valid; Tests: /req/ maintenance-information-instance/validation Procedure: Validate with mmi.xsd[c]
			Test URI: /conf/maintenance-information-xml/schematron-rules; Tests: /req/maintenance-information-instance/frequency Procedure: Validate with mmi.sch
/mpc/1.0	/conf/portrayal-catalogue-xml	/conf/citation-xml /conf/common-classes-xml	Test URI: /conf/portrayal-catalogue-xml/schema-valid; Tests: /req/ portrayal-catalogue-instance/validation Procedure: Validate with mpc.xsd[c]
/mrc/1.0	/conf/resource-content-xml	/conf/citation-xml /conf/common-classes-xml /conf/language-localisation-xml /conf/gml-wrapper-xml	Test URI: /conf/resource-content-xml/schema-valid; Tests: /req/resource-content-instance/validation Procedure: Validate with mrc.xsd[c]
			Test URI: /conf/resource-content-xml/schematron-rules; Tests: /req/resource-content-instance/feature-catalogue /req/resource-content-instance/inline-feature-catalogue /req/resource-content-instance/dimension-units /req/resource-content-instance/band-dimension-units Procedure: Validate with mrc.sch
/mrd/1.0	/conf/resource-distribution-xml	/conf/citation-xml /conf/common-classes-xml	Test URI: /conf/resource-distribution-xml/schema-valid; Tests: /req/resource-distribution-instance/validation Procedure: Validate with mrd.xsd[c]
			Test URI: /conf/ resource-distribution-xml/schematron-rules; Tests: /req/resource-distribution/medium-density Procedure: Validate with mrd.sch

Table A.2 *(continued)*

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Test[b]
/mri/1.0	/conf/resource-identification-xml	/conf/citation-xml /conf/common-classes-xml /conf/gml-wrapper-xml	Test URI: /conf/resource-identification-xml/schema-valid; Tests: /req/resource-identification-instance/validation Procedure: Validate with mri.xsd[c]
			Test URI: /conf/resource-identification-xml/schematron-rules; Tests: /req/resource-identification-instance/topic-category /req/resource-identification-instance/associated-resource Procedure: Validate with mri.sch
/mrl/1.0	/conf/lineage-xml	/conf/citation-xml /conf/common-classes-xml /conf/gml-wrapper-xml	Test URI: /conf/lineage-xml/schema-valid; Tests: /req/lineage-instance/validation Procedure: Validate with mrl.xsd[c]
			Test URI: /conf/lineage-xml/schematron-rules; Tests: /req/lineage-instance/lineage-content /req/lineage-instance/source Procedure: Validate with mrl.sch
/mrs/1.0	/conf/reference-system-xml	/conf/common-classes-xml	Test URI: /conf/reference-system-xml/schema-valid; Tests: /req/reference-system-instance/validation Procedure: Validate with mrs.xsd[c]
/msr/1.0	/conf/spatial-representation-xml	/conf/citation-xml /conf/common-classes-xml /conf/gml-wrapper-xml	Test URI: /conf/spatial-representation-xml/schema-valid; Tests: /req/spatial-representation-instance/validation Procedure: Validate with msr.xsd[c]

Table A.2 *(continued)*

Namespace[a]	Requirement class URI[b]	Dependencies[b]	Test[b]
/srv/2.0	/conf/service-metadata-xml	/conf/citation-xml /conf/common-classes-xml /conf/resource-distribution-xml	Test URI: /conf/service-metadata-xml/schema-valid; Tests: /req/service-metadata-instance/validation Procedure: Validate with srv.xsd[c]
			Test URI: /conf/service-metadata-xml/schematron-rules; Tests: /req/service-metadata-instance/service-keyword /req/service-metadata-instance/chain-or-operation /req/service-metadata-instance/coupled-resource-exists /req/service-metadata-instance/operated-or-operates-on /req/service-metadata-instance/coupled-resource-defined /req/service-metadata-instance/coupled-resource-linkage Procedure: Validate with srv.sch

NOTE All tests are based on validating conforming documents with the specified XML schema document and Schematron document (if one is specified). Location of normative XML schema and Schematron rule set documents is specified in B.1. Conformance target is XML instance document encoding a single metadata module.

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

[b] All requirements URIs are HTTP URIs, prefix "http://standards.iso.org/iso/19115/-3/1.0" to the paths in the table cell to get the complete URI.

[c] See discussion of validation tools in A.1.1.

A.2.4 Conformance classes for metadata interchange documents

A.2.4.1 General

The conformance classes specified in A.2.4.2 through A.2.4.8 define XML schema that import one or more metadata modules to allow implementation of metadata records for various use scenarios. Conformance target is a complete metadata XML instance document.

A.2.4.2 Conformance class: Minimal valid XML metadata instance document

The conformance class specified in Table A.3 defines a minimal metadata document conforming to ISO 19115-1. This conformance class is intended as a lightweight starting point for profiles that will selectively use other metadata modules from this document, and might use other implementations for some of the modules.

Table A.3 — Conformance class: Minimum valid XML metadata instance

Identifier	http://standards.iso.org/iso/19115/-3/1.0/conf/metadata-minimal-instance	
Requirements	http://standards.iso.org/iso/19115/-3/1.0/req/metadata-minimal-instance	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/metadata-core-xml	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/common-classes-xml	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/citation-xml	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/geospatial-extent-xml	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/resource-identification-xml	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/language-localisation-xml	
Test	Identifier	/conf/metadata-minimal-instance/validation
	Requirement	/req/metadata-minimal-instance/validation
	Test purpose	Verify that the minimal XML metadata instance document is well formed and valid
	Test method	Use an XML validation tool to determine if XML instance is valid using the XML schema mdb.xsd. See discussion of validation tools in A.1.1
	Test type	Validation
Test	Identifier	/conf/metadata-minimal-instance/schematron-rules
	Requirement	/req/metadata-minimal-instance/dataset-extent /req/metadata-minimal-instance/topic-category
	Test purpose	Verify that XML instance is conformant with additional constraints that cannot be tested by XML schema
	Test method	Verify that document validates with Schematron rule set metadata-minimal.sch
	Test type	Validation
Test	Identifier	/conf/metadata-minimal-instance/allowed-namespaces
	Requirement	/req/metadata-minimal-instance/allowed-namespaces
	Test purpose	Verify that the MD_Metadata element instance contains only child elements in the mcc, cit, lan, mri, mdq, gex, gco, or gmw namespace
	Test method	Use an XML validation tool to determine if XML instance is valid using the XML schema mdb.xsd. See discussion of validation tools in A.1.1
	Test type	Validation
	Identifier	/conf/metadata-minimal-instance/metadata-creation-date
	Requirement	/req/metadata-minimal-instance/ metadata-creation-date
Test	Test purpose	Verify that the MD_Metadata element instance specifies a creation date for the metadata record
	Test method	Verify that document validates with Schematron rule set metadata-minimal.sch
	Test type	Validation

A.2.4.3 Conformance class: Complete metadata record

The conformance class specified in Table A.4 defines a metadata record that contains all elements necessary to produce a complete metadata record as defined by ISO 19115-1, describing any type of geospatial resource or service. The intention of this class is to support standard catalogue services that do not implement metadata extensions or use the extended types defined in the geospatial common extended types namespace. By declaring conformance to this class, an application can clearly indicate that it does not support those extensions.

Table A.4 — Conformance class: Complete valid XML metadata instance

Identifier	http://standards.iso.org/iso/19115/-3/1.0/conf/metadata-data-or-service-instance	
Requirements	http://standards.iso.org/iso/19115/-3/1.0/req/metadata-data-or-service-instance	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/metadata-minimal-instance	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/application-schema-xml	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/constraint-xml	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/lineage-xml	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/geospatial-extent-xml	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/resource-content-xml	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/resource-distribution-xml	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/maintenance-information-xml	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/portrayal-catalogue-xml	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/reference-system-xml	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/service-metadata-xml	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/spatial-representation-xml	
	Identifier	/conf/metadata-data-or-service-instance/schema-valid
	Requirement	/req/metadata-data-or-service-instance/validation
Test	Test purpose	Verify that a MD_Metadata instance that includes optional properties as defined in ISO 19115-1:2014, 6.5.2, except for those in the mex name-space, will validate
	Test method	Use an XML validation tool to determine if XML instance is valid using the XML schema mds.xsd. See discussion of validation tools in A.1.1
	Test type	Validation

A.2.4.4 Conformance class: Metadata using geospatial common extended types

The conformance class specified in Table A.5 defines tests to validate metadata records that include all ISO metadata elements associated with MD_Metadata except the metadata extension namespace, and include substitutions for character strings from the geospatial common extension namespace. Applications advertising conformance to this class shall recognize and correctly interpret substitutions for character strings from the geospatial common extension namespace. Applications advertising conformance to this class shall not be expected to process extended metadata records without error.

Table A.5 — Conformance class: Valid XML metadata instance with extended types

Identifier	http://standards.iso.org/iso/19115/-3/1.0/conf/metadata-extended-types-xml	
Requirements	http://standards.iso.org/iso/19115/-3/1.0/req/metadata-extended-types-instance	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/metadata-data-or-service-instance	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/extended-types-xml	
Test	Identifier	/conf/metadata-extended-types-xml/schema-valid
	Requirement	/req/ metadata-extended-types-instance/validation
	Test purpose	Verify that a MD_Metadata XML instance that include optional properties as defined in ISO 19115-1:2014, 6.5.2, except for those in the mex namespace, and including substitutions for gco:CharacterString from the gcx namespace will validate
	Test method	Use an XML validation tool to determine if XML instance is valid using the XML schema md1.xsd. See discussion of validation tools in A.1.1
	Test type	Validation

A.2.4.5 Conformance class: Extended metadata record

The conformance class specified in Table A.6 defines tests to determine if a metadata record in which the ISO 19115-1 model has been extended is implemented following the rules specified in ISO/TS 19139:2007, A.3 and A.4. Applications that advertise conformance to this class shall have a valid XML root element mdb:MD_Metadata, and be able to process information provided in the MD_MetadataExtension section of metadata instance documents. The modular implementation defined in this document enables metadata extensions that substitute different concrete elements for one or more of the optional MD_Metadata properties that are implemented with abstract class property types. The MD_MetadataExtensionInformation content should be used in these cases to document the extended content.

Note that any profile that extends the base schema will need to include schema imports for the extension namespace, as well as any other components from this document that are needed, and will need to specify schema locations for the extension namespaces in all instance documents.

Table A.6 — Conformance class: Valid XML metadata instance with extended content model

Identifier	http://standards.iso.org/iso/19115/-3/1.0/conf/extended-metadata-xml	
Requirements	http://standards.iso.org/iso/19115/-3/1.0/req/extended-metadata-instance	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/metadata-minimal-instance	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/metadata-extended-types-xml	
Test	Identifier	/conf/extended-metadata-xml/schema-valid
	Requirement	/req/extended-metadata-instance/extension-information
	Test purpose	Verify that a MD_Metadata XML instance that includes child elements not defined by this document include at least one MD_MetadataExtensionInformation element that is valid against the XML schema for the http://standards.iso.org/iso/19115/-3/mex/1.0 namespace
	Test method	Verify that document validates with Schematron rule set extended-metadata.sch
	Test type	Validation
Test	Identifier	/conf/extended-metadata-xml/new-section
	Requirement	/req/extended-metadata-instance/new-section
	Test purpose	Verify that if a MD_Metadata XML instance includes child elements not defined by this document, those elements are namespace-qualified with a namespace URI different from namespaces defined by this document
	Test method	Verify that document validates with Schematron rule set extended-metadata.sch
	Test type	Validation
Test	Identifier	/conf/extended-metadata-xml/validation
	Requirement	/req/extended-metadata-instance/validation
	Test purpose	Verify that a MD_Metadata XML instance that includes child elements not defined by this document can be validated using a XML schema validation tool; all namespaces shall be associated with working schema locations
	Test method	Use an XML validation tool to determine if the document will validate using the supplied namespaces and schema locations. See discussion of validation tools in A.1.1
	Test type	Validation

Table A.6 *(continued)*

Test	Identifier	/conf/extended-metadata-xml/new-codelist
	Requirement	/req/extended-metadata-instance/new-codelist
	Test purpose	Verify that any codelists utilized in the extended metadata content are implemented following the rules in ISO/TS 19139:2007, 8.5.5
	Test method	Inspection of codelists defined for extended content
	Test type	Validation
Test	Identifier	/conf/extended-metadata-xml/new-element
	Requirement	/req/extended-metadata-instance/new-element
	Test purpose	Verify that any new XML elements utilized in the extended metadata content are implemented as subclasses of existing ISO geographic information standards classes following guidelines in ISO/TS 19139:2007, 8.5.3
	Test method	Inspection of XML schema for extended content.
	Test type	Validation
Test	Identifier	/conf/extended-metadata-xml/iso-type
	Requirement	/req/extended-metadata-instance/iso-type
	Test purpose	Verify that any new XML elements utilized in the extended metadata content includes an isoType attribute with a value that is the name of an existing ISO geographic information standard class
	Test method	Inspection of extension XML elements in XML instance document.
	Test type	Validation
	Identifier	/conf/extended-metadata-xml/extension-by-restriction
	Requirement	/req/extended-metadata-instance/extension-by-restriction
Test	Test purpose	Verify that any restrictions to element or attribute cardinality specified in ISO 19115-1 that are asserted in a metadata profile have an associated validation process specified by that profile
	Test method	Inspection of metadata extension documentation
	Test type	Validation

A.2.4.6 Conformance class: Valid catalogue instance

A catalogue is a collection of information items (CT_Items) that are managed using a registry (CT_Catalogue). The abstract concept of catalogue was defined in ISO/TS 19139 to harmonize the different ISO geographic information standards series catalogue concepts, such as PF_PortrayalCatalogue (ISO 19117) and FC_FeatureCatalogue (ISO 19110), and is implemented in this document for compatibility with ISO 19115-1. The conformance class specified in Table A.7 defines tests to verify valid instances of concrete elements that substitute for the abstract CT_Catalogue and CT_Item to define a valid catalogue listing of information items.

Table A.7 — Conformance class: Valid XML catalogue instance

Identifier	http://standards.iso.org/iso/19115/-3/1.0/conf/catalogue-xml	
Requirements	http://standards.iso.org/iso/19115/-3/1.0/req/catalogue-instance	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/metadata-core-instance	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/language-localisation-xml	
Test	Identifier	/conf/catalogue-xml/schema-valid
	Requirement	/req/catalogue-instance/validation
	Test purpose	Verify that instances of XML elements from the namespace http://standards.iso.org/iso/19115/-3/cat/1.0 validate
	Test method	Use an XML validation tool to determine if XML instance is valid using the XML schema cat.xsd. See discussion of validation tools in A.1.1
	Test type	Validation

A.2.4.7 Conformance Class: Metadata application

The conformance class specified in Table A.8 defines tests to validate XML instances that aggregate metadata for multipart resources with a root element in the substitution group for the abstract DS_Aggregate. Metadata instances linked through the "has" association to members of the aggregate have a root element in the substitution group for MD_Metadata, and may include all ISO metadata elements associated with MD_Metadata including the Metadata Extension namespace, substitutions for character strings from the geospatial common extension namespace. Users of the metadata application package may wish to define profiles that restrict usage of the extended types, metadata extensions, or other metadata modules to simplify software development requirements.

Table A.8 — Conformance class: Valid XML instance of metadata application namespace

Identifier	http://standards.iso.org/iso/19115/-3/1.0/conf/metadata-application-xml	
Requirements	http://standards.iso.org/iso/19115/-3/1.0/req/metadata-application-instance	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/metadata-data-or-service-instance	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/extended-types-xml	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/extended-metadata-xml	
Test	Identifier	/conf/metadata-application-xml/root-element
	Requirement	/req/metadata-application-instance/root-element
	Test purpose	Verify that instances of XML elements from the namespace http://standards.iso.org/iso/19115/-3/mda/1.0 have a root element that is in the substitution group for mda:DS_Aggregate
	Test method	Inspection.
	Test type	Validation
	Identifier	/conf/metadata-application-xml/schema-valid
	Requirement	/req/metadata-application-instance/validation
Test	Test purpose	Verify that instances of XML elements from the namespace http://standards.iso.org/iso/19115/-3/mda/1.0 validate
	Test method	Use an XML validation tool to determine if XML instance is valid using the XML schema mda.xsd. See discussion of validation tools in A.1.1
	Test type	Validation

A.2.4.8 Conformance class: Metadata for data transfer package

The conformance class specified in Table A.9 defines tests to validate XML instance documents that implement data transfer using packages that bundle files containing resources, metadata records

documenting the resources, and optional supplementary files, all of which are documented in an accompanying catalogue instance.

Users of the metadata for data transfer package will need to define or adopt a concrete substitution for abstract CT_Catalogue applicable to their application, and import the appropriate namespace. They may also wish to define or adopt profiles of the mda namespace that restrict usage of the extended types, metadata extensions, or other metadata modules to simplify software development requirements.

Table A.9 — Conformance class: Valid XML instance of metadata for data transfer namespace

Identifier	http://standards.iso.org/iso/19115/-3/1.0/conf/metadata-data-transfer-xml	
Requirements	http://standards.iso.org/iso/19115/-3/1.0/req/data-transfer-instance	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/metadata-application-xml	
Dependency	http://standards.iso.org/iso/19115/-3/1.0/conf/extended-types-xml	
	Identifier	/conf/metadata-data-transfer-xml/schema-valid
	Requirement	/req/data-transfer-instance/validation
Test	Test purpose	Verify that instances of XML elements from the namespace http://standards.iso.org/iso/19115/-3/mdt/1.0 validate
	Test method	Use an XML validation tool to determine if XML instance is valid using the XML schema mdt.xsd. See discussion of validation tools in A.1.1
	Test type	Validation

Annex B
(informative)

Geographic metadata XML resources

B.1 XML schemas defined in this document

This document defines the content of 27 XML Namespaces identified by convention using the following prefixes: cat, cit, gco, gcx, gex, gmw, lan, mac, mas, mcc, mco, md1, md2, mda, mdb, mds, mdt, mex, mmi, mpc, mrc, mrd, mri, mrl, mrs, msr, and srv. Each of these namespace prefixes is appended to "http://standards.iso.org/iso/19115/-3/", and the schema version number (major and first minor), e.g. "/1.0" is appended after the namespace abbreviation to make a complete namespace URI. These schema use a new version of the namespace defined by ISO/TS 19139 that is conventionally identified using the prefix gco. Two example instance documents are included in Annex D.

The XML schemas defined by this document can be found online at http://standards.iso.org/iso/19115/-3/ with a subdirectory for each namespace, identified by the three-character default namespace prefix (see 5.2), and a subdirectory within the namespace directory for each numbered release version of the XML artefacts for that namespace. Files in the numbered release folders contain xml schema, Schematron rules, codelists, examples of valid and invalid instances of the namespace schema for testing, and an html web page containing explanation of the namespace and links to the supporting documents in the namespace folder.

B.2 XML schemas defined outside this document

In addition to those namespaces listed in B.1, this document makes use of the geography markup language version 3.2 (http://www.opengis.net/gml/3.2) namespace. To locate the authoritative XML schemas associated with this namespace, please refer to ISO 19136. This document makes use of the xml linking language version 1.0 (http://www.w3.org/1999/xlink) namespace. To locate the authoritative XML schemas associated with this namespace, also refer to ISO 19136.

This document makes use of the abstract class namespaces dqc and fcc defined in the XML implementations of ISO 19157 and ISO 19110.

B.3 Additional resources

To ease the use of this document, several xml files are available for download in the "resources" directory at http://standards.iso.org/iso/19115/resources. They are organized into the following categories of support: Codelists, namespaceInformationAndTools, and transforms.

The xml files related to the utilization of codelists that are available for download are found in the "codelist" directory of the "resources". The "cat" subdirectory in this directory contains two files: codelists.html that contain an html listing of all codelists defined by ISO 19115-1, for presentation to humans. The codelists.xml file contains all codelists defined by ISO 19115-1 encoded using the xml schema from the cat namespace defined in this document. The "gml" subdirectory under codelist contains individual files for each codelists defined by ISO 19115-1 encoded using the gml dictionary schema.

The namespaceInformationAndTools directory contains an XML file with information describing all the ISO 19115 namespaces, and XSLT transform files that convert the XML file into http://standards.iso.org/iso/19115/resources/namespaceSummary.html for display and use by humans.

The transforms directory contains XSLT transform files that will convert ISO/TS 19139 XML instance documents into ISO 19115-3 XML instance documents (ISO19139to19115-3.xsl) and one that will

convert XML instance documents from this document to ISO/TS 19139 XML instance documents (ISO19115-3toISO19139.xsl). Note that the backward conversion may lose some information because there are elements in this document that are not present in ISO/TS 19139.

Annex C
(informative)

Encoding descriptions

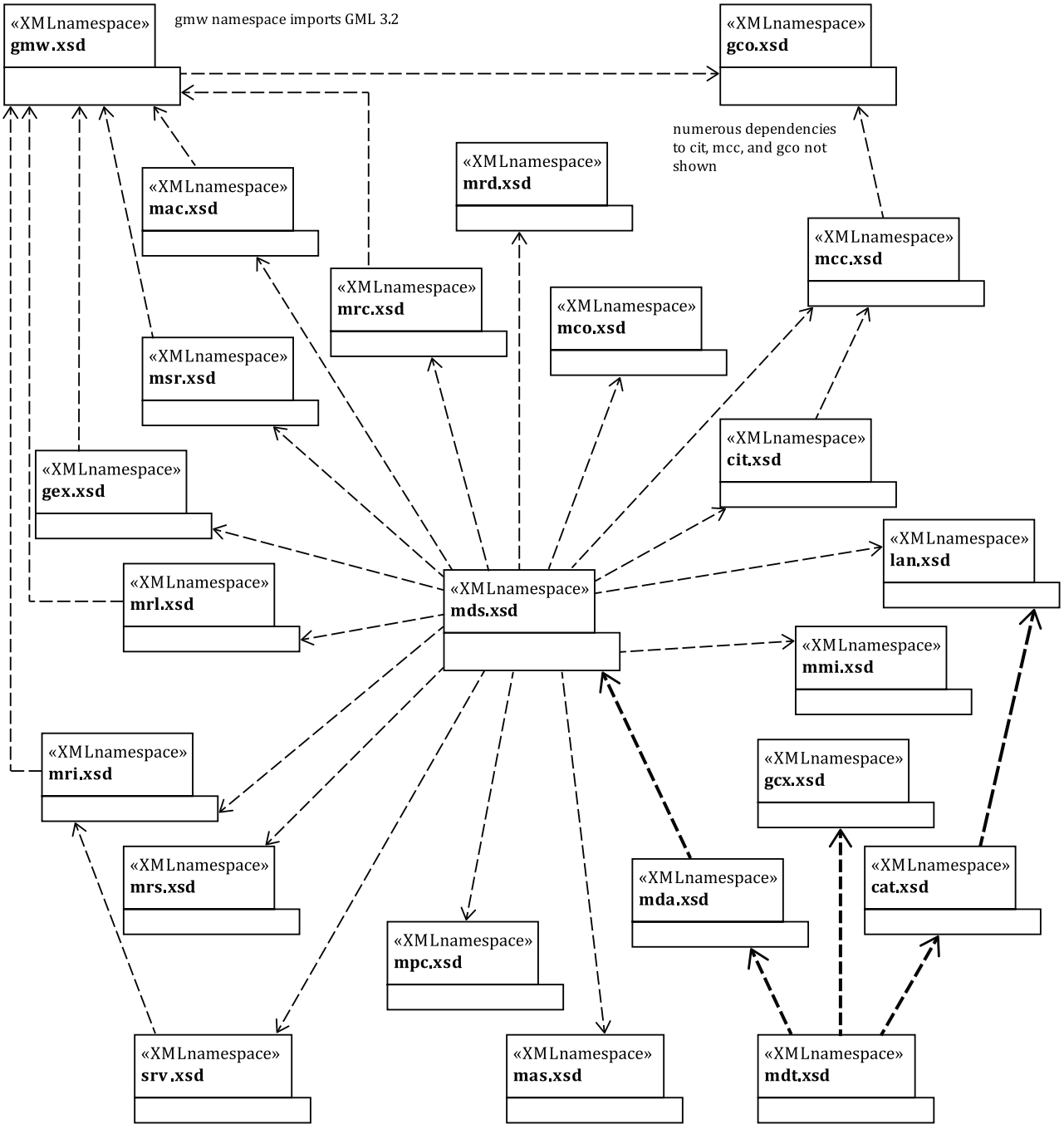
C.1 Introduction to the encoding descriptions

The implementation of ISO 19115-1 and related standards follows the encoding rules defined in ISO 19118:2011, Annex A, and extended in ISO/TS 19139, along with the package decoupling pattern described above. The exceptions and the implementations based on external types and for modularizing XML packages are detailed in ISO/TS 19139:2007, Clause 9; the packaging of these elements has been refactored in this implementation to isolate dependency on GML elements into the gmw namespace.

C.2 XML namespaces

XML namespaces are implementation-specific groupings of elements designed to facilitate reuse and extension of content components from the ISO 19115-1 conceptual model. Tables 3 to 5 summarize the namespaces for XML schema components used in this implementation. The approach to clustering elements here is designed with the intention to facilitate reuse of the XML components and promote interoperability of metadata. The XML implementation namespace mdb in this document defines a root element (MD_Metadata) that has all the properties defined in ISO 19115-1, and imports all the necessary namespaces required to implement those properties in ISO 19115-1 conformant XML metadata instance.

Figure C.1 shows the dependency relationships between namespaces used to implement ISO 19115-1. The "import" relationship stereotype indicates that the source namespace imports (depends on) the target namespace (at the pointed end of the arrow). All packages import the citation namespace. Note that all packages also import the geographic common (gco) namespace, which in turn imports XLink. Packages that utilize GML namespace elements import the gmw namespace. Linkages to other ISO geographic information standards schema for data quality and feature catalogues are implemented through optional abstract classes.



NOTE The import dependency shown with heavier lines indicate imports from application packages other than mds.

Figure C.1 — Dependencies between the mds namespace and other XML namespace packages in this document

Annex D
(informative)

Implementation examples

D.1 Minimal — Metadata example

The following XML instance document includes only the mandatory elements from ISO 19115-1 and was derived from the example in ISO 19115-1:2014, E.2.

```
<?xml version="1.0" encoding="UTF-8"?>
<mdb:MD_Metadata xmlns="http://standards.iso.org/iso/19115/-3/mdb/1.0"
    xmlns:dqc="http://standards.iso.org/iso/19157/-2/dqc/1.0"
    xmlns:gco="http://standards.iso.org/iso/19115/-3/gco/1.0"
    xmlns:lan="http://standards.iso.org/iso/19115/-3/lan/1.0"
    xmlns:mcc="http://standards.iso.org/iso/19115/-3/mcc/1.0"
    xmlns:mdb="http://standards.iso.org/iso/19115/-3/mdb/1.0"
    xmlns:cit="http://standards.iso.org/iso/19115/-3/cit/1.0"
    xmlns:mri="http://standards.iso.org/iso/19115/-3/mri/1.0"
    xmlns:gex="http://standards.iso.org/iso/19115/-3/gex/1.0"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://standards.iso.org/iso/19115/-3/mdb/1.0 mdb.xsd">
    <mdb:contact>
        <cit:CI_Responsibility>
            <cit:role>
                <cit:CI_RoleCode codeList="http://standards.iso.org/iso/19115/resources/
Codelist/cat/codeLists.xml#CI_RoleCode" codeListValue="custodian">custodian</cit:CI_
RoleCode>
            </cit:role>
            <cit:party>
                <cit:CI_Organisation>
<!-- name or logo is mandatory by Schematron-enforced constraint -->
                    <cit:name>
                        <gco:CharacterString>Department of Primary Industries and
Resources SA</gco:CharacterString>
                    </cit:name>
                </cit:CI_Organisation>
            </cit:party>
        </cit:CI_Responsibility>
    </mdb:contact>
    <mdb:dateInfo>
        <cit:CI_Date>
            <cit:date>
                <gco:DateTime>2004-03-12T12:00:00</gco:DateTime>
            </cit:date>
            <cit:dateType>
                <cit:CI_DateTypeCode codeList="http://standards.iso.
org/iso/19115/resources/Codelist/cat/codeLists.xml#creation" codeListValue="Creation"/>
            </cit:dateType>
        </cit:CI_Date>
    </mdb:dateInfo>
    <mdb:identificationInfo>
        <mri:MD_DataIdentification>
            <mri:citation>
                <cit:CI_Citation>
                    <cit:title>
                        <gco:CharacterString>Exploration Licences for Minerals</
gco:CharacterString>
                    </cit:title>

<!-- mandatory (dataType= creation) by constraint enforced by Schematron rule -->
                    <cit:date>
                        <cit:CI_Date>
```

```
                            <cit:date>
                                <gco:DateTime>1993-01-01T12:00:00</gco:DateTime>
                            </cit:date>
                            <cit:dateType>
                                <cit:CI_DateTypeCode codeList="http://standards.
iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#CI_DateTypeCode"
codeListValue="publication">publication</cit:CI_DateTypeCode>
                            </cit:dateType>
                        </cit:CI_Date>
                    </cit:date>
                </cit:CI_Citation>
            </mri:citation>
            <mri:abstract>
                <gco:CharacterString>Location of all current mineral Exploration Licences
issued under the Mining Act, 1971. Exploration Licences provide exclusive tenure rights
to explore for mineral resources for up to a maximum of 5 years. Comment is sought on
applications for Exploration Licences from numerous sources before granting. Exploration
programs are subject to strict environmental and heritage conditions. Exploitation
of identified resources shall be made under separate mineral production leases.</
gco:CharacterString>
            </mri:abstract>

 <!-- mandatory since MD_MetadataScope is not specified, and defaults to 'dataset' enforced
by Schematron rule -->
            <mri:topicCategory>
                <mri:MD_TopicCategoryCode>boundaries</mri:MD_TopicCategoryCode>
            </mri:topicCategory>

<!-- a bounding box is required because the mdb:MD_MetadataScope is not specified; enforced
by Schematron rule-->
            <mri:extent>
                <gex:EX_Extent>
                    <gex:description>
                        <gco:CharacterString>location description</gco:CharacterString>
                    </gex:description>
                    <gex:geographicElement>
                        <gex:EX_GeographicBoundingBox>
                            <gex:extentTypeCode>
                                <gco:Boolean>false</gco:Boolean>
                            </gex:extentTypeCode>
                            <gex:westBoundLongitude>
                                <gco:Decimal>129.0</gco:Decimal>
                            </gex:westBoundLongitude>
                            <gex:eastBoundLongitude>
                                <gco:Decimal>141.0</gco:Decimal>
                            </gex:eastBoundLongitude>
                            <gex:southBoundLatitude>
                                <gco:Decimal>-38.5</gco:Decimal>
                            </gex:southBoundLatitude>
                            <gex:northBoundLatitude>
                                <gco:Decimal>-26.0</gco:Decimal>
                            </gex:northBoundLatitude>
                        </gex:EX_GeographicBoundingBox>
                    </gex:geographicElement>
                </gex:EX_Extent>
            </mri:extent>
<!-- mandatory if resource contains textual content (has to be enforced by inspection) -->
            <mri:defaultLocale>
                <lan:PT_Locale>
                    <lan:language>
                        <lan:LanguageCode codeList="http://standards.iso.
org/iso/19115/resources/Codelist/lan/LanguageCode.xml" codeListValue="eng">English</
lan:LanguageCode>
                    </lan:language>
                    <lan:characterEncoding>
                        <lan:MD_CharacterSetCode codeList="http://standards.iso.
org/iso/19115/resources/Codelist/lan/CharacterSetCode.xml" codeListValue="utf8">UTF-8</
lan:MD_CharacterSetCode>
                    </lan:characterEncoding>
                </lan:PT_Locale>
            </mri:defaultLocale>
```

```
        </mri:MD_DataIdentification>
    </mdb:identificationInfo>
</mdb:MD_Metadata>
```

D.2 Vector Smart Map Level 0

The following XML instance document includes sample metadata from a Vector Smart Map Level 0 dataset.

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- VMAP 0 gmd based instance document -->
<mdb:MD_Metadata xmlns="http://standards.iso.org/iso/19115/-3/mds/1.0"
    xmlns:fcc="http://standards.iso.org/19110/fcc/1.0"
    xmlns:gex="http://standards.iso.org/iso/19115/-3/gex/1.0"
    xmlns:mac="http://standards.iso.org/iso/19115/-3/mac/1.0"
    xmlns:mas="http://standards.iso.org/iso/19115/-3/mas/1.0"
    xmlns:mco="http://standards.iso.org/iso/19115/-3/mco/1.0"
    xmlns:mdb="http://standards.iso.org/iso/19115/-3/mdb/1.0"
    xmlns:mdq="http://standards.iso.org/iso/19157/-2/mdq/1.0"
    xmlns:mds="http://standards.iso.org/iso/19115/-3/mds/1.0"
    xmlns:mmi="http://standards.iso.org/iso/19115/-3/mmi/1.0"
    xmlns:mpc="http://standards.iso.org/iso/19115/-3/mpc/1.0"
    xmlns:mrc="http://standards.iso.org/iso/19115/-3/mrc/1.0"
    xmlns:mrd="http://standards.iso.org/iso/19115/-3/mrd/1.0"
    xmlns:mrl="http://standards.iso.org/iso/19115/-3/mrl/1.0"
    xmlns:mrs="http://standards.iso.org/iso/19115/-3/mrs/1.0"
    xmlns:msr="http://standards.iso.org/iso/19115/-3/msr/1.0"
    xmlns:srv="http://standards.iso.org/iso/19115/-3/srv/2.0"
    xmlns:dqc="http://standards.iso.org/iso/19115/-3/dqc/1.0"
    xmlns:gco="http://standards.iso.org/iso/19115/-3/gco/1.0"
    xmlns:lan="http://standards.iso.org/iso/19115/-3/lan/1.0"
    xmlns:mcc="http://standards.iso.org/iso/19115/-3/mcc/1.0"
    xmlns:cit="http://standards.iso.org/iso/19115/-3/cit/1.0"
    xmlns:mri="http://standards.iso.org/iso/19115/-3/mri/1.0"
    xmlns:gml="http://www.opengis.net/gml/3.2"
    xmlns:xlink="http://www.w3.org/1999/xlink"
    xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xsi:schemaLocation="http://standards.iso.org/iso/19115/-3/mds/1.0 mds.xsd"
    uuid="US_NGA_VPF_VMAP0"
    id="VMAP0">
    <mdb:defaultLocale>
        <lan:PT_Locale>
            <lan:language>
                <lan:LanguageCode codeList="http://standards.iso.org/iso/19115/resources/
Codelist/lan/LanguageCode.xml" codeListValue="eng">English</lan:LanguageCode>
            </lan:language>
            <lan:characterEncoding>
                <lan:MD_CharacterSetCode codeList="http://standards.iso.
org/iso/19115/resources/Codelist/lan/CharacterSetCode.xml" codeListValue="utf8">UTF-8</
lan:MD_CharacterSetCode>
            </lan:characterEncoding>
        </lan:PT_Locale>
    </mdb:defaultLocale>
    <mdb:contact>
        <cit:CI_Responsibility>
            <cit:role>
                <cit:CI_RoleCode codeList="http://standards.iso.org/iso/19115/resources/
Codelist/cat/codeLists.xmlresources/Codelist/cat/codeLists.xml#CI_RoleCode"
codeListValue="publisher"/>
            </cit:role>
            <cit:party>
                <cit:CI_Organisation>
                    <cit:name>
                        <gco:CharacterString>US National Geospatial-
                        Intelligence Agency</gco:CharacterString>
                    </cit:name>
                    <cit:contactInfo>
                        <cit:CI_Contact>
                            <cit:phone/>
                            <cit:address xlink:href="#ID00003"/>
```

```
                            <cit:onlineResource xlink:href="#ID00009"/>
                        </cit:CI_Contact>
                    </cit:contactInfo>
                </cit:CI_Organisation>
            </cit:party>
        </cit:CI_Responsibility>
    </mdb:contact>
    <!-- Date the metadata was created -->
    <mdb:dateInfo>
        <cit:CI_Date>
            <cit:date>
                <gco:DateTime>2004-03-14T12:00:00</gco:DateTime>
            </cit:date>
            <cit:dateType>
                <cit:CI_DateTypeCode codeList="http://standards.iso.
org/iso/19115/resources/Codelist/cat/codeLists.xmlresources/Codelist/cat/codeLists.
xml#CI_DateTypeCode" codeListValue="creation"/>
            </cit:dateType>
        </cit:CI_Date>
    </mdb:dateInfo>
    <mdb:metadataStandard>
        <cit:CI_Citation>
            <cit:title>
                <gco:CharacterString>ISO 19115-1</gco:CharacterString>
            </cit:title>
            <cit:edition>
                <gco:CharacterString>2003</gco:CharacterString>
            </cit:edition>
        </cit:CI_Citation>
    </mdb:metadataStandard>

    <!-- REFERENCE SYSTEM INFORMATION -->
    <mdb:referenceSystemInfo>
        <mrs:MD_ReferenceSystem>
            <mrs:referenceSystemIdentifier>
                <mcc:MD_Identifier>
                    <mcc:authority>
                        <cit:CI_Citation>
                            <cit:title>
                                <gco:CharacterString>World Geodetic System</
gco:CharacterString>
                            </cit:title>
                        </cit:CI_Citation>
                    </mcc:authority>
                    <mcc:code>
                        <gco:CharacterString>WGS 84</gco:CharacterString>
                    </mcc:code>
                </mcc:MD_Identifier>
            </mrs:referenceSystemIdentifier>
        </mrs:MD_ReferenceSystem>
    </mdb:referenceSystemInfo>
    <!-- END REFERENCE SYSTEM INFORMATION -->
    <!-- IDENTIFICATION INFORMATION -->
    <mdb:identificationInfo>
        <mri:MD_DataIdentification>
            <mri:citation>
                <cit:CI_Citation>
                    <cit:title>
                       <gco:CharacterString>VMAPLV0</gco:CharacterString>
                    </cit:title>
                    <cit:date>
                        <cit:CI_Date>
                            <cit:date>
                                <gco:DateTime>2000-09-03T12:00:00</gco:DateTime>
                            </cit:date>
                            <cit:dateType>
                                <cit:CI_DateTypeCode codeList="http://standards.iso.
org/iso/19115/resources/Codelist/cat/codeLists.xml#CI_DateTypeCode"
codeListValue="publication"/>
                            </cit:dateType>
                        </cit:CI_Date>
```

```
                    </cit:date>
                    <cit:presentationForm>
                        <cit:CI_PresentationFormCode codeList="http://standards.iso.
org/iso/19115/resources/Codelist/cat/codeLists.xml#CI_PresentationFormCode"
codeListValue="mapDigital"/>
                    </cit:presentationForm>
                </cit:CI_Citation>
            </mri:citation>
            <mri:abstract>
                <gco:CharacterString>Vector Map: a general purpose database design to
support GIS
                    applications</gco:CharacterString>
            </mri:abstract>
            <mri:status>
                <mcc:MD_ProgressCode codeList="http://standards.iso.
org/iso/19115/resources/Codelist/cat/codeLists.xml#MD_ProgressCode"
codeListValue="completed"/>
            </mri:status>
            <mri:pointOfContact>
                <cit:CI_Responsibility id="ID00001">
                    <cit:role>
                        <cit:CI_RoleCode codeList="http://standards.iso.
org/iso/19115/resources/Codelist/cat/codeLists.xml#CI_RoleCode"
codeListValue="originator"/>
                    </cit:role>
                    <cit:party>
                        <cit:CI_Organisation>
                            <cit:name>
                                <gco:CharacterString>US National Geospatial-Intelligence
                                Agency</gco:CharacterString>
                            </cit:name>
                            <cit:contactInfo>
                                <cit:CI_Contact id="ID00002">
                                    <cit:phone>
                                        <cit:CI_Telephone>
                                            <cit:number>
                                                <gco:CharacterString>888-888-8888</
gco:CharacterString>
                                            </cit:number>
                                        </cit:CI_Telephone>
                                    </cit:phone>
                                    <cit:address>
                                        <cit:CI_Address id="ID00003">
                                            <cit:deliveryPoint>
                                                <gco:CharacterString>4600 Sangamore Rd</
gco:CharacterString>
                                            </cit:deliveryPoint>
                                            <cit:city>
                                                <gco:CharacterString>Bethesda</
gco:CharacterString>
                                            </cit:city>
                                            <cit:administrativeArea>
                                                <gco:CharacterString>MD</
gco:CharacterString>
                                            </cit:administrativeArea>
                                            <cit:postalCode>
                                                <gco:CharacterString>20816-5003</
gco:CharacterString>
                                            </cit:postalCode>
                                            <cit:country>
                                                <gco:CharacterString>United States</
gco:CharacterString>
                                            </cit:country>
                                        </cit:CI_Address>
                                    </cit:address>
                                    <cit:onlineResource>
                                        <cit:CI_OnlineResource id="ID00004">
                                            <cit:linkage>
                                                <gco:CharacterString>http://geoengine.nga.
mil</gco:CharacterString>
                                            </cit:linkage>
```

```
                                        <cit:protocol>
                                            <gco:CharacterString>http</
gco:CharacterString>
                                        </cit:protocol>
                                        <cit:function>
                                            <cit:CI_OnLineFunctionCode
codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#CI_
OnLineFunctionCode" codeListValue="download"/>
                                        </cit:function>
                                    </cit:CI_OnlineResource>
                                </cit:onlineResource>
                            </cit:CI_Contact>
                        </cit:contactInfo>
                        <cit:individual>
                            <cit:CI_Individual>
                                <cit:positionName>
                                    <gco:CharacterString>Director, NGA, ATTN:COD, MS
P-37</gco:CharacterString>
                                </cit:positionName>
                            </cit:CI_Individual>
                        </cit:individual>
                    </cit:CI_Organisation>
                </cit:party>
            </cit:CI_Responsibility>
        </mri:pointOfContact>
        <mri:spatialRepresentationType>

            <mcc:MD_SpatialRepresentationTypeCode codeList="http://standards.iso.
org/iso/19115/resources/Codelist/cat/codeLists.xml#MD_SpatialRepresentationTypeCode"
codeListValue="vector"/>
        </mri:spatialRepresentationType>
        <mri:spatialResolution>
            <mri:MD_Resolution>
                <mri:equivalentScale>
                    <mri:MD_RepresentativeFraction>
                        <mri:denominator>
                            <gco:Integer>1000000</gco:Integer>
                        </mri:denominator>
                    </mri:MD_RepresentativeFraction>
                </mri:equivalentScale>
            </mri:MD_Resolution>
        </mri:spatialResolution>
        <mri:topicCategory>
            <mri:MD_TopicCategoryCode>boundaries</mri:MD_TopicCategoryCode>
        </mri:topicCategory>
        <mri:topicCategory>
            <mri:MD_TopicCategoryCode>elevation</mri:MD_TopicCategoryCode>
        </mri:topicCategory>
        <mri:topicCategory>
            <mri:MD_TopicCategoryCode>inlandWaters</mri:MD_TopicCategoryCode>
        </mri:topicCategory>
        <mri:topicCategory>
            <mri:MD_TopicCategoryCode>oceans</mri:MD_TopicCategoryCode>
        </mri:topicCategory>
        <mri:topicCategory>
            <mri:MD_TopicCategoryCode>society</mri:MD_TopicCategoryCode>
        </mri:topicCategory>
        <mri:topicCategory>
            <mri:MD_TopicCategoryCode>structure</mri:MD_TopicCategoryCode>
        </mri:topicCategory>
        <mri:topicCategory>
            <mri:MD_TopicCategoryCode>transportation</mri:MD_TopicCategoryCode>
        </mri:topicCategory>
        <mri:topicCategory>
            <mri:MD_TopicCategoryCode>utilitiesCommunication</mri:MD_
TopicCategoryCode>
        </mri:topicCategory>
        <!-- Method one for indicating data coverage area -->
        <!-- Use EX_GeographicBoundingBoxType to describe -->
        <!-- the data coverage area using approximate coordinates -->
```

```
            <!-- THIS METHOD IS MANDATORY IF THE HIERARCHY  -->
            <!-- LEVEL OF THIS METADATA IS "DATASET" -->
            <mri:extent>
                <gex:EX_Extent>
                    <gex:description>
                        <gco:CharacterString>location description</gco:CharacterString>
                    </gex:description>
                    <gex:geographicElement>
                        <gex:EX_GeographicBoundingBox>
                            <gex:extentTypeCode>
                                <gco:Boolean>false</gco:Boolean>
                            </gex:extentTypeCode>
                            <gex:westBoundLongitude>
                                <gco:Decimal>-180.00</gco:Decimal>
                            </gex:westBoundLongitude>
                            <gex:eastBoundLongitude>
                                <gco:Decimal>180.00</gco:Decimal>
                            </gex:eastBoundLongitude>
                            <gex:southBoundLatitude>
                                <gco:Decimal>-90.00</gco:Decimal>
                            </gex:southBoundLatitude>
                            <gex:northBoundLatitude>
                                <gco:Decimal>90.00</gco:Decimal>
                            </gex:northBoundLatitude>
                        </gex:EX_GeographicBoundingBox>
                    </gex:geographicElement>
                </gex:EX_Extent>
            </mri:extent>
            <!-- Method two for indicating data coverage area -->
            <!-- Use EX_GeographicBoundingPolygonType to describe -->
            <!-- the data coverage area using more accurate coordinates -->
            <!-- Make sure to include the proper coordinate reference   -->
            <!-- system information when using this method -->
            <mri:extent>
                <gex:EX_Extent>
                    <gex:description>
                        <gco:CharacterString>location description</gco:CharacterString>
                    </gex:description>
                    <gex:geographicElement>
                        <gex:EX_BoundingPolygon>
                            <gex:extentTypeCode>
                                <gco:Boolean>false</gco:Boolean>
                            </gex:extentTypeCode>
                            <gex:polygon>
                                <gml:Polygon gml:id="p1">
                                    <gml:exterior>
                                        <gml:LinearRing>
                                            <gml:posList>180.000000</gml:posList>
                                        </gml:LinearRing>
                                    </gml:exterior>
                                </gml:Polygon>
                            </gex:polygon>
                        </gex:EX_BoundingPolygon>
                    </gex:geographicElement>
                </gex:EX_Extent>
            </mri:extent>
            <mri:extent>
                <gex:EX_Extent>
                    <gex:description>
                        <gco:CharacterString>temporal extent of source information</
gco:CharacterString>
                    </gex:description>
                    <gex:temporalElement>
                        <gex:EX_TemporalExtent>
                            <gex:extent>
                                <gml:TimePeriod gml:id="tp1">
                                    <gml:begin>
                                        <gml:TimeInstant gml:id="ti1">
                                            <gml:timePosition>1992-04-01T00:00:00-00:00</
gml:timePosition>
                                        </gml:TimeInstant>
```

```
                                    </gml:begin>
                                    <gml:end>
                                        <gml:TimeInstant gml:id="ti2">
                                            <gml:timePosition>2002-02-23T00:00:00-00:00</
gml:timePosition>
                                        </gml:TimeInstant>
                                    </gml:end>
                                </gml:TimePeriod>
                            </gex:extent>
                        </gex:EX_TemporalExtent>
                    </gex:temporalElement>
                </gex:EX_Extent>
            </mri:extent>
            <mri:resourceFormat>
                <mrd:MD_Format id="ID00005">
                    <mrd:formatSpecificationCitation>
                        <cit:CI_Citation>
                            <cit:title>
                                <gco:CharacterString>VPF</gco:CharacterString>
                            </cit:title>
                            <cit:edition>
                                <gco:CharacterString>9606</gco:CharacterString>
                            </cit:edition>
                        </cit:CI_Citation>
                    </mrd:formatSpecificationCitation>
                </mrd:MD_Format>
            </mri:resourceFormat>
            <mri:resourceFormat>
                <mrd:MD_Format id="ID00006">
                    <mrd:formatSpecificationCitation>
                        <cit:CI_Citation>
                            <cit:title>
                                <gco:CharacterString>VMap 0</gco:CharacterString>
                            </cit:title>
                            <cit:identifier>
                                <mcc:MD_Identifier>
                                    <mcc:code>
                                        <gco:CharacterString>MIL-V-89039</
gco:CharacterString>
                                    </mcc:code>
                                </mcc:MD_Identifier>
                            </cit:identifier>
                        </cit:CI_Citation>
                    </mrd:formatSpecificationCitation>
                    <mrd:amendmentNumber>
                        <gco:CharacterString>Ammendment 1</gco:CharacterString>
                    </mrd:amendmentNumber>
                </mrd:MD_Format>
            </mri:resourceFormat>
        </mri:MD_DataIdentification>
    </mdb:identificationInfo>
    <!-- END OF IDENTIFICATION INFORMATION -->
    <mdb:distributionInfo>
        <mrd:MD_Distribution>
            <mrd:distributor>
                <mrd:MD_Distributor>
                    <mrd:distributorContact>
                        <cit:CI_Responsibility>
                            <cit:role>
                                <cit:CI_RoleCode codeList="http://standards.iso.
org/iso/19115/resources/Codelist/cat/codeLists.xml#CI_RoleCode"
codeListValue="distributor"/>
                            </cit:role>
                            <cit:party>
                                <cit:CI_Individual>
                                    <cit:positionName>
                                        <gco:CharacterString>Director, NGA, ATTN:COD, MS
P-37</gco:CharacterString>
                                    </cit:positionName>
                                </cit:CI_Individual>
                            </cit:party>
```

```
                            <cit:party>
                                <cit:CI_Organisation>
                                    <cit:name>
                                        <gco:CharacterString>US National Geospatial-
                                        Intelligence Agency</gco:CharacterString>
                                    </cit:name>
                                    <cit:contactInfo>
                                        <cit:CI_Contact>
                                            <cit:phone>
                                                <cit:CI_Telephone>
                                                  <cit:number>
                                                  <gco:CharacterString>555-555-5555</
gco:CharacterString>
                                                  </cit:number>
                                                  <cit:numberType>
                                                  <cit:CI_TelephoneTypeCode
codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#CI_
TelephoneTypeCode" codeListValue="office"/>
                                                  </cit:numberType>
                                                </cit:CI_Telephone>
                                            </cit:phone>
                                            <cit:address xlink:href="#ID00003"/>
                                        </cit:CI_Contact>
                                    </cit:contactInfo>
                                </cit:CI_Organisation>
                            </cit:party>
                        </cit:CI_Responsibility>
                    </mrd:distributorContact>
                    <mrd:distributorFormat>
                        <mrd:MD_Format>
                            <mrd:formatSpecificationCitation>
                                <cit:CI_Citation>
                                    <cit:title>
                                        <gco:CharacterString>gzip</gco:CharacterString>
                                    </cit:title>
                                    <cit:alternateTitle>
                                        <gco:CharacterString>GNU RFC 1952</
gco:CharacterString>
                                    </cit:alternateTitle>
                                </cit:CI_Citation>
                            </mrd:formatSpecificationCitation>
                            <mrd:amendmentNumber>
                                <gco:CharacterString>1.2.4</gco:CharacterString>
                            </mrd:amendmentNumber>
                        </mrd:MD_Format>
                    </mrd:distributorFormat>
                    <mrd:distributorTransferOptions>
                        <mrd:MD_DigitalTransferOptions>
                            <mrd:onLine>
                                <cit:CI_OnlineResource>
                                    <cit:linkage>
                                        <gco:CharacterString>http://geoengine.nga.
mil/ftpdir/archive/vpf_data/v0noa.tar.gz</gco:CharacterString>
                                    </cit:linkage>
                                    <cit:function>
                                        <cit:CI_OnLineFunctionCode codeList="http://
standards.iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#CI_OnLineFunctionCode"
codeListValue="download"/>
                                    </cit:function>
                                </cit:CI_OnlineResource>
                            </mrd:onLine>
                            <mrd:onLine>
                                <cit:CI_OnlineResource>
                                    <cit:linkage>
                                        <gco:CharacterString>http://geoengine.nga.
mil/ftpdir/archive/vpf_data/v0sas.tar.gz</gco:CharacterString>
                                    </cit:linkage>
                                    <cit:function>
                                        <cit:CI_OnLineFunctionCode codeList="http://
standards.iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#CI_OnLineFunctionCode"
codeListValue="download"/>
```

```
                                    </cit:function>
                                </cit:CI_OnlineResource>
                            </mrd:onLine>
                            <mrd:onLine>
                                <cit:CI_OnlineResource>
                                    <cit:linkage>
                                        <gco:CharacterString>http://geoengine.nga.
mil/ftpdir/archive/vpf_data/v0soa.tar.gz</gco:CharacterString>
                                    </cit:linkage>
                                    <cit:function>
                                        <cit:CI_OnLineFunctionCode codeList="http://
standards.iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#CI_OnLineFunctionCode"
codeListValue="download"/>
                                    </cit:function>
                                </cit:CI_OnlineResource>
                            </mrd:onLine>
                        </mrd:MD_DigitalTransferOptions>
                    </mrd:distributorTransferOptions>
                </mrd:MD_Distributor>
            </mrd:distributor>
            <!-- CD-Ordering for Military Customers -->
            <mrd:distributor>
                <mrd:MD_Distributor>
                    <mrd:distributorContact>
                        <cit:CI_Responsibility>
                            <cit:role>
                                <cit:CI_RoleCode codeList="http://standards.iso.
org/iso/19115/resources/Codelist/cat/codeLists.xml#CI_RoleCode"
codeListValue="distributor"/>
                            </cit:role>
                            <cit:party>
                                <cit:CI_Individual>
                                    <cit:name>
                                        <gco:CharacterString>Defense Supply Center
                                    Rich-mond (DLA)</gco:CharacterString>
                                    </cit:name>
                                    <cit:contactInfo>
                                        <cit:CI_Contact id="ID00007">
                                            <cit:phone gco:nilReason="missing"/>
                                            <cit:address>
                                                <cit:CI_Address id="ID00008">
                                                  <cit:deliveryPoint>
                                                  <gco:CharacterString>8000 Jefferson
                                                Davis Hwy</gco:CharacterString>
                                                  </cit:deliveryPoint>
                                                  <cit:city>
                                                  <gco:CharacterString>Richmond</
gco:CharacterString>
                                                  </cit:city>
                                                  <cit:administrativeArea>
                                                  <gco:CharacterString>VA</
gco:CharacterString>
                                                  </cit:administrativeArea>
                                                  <cit:postalCode>
                                                  <gco:CharacterString>23297</
gco:CharacterString>
                                                  </cit:postalCode>
                                                  <cit:country>
                                                  <gco:CharacterString>United
                                                States</gco:CharacterString>
                                                  </cit:country>
                                                </cit:CI_Address>
                                            </cit:address>
                                            <cit:onlineResource>
                                                <cit:CI_OnlineResource>
                                                  <cit:linkage>
                                                  <gco:CharacterString>http://www.dscr.
dla.mil/pc9</gco:CharacterString>
                                                  </cit:linkage>
                                                  <cit:function>
                                                  <cit:CI_OnLineFunctionCode
```

```
codeList="http://standards.iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#CI_
OnLineFunctionCode" codeListValue="order"/>
                                                    </cit:function>
                                                </cit:CI_OnlineResource>
                                            </cit:onlineResource>
                                        </cit:CI_Contact>
                                    </cit:contactInfo>
                                </cit:CI_Individual>
                            </cit:party>
                        </cit:CI_Responsibility>
                    </mrd:distributorContact>
                    <mrd:distributorFormat>
                        <mrd:MD_Format>
                            <mrd:formatSpecificationCitation>
                                <cit:CI_Citation>
                                    <cit:title>
                                        <gco:CharacterString>VPF</gco:CharacterString>
                                    </cit:title>
                                    <cit:identifier>
                                        <mcc:MD_Identifier>
                                            <mcc:code>
                                                <gco:CharacterString>MIL-STD-2407</
gco:CharacterString>
                                            </mcc:code>
                                        </mcc:MD_Identifier>
                                    </cit:identifier>
                                </cit:CI_Citation>
                            </mrd:formatSpecificationCitation>
                            <mrd:amendmentNumber>
                                <gco:CharacterString>9606</gco:CharacterString>
                            </mrd:amendmentNumber>
                        </mrd:MD_Format>
                    </mrd:distributorFormat>
                    <mrd:distributorTransferOptions>
                        <mrd:MD_DigitalTransferOptions>
                            <mrd:offLine>
                                <mrd:MD_Medium>
                                    <mrd:name>
                                        <cit:CI_Citation>
                                            <cit:title>
                                                <gco:CharacterString>cdROM</
gco:CharacterString>
                                            </cit:title>
                                        </cit:CI_Citation>
                                    </mrd:name>
                                    <mrd:volumes>
                                        <gco:Integer>4</gco:Integer>
                                    </mrd:volumes>
                                    <mrd:mediumFormat>
                                        <mrd:MD_MediumFormatCode codeList="http://
standards.iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#MD_MediumFormatCode"
codeListValue="iso9660"/>
                                    </mrd:mediumFormat>
                                </mrd:MD_Medium>
                            </mrd:offLine>
                        </mrd:MD_DigitalTransferOptions>
                    </mrd:distributorTransferOptions>
                </mrd:MD_Distributor>
            </mrd:distributor>
        </mrd:MD_Distribution>
    </mdb:distributionInfo>
    <!-- DATA QUALITY AND LINEAGE (No XML schema yet, can't validate this part, so is
commented out…-->
    <mdb:dataQualityInfo>
        <mdq:DQ_DataQuality>
            <mdq:scope>
                <mcc:MD_Scope>
                    <mcc:level>
                        <mcc:MD_ScopeCode codeList="http://standards.iso.
org/iso/19115/resources/Codelist/cat/codeLists.xml#MD_ScopeCode" codeListValue="dataset"/>
                    </mcc:level>
```

```
                </mcc:MD_Scope>
            </mdq:scope>
            <mdq:report>
                <mdq:DQ_DomainConsistency>
                    <mdq:measure>
                        <mdq:DQ_MeasureReference>
                            <mdq:nameOfMeasure>
                                <gco:CharacterString>Attribute Completeness Percentage</
gco:CharacterString>
                            </mdq:nameOfMeasure>
                        </mdq:DQ_MeasureReference>
                    </mdq:measure>
                    <mdq:result>
                        <mdq:DQ_ConformanceResult>
                            <mdq:specification>
                                <cit:CI_Citation>
                                    <cit:title>
                                        <gco:CharacterString>MIL-V-89039</
gco:CharacterString>
                                    </cit:title>
                                    <cit:date>
                                        <cit:CI_Date>
                                            <cit:date>

                                                <gco:DateTime>1995-02-09T00:00:00Z</
gco:DateTime>
                                            </cit:date>
                                            <cit:dateType>
                                                <cit:CI_DateTypeCode codeList="http://
standards.iso.org/iso/19115/resources/Codelist/cat/codeLists.xml#CI_DateTypeCode"
codeListValue="creation"/>
                                            </cit:dateType>
                                        </cit:CI_Date>
                                    </cit:date>
                                </cit:CI_Citation>
                            </mdq:specification>
                            <mdq:explanation>
                                <gco:CharacterString>All features in this library have
                                valid attribute codes assigned to them in accordance
                                with this specification</gco:CharacterString>
                            </mdq:explanation>
                            <mdq:pass>
                                <gco:Boolean>true</gco:Boolean>
                            </mdq:pass>
                        </mdq:DQ_ConformanceResult>
                    </mdq:result>
                </mdq:DQ_DomainConsistency>
            </mdq:report>
        </mdq:DQ_DataQuality>
    </mdb:dataQualityInfo>
    <mdb:resourceLineage>
        <mrl:LI_Lineage>
            <mrl:statement>
                <gco:CharacterString>HISTORICAL BACKGROUND - While the fifth edition of
NOAMER has evolved from previous digital version, the majority of the feature content is
based on the National Imagery and Mapping Agency's  (NIMA) hardcopy Operational
Navigational Chart (ONC) series. The initial digital version of VMap0 was the Digital
Chart of the World and was NIMA's first Vector Product Format (VPF) product. The DCW was
released in 1992. With the ongoing development of the VPF Military Standard and the advent
of the VMap0 product specification, a new version of the database was needed. VMap 0
library, NOAMER, Edition 4 was released in 1997.</gco:CharacterString>
            </mrl:statement>
        </mrl:LI_Lineage>
    </mdb:resourceLineage>
    <!-- END OF DATA QUALITY & LINEAGE -->

    <!-- CONSTRAINTS -->
    <mdb:metadataConstraints>
        <mco:MD_SecurityConstraints>
            <mco:classification>
                <mco:MD_ClassificationCode codeList="http://standards.iso.
```

```
org/iso/19115/resources/Codelist/cat/codeLists.xml#MD_ClassificationCode"
codeListValue="unclassified"/>
            </mco:classification>
            <mco:handlingDescription>
                <gco:CharacterString>RELEASABILITY - unrestricted</gco:CharacterString>
            </mco:handlingDescription>
        </mco:MD_SecurityConstraints>
    </mdb:metadataConstraints>
    <!-- END OF CONSTRAINTS -->

</mdb:MD_Metadata>
```

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1) Withdrawn.

2) Withdrawn.

3) Withdrawn.

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