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Geographic information — Metadata

Information géographique — Métadonnées



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Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 19115 was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*.

Introduction

A revival in the awareness of the importance of geography and how things relate spatially, combined with the advancement of electronic technology, have caused an expansion in the use of digital geographic information and geographic information systems worldwide. Increasingly, individuals from a wide range of disciplines outside of the geographic sciences and information technologies are capable of producing, enhancing, and modifying digital geographic information. As the number, complexity, and diversity of geographic datasets grow, a method for providing an understanding of all aspects of this data grows in importance.

Digital geographic data is an attempt to model and describe the real world for use in computer analysis and graphic display of information. Any description of reality is always an abstraction, always partial, and always just one of many possible "views". This "view" or model of the real world is not an exact duplication; some things are approximated, others are simplified, and some things are ignored. There is seldom perfect, complete, and correct data. To ensure that data is not misused, the assumptions and limitations affecting the creation of data must be fully documented. Metadata allows a producer to describe a dataset fully so that users can understand the assumptions and limitations and evaluate the dataset's applicability for their intended use.

Typically, geographic data is used by many people other than the producer. It is often produced by one individual or organization and used by another. Proper documentation will provide those unfamiliar with the data with a better understanding, and enable them to use it properly. As geographic data producers and users handle more and more data, proper documentation will provide them with a keener knowledge of their holdings and will allow them to better manage data production, storage, updating, and reuse.

The objective of this International Standard is to provide a structure for describing digital geographic data. This International Standard is intended to be used by information system analysts, program planners, and developers of geographic information systems, as well as others in order to understand the basic principles and the overall requirements for standardization of geographic information. This International Standard defines metadata elements, provides a schema and establishes a common set of metadata terminology, definitions, and extension procedures. When implemented by a data producer, this International Standard will:

- 1) Provide data producers with appropriate information to characterize their geographic data properly.
- 2) Facilitate the organization and management of metadata for geographic data.
- 3) Enable users to apply geographic data in the most efficient way by knowing its basic characteristics.
- 4) Facilitate data discovery, retrieval and reuse. Users will be better able to locate, access, evaluate, purchase and utilize geographic data.
- 5) Enable users to determine whether geographic data in a holding will be of use to them.

This International Standard defines general-purpose metadata, in the field of geographic information. More detailed metadata for geographic datatypes and geographic services are defined in other ISO 19100 series standards and user extensions.

Geographic information — Metadata

1 Scope

This International Standard defines the schema required for describing geographic information and services. It provides information about the identification, the extent, the quality, the spatial and temporal schema, spatial reference, and distribution of digital geographic data.

This International Standard is applicable to:

- the cataloguing of datasets, clearinghouse activities, and the full description of datasets;
- geographic datasets, dataset series, and individual geographic features and feature properties.

This International Standard defines:

- mandatory and conditional metadata sections, metadata entities, and metadata elements;
- the minimum set of metadata required to serve the full range of metadata applications (data discovery, determining data fitness for use, data access, data transfer, and use of digital data);
- optional metadata elements – to allow for a more extensive standard description of geographic data, if required;
- a method for extending metadata to fit specialized needs.

Though this International Standard is applicable to digital data, its principles can be extended to many other forms of geographic data such as maps, charts, and textual documents as well as non-geographic data.

NOTE Certain mandatory metadata elements may not apply to these other forms of data.

2 Conformance

2.1 Conformance requirements

Metadata shall be provided as specified in Clause 6 and Annexes A and B.

User-defined metadata shall be defined and provided as specified in Annex C.

Any metadata claiming conformance with this International Standard shall pass the requirements described in the abstract test suite presented in Annex D.

2.2 Metadata Profiles

Any profile conforming to this International Standard shall conform to the rules in Annex C, Clause C.6.

2.3 Obligation and condition

For the purposes of conformance testing using the abstract test suite in Annex D, metadata entities and elements shall be considered to be mandatory, conditional or optional as specified in the applicable profile.

3 Normative references

The following referenced documents are indispensable for the application 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 639 (all parts), *Code for the representation of names of languages*

ISO 3166 (all parts), *Codes for the representation of names of countries and their subdivisions*

ISO 4217:2001, *Codes for the representation of currencies and funds*

ISO 8859 (parts 1 to 16), *Information technology — 8-bit single-byte coded graphic character sets*

ISO 8879, *Information processing — Text and office systems — Standard Generalized Markup Language (SGML)*

ISO/IEC 10646-1, *Information technology — Universal Multiple-Octet Coded Character Set (UCS) — Part 1: Architecture and Basic Multilingual Plane*

ISO/IEC 11179 (all parts), *Information technology — Specification and standardization of data elements*

ISO 19106:—¹⁾, *Geographic information — Profiles*

ISO 19107:—¹⁾, *Geographic information — Spatial schema*

ISO 19108:2002, *Geographic information — Temporal schema*

ISO 19109:—¹⁾, *Geographic information — Rules for application schema*

ISO 19110:—¹⁾, *Geographic information — Methodology for feature cataloguing*

ISO 19111:2003, *Geographic information — Spatial referencing by coordinates*

ISO 19112:—¹⁾, *Geographic information — Spatial referencing by geographic identifiers*

ISO 19113:2002, *Geographic information — Quality principles*

ISO 19114:—¹⁾, *Geographic information — Quality evaluation procedures*

ISO 19117:—¹⁾, *Geographic information — Portrayal*

ISO 19118:—¹⁾, *Geographic information — Encoding*

1) To be published.

4 Terms and definitions

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

NOTE The terms and definitions used in conjunction with the UML models are addressed in Clause 5.

4.1

data type

specification of a value domain with operations allowed on values in this domain [ISO 19103]

EXAMPLE Integer, Real, Boolean, String, Date, and GM_Point.

NOTE A data type is identified by a term, e.g. Integer.

4.2

dataset

identifiable collection of data

NOTE A dataset may be a smaller grouping of data which, though limited by some constraint such as spatial extent or feature type, is located physically within a larger dataset. Theoretically, a dataset may be as small as a single feature or feature attribute contained within a larger dataset. A hardcopy map or chart may be considered a dataset.

4.3

dataset series

collection of datasets sharing the same product specification

4.4

grid

network composed of two or more sets of curves in which the member of each set intersect the members of the other sets in an algorithmic way [ISO 19123]

4.5

metadata

data about data

4.6

metadata element

discrete unit of metadata

NOTE 1 Metadata elements are unique within a metadata entity.

NOTE 2 Equivalent to an attribute in UML terminology.

4.7

metadata entity

set of metadata elements describing the same aspect of data

NOTE 1 May contain one or more metadata entities.

NOTE 2 Equivalent to a class in UML terminology.

4.8

metadata section

subset of metadata which consists of a collection of related metadata entities and metadata elements

NOTE Equivalent to a package in UML terminology.

4.9

model

abstraction of some aspects of a universe of discourse [ISO 19109]

4.10

resource

asset or means that fulfils a requirement

EXAMPLE Dataset, service, document, person or organization.

4.11

temporal reference system

reference system against which time is measured [ISO 19108]

5 Symbols and abbreviated terms

5.1 Abbreviations

DTD	Document Type Definition
IDL	Interface Definition Language
OCL	Object Constraint Language
SGML	Standard Generalized Markup Language
UML	Unified Modelling Language
XML	Extensible Markup Language

5.2 UML notations

The diagrams that appear in this International Standard are presented using the Unified Modelling Language (UML) static structure diagram with the ISO Interface Definition Language (IDL) basic type definitions and the UML Object Constraint Language (OCL) as the conceptual schema language. The UML notations used in this International Standard are described in the Figure 1.

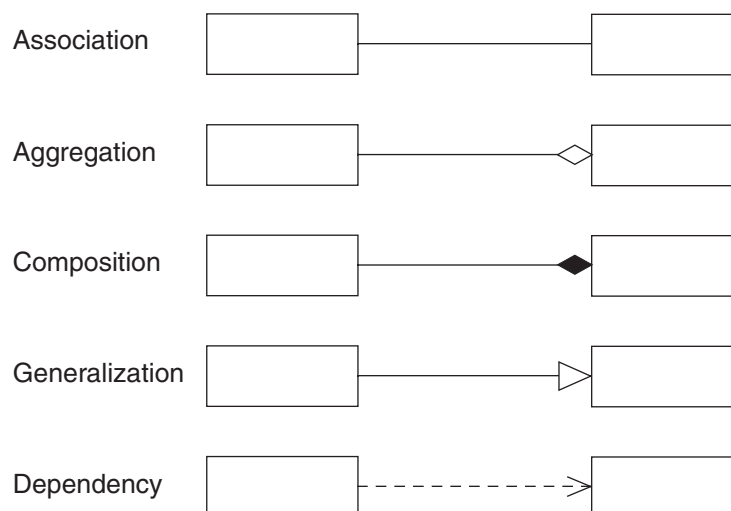


Figure 1 — UML notation

5.3 UML model relationships

5.3.1 Associations

An association is used to describe a relationship between two or more classes. UML defines three different types of relationships, called association, aggregation and composition. The three types have different semantics. An ordinary association shall be used to represent a general relationship between two classes. The aggregation and composition associations shall be used to create part-whole relationships between two classes. The direction of an association must be specified. If the direction is not specified, it is assumed to be a two-way association. If one-way associations are intended, the direction of the association can be marked by an arrow at the end of the line.

An aggregation association is a relationship between two classes in which one of the classes plays the role of container and the other plays the role of a containee.

A composition association is a strong aggregation. In a composition association, if a container object is deleted, then all of its containee objects are deleted as well. The composition association shall be used when the objects representing the parts of a container object cannot exist without the container object.

5.3.2 Generalization

A generalization is a relationship between a superclass and the subclasses that may be substituted for it. The superclass is the generalized class, while the subclasses are specified classes.

5.3.3 Instantiation/Dependency

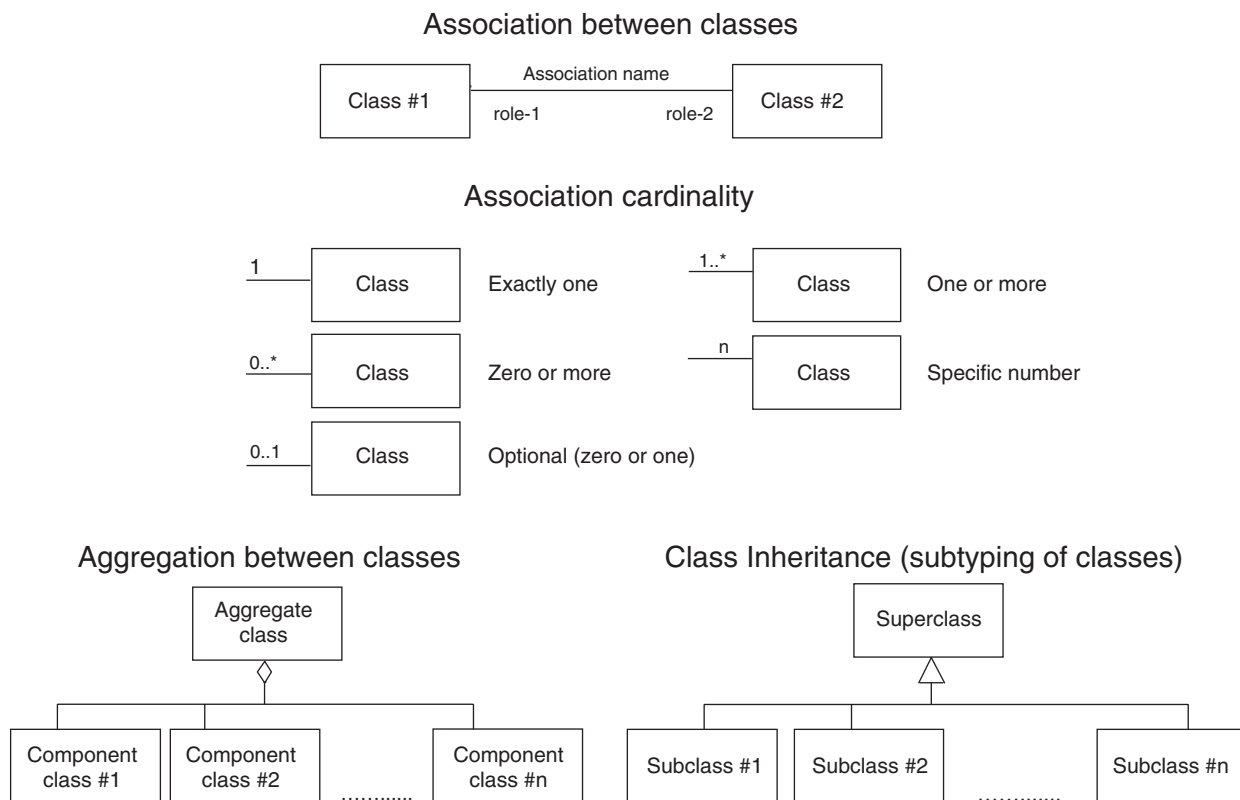
A dependency relationship shows that the client class depends on the supplier class/interface to provide certain services, such as:

- Client class accesses a value (constant or variable) defined in the supplier class/interface;
- Operations of the client class invoke operations of the supplier class/interface;
- Operations of the client class have signatures whose return class or arguments are instances of the supplier class/interface.

An instantiated relationship represents the act of substituting actual values for the parameters of a parameterized class or parameterized class utility to create a specialized version of the more general item.

5.3.4 Roles

If an association is navigable in a particular direction, the model shall supply a “role name” that is appropriate for the role of the target object in relation to the source object. Thus in a two-way association, two role names will be supplied. Figure 2 represents how role names and cardinalities are expressed in UML diagrams.

**Figure 2 — UML roles**

5.4 UML model stereotypes

A UML stereotype is an extension mechanism for existing UML concepts. It is a model element that is used to classify (or mark) other UML elements so that they in some respect behave as if they were instances of new virtual or pseudo metamodel classes whose form is based on existing base metamodel classes. Stereotypes augment the classification mechanisms on the basis of the built-in UML metamodel class hierarchy. Below are brief descriptions of the stereotypes used in this International Standard, for more detailed descriptions consult ISO/TS 19103.

In this International Standard the following stereotypes are used:

- a) **<<Type>>** class used for specification of a domain of instances (objects), together with the operations applicable to the objects. A type may have attributes and associations.
- b) **<<Enumeration>>** data type whose instances form a list of named literal values. Both the enumeration name and its literal values are declared. Enumeration means a short list of well-understood potential values within a class.
- c) **<<DataType>>** a descriptor of a set of values that lack identity and whose operations do not have side effects. Datatypes include primitive pre-defined types and user-definable types. Pre-defined types include numbers, string, and time. User-definable types include enumerations.
- d) **<<CodeList>>** used to describe a more open enumeration. **<<CodeList>>** is a flexible enumeration. Code lists are useful for expressing a long list of potential values. If the elements of the list are completely known, an enumeration should be used; if the only likely values of the elements are known, a code list should be used.

- e) <<Union>> describes a selection of one of the specified types. This is useful to specify a set of alternative classes/types that can be used, without the need to create a common super-type/class.
- f) <<Abstract>> class (or other classifier) that cannot be directly instantiated. UML notation for this to show the name in italics.
- g) <<Metaclass>> class whose instances are classes. Metaclasses are typically used in the construction of metamodels. A metaclass is an object class whose primary purpose is to hold metadata about another class.
- h) <<Interface>> named set of operations that characterize the behaviour of an element.
- i) <<Package>> cluster of logically related components, containing sub-packages.
- j) <<Leaf>> package that contains definitions, without any sub-packages.

5.5 Package abbreviations

Two letter abbreviations are used to denote the package that contains a class. Those abbreviations precede class names, connected by a “_”. The standard that those classes are located in is indicated in parentheses. A list of those abbreviations follows.

CC	Changing Coordinates (ISO 19111)
CI	Citation (ISO 19115)
CV	Coverages (ISO 19123)
DQ	Data quality (ISO 19115)
DS	Dataset (ISO 19115)
EX	Extent (ISO 19115)
FC	Feature Catalogue (ISO 19110)
FE	Feature (ISO 19109)
FT	Feature Topology (ISO 19107)
GF	General Feature (ISO 19109)
GM	Geometry (ISO 19107)
GR	Graph (ISO 19107)
LI	Lineage (ISO 19115)
MD	Metadata (ISO 19115)
PF	Feature Portrayal (ISO 19117)
PS	Positioning Services (ISO 19116)
RS	Reference System (ISO 19115)
SC	Spatial Coordinates (ISO 19111)

SI	Spatial Identification (ISO 19112)
SV	Services (ISO 19119)
TM	Temporal (ISO 19108)
TP	Topology (ISO 19107)
TS	Simple Topology (ISO 19107)

5.6 UML model/data dictionary relationships

Table 1 illustrates the relationship between the terminology of the UML models and the data dictionary.

Table 1 — Relationship between UML model and data dictionary

UML Model	Data Dictionary
Package	Section
Generalized Class	Entity
Specified Class	Entity
Class	Entity
Attribute	Element
Association	Element

6 Requirements

6.1 Metadata for geographic data requirement

This International Standard identifies the metadata required to describe digital geographic data. Metadata is applicable to independent datasets, aggregations of datasets, individual geographic features, and the various classes of objects that compose a feature. Metadata shall be provided for geographic datasets and may, optionally, be provided for aggregations of datasets, features, and attributes of features. Metadata is composed of one or more Metadata Sections (UML Packages) containing one or more Metadata Entities (UML classes).

6.2 Metadata application information

Figure 3 is a UML class diagram defining the classes of geographic information to which metadata applies. It specifies that a dataset (DS_DataSet) must have one or more related Metadata entity sets (MD_Metadata). Metadata may optionally relate to a Feature, Feature Attribute, Feature Type, Feature Property Type (a Metaclass instantiated by Feature association role, Feature attribute type, and Feature operation), and aggregations of datasets (DS_Aggregate). Dataset aggregations may be specified (subclassed) as a general association (DS_OtherAggregate), a dataset series (DS_Series), or a special activity (DS_Initiative). MD_Metadata also applies to other classes of information and services not shown in this diagram (see MD_ScopeCode, B.5.25).

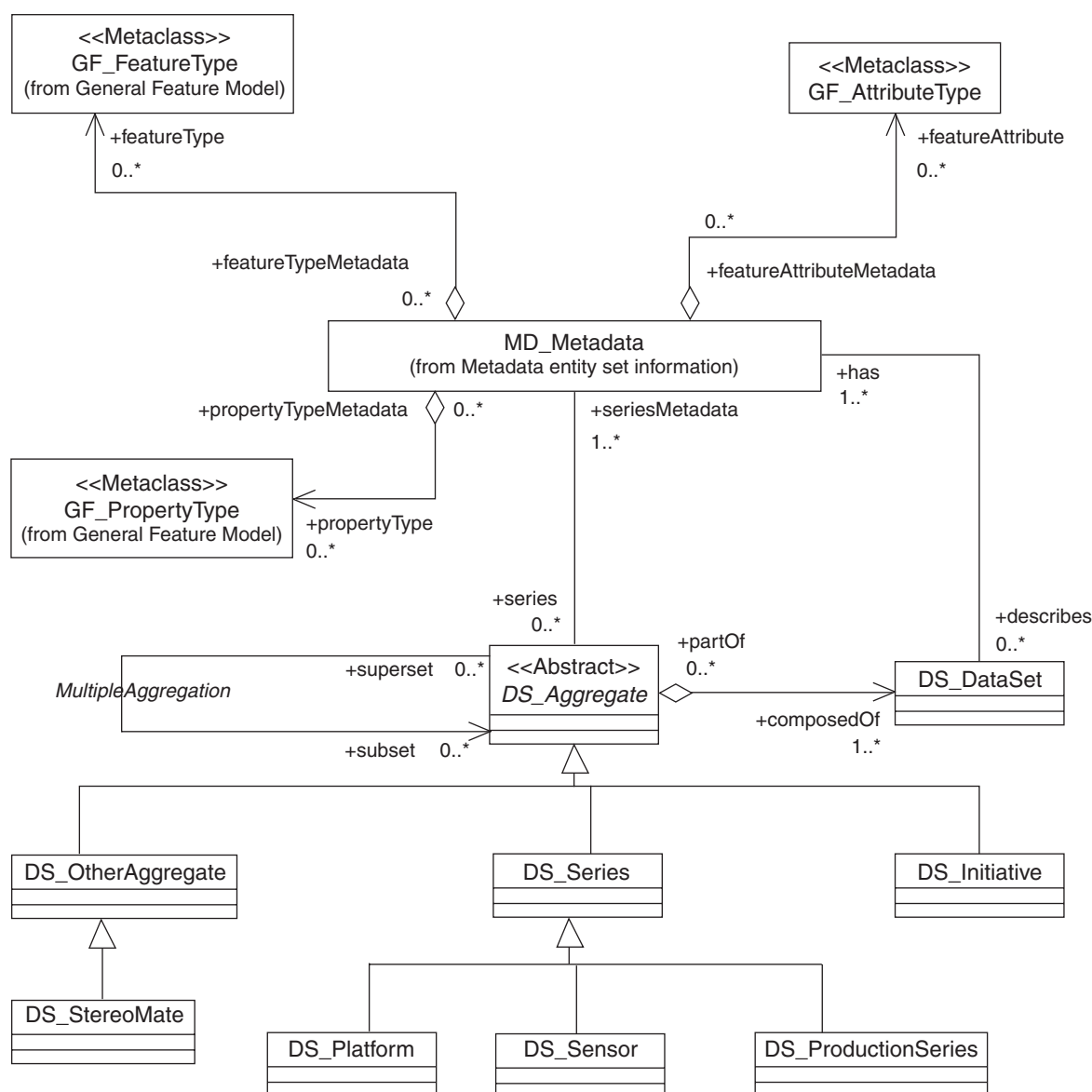


Figure 3 — Metadata application

6.3 Metadata packages

6.3.1 Metadata package and entity relationship

In this International Standard, metadata for geographic data is presented in UML Packages. Each package contains one or more entities (UML Classes), which can be specified (subclassed) or generalized (superclassed). Entities contain elements (UML class attributes) which identify the discrete units of metadata. Entities may be related to one or more other entities. Entities can be aggregated and repeated as necessary to meet: (1) the mandatory requirements stated in this International Standard; (2) additional user requirements. Figure 4 illustrates the layout of the packages. The metadata is fully specified in the UML model diagrams and data dictionary for each package, which can be found in Annexes A and B respectively. If a discrepancy between the two annexes exists, Annex A shall be considered authoritative.

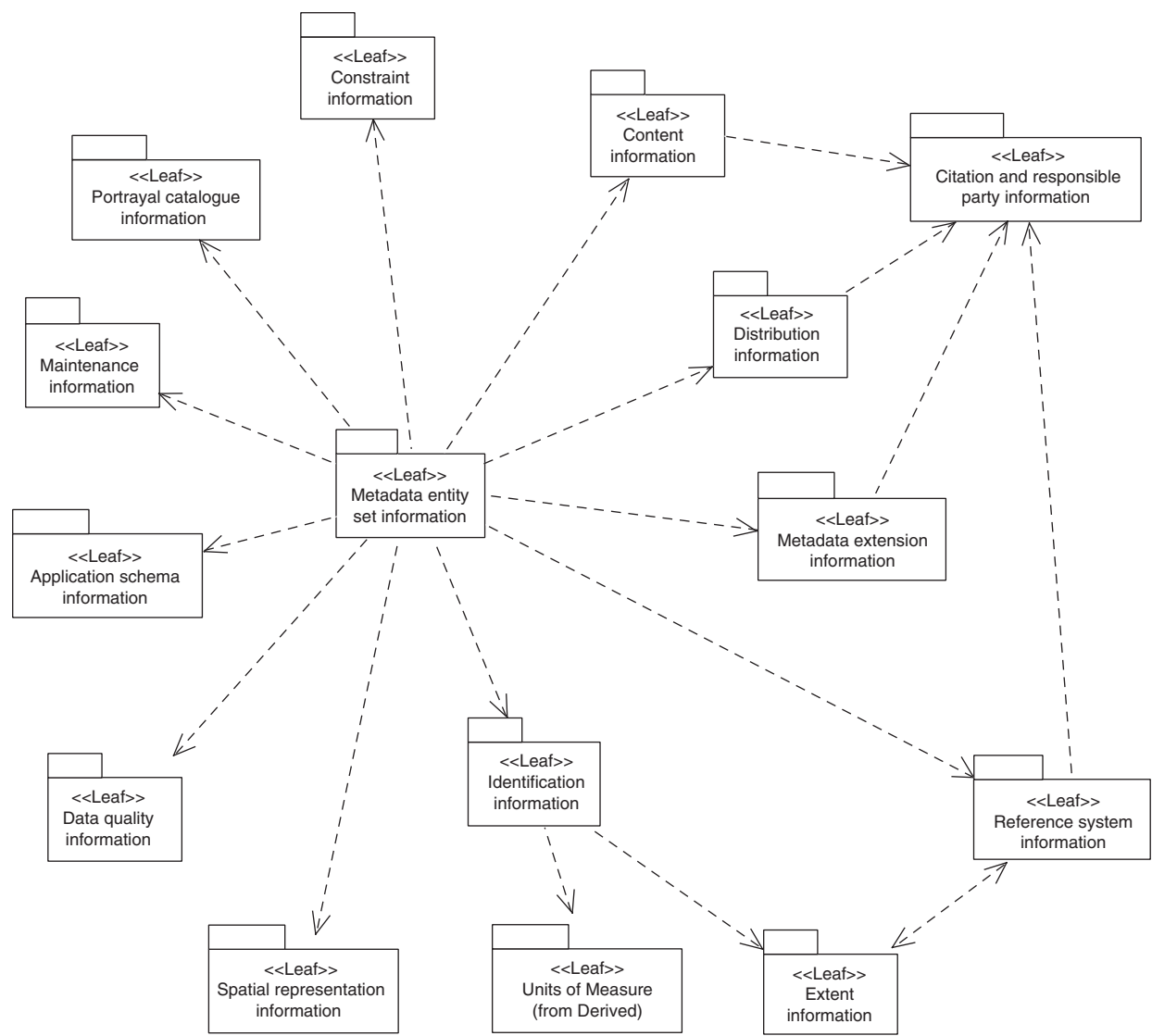


Figure 4 — Metadata packages

The relationship between packages of metadata and metadata entities is shown in Table 2. The packages of metadata are listed in the Package column and the aggregate entity of metadata contained within the corresponding package is listed in the Entity column. The entities contained within the packages are further defined in 6.3.2 through 6.4.2. Each package has a corresponding subclause, which is listed in the Subclause Number column.

Table 2 — Relationship between packages of metadata and metadata entities

Subclause Number	Package	Entity	UML Diagram	Data Dictionary
6.3.2.1	Metadata entity set information	MD_Metadata	A.2.1	B.2.1
6.3.2.2	Identification information	MD_Identification	A.2.2	B.2.2
6.3.2.3	Constraint information	MD_Constraints	A.2.3	B.2.3
6.3.2.4	Data quality information	DQ_DataQuality	A.2.4.1 A.2.4.2 A.2.4.3	B.2.4.1 B.2.4.2 B.2.4.3
6.3.2.5	Maintenance information	MD_MaintenanceInformation	A.2.5	B.2.5
6.3.2.6	Spatial representation information	MD_SpatialRepresentation	A.2.6	B.2.6
6.3.2.7	Reference system information	MD_ReferenceSystem	A.2.7	B.2.7
6.3.2.8	Content information	MD_ContentInformation	A.2.8	B.2.8
6.3.2.9	Portrayal catalogue information	MD_PortrayalCatalogueReference	A.2.9	B.2.9
6.3.2.10	Distribution information	MD_Distribution	A.2.10	B.2.10
6.3.2.11	Metadata extension information	MD_MetadataExtensionInformation	A.2.11	B.2.11
6.3.2.12	Application schema information	MD_ApplicationSchemaInformation	A.2.12	B.2.12
6.4.1	Extent information	EX_Extent	A.3.1	B.3.1
6.4.2	Citation and responsible party information	CI_Citation CI_ResponsibleParty	A.3.2	B.3.2

6.3.2 Package descriptions

6.3.2.1 Metadata entity set information (MD_Metadata)

Metadata entity set information consists of the entity (UML class) MD_Metadata, which is mandatory. The MD_Metadata entity contains both mandatory and optional metadata elements (UML attributes). The MD_Metadata entity is an aggregate of the following entities (which are further explained in the following subclauses):

- MD_Identification
- MD_Constraints
- DQ_DataQuality
- MD_MaintenanceInformation
- MD_SpatialRepresentation
- MD_ReferenceSystem
- MD_ContentInformation
- MD_PortrayalCatalogueReference
- MD_Distribution
- MD_MetadataExtensionInformation
- MD_ApplicationSchemaInformation

6.3.2.2 Identification information (MD_Identification)

Identification information contains information to uniquely identify the data. Identification information includes information about the citation for the resource, an abstract, the purpose, credit, the status and points of contact. The MD_Identification entity is mandatory. It contains mandatory, conditional, and optional elements. The MD_Identification entity may be specified (subclassed) as MD_DataIdentification when used to identify data and as MD_ServiceIdentification when used to identify a service. MD_ServiceIdentification provides a high level description of a service, for further information see ISO 19119. MD_Identification is an aggregate of the following entities:

- MD_Format, format of the data
- MD_BrowseGraphic, graphic overview of the data
- MD_Usage, specific uses of the data
- MD_Constraints, constraints placed on the resource
- MD_Keywords, keywords describing the resource
- MD_MaintenanceInformation, how often the data is scheduled to be updated and the scope of the update
- MD_AggregateInformation, information about datasets that are aggregate parts of the dataset that the metadata describes

The extent element of MD_DataIdentification is conditional; either the EX_GeographicBoundingBox or the EX_GeographicDescription subclass of extent's geographicElement Role shall be included if the dataset is spatially referenced. If necessary both may be used.

The characterSet element of MD_DataIdentification is conditional; it is documented if ISO/IEC 10646-1 is not used.

6.3.2.3 Constraint information (MD_Constraints)

This package contains information concerning the restrictions placed on data. The MD_Constraints entity is optional and may be specified as MD_LegalConstraints and/or MD_SecurityConstraints.

The otherConstraint element of MD_LegalConstraints shall be non-zero (used) only if accessConstraints and/or useConstraints elements have a value of "otherRestrictions", which is found in the MD_RestrictionCodeodelist.

6.3.2.4 Data quality information (DQ_DataQuality)

This package contains a general assessment of the quality of the dataset. The DQ_DataQuality entity is optional and contains the scope of the quality assessment. DQ_DataQuality is an aggregate of LI_Lineage and DQ_Element. DQ_Element can be specified as DQ_Completeness, DQ_LogicalConsistency, DQ_PositionalAccuracy, DQ_ThematicAccuracy and DQ_TemporalAccuracy. Those five entities represent Elements of data quality and can be further subclassed to the sub-Elements of data quality. Users may add additional elements and sub-elements of data quality by sub-classing DQ_Element or the appropriate sub-element.

This package also contains information about the sources and production processes used in producing a dataset. The LI_Lineage entity is optional and contains a statement about the lineage. LI_Lineage is an aggregate of LI_ProcessStep and LI_Source.

Either the "report" or "lineage" roles of DQ_DataQuality must be present if DQ_DataQuality.scope.DQ_Scope.level has a value of "dataset".

The “levelDescription” element of DQ_Scope is mandatory if the “level” element of DQ_Scope does not have a value of “dataset” or “series”.

The “statement” element of LI_Lineage is mandatory if DQ_DataQuality.scope.DQ_Scope.level has a value of “dataset” or “series” and the LI_Lineage roles of “source” and “processStep” are not documented.

The “source” role of LI_Lineage is mandatory if the “statement” element and the “processStep” role of LI_Lineage are not documented.

The “processStep” role of LI_Lineage is mandatory if the “statement” element and the “source” role of LI_Lineage are not documented.

Either the “description” or “sourceExtent” element of LI_Source must be documented.

6.3.2.5 Maintenance information (MD_MaintenanceInformation)

This package contains information about the scope and frequency of updating data. The MD_MaintenanceInformation entity is optional and contains mandatory and optional metadata elements.

6.3.2.6 Spatial representation information (MD_SpatialRepresentation)

This package contains information concerning the mechanisms used to represent spatial information in a dataset. The MD_SpatialRepresentation entity is optional and can be specified as MD_GridSpatialRepresentation and MD_VectorSpatialRepresentation. Each of the specified entities contains mandatory and optional metadata elements. When further description is necessary, MD_GridSpatialRepresentation may be specified as MD_Georectified and/or MD_Georeferenceable. Metadata for Spatial data representation are derived from ISO 19107.

6.3.2.7 Reference system information (MD_ReferenceSystem)

This package contains the description of the spatial and temporal reference system(s) used in a dataset. MD_ReferenceSystem contains an element to identify the reference system used. MD_ReferenceSystem may be subclassed as MD_CRS, which is an aggregate of MD_ProjectionParameters and MD_EllipsoidParameters. MD_ProjectionParameters is an aggregate of MD_ObliqueLineAzimuth and MD_ObliqueLinePoint.

6.3.2.8 Content information (MD_ContentInformation)

This package contains information identifying the feature catalogue used (MD_FeatureCatalogueDescription) and/or information describing the content of a coverage dataset (MD_CoverageDescription). Both description entities are subclasses of the MD_ContentInformation entity. MD_CoverageDescription may be subclassed as MD_ImageDescription, and has an aggregate of MD_RangeDimension. MD_RangeDimension may additionally be subclassed as MD_Band.

6.3.2.9 Portrayal catalogue information (MD_PortrayalCatalogueReference)

This package contains information identifying the portrayal catalogue used. It consists of the optional entity MD_PortrayalCatalogueReference. This entity contains the mandatory element used to specify which portrayal catalogue is used by the dataset.

6.3.2.10 Distribution information (MD_Distribution)

This package contains information about the distributor of, and options for obtaining, a resource. It contains the optional MD_Distribution entity. MD_Distribution is an aggregate of the options for the digital distribution of a dataset (MD_DigitalTransferOptions), identification of the distributor (MD_Distributor) and the format of the distribution (MD_Format), which contains mandatory and optional elements. MD_DigitalTransferOptions contains the medium used for the distribution (MD_Medium) of a dataset, and is an aggregate of

MD_Distributor. MD_Distributor's other aggregate is the process for ordering a distribution (MD_StandardOrderProcess).

The "distributionFormat" role of MD_Distribution is mandatory if the "distributorFormat" role of MD_Distributor is not documented.

The "distributorFormat" role of MD_Distributor is mandatory if the "distributionFormat" role of MD_Distribution is not documented.

6.3.2.11 Metadata extension information (MD_MetadataExtensionInformation)

This package contains information about user specified extensions. It contains the optional MD_MetadataExtensionInformation entity. MD_MetadataExtensionInformation is an aggregate of information describing the extended metadata elements (MD_ExtendedElementInformation).

If the "dataType" element of MD_ExtendedElementInformation does not have a value of 'codelist', 'enumeration' or 'codelistElement'; then the "obligation", "maximumOccurrence" and "domainValue" elements are mandatory.

If the "dataType" element of MD_ExtendedElementInformation has a value of 'codelistElement', then the "domainCode" element is mandatory.

If the "dataType" element of MD_ExtendedElementInformation does not have a value of 'codelistElement', then the "shortName" element is mandatory.

If the "obligation" element of MD_ExtendedElementInformation has a value of 'conditional', then the "condition" element is mandatory.

6.3.2.12 Application schema information (MD_ApplicationSchemaInformation)

This package contains information about the application schema used to build a dataset. It contains the optional entity MD_ApplicationSchemaInformation. The entity contains mandatory and optional elements.

6.4 Metadata datatypes

6.4.1 Extent information (EX_Extent)

The datatype in this package is an aggregate of the metadata elements that describe the spatial and temporal extent of the referring entity. The EX_Extent entity contains information about the geographic (EX_GeographicExtent), temporal (EX_TemporalExtent) and the vertical (EX_VerticalExtent) extent of the referring entity. EX_GeographicExtent can be subclassed as EX_BoundingPolygon, EX_GeographicBoundingBox and EX_GeographicDescription. The combined spatial and temporal extent (EX_SpatialTemporalExtent) is an aggregate of EX_GeographicExtent. EX_SpatialTemporalExtent is a subclass of EX_TemporalExtent.

The EX_Extent entity has three optional roles named "geographicElement", "temporalElement", and "verticalElement" and an element called "description". At least one of the four shall be used.

The entity stereotype "DataType" is defined in 5.4.

6.4.2 Citation and responsible party information (CI_Citation and CI_ResponsibleParty)

This package of datatypes provides a standardized method (CI_Citation) for citing a resource (dataset, feature, source, publication, etc.), as well as information about the party responsible (CI_ResponsibleParty) for a resource. The CI_ResponsibleParty datatype contains the identity of person(s), and/or position, and/or organization(s) associated with the resource. The location (CI_Address) of the responsible person or organization is also defined here.

The entity stereotype "DataType" is defined in 5.4.

6.5 Core metadata for geographic datasets

This International Standard defines an extensive set of metadata elements; typically only a subset of the full number of elements is used. However, it is essential that a basic minimum number of metadata elements be maintained for a dataset. Listed are the core metadata elements required to identify a dataset, typically for catalogue purposes. This list contains metadata elements answering the following questions: "Does a dataset on a specific topic exist ('what')?", "For a specific place ('where')?", "For a specific date or period ('when')?" and "A point of contact to learn more about or order the dataset ('who')?". Using the recommended optional elements in addition to the mandatory elements will increase interoperability, allowing users to understand without ambiguity the geographic data and the related metadata provided by either the producer or the distributor. Dataset metadata profiles of this International Standard shall include this core.

Listed below (see Table 3) are the core metadata elements (mandatory and recommended optional) required for describing a dataset. An "M" indicates that the element is mandatory. An "O" indicates that the element is optional. A "C" indicates that the element is mandatory under certain conditions.

Table 3 — Core metadata for geographic datasets

Dataset title (M) (MD_Metadata > MD_DataIdentification.citation > CI_Citation.title)	Spatial representation type (O) (MD_Metadata > MD_DataIdentification.spatialRepresentationType)
Dataset reference date (M) (MD_Metadata > MD_DataIdentification.citation > CI_Citation.date)	Reference system (O) (MD_Metadata > MD_ReferenceSystem)
Dataset responsible party (O) (MD_Metadata > MD_DataIdentification.pointOfContact > CI_ResponsibleParty)	Lineage (O) (MD_Metadata > DQ_DataQuality.lineage > LI_Lineage)
Geographic location of the dataset (by four coordinates or by geographic identifier) (C) (MD_Metadata > MD_DataIdentification.extent > EX_Extent > EX_GeographicExtent > EX_GeographicBoundingBox or EX_GeographicDescription)	On-line resource (O) (MD_Metadata > MD_Distribution > MD_DigitalTransferOption.onLine > CI_OnlineResource)
Dataset language (M) (MD_Metadata > MD_DataIdentification.language)	Metadata file identifier (O) (MD_Metadata.fileIdentifier)
Dataset character set (C) (MD_Metadata > MD_DataIdentification.characterSet)	Metadata standard name (O) (MD_Metadata.metadataStandardName)
Dataset topic category (M) (MD_Metadata > MD_DataIdentification.topicCategory)	Metadata standard version (O) (MD_Metadata.metadataStandardVersion)
Spatial resolution of the dataset (O) (MD_Metadata > MD_DataIdentification.spatialResolution > MD_Resolution.equivalentScale or MD_Resolution.distance)	Metadata language (C) (MD_Metadata.language)
Abstract describing the dataset (M) (MD_Metadata > MD_DataIdentification.abstract)	Metadata character set (C) (MD_Metadata.characterSet)
Distribution format (O) (MD_Metadata > MD_Distribution > MD_Format.name and MD_Format.version)	Metadata point of contact (M) (MD_Metadata.contact > CI_ResponsibleParty)
Additional extent information for the dataset (vertical and temporal) (O) (MD_Metadata > MD_DataIdentification.extent > EX_Extent > EX_TemporalExtent or EX_VerticalExtent)	Metadata date stamp (M) (MD_Metadata.dateStamp)

6.6 Unified Modelling Language (UML) diagrams

Annex A provides the metadata schemas in the form of Unified Modelling Language (UML) diagrams. These diagrams, in conjunction with the data dictionary presented in Annex B, serve to fully define the total abstract model for metadata.

6.7 Data dictionary

Annex B contains the element and entity definitions for the metadata schemas. This dictionary, in conjunction with the diagrams presented in Annex A, serve to fully define the total abstract model for metadata.

Codelists and their values provided in this International Standard (B.5 and A.2) are normative. User extensions to codelists shall follow the rules as described in Annex C and ISO/IEC 11179-6. ISO/IEC 11179-6 defines the information to be specified, conditions to be fulfilled and procedure(s) to be followed for registering data elements.

6.8 Metadata extensions and profiles

Annex C provides the rules for defining and applying additional metadata to better serve special user needs.

6.9 Abstract test suite

Annex D defines the tests that must be passed to claim conformance with this International Standard.

6.10 Comprehensive dataset metadata application profile

Annex E defines a comprehensive metadata application schema, which provides an implementable metadata profile. It incorporates the mandatory and optional metadata required to document a geographic data resource completely (independent dataset, dataset series, or individual geographic features). This schema fully defines the complete range of metadata required to identify, evaluate, extract, employ, and manage geographic information. Data producers typically provide comprehensive metadata.

This schema is provided as a UML model.

6.11 Metadata extension methodology

Annex F provides guidance on extending metadata. Additional metadata elements shall be defined according to the rules described in Annex C.

6.12 Metadata implementation

Annex G provides an overview of methods and ideas for the implementation and management of metadata for the purposes of search and retrieval, metadata exchange, and presentation.

6.13 Hierarchical levels of metadata

Annex H provides methods for efficiently handling metadata for datasets with metadata requirements at different levels.

6.14 Implementation examples

Annex I provides an example of the use of this International Standard, utilizing the core components of the comprehensive profile, for a geographic dataset. An example of extended metadata elements, as may be developed by a specific information community, is provided (I.3).

6.15 Multilingual support for free text fields

Annex J provides a structure to implement the free text fields of this International Standard in multiple languages.

Annex A **(normative)**

Metadata schemas

A.1 Metadata UML models

Metadata for describing geographic data is defined using an abstract object model in the Unified Modelling Language (UML). The diagrams in the following subclauses provide “views,” which are portions of the total abstract model for metadata. Each diagram defines a metadata section (UML package) of related entities, elements, data types, and code lists. Related entities, which are defined in another diagram, are shown with elements suppressed and the defining package specified under the entity name in parenthesis. Throughout the following models, entities may have mandatory and/or optional elements and associations. In some cases, optional entities may have mandatory elements; those elements become mandatory only if the optional element is used.

A.2 Metadata package UML diagrams

A.2.1 Metadata entity set information

Figure A.1 defines the class “MD_Metadata” and shows containment relationships with the other metadata classes which, in aggregate, define metadata for geographic data. The other metadata class diagrams can be found on the following pages. The data dictionary for this diagram is located in B.2.1.

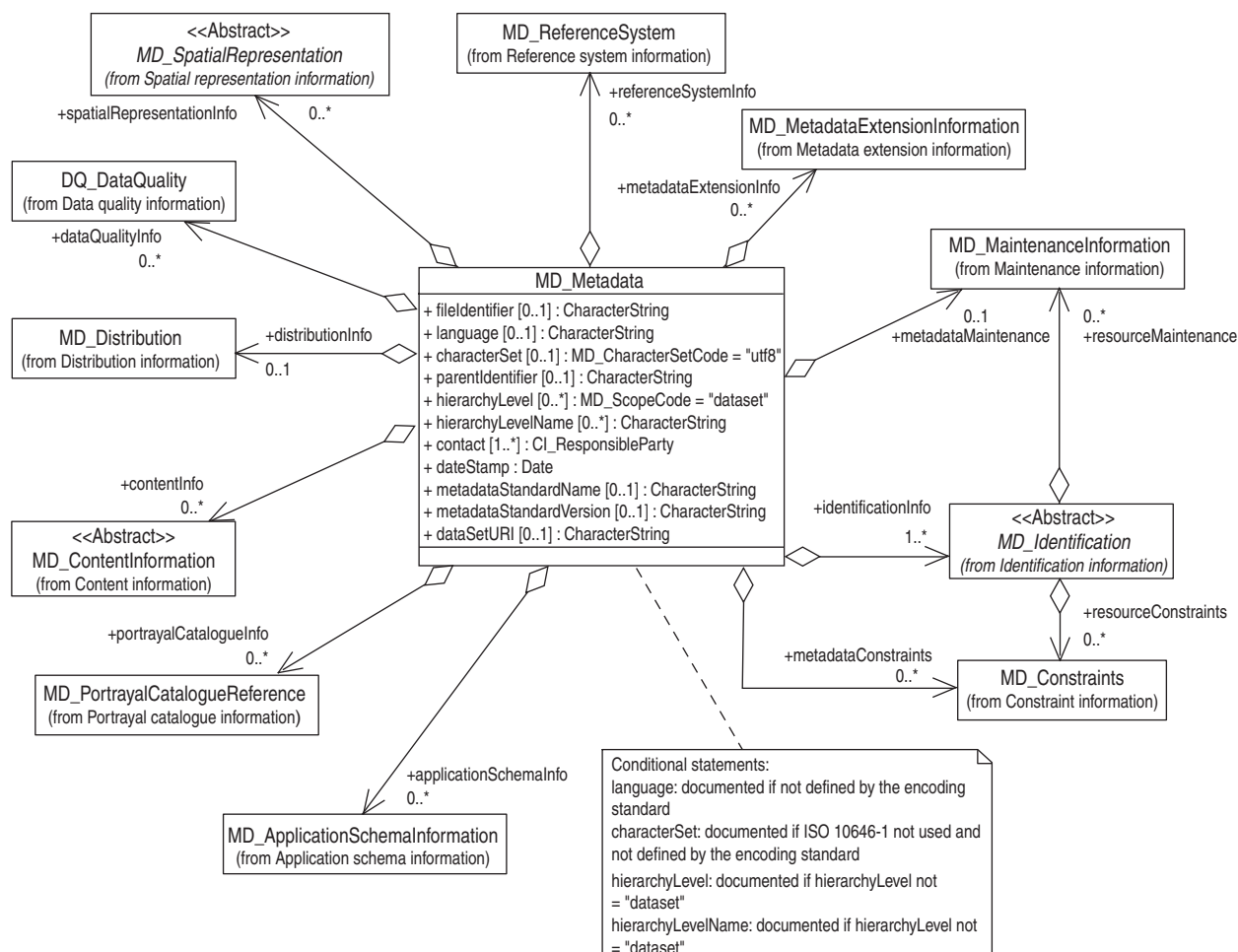


Figure A.1 — Metadata entity set information

A.2.2 Identification information

Figure A.2 defines the metadata classes required to identify a resource. It also defines separate specialization sub-classes for identifying data and services. The data dictionary for this diagram is located in B.2.2.



Figure A.2 — Identification information

A.2.3 Constraint information

Figure A.3 defines the metadata required for managing rights to information including restrictions on access and use. The data dictionary for this diagram is located in B.2.3.

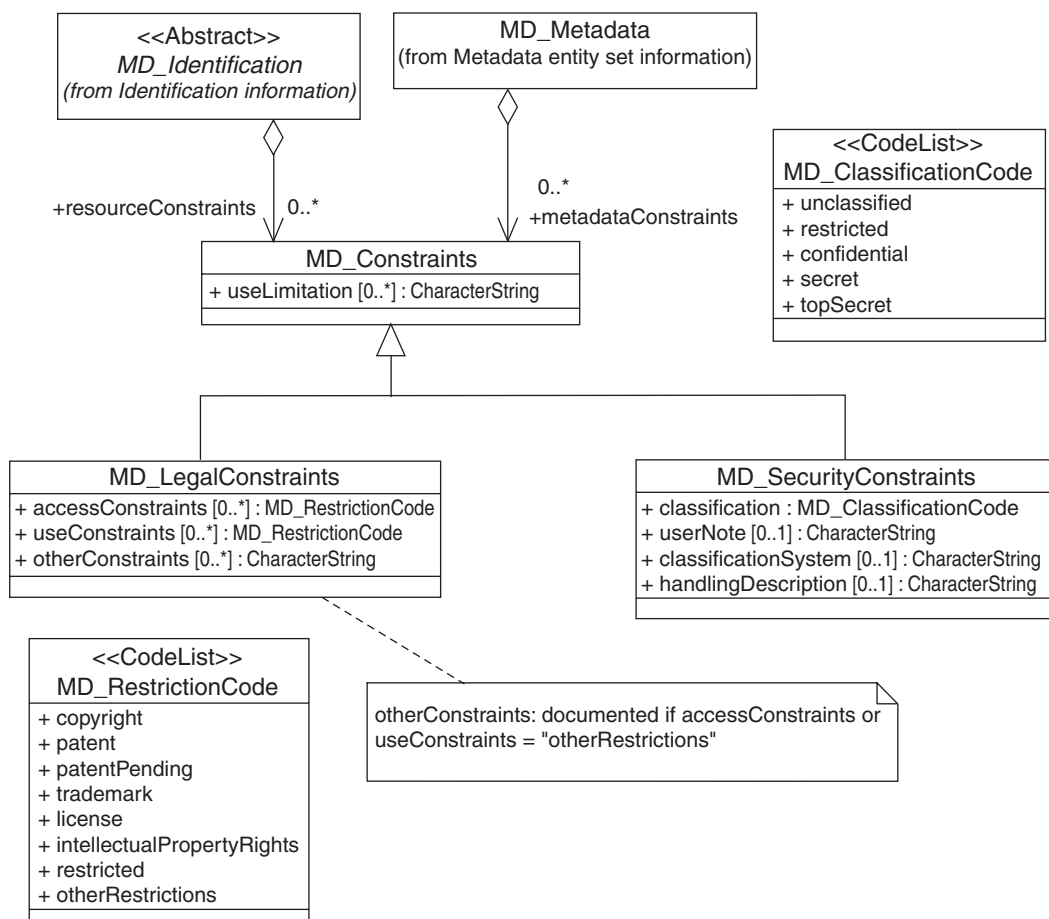


Figure A.3 — Constraint information

A.2.4 Data quality information

A.2.4.1 General

Figure A.4 defines the metadata required to give a general assessment of the quality of a resource. The data dictionary for this diagram is located in B.2.4.

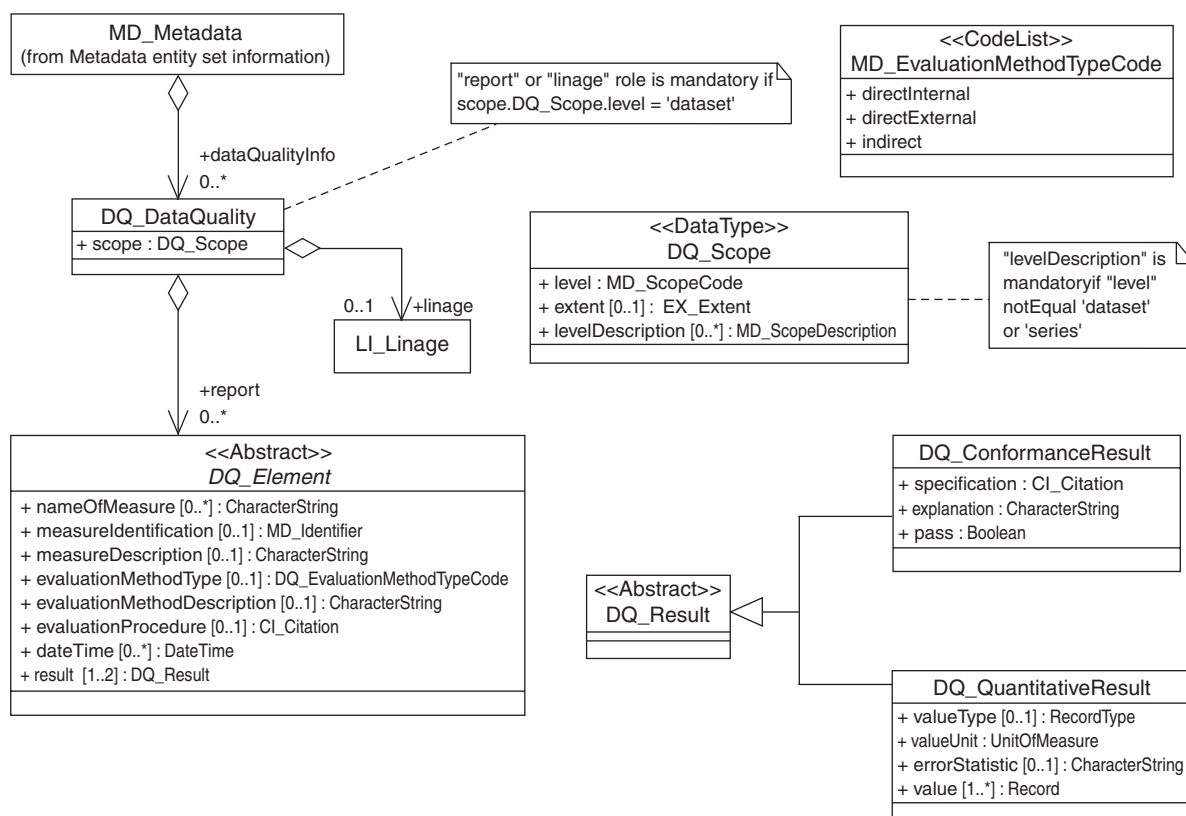


Figure A.4 — Data quality information

A.2.4.2 Lineage information

Figure A.5 defines metadata required to describe the sources and production processes used in producing a dataset. The data dictionary for this diagram is located in B.2.4.2.

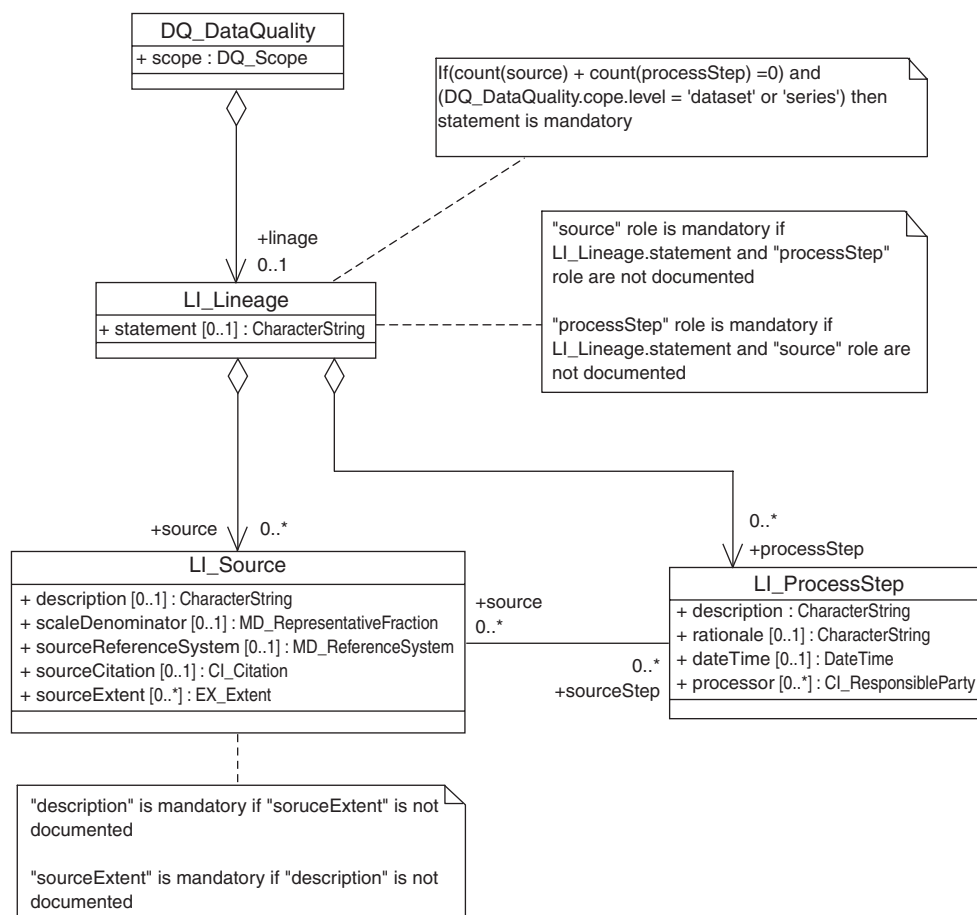


Figure A.5 — Lineage information

A.2.4.3 Data quality classes and subclasses

Figure A.6 defines the classes and subclasses of data quality used in the data quality diagram. The data dictionary for this diagram is located in B.2.4.3.

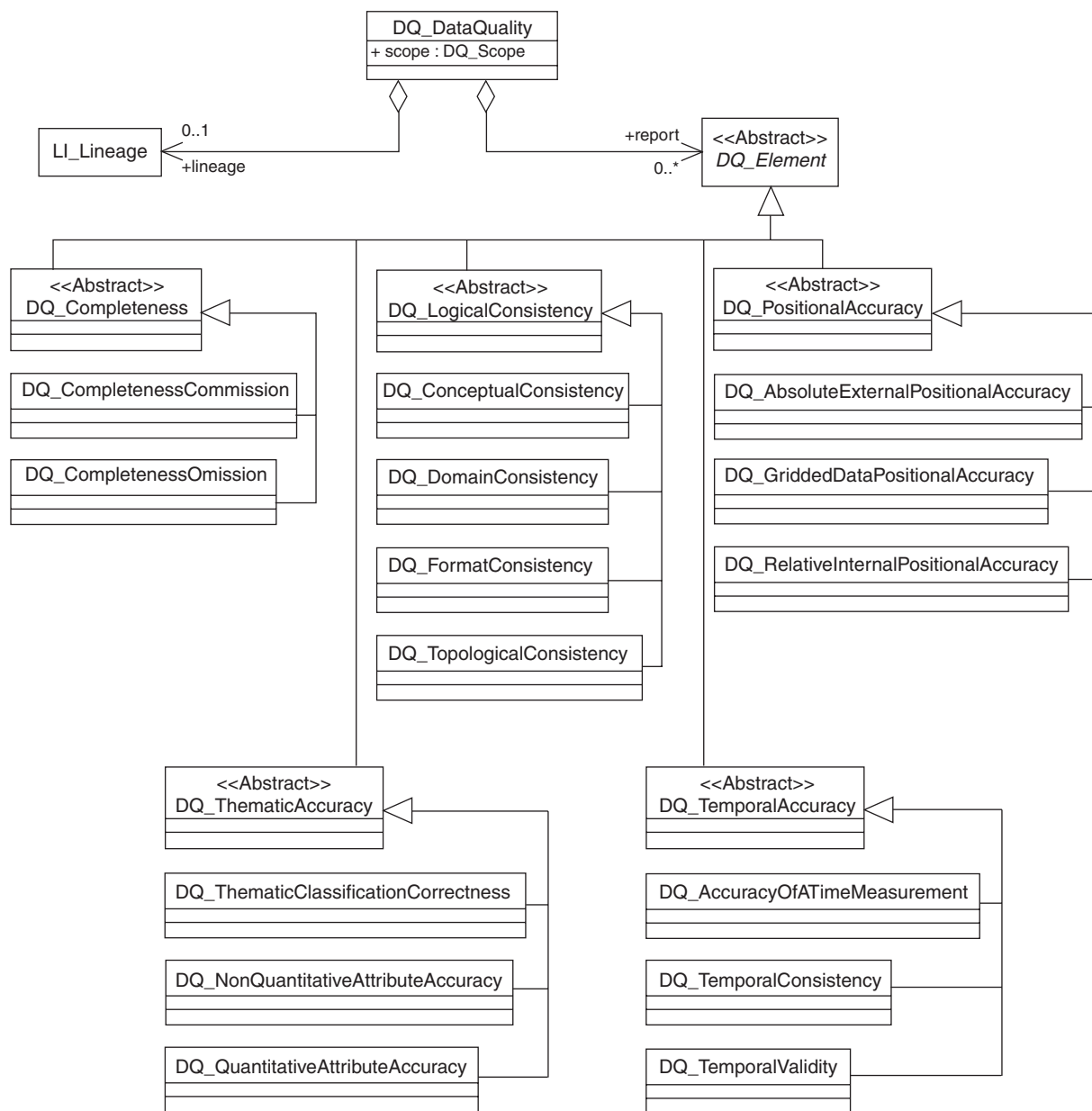


Figure A.6 — Data quality classes and subclasses

A.2.5 Maintenance information

Figure A.7 defines the metadata required to describe the maintenance and update practices for information. The data dictionary for this diagram is located in B.2.5.

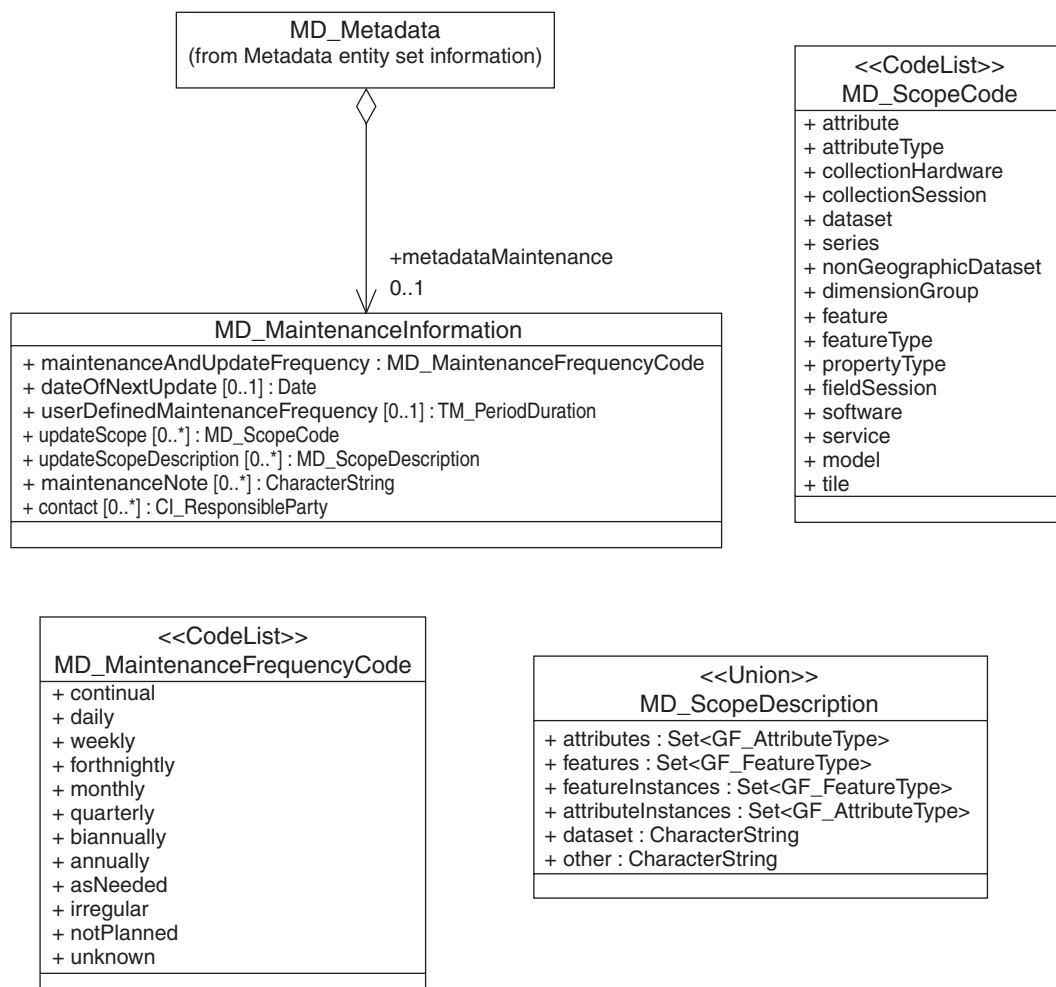


Figure A.7 — Maintenance information

A.2.6 Spatial representation information

Figure A.8 defines metadata required to describe the mechanism used to represent spatial information. The data dictionary for this diagram is located in B.2.6.

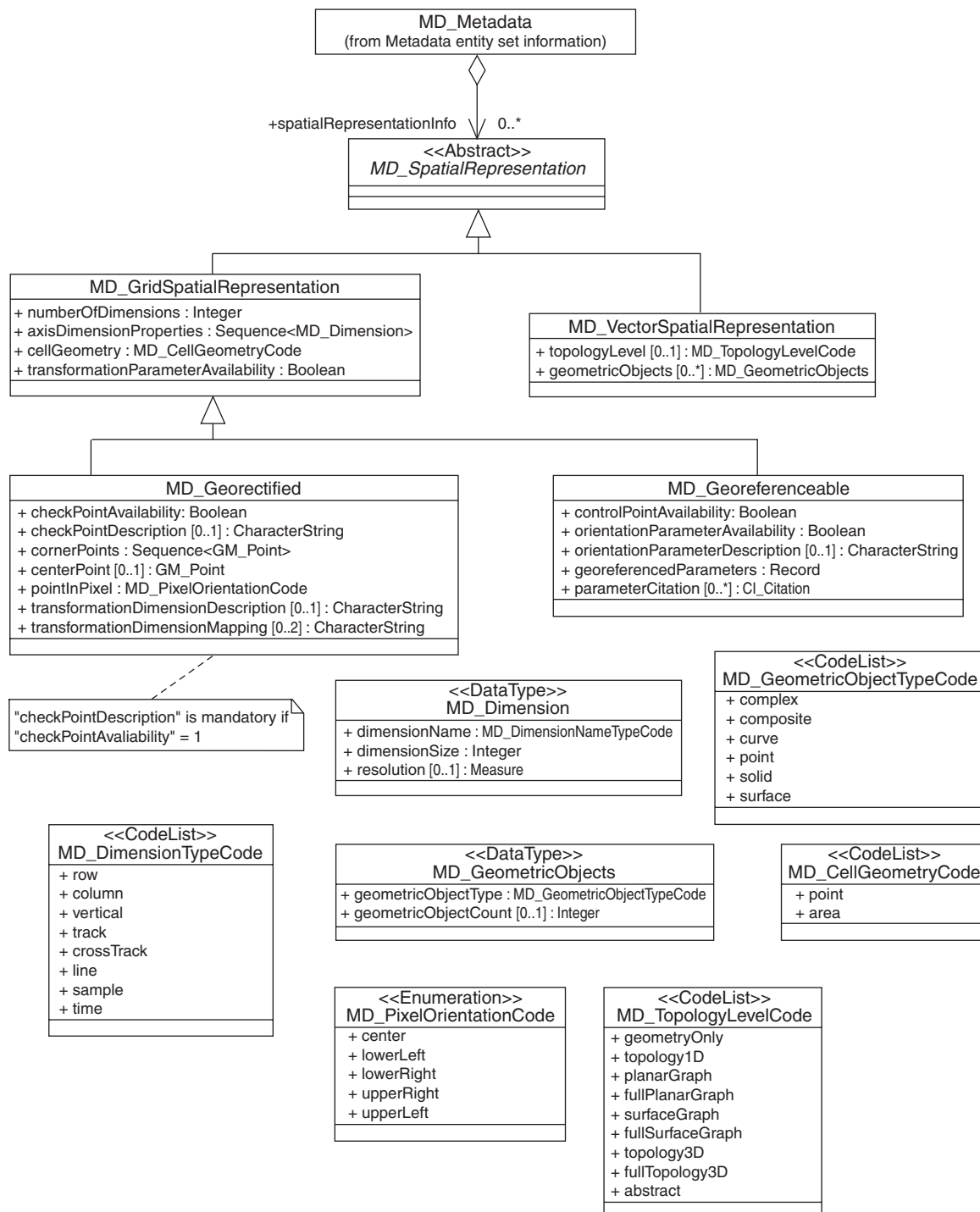


Figure A.8 — Spatial representation information

A.2.7 Reference system information

Figure A.9 defines metadata required to describe the spatial and temporal reference system used. The data dictionary for this diagram is located in B.2.7.

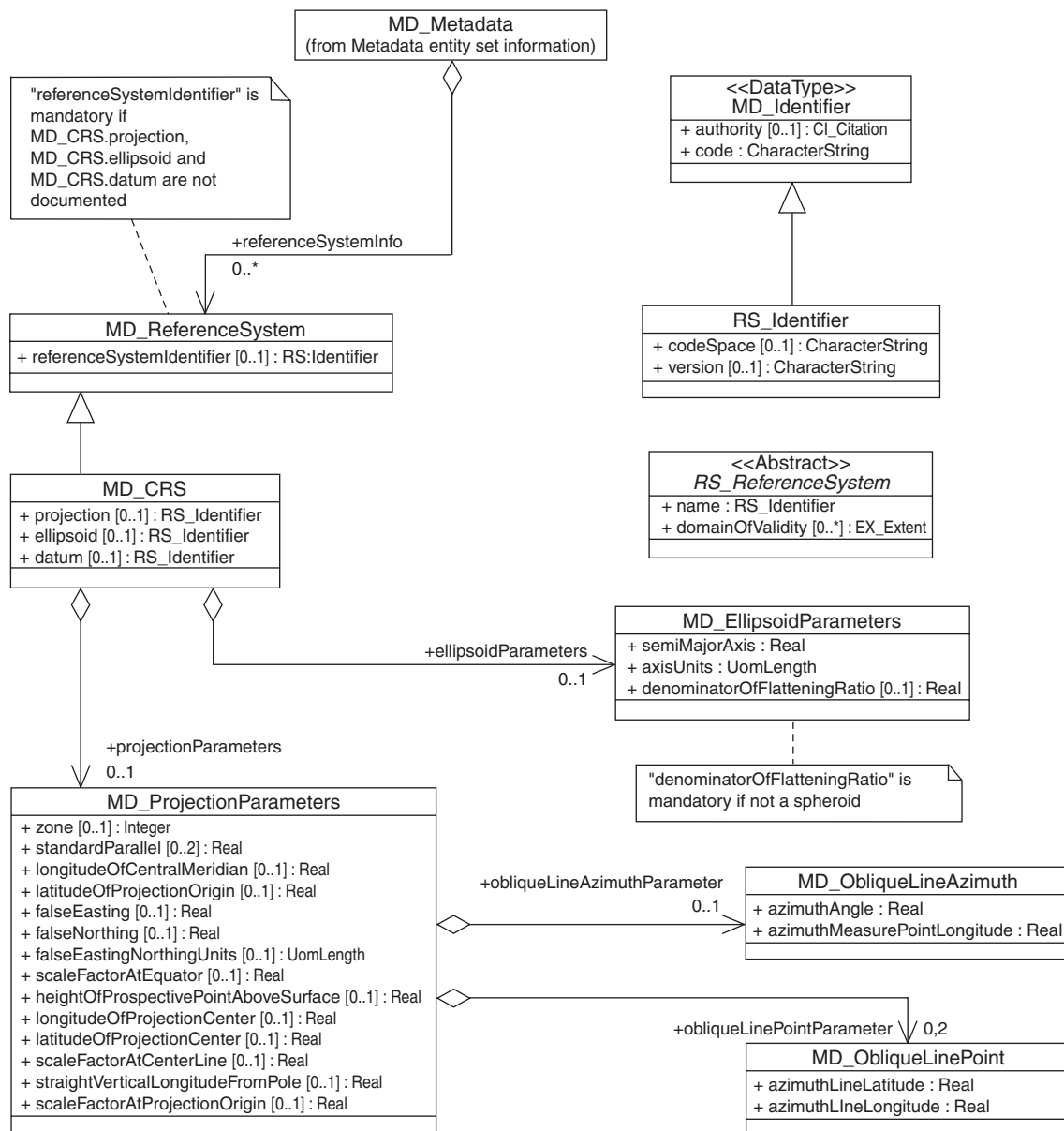


Figure A.9 — Reference system information

A.2.8 Content information

Figure A.10 defines metadata about the content of a coverage and the feature catalogue(s) used to define features. The data dictionary for this diagram is located in B.2.8.

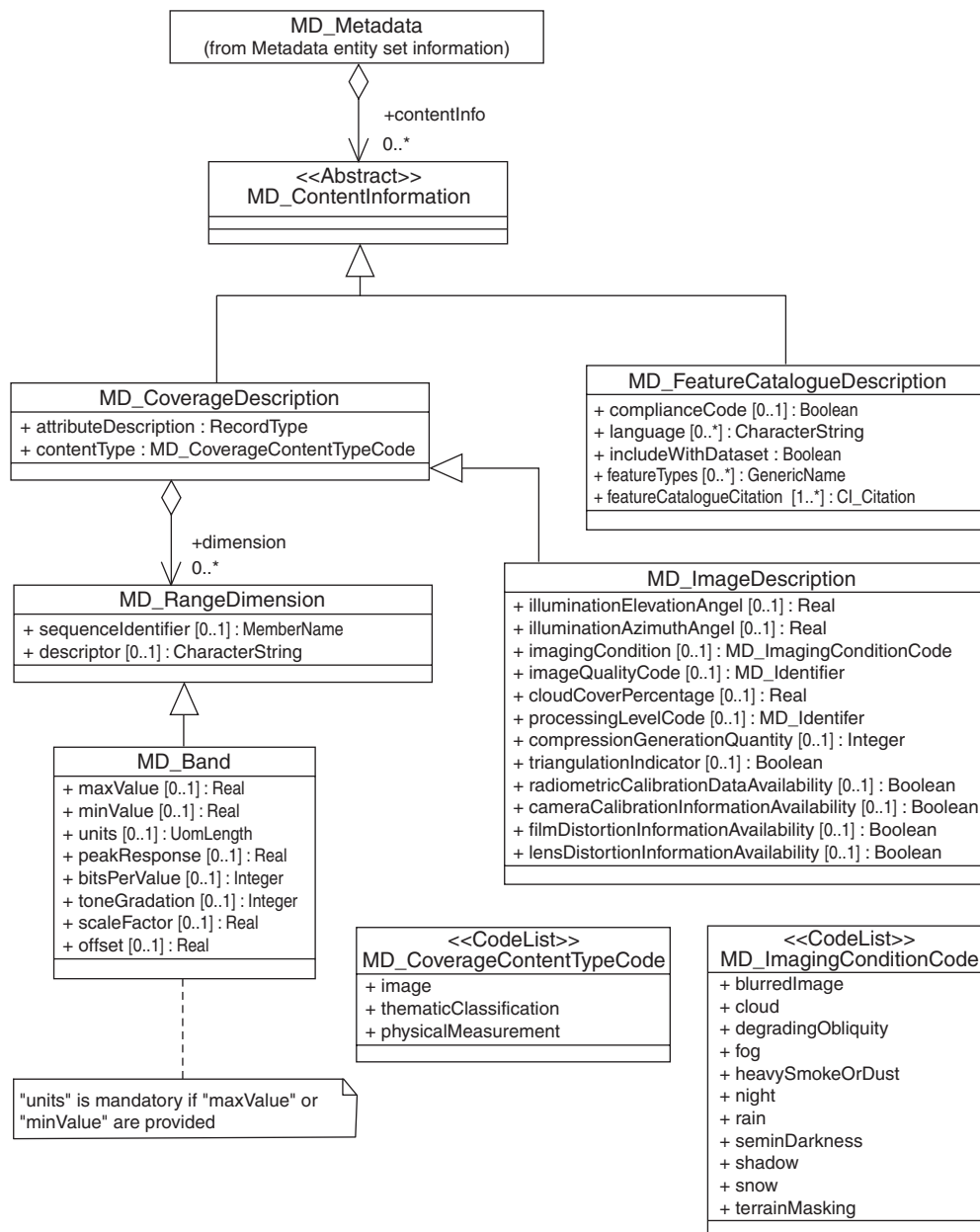


Figure A.10 — Content information

A.2.9 Portrayal catalogue information

Figure A.11 defines metadata about the portrayal catalogue(s) used to display data. The data dictionary for this diagram is located in B.2.9.

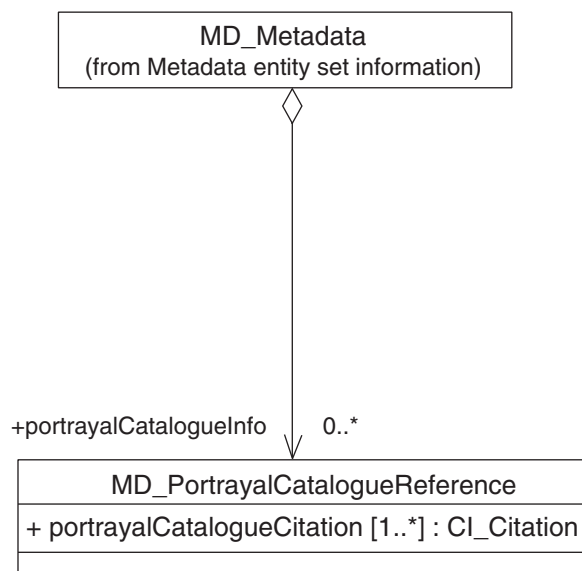


Figure A.11 — Portrayal catalogue information

A.2.10 Distribution information

Figure A.12 defines metadata required for accessing a resource. The data dictionary for this diagram is located in B.2.10.

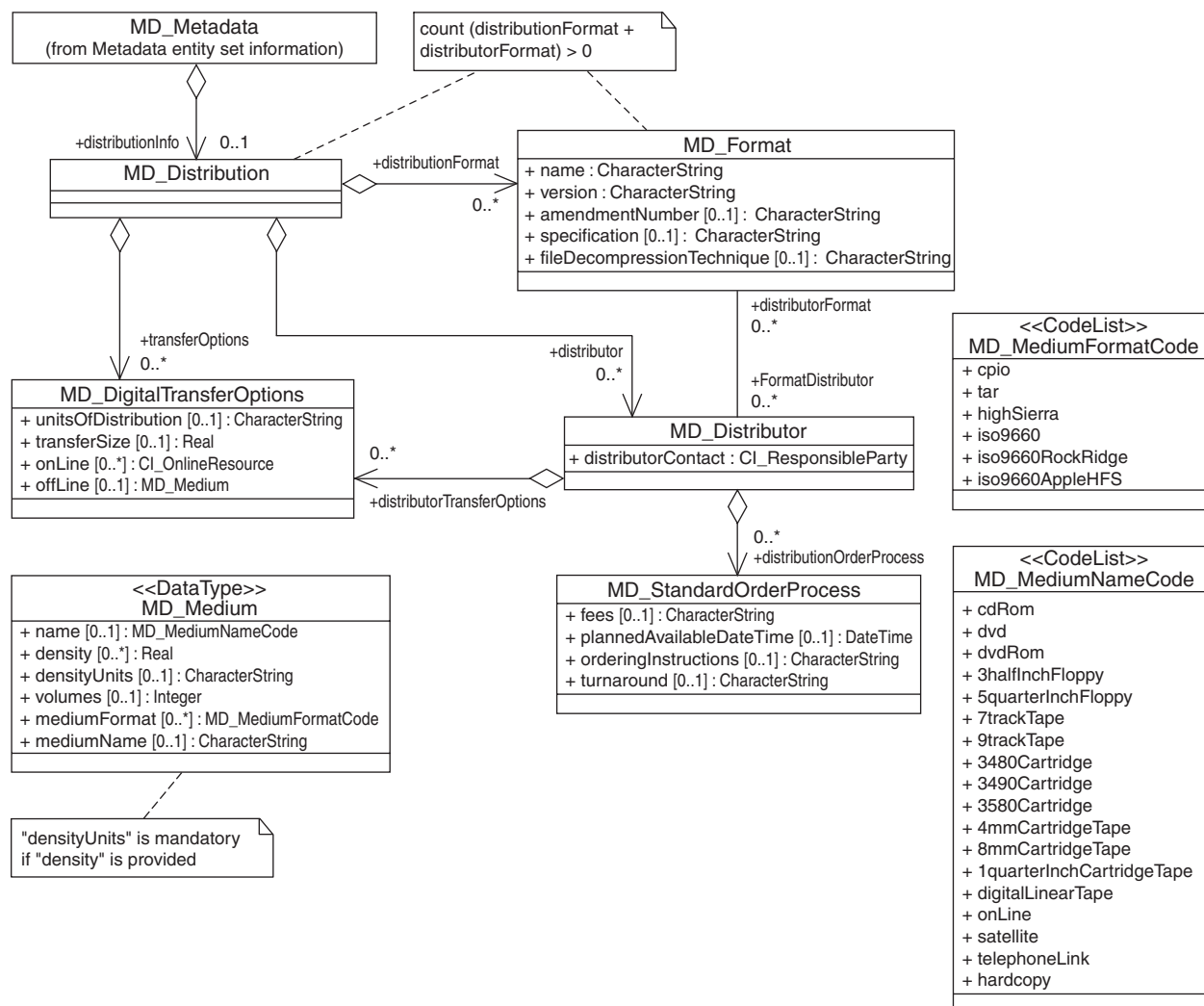


Figure A.12 — Distribution information

A.2.11 Metadata extension information

Figure A.13 defines the extended metadata elements. The data dictionary for this diagram is located in B.2.11.

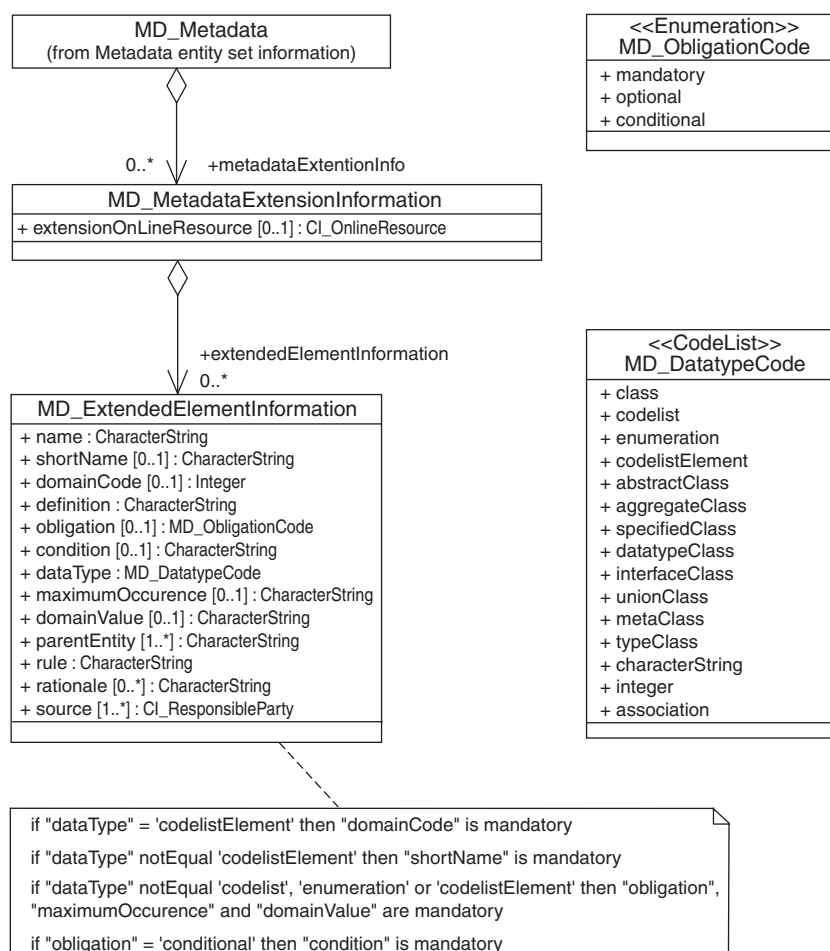


Figure A.13 — Metadata extension information

A.2.12 Application schema information

Figure A.14 defines the application schema used. The data dictionary for this diagram is located in B.2.12.

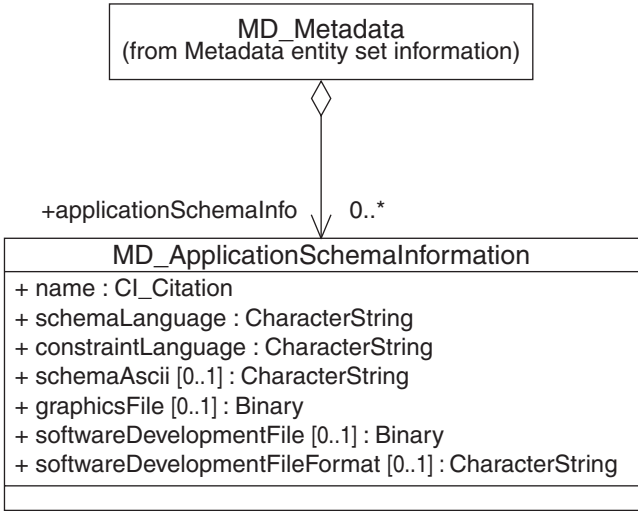


Figure A.14 — Application schema information

A.3 Metadata data types

A.3.1 Extent information

Figure A.15 defines metadata describing the spatial and temporal extent covered by a resource. The data dictionary for this diagram is located in B.3.1.

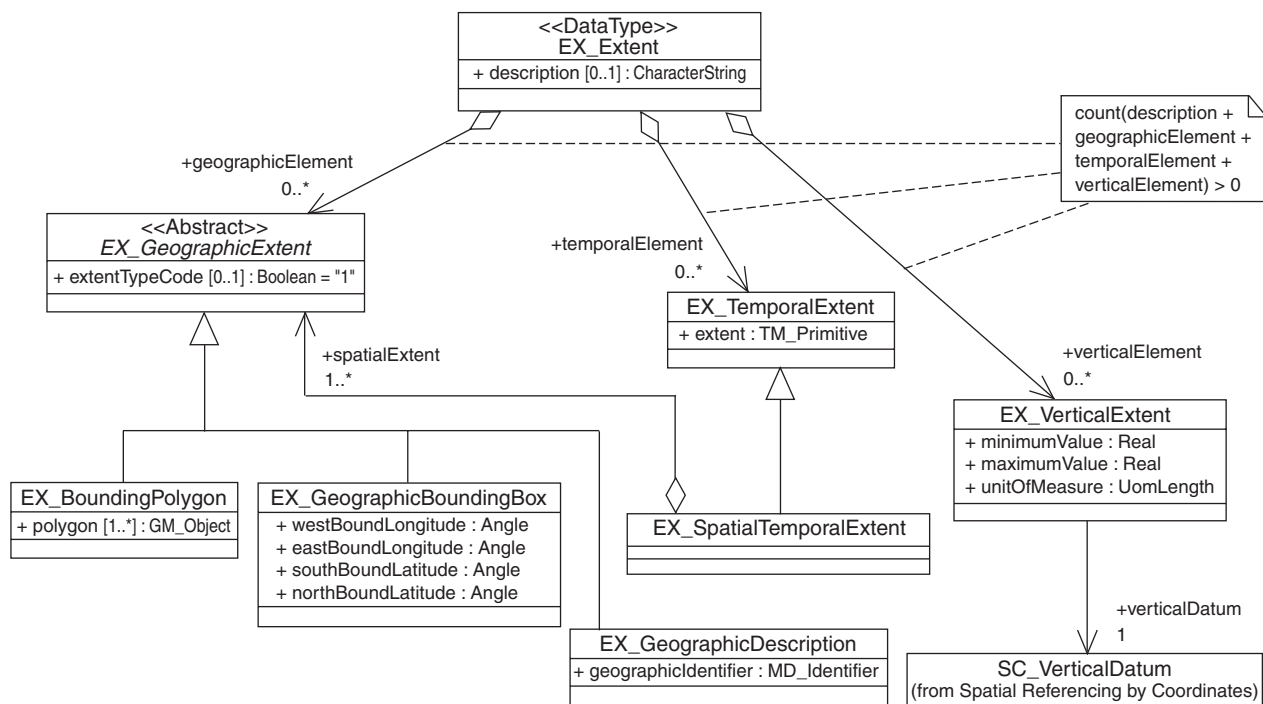


Figure A.15 — Extent information

A.3.2 Citation and responsible party information

Figure A.16 defines metadata describing authoritative reference information, including responsible party and contact information. The data dictionary for this diagram is located in B.3.2.

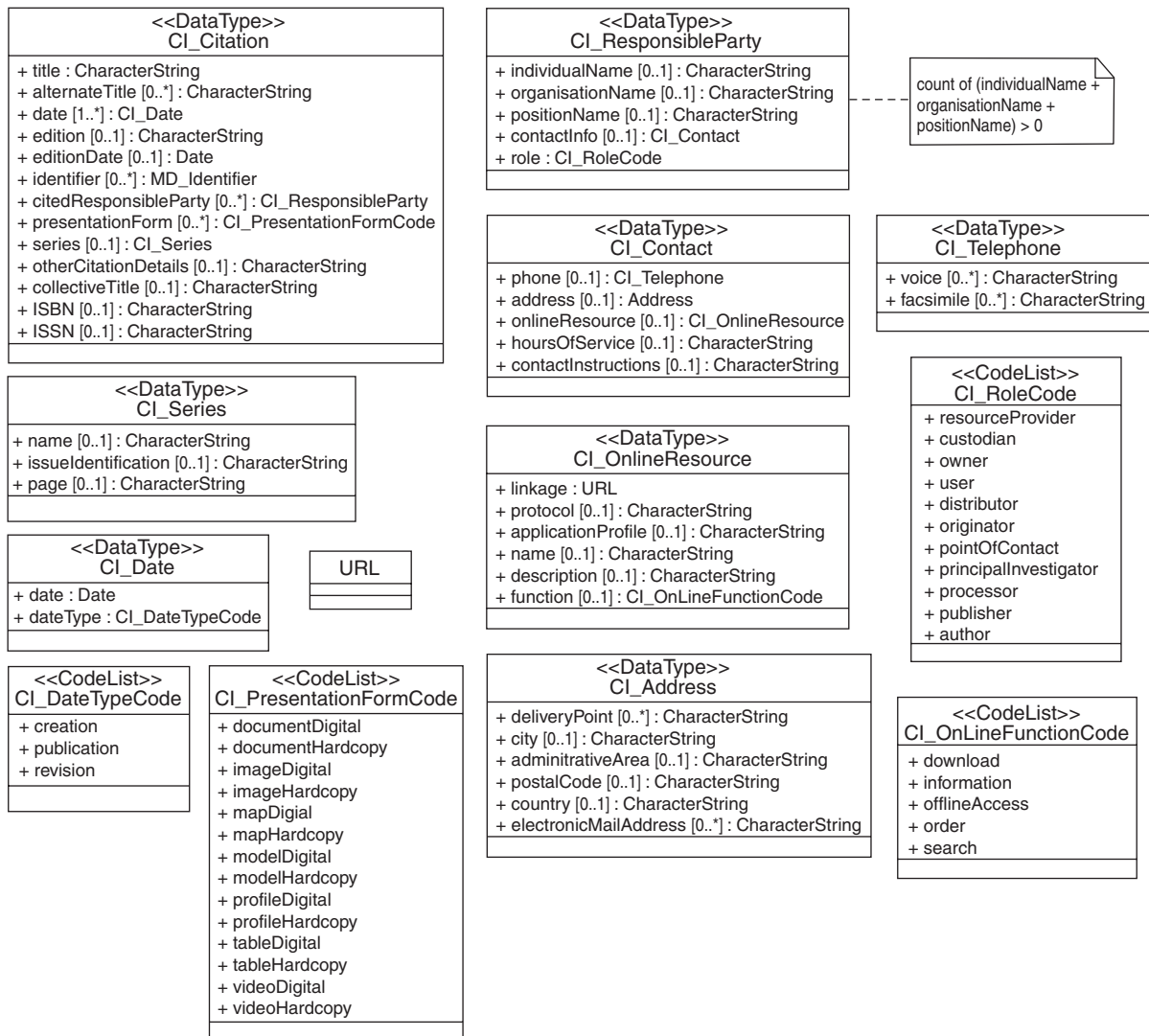


Figure A.16 — Citation and responsible party information

Annex B (normative)

Data dictionary for geographic metadata

B.1 Data dictionary overview

B.1.1 Introduction

This data dictionary describes the characteristics of the metadata defined in Clause 6 and Annex A. The dictionary is specified in a hierarchy to establish relationships and an organization for the information. The dictionary is categorised into sections by UML model package diagram: Metadata Entity Set, Identification, Resource Constraints, Data Quality, Maintenance, Spatial Representation, Reference System, Content, Portrayal Catalogue, Distribution, Metadata Extension, Application Schema, Extent, Citation and Responsible Party and Metadata Application. The clause titles of several of the tables have been expanded to reflect class specification within the respective diagram. Each model diagram from Annex A has a section within the data dictionary. Each UML model class equates to a data dictionary entity. Each UML model class attribute equates to a data dictionary element. The shaded rows define entities. The entities and elements within the data dictionary are defined by seven attributes (those attributes are listed below and are based on those specified in ISO/IEC 11179-3 for the description of data element concepts, i.e. data elements without representation). The term “dataset” when used as part of a definition is synonymous with all types of geographic data resources (aggregations of datasets, individual features and the various classes that compose a feature).

B.1.2 Name/role name

A label assigned to a metadata entity or to a metadata element. Metadata entity names start with an upper case letter. Spaces do not appear in a metadata entity name. Instead, multiple words are concatenated, with each new subword starting with a capital letter (example: XnnnYmmm). Metadata entity names are unique within the entire data dictionary of this International Standard. Metadata element names are unique within a metadata entity, not the entire data dictionary of this International Standard. Metadata element names are made unique, within an application, by the combination of the metadata entity and metadata element names (example: MD_Metadata.characterSet). Role names are used to identify metadata abstract model associations and are preceded by “Role name:” to distinguish them from other metadata elements. Names and role names may be in a language other than that used in this International Standard.

B.1.3 Short name and domain code

Those classes that are not CodeList or Enumeration stereotypes are provided with a Short Name for each element. These short names are unique within this International Standard and may be used with the Extensible Markup Language (XML) and ISO 8879 (SGML) or other similar implementation techniques. A naming convention similar to that used to create the longer entity and element names was used to create the short names.

NOTE Implementation using SGML and XML is not mandatory; other implementation methods may be accommodated. For CodeList and Enumeration stereotypes, a code is provided for each possible selection. These domain codes are numerical, unique within the codelist and 3 digits long. Row one of each CodeList and Enumeration contains an alphabetic short name, described above, as row one is the name of the CodeList or Enumeration.

B.1.4 Definition

The metadata entity/element description.

B.1.5 Obligation/Condition

B.1.5.1 General

This is a descriptor indicating whether a metadata entity or metadata element shall always be documented in the metadata or sometimes be documented (i.e. contains value(s)). This descriptor may have the following values: M (mandatory), C (conditional), or O (optional).

B.1.5.2 Mandatory (M):

The metadata entity or metadata element shall be documented.

B.1.5.3 Conditional (C):

Specifies an electronically manageable condition under which at least one metadata entity or a metadata element is mandatory. 'Conditional' is used for one of the three following possibilities:

- Expressing a choice between two or more options. At least one option is mandatory and must be documented.
- Documenting a metadata entity or a metadata element if another element has been documented.
- Documenting a metadata element if a specific value for another metadata element has been documented. To facilitate reading by humans, the specific value is used in plain text (ex. table in Clause B.2, row 3 "C/not defined by encoding?"). However, the code shall be used to verify the condition in an electronic user interface.

If the answer to the condition is positive, then the metadata entity or the metadata element shall be mandatory.

B.1.5.4 Optional (O):

The metadata entity or the metadata element may be documented or may not be documented. Optional metadata entities and optional metadata elements have been defined to provide a guide to those looking to fully document their data. (Use of this common set of defined elements will help promote interoperability among geographic data users and producers world-wide.) If an optional entity is not used, the elements contained within that entity (including mandatory elements) will also not be used. Optional entities may have mandatory elements; those elements only become mandatory if the optional entity is used.

B.1.6 Maximum occurrence

Specifies the maximum number of instances the metadata entity or the metadata element may have. Single occurrences are shown by "1"; repeating occurrences are represented by "N". Fixed number occurrences other than one are allowed, and will be represented by the corresponding number (i.e. "2", "3"...etc).

B.1.7 Data type

Specifies a set of distinct values for representing the metadata elements; for example, integer, real, string, DateTime, and Boolean. The data type attribute is also used to define metadata entities, stereotypes, and metadata associations.

NOTE Data types are defined in ISO/TS 19103, 6.5.2.

B.1.8 Domain

For an entity, the domain indicates the line numbers covered by that entity.

For a metadata element, the domain specifies the values allowed or the use of free text. "Free text" indicates that no restrictions are placed on the content of the field. Integer-based codes shall be used to represent values for domains containing codelists.

B.2 Metadata package data dictionaries

B.2.1 Metadata entity set information

- UML model shown in Figure A.1.

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
1	MD_Metadata	Metadata	root entity which defines metadata about a resource or resources	M	1	Class	Lines 2-22
2	fileIdentifier	mdFileID	unique identifier for this metadata file	O	1	CharacterString	Free text
3	language	mdLang	language used for documenting metadata	C / not defined by encoding?	1	CharacterString	ISO 639-2, other parts may be used
4	characterSet	mdChar	full name of the character coding standard used for the metadata set	C / ISO/IEC 10646-1 not used and not defined by encoding?	1	Class	MD_CharacterSetCode <<CodeList>> (B.5.10)
5	parentIdentifier	mdParentID	file identifier of the metadata to which this metadata is a subset (child)	C / hierarchyLevel is not equal to "dataset"?	1	CharacterString	Free text
6	hierarchyLevel	mdHrLv	scope to which the metadata applies (see Annex H for more information about metadata hierarchy levels)	C / hierarchyLevel is not equal to "dataset"?	N	Class	MD_ScopeCode <<CodeList>> (B.5.25)
7	hierarchyLevelName	mdHrLvName	name of the hierarchy levels for which the metadata is provided	C / hierarchyLevel is not equal to "dataset"?	N	CharacterString	Free text
8	contact	mdContact	party responsible for the metadata information	M	N	Class	CI_ResponsibleParty (B.3.2) <<DataType>>
9	dateStamp	mdDateSt	date that the metadata was created	M	1	Class	Date (B.4.2)
10	metadataStandardName	mdStanName	name of the metadata standard (including profile name) used	O	1	CharacterString	Free text
11	metadataStandardVersion	mdStanVer	version (profile) of the metadata standard used	O	1	CharacterString	Free text

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
11.1	dataSetURI	dataSetURI	Uniformed Resource Identifier (URI) of the dataset to which the metadata applies	O	1	CharacterString	Free text
12	<i>Role name:</i> spatialRepresentationInfo	spatRepInfo	digital representation of spatial information in the dataset	O	N	Association	MD_SpatialRepresentation <<Abstract>> (B.2.6)
13	<i>Role name:</i> referenceSystemInfo	refSysInfo	description of the spatial and temporal reference systems used in the dataset	O	N	Association	MD_ReferenceSystem (B.2.7)
14	<i>Role name:</i> metadataExtensionInfo	mdExtInfo	information describing metadata extensions	O	N	Association	MD_MetadataExtension Information (B.2.11)
15	<i>Role name:</i> identificationInfo	dataIdInfo	basic information about the resource(s) to which the metadata applies	M	N	Association	MD_Identification <<Abstract>> (B.2.2)
16	<i>Role name:</i> contentInfo	contInfo	provides information about the feature catalogue and describes the coverage and image data characteristics	O	N	Association	MD_ContentInformation <<Abstract>> (B.2.8)
17	<i>Role name:</i> distributionInfo	distInfo	provides information about the distributor of and options for obtaining the resource(s)	O	1	Association	MD_Distribution (B.2.10)
18	<i>Role name:</i> dataQualityInfo	dqInfo	provides overall assessment of quality of a resource(s)	O	N	Association	DQ_DataQuality (B.2.4)
19	<i>Role name:</i> portrayalCatalogueInfo	porCatInfo	provides information about the catalogue of rules defined for the portrayal of a resource(s)	O	N	Association	MD_PortrayalCatalogue Reference (B.2.9)
20	<i>Role name:</i> metadataConstraints	mdConst	provides restrictions on the access and use of metadata	O	N	Association	MD_Constraints (B.2.3)
21	<i>Role name:</i> applicationSchemaInfo	appSchInfo	provides information about the conceptual schema of a dataset	O	N	Association	MD_ApplicationSchema Information (B.2.12)
22	<i>Role name:</i> metadataMaintenance	mdMaint	provides information about the frequency of metadata updates, and the scope of those updates	O	1	Association	MD_MaintenanceInformation (B.2.5)

B.2.2 Identification information (includes data and service identification)

B.2.2.1 General

- UML model shown in Figure A.2

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
23.	<i>MD_Identification</i>	Ident	basic information required to uniquely identify a resource or resources	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Metadata) <<Abstract>>	Lines 24-35.1
24.	citation	idCitation	citation data for the resource(s)	M	1	Class	CI_Citation (B.3.2) <<DataType>>
25.	abstract	idAbs	brief narrative summary of the content of the resource(s)	M	1	CharacterString	Free text
26.	purpose	idPurp	summary of the intentions with which the resource(s) was developed	O	1	CharacterString	Free text
27.	credit	idCredit	recognition of those who contributed to the resource(s)	O	N	CharacterString	Free text
28.	status	idStatus	status of the resource(s)	O	N	Class	MD_ProgressCode <<CodeList>> (B.5.23)
29.	pointOfContact	idPoC	identification of, and means of communication with, person(s) and organization(s) associated with the resource(s)	O	N	Class	CI_ResponsibleParty (B.3.2) <<DataType>>
30.	<i>Role name:</i> resourceMaintenance	resMaint	provides information about the frequency of resource updates, and the scope of those updates	O	N	Association	MD_MaintenanceInformation (B.2.5)
31.	<i>Role name:</i> graphicOverview	graphOver	provides a graphic that illustrates the resource(s) (should include a legend for the graphic)	O	N	Association	MD_BrowseGraphic (B.2.2.2)
32.	<i>Role name:</i> resourceFormat	dsFormat	provides a description of the format of the resource(s)	O	N	Association	MD_Format (B.2.10.4)

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
33.	<i>Role name:</i> descriptiveKeywords	desckey	provides category keywords, their type, and reference source	O	N	Association	MD_Keywords (B.2.2.3)
34.	<i>Role name:</i> resourceSpecificUsage	idSpecUse	provides basic information about specific application(s) for which the resource(s) has/have been or is being used by different users	O	N	Association	MD_Usage (B.2.2.6)
35.	<i>Role name:</i> resourceConstraints	resConst	provides information about constraints which apply to the resource(s)	O	N	Association	MD_Constraints (B.2.3)
35.1	<i>Role name:</i> aggregationInfo	aggrInfo	provides aggregate dataset information	O	N	Association	MD_AggregateInformation (B.2.2.7)
36.	MD_DataIdentification	DataIdent	information required to identify a dataset	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (MD_Identification)	Lines 37-46 and 24-35.1
37.	spatialRepresentationType	spatRpType	method used to spatially represent geographic information	O	N	Class	MD_SpatialRepresentationTypeCode <<CodeList>> (B.5.26)
38.	spatialResolution	dataScale	factor which provides a general understanding of the density of spatial data in the dataset	O	N	Class	MD_Resolution <<Union>> (B.2.2.5)
39.	language	dataLang	language(s) used within the dataset	M	N	CharacterString	ISO 639-2, other parts may be used
40.	characterSet	dataChar	full name of the character coding standard used for the dataset	C/ISO/IEC 10646-1 not used?	N	Class	MD_CharacterSetCode <<CodeList>> (B.5.10)
41.	topicCategory	tpCat	main theme(s) of the dataset	C / if hierarchyLevel equals "dataset"?	N	Class	MD_TopicCategoryCode <<Enumeration>> (B.5.27)
42.	intentionally left blank						
43.	intentionally left blank						

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
44.	environmentDescription	envirDesc	description of the dataset in the producer's processing environment, including items such as the software, the computer operating system, file name, and the dataset size	O	1	CharacterString	Free text
45.	extent	dataExt	extent information including the bounding box, bounding polygon, vertical, and temporal extent of the dataset	C / if hierarchyLevel equals "dataset"? either extent.geographic Element.EX_ GeographicBounding Box or extent.geographic Element.EX_ Geographic Description is required	N	Class	EX_Extent <<DataType>> (B.3.1)
46.	supplementalInformation	suppInfo	any other descriptive information about the dataset	O	1	CharacterString	Free text
47.	MD_ServiceIdentification	SerIdent	identification of capabilities which a service provider makes available to a service user through a set of interfaces that define a behaviour - See ISO 19119 for further information	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (MD_Identification)	Lines 24-35.1

B.2.2.2 Browse graphic information

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
48.	MD_BrowseGraphic	BrowGraph	graphic that provides an illustration of the dataset (should include a legend for the graphic)	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Identification)	Lines 49-51

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
49.	fileName	bgFileName	name of the file that contains a graphic that provides an illustration of the dataset	M	1	CharacterString	Free text
50.	fileDescription	bgFileDesc	text description of the illustration	O	1	CharacterString	Free text
51.	fileType	bgFileType	format in which the illustration is encoded Examples: CGM, EPS, GIF, JPEG, PBM, PS, TIFF, XWD	O	1	CharacterString	Free text

B.2.2.3 Keyword information

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
52.	MD_Keywords	Keywords	keywords, their type and reference source	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Identification)	Lines 53-55
53.	keyword	keyword	commonly used word(s) or formalised word(s) or phrase(s) used to describe the subject	M	N	CharacterString	Free text
54.	Type	keyType	subject matter used to group similar keywords	O	1	Class	MD_KeywordTypeCode <<CodeList>> (B.5.17)
55.	ThesaurusName	thesaName	name of the formally registered thesaurus or a similar authoritative source of keywords	O	1	Class	CI_Citation (B.3.2) <<DataType>>

B.2.2.4 Representative fraction information

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
56.	MD_RepresentativeFraction	RepFract	derived from ISO 19103 Scale where MD_Representative Fraction.denominator = 1 / Scale.measure And Scale.targetUnits = Scale.sourceUnits	Use obligation from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Line 57
57.	denominator	rfDenom	the number below the line in a vulgar fraction	M	1	Integer	Integer > 0
58.	intentionally left blank						

B.2.2.5 Resolution information

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
59.	MD_Resolution	Resol	level of detail expressed as a scale factor or a ground distance	Use obligation from referencing object	Use maximum occurrence from referencing object	Class <<Union>>	Lines 60-61
60.	equivalentScale	equScale	level of detail expressed as the scale of a comparable hardcopy map or chart	C / distance not documented?	1	Class	MD_RepresentativeFraction <<DataType>> (B.2.2.4)
61.	distance	scaleDist	ground sample distance	C / equivalentScale not documented?	1	Class	Distance (B.4.3)

B.2.2.6 Usage information

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
62.	MD_Usage	Usage	brief description of ways in which the resource(s) is/are currently or has been used	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Identification)	Lines 63-66
63.	specificUsage	specUsage	brief description of the resource and/or resource series usage	M	1	CharacterString	Free text
64.	usageDateTime	usageDate	date and time of the first use or range of uses of the resource and/or resource series	O	1	Class	DateTime (B.4.2)
65.	userDeterminedLimitations	usrDetLim	applications, determined by the user for which the resource and/or resource series is not suitable	O	1	CharacterString	Free text
66.	userContactInfo	usrCntInfo	identification of and means of communicating with person(s) and organization(s) using the resource(s)	M	N	Class	CI_ResponsibleParty <<DataType>> (B.3.2)

B.2.2.7 Aggregation information

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
66.1	MD_AggregateInformation	AggregateInfo	aggregate dataset information	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Identification)	Lines 66.2-66.5
66.2	aggregateDataSetName	aggrDSName	citation information about the aggregate dataset	C / if aggregateDataSet Identifier not documented?	1	Class	CI_Citation (B.3.2) <<DataType>>

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
66.3	aggregateDataSetIdentifier	aggrDSIdent	identification information about aggregate dataset	C / if aggregateDataSet Name not documented?	1	Class	MD_Identifier (B.2.7.3) <<DataType>>
66.4	associationType	assocType	association type of the aggregate dataset	M	1	Class	DS_AssociationTypeCode (B.5.7) <<CodeList>>
66.5	initiativeType	initType	type of initiative under which the aggregate dataset was produced	O	1	Class	DS_InitiativeTypeCode (B.5.8) <<CodeList>>

B.2.3 Constraint information (includes legal and security)

- UML model shown in Figure A.3

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
67.	MD_Constraints	Consts	restrictions on the access and use of a resource or metadata	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Metadata and MD_Identification)	Line 68
68.	useLimitation	useLimit	limitation affecting the fitness for use of the resource or metadata. Example, "not to be used for navigation"	O	N	CharacterString	Free text
69.	MD_LegalConstraints	LegConsts	restrictions and legal prerequisites for accessing and using the resource or metadata	Use obligation from referencing object	N	Specified Class (MD_Constraints)	Lines 70-72 and 68
70.	accessConstraints	accessConsts	access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on obtaining the resource or metadata	O	N	Class	MD_RestrictionCode <<CodeList>> (B.5.24)

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
71.	useConstraints	useConsts	constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations or warnings on using the resource or metadata	O	N	Class	MD_RestrictionCode <<CodeList>> (B.5.24)
72.	otherConstraints	othConsts	other restrictions and legal prerequisites for accessing and using the resource or metadata	C / accessConstraints or useConstraints equal "otherRestrictions"?	N	CharacterString	Free text
73.	MD_SecurityConstraints	SecConsts	handling restrictions imposed on the resource or metadata for national security or similar security concerns	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (MD_Constraints)	Lines 74-77 and 68
74.	classification	class	name of the handling restrictions on the resource or metadata	M	1	Class	MD_ClassificationCode <<CodeList>> (B.5.11)
75.	userNote	userNote	explanation of the application of the legal constraints or other restrictions and legal prerequisites for obtaining and using the resource or metadata	O	1	CharacterString	Free text
76.	classificationSystem	classSys	name of the classification system	O	1	CharacterString	Free text
77.	handlingDescription	handDesc	additional information about the restrictions on handling the resource or metadata	O	1	CharacterString	Free text

B.2.4 Data quality information

B.2.4.1 General

- UML model shown in Figures A.4, A.5 (Lineage) and A.6 (Data quality classes and subclasses)

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
78.	DQ_DataQuality	DataQual	quality information for the data specified by a data quality scope	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Metadata)	Lines 79-81
79.	scope	dqScope	the specific data to which the data quality information applies	M	1	Class	DQ_Scope <<DataType>> (B.2.4.5)
80.	Role name: report	dqReport	quantitative quality information for the data specified by the scope	C / lineage not provided?	N	Association	DQ_Element <<Abstract>> (B.2.4.3)
81.	Role name: lineage	dataLineage	non-quantitative quality information about the lineage of the data specified by the scope	C / report not provided?	1	Association	LI_Lineage (B.2.4.2)

B.2.4.2 Lineage information

B.2.4.2.1 General

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
82.	LI_Lineage	Lineage	information about the events or source data used in constructing the data specified by the scope or lack of knowledge about lineage	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (DQ_DataQuality)	Lines 83-85

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
83.	statement	statement	general explanation of the data producer's knowledge about the lineage of a dataset	C / (DQ_DataQuality.scope.DQ_Scope.level = "dataset" or "series")?	1	CharacterString	Free text
84.	<i>Role name:</i> processStep	prcStep	information about events in the life of a dataset specified by the scope	C / mandatory if statement and source not provided?	N	Association	LI_ProcessStep (B.2.4.2.2)
85.	<i>Role name:</i> source	dataSource	information about the source data used in creating the data specified by the scope	C / mandatory if statement and processStep not provided?	N	Association	LI_Source (B.2.4.2.3)

B.2.4.2.2 Process step information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
86.	LI_ProcessStep	ProcessStep	information about an event or transformation in the life of a dataset including the process used to maintain the dataset	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (LI_Lineage and LI_Source)	Lines 87-91
87.	description	stepDesc	description of the event, including related parameters or tolerances	M	1	CharacterString	Free Text
88.	rationale	stepRat	requirement or purpose for the process step	O	1	CharacterString	Free Text
89.	dateTime	stepDateTm	date and time or range of date and time on or over which the process step occurred	O	1	Class	DateTime (B.4.2)
90.	processor	stepProc	identification of, and means of communication with, person(s) and organization(s) associated with the process step	O	N	Class	CI_ResponsibleParty <<DataType>> (B.3.2)

91.	<i>Role name:</i> source	stepSrc	information about the source data used in creating the data specified by the scope	O	N	Association	LI_Source (B.2.4.2.3)
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B.2.4.2.3 Source information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
92.	LI_Source	Source	information about the source data used in creating the data specified by the scope	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (LI_Lineage and LI_ProcessStep)	Lines 93-98
93.	description	srcDesc	detailed description of the level of the source data	C / sourceExtent not provided?	1	CharacterString	Free Text
94.	scaleDenominator	srcScale	denominator of the representative fraction on a source map	O	1	Class	MD_RepresentativeFraction <<DataType>> (B.2.2.4)
95.	sourceReferenceSystem	srcRefSys	spatial reference system used by the source data	O	1	Class	MD_ReferenceSystem (B.2.7)
96.	sourceCitation	srcCitatn	recommended reference to be used for the source data	O	1	Class	CI_Citation <<DataType>> (B.3.2)
97.	sourceExtent	srcExt	information about the spatial, vertical and temporal extent of the source data	C / description not provided?	N	Class	EX_Extent <<DataType>> (B.3.1)
98.	<i>Role name:</i> sourceStep	srcStep	information about an event in the creation process for the source data	O	N	Association	LI_ProcessStep (B.2.4.2.2)

B.2.4.3 Data quality element information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
99.	<i>DQ_Element</i>	DQElement	aspect of quantitative quality information	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (DQ_DataQuality) <<Abstract>>	Lines 100-107
100.	nameOfMeasure	measName	name of the test applied to the data	O	N	CharacterString	Free text
101.	measureIdentification	measId	code identifying a registered standard procedure	O	1	Class	MD_Identifier <<DataType>> (B.2.7.3)
102.	measureDescription	measDesc	description of the measure	O	1	CharacterString	Free text
103.	evaluationMethodType	evalMethType	type of method used to evaluate quality of the dataset	O	1	Class	DQ_EvaluationMethodType Code <<CodeList>> (B.5.6)
104.	evaluationMethodDescription	evalMethDesc	description of the evaluation method	O	1	CharacterString	Free text
105.	evaluationProcedure	evalProc	reference to the procedure information	O	1	Class	CI_Citation <<DataType>> (B.3.2)
106.	dateTime	measDateTm	date or range of dates on which a data quality measure was applied	O	N	Class	DateTime (B.4.2)
107.	result	measResult	value (or set of values) obtained from applying a data quality measure or the outcome of evaluating the obtained value (or set of values) against a specified acceptable conformance quality level	M	2	Class	DQ_Result <<Abstract>> (B.2.4.4)
108.	DQ_Completeness	DQComplete	presence and absence of features, their attributes and their relationships	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Element) <<Abstract>>	Lines 100-107

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
109.	DQ_Completeness Commission	DQCompComm	excess data present in the dataset, as described by the scope	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Completeness)	Lines 100-107
110.	DQ_CompletenessOmission	DQCompOm	data absent from the dataset, as described by the scope	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Completeness)	Lines 100-107
111.	DQ_LogicalConsistency	DQLogConsis	degree of adherence to logical rules of data structure, attribution and relationships (data structure can be conceptual, logical or physical)	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Element) <<Abstract>>	Lines 100-107
112.	DQ_ConceptualConsistency	DQConcConsis	adherence to rules of the conceptual schema	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Logical Consistency)	Lines 100-107
113.	DQ_DomainConsistency	DQDomConsis	adherence of values to the value domains	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Logical Consistency)	Lines 100-107
114.	DQ_FormatConsistency	DQFormConsis	degree to which data is stored in accordance with the physical structure of the dataset, as described by the scope	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Logical Consistency)	Lines 100-107

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
115.	DQ_TopologicalConsistency	DQTopConsis	correctness of the explicitly encoded topological characteristics of the dataset as described by the scope	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Logical Consistency)	Lines 100-107
116.	DQ_PositionalAccuracy	DQPosAcc	accuracy of the position of features	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Element) <<Abstract>>	Lines 100-107
117.	DQ_AbsoluteExternal PositionalAccuracy	DQAbsExtPosAcc	closeness of reported coordinate values to values accepted as or being true	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Positional Accuracy)	Lines 100-107
118.	DQ_GridDataPositional Accuracy	DQGridDataPosAcc	closeness of gridded data position values to values accepted as or being true	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Positional Accuracy)	Lines 100-107
119.	DQ_RelativeInternalPositional Accuracy	DQRelIntPosAcc	closeness of the relative positions of features in the scope to their respective relative positions accepted as or being true	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Positional Accuracy)	Lines 100-107
120.	DQ_TemporalAccuracy	DQTempAcc	accuracy of the temporal attributes and temporal relationships of features	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Element) <<Abstract>>	Lines 100-107

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
121.	DQ_AccuracyOfATime Measurement	DQAccTime Meas	correctness of the temporal references of an item (reporting of error in time measurement)	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Temporal Accuracy)	Lines 100-107
122.	DQ_TemporalConsistency	DQTempConsis	correctness of ordered events or sequences, if reported	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Temporal Accuracy)	Lines 100-107
123.	DQ_TemporalValidity	DQTempValid	validity of data specified by the scope with respect to time	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Temporal Accuracy)	Lines 100-107
124.	DQ_ThematicAccuracy	DQThemAcc	accuracy of quantitative attributes and the correctness of non-quantitative attributes and of the classifications of features and their relationships	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Element) <<Abstract>>	Lines 100-107
125.	DQ_ThematicClassification Correctness	DQThemClass Cor	comparison of the classes assigned to features or their attributes to a universe of discourse	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Thematic Accuracy)	Lines 100-107
126.	DQ_NonQuantitativeAttribute Accuracy	DQNonQuanAtt Acc	accuracy of non-quantitative attributes	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Thematic Accuracy)	Lines 100-107

Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
127. DQ_QuantitativeAttribute Accuracy	DQQuanAttAcc	accuracy of quantitative attributes	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Thematic Accuracy)	Lines 100-107

B.2.4.4 Result information

Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
128. DQ_Result	Result	generalization of more specific result classes	Use obligation from referencing object	Use maximum occurrence from referencing object	Class <<Abstract>>	
129. DQ_ConformanceResult	ConResult	Information about the outcome of evaluating the obtained value (or set of values) against a specified acceptable conformance quality level	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Result)	Lines 130-132
130. specification	conSpec	citation of product specification or user requirement against which data is being evaluated	M	1	Class	CI_Citation <<DataType>> (B.3.2)
131. explanation	conExpl	explanation of the meaning of conformance for this result	M	1	CharacterString	Free text
132. pass	conPass	indication of the conformance result where 0 = fail and 1 = pass	M	1	Boolean	1 = yes 0 = no
133. DQ_QuantitativeResult	QuanResult	the values or information about the value(s) (or set of values) obtained from applying a data quality measure	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Result)	Lines 134-137

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
134.	valueType	quanValType	value type for reporting a data quality result	O	1	Class	RecordType <<Metaclass>> (B.4.3)
135.	valueUnit	quanValUnit	value unit for reporting a data quality result	M	1	Class	UnitOfMeasure (B.4.3)
136.	errorStatistic	errStat	statistical method used to determine the value	O	1	CharacterString	Free text
137.	value	quanVal	quantitative value or values, content determined by the evaluation procedure used	M	N	Class	Record (B.4.3)

B.2.4.5 Scope information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
138.	DQ_Scope	DQScope	extent of characteristic(s) of the data for which quality information is reported	Use obligation from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 139-141
139.	level	scpLvl	hierarchical level of the data specified by the scope	M	1	Class	MD_ScopeCode <<CodeList>> (B.5.25)
140.	extent	scpExt	information about the horizontal, vertical and temporal extent of the data specified by the scope	O	1	Class	EX_Extent <<DataType>> (B.3.1)
141.	levelDescription	scpLvlDesc	detailed description about the level of the data specified by the scope	C / level not equal "dataset" or "series"?	N	Class	MD_ScopeDescription <<Union>> (B.2.5.2)

B.2.5 Maintenance information

B.2.5.1 General

- UML model shown in Figure A.7

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
142.	MD_MaintenanceInformation	MaintInfo	information about the scope and frequency of updating	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Metadata and MD_Identification)	Lines 143-148.1
143.	maintenanceAndUpdateFrequency	maintFreq	frequency with which changes and additions are made to the resource after the initial resource is completed	M	1	Class	MD_MaintenanceFrequency Code <<CodeList>> (B.5.18)
144.	dateOfNextUpdate	dateNext	scheduled revision date for resource	O	1	Class	Date (B.4.2)
145.	userDefinedMaintenanceFrequency	usrDefFreq	maintenance period other than those defined	O	1	Class	TM_PeriodDuration (B.4.5)
146.	updateScope	maintScp	scope of data to which maintenance is applied	O	N	Class	MD_ScopeCode <<CodeList>> (B.5.25)
147.	updateScopeDescription	upScpDesc	additional information about the range or extent of the resource	O	N	Class	MD_ScopeDescription <<Union>> (B.2.5.2)
148.	maintenanceNote	maintNote	information regarding specific requirements for maintaining the resource	O	N	CharacterString	Free text
148.1	contact	maintCont	identification of, and means of communicating with, person(s) and organization(s) with responsibility for maintaining the metadata	O	N	Class	CL_ResponsibleParty <<DataType>> (B.3.2)

B.2.5.2 Scope description information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
149.	MD_ScopeDescription	ScpDesc	description of the class of information covered by the information	Use obligation from referencing object	Use maximum occurrence from referencing object	Class <<Union>>	Lines 150-155
150.	attributes	attribSet	attributes to which the information applies	C / features, featureInstances, attributeInstances, dataset and other not documented?	1	Set (B.4.7)	GF_AttributeType (B.4.4)
151.	features	featSet	features to which the information applies	C / attributes, featureInstances, attributeInstances, dataset and other not documented?	1	Set (B.4.7)	GF_FeatureType (B.4.4)
152.	featureInstances	featIntSet	feature instances to which the information applies	C / attributes, features, attributeInstances, dataset and other not documented?	1	Set (B.4.7)	GF_FeatureType (B.4.4)
153.	attributeInstances	attribIntSet	attribute instances to which the information applies	C / attributes, features, featureInstances, dataset and other not documented?	1	Set (B.4.7)	GF_AttributeType (B.4.4)
154.	dataset	datasetSet	dataset to which the information applies	C / attributes, features, featureInstances, attributeInstances, and other not documented?	1	CharacterString	Free text

Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
155. other	other	class of information that does not fall into the other categories to which the information applies	C / attributes, features, featureInstances, attributeInstances, and dataset not documented?	1	CharacterString	Free text

B.2.6 Spatial representation information (includes grid and vector representation)

B.2.6.1 General

- UML model shown in Figure A.8

Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
156. <i>MD_SpatialRepresentation</i>	SpatRep	digital mechanism used to represent spatial information	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Metadata) <<Abstract>>	
157. MD_GridSpatialRepresentation	GridSpatRep	information about grid spatial objects in the dataset	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (MD_SpatialRepresentation)	Lines 158-161
158. numberOfDimensions	numDims	number of independent spatial-temporal axes	M	1	Integer	Integer
159. axisDimensionsProperties	axDimProps	information about spatial-temporal axis properties	M	1	Sequence (B.4.7)	MD_Dimension <<DataType>> (B.2.6.2)
160. cellGeometry	cellGeo	identification of grid data as point or cell	M	1	Class	MD_CellGeometryCode <<CodeList>> (B.5.9)

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
161.	transformationParameterAvailability	tranParaAv	indication of whether or not parameters for transformation between image coordinates and geographic or map coordinates exist (are available)	M	1	Boolean	1 = yes 0 = no
162.	MD_Georectified	Georect	grid whose cells are regularly spaced in a geographic (i.e., lat / long) or map coordinate system defined in the Spatial Referencing System (SRS) so that any cell in the grid can be geolocated given its grid coordinate and the grid origin, cell spacing, and orientation	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified (MD_GridSpatial Representation)	Lines 163-169 and 158-161
163.	checkPointAvailability	chkPtAv	indication of whether or not geographic position points are available to test the accuracy of the georeferenced grid data	M	1	Boolean	1 = yes 0 = no
164.	checkPointDescription	chkPtDesc	description of geographic position points used to test the accuracy of the georeferenced grid data	C / checkPointAvailability equals "yes"?	1	CharacterString	Free text
165.	cornerPoints	cornerPts	earth location in the coordinate system defined by the Spatial Reference System and the grid coordinate of the cells at opposite ends of grid coverage along two diagonals in the grid spatial dimensions. There are four corner points in a georectified grid; at least two corner points along one diagonal are required	M	1	Sequence (B.4.7)	GM_Point <<Type>> (B.4.6)
166.	centerPoint	centerPt	earth location in the coordinate system defined by the Spatial Reference System and the grid coordinate of the cell halfway between opposite ends of the grid in the spatial dimensions	O	1	Class	GM_Point <<Type>> (B.4.6)
167.	pointInPixel	ptInPixel	point in a pixel corresponding to the Earth location of the pixel	M	1	Class	MD_PixelOrientationCode <<Enumeration>> (B.5.22)

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
168.	transformationDimension Description	transDimDesc	general description of the transformation	O	1	CharacterString	Free text
169.	transformationDimension Mapping	transDimMap	information about which grid axes are the spatial (map) axes	O	2	CharacterString	Free text
170.	MD_Georeferenceable	Georef	grid with cells irregularly spaced in any given geographic/map projection coordinate system, whose individual cells can be geolocated using geolocation information supplied with the data but cannot be geolocated from the grid properties alone	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (MD_GridSpatial Representation)	Lines 171-175 and 158-161
171.	controlPointAvailability	ctrlPtAv	indication of whether or not control point(s) exists	M	1	Boolean	1 = yes 0 = no
172.	orientationParameter Availability	orieParaAv	indication of whether or not orientation parameters are available	M	1	Boolean	1 = yes 0 = no
173.	orientationParameter Description	orieParaDs	description of parameters used to describe sensor orientation	O	1	CharacterString	Free text
174.	georeferencedParameters	georefPars	terms which support grid data georeferencing	M	1	Class	Record (B.4.3)
175.	parameterCitation	paraCit	reference providing description of the parameters	O	N	Class	CI_Citation <<DataType>> (B.3.2)
176.	MD_VectorSpatial Representation	VectSpatRep	information about the vector spatial objects in the dataset	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (MD_Spatial Representation)	Lines 177-178
177.	topologyLevel	topLvI	code which identifies the degree of complexity of the spatial relationships	O	1	Class	MD_TopologyLevelCode <<CodeList>> (B.5.28)
178.	geometricObjects	geometObjs	information about the geometric objects used in the dataset	O	N	Class	MD_GeometricObjects <<DataType>> (B.2.6.3)

B.2.6.2 Dimension information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
179.	MD_Dimension	Dimen	axis properties	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 180-182
180.	dimensionName	dimName	name of the axis	M	1	Class	MD_DimensionNameType Code <<CodeList>> (B.5.14)
181.	dimensionSize	dimSize	number of elements along the axis	M	1	Integer	Integer
182.	resolution	dimResol	degree of detail in the grid dataset	O	1	Class	Measure (B.4.3)

B.2.6.3 Geometric object information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
183.	MD_GeometricObjects	GeometObjs	number of objects, listed by geometric object type, used in the dataset	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 184-185
184.	geometricObjectType	geoObjTyp	name of point or vector objects used to locate zero-, one-, two-, or three-dimensional spatial locations in the dataset	M	1	Class	MD_GeometricObjectType Code <<CodeList>> (B.5.15)
185.	geometricObjectCount	geoObjCnt	total number of the point or vector object type occurring in the dataset	O	1	Integer	> 0

B.2.7 Reference system information (includes temporal, coordinate and geographic identifiers)

B.2.7.1 General

- UML model shown in Figure A.9

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
186.	MD_ReferenceSystem	RefSystem	information about the reference system	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Metadatum)	Line 187
187.	referenceSystemIdentifier	refSysId	name of reference system	C / MD_CRS.projection, MD_CRS.ellipsoid, and MD_CRS.datum not documented?	1	Class	RS_Identifier (B.2.7.3)
188.	intentionally left blank						
189.	MD_CRS	MdCoRefSys	metadata about a coordinate system in which attributes have been derived from SC_CRS as defined in ISO 19111 – Spatial referencing by coordinates	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (MD_ReferenceSystem)	Lines 190-194 and 187
190.	projection	projection	identity of the projection used	O	1	Class	RS_Identifier (B.2.7.3)
191.	ellipsoid	ellipsoid	identity of the ellipsoid used	O	1	Class	RS_Identifier (B.2.7.3)
192.	datum	datum	identity of the datum used	O	1	Class	RS_Identifier (B.2.7.3)
193.	role name: ellipsoidParameters	ellParas	set of parameters that describe the ellipsoid	O	1	Association	MD_EllipsoidParameters (B.2.7.2)
194.	role name: projectionParameters	projParas	set of parameters that describe the projection	O	1	Association	MD_ProjectionParameters (B.2.7.6)

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
195.	<i>RS_ReferenceSystem</i>	RefSys	description of the spatial and temporal reference systems used in the dataset	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<Abstract>>	Lines 196-197
196.	name	refSysName	name of reference system used	M	1	Class	RS_Identifier (B.2.7.3)
197.	domainOfValidity	domOValid	range which is valid for the reference system	O	N	Class	EX_Extent <<DataType>> (B.3.1)
198.	intentionally left blank						
199.	intentionally left blank						
200.	intentionally left blank						

B.2.7.2 Ellipsoid parameter information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
201.	MD_EllipsoidParameters	EllParas	set of parameters that describe the ellipsoid	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_CRS)	Lines 202-204
202.	semiMajorAxis	semiMajAx	radius of the equatorial axis of the ellipsoid	M	1	Real	> 0,0
203.	axisUnits	axisUnits	units of the semi-major axis	M	1	Class	UomLength (B.4.3)
204.	denominatorOfFlatteningRatio	denFlatRat	ratio of the difference between the equatorial and polar radii of the ellipsoid to the equatorial radius when the numerator is set to 1	C / not a spheroid?	1	Real	> 0,0

B.2.7.3 Identifier information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
205.	MD_Identifier	MdIdent	value uniquely identifying an object within a namespace	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class	Lines 206-207
206.	authority	identAuth	person or party responsible for maintenance of the namespace	O	1	Class	CL_Citation <<DataType>> (B.3.2)
207.	code	identCode	alphanumeric value identifying an instance in the namespace	M	1	CharacterString	Free text
208.	RS_Identifier	RsIdent	identifier used for reference systems	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (MD_Identifier)	Lines 206-207 and 208.1-208.2
208.1	codeSpace	identCodeSpace	name or identifier of the person or organization responsible for namespace	O	1	CharacterString	Free text
208.2	version	identVrsn	version identifier for the namespace	O	1	CharacterString	Free text

B.2.7.4 Oblique line azimuth information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
209.	MD_ObliqueLineAzimuth	ObLineAzi	method used to describe the line along which an oblique mercator map projection is centred using the map projection origin and an azimuth	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Projection Parameters)	Lines 210-211

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
210.	azimuthAngle	aziAngle	angle measured clockwise from north, and expressed in degrees	M	1	Real	Real
211.	azimuthMeasurePoint Longitude	aziPtLong	longitude of the map projection origin	M	1	Real	Real

B.2.7.5 Oblique line point information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
212.	MD_ObliqueLinePoint	ObLinePt	method used to describe the line along which an oblique mercator map projection is centred using two points near the limits of the mapped region that define the centre line	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Projection Parameters)	Lines 213-214
213.	obliqueLineLatitude	obLineLat	latitude of a point defining the oblique line	M	1	Real	Real
214.	obliqueLineLongitude	obLineLong	longitude of a point defining the oblique line	M	1	Real	Real

B.2.7.6 Projection parameter information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
215.	MD_ProjectionParameters	ProjParas	set of parameters that describe the projection	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_CRS)	Lines 216-231
216.	zone	zone	unique identifier for 100,000 metre grid zone	O	1	Integer	Integer

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
217.	standardParallel	stanParal	line of constant latitude at which the surface of the Earth and the plane or developable surface intersect	O	2	Real	Real
218.	longitudeOfCentralMeridian	longCntMer	line of longitude at the centre of a map projection generally used as the basis for constructing the projection	O	1	Real	Real
219.	latitudeOfProjectionOrigin	latProjOri	latitude chosen as the origin of rectangular coordinates for a map projection	O	1	Real	Real
220.	falseEasting	falseEasting	value added to all "x" values in the rectangular coordinates for a map projection. This value frequently is assigned to eliminate negative numbers. Expressed in the unit of measure identified in Planar Coordinate Units	O	1	Real	Real
221.	falseNorthing	falseNorthing	value added to all "y" values in the rectangular coordinates for a map projection. This value frequently is assigned to eliminate negative numbers. Expressed in the unit of measure identified in Planar Coordinate Units	O	1	Real	Real
222.	falseEastingNorthingUnits	falseENUUnits	units of false northing and false easting	O	1	Class	UomLength (B.4.3)
223.	scaleFactorAtEquator	scfFacEqu	ratio between physical distance and corresponding map distance, along the equator	O	1	Real	> 0,0
224.	heightOfProspectivePoint Above Surface	hgtProsPt	height of viewpoint above the Earth, expressed in metres	O	1	Real	>0,0
225.	longitudeOfProjectionCenter	longProjCnt	longitude of the point of projection for azimuthal projections	O	1	Real	Real
226.	latitudeOfProjectionCenter	latProjCnt	latitude of the point of projection for azimuthal projections	O	1	Real	Real

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
227.	scaleFactorAtCenterLine	scIFacCnt	ratio between physical distance and corresponding map distance, along the centre line	O	1	Real	Real
228.	straightVerticalLongitudeFrom Pole	stVrtLongPI	longitude to be oriented straight up from the North or South Pole	O	1	Real	Real
229.	scaleFactorAtProjectionOrigin	scIFacPrOr	multiplier for reducing a distance obtained from a map by computation or scaling to the actual distance at the projection origin	O	1	Real	Real
230.	<i>role name:</i> obliqueLineAzimuthParameter	obLnAziPars	parameters describing the oblique line azimuth	O	1	Association	MD_ObliqueLineAzimuth (B.2.7.4)
231.	<i>role name:</i> obliqueLinePointParameter	obLnPtPars	parameters describing the oblique line point	O	2	Association	MD_ObliqueLinePoint (B.2.7.5)

B.2.8 Content information (includes Feature catalogue and Coverage descriptions)

B.2.8.1 General

- UML model shown in Figure A.10

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
232.	<i>MD_ContentInformation</i>	ContInfo	description of the content of a dataset	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Metadata) <<Abstract>>	

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
233.	MD_FeatureCatalogue Description	FetCatDesc	information identifying the feature catalogue or the conceptual schema	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (MD_Content Information)	Lines 234-238
234.	complianceCode	compCode	indication of whether or not the cited feature catalogue complies with ISO 19110	O	1	Boolean	0=not compliant 1=compliant
235.	language	catLang	language(s) used within the catalogue	O	N	CharacterString	ISO 639-2, other parts can be used
236.	includedWithDataset	incWithDS	indication of whether or not the feature catalogue is included with the dataset	M	1	Boolean	0=no 1=yes
237.	featureTypes	catFetTypes	subset of feature types from cited feature catalogue occurring in dataset	O	N	Class	GenericName (B.4.8)
238.	featureCatalogueCitation	catCitation	complete bibliographic reference to one or more external feature catalogues	M	N	Class	CI_Citation <<DataType>> (B.3.2)
239.	MD_CoverageDescription	CovDesc	information about the content of a grid data cell	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (MD_Content Information)	Lines 240-242
240.	attributeDescription	attDesc	description of the attribute described by the measurement value	M	1	Class	RecordType <<Metaclass>> (B.4.3)
241.	contentType	contentTyp	type of information represented by the cell value	M	1	Class	MD_CoverageContentType Code <<CodeList>> (B.5.12)
242.	Role name: dimension	covDim	information on the dimensions of the cell measurement value	O	N	Class	MD_RangeDimension (B.2.8.2)

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
243.	MD_ImageDescription	ImgDesc	information about an image's suitability for use	O	Use maximum occurrence from referencing object	Specified Class (MD_Coverage Description)	Lines 244-255 and 240-242
244.	illuminationElevationAngle	illElevAng	illumination elevation measured in degrees clockwise from the target plane at intersection of the optical line of sight with the Earth's surface. For images from a scanning device, refer to the centre pixel of the image	O	1	Real	-90 – 90
245.	illuminationAzimuthAngle	illAziAng	illumination azimuth measured in degrees clockwise from true north at the time the image is taken. For images from a scanning device, refer to the centre pixel of the image	O	1	Real	0,00 – 360
246.	imagingCondition	imagCond	conditions affected the image	O	1	Class	MD_ImagingConditionCode <<CodeList>> (B.5.16)
247.	imageQualityCode	imagQuCode	specifies the image quality	O	1	Class	MD_Identifier <<DataType>> (B.2.7.3)
248.	cloudCoverPercentage	cloudCovPer	area of the dataset obscured by clouds, expressed as a percentage of the spatial extent	O	1	Real	0,0 – 100,0
249.	processingLevelCode	prcTypCde	image distributor's code that identifies the level of radiometric and geometric processing that has been applied	O	1	Class	MD_Identifier <<DataType>> (B.2.7.3)
250.	compressionGeneration Quantity	cmpGenQuan	count of the number of lossy compression cycles performed on the image	O	1	Integer	Integer
251.	triangulationIndicator	trianInd	indication of whether or not triangulation has been performed upon the image	O	1	Boolean	0-no 1-yes

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
252.	radiometricCalibrationData Availability	radCalDatAv	indication of whether or not the radiometric calibration information for generating the radiometrically calibrated standard data product is available	O	1	Boolean	0-no 1-yes
253.	cameraCalibrationInformation Availability	camCallnAv	indication of whether or not constants are available which allow for camera calibration corrections	O	1	Boolean	0-no 1-yes
254.	filmDistortionInformation Availability	filmDistInAv	indication of whether or not Calibration Reseau information is available	O	1	Boolean	0-no 1-yes
255.	lensDistortionInformation Availability	lensDistInAv	indication of whether or not lens aberration correction information is available	O	1	Boolean	0-no 1-yes

B.2.8.2 Range dimension information (includes Band information)

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
256.	MD_RangeDimension	RangeDim	information on the range of each dimension of a cell measurement value	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Coverage Description)	Lines 257-258
257.	sequenceIdentifier	seqID	number that uniquely identifies instances of bands of wavelengths on which a sensor operates	O	1	Class	MemberName (B.4.8)
258.	descriptor	dimDescrp	description of the range of a cell measurement value	O	1	CharacterString	Free text

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
259.	MD_Band	Band	range of wavelengths in the electromagnetic spectrum	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (MD_RangeDimension)	Lines 260-267 and 257-258
260.	maxValue	maxVal	longest wavelength that the sensor is capable of collecting within a designated band	O	1	Real	Real
261.	minValue	minVal	shortest wavelength that the sensor is capable of collecting within a designated band	O	1	Real	Real
262.	units	valUnit	units in which sensor wavelengths are expressed	C / minValue or maxVal provided?	1	Class	UomLength (B.4.3)
263.	peakResponse	pkResp	wavelength at which the response is the highest	O	1	Real	Real
264.	bitsPerValue	bitsPerVal	maximum number of significant bits in the uncompressed representation for the value in each band of each pixel	O	1	Integer	Integer
265.	toneGradation	toneGrad	number of discrete numerical values in the grid data	O	1	Integer	Integer
266.	scaleFactor	sciFac	scale factor which has been applied to the cell value	O	1	Real	Real
267.	offset	offset	the physical value corresponding to a cell value of zero	O	1	Real	Real

B.2.9 Portrayal catalogue information

- UML model shown in Figure A.11

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
268.	MD_PortrayalCatalogue Reference	PortCatRef	information identifying the portrayal catalogue used	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Metadata)	Line 269
269.	portrayalCatalogueCitation	portCatCit	bibliographic reference to the portrayal catalogue cited	M	N	Class	CI_Citation <<DataType>> (B.3.2)

B.2.10 Distribution information

B.2.10.1 General

- UML model shown in Figure A.12

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
270.	MD_Distribution	Distrib	information about the distributor of and options for obtaining the resource	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Metadata)	Lines 271-273
271.	Role name: distributionFormat	distFormat	provides a description of the format of the data to be distributed	C / MD_Distributor. distributorFormat not documented?	N	Association	MD_Format (B.2.10.4)
272.	Role name: distributor	distributor	provides information about the distributor	O	N	Association	MD_Distributor (B.2.10.3)

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
273.	<i>Role name:</i> transferOptions	distTranOps	provides information about technical means and media by which a resource is obtained from the distributor	O	N	Association	MD_DigitalTransferOptions (B.2.10.2)

B.2.10.2 Digital transfer options information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
274.	MD_DigitalTransferOptions	DigTranOps	technical means and media by which a resource is obtained from the distributor	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Distribution and MD_Distributor)	Lines 275-278
275.	unitsOfDistribution	unitsODist	tiles, layers, geographic areas, etc., in which data is available	O	1	CharacterString	Free text
276.	transferSize	transSize	estimated size of a unit in the specified transfer format, expressed in megabytes. The transfer size is > 0.0	O	1	Real	> 0.0
277.	onLine	onLineSrc	information about online sources from which the resource can be obtained	O	N	Class	CI_OnlineResource <<DataType>> (B.3.2.5)
278.	offLine	offLineMed	information about offline media on which the resource can be obtained	O	1	Class	MD_Medium <<DataType>> (B.2.10.5)

B.2.10.3 Distributor information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
279.	MD_Distributor	Distributor	information about the distributor	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Distribution and MD_Format)	Lines 280-283
280.	distributorContact	distorCont	party from whom the resource may be obtained. This list need not be exhaustive	M	1	Class	CI_ResponsibleParty <<DataType>> (B.3.2)
281.	<i>Role name:</i> distributionOrderProcess	distorOrdPrc	provides information about how the resource may be obtained, and related instructions and fee information	O	N	Association	MD_StandardOrderProcess (B.2.10.6)
282.	<i>Role name:</i> distributorFormat	distorFormat	provides information about the format used by the distributor	C / MD_Distribution. distributionFormat not documented?	N	Association	MD_Format (B.2.10.4)
283.	<i>Role name:</i> distributorTransferOptions	distorTran	provides information about the technical means and media used by the distributor	O	N	Association	MD_DigitalTransferOptions (B.2.10.2)

B.2.10.4 Format information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
284.	MD_Format	Format	description of the computer language construct that specifies the representation of data objects in a record, file, message, storage device or transmission channel	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Distribution, MD_Identifier, and MD_Distributor)	Lines 285-290
285.	name	formatName	name of the data transfer format(s)	M	1	CharacterString	Free text
286.	version	formatVer	version of the format (date, number, etc.)	M	1	CharacterString	Free text

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
287.	amendmentNumber	formatAmdNum	amendment number of the format version	O	1	CharacterString	Free text
288.	specification	formatSpec	name of a subset, profile, or product specification of the format	O	1	CharacterString	Free text
289.	fileDecompressionTechnique	fileDecmTech	recommendations of algorithms or processes that can be applied to read or expand resources to which compression techniques have been applied	O	1	CharacterString	Free text
290.	<i>Role name:</i> formatDistributor	formatDist	provides information about the distributor's format	O	N	Association	MD_Distributor (B.2.10.3)

B.2.10.5 Medium information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
291.	MD_Medium	Medium	information about the media on which the resource can be distributed	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 292-297
292.	name	medName	name of the medium on which the resource can be received	O	1	Class	MD_MediumNameCode <<CodeList>> (B.5.20)
293.	density	medDensity	density at which the data is recorded	O	N	Real	> 0,0
294.	densityUnits	medDenUnits	units of measure for the recording density	C / density documented?	1	CharacterString	Free text
295.	volumes	medVol	number of items in the media identified	O	1	Integer	> 0,0
296.	mediumFormat	medFormat	method used to write to the medium	O	N	Class	MD_MediumFormatCode <<CodeList>> (B.5.19)

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
297.	mediumNote	medNote	description of other limitations or requirements for using the medium	O	1	CharacterString	Free text

B.2.10.6 Standard order process information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
298.	MD_StandardOrderProcess	StanOrdProc	common ways in which the resource may be obtained or received, and related instructions and fee information	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Distributor)	Lines 299-302
299.	fees	resFees	fees and terms for retrieving the resource. Include monetary units (as specified in ISO 4217)	O	1	CharacterString	Free text
300.	plannedAvailableDateTime	planAvDtTm	date and time when the resource will be available	O	1	Class	DateTime (B.4.2)
301.	orderingInstructions	ordInstr	general instructions, terms and services provided by the distributor	O	1	CharacterString	Free text
302.	turnaround	ordTurn	typical turnaround time for the filling of an order	O	1	CharacterString	Free text

B.2.11 Metadata extension information

B.2.11.1 General

- UML model shown in Figure A.13

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
303.	MD_MetadataExtensionInformation	MdExtInfo	information describing metadata extensions	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Metadata)	Lines 304-305
304.	extensionOnLineResource	extOnRes	information about on-line sources containing the community profile name and the extended metadata elements. Information for all new metadata elements	O	1	Class	CI_OnlineResource <<DataType>> (B.3.2.5)
305.	<i>Role name:</i> extendedElementInformation	extEleInfo	provides information about a new metadata element, not found in ISO 19115, which is required to describe geographic data	O	N	Association	MD_ExtendedElement Information (B.2.11.2)

B.2.11.2 Extended element information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
306.	MD_ExtendedElementInformation	ExtEleInfo	new metadata element, not found in ISO 19115, which is required to describe geographic data	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Metadata ExtensionInformation)	Lines 307-319
307.	name	extEleName	name of the extended metadata element	M	1	CharacterString	Free text

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
308.	shortName	extShortName	short form suitable for use in an implementation method such as XML or SGML. NOTE other methods may be used	C / data Type notEqual "codelistElement"?	1	CharacterString	Free text
309.	domainCode	extDomCode	three digit code assigned to the extended element	C / is data Type "codelistElement"?	1	Integer	Integer
310.	definition	extEleDef	definition of the extended element	M	1	CharacterString	Free text
311.	obligation	extEleOb	obligation of the extended element	C / data Type not "codelist", "enumeration" or "codelistElement"?	1	Class	MD_ObligationCode <<Enumeration>> (B.5.21)
312.	condition	extEleCond	condition under which the extended element is mandatory	C / obligation = "Conditional"?	1	CharacterString	Free text
313.	data Type	eleDataType	code which identifies the kind of value provided in the extended element	M	1	Class	MD_DataTypeCode <<CodeList>> (B.5.13)
314.	maximumOccurrence	extEleMxOc	maximum occurrence of the extended element	C / data Type not "codelist", "enumeration" or "codelistElement"?	1	CharacterString	N or any integer
315.	domainValue	extEleDomVal	valid values that can be assigned to the extended element	C / data Type not "codelist", "enumeration" or "codelistElement"?	1	CharacterString	Free text
316.	parentEntity	extEleParEnt	name of the metadata entity(s) under which this extended metadata element may appear. The name(s) may be standard metadata element(s) or other extended metadata element(s)	M	N	CharacterString	Free text
317.	rule	extEleRule	specifies how the extended element relates to other existing elements and entities	M	1	CharacterString	Free text
318.	rationale	extEleRat	reason for creating the extended element	O	N	CharacterString	Free text

Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
319. source	extEleSrc	name of the person or organization creating the extended element	M	N	Class	CI_ResponsibleParty <<DataType>> (B.3.2)

B.2.12 Application schema information

- UML model shown in Figure A.14

Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
320. MD_ApplicationSchema Information	AppSchInfo	information about the application schema used to build the dataset	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Metadata)	Lines 321-327
321. name	asName	name of the application schema used	M	1	Class	CI_Citation <<DataType>> (B.3.2)
322. schemaLanguage	asSchLang	identification of the schema language used	M	1	CharacterString	Free text
323. constraintLanguage	asCstLang	formal language used in Application Schema	M	1	CharacterString	Free text
324. schemaAscii	asAscii	full application schema given as an ASCII file	O	1	CharacterString	Free text
325. graphicsFile	asGraFile	full application schema given as a graphics file	O	1	Binary	Binary
326. softwareDevelopmentFile	asSwDevFile	full application schema given as a software development file	O	1	Binary	Binary
327. softwareDevelopmentFile Format	asSwDevFiT	software dependent format used for the application schema software dependent file	O	1	CharacterString	Free text
328. intentionally left blank						
329. intentionally left blank						

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
330.	intentionally left blank						
331.	intentionally left blank						
332.	intentionally left blank						
333.	intentionally left blank						

B.3 Data type information

B.3.1 Extent information

B.3.1.1 General

- UML model shown in Figure A.15

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
334.	EX_Extent	Extent	information about horizontal, vertical, and temporal extent	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 335-338
335.	description	exDesc	spatial and temporal extent for the referring object	C / geographicElement and temporalElement and verticalElement not documented?	1	CharacterString	Free text
336.	Role name: geographicElement	geoEle	provides geographic component of the extent of the referring object	C / description and temporalElement and verticalElement not documented?	N	Association	EX_GeographicExtent <<Abstract>> (B.3.1.2)
337.	Role name: temporalElement	tempEle	provides temporal component of the extent of the referring object	C / description and geographicElement and verticalElement not documented?	N	Association	EX_TemporalExtent (B.3.1.3)

Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
338. <i>Role name:</i> VerticalElement	vertEle	provides vertical component of the extent of the referring object	C / description and geographicElement and temporalElement not documented?	N	Association	EX_VerticalExtent (B.3.1.4)

B.3.1.2 Geographic extent information

Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
339. <i>EX_GeographicExtent</i>	GeoExtent	geographic area of the dataset	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (EX_Extent and EX_SpatialTemporal <<Abstract>>	Line 340
340.	extentTypeCode	indication of whether the bounding polygon encompasses an area covered by the data or an area where data is not present	O	1	Boolean	0 – exclusion 1 – inclusion
341.	EX_BoundingPolygon	boundary enclosing the dataset, expressed as the closed set of (x,y) coordinates of the polygon (last point replicates first point)	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (EX_GeographicExtent)	Line 342 and 340
342.	polygon	sets of points defining the bounding polygon	M	N	Class	GM_Object (B.4.6) -90 to 90 latitude -180 to 360 longitude
343.	EX_GeographicBoundingBox	geographic position of the dataset NOTE This is only an approximate reference so specifying the coordinate reference system is unnecessary	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (EX_GeographicExtent)	Lines 344-347 and 340

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
344.	westBoundLongitude	westBL	western-most coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees (positive east)	M	1		Angle (B.4.3) -180,0 <= West Bounding Longitude Value <= 180,0
345.	eastBoundLongitude	eastBL	eastern-most coordinate of the limit of the dataset extent, expressed in longitude in decimal degrees (positive east)	M	1	Class	Angle (B.4.3) -180,0 <= East Bounding Longitude Value <= 180,0
346.	southBoundLatitude	southBL	southern-most coordinate of the limit of the dataset extent, expressed in latitude in decimal degrees (positive north)	M	1	Class	Angle (B.4.3) -90,0 <= South Bounding Latitude Value <= 90,0; South Bounding Latitude Value <= North bounding Latitude Value
347.	northBoundLatitude	northBL	northern-most, coordinate of the limit of the dataset extent expressed in latitude in decimal degrees (positive north)	M	1	Class	Angle (B.4.3) -90,0 <= North Bounding Latitude Value <= 90,0; North Bounding Latitude Value >= South Bounding Latitude Value
348.	EX_GeographicDescription	GeoDesc	description of the geographic area using identifiers	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (EX_GeographicExtent)	Line 349 and 340
349.	geographicIdentifier	geoid	identifier used to represent a geographic area	M	1	Class	MD_Identifier (B.2.7.3)

B.3.1.3 Temporal extent information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
350.	EX_TemporalExtent	TempExtent	time period covered by the content of the dataset	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (EX_Extent)	Line 351
351.	extent	exTemp	date and time for the content of the dataset	M	1	Class	TM_Primitive (B.4.5)
352.	EX_SpatialTemporalExtent	SpatTempEx	extent with respect to date/time and spatial boundaries	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (EX_TemporalExtent)	Line 353 and 351
353.	<i>role name:</i> spatialExtent	exSpat	spatial extent component of composite spatial and temporal extent	M	N	Association	EX_GeographicExtent <<Abstract>> (B.3.1.2)

B.3.1.4 Vertical extent information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
354.	EX_VerticalExtent	VertExtent	vertical domain of dataset	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (EX_Extent)	Lines 355-358
355.	minimumValue	vertMinVal	lowest vertical extent contained in the dataset	M	1	Real	Real
356.	maximumValue	vertMaxVal	highest vertical extent contained in the dataset	M	1	Real	Real

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
357.	unitOfMeasure	vertUoM	vertical units used for vertical extent information Examples: metres, feet, millimetres, hectopascals	M	1	Class	UomLength (B.4.3)
358.	<i>role name:</i> verticalDatum	vertDatum	provides information about the origin from which the maximum and minimum elevation values are measured	M	1	Association	SC_VerticalDatum (B.4.9)

B.3.2 Citation and responsible party information

B.3.2.1 General

- UML model shown in Figure A.16

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
359.	Citation	Citation	standardized resource reference	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 360-373
360.	title	resTitle	name by which the cited resource is known	M	1	CharacterString	Free text
361.	alternateTitle	resAltTitle	short name or other language name by which the cited information is known. Example: "DCW" as an alternative title for "Digital Chart of the World"	O	N	CharacterString	Free text
362.	date	resRefDate	reference date for the cited resource	M	N	Class	CI_Date (B.3.2.4) <<DataType>>
363.	edition	resEd	version of the cited resource	O	1	CharacterString	Free text
364.	editionDate	resEdDate	date of the edition	O	1	Class	Date (B.4.2)

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
365.	identifier	citId	value uniquely identifying an object within a namespace	O	N	Class	MD_Identifier <<DataType>> (B.2.7.3)
366.	intentionally left blank						
367.	citedResponsibleParty	citRespParty	name and position information for an individual or organization that is responsible for the resource	O	N	Class	CI_ResponsibleParty <<DataType>> (B.3.2)
368.	presentationForm	presForm	mode in which the resource is represented	O	N	Class	CI_PresentationFormCode <<CodeList>> (B.5.4)
369.	series	datasetSeries	information about the series, or aggregate dataset, of which the dataset is a part	O	1	Class	CI_Series <<DataType>> (B.3.2.6)
370.	otherCitationDetails	otherCitDet	other information required to complete the citation that is not recorded elsewhere	O	1	CharacterString	Free text
371.	collectiveTitle	collTitle	common title with holdings note NOTE title identifies elements of a series collectively, combined with information about what volumes are available at the source cited	O	1	CharacterString	Free text
372.	ISBN	isbn	international Standard Book Number	O	1	CharacterString	Free text
373.	ISSN	issn	international Standard Serial Number	O	1	CharacterString	Free text
374.	CI_ResponsibleParty	RespParty	identification of, and means of communication with, person(s) and organizations associated with the dataset	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 375-379
375.	individualName	rpIndName	name of the responsible person-surname, given name, title separated by a delimiter	C / organisationName and positionName not documented?	1	CharacterString	Free text
376.	organisationName	rpOrgName	name of the responsible organization	C / individualName and positionName not documented?	1	CharacterString	Free text

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
377.	positionName	rpPosName	role or position of the responsible person	C / individualName and organisationName not documented?	1	CharacterString	Free text
378.	contactInfo	rpCntInfo	address of the responsible party	O	1	Class	CI_Contact <<DataType>> (B.3.2.3)
379.	role	role	function performed by the responsible party	M	1	Class	CI_RoleCode <<CodeList>> (B.5.5)

B.3.2.2 Address information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
380.	CI_Address	Address	location of the responsible individual or organization	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 381-386
381.	deliveryPoint	delPoint	address line for the location (as described in ISO 11180, Annex A)	O	N	CharacterString	Free text
382.	city	city	city of the location	O	1	CharacterString	Free text
383.	administrativeArea	adminArea	state, province of the location	O	1	CharacterString	Free text
384.	postalCode	postCode	ZIP or other postal code	O	1	CharacterString	Free text
385.	country	country	country of the physical address	O	1	CharacterString	ISO 3166-3, other parts may be used
386.	electronicMailAddress	eMailAdd	address of the electronic mailbox of the responsible organization or individual	O	N	CharacterString	Free text

B.3.2.3 Contact information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
387.	CI_Contact	Contact	information required to enable contact with the responsible person and/or organization	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 388-392
388.	phone	cntPhone	telephone numbers at which the organization or individual may be contacted	O	1	Class	CI_Telephone <<DataType>> (B.3.2.7)
389.	address	cntAddress	physical and email address at which the organization or individual may be contacted	O	1	Class	CI_Address <<DataType>> (B.3.2.2)
390.	onlineResource	cntOnlineRes	on-line information that can be used to contact the individual or organization	O	1	Class	CI_OnlineResource <<DataType>> (B.3.2.5)
391.	hoursOfService	cntHours	time period (including time zone) when individuals can contact the organization or individual	O	1	CharacterString	Free text
392.	contactInstructions	cntInstr	supplemental instructions on how or when to contact the individual or organization	O	1	CharacterString	Free text

B.3.2.4 Date information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
393.	CI_Date	DateRef	reference date and event used to describe it	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 394-395

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
394.	date	refDate	reference date for the cited resource	M	1	Class	Date (B.4.2)
395.	dateType	refDateType	event used for reference date	M	1	Class	CI_DateTypeCode <<CodeList>> (B.5.2)

B.3.2.5 OnLine resource information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
396.	CI_OnlineResource	OnlineRes	information about on-line sources from which the dataset, specification, or community profile name and extended metadata elements can be obtained	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 397-402
397.	linkage	linkage	location (address) for on-line access using a Uniform Resource Locator address or similar addressing scheme such as http://www.statkart.no/isotc211	M	1	Class	URL (IETF RFC1738 IETF RFC 2056)
398.	protocol	protocol	connection protocol to be used	O	1	CharacterString	Free text
399.	applicationProfile	appProfile	name of an application profile that can be used with the online resource	O	1	CharacterString	Free text
400.	name	orName	name of the online resource	O	1	CharacterString	Free text
401.	description	orDesc	detailed text description of what the online resource is/does	O	1	CharacterString	Free text
402.	function	orFunct	code for function performed by the online resource	O	1	Class	CI_OnLineFunctionCode <<CodeList>> (B.5.3)

B.3.2.6 Series information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
403.	CI_Series	DatasetSeries	information about the series, or aggregate dataset, to which a dataset belongs	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 404-406
404.	name	seriesName	name of the series, or aggregate dataset, of which the dataset is a part	O	1	CharacterString	Free text
405.	issueIdentification	issId	information identifying the issue of the series	O	1	CharacterString	Free text
406.	page	artPage	details on which pages of the publication the article was published	O	1	CharacterString	Free text

B.3.2.7 Telephone information

	Name / Role Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
407.	CI_Telephone	Telephone	telephone numbers for contacting the responsible individual or organization	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 408-409
408.	voice	voiceNum	telephone number by which individuals can speak to the responsible organization or individual	O	N	CharacterString	Free text
409.	facsimile	faxNum	telephone number of a facsimile machine for the responsible organization or individual	O	N	CharacterString	Free text

B.4 Externally referenced entities

B.4.1 Introduction

There are several entities referenced by this International Standard that are documented by another, external, standard. Those externally referenced entities are explained below.

B.4.2 Date and DateTime information

Date: gives values for year, month and day. Character encoding of a date is a string which shall follow the format for date specified by ISO 8601. This class is documented in full in ISO/TS 19103.

DateTime: combination of a date and a time type (given by an hour, minute and second). Character encoding of a DateTime shall follow ISO 8601. This class is documented in full in ISO/TS 19103.

B.4.3 Distance, angle, measure, number, record, recordType, scale and UomLength information

Distance: This class is documented in full in ISO/TS 19103.

Angle: Amount of rotation need to bring one line or plane into coincidence with another, generally measured in radians or degrees. This class is documented in full in ISO/TS 19103.

Measure: result from performing the act or process of ascertaining the extent, dimensions, or quantity of some entity. This class is documented in full in ISO/TS 19103.

Number: abstract class that can be sub-typed to a specific number type (real, integer, decimal, double, float). This class is documented in full in ISO/TS 19103.

Record: This class is documented in full in ISO/TS 19103.

RecordType: This class is documented in full in ISO/TS 19103.

Scale: This class is documented in full in ISO/TS 19103.

UnitOfMeasure: This class is documented in full in ISO/TS 19103.

UomLength: any of the measuring systems to measure the length, distance between two entities. This class is documented in full in ISO/TS 19103.

B.4.4 Feature type, property type, and attribute type information

GF_AttributeType: class of attribute definitions of a feature type. This class is fully documented in ISO 19109.

GF_FeatureType: textual information describing the concept of a feature type, containing all feature types. This class is documented in full in ISO 19109.

GF_PropertyType: textual information related to the feature type because its text comprises characteristics and behaviour of any property of a feature type, as well as its roles within associations between features. This class is documented in full in ISO 19109.

B.4.5 PeriodDuration and temporal primitive information

TM_PeriodDuration: duration of a period as specified by ISO 8601. This class is fully documented in ISO 19108.

TM_Primitive: an abstract class representing a non-decomposed element of geometry or topology. This class is fully documented in ISO 19108.

B.4.6 Point and Object information

GM_Point: 0-dimensional geometric primitive, representing a position, but not having extent. This class is fully documented in ISO 19107.

GM_Object: root class of the geometric object taxonomy and supports interfaces common to all geographically referenced geometric objects. This class is fully documented in ISO 19107.

B.4.7 Set and Sequence information

Set: finite collection of objects, where each object appears in the collection only once. A set shall not contain any duplicated instances. The order of the elements of the set is not specified. This class is documented in full in ISO/TS 19103.

Sequence: A sequence refers to a collection of sequential ordering between its elements. Sequences can be repeated, and may be used as a list or an array. This class is documented in full in ISO/TS 19103.

B.4.8 Type name information

AttributeName: This class is documented in full in ISO/TS 19103.

GenericName: This class is documented in full in ISO/TS 19103.

MemberName: This class is documented in full in ISO/TS 19103.

B.4.9 Vertical datum information

SC_VerticalDatum: set of parameters describing the relation of gravity-related heights to the Earth. This class is fully documented in ISO 19111.

B.5 CodeLists and enumerations

B.5.1 Introduction

The stereotype classes <<CodeList>> and <<Enumeration>> can be found below. These two stereotype classes do not contain “obligation / condition”, “maximum occurrence”, “data type” and “domain” attributes. These two stereotype classes also do not contain any “other” values as <<Enumeration>>s are closed (not extendable) and <<CodeList>>s are extendable. Consult Annex C and Annex F for information about how to extend <<CodeList>>s.

B.5.2 CI_DateTypeCode <<CodeList>>

	Name	Domain code	Definition
1.	CI_DateTypeCode	DateTypCd	identification of when a given event occurred
2.	creation	001	date identifies when the resource was brought into existence
3.	publication	002	date identifies when the resource was issued
4.	revision	003	date identifies when the resource was examined or re-examined and improved or amended

B.5.3 CI_OnLineFunctionCode <<CodeList>>

	Name	Domain code	Definition
1.	CI_OnLineFunctionCode	OnFunctCd	function performed by the resource
2.	download	001	online instructions for transferring data from one storage device or system to another
3.	information	002	online information about the resource
4.	offlineAccess	003	online instructions for requesting the resource from the provider
5.	order	004	online order process for obtaining the resource
6.	search	005	online search interface for seeking out information about the resource

B.5.4 CI_PresentationFormCode <<CodeList>>

	Name	Domain code	Definition
1.	CI_PresentationFormCode	PresFormCd	mode in which the data is represented
2.	documentDigital	001	digital representation of a primarily textual item (can contain illustrations also)
3.	documentHardcopy	002	representation of a primarily textual item (can contain illustrations also) on paper, photographic material, or other media
4.	imageDigital	003	likeness of natural or man-made features, objects, and activities acquired through the sensing of visual or any other segment of the electromagnetic spectrum by sensors, such as thermal infrared, and high resolution radar and stored in digital format
5.	imageHardcopy	004	likeness of natural or man-made features, objects, and activities acquired through the sensing of visual or any other segment of the electromagnetic spectrum by sensors, such as thermal infrared, and high resolution radar and reproduced on paper, photographic material, or other media for use directly by the human user
6.	mapDigital	005	map represented in raster or vector form
7.	mapHardcopy	006	map printed on paper, photographic material, or other media for use directly by the human user
8.	modelDigital	007	multi-dimensional digital representation of a feature, process, etc.
9.	modelHardcopy	008	3-dimensional, physical model
10.	profileDigital	009	vertical cross-section in digital form
11.	profileHardcopy	010	vertical cross-section printed on paper, etc.
12.	tableDigital	011	digital representation of facts or figures systematically displayed, especially in columns
13.	tableHardcopy	012	representation of facts or figures systematically displayed, especially in columns, printed on paper, photographic material, or other media
14.	videoDigital	013	digital video recording
15.	videoHardcopy	014	video recording on film

B.5.5 CI_RoleCode <<CodeList>>

	Name	Domain code	Definition
1.	CI_RoleCode	RoleCd	function performed by the responsible party
2.	resourceProvider	001	party that supplies the resource
3.	custodian	002	party that accepts accountability and responsibility for the data and ensures appropriate care and maintenance of the resource

	Name	Domain code	Definition
4.	owner	003	party that owns the resource
5.	user	004	party who uses the resource
6.	distributor	005	party who distributes the resource
7.	originator	006	party who created the resource
8.	pointOfContact	007	party who can be contacted for acquiring knowledge about or acquisition of the resource
9.	principalInvestigator	008	key party responsible for gathering information and conducting research
10.	processor	009	party who has processed the data in a manner such that the resource has been modified
11.	publisher	010	party who published the resource
12.	author	011	party who authored the resource

B.5.6 DQ_EvaluationMethodTypeCode <<CodeList>>

	Name	Domain code	Definition
1.	DQ_EvaluationMethodTypeCode	EvalMethTypeCd	type of method for evaluating an identified data quality measure
2.	directInternal	001	method of evaluating the quality of a dataset based on inspection of items within the dataset, where all data required is internal to the dataset being evaluated
3.	directExternal	002	method of evaluating the quality of a dataset based on inspection of items within the dataset, where reference data external to the dataset being evaluated is required
4.	indirect	003	method of evaluating the quality of a dataset based on external knowledge

B.5.7 DS_AssociationTypeCode <<CodeList>>

	Name	Domain code	Definition
1.	DS_AssociationTypeCode	AscTypeCd	justification for the correlation of two datasets
2.	crossReference	001	reference from one dataset to another
3.	largerWorkCitation	002	reference to a master dataset of which this one is a part
4.	partOfSeamlessDatabase	003	part of same structured set of data held in a computer
5.	source	004	mapping and charting information from which the dataset content originates
6.	stereoMate	005	part of a set of imagery that when used together, provides three-dimensional images

B.5.8 DS_InitiativeTypeCode <<CodeList>>

	Name	Domain code	Definition
1.	DS_InitiativeTypeCode	InitTypCd	type of aggregation activity in which datasets are related
2.	campaign	001	series of organized planned actions
3.	collection	002	accumulation of datasets assembled for a specific purpose
4.	exercise	003	specific performance of a function or group of functions
5.	experiment	004	process designed to find if something is effective or valid
6.	investigation	005	search or systematic inquiry

	Name	Domain code	Definition
7.	mission	006	specific operation of a data collection system
8.	sensor	007	device or piece of equipment which detects or records
9.	operation	008	action that is part of a series of actions
10.	platform	009	vehicle or other support base that holds a sensor
11.	process	010	method of doing something involving a number of steps
12.	program	011	specific planned activity
13.	project	012	organized undertaking, research, or development
14.	study	013	examination or investigation
15.	task	014	piece of work
16.	trial	015	process of testing to discover or demonstrate something

B.5.9 MD_CellGeometryCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_CellGeometryCode	CellGeoCd	code indicating whether grid data is point or area
2.	point	001	each cell represents a point
3.	area	002	each cell represents an area

B.5.10 MD_CharacterSetCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_CharacterSetCode	CharSetCd	name of the character coding standard used for the resource
2.	ucs2	001	16-bit fixed size Universal Character Set, based on ISO/IEC 10646
3.	ucs4	002	32-bit fixed size Universal Character Set, based on ISO/IEC 10646
4.	utf7	003	7-bit variable size UCS Transfer Format, based on ISO/IEC 10646
5.	utf8	004	8-bit variable size UCS Transfer Format, based on ISO/IEC 10646
6.	utf16	005	16-bit variable size UCS Transfer Format, based on ISO/IEC 10646
7.	8859part1	006	ISO/IEC 8859-1, Information technology – 8-bit single-byte coded graphic character sets – Part 1: Latin alphabet No. 1
8.	8859part2	007	ISO/IEC 8859-2, Information technology – 8-bit single-byte coded graphic character sets – Part 2: Latin alphabet No. 2
9.	8859part3	008	ISO/IEC 8859-3, Information technology – 8-bit single-byte coded graphic character sets – Part 3: Latin alphabet No. 3
10.	8859part4	009	ISO/IEC 8859-4, Information technology – 8-bit single-byte coded graphic character sets – Part 4: Latin alphabet No. 4
11.	8859part5	010	ISO/IEC 8859-5, Information technology – 8-bit single-byte coded graphic character sets – Part 5: Latin/Cyrillic alphabet
12.	8859part6	011	ISO/IEC 8859-6, Information technology – 8-bit single-byte coded graphic character sets – Part 6: Latin/Arabic alphabet
13.	8859part7	012	ISO/IEC 8859-7, Information technology – 8-bit single-byte coded graphic character sets – Part 7: Latin/Greek alphabet
14.	8859part8	013	ISO/IEC 8859-8, Information technology – 8-bit single-byte coded graphic character sets – Part 8: Latin/Hebrew alphabet
15.	8859part9	014	ISO/IEC 8859-9, Information technology – 8-bit single-byte coded graphic character sets – Part 9: Latin alphabet No. 5

	Name	Domain code	Definition
16.	8859part10	015	ISO/IEC 8859-10, Information technology – 8-bit single-byte coded graphic character sets – Part 10: Latin alphabet No. 6
17.	8859part11	016	ISO/IEC 8859-11, Information technology – 8-bit single-byte coded graphic character sets – Part 11: Latin/Thai alphabet
18.	(reserved for future use)	017	a future ISO/IEC 8-bit single-byte coded graphic character set (e.g. possibly 8859 part 12)
19.	8859part13	018	ISO/IEC 8859-13, Information technology – 8-bit single-byte coded graphic character sets – Part 13: Latin alphabet No. 7
20.	8859part14	019	ISO/IEC 8859-14, Information technology – 8-bit single-byte coded graphic character sets – Part 14: Latin alphabet No. 8 (Celtic)
21.	8859part15	020	ISO/IEC 8859-15, Information technology – 8-bit single-byte coded graphic character sets – Part 15: Latin alphabet No. 9
22.	8859part16	021	ISO/IEC 8859-16, Information technology – 8-bit single-byte coded graphic character sets – Part 16: Latin alphabet No. 10
23.	jjs	022	japanese code set used for electronic transmission
24.	shiftJIS	023	japanese code set used on MS-DOS based machines
25.	eucJP	024	japanese code set used on UNIX based machines
26.	usAscii	025	united states ASCII code set (ISO 646 US)
27.	ebcdic	026	ibm mainframe code set
28.	euckR	027	korean code set
29.	big5	028	traditional Chinese code set used in Taiwan, Hong Kong of China and other areas
30.	GB2312	029	simplified Chinese code set

B.5.11 MD_ClassificationCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_ClassificationCode	ClasscatCd	name of the handling restrictions on the dataset
2.	unclassified	001	available for general disclosure
3.	restricted	002	not for general disclosure
4.	confidential	003	available for someone who can be entrusted with information
5.	secret	004	kept or meant to be kept private, unknown, or hidden from all but a select group of people
6.	topSecret	005	of the highest secrecy

B.5.12 MD_CoverageContentTypeCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_CoverageContentTypeCode	ContentTypCd	specific type of information represented in the cell
2.	image	001	meaningful numerical representation of a physical parameter that is not the actual value of the physical parameter
3.	thematicClassification	002	code value with no quantitative meaning, used to represent a physical quantity
4.	physicalMeasurement	003	value in physical units of the quantity being measured

B.5.13 MD_DatatypeCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_DatatypeCode	DatatypeCd	datatype of element or entity
2.	class	001	descriptor of a set of objects that share the same attributes, operations, methods, relationships, and behavior
3.	codelist	002	flexible enumeration useful for expressing a long list of values, can be extended
4.	enumeration	003	data type whose instances form a list of named literal values, not extendable
5.	codelistElement	004	permissible value for a codelist or enumeration
6.	abstractClass	005	class that cannot be directly instantiated
7.	aggregateClass	006	class that is composed of classes it is connected to by an aggregate relationship
8.	specifiedClass	007	subclass that may be substituted for its superclass
9.	datatypeClass	008	class with few or no operations whose primary purpose is to hold the abstract state of another class for transmittal, storage, encoding or persistent storage
10.	interfaceClass	009	named set of operations that characterize the behavior of an element
11.	unionClass	010	class describing a selection of one of the specified types
12.	metaClass	011	class whose instances are classes
13.	typeClass	012	class used for specification of a domain of instances (objects), together with the operations applicable to the objects. A type may have attributes and associations
14.	characterString	013	free text field
15.	integer	014	numerical field
16.	association	015	semantic relationship between two classes that involves connections among their instances

B.5.14 MD_DimensionNameTypeCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_DimensionNameType Code	DimNameTypCd	name of the dimension
2.	row	001	ordinate (y) axis
3.	column	002	abscissa (x) axis
4.	vertical	003	vertical (z) axis
5.	track	004	along the direction of motion of the scan point
6.	crossTrack	005	perpendicular to the direction of motion of the scan point
7.	line	006	scan line of a sensor
8.	sample	007	element along a scan line
9.	time	008	duration

B.5.15 MD_GeometricObjectTypeCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_GeometricObjectType Code	GeoObjTypCd	name of point or vector objects used to locate zero-, one-, two-, or three-dimensional spatial locations in the dataset
2.	complex	001	set of geometric primitives such that their boundaries can be represented as a union of other primitives

	Name	Domain code	Definition
3.	composite	002	connected set of curves, solids or surfaces
4.	curve	003	bounded, 1-dimensional geometric primitive, representing the continuous image of a line
5.	point	004	zero-dimensional geometric primitive, representing a position but not having an extent
6.	solid	005	bounded, connected 3-dimensional geometric primitive, representing the continuous image of a region of space
7.	surface	006	bounded, connected 2-dimensional geometric primitive, representing the continuous image of a region of a plane

B.5.16 MD_ImagingConditionCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_ImagingConditionCode	ImgCondCd	code which indicates conditions which may affect the image
2.	blurredImage	001	portion of the image is blurred
3.	cloud	002	portion of the image is partially obscured by cloud cover
4.	degradingObliquity	003	acute angle between the plane of the ecliptic (the plane of the Earth's orbit) and the plane of the celestial equator
5.	fog	004	portion of the image is partially obscured by fog
6.	heavySmokeOrDust	005	portion of the image is partially obscured by heavy smoke or dust
7.	night	006	image was taken at night
8.	rain	007	image was taken during rainfall
9.	semiDarkness	008	image was taken during semi-dark conditions—twilight conditions
10.	shadow	009	portion of the image is obscured by shadow
11.	snow	010	portion of the image is obscured by snow
12.	terrainMasking	011	the absence of collection data of a given point or area caused by the relative location of topographic features which obstruct the collection path between the collector(s) and the subject(s) of interest

B.5.17 MD_KeywordTypeCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_KeywordTypeCode	KeyTypCd	methods used to group similar keywords
2.	discipline	001	keyword identifies a branch of instruction or specialized learning
3.	place	002	keyword identifies a location
4.	stratum	003	keyword identifies the layer(s) of any deposited substance
5.	temporal	004	keyword identifies a time period related to the dataset
6.	theme	005	keyword identifies a particular subject or topic

B.5.18 MD_MaintenanceFrequencyCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_MaintenanceFrequencyCode	MaintFreqCd	frequency with which modifications and deletions are made to the data after it is first produced
2.	continual	001	data is repeatedly and frequently updated
3.	daily	002	data is updated each day
4.	weekly	003	data is updated on a weekly basis
5.	fortnightly	004	data is updated every two weeks
6.	monthly	005	data is updated each month
7.	quarterly	006	data is updated every three months
8.	biannually	007	data is updated twice each year
9.	annually	008	data is updated every year
10.	asNeeded	009	data is updated as deemed necessary
11.	irregular	010	data is updated in intervals that are uneven in duration
12.	notPlanned	011	there are no plans to update the data
13.	unknown	012	frequency of maintenance for the data is not known

B.5.19 MD_MediumFormatCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_MediumFormatCode	MedFormCd	method used to write to the medium
2.	cpio	001	CoPy In / Out (UNIX file format and command)
3.	tar	002	Tape ARchive
4.	highSierra	003	high sierra file system
5.	iso9660	004	information processing – volume and file structure of CD-ROM
6.	iso9660RockRidge	005	rock ridge interchange protocol (UNIX)
7.	iso9660AppleHFS	006	hierarchical file system (Macintosh)

B.5.20 MD_MediumNameCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_MediumNameCode	MedNameCd	name of the medium
2.	cdRom	001	read-only optical disk
3.	dvd	002	digital versatile disk
4.	dvdRom	003	digital versatile disk, read only
5.	3halfInchFloppy	004	3,5 inch magnetic disk
6.	5quarterInchFloppy	005	5,25 inch magnetic disk
7.	7trackTape	006	7 track magnetic tape
8.	9trackTape	007	9 track magnetic tape
9.	3480Cartridge	008	3480 cartridge tape drive
10.	3490Cartridge	009	3490 cartridge tape drive
11.	3580Cartridge	010	3580 cartridge tape drive

	Name	Domain code	Definition
12.	4mmCartridgeTape	011	4 millimetre magnetic tape
13.	8mmCartridgeTape	012	8 millimetre magnetic tape
14.	1quarterInchCartridgeTape	013	0,25 inch magnetic tape
15.	digitalLinearTape	014	half inch cartridge streaming tape drive
16.	onLine	015	direct computer linkage
17.	satellite	016	linkage through a satellite communication system
18.	telephoneLink	017	communication through a telephone network
19.	hardcopy	018	pamphlet or leaflet giving descriptive information

B.5.21 MD_ObligationCode <<Enumeration>>

	Name	Domain code	Definition
1.	MD_ObligationCode	ObCd	obligation of the element or entity
2.	mandatory	001	element is always required
3.	optional	002	element is not required
4.	conditional	003	element is required when a specific condition is met

B.5.22 MD_PixelOrientationCode <<Enumeration>>

	Name	Domain code	Definition
1.	MD_PixelOrientationCode	PixOrientCd	point in a pixel corresponding to the Earth location of the pixel
2.	center	001	point halfway between the lower left and the upper right of the pixel
3.	lowerLeft	002	the corner in the pixel closest to the origin of the SRS; if two are at the same distance from the origin, the one with the smallest x-value
4.	lowerRight	003	next corner counterclockwise from the lower left
5.	upperRight	004	next corner counterclockwise from the lower right
6.	upperLeft	005	next corner counterclockwise from the upper right

B.5.23 MD_ProgressCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_ProgressCode	ProgCd	status of the dataset or progress of a review
2.	completed	001	production of the data has been completed
3.	historicalArchive	002	data has been stored in an offline storage facility
4.	obsolete	003	data is no longer relevant
5.	onGoing	004	data is continually being updated
6.	planned	005	fixed date has been established upon or by which the data will be created or updated
7.	required	006	data needs to be generated or updated
8.	underDevelopment	007	data is currently in the process of being created

B.5.24 MD_RestrictionCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_RestrictionCode	RestrictCd	limitation(s) placed upon the access or use of the data
2.	copyright	001	exclusive right to the publication, production, or sale of the rights to a literary, dramatic, musical, or artistic work, or to the use of a commercial print or label, granted by law for a specified period of time to an author, composer, artist, distributor
3.	patent	002	government has granted exclusive right to make, sell, use or license an invention or discovery
4.	patentPending	003	produced or sold information awaiting a patent
5.	trademark	004	a name, symbol, or other device identifying a product, officially registered and legally restricted to the use of the owner or manufacturer
6.	license	005	formal permission to do something
7.	intellectualPropertyRights	006	rights to financial benefit from and control of distribution of non-tangible property that is a result of creativity
8.	restricted	007	withheld from general circulation or disclosure
9.	otherRestrictions	008	limitation not listed

B.5.25 MD_ScopeCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_ScopeCode	ScopeCd	class of information to which the referencing entity applies
2.	attribute	001	information applies to the attribute class
3.	attributeType	002	information applies to the characteristic of a feature
4.	collectionHardware	003	information applies to the collection hardware class
5.	collectionSession	004	information applies to the collection session
6.	dataset	005	information applies to the dataset
7.	series	006	information applies to the series
8.	nonGeographicDataset	007	information applies to non-geographic data
9.	dimensionGroup	008	information applies to a dimension group
10.	feature	009	information applies to a feature
11.	featureType	010	information applies to a feature type
12.	propertyType	011	information applies to a property type
13.	fieldSession	012	information applies to a field session
14.	software	013	information applies to a computer program or routine
15.	service	014	information applies to a capability which a service provider entity makes available to a service user entity through a set of interfaces that define a behaviour, such as a use case
16.	model	015	information applies to a copy or imitation of an existing or hypothetical object
17.	tile	016	information applies to a tile, a spatial subset of geographic data

B.5.26 MD_SpatialRepresentationTypeCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_SpatialRepresentationTypeCode	SpatRepTypCd	method used to represent geographic information in the dataset
2.	vector	001	vector data is used to represent geographic data
3.	grid	002	grid data is used to represent geographic data
4.	textTable	003	textual or tabular data is used to represent geographic data
5.	tin	004	triangulated irregular network
6.	stereoModel	005	three-dimensional view formed by the intersecting homologous rays of an overlapping pair of images
7.	video	006	scene from a video recording

B.5.27 MD_TopicCategoryCode << Enumeration>>

	Name	Domain code	Definition
1.	MD_TopicCategoryCode	TopicCatCd	high-level geographic data thematic classification to assist in the grouping and search of available geographic data sets. Can be used to group keywords as well. Listed examples are not exhaustive. NOTE It is understood there are overlaps between general categories and the user is encouraged to select the one most appropriate.
2.	farming	001	rearing of animals and/or cultivation of plants Examples: agriculture, irrigation, aquaculture, plantations, herding, pests and diseases affecting crops and livestock
3.	biota	002	flora and/or fauna in natural environment Examples: wildlife, vegetation, biological sciences, ecology, wilderness, sealife, wetlands, habitat
4.	boundaries	003	legal land descriptions Examples: political and administrative boundaries
5.	climatologyMeteorologyAtmosphere	004	processes and phenomena of the atmosphere Examples: cloud cover, weather, climate, atmospheric conditions, climate change, precipitation
6.	economy	005	economic activities, conditions and employment Examples: production, labour, revenue, commerce, industry, tourism and ecotourism, forestry, fisheries, commercial or subsistence hunting, exploration and exploitation of resources such as minerals, oil and gas
7.	elevation	006	height above or below sea level Examples: altitude, bathymetry, digital elevation models, slope, derived products
8.	environment	007	environmental resources, protection and conservation Examples: environmental pollution, waste storage and treatment, environmental impact assessment, monitoring environmental risk, nature reserves, landscape
9.	geoscientificInformation	008	information pertaining to earth sciences Examples: geophysical features and processes, geology, minerals, sciences dealing with the composition, structure and origin of the earth's rocks, risks of earthquakes, volcanic activity, landslides, gravity information, soils, permafrost, hydrogeology, erosion
10.	health	009	health, health services, human ecology, and safety Examples: disease and illness, factors affecting health, hygiene, substance abuse, mental and physical health, health services

	Name	Domain code	Definition
11.	imageryBaseMapsEarthCover	010	base maps Examples: land cover, topographic maps, imagery, unclassified images, annotations
12.	intelligenceMilitary	011	military bases, structures, activities Examples: barracks, training grounds, military transportation, information collection
13.	inlandWaters	012	inland water features, drainage systems and their characteristics Examples: rivers and glaciers, salt lakes, water utilization plans, dams, currents, floods, water quality, hydrographic charts
14.	location	013	positional information and services Examples: addresses, geodetic networks, control points, postal zones and services, place names
15.	oceans	014	features and characteristics of salt water bodies (excluding inland waters) Examples: tides, tidal waves, coastal information, reefs
16.	planningCadastre	015	information used for appropriate actions for future use of the land Examples: land use maps, zoning maps, cadastral surveys, land ownership
17.	society	016	characteristics of society and cultures Examples: settlements, anthropology, archaeology, education, traditional beliefs, manners and customs, demographic data, recreational areas and activities, social impact assessments, crime and justice, census information
18.	structure	017	man-made construction Examples: buildings, museums, churches, factories, housing, monuments, shops, towers
19.	transportation	018	means and aids for conveying persons and/or goods Examples: roads, airports/airstrips, shipping routes, tunnels, nautical charts, vehicle or vessel location, aeronautical charts, railways
20.	utilitiesCommunication	019	energy, water and waste systems and communications infrastructure and services Examples: hydroelectricity, geothermal, solar and nuclear sources of energy, water purification and distribution, sewage collection and disposal, electricity and gas distribution, data communication, telecommunication, radio, communication networks

B.5.28 MD_TopologyLevelCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_TopologyLevelCode	TopoLevCd	degree of complexity of the spatial relationships
2.	geometryOnly	001	geometry objects without any additional structure which describes topology
3.	topology1D	002	1-dimensional topological complex – commonly called “chain-node” topology
4.	planarGraph	003	1-dimensional topological complex that is planar. (A planar graph is a graph that can be drawn in a plane in such a way that no two edges intersect except at a vertex.)
5.	fullPlanarGraph	004	2-dimensional topological complex that is planar. (A 2-dimensional topological complex is commonly called “full topology” in a cartographic 2D environment.)
6.	surfaceGraph	005	1-dimensional topological complex that is isomorphic to a subset of a surface. (A geometric complex is isomorphic to a topological complex if their elements are in a one-to-one, dimensional-and boundary-preserving correspondence to one another.)
7.	fullSurfaceGraph	006	2-dimensional topological complex that is isomorphic to a subset of a surface
8.	topology3D	007	3-dimensional topological complex. (A topological complex is a collection of topological primitives that are closed under the boundary operations.)
9.	fullTopology3D	008	complete coverage of a 3D Euclidean coordinate space
10.	abstract	009	topological complex without any specified geometric realisation

Annex C (normative)

Metadata extensions and profiles

C.1 Background

Annexes A, B and Clause 6 of this International Standard provide standard metadata and an associated structure that will serve a wide variety of digital geographic data. The definitions and domain values are intended to be sufficiently generic to satisfy the metadata needs of various disciplines. However, the very diversity of data means that generic metadata may not accommodate all applications. This annex provides the rules for defining and applying additional metadata to better serve special user needs.

C.2 Types of extensions

The following types of extensions shall be allowed:

- 1) adding a new metadata section;
- 2) creating a new metadata codelist to replace the domain of an existing metadata element that has “free text” listed as its domain value;
- 3) creating new metadata codelist elements (expanding a codelist);
- 4) adding a new metadata element;
- 5) adding a new metadata entity;
- 6) imposing a more stringent obligation on an existing metadata element;
- 7) imposing a more restrictive domain on an existing metadata element.

C.3 Creating an extension

Prior to the creation of extended metadata a careful review of the existing metadata within this International Standard must be performed to confirm that suitable metadata does not already exist. For each extended metadata section, entity, and/or element, the name, short name, definition, obligation, condition, maximum occurrence, data type, and domain values shall be defined. Relationships as provided in Annex A shall be defined so a structure and schema can be determined.

C.4 Rules for creating an extension

- 1) Extended metadata elements shall not be used to change the name, definition or data type of an existing element.
- 2) Extended metadata may be defined as entities and may include extended and existing metadata elements as components.

- 3) An extension is permitted to impose more stringent obligation on existing metadata elements than the standard requires. (Metadata elements that are optional in the standard may be mandatory in an extension.)
- 4) An extension is permitted to contain metadata elements with domains that are more restrictive than the standard. (Metadata elements whose domains have free text in the standard may have a closed list of appropriate values in the profile.)
- 5) An extension is permitted to restrict the use of domain values allowed by the standard. (If the standard contains five values in the domain of an existing metadata element, the extension may specify that its domain consists of three domain values. The extension shall require that the user select a value from the three domain values.)
- 6) An extension is permitted to expand the number of values in a codelist.
- 7) An extension shall not permit anything not allowed by the standard.

C.5 Community profile

If the information to be added is extensive, involving the creation of many metadata elements within a metadata entity, specific to a discipline or application, co-ordination of the proposed extension via user groups and creation of a community profile is recommended.

This International Standard defines almost 300 metadata elements, with most of these being listed as "optional". They are explicitly defined in order to help users understand exactly what is being described. Individual communities, nations, or organizations may develop a "community profile" of this International Standard. They will make a select set of metadata elements mandatory. A given metadata element (e.g., the "price" of a dataset) may be established as "mandatory" for a certain community that will always want that metadata element reported. A community of users may want to establish additional metadata elements that are not in this International Standard. For example, a community may want to develop metadata elements for the status of datasets within their system to help manage production. However, these added elements will not be known outside the community unless they are published. A community profile should establish field sizes and domains for all metadata elements. If one system within a community uses thirty-two (32) characters for the title of a dataset and another system handles eight (8) characters, interoperability will not be achieved. Standardizing selected domains within a community is important to allow more efficient searches and better system control. See ISO 19106 for more information on community profiles.

Figure C.1 illustrates the relationship between the Core Metadata components, the comprehensive metadata application profile and national, regional, domain specific or organizational profiles.

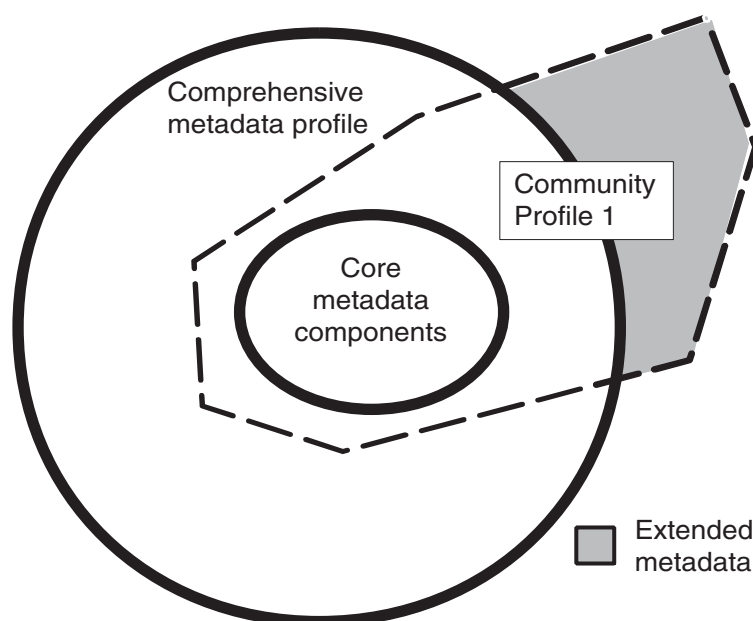


Figure C.1 — Metadata community profile

The inner circle contains the core metadata components. The comprehensive metadata includes the core metadata components. A community profile shall contain the core metadata components, but not necessarily all the other metadata components. Additionally it may contain metadata extensions (shaded area) which shall be defined following the metadata extension rules in this annex.

C.6 Rules for creating a profile

- 1) Before creating a profile, the user shall check registered profiles.
- 2) A profile must adhere to the rules for defining an extension.
- 3) A profile shall not change the name, definition, or data type of a metadata element.
- 4) A profile shall include:
 - the core metadata collected for a digital geographic dataset
 - all mandatory metadata elements in all mandatory sections
 - all conditional metadata elements in all mandatory sections, if the dataset meets the condition required by the metadata element
 - all mandatory metadata elements in all conditional sections, if the dataset meets the condition required by the section
 - all conditional metadata elements in all conditional sections, if the dataset meets the condition required by the metadata element and the section
- 5) Relationships, as provided in Annex A, shall be defined so that a structure and schema can be determined.
- 6) A profile shall be made available to anyone receiving metadata that was created according to that profile.

Annex D **(normative)**

Abstract test suite

D.1 Abstract test suite

This abstract test suite applies to the comprehensive profile and any profile derived from this International Standard. Metadata shall be provided as specified in Clause 6 and Annexes A and B. User-defined metadata shall be defined and provided as specified in Annex C. User-defined metadata shall satisfy the requirements as stated in D.3.

D.2 Metadata test suite

D.2.1 Test case identifier: Completeness test

- a) Test Purpose: to determine conformance by the inclusion of all metadata sections, metadata entities, and metadata elements that are specified with an obligation of “mandatory” or mandatory under the conditions specified.

NOTE Many elements designated as mandatory are contained within optional entities. These elements become mandatory only when their containing entity is used.

- b) Test Method: a comparison between this International Standard and a subject metadata set to be tested shall be performed to determine if all metadata defined as mandatory in annex B are present. A comparison test shall also be performed to determine if all metadata elements defined as conditional in Annex B are present if the conditions set out in this International Standard apply.
- c) Reference: Annex B.
- d) Test Type: Basic.

The following test cases apply at all levels of obligation – mandatory, conditional, and optional.

D.2.2 Test case identifier: Maximum occurrence test

- a) Test Purpose: to ensure each metadata element occurs no more than the number of times specified in this International Standard.
- b) Test Method: examine a subject metadata set for the number of occurrences of each metadata section, metadata entity, and metadata element provided. The number of occurrences for each shall be compared with its “Maximum Occurrences” attribute specified in Annex B.
- c) Reference: Annex B.
- d) Test Type: Basic.

D.2.3 Test case identifier: Short name test

- a) Test Purpose: to determine if short names used in a subject metadata set fall within the domain specified within this International Standard.

- b) Test Method: the short name for each metadata element in a subject metadata set is examined to determine if it is defined in this International Standard.
- c) Reference: Annex B.
- d) Test Type: Basic.

D.2.4 Test case identifier: Data type test

- a) Test Purpose: to determine if each metadata element within a subject metadata set uses the specified data type.
- b) Test Method: the value of each provided metadata element is tested to ensure its data type adheres to the data type specified.
- c) Reference: Annex B.
- d) Test Type: Basic.

D.2.5 Test case identifier: Domain test

- a) Test Purpose: to determine if each provided metadata element within a subject metadata set falls within the specified domain.
- b) Test Method: the values of each metadata element are tested to ensure they fall within the specified domain.
- c) Reference: Annex B.
- d) Test Type: Basic.

D.2.6 Test case identifier: Schema test

- a) Test Purpose: to determine if a subject metadata set follows the schema specified in this International Standard.
- b) Test Method: test each metadata element and ensure it is contained within the specified metadata entity.
- c) Reference: Annex B.
- d) Test Type: Basic.

D.3 User-defined extension metadata test suite

D.3.1 Test case identifier: Exclusiveness test

- a) Test Purpose: to verify that each user-defined metadata section, metadata entity, and metadata element is unique and not already defined in this International Standard.
- b) Test Method: each user-defined metadata entity and metadata element is tested to ensure it is unique and not previously used.
- c) Reference: Annex B.
- d) Test Type: Basic.

D.3.2 Test case identifier: Definition test

- a) Test Purpose: to verify that user-defined metadata entities and metadata elements have been defined as specified in this International Standard.
- b) Test Method: each user-defined metadata entity and metadata element is tested to ensure that all attributes have been defined.
- c) Reference: Annex B.
- d) Test Type: Basic.

D.3.3 Test case identifier: Standard metadata test

- a) Test Purpose: to verify that user-defined metadata within a subject metadata set fulfils the same requirements as ISO 19115 standard metadata.
- b) Test Method: all user-defined metadata in a subject metadata set is tested in accordance with D.2 of this International Standard.
- c) Reference: 2.3.
- d) Test Type: Basic.

D.4 Metadata profiles

D.4.1 Test case identifier: Metadata profiles

- a) Test Purpose: to verify that a profile follows the rules specified in this International Standard.
- b) Test Method: apply tests defined in Clauses D.2 and D.3 of this International Standard.
- c) Reference: 2.2.
- d) Test Type: Basic.

Annex E (normative)

Comprehensive dataset metadata application profile

E.1 Comprehensive dataset metadata application schema

The ISO 19100 series of geographic information standards define, in the abstract, the classes of information needed to: 1) model geographic phenomena; and 2) manipulate, manage and understand these models. In order to implement these standards, profiles must be developed. Typically, an information community with special requirements will develop profiles that use the appropriate parts provided by this series of standards. This comprehensive dataset metadata profile is a basic profile. It provides an international standardized profile applicable to a wide range of information communities. Use of this profile will promote interoperability between information communities. The comprehensive dataset metadata profile is a subset of packages, classes, attributes and relationships defined in Annexes A and B. Only the classes, attributes and relationships necessary to fulfill the requirements for general-purpose dataset metadata are present.

The following are changes that were made to create the profile:

- Removed MD_ServiceIdentification class from the Identification information package
- Replaced simple conceptual types (Binary, Boolean, CharacterString, Date, DateTime, GenericName, Integer, and RecordType) with ISO/TS 19103-equivalent types
- Replaced simple conceptual type, CharacterString, with the newly-defined XML type, nonNullString (based on the ISO/TS 19103 CharacterString type), in cases where the attribute is not optional
- Replaced simple conceptual type Real with newly-defined types (decimalLatitude, decimalLongitude, nonNegativeDecimal, and positiveDecimal), which are based on ISO/TS 19103 type, Decimal, in contextually appropriate cases, otherwise with the ISO/TS 19103 type, Decimal
- Replaced simple conceptual type TM_PeriodDuration with the XSD-equivalent type, duration
- Replaced complex conceptual types MemberName and Record with ISO/TS 19103-equivalent types
- Replaced complex conceptual types GF_AttributeType and GF_FeatureType with ISO 19109-equivalent types
- Replaced complex conceptual types (Angle, Distance, GM_Object, GM_Point, Measure, TM_Primitive and UomLength) with newly-defined XML-equivalent types
- Removed the Metadata application package (which contained classes of geographic information to which metadata applies – eg. DS_Aggregate, DS_Dataset, DS_Initiative, DS_OtherAggregate)
- Removed the aggregate relationship between MD_Distribution and MD_Format
- Constrained the implementation of the EX_BoundingPolygon's polygon attribute to be a Box (upper and lower corner Points) or Polygon (outer and inner bounding Rings)
- Changed all non-conforming class associations (e.g. two-way association, one-way ByReference or Unspecified aggregation) to be one-way ByValue aggregation relationships

E.2 Comprehensive dataset metadata profile – UML model

The comprehensive dataset metadata profile is presented in a UML metadata application schema, Figure E.1. The attributes within each class and codelist have not been displayed in the model in order to simplify the diagram. Note that the diagram does not reference the relevant application schemas for the conceptual model since all conceptual types from these schemas have been replaced with other XML equivalent types. The models of these XML equivalent types are also not displayed in order to simplify the diagram.

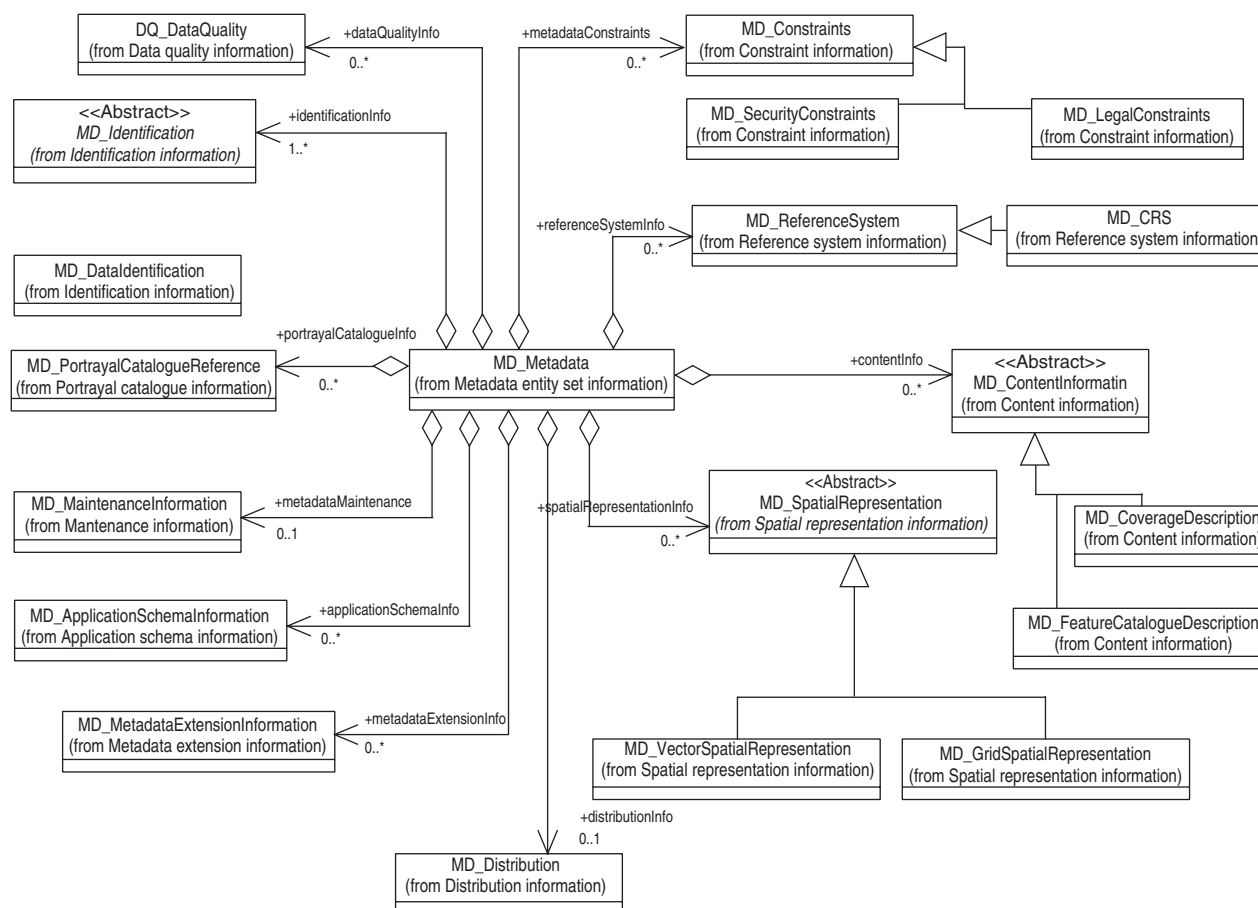


Figure E.1 — Comprehensive dataset metadata profile

Annex F (informative)

Metadata extension methodology

F.1 Metadata extensions methodology

The following nine-stage methodology should be followed in order to define additional metadata.

F.2 Review of existing metadata elements (Stage 1)

Stage 1 of the methodology is intended to ensure that only valid extensions are made to the standard set defined by ISO 19115. A full review of the standard set of metadata described in Annex B and any formally documented/published profiles should be conducted. This review should not only cover the metadata entity/element name, but also the definition, data type, obligation, domain, and the maximum number of occurrences. It is possible that a new entity/element is not required as an existing entity/element meets the requirements.

If a suitable entity/element can be identified, then the relationships of this entity/element should be reviewed with those in Annex A to ensure that the candidate entity/element is not precluded by excluded combinations with other entities/elements.

METHOD:

EITHER

- I) An existing metadata element or entity is identified as meeting the requirement. ACTION - Utilize the existing metadata entity/element, no metadata extensions are required.
- II) A new section of metadata entities is needed to meet the new requirement. ACTION - Go to Stage 2.
- III) An existing metadata element is identified whose domain could logically be restricted to meet the identified requirement by taking the action of limiting the existing "free text" domain. ACTION – Go to Stage 3.
- IV) An existing metadata element is identified whose domain could logically be expanded to meet the identified requirement by taking the action of adding values to the existing codelist. ACTION – Go to Stage 4.
- V) A new metadata element is needed to meet the requirement. Check that no existing metadata element could be modified to meet the requirement. ACTION - Go to Stage 5.
- VI) A new metadata entity is needed to meet the requirement. A metadata entity is a group of related elements, that in conjunction, meet the needs of the new requirement. Check that no existing metadata entity could be modified to meet the requirements by the addition of metadata elements. ACTION - Go to Stage 6.
- VII) An existing metadata element or entity or section meets the requirement, but the profile requires that a more stringent obligation is applied than that defined in this International Standard. The metadata obligations defined in the ISO 19115 cannot be relaxed in a profile. ACTION - Go to Stage 7.

VIII) An existing metadata element meets the requirements, but the domain required by the profile is a subset of the ISO 19115 domain. ACTION - Go to Stage 8.

F.3 Definition of a new metadata section (Stage 2)

A new metadata section is to be defined, but no existing metadata section from ISO 19115 is suitable, nor can any existing section be expanded to meet the requirement. In this case, a new metadata section may be defined.

The new metadata section should be defined in a style consistent with that of ISO 19115 (which is based on ISO/IEC 11179-3).

METHOD:

- I) Go to Stage 5 to define the new metadata elements required to populate the section.
- II) Go to Stage 6 to define the new metadata entities required to populate the section.
- III) Go to Stage 9.

F.4 Definition of a new metadata codelist (Stage 3)

An existing metadata element is suitable, given that the “free text” domain of the identified element is restricted. No existing metadata codelist can be identified within the metadata standard that meets the requirements. In this circumstance a new metadata codelist may be defined to meet the specific requirements of the profile.

The new metadata codelist should be defined in a style consistent with that of ISO 19115 (which is based on ISO/IEC 11179-3).

METHOD:

- I) Define the new metadata codelist in terms of Definition (B.1.4), Name (B.1.2), and Short Name (B.1.3). The definition of the new codelist should be done so as to be consistent with the existing codelists which can be found in Clause B.5.
- II) Define the new metadata codelist elements in terms of Definition (B.1.4) and Domain code and Short Name (B.1.3). This definition should also be done so as to be consistent with the existing codelist elements found in Clause B.5.
- III) Got to Stage 9.

F.5 Definition of a new metadata codelist element (Stage 4)

An existing metadata element is suitable, given that the metadata codelist of the identified element is expanded. The new metadata codelist elements should be defined with reference to the existing set of elements. The expanded metadata codelist must be a logical expansion of the standard set of values.

If the proposed new metadata domain element does not logically build upon the original domain then it may be that the identified element is not suitable for expansion, and the developer should return to Stage 1.

To document the new metadata codelist element go to Stage 9.

F.6 Definition of a new metadata element (Stage 5)

No existing metadata element can be identified within the metadata standard that meets the requirements. In this circumstance a new metadata element may be defined to meet the specific requirements of the profile.

The new metadata element should be defined in a style consistent with that of ISO 19115 (which is based on ISO/IEC 11179-3).

METHOD:

- I) Using the metadata schema described in Annex A and the data dictionary given in Annex B and any existing extensions to the metadata standard, identify the existing metadata entity to which the new element should be added. If no suitable grouping can be found then go to Stage 6.
- II) Define the new metadata element in terms of the extended element information as described in B.2.11.2: name, shortName, domainCode, definition, obligation, condition, dataType, domainValue, maximumOccurrence, parentEntity, rule, rationale and source. Identify any excluded metadata relationships with the newly defined element. See Annex A for the metadata UML model.
- III) Utilize the new metadata element to meet the requirement.
- IV) Go to Stage 9.

F.7 Definition of a new metadata entity (Stage 6)

No existing metadata element or entity can be identified within the metadata standard that meets the requirements, nor can an existing metadata entity be modified by the addition of simple metadata elements to meet the requirements. In this circumstance a new metadata entity may be defined to meet the specific requirements of the profile.

The new metadata entity should be defined in a style consistent with that of ISO 19115 (which is based on ISO/IEC 11179-3).

METHOD:

- I) Using the schema described in Annex A and the data dictionary given in Annex B and any existing extensions to the metadata standard, identify which grouping of metadata best describe the function of the new Metadata entity. Choose from:

6.3.2.1	Metadata entity set
6.3.2.2	Identification
6.3.2.3	Constraints
6.3.2.4	Data quality
6.3.2.5	Maintenance
6.3.2.6	Spatial representation
6.3.2.7	Reference system
6.3.2.8	Content

- 6.3.2.9 Portrayal catalogue
- 6.3.2.10 Distribution
- 6.3.2.11 Metadata extension
- 6.3.2.12 Application schema
- 6.4.1 Extent
- 6.4.2 Citation and responsible party

If no suitable grouping can be found then go to Stage 2.

- II) Define the new metadata entity in terms of the extended element information as described in B.2.11.2: name, shortName, domainCode, definition, obligation, condition, dataType, domainValue, maximumOccurrence, parentEntity, rule, rationale and source. Data type is 'Class' for a metadata entity.
- III) Identify the elements that form the metadata entity, by following the steps outlined in Stage 5.
- IV) Identify any excluded metadata relationships with the newly defined entity. See Annex A for the UML metadata schema models.
- V) Utilize the new metadata entity to meet the requirement.
- VI) Go to Stage 9.

F.8 Definition of a more stringent metadata obligation (Stage 7)

An existing metadata element, entity or section meets the requirement, but the profile requires that the obligation category is more stringent than that defined in the ISO standard. (Where optional (O) is the least and mandatory (M) the most stringent obligation category).

METHOD:

- I) Identify the new Obligation/Condition (B.1.5) value to be applied to the element, entity or section. If the chosen obligation is conditional, then the conditions under which the metadata is to be applied should be identified. The rules for creating conditions can be found in B.1.5.3.
- II) Go to Stage 9.

F.9 Definition of more restrictive metadata codelist (Stage 8)

An existing metadata codelist meets the requirement, but the profile requires that the elements defined for the codelist be a restricted subset of the standard domain defined in the ISO standard.

METHOD:

- I) Identify the restricted elements needed to meet the new requirement.
- II) Go to Stage 9.

F.10 Documentation of metadata extensions (Stage 9)

Once new metadata entities/elements have been defined, it is essential that the changes from the base standard be recorded clearly. The modifications must be recorded in the profile document, in a standard format, which is derived from the ISO 19115 document itself and issued as a document along with the dataset and the metadata.

Metadata issued according to the profile must also record the changes to the standard metadata set by completing the metadata extension fields defined in ISO 19115 (B.2.11.2).

Seven possible types of extensions may be documented:

- Definition of a new metadata section.
- Definition of new metadata codelist to replace a “free text” domain.
- Definition of additional metadata codelist elements.
- Definition of a new metadata element.
- Definition of new metadata entity.
- Definition of a restricted metadata domain.
- Definition of more stringent metadata obligation.

METHOD:

- I) Update the metadata extension information field in the metadata for the product. This field should describe the extensions made to the metadata, including a definition of new elements.

- II) IF a new metadata section is defined:

Create a UML schema for the new metadata section based on those from Annex A.

- III) IF new metadata entities defined:

In accordance with ISO/IEC 11179 and using B.2.11.2 as a template, record the new metadata entity description in terms of name, shortName, domainCode, definition, obligation, condition, dataType, domainValue, maximumOccurrence, parentEntity, rule, rationale and source.

Update the appropriate UML schemas in Annex A with the new extension information.

- IV) IF new metadata elements defined:

In accordance with ISO/IEC 11179 and using B.2.11.2 as a template, record the new metadata elements description in terms of name, shortName, definition, obligation, condition, dataType, domainValue, maximumOccurrence, parentEntity, rule, rationale and source.

Update the appropriate UML schemas in Annex A with the new extension information.

- V) IF an existing metadata codelist expanded:

In accordance with ISO/IEC 11179 and using B.2.11.2 and B.5 identify the metadata code list and record the new domain elements as described in B.2.11.2.

VI) IF new metadata codelist created:

In accordance with ISO/IEC 11179 and using B.2.11.2 and B.5 as a template, record the new metadata codelist in terms of name, shortName, definition and dataType. Record any new metadata codelist elements as described in B.2.11.2.

VII) IF an existing metadata element domain restricted:

In accordance with ISO/IEC 11179 and using Clause B.1 identify the metadata element and record the modified domain set in terms of dataType and domainValue.

VIII) IF an existing metadata element or entity obligation made more stringent.

In accordance with ISO/IEC 11179 and using Annex B identify the metadata entity/element and record the modified obligation characteristics in terms of Obligation/Condition (B.1.5).

Update the appropriate UML schemas in Annex A with the new extension information.

Annex G (informative)

Metadata implementation

G.1 Background

G.1.1 Problem statement

The body of this International Standard defines the content of a set of metadata elements, their definitions, data types, and inherent dependencies. The logical model of the metadata specifies the content and not the form of implementation or the form of presentation. A primary goal in the management of metadata for geographic data is the ability to access the metadata and the related spatial data it describes. This requires software implementations using common encoding methods to achieve operational use of the metadata for geographic data.

Implementation methods are required to provide for the exchange of metadata between data management systems, the presentation of the metadata element tags in a variety of forms and languages, and to ensure means to assess the conformance of metadata produced and made available.

G.1.2 Scope and objectives

This annex provides an overview of methods for the encoding of metadata element structure and content for the purposes of search and retrieval, metadata exchange, and presentation. The intent of this International Standard is to permit flexibility in the local management of the metadata while standardizing the understanding of metadata for geographic data. The intent of this implementation annex is to provide guidance on the creation of a metadata for geographic data service (Clearinghouse) on a local or wide-area network.

G.1.3 Granularity of spatial data supported

The notion of cataloguing a set of related documents together in a discoverable series is common in map catalogues. With digital spatial data, the definition of what constitutes a “dataset” is more problematic and reflects the institutional and software environments of the originating organization. Common metadata can be derived for a series of related spatial datasets, and such metadata is generally relevant or can be inherited by each of the dataset instances. Software to support this inheritance of metadata for geographic data within a cataloguing system can simplify data entry, update and reporting.

There is a potential hierarchy of re-usable metadata that can be employed in implementing a metadata collection. By creating several levels of abstraction, a linked hierarchy can assist in filtering or targeting user queries to the requested level of detail. The hierarchy should not necessarily be interpreted to require multiple copies of metadata being managed on-line. Conversely, the definition of general metadata can be supplemented by spatially specific metadata that, when queried, either inherits or overrides the general case. Through use of pointers this method can reduce the redundancy of metadata managed at a site and provide for different views of the holdings by users.

This hierarchy of metadata can be graphically represented as shown in Figure G.1.

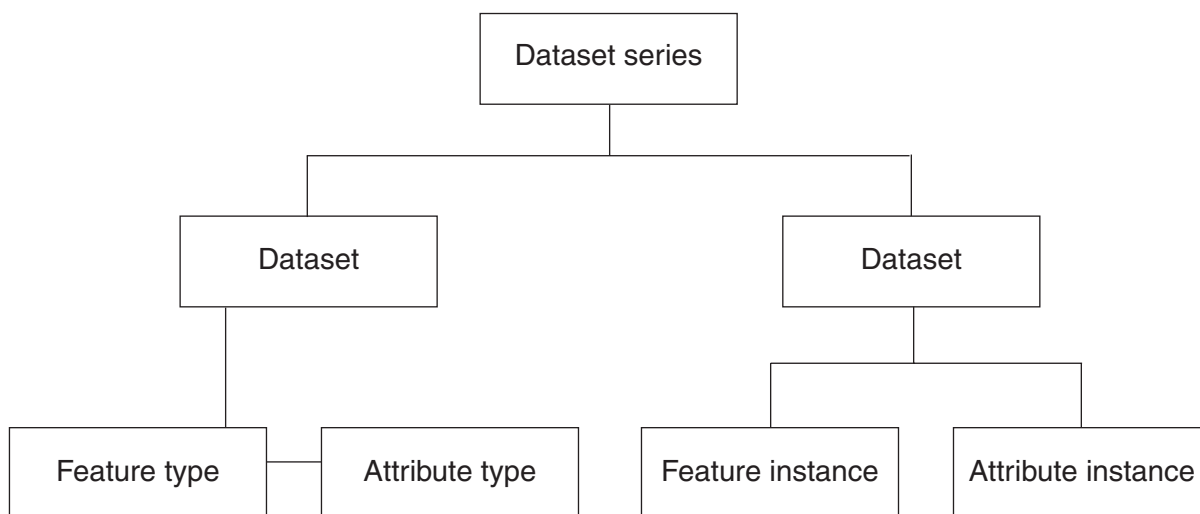


Figure G.1 — Metadata hierarchy

G.2 Metadata hierarchy levels

G.2.1 Dataset series metadata (optional)

A dataset series is a collection of spatial data that shares similar characteristics of theme, source date, resolution, and methodology. The exact definition of what constitutes a series entry will be determined by the data provider. Examples of dataset series metadata entries may include:

- A flight line of digital aerial photographs collected during a single flight with one camera and film type. A continuous scan swathe collected from a satellite using the same sensors on a single orbital pass.
- A collection of raster map data captured from a common series of paper maps.
- A collection of vector datasets depicting surface hydrography with associated attribution for multiple administrative areas within a country.

The creation of a “dataset series” metadata level is an optional feature that allows users to consult higher-level characteristics for data search. The definition of this type of metadata may be adequate for the initial characterization of available spatial data, but may not be adequate for detailed assessment of data quality of specific datasets.

G.2.2 Dataset metadata

For the purposes of this International Standard, a dataset should be a consistent spatial data product instance that can be generated or made available by a spatial data distributor. A dataset may be a member of a data series, as defined in the previous subclause. A dataset may be composed of a set of identified feature types and instances, and attribute types and instances as described in the following four subclauses.

On a demand basis, metadata from series and dataset information will be merged to present the user with a view of the metadata at the dataset level of abstraction. Metadata for which no hierarchy is listed are interpreted to be “dataset” metadata, by default.

G.2.3 Feature type metadata (optional)

Constructs known as features are grouped with common characteristics. Spatial data services may elect to support feature type-level metadata where it is available and make such metadata available for query or retrieval. Feature Type -level metadata, together with feature instance-, attribute type- and attribute instance-level metadata, will be grouped into datasets, as defined in the previous subclause. Examples of feature type metadata entries may include:

- All bridges within a dataset.

G.2.4 Feature instance metadata (optional)

Feature instances are spatial constructs (features) that have a direct correspondence with a real world object. Spatial data services may elect to support feature instance-level metadata where it is available and make such metadata available for query or retrieval. Feature Instance-level metadata, together with feature type-, attribute type- and attribute instance-level metadata, will be grouped into datasets, as defined in G.2.2. Examples of feature instance metadata entries may include:

- The Sydney harbour bridge.
- The Golden Gate bridge, in San Francisco.

G.2.5 Attribute type metadata (optional)

Attribute types are the digital parameters that describe a common aspect of grouped spatial primitives (0-, 1-, 2-, and 3-dimensional geometric objects). Spatial data services may elect to support attribute type-level metadata where it is available and make such metadata available for query or retrieval. Attribute type-level metadata, together with feature type-, feature instance-, and attribute instance-level metadata, will be grouped into datasets, as defined in G.2.2. Examples of attribute type metadata entries may include:

- Overhead clearance associated with a bridge.

G.2.6 Attribute instance metadata (optional)

Attribute instances are the digital parameters that describe an aspect of a feature instance. Spatial data services may elect to support attribute instance-level metadata where it is available and make such metadata available for query or retrieval. Attribute instance-level metadata, together with feature type-, feature instance-, and attribute type-level metadata, will be grouped into datasets, as defined in G.2.2. Examples of attribute instance metadata entries may include:

- The overhead clearance associated with a specific bridge across a road.

Annex H (informative)

Hierarchical levels of metadata

H.1 Levels of metadata

At first sight, it can appear that there are many levels of metadata to be maintained. In the majority of cases, this is not so, as only metadata exceptions are defined at lower levels. If the metadata values are not changed, then the metadata is aggregated at a high level. It is anticipated that this situation would be the most common, with additional levels of metadata only being defined as the original data is maintained over a period of time.

When the lower levels of the metadata hierarchy are populated, only the revised metadata values are recorded. So, if the distributor of the data remains the same, this need not be carried down the structure.

In order to clarify this concept, the following example follows the life cycle of an example set of geographic data.

H.2 Example

- 1) Consider a geographic data provider generating vector mapping data for three Administrative areas (A, B and C). Initially the vector mapping was generated using a common series of paper maps, which were processed in the same way into a vector format. The bulk of the metadata for this initial data could be carried at a single level, (Dataset series). This metadata would describe the quality, citation, source, processing, of the data for the three administrative areas.

So, the metadata could be carried exclusively at Dataset Series level.

Dataset series – Administrative areas A, B & C

Metadata entity set

Identification

Citation and responsible party

Extent

Constraints

Data quality

Maintenance

Spatial representation

Reference system

Content

Portrayal catalogue

Distribution

Metadata extension

Application schema

- 2) After some time alternate vector mapping of Administrative area A becomes available. The metadata would then be extended for Administrative area A, to describe the new quality data values. These values would supersede those given for the Dataset series, but only for Administrative area A. The metadata for B and C would remain unchanged. This new metadata would be recorded at Dataset level.

So, additional metadata is required at Dataset level to describe the new Administrative area A data. The minimum level of metadata required to reflect this change would be:

Dataset series – Administrative areas A, B & C

Metadata entity set

Identification

Citation and responsible party

Extent

Constraints

Data quality

Maintenance

Spatial representation

Reference system

Content

Portrayal catalogue

Distribution

Metadata extension

Application schema

Dataset - Administrative area A

Dataset Identification

Citation and Responsible Party

Extent

- 3) Eventually further data becomes available for Administrative area A, with a complete re-survey of the road network. Again this implies new metadata for the affected feature types. This metadata would be carried at Feature type level for Administrative area A. All other metadata relating to other feature types remains unaffected. Only the metadata for roads in Administrative area A is modified. This road metadata is recorded at Feature type level.

So, additional metadata is required at Feature type level to describe the new Administrative area A road data. The minimum level of metadata required to reflect this change would be:

Dataset series – Administrative areas A, B & C

Metadata entity set

Identification

Citation and responsible party

Extent

Constraints

Data quality

Maintenance

Spatial representation

Reference system

Content

Portrayal catalogue

Distribution

Metadata extension

Application schema

Dataset – Administrative area A

Dataset Identification

Citation and Responsible Party

Extent

Feature type - Administrative area A - Road network

Dataset Identification

Citation and Responsible Party

- 4) An anomaly in the road survey is identified, in that all Overhead clearances for the Administrative area A have been surveyed to the nearest metre. These are re-surveyed to the nearest decimetre. This re-survey implies new metadata for the affected attribute type 'Overhead Clearance'. All other

metadata for Administrative area A remains unaffected. This 'Overhead Clearance' metadata is recorded at Attribute Type level.

So, additional metadata is required at Attribute type level to describe the new Administrative area A 'Overhead Clearance' data. The minimum level of metadata required reflecting this change would be:

Dataset series – Administrative areas A, B & C

Metadata entity set

Identification

Citation and responsible party

Extent

Constraints

Data quality

Maintenance

Spatial representation

Reference system

Content

Portrayal catalogue

Distribution

Metadata extension

Application schema

Dataset - Administrative area A

Dataset Identification

Citation and Responsible Party

Extent

Feature type - Administrative area A - Road network

Dataset Identification

Citation and Responsible Party

Attribute type - Administrative area A - 'Overhead Clearance'

Dataset Identification

Citation and Responsible Party

Data quality

- 5) A new bridge is constructed in Administrative area A. This new data is reflected in the geographic data for Administrative area A, and new metadata is required to record this new feature. All other metadata for Administrative area A remains unaffected. This new feature metadata is recorded at Feature instance level.

So, additional metadata is required at Feature instance level to describe the new Bridge. The minimum level of metadata required reflecting this change would be:

Dataset series – Administrative areas A, B & C

Metadata entity set

Identification

Citation and responsible party

Extent

Constraints

Data quality

Maintenance

Spatial representation

Reference system

Content

Portrayal catalogue

Distribution

Metadata extension

Application schema

Dataset - Administrative area A
 Dataset Identification
 Citation and Responsible Party
 Extent
 Feature type - Administrative area A - Road network
 Dataset Identification
 Citation and Responsible Party
 Attribute type - Administrative area A - 'Overhead Clearance'
 Dataset Identification
 Citation and Responsible Party
 Data Quality
 Feature instance - Administrative area A - New bridge
 Dataset Identification
 Citation and Responsible Party
 Extent

- 6) The overhead clearance attribute of the new bridge was wrongly recorded, and is modified. Again this new attribute requires new metadata to describe the modification. All other metadata for Administrative area A remains unaffected. This new attribute metadata is recorded at Attribute instance level.

So, additional metadata is required at Attribute Instance level to describe the new Overhead Clearance. The minimum level of metadata required reflecting this change would be:

Dataset series – Administrative areas A, B & C

Metadata entity set
 Identification
 Citation and responsible party
 Extent
 Constraints
 Data quality
 Maintenance
 Spatial representation
 Reference system
 Content
 Portrayal catalogue
 Distribution
 Metadata extension
 Application schema

Dataset - Administrative area A
 Dataset Identification
 Citation and Responsible Party
 Extent
 Feature type - Administrative area A - Road network
 Dataset Identification
 Citation and Responsible Party
 Attribute type - Administrative area A - 'Overhead Clearance'
 Dataset Identification
 Citation and Responsible Party
 Data Quality
 Feature instance - Administrative area A - New bridge
 Dataset Identification
 Citation and Responsible Party
 Extent
 Attribute instance - Administrative area A - New bridge - Overhead clearance
 Dataset Identification
 Citation and Responsible Party
 Data Quality

Annex I (informative)

Implementation examples

I.1 Metadata examples

Two examples are provided. One example is for a dataset titled "Exploration Licences for Minerals". The other example illustrates an extension of the metadata standard.

Examples are presented in English. However, countries and users are allowed to use their own natural language(s) in the implementation of this International Standard.

I.2 Example 1 – Exploration Licences for Minerals

The example below is provided in a tabbed-outline format with element values underlined and role names denoted with a "+". This example illustrates the hierarchical structure of ISO 19115 metadata and is based on an implementation schema that governs the ordering of the elements within the metadata instance document.

MD_Metadata

+identificationInfo

MD_DataIdentification

citation:

. CI_Citation

. title: Exploration Licences for Minerals

. date:

. CI_Date

. dateType: 001

. date: 193001

abstract: 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 must be made under separate mineral production leases.

status: 004

pointOfContact:

. CI_ResponsibleParty

.. contactInfo:

.. CI_Contact

.. phone:

.. CI_Telephone

.. voice: 61 8 8463 3306

.. facsimile: 61 8 8463 3268

.. address:

.. CI_Address

.. deliveryPoint: GPO Box 167

.. city: Adelaide

.. administrativeArea: South Australia

.. postalCode: 5001

.. country: Australia

.. electronicMailAddress: pirsa.spatial@saugov.sa.gov.au

.. onlineResource:

```

..      .... CI_OnlineResource
..      .... linkage: http://www.pir.sa.gov.au
.. role: 007
.. organisationName: Department of Primary Industries and Resources SA
.. positionName: GIS Coordinator
+resourceConstraints
.. MD_Constraints
.. useLimitation: The data should not be used at a scale larger than 1:50 000.
+resourceFormat
.. MD_Format
.. name: ArcInfo Export
.. version: 8.0.2
+resourceFormat
.. MD_Format
.. name: MapInfo
.. version: 6.0
+resourceFormat
.. MD_Format
.. name: DXF
.. version: 14
+resourceFormat
.. MD_Format
.. name: Plotted Maps
.. version: Not applicable
+resourceSpecificUsage
.. MD_Usage
.. specificUsage: Used to supply government, industry and the general public with an up-to-date status
and extent of mineral exploration activities throughout the State.
.. userContactInfo:
..   CI_ResponsibleParty
..   role: 007
..   positionName: GIS Coordinator
+resourceMaintenance
.. MD_MaintenanceInformation
.. maintenanceAndUpdateFrequency: 002
+descriptiveKeywords
.. MD_Keywords
.. keyword: BOUNDARIES Administrative
.. keyword: INDUSTRY Mining Exploration
.. keyword: MINERALS Exploration
.. thesaurusName:
..   CI_Citation
..   title: ANZLIC Search Words
..   date:
..     .... CI_Date
..     .... dateType: 002
..     .... date: 199607
purpose: The dataset was developed to record information necessary for the administration of the
Mining Act.
spatialRepresentationType: 001
spatialResolution:
.. MD_Resolution
.. equivalentScale:
..   MD_RepresentativeFraction
..   denominator: 50000
characterSet: 001
topicCategory: 003
topicCategory: 008
extent:
.. EX_Extent

```

```

..... +geographicElement
..... EX_GeographicBoundingBox
..     .... westBoundLongitude: 129.0
..     .... eastBoundLongitude: 141.0
..     .... southBoundLatitude: -26.0
..     .... northBoundLatitude: -38.5
..... description: South Australia
language: en
+dataQualityInformation
  DQ_DataQuality
  scope:
  . DQ_Scope
  . level: dataset
+lineage
. LI_Lineage
. statement: Source Data History: Exploration Licence boundaries were sourced from the official Mining Register licence documents. Licence boundaries are legally defined to follow lines of latitude and longitude. The register has existed since 1930. Processing Steps: Coordinates entered by keyboard from licence documents. Linework cleaned to remove duplicate arcs. Data adjusted for accurate state border and coastline. Where appropriate, cadastral parcels removed from licence polygons. Associated attribute data also captured from licence documents.
+report
. DQ_CompletenessOmission
. result:
.   DQ_QuantitativeResult
.   valueUnit
.   .... uomName: percent
.   value: Spatial data is 100% complete. Associated attribute data is 100% complete.
. DQ_TopologicalConsistency
. result:
.   DQ_QuantitativeResult
.   valueUnit
.   .... uomName: percent
.   value: The dataset contains no overshoots, undershoots or duplicate lines. All polygons representing licences contain only one label.
. DQ_PositionalAccuracy
. result:
.   DQ_ConformanceResult
.   specification:
.   CI_Citation
.   .... title: Map Boundries
.   .... date
.   .... CI_Date
.   .... dateType: 002
.   .... date: 199703
.   explanation: Most boundary locations are constructed from lines of latitude and longitude, hence are scale independent. The accuracy of other boundaries is dependent upon the source, eg. state border, coastline, cadastre.
.   pass: 1
. DQ_ThematicAccuracy
. result:
.   DQ_QuantitativeResult
.   valueUnit
.   .... uomName: percent
.   value: Validation checks are performed periodically, resulting in an estimated 99% accuracy. These checks include comparisons between reports from the spatial dataset and the digital Mining Register.
+referenceSystemInfo
  MD_ReferenceSystem
  referenceSystemIdentifier:

```


. RS_Identifier
 . code: GDA 94
 . codeSpace: DIPR
 fileIdentifier: ANZSA1000001233
 language: en
 characterSet: 001
 contact:
 CI_ResponsibleParty
 role: 002
 organisationName: Department of Primary Industries and Resources SA
 dateStamp: 20000803
 metadataStandardName: ISO 19115
 metadataStandardVersion: FDIS
 dataset: https://info.pir.sa.gov.au/geometa/migs/MIGS_Down_cat.jsp

I.3 Example 2 – Example of extended metadata

This example illustrates the addition of new metadata entities and an extended codelist that can be used to document a hierarchical classification-based taxonomy. Figure I.1 presents a UML model of the extension information, Clause I.4 provides data dictionary entries for the extended entities and elements.

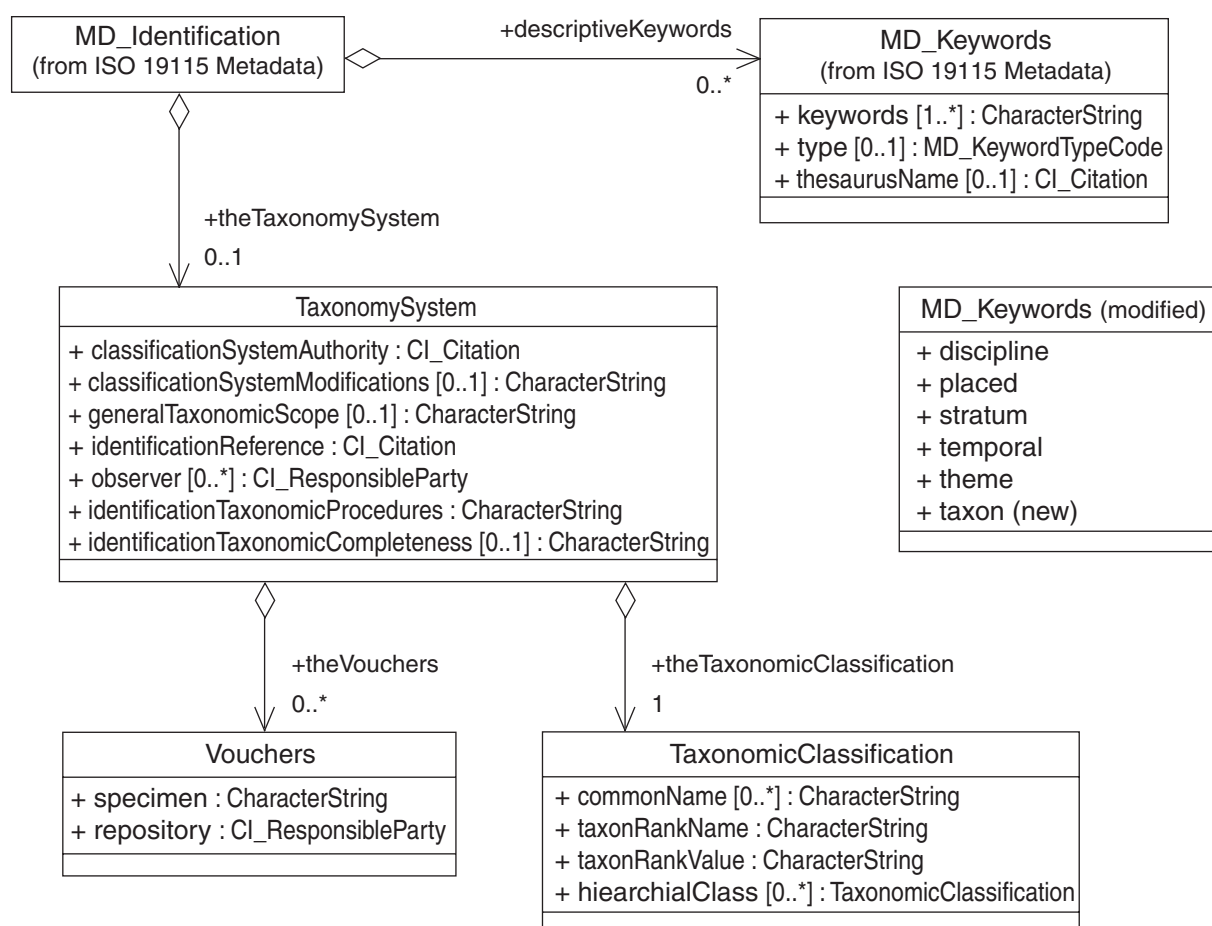


Figure I.1 — Examples of extended metadata

I.4 Data dictionary for the extended elements

Name	Short Name	Domain Code	Definition	Obligation/Condition	Data Type	Domain	Max Occur	Parent Entity	Rule	Rationale	Source
Role name: the Taxonomy System	taxonomy		information on the taxa (1 or more) included in the data set, including keywords, taxonomic system and coverage information, and taxonomic classification system.	O	Association		1	MD_Identification	New Metadata section	To provide for documentation of taxonomic information	National Biological Information Infrastructure (NBII)
Taxonomy System	Taxonsys		documentation of taxonomic sources, procedures, and treatments.	O	Class		1	MD_Identification	New Metadata section as a class to MD_Identification	The set of data elements contained within this class element represents an attempt to provide better documentation of taxonomic sources, procedures, and treatments.	National Biological Information Infrastructure (NBII)
Classification System Authority	classsys		information about the Classification system or authority used	M	Class	CI_Citation	N	TaxonomySystem	New Metadata class	Together, the Classification system and any modifications made to it represent a significant piece of information concerning the data being documented.	National Biological Information Infrastructure (NBII)
Classification System Modifications	classmod		description of any modifications or exceptions made to the Classification system or authority used	C / taxonomic classification system modified?	Character String	Free text	1	classificationSystemAuthority	New Metadata attribute	Many times a standard system is used, but exceptions are made to specific taxa or groups, this element allows for exceptions or modifications to be described.	National Biological Information Infrastructure (NBII)

Name	Short Name	Domain Code	Definition	Obligation/Condition	Data Type	Domain	Max Occur	Parent Entity	Rule	Rationale	Source
General Taxonomic Scope	taxogen		description of the range of taxa addressed in the data set or collection. For example, "all vascular plants were identified to family or species, mosses and lichens were identified as moss or lichen."	O	Character String	Free text	1	TaxonomySystem	New Metadata attribute	To provide the capability to document the taxa addressed in the data set or collection via a free text description. This is especially important with data sets or collections which contain examples of a many taxonomic levels.	National Biological Information Infrastructure (NBII)
Identification Reference	idref		information on any non-authoritative materials (e.g. field guides) useful for reconstructing the actual process	M	Class		N	TaxonomySystem	New Metadata class	This information can be useful for someone who wishes to make use of a data set, and perhaps expand on it, following similar procedures	National Biological Information Infrastructure (NBII)
observer	obs		information about the individual(s) responsible for the identification(s) of the specimens or sightings, etc.	O	Class	CI_ResponsibleParty	N	TaxonomySystem	New Metadata class	If there are any questions on the identification of specimens or field sightings, this should provide some insight into the data creator.	National Biological Information Infrastructure (NBII)
Identification Taxonomic Procedures	taxonpro		description of the methods used for taxonomic identification. Could include specimen processing, comparison with museum materials, keys, and key characters, chemical or genetic analyses, etc.	M	Character String	Free text	1	TaxonomySystem	New Metadata attribute		National Biological Information Infrastructure (NBII)

Name	Short Name	Domain Code	Definition	Obligation/Condition	Data Type	Domain	Max Occur	Parent Entity	Rule	Rationale	Source
Identification Taxonomic Completeness	taxoncom		information concerning the proportions and treatment of unidentified materials (i.e. materials sent to experts, and not yet determined); estimates of the importance, and identities of misidentifications, uncertain determinations, synonyms or other incorrect usages; taxa not well treated or requiring further work; and expertise of field workers.	O	Character String	Free text	1	TaxonomySystem	New Metadata attribute		National Biological Information Infrastructure (NBII)
Role name: theVouchers	voucher		information about the voucher		Association						
Vouchers	Vouchers		information on the types of specimen, the repository, and the individuals who identified the vouchers.	C / vouchers used?	Class		N	TaxonomicSystem	New Metadata class		National Biological Information Infrastructure (NBII)

Name	Short Name	Domain Code	Definition	Obligation/Condition	Data Type	Domain	Max Occur	Parent Entity	Rule	Rationale	Source
specimen	specimen		word or phrase describing the type of specimen collected (e.g. herbarium specimens, blood samples, photographs, individuals, or batches). Example: "herbarium specimens" "blood samples" "photographs" "individuals" free text	M	Character String	free text	1	Vouchers	New Metadata attribute		National Biological Information Infrastructure (NBII)
repository	reposit		information about the curator or contact person and/or agency responsible for the specimens.	M	Class	CI_ResponsibleParty	1	Vouchers	New Metadata class	If, for any reason, the specimens should need to be referred to, information about where they are being housed and who is responsible for them should be kept along with the documentation of the data set. If they have not been archived, this should be noted.	National Biological Information Infrastructure (NBII)
Role name: theTaxonomic Classification			information about the taxonomic classification	M			1				

Name	Short Name	Domain Code	Definition	Obligation/Condition	Data Type	Domain	Max Occur	Parent Entity	Rule	Rationale	Source
Taxonomic Classification	Taxoncl		information about the range of taxa addressed in the data set or collection. It is recommended that one provide information starting from the taxonomic rank of kingdom, to a level which reflects the data set or collection being documented. The levels of Kingdom, Division/Phylum, Class, Order, Family, Genus, and Species should be included as ranks as appropriate. For example, if the data set deals with the species "red maple" or <i>Acer rubrum</i> var. <i>rubrum</i> , then the contents might look like the following:	M	Class		1	Taxonomic Classification	New Metadata class	To provide the capability to describe precisely the taxa addressed in the data set or collection. This can be accomplished using a hierarchical structure to specify from Kingdom down to the appropriate taxonomic level.	National Biological Information Infrastructure (NBII)
commonName	common		specification of applicable common names. These common names may be general descriptions of a group of organisms if appropriate (e.g. insects, vertebrate, grasses, waterfowl, vascular plants, etc.)	O	Character String	free text	N	Taxonomic Classification	New Metadata attribute	To provide the capability to describe precisely the taxa addressed in the data set or collection.	National Biological Information Infrastructure (NBII)

Name	Short Name	Domain Code	Definition	Obligation/Condition	Data Type	Domain	Max Occur	Parent Entity	Rule	Rationale	Source
taxonRank Name	taxonrn		name of the taxonomic rank for which the Taxon_Rank_Value is provided. See the example included in the definition of Taxonomic_Classification Example: "Kingdom" "Division" "Phylum" "Subphylum" "SuperClass" "Class" "SubClass" "InfraClass" "Superorder" "Order" "Suborder" "Infraorder" "Superfamily" "Family" "Subfamily" "Tribe" "Subtribe" "Genus" "Species"	M	Character String	free text	1	Taxonomic Classification	New Metadata attribute	To provide the capability to describe precisely the taxa addressed in the data set or collection.	National Biological Information Infrastructure (NBII)
taxonRank Value	taxonry		name representing the taxonomic rank of the taxon being described. See the example included in the definition of Taxonomic Classification.	M	Character String	Free text	1	Taxonomic Classification	New Metadata attribute	To provide the capability to describe precisely the taxa addressed in the data set or collection.	National Biological Information Infrastructure (NBII)
Hierarchical Class	hidclass		number of recursive sets of taxonomic classification systems	O	Character String	Free text	N	Taxonomic Classification	New Metadata attribute	To provide the capability to declare the number of recursive taxonomic classification systems	National Biological Information Infrastructure (NBII)

I.5 MD_KeywordType (Modified)

Name	Domain code	Definition
MD_KeywordType		Methods used to group similar keywords
discipline	001	Keyword identifies a branch of instruction or specialized learning
place	002	Keyword identifies a location
stratum	003	Keyword identifies the layer(s) of any deposited subsurface
temporal	004	Keyword identifies a time period related to the dataset
theme	005	Keyword identifies a particular subject or topic
taxon	006	Keyword identifies a taxonomy of the dataset

Annex J

(informative)

Multilingual support for free text metadata element

J.1 Free text metadata elements

In this International Standard a free text element may include multiple instances of information in different languages. Where the language is different from the language defined for the whole dataset, it may be identified, along with an optional attribute that specifies the variant of the language used in a particular country, and the character set used when that differs from the default for the whole dataset.

Defined in Clause J.2 are metadata elements that allow for the specification of free text in multiple languages. Optionally, everywhere in this International Standard where “free text” is specified as the domain the class PT_FreeText can be used.

An example of how the free text metadata elements may be used is described in J.3. The metadata element “useLimitation” is used in the example. It can be found in B.2.3 of this International Standard.

J.2 Data structure for handling multi-languages support in free text metadata elements

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
1x	PT_FreeText	PtFreeText	description of a multi-language free text metadata element	Use obligation from referencing object	Use maximum occurrence from referencing object	Class	Line 2x
2x	<i>Role name:</i> textGroup	textGroup	information about the metadata elements required to support multilingual free text fields	M	N	Association	PT_Group
3x	PT_Group	PtGroup	description of metadata elements required to support multi-languages in free text metadata elements	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (PT_FreeText)	Lines 2x and 4x-7x
4x	languageCode	PtLangCode	language used for documenting a plain text	O	1	Class	LanguageCode <<CodeList>> (ISO 639, recommended 3-alphabetic digits code)
5x	country	PtCountry	country of language used for documenting a plain text	O	1	CharacterString	Country <<CodeList>> (ISO 3166 recommended 3-numeric digits code)
6x	characterSetCode	PtCharCode	full name of the ISO character coding standard used for documenting a plain text	O	1	Class	MD_CharacterSetCode <<CodeList>> (B 5.10)
7x	plainText	PtText	content of a free text metadata element	M	1	CharacterString	Free text

J.3 Example of multi-languages free text in a metadata element

The metadata element “useLimitation” is used in the following example (B.2.3 line 68).

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
68	useLimitation	useLimit	limitation affecting the fitness for use of the resource or metadata. Example, “not to be used for navigation”	O	N	CharacterString	Free text

Example of multi-languages occurrences on free text metadata element titled “useLimitation”			
Language code (Optional)	Country code (Optional)	Character set code (Optional)	Plain text (Mandatory)
eng (English) (see Note)	826 (United Kingdom) (see Note)	017 (ISO/IEC 8859-15) (see Note)	Weight restriction on bridges Lorries exceeding five metric tonnes gross weight are not permitted on bridges
fra (French)		017 (ISO/IEC 8859-15)	Limitation de poids sur les ponts: Les camions dont le poids total excède 5 tonnes métriques ne sont pas autorisés à circuler sur les ponts.
ara (Arabic)		011 (ISO/IEC 8859-6)	محدود الثقل على الجسور ممنوع على الحافلات بمقدار أكثر من ٥٠٠٠ كيلوغرام متري العبور على الجسور
zho (Chinese)		029 (GB2312)	桥梁承重限制: 卡车毛重超过五公吨不得上桥
NOTE If “English”, “United Kingdom” and “ISO/IEC 8859-15” would have been specified as default values for the entire metadata file, it would not have been necessary to specify them in this occurrence.			

Bibliography

- [1] ISO/IEC 646, *Information technology — ISO 7-bit coded character set for information interchange*
- [2] ISO 690:1987, *Documentation — Bibliographic references — Content, form and structure*
- [3] ISO 8601:2000, *Data elements and interchange formats — Information interchange — Representation of dates and times*
- [4] ISO 11180, *Postal addressing*
- [5] ISO/TS 19103:—²⁾, *Geographic information — Conceptual schema language*
- [6] ISO 19104:—²⁾, *Geographic information — Terminology*
- [7] ISO 19116:—²⁾, *Geographic information — Positioning services*
- [8] ISO 19119:—²⁾, *Geographic information — Services*
- [9] ISO 19123:—²⁾, *Geographic information — Schema for coverage geometry and functions*
- [10] ISO 23950:1998, *Information and documentation — Information retrieval (Z39.50) — Application service definition and protocol specification*
- [11] ISO/TR 19121:2000, *Geographic information — Imagery and gridded data*
- [12] IETF RFC 1738, *Uniform Resource Locators (URL)*
- [13] IETF RFC 2056, *Uniform Resource Locators for Z39.50*

2) To be published.

