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ISO/TC 211**/SC**

Title

`Geographic information/Geomatics`

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Geographic information - Metadata

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Geographic information — Metadata

Information géomatique — Métadonnées

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Contents

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 3.

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.

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

This document contains nine annexes. Annexes A to E are normative, annexes F to I are informative.

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 manage better data production, storage, updating, and reuse.

The objective of this standard is to provide a structure for describing digital geographic data. This 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 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.

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.

This International Standard is applicable to geographic datasets, dataset series, and individual geographic features and feature properties.

This International Standard defines:

— mandatory and conditional metadata packages, metadata entities, and metadata elements — the minimum set 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.

2　Confomance

2.1 Profiles

Any profile conforming to this International Standard shall conform to the rules in annex C subclause C.6.

2.2 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.

2.3 Conformance requirements

Any product claiming conformance with this International Standard shall pass the requirements described in the abstract test suite presented in annex D.　Conformance is specified for two types of metadata: 1) ISO 19115 standard metadata – metadata that is specified in this standard; 2) metadata that is defined (extended) by the user.

Metadata shall be provided as specified in clause 6 and annexes A and B.　It shall meet the requirements in the Abstract Test Suite (annex D) subclause D.2.

User-defined metadata shall be defined and provided as specified in annex C. It shall satisfy the requirements in the Abstract Test Suite (annex D) subclause D.3.

3   Normative references

The following standards contain provisions that, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties involved in agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 639:1988 (all parts), *Code for the representation of names of languages*

ISO 3166:1993 (all parts), *Codes for the representation of names of countries and their subdivisions*

ISO 8859:1987 (parts 1 to 10), *Information processing — 8 bit single byte coded graphic character sets*

ISO 8879:1986, *Information processing — Text and office systems — Standard Generalized Markup Language*

ISO/IEC 10646-1:1993, *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 19103, *Geographic information — Conceptual schema language* [1]

ISO 19104, *Geographic information — Terminology* [1]

ISO 19106, *Geographic information — Profiles* [1]

ISO 19107, *Geographic information — Spatial schema* [1]

ISO 19108, *Geographic information — Temporal schema* [1]

ISO 19109, *Geographic information — Rules for application schema* [1]

ISO 19110, *Geographic information — Feature cataloguing methodology* [1]

ISO 19111, *Geographic information — Spatial referencing by coordinates* [1]

ISO 19112, *Geographic information — Spatial referencing by geographic identifiers* [1]

ISO 19113, *Geographic information — Quality principles* [1]

ISO 19114, *Geographic information — Quality evaluation procedures* [1]

ISO 19117, *Geographic information — Portrayal* [1]

ISO 19118, *Geographic information — Encoding* [1]

ISO TR 19121, *Geographic information — Imagery and gridded data* [1]

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[1]   To be published

4 Terms and definitions

For the purposes of this International Standard, the terms and definitions given in ISO 19104 and the following 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 legal value domain and legal operations allowed on values in this domain

EXAMPLE   Integer, Real, Boolean, String, Date, and SG_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
metadata
data about data

4.5
metadata element
discrete unit of metadata

NOTE 1   Equivalent to an attribute in UML terminology

NOTE 2   Elements are unique within an entity

4.6
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

4.7
metadata section
subset of metadata which consists of a collection of related metadata entities and elements

4.8
model
abstraction of some aspects of reality

4.9
resource
asset or means that fulfils a requirement

EXAMPLE   dataset, service, document, person or organization

4.10
temporal reference system
reference system against which time is measured

5 Symbols and abbreviated terms

5.1 Abbreviations

ASCII   American Standard Code for Information Interchange

CD-ROM   Compact Disk - Read Only Memory

CGM   Computer Graphics Metafile

CUT   Coordinated Universal Time

CPIO   CoPy In/Out

DCW   Digital Chart of the World

DTD   Document Type Definition

EPS   Encapsulated PostScript Format

GIF   Graphic Interchange Format

HFS   Hierarchical File System

HTML   HyperText Markup Language

IDL   Interface Definition Language

JPEG   Joint Photographic Experts Group

NATO   North Atlantic Treaty Organization

NSN   National Stock Number

OCL   Object Constraint Language

PBM   Portable Bit Map Format

PS   Adobe PostScript Format

RGB   Red, Green, Blue

SGML   Standard Generalized Markup Language

UML   Unified Modelling Language

URC   Uniform Resource Citation (Characteristics)

URL   Uniform Resource Locator

WGS   World Geodetic System

XML   Extensible Markup Language

XWD   X-Windows Dump

5.2 UML notations

The diagrams that appear in this 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 standard are described in the Figure 1 below.
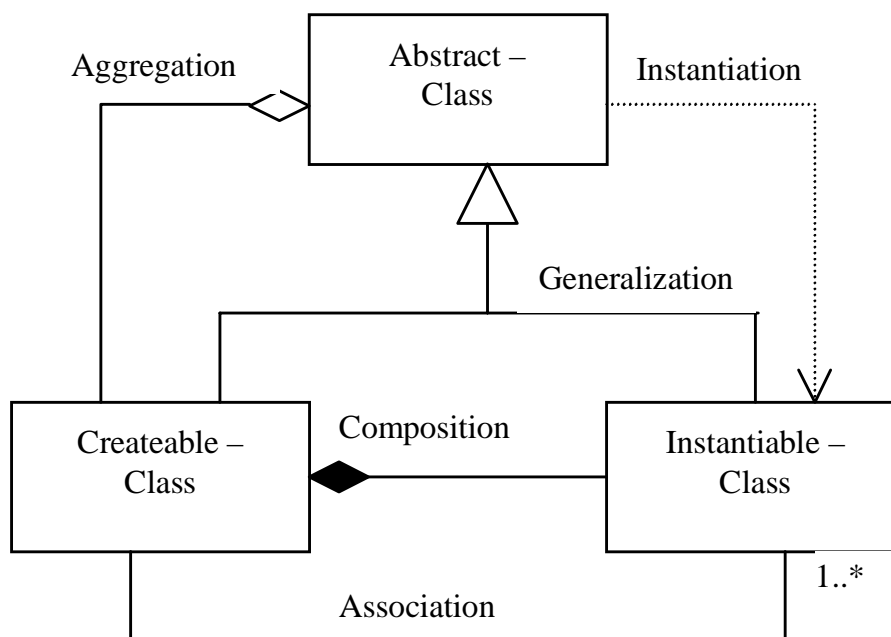
Figure 1 — UML notation

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 associations 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 super-class and the sub-classes that may be substituted for it. The super-class is the generalized class, while the sub-classes are specified classes.

5.3.3   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 2-way association, two role names will be supplied.
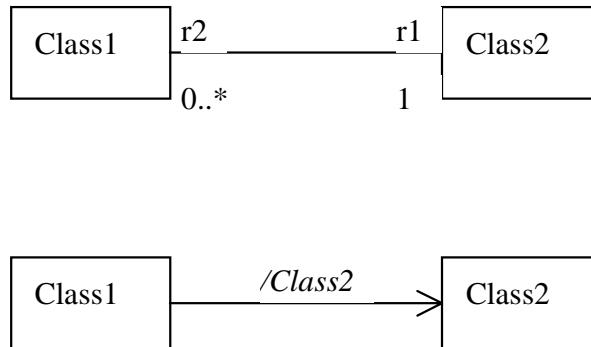
Figure 2 — UML roles

Figure 2 represents how role names and cardinalities are expressed in UML diagrams. The role name "r1'" is Class1's relationship to Class2. The role name "r2" is Class2's relationship to Class1. The cardinalities show that "zero or many" Class1s are related to "exactly one" Class2.

Figure 2 also shows how derived classes will be expressed. The diagram indicates that Class1 is a derived class of Class2. Any attributes and aggregates of Class1 are also derived from Class2.

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 standard, for more detailed descriptions consult ISO 19103, *Geographic information — Conceptual schema language.*

In this standard the following stereotypes are used:

a)   <<Type>> a stereotyped 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>> A 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 (independent existence and the possibility of side effects). Data types include primitive predefined types and user-definable types. A DataType is thus a class with few or no operations whose primary purpose is to hold the abstract state of another class.

d)   <<CodeList>> can be 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>> 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*>> - is a class (or other classifier) that cannot be directly instantiated. UML notation for this is to show the name in italics.

g) <<Package>> - a cluster of logically related components, containing sub-packages

h) <<Leaf>> - A 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, *Geographic information — Spatial referencing by geographic identifiers*)

CI – Citation (ISO 19115, *Geographic information — Metadata*)

CV – Coverages (ISO 19123, *Geographic information — Schema for coverage geometry and functions*)

DQ – Data quality (ISO 19115, *Geographic information — Metadata*)

DS – Dataset (ISO 19115, *Geographic information — Metadata*)

EX – Extent (ISO 19115 *Geographic information — Metadata*)

FC – Feature Catalogue (ISO 19110, *Geographic information — Feature cataloguing methodology*)

FE – Feature (ISO 19109, *Geographic information — Rules for application schema*)

FT – Feature Topology (ISO 19107, *Geographic information — Spatial schema*)

GF – General Feature (ISO 19109, *Geographic information — Rules for application schema*)

GM – Geometry (ISO 19107, *Geographic information — Spatial schema*)

GR – Graph (ISO 19107, *Geographic information — Spatial schema*)

LI – Lineage (ISO 19115, *Geographic information — Metadata*)

MD – Metadata (ISO 19115, *Geographic information — Metadata*)

PF – Feature Portrayal (ISO 19117, *Geographic information — Portrayal*)

PS – Positioning Services (ISO 19116, *Geographic information — Positioning services*)

RS – Reference System (ISO 19115, *Geographic information — Metadata*)

SC – Spatial Coordinates (ISO 19111, *Geographic information — Spatial referencing by coordinates*)

SI – Spatial Identification (ISO 19112, *Geographic information — Spatial referencing by geographic identifiers*)

SV – Services (ISO 19119, *Geographic information — Services*)

TM – Temporal (ISO 19108, *Geographic information — Temporal schema*)

TP – Topology (ISO 19107, *Geographic information — Spatial schema*)

TS – Simple Topology (ISO 19107, *Geographic information — Spatial schema*)

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 each geographic dataset 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

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 (sub-classed) as a general association (DS_OtherAssociation), a dataset series (DS_Series), or a special activity (DS_Initiative). This UML model and the associated data dictionary, Figure 3 and annex B.4 respectively, further define this requirement.
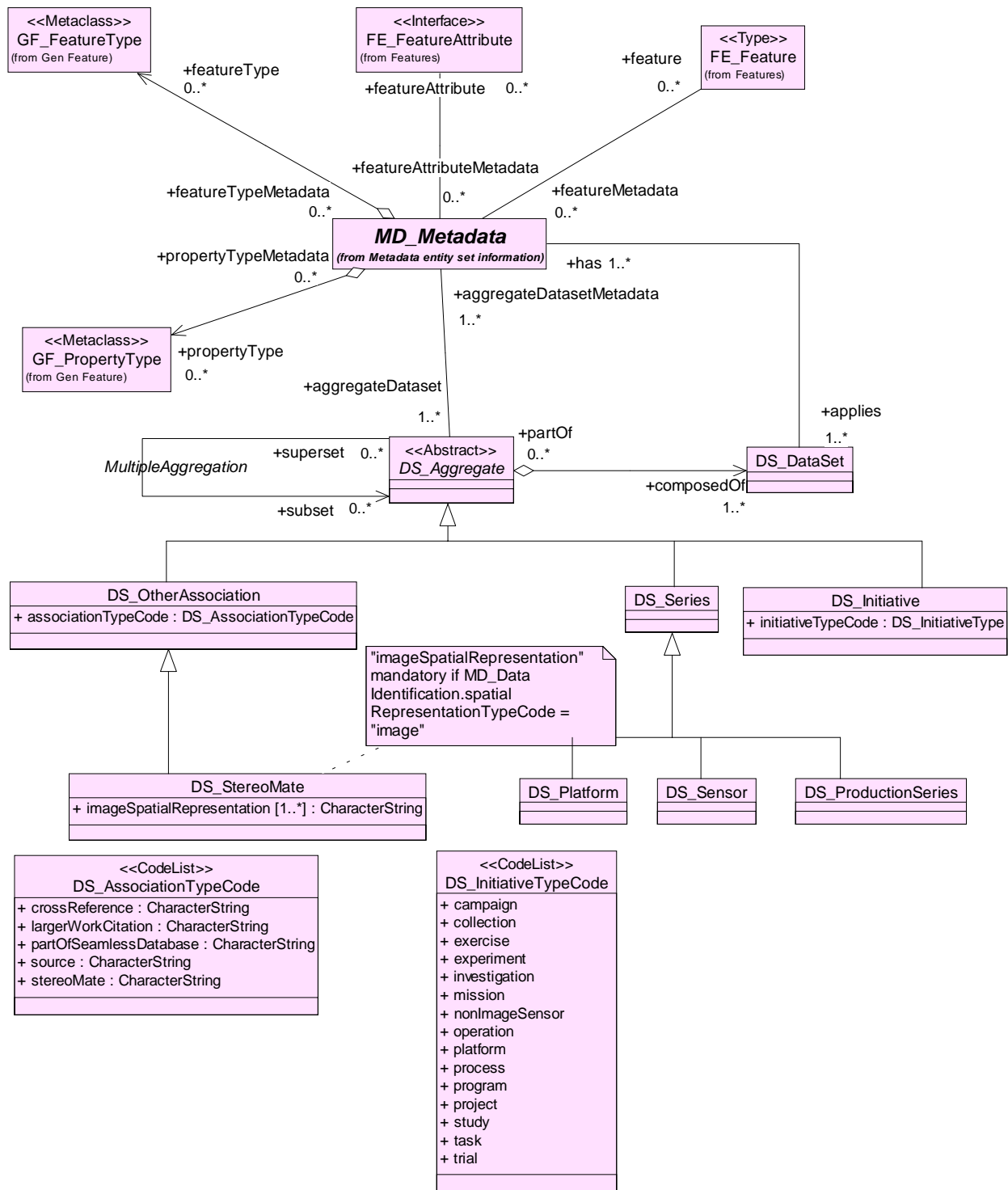
Figure 3 — Metadata application

6.3 Metadata packages

6.3.1 Metadata package and entity relationship

In this standard, metadata for geographic data is presented in UML Packages. Each package contains one or more entities (UML Classes), which can be specified (sub-classed) or generalized (super-classed). 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 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.
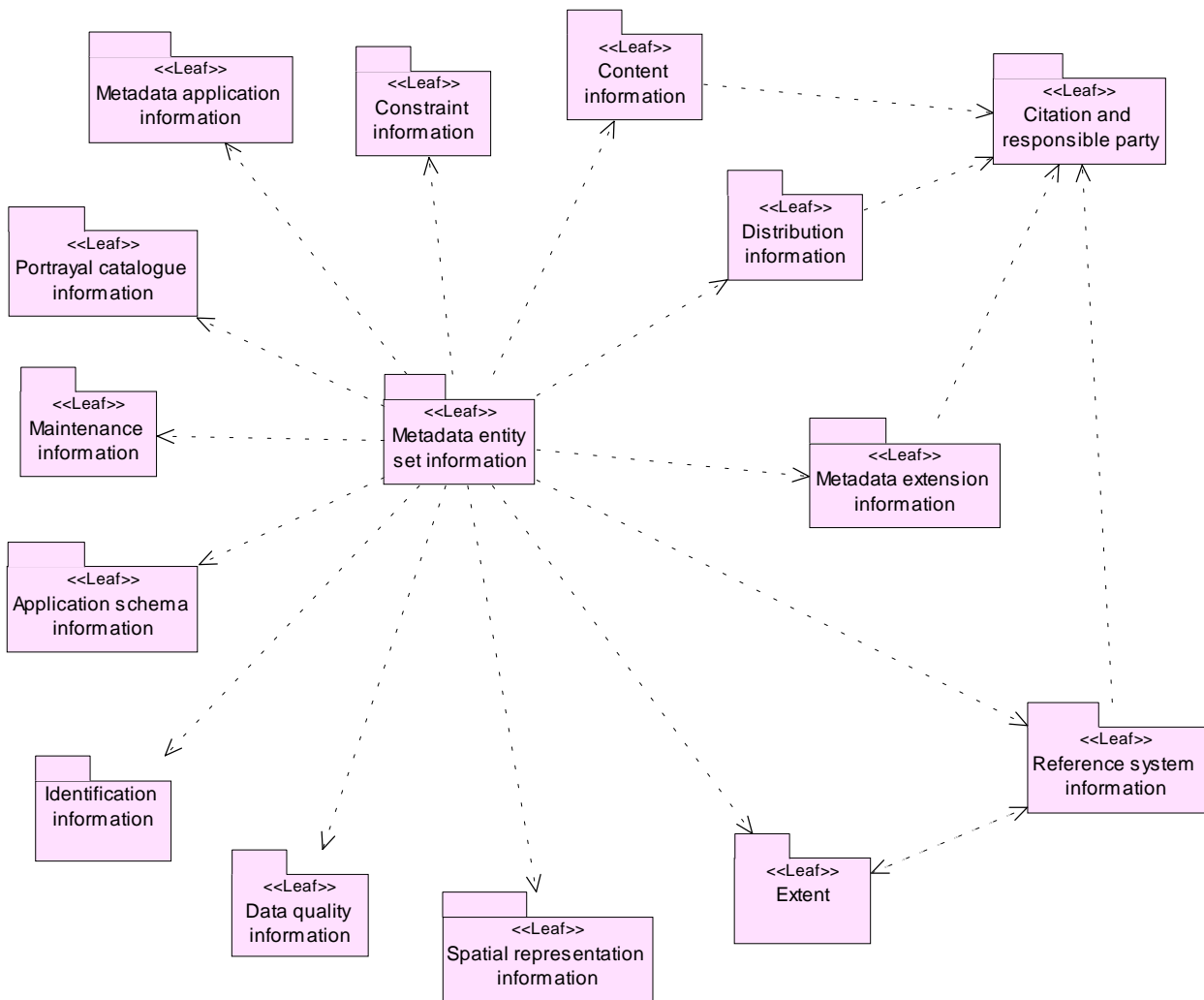
Figure 4 — Metadata packages

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 subclauses 6.3.2 through 6.3.2.10. Each package has a corresponding sub-clause, which is listed in the subclause Name column.

Table 2 — Relationship between packages of metadata and metadata entities

Sub-Clause Name	Package	Entity	UML Diagram	Data Dictionary
6.3.2	Metadata Entity Set Information	MD_Metadata	A.2	B.2
6.3.2.1	Identification Information	MD_Identification	A.2.1	B.2.1
6.3.2.2	Constraint Information	MD_Constraints	A.2.2	B.2.2
6.3.2.3	Data Quality (from ISO 19113)	DQ_DataQuality	A.2.3	B.2.3
6.3.2.4	Maintenance Information	MD_MaintenanceInformation	A.2.4	B.2.4
6.3.2.5	Spatial Representation Information	MD_SpatialRepresentation	A.2.5	B.2.5
6.3.2.6	Reference System Information	RS_ReferenceSystem	A.2.6	B.2.6
6.3.2.7	ContentInformation	MD_ContentDescription	A.2.7	B.2.7
6.3.2.8	Portrayal Catalogue Information	MD_PortrayalCatalogueReference	A.2.8	B.2.8
6.3.2.9	Distribution Information	MD_Distribution	A.2.9	B.2.9
6.3.2.10	Metadata Extension Information	MD_MetadataExtensionInformation	A.2.10	B.2.10
6.3.2.11	Application Schema Information	MD_ApplicationSchemaInfo	A.2.11	B.2.11
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   Metadata entity set information

6.3.2.1   Identification information

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_ContentDescription

- MD_PortrayalCatalogueReference

- MD_Distribution

- MD_MetadataExtensionInformation

- MD_ApplicationSchemaInfo

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 (sub-classed) as MD_DataIdentification when used to identify data and as MD_ServiceIdentification when used to identify a service. 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

The geographicBox and geographicDescription attributes of MD_Identification are conditional; one of them shall be included if the dataset is spatially referenced. If necessary both may be used. However, if the dataset is not spatially referenced neither geographicBox nor geographicDescription are required.

6.3.2.2 Resource constraint information

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 attribute of MD_LegalConstraints shall be non-zero (used) only if accessConstraints and/or useConstraints have a value of "otherRestrictions", which is found in the MD_Restriction codelist.

6.3.2.3 Data quality information

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, DQ_ElementSubElement, MD_Usage and DQ_OverviewElement.

This package 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.

6.3.2.4 Maintenance information

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.

6.3.2.5 Spatial representation information

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_RasterSpatialRepresentation and MD_VectorSpatialRepresentation. Each of the specified entities contains mandatory and optional metadata elements. When further description is necessary, MD_RasterSpatialRepresentation may be specified as MD_Georectified and/or MD_Georeferenceable. Metadata for Spatial data representation are derived from ISO 19107, *Geographic information — Spatial schema*.

6.3.2.6 Reference system information

This package contains the description of the spatial and temporal reference system(s) used in a dataset. MD_ReferenceSystem contains an attribute to identify the reference system used. MD_ReferenceSystem may be sub-classed as MD_CRS, which is an aggregate of MD_ProjectionParameters. MD_ReferenceSystem is derived from RS_ReferenceSystem, which can be specified as SC_CRS, SI_SpatialReferenceSystemUsingGeographicIdentifiers and TM_ReferenceSystem. Metadata for Reference system information are derived from ISO 19108, *Geographic information — Temporal schema*, ISO 19111, *Geographic information — Spatial referencing by coordinates*, and ISO 19112, *Geographic information — Spatial referencing by geographic identifiers*.

6.3.2.7 Content information

This package contains information identifying the feature catalogue used for a vector dataset (MD_FeatureCatalogueDescription) and/or information describing the content of raster data for a raster dataset (MD_RasterDescription). It consists of the optional entity MD_ContentDescription. MD_RasterDescription may be sub-classed as MD_ImageDescription, which is an aggregate of MD_Band.

6.3.2.8 Portrayal catalogue information

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.

6.3.2.9 Distribution information

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 contain mandatory and optional elements. MD_DigitalTransferOptions is an aggregate of the medium used for the distribution (MD_Medium) of a dataset. MD_Distributor is an aggregate of the process for ordering a distribution (MD_StandardOrderProcess).

6.3.2.10 Metadata extension information

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).

6.3.2.11 Application schema information

This package contains information about the application schema used to build a dataset. It contains the optional entity MD_ApplicationSchemaInfo which is an aggregate of MD_SpatialAttributeSupplement, which is an aggregate of MD_FeatureTypeList. The entities contain only mandatory elements.

6.4 Metadata datatypes

6.4.1 Extent information

This datatype contains the metadata elements which 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 sub-classed as EX_BoundingPolygon, EX_GeographicBoundingBox and Set<SI_LocationInstance>. The combined spatial and temporal extent (EX_SpatialTemporalExtent) has an aggregate relationship with EX_GeographicExtent. EX_TemporalExtent can be sub-classed as EX_SpatialTemporalExtent.

The EX_Extent entity has three optional roles named "geographicElement", "temporalElement", and "verticalElement" and an attribute called "description". One of four must be used.

6.4.2 Citation and responsible party information

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 Responsible Party 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.

6.5 Recommended core metadata for geographic datasets

This standard defines an extensive set of metadata elements; typically only a subset of the full number of elements are used. However, it is essential that a basic minimum number of metadata elements be maintained for a dataset. Listed are the recommended 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')?". Every derived dataset metadata profile should include this recommended core.

Dataset title	Spatial representation type
Dataset reference date	Reference system
Dataset responsible party	Lineage statement
Geographic location of the dataset (by four coordinates or by geographic identifier)	On-line resource
Dataset language	Metadata file identifier
Dataset character set	Metadata standard name
Dataset topic category	Metadata standard version
Scale of the dataset	Metadata language
Abstract describing the dataset	Metadata character set
Dataset format name	Metadata point of contact
Dataset format version	Metadata time stamp
Additional extent information for the dataset (vertical and temporal)	

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.

The codelist and their values provided in this standard (B.6) are normative. User extensions to codelists shall follow the rules as described in annex C and data element registries in ISO 11179-6.

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 which must be passed to claim conformance with this 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 in a UML model as well as an XML DTD.

6.11 Metadata extension methodology

Annex F gives additional metadata elements which may be defined. Any 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 metadata standard, utilizing the recommended core components of the comprehensive profile, for a geographic dataset. It is presented in an XML document (I.1). An example of extended metadata elements, as may be developed by a specific information community, is also provided (I.2).

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 sub-clauses 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 attributes 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 only becoming mandatory if the optional entity is used.

A.2 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.
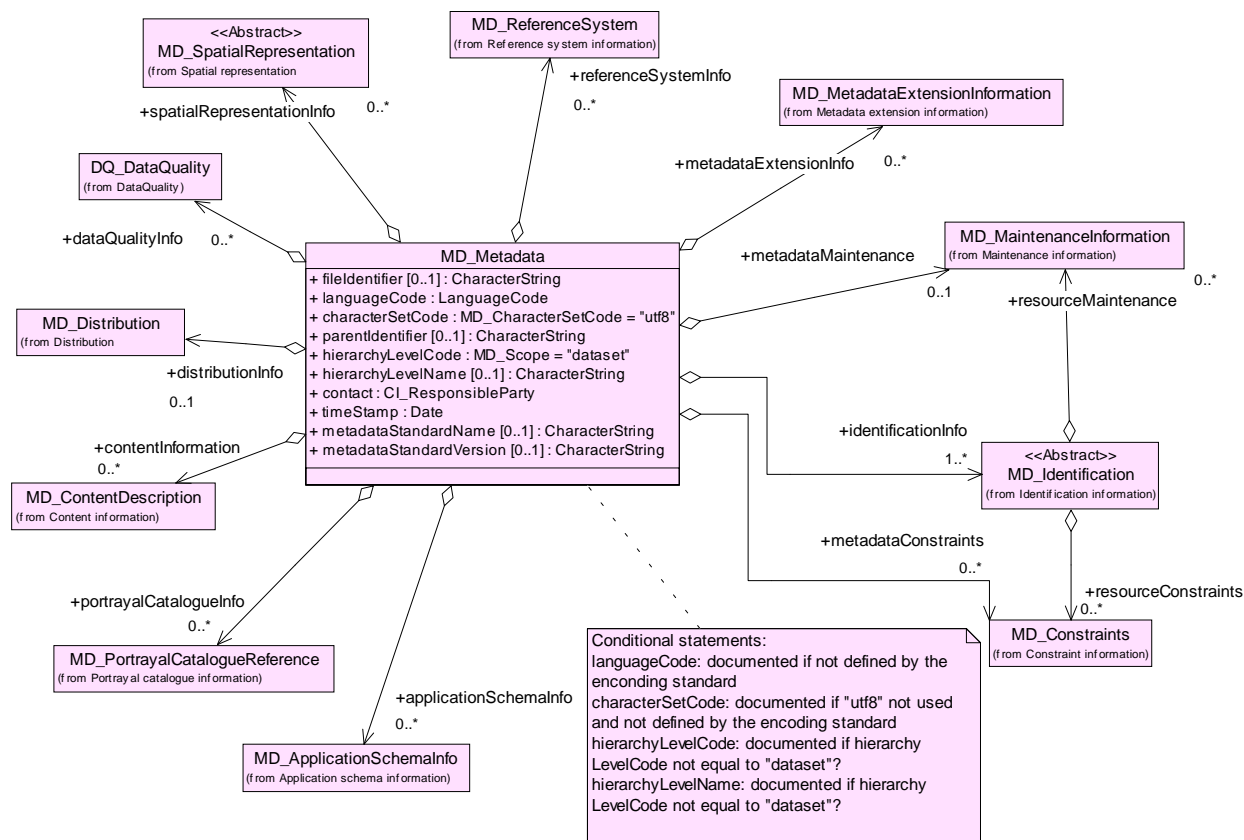
Figure A.1 — Metadata entity set information

A.2.1 Identification information

Figure A.2 defines the metadata classes required to identify a resource. It also defines separate specialization subclasses for identifying data and services. The data dictionary for this diagram is located in B.2.1.
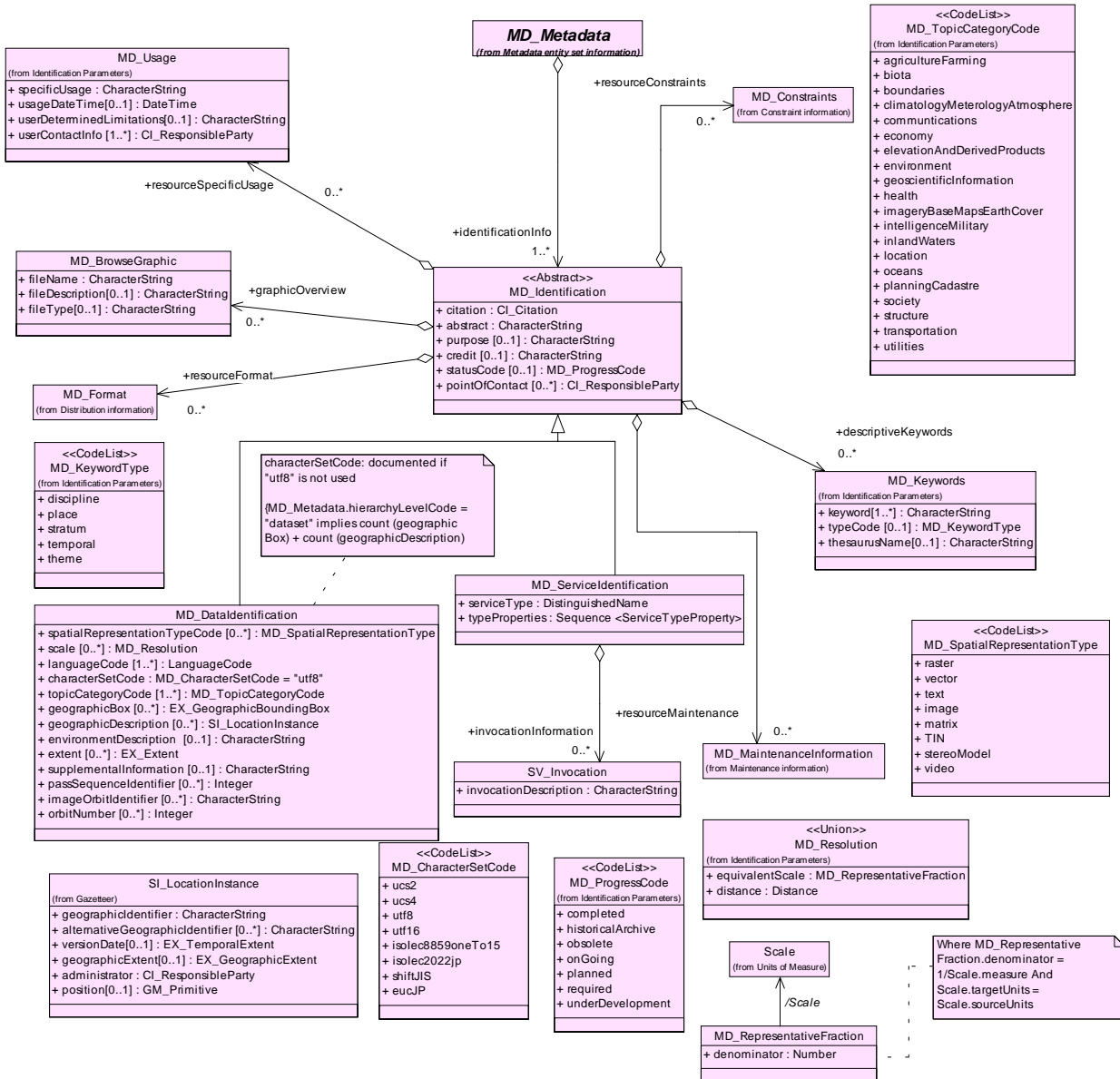
Figure A.2 — Identification information

A.2.2 Resource 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.2.2.
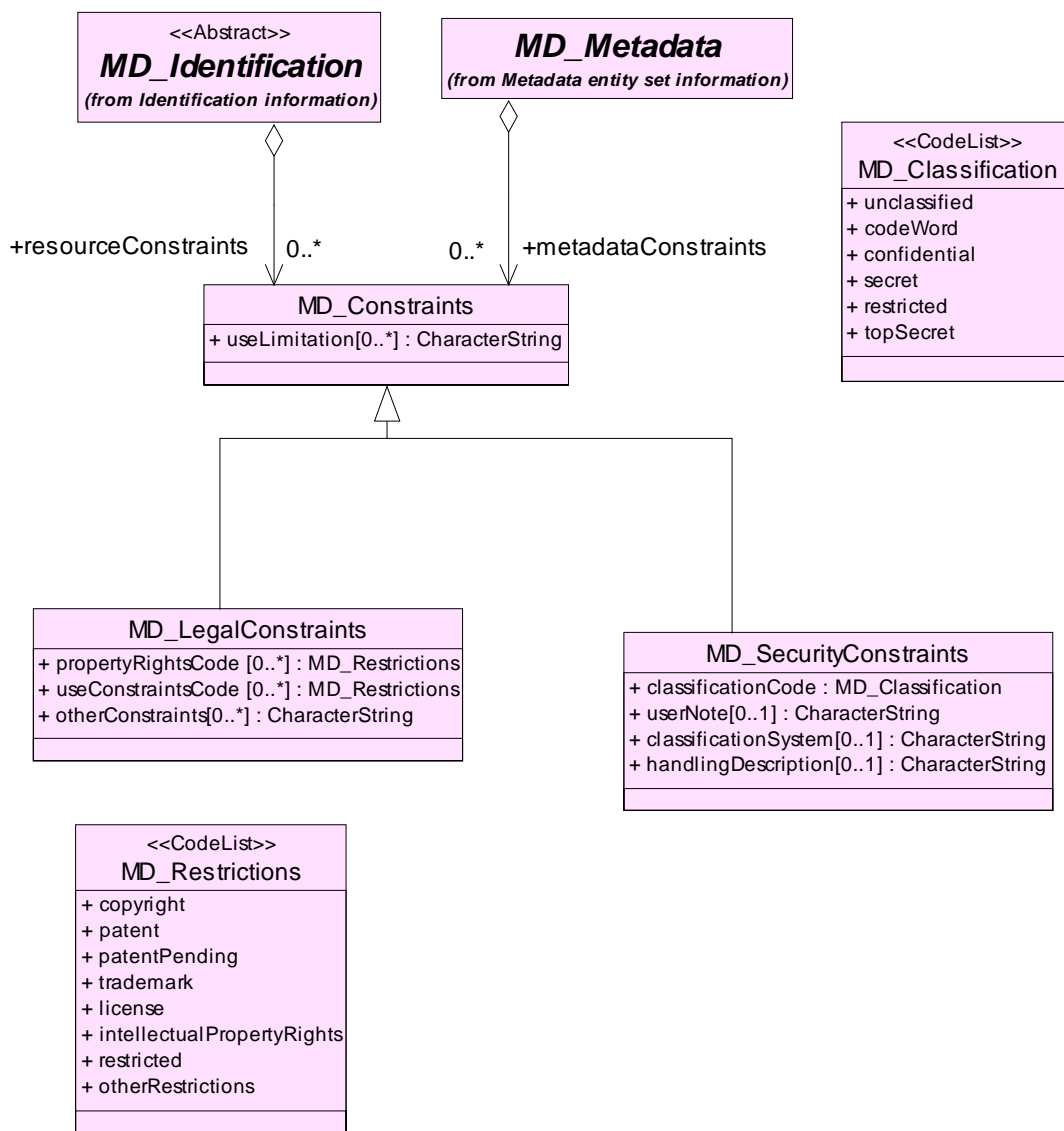
Figure A.3 — Resource constraint information

A.2.3 Data quality information

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.2.3.
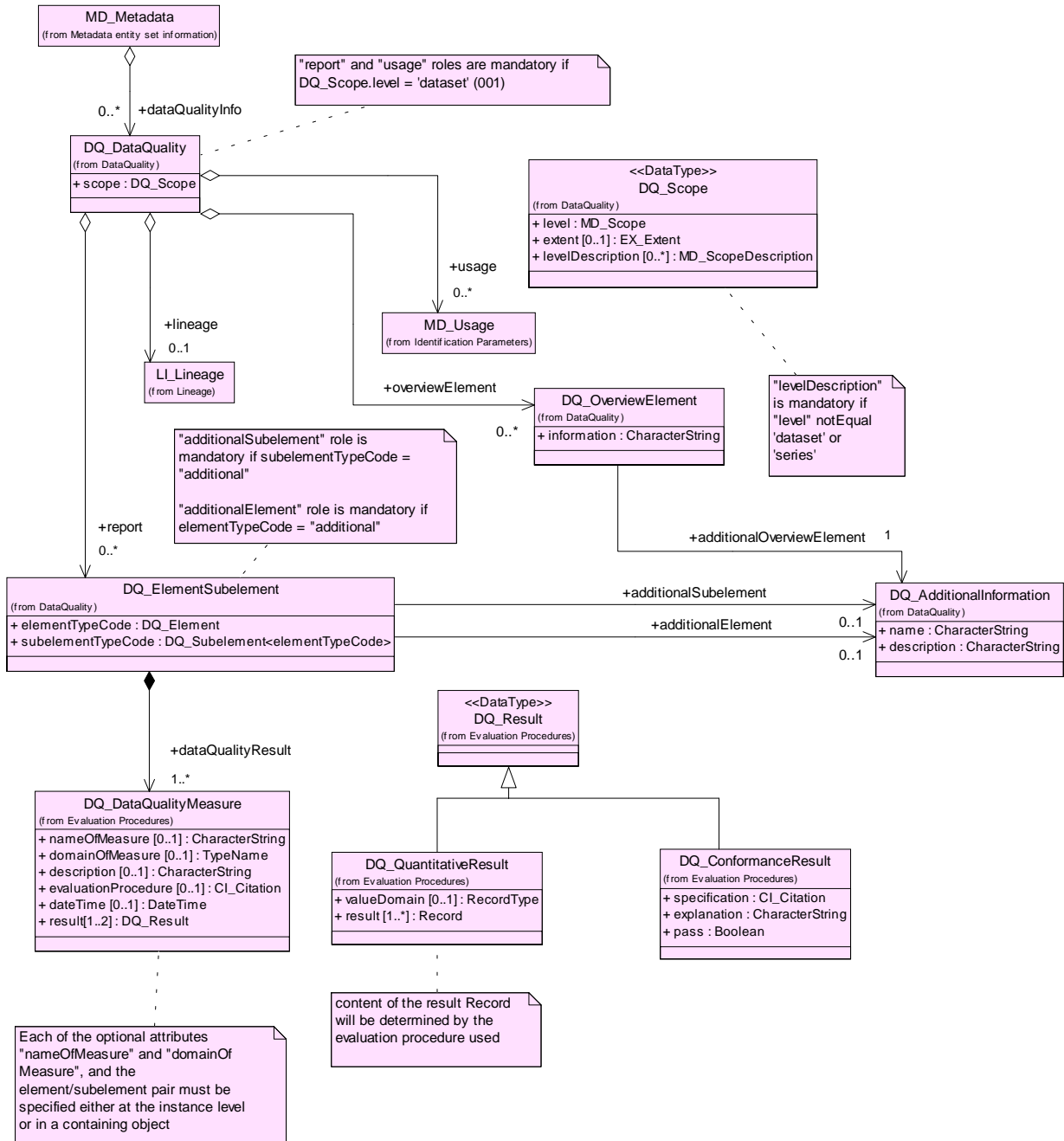
Figure A.4 — Data quality information

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.2.3.1
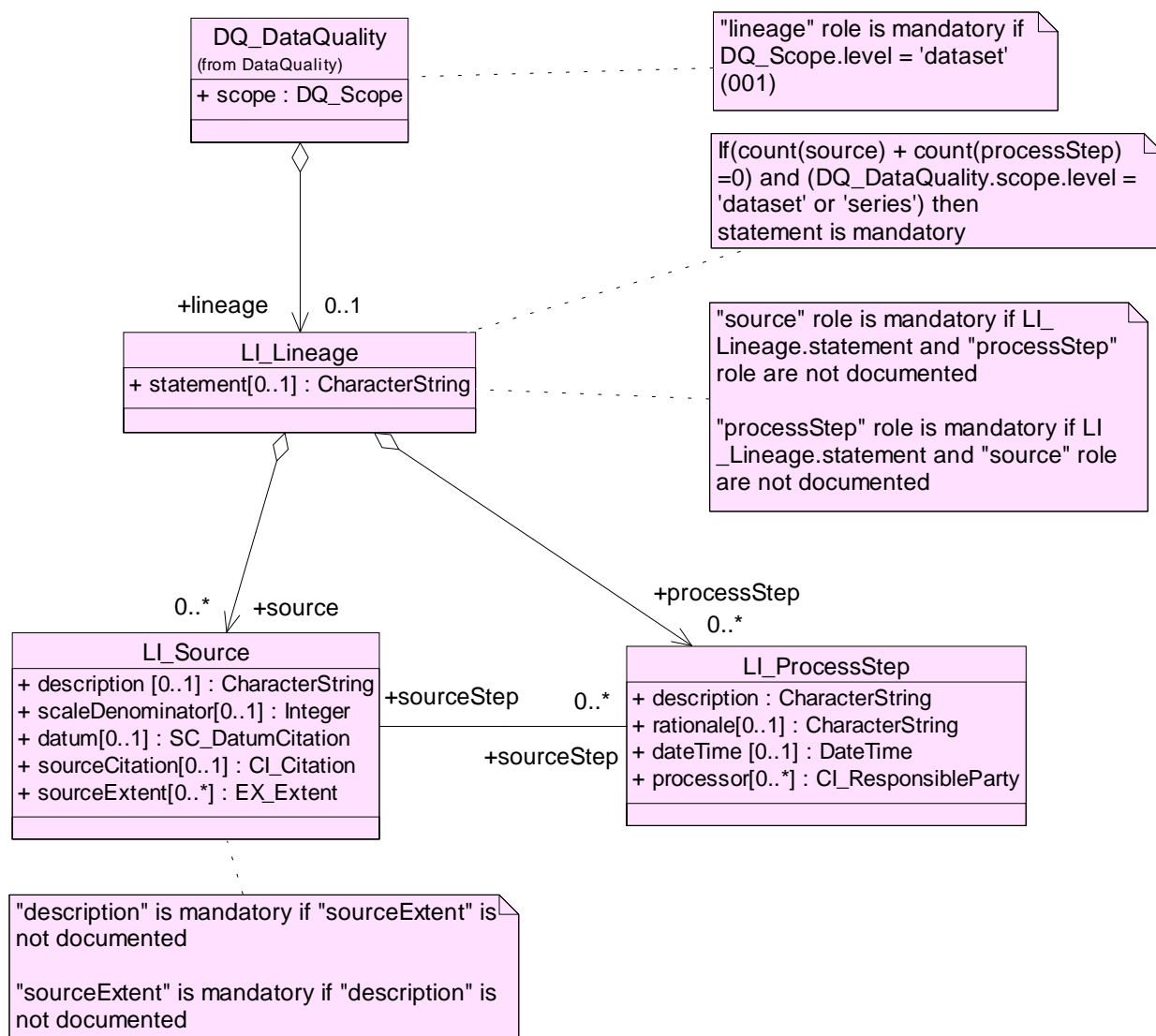
Figure A.5 — Lineage information

Figure A.6 defines the codelists used in the data quality diagram. Codelists are defined in B.6.
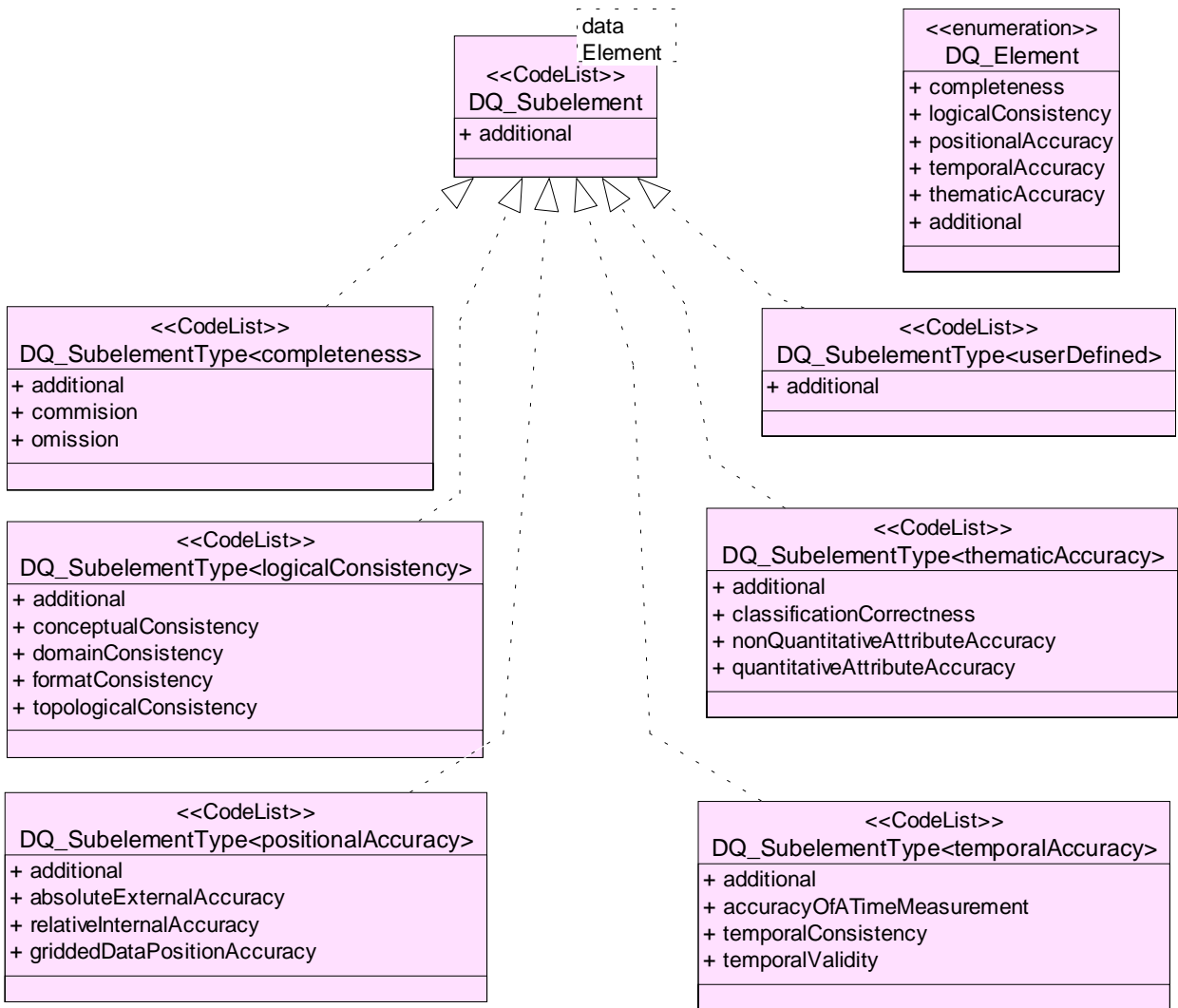
Figure A.6 — Data quality codelists

A.2.4 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.2.4.
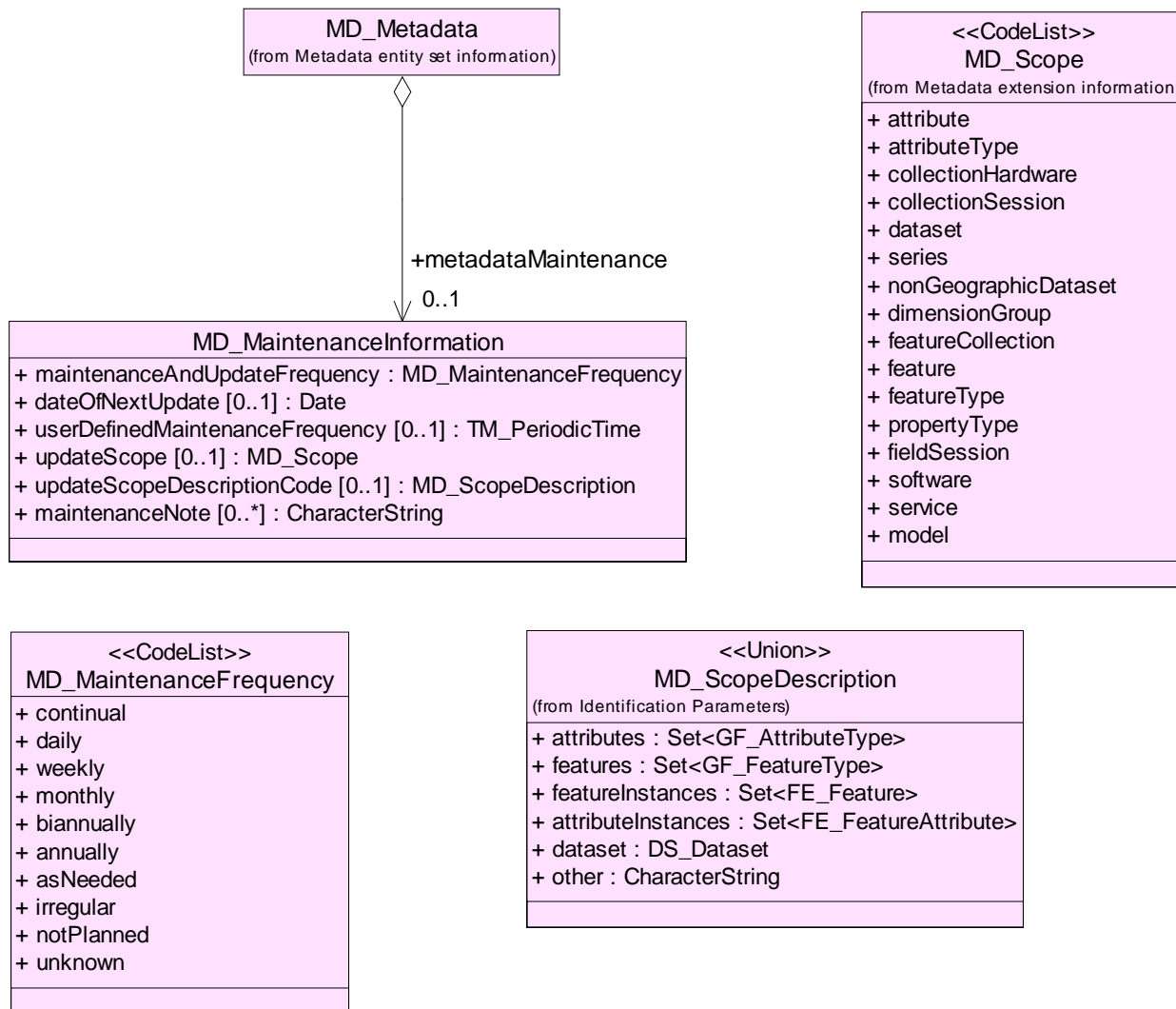
Figure A.7 — Maintenance information

A.2.5 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.2.5.
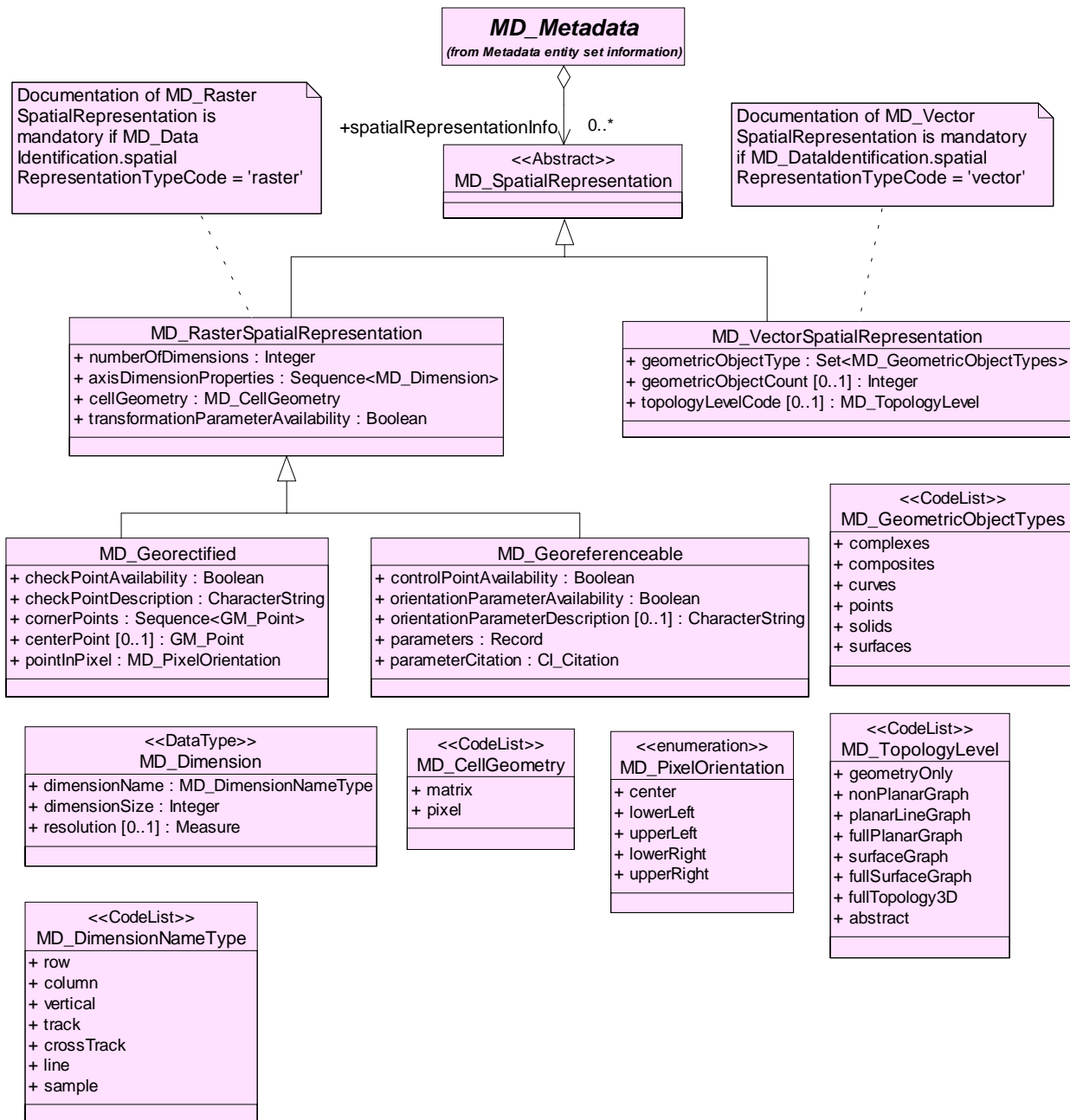
Figure A.8 — Spatial representation information

A.2.6 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.2.6.
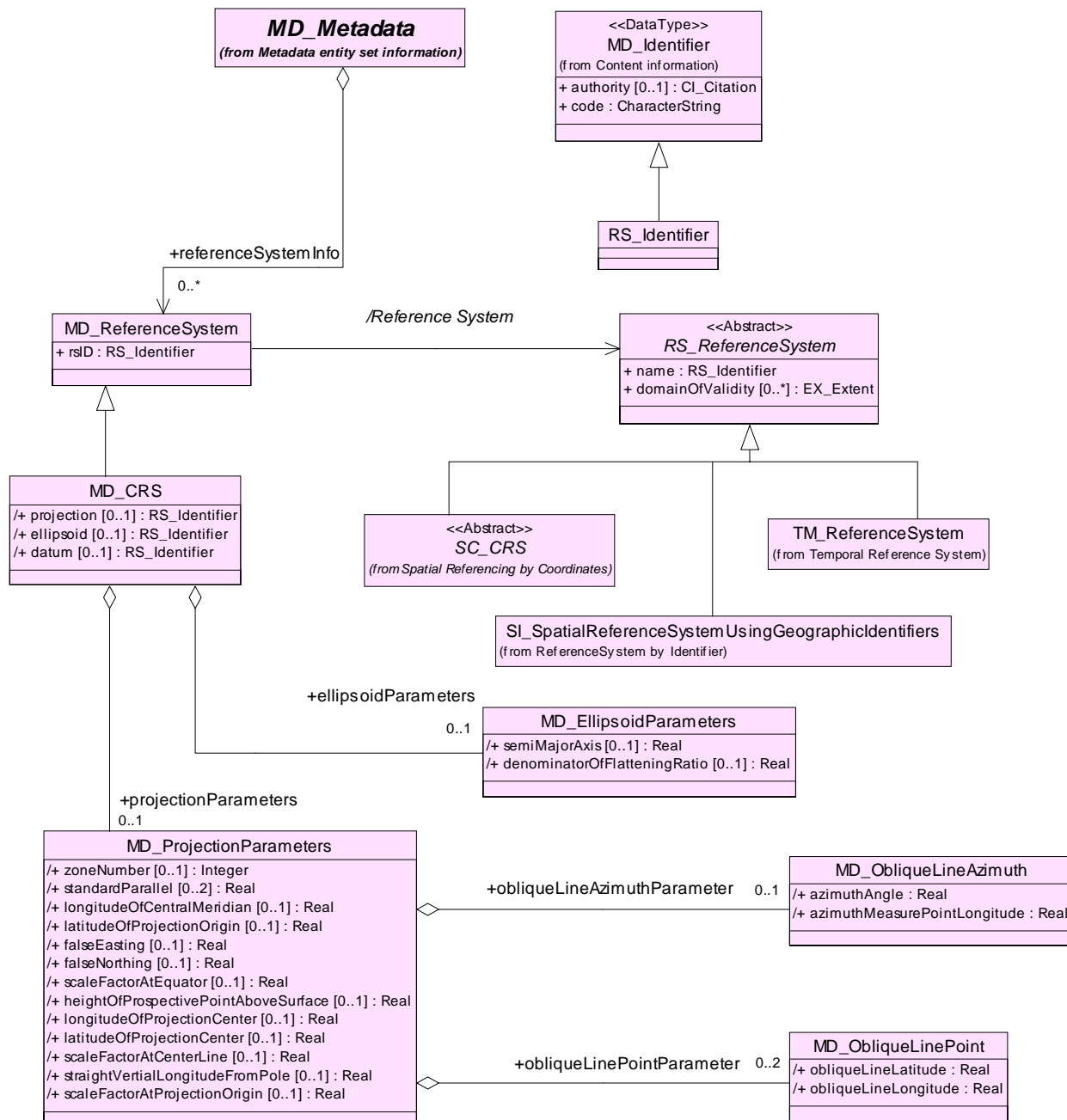
Figure A.9 — Reference system information

A.2.7 Content information

Figure A.10 defines metadata about the content of a raster cell and the feature catalogue(s) used to define features. The data dictionary for this diagram is located in B.2.7.
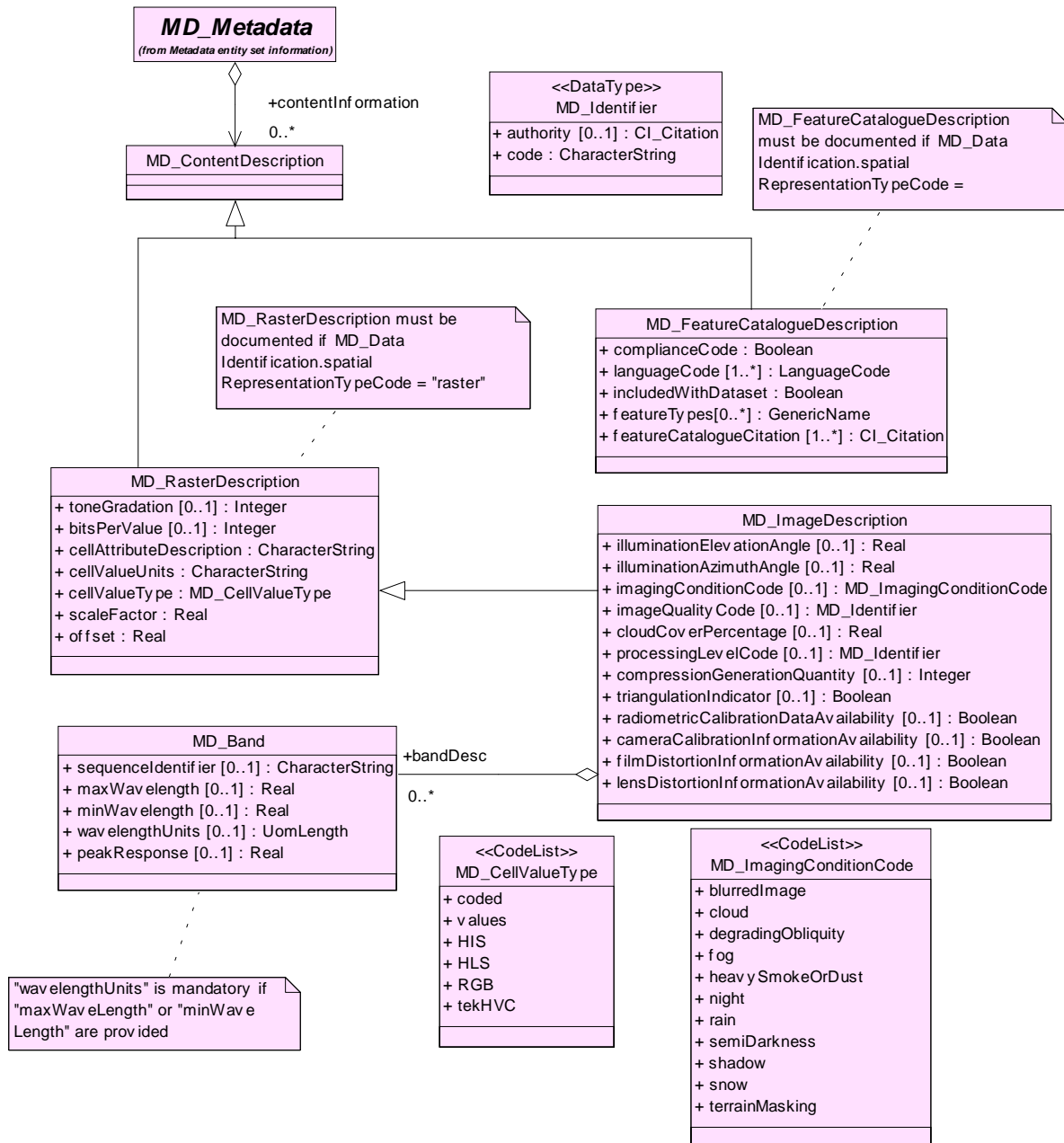
Figure A.10 — Content information

A.2.8 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.2.8.
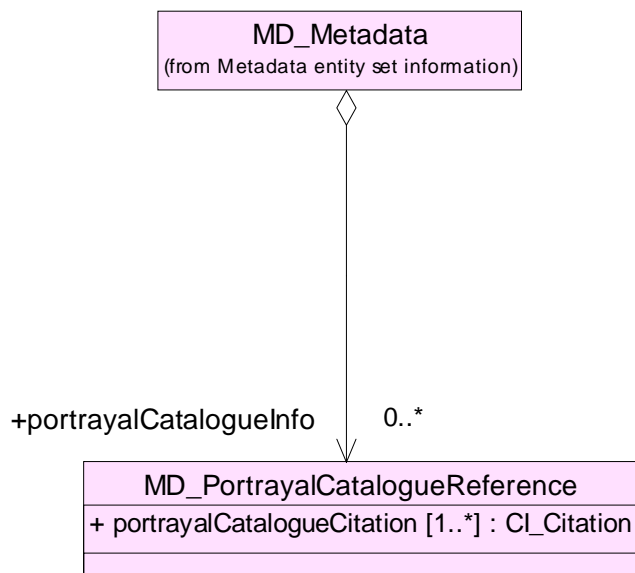
Figure A.11 — Portrayal catalogue information

A.2.9 Distribution information

Figure A.12 defines metadata required for accessing a resource. The data dictionary for this diagram is located in B.2.9.
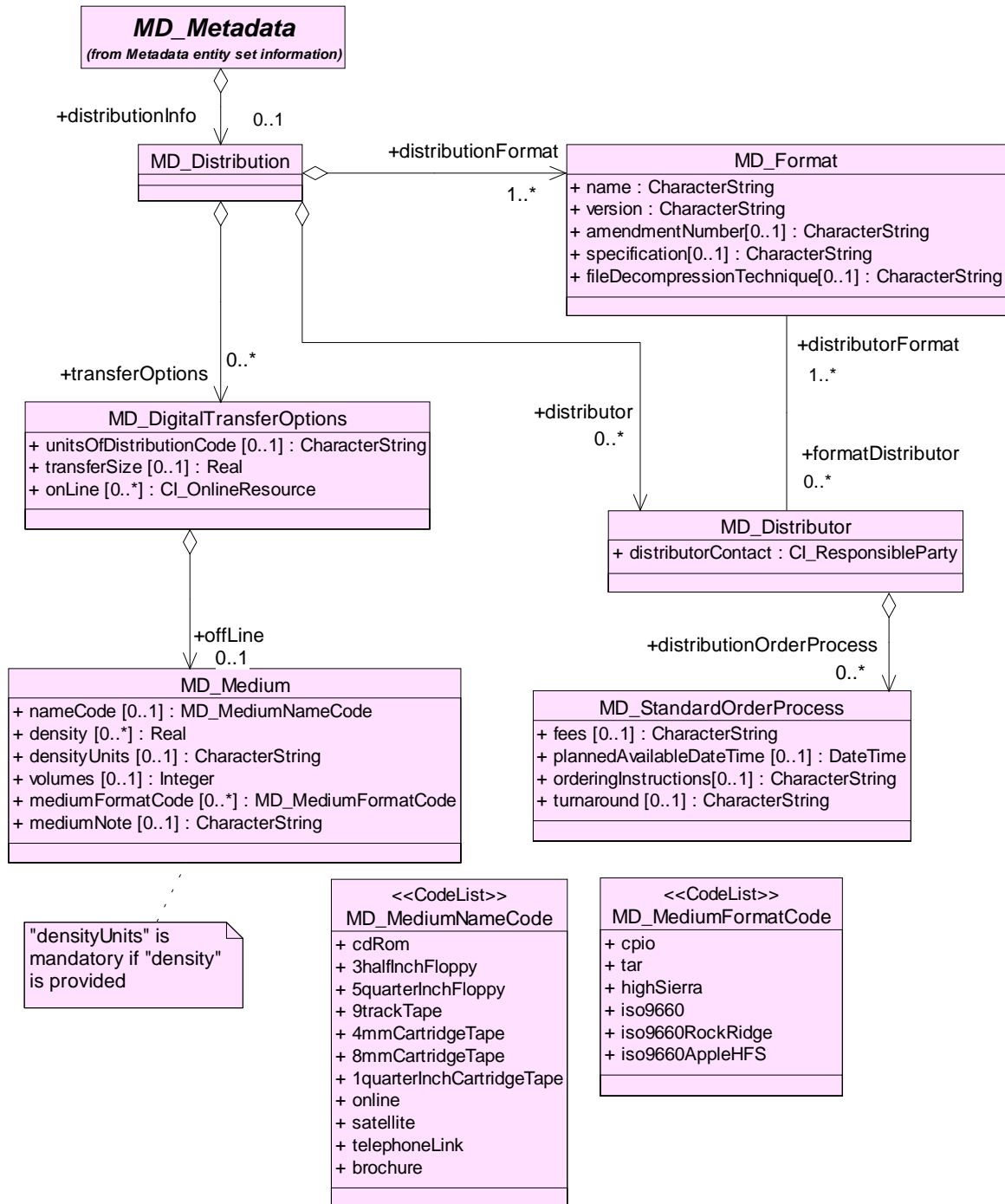
Figure A.12 — Distribution information

A.2.10   Metadata extension information

Figure A.13 defines the extended metadata elements. The data dictionary for this diagram is located in B.2.10.
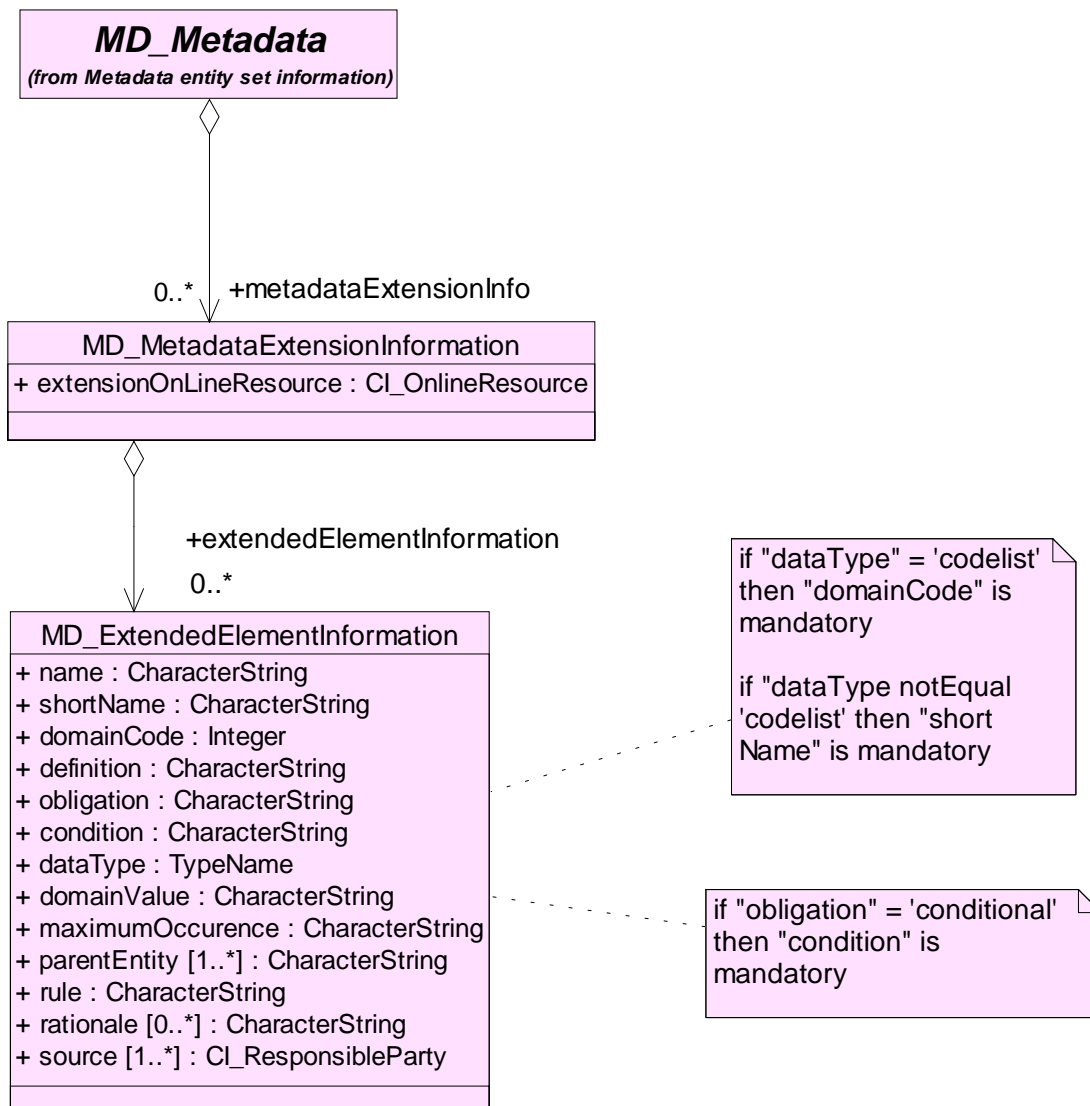
Figure A.13 — Metadata extension information

A.2.11   Application schema information

Figure A.14 defines the application schema used. The data dictionary for this diagram is located in B.2.11.
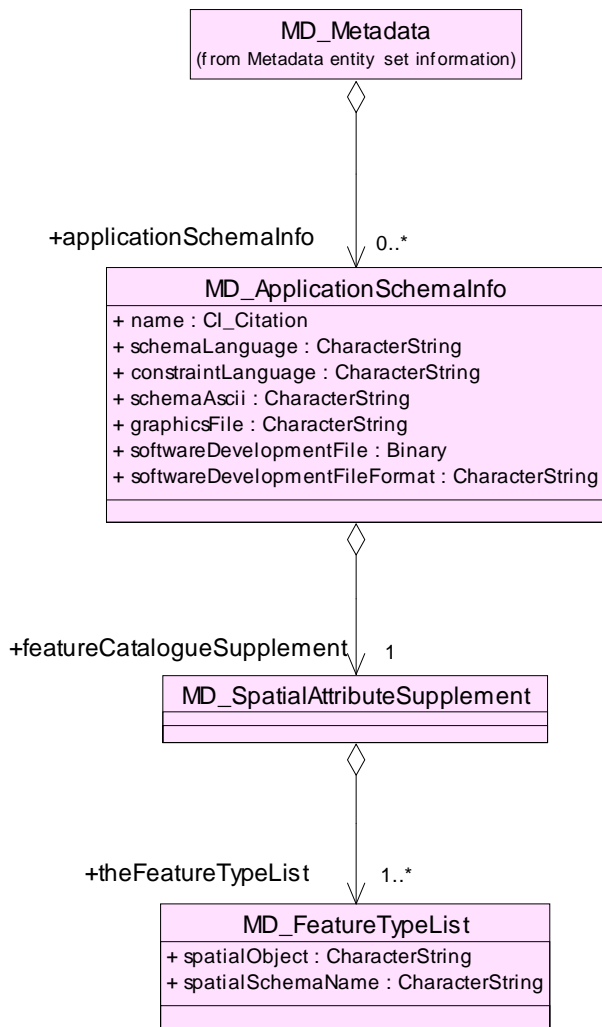
Figure A.14 — Application schema information

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.
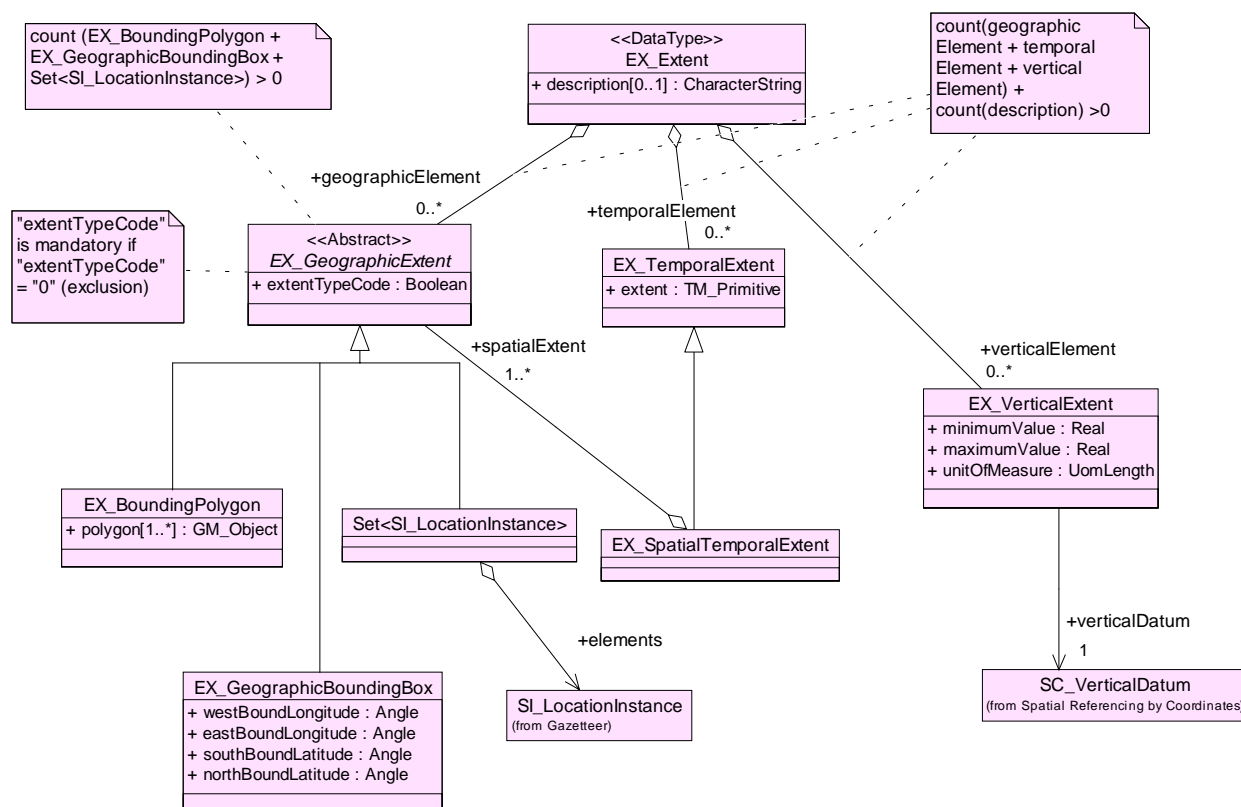
Figure A.15 — Extent information

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.
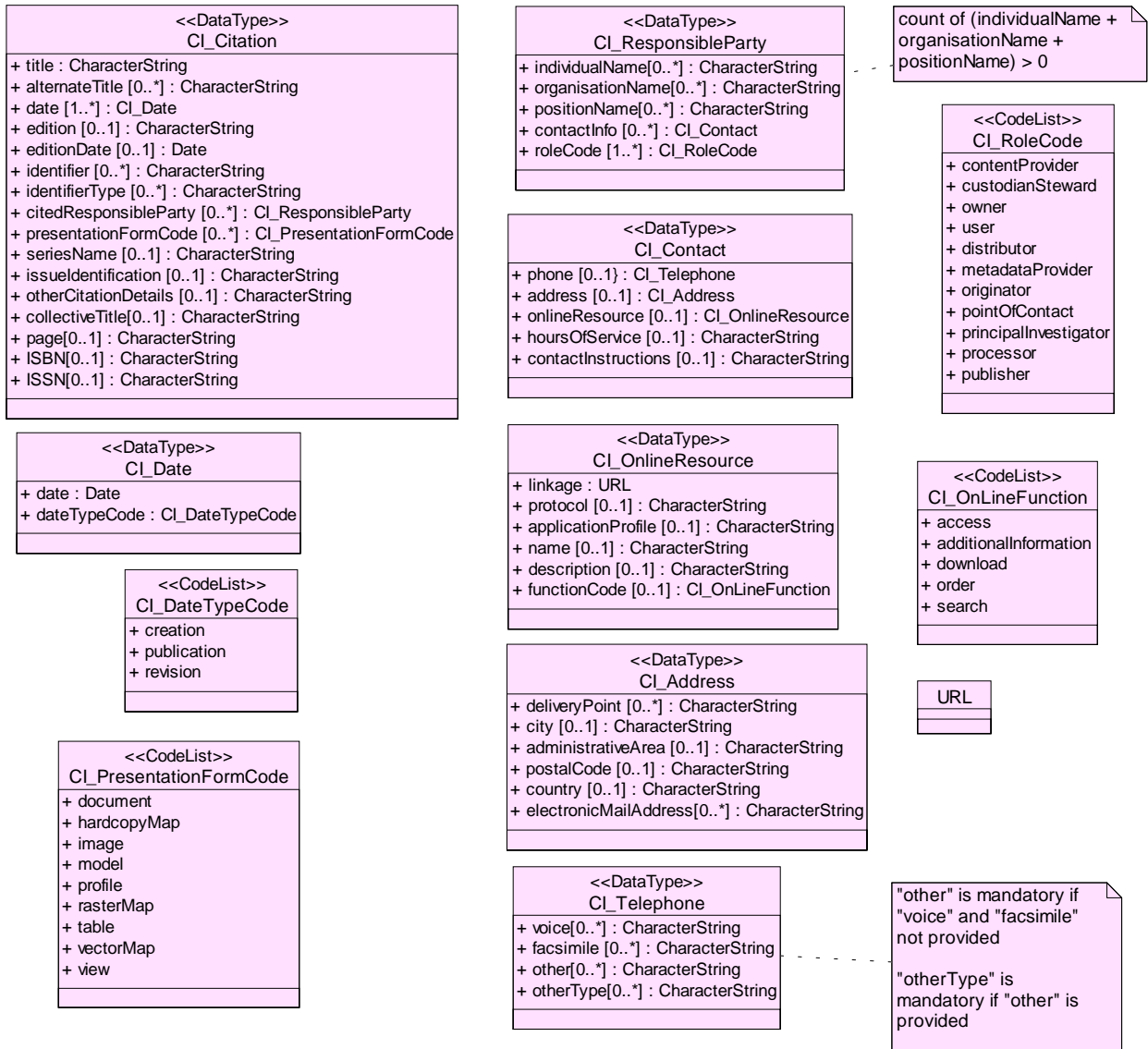
Figure A.16 — Citation and responsible party information

Annex B
(normative)

Metadata for geographic data data-dictionary

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 categorized 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, as well as figure 3, 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 eight 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 geographic 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. Entity names start with an upper case letter. Spaces do not appear in a class name. Instead, multiple words are concatenated, with each new sub-word starting with a capital letter (example: XnnnYmmm). Role names are used to identify metadata abstract model associations. Element names are unique within an entity, not the entire dictionary. Entity names are unique within the entire dictionary.

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 the 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, with the addition that short names are case sensitive. NOTE: Implementation using SGML and XML is not mandatory; other implementation methods may be accommodated. For domain selections that are incorporated in 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. Each selection has a numerical code, the row identifying the name of the CodeList or Enumeration contains an alphabetical short name.

B.1.4 Definition

The metadata entity/element description.

B.1.5 Obligation / Condition

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

B.1.5.1 Mandatory (M):

The metadata entity or metadata element shall be documented.

B.1.5.2 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 out of the three following possibilities:

— Expressing a choice between two or more options. At least one possible option or more 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 6 "C/ hierarchyLevelCode is not equal to 'dataset'?). However, the code shall be used to verify the condition in an electronical user-interface.

If the answer to the condition is positive, then the metadata entity or the metadata element shall be mandatory. The condition identifies also the metadata entity identifier or the metadata element identifier and the allowed value where appropriate, upon which the condition is formulated.

B.1.5.3 Optional (O):

The metadata entity or the metadata element may be documented or not 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".

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 19118, *Geographic information — Encoding*, subclause 8.2.2.

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 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	M	1	Class	Lines 2-28
2.	fileIdentifier	mdFileID	unique identifier for this metadata file	O	1	CharacterString	Free text
3.	languageCode	mdLangCode	language used for documenting metadata	C / not defined by encoding?	1	Class	LanguageCode <<CodeList>> (ISO 639)
4.	characterSetCode	mdCharCode	full name of the ISO character coding standard used for the metadata set	C / ISO 10646-2 not used and not defined by encoding	1	Class	MD_CharacterSetCode <<CodeList>> (B 6.16)
5.	parentIdentifier	mdParentID	unique identifier of the metadata to which this metadata is a subset (child)	O	1	CharacterString	Free text
6.	hierarchyLevelCode	mdHrLvCode	scope to which the metadata applies (see annex H for more information about metadata hierarchy levels)	C/ hierarchyLevelCode is not equal to "dataset"?	1	Class	MD_Scope <<CodeList>> (B.6.28)
7.	hierarchyLevelName	mdHrLvName	name of the hierarchy level	C/ hierarchyLevelCode is not equal to "dataset"?	1	CharacterString	Free text
8.	contact	mdContact	party responsible for the metadata information	M	1	Class	CI_ResponsibleParty (B.3.2) <<DataType>>
9.	timeStamp	mdTimeSt	date that the metadata was created	M	1	Date	ISO 19108
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
12.	*Role name:* spatialRepresentationInfo	spatRepInfo	digital mechanism used to represent spatial information in the dataset	O	N	Association	MD_SpatialRepresentation (B.2.5)
13.	*Role name:* referenceSystemInfo	refSysInfo	description of the spatial and temporal reference systems used in the dataset	O	N	Association	MD_ReferenceSystem (B.2.6)
14.	*Role name:* metadataExtensionInfo	mdExtInfo	information describing metadata extensions	O	N	Association	MD_MetadataExtensionInformation (B.2.10)
15.	*Role name:* identificationInfo	idInfo	basic information about the resource to which the metadata applies	M	N	Association	MD_Identification (B.2.1)
16.	*Role name:* contentInfo	contInfo	provides information about a catalogue which defines and describes the feature types, functions, attributes, and relationships, occurring in a set of geographic data	O	N	Association	MD_ContentDescription (B.2.7)
17.	*Role name:* distributionInfo	distInfo	provides information about the distributor of and options for obtaining the resource	O	1	Association	MD_Distribution (B.2.9)

18.	*Role name:* dataQualityInfo	dqInfo	provides overall assessment of quality of a resource	O	N	Association	DQ_DataQuality (B 2.3) (ISO 19113)
19.	*Role name:* portrayalCatalogueInfo	porCatInfo	provides information about the catalogue of rules defined for the portrayal of a resource	O	N	Association	MD_PortrayalCatalogueReference (B 2.8)
20.	*Role name:* metadataConstraints	mdConst	provides restrictions on the access and use of data	O	N	Association	MD_Constraints (B 2.2)
21.	*Role name:* applicationSchemaInfo	appSchInfo	provides information about the conceptual schema of a dataset	O	N	Association	MD_ApplicationSchemaInfo (B 2.11)
22.	*Role name:* metadataMaintenance	mdMaint	provides information about the frequency of metadata updates, and the scope of those updates	O	1	Association	MD_MaintenanceInformation (B 2.4)

Metadata application roles

- UML model shown in Figure 4.

- The roles described in the following table describe metadata applications. Metadata can exist about them, and is not composed of them.

23.	*Role name:* applies	applies	a collection of geographic data to which metadata applies	M	N	Association	DS_Dataset (B 4.1)
24.	*Role name:* propertyType	propType	metadata is associated with the property of a feature	O	N	Association	GF_PropertyType (B.5)
25.	*Role name:* featureType	featType	metadata is associated with feature types	O	N	Association	GF_FeatureType (B.5)
26.	*Role name:* featureAttribute	featAtt	metadata is associated with the characteristic(s) of a feature	O	N	Association	FE_FeatureAttribute (B.5)
27.	*Role name:* feature	feat	metadata is associated with an abstraction of real world phenomena	O	N	Association	FE_Feature (B.5)
28.	*Role name:* aggregateDataset	aggDS	metadata is associated with multiple datasets	M	N	Association	DS_Aggregate (B.4)

B.2.1 Identification information (includes data and service identification)

- UML model shown in Figure A.2

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
29.	*MD_Identification*	Ident	basic information required to uniquely identify a resource	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Metadata) <<Abstract>>	Lines 30-41
30.	citation	idCitation	citation data for the resource	M	1	Class	CI_Citation (B 3.2) <<DataType>>
31.	abstract	idAbs	brief narrative summary of the content of the resource	M	1	CharacterString	Free text
32.	purpose	idPurp	summary of the intentions with which the resource was developed	O	1	CharacterString	Free text
33.	credit	idCredit	recognition of those who contributed to the resource	O	1	CharacterString	Free text
34.	statusCode	idStatCode	status of resource	O	N	Class	MD_ProgressCode <<CodeList>> (B.6.26)
35.	pointOfContact	idPoC	identification of, and means of communication with, person(s) and organisations(s) associated with the dataset	O	N	Class	CI_ResponsibleParty (B.3.2) <<DataType>>
36.	*Role name:* resourceMaintenance	resMaint	provides information about the scope and frequency of updating	O	N	Association	MD_MaintenanceInformation (B 2.4)
37.	*Role name:* graphicOverview	graphOver	provides a graphic that illustrates the resource (should include a legend for the graphic)	O	N	Association	MD_BrowseGraphic (B 2.1.1)
38.	*Role name:* resourceFormat	dsFormat	provides a description of the format of the resource to be distributed	O	N	Association	MD_Format (B 2.9.3)
39.	*Role name:* descriptiveKeywords	descKeys	provides category keywords, their type, and reference source	O	N	Association	MD_Keywords (B 2.1.2)
40.	*Role name:* resourceSpecificUsage	idSpecUse	provides basic information about specific application(s) for which the resource has been or is being used by different users	O	N	Association	MD_Usage (B 2.1.6)
41.	*Role name:* resourceConstraints	resConst	provides information about constraints which the resource must fall under	O	N	Association	MD_Constraints (B 2.2)

42.	MD_DataIdentification	dataIdent	information required to identify a dataset		Use maximum occurrence from referencing object	Specified Class (MD_Identification)	Lines 43-55
43.	spatialRepresentationTypeCode	spatRpType	method used to spatially represent geographic information	O	N	Class	MD_SpatialRepresentationType <<enumeration>> (B.6.29)
44.	scale	datScale	factor which provides a general understanding of the density of spatial data in the dataset	O	N	Class	MD_Resolution (B.2.5.1)
45.	languageCode	datLangCode	language(s) used within the resource	M	N	Class	LanguageCode <<CodeList>> (ISO 639)
46.	characterSetCode	datCharCode	full name of the ISO character coding standard used for the resource	C/ISO 10646-2 not used?	1	Class	MD_CharacterSetCode <<CodeList>> (B 6.16)
47.	topicCategoryCode	tpCatCode	main theme(s) of the resource	M	N	Class	MD_TopicCategoryCode <<CodeList>> (B.6.30)
48.	geographicBox	geoBox	minimum bounding rectangle within which data is available	C / if hierarchyLevelCode equals "dataset", count of geographicBox and geographicDescription > 0	N	Class	EX_GeographicBoundingBox (B.3.1.1)
49.	geographicDescription	geoDesc	description of the geographic area within which data is available	C / if hierarchyLevelCode equals "dataset", count of geographicBox and geographicDescription > 0	N	Class	SI_LocationInstance (B.5)
50.	environmentDescription	envirDesc	description of the resource in the producer's processing environment, including items such as the included software, the computer operating system, file name, and the dataset size	O	1	CharacterString	Free text
51.	extent	datExt	additional extent information including the bounding polygon, vertical, and temporal extent of the dataset	O	N	Class	EX_Extent <<DataType>> (B.3.1)
52.	supplementalInformation	suppInfo	other descriptive information about the resource Example: Data Model	O	1	CharacterString	Free text
53.	passSequenceIdentifier	passSeqID	number that uniquely identifies the pass performed by a platform	O	N	Integer	Integer
54.	imageOrbitalIdentifier	imagOrbID	unique identifier for the orbital path of a platform and the row along an orbital path of a platform	O	N	CharacterString	Free text
55.	orbitNumber	orbNum	number of the orbit in which the image was taken	O	N	Integer	Integer

56.	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	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (MD_Identification)	Lines 57-59
57.	serviceType	serType	a service type name from a registry of service. Example, "OGC" may be the namespace and "catalogue" may be the identifier	M	1	Class	DistinguishedName (B.5)
58.	typeProperties	typeProps	queriable attributes for this service type. Standardised in a service type registry	M	1	Sequence	ServiceTypeProperty (B.5)
59.	*role name:* invocationInformation	invInfo	identifying procedure for carrying out a service function	O	N	Class	SV_Invocation (B.2.1.2)

B.2.1.1   Browse graphic information

60.	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 61-63
61.	fileName	bgFileName	name of the file that contains a graphic that provides an illustration of the dataset	M	1	CharacterString	Free text
62.	fileDescription	bgFileDesc	text description of the illustration	O	1	CharacterString	Free text
63.	fileType	bgFileType	graphic file type of a related graphic file Examples: CGM, EPS, GIF, JPEG, PBM, PS, TIFF, XWD	O	1	CharacterString	Free text

B.2.1.2   Service invocation information

64.	SV_InvocationInformation	Invoc	information about a request / procedure call to trigger an operation	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_ServiceIdentification)	Line 65
65.	invocationDescription	invDesc	description of a request / procedure call to trigger an operation	M	1	CharacterString	Free text

B.2.1.3 Keyword information

66.	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 67-69
67.	keyword	keyword	commonly used formalised word(s) or phrase(s) used to describe the subject	M	N	CharacterString	Free text
68.	typeCode	keyTypCode	subject matter used to group similar keywords	O	1	Class	MD_KeywordType <<CodeList>> (B.6.21)
69.	thesaurusName	thesaName	name of the formally registered thesaurus or a similar authoritative source of keywords	O	1	CharacterString	Free text

B.2.1.4 Representative fraction information

70.	MD_RepresentativeFraction	RepFract	derived from Scale where MD_RepresentativeFraction.denominator = 1 / Scale.measure And Scale.targetUnits = Scale.sourceUnits	Use obligation from referencing object	Use maximum occurrence from referencing object	Class	Lines 71-72
71.	denominator	rfDenom	the number below the line in a vulgar fraction	M	1	Class	Number (B.5)
72.	*Role name: /Scale*	derScale	role indicating that MD_RepresentativeFraction is derived from Scale	M	1	Class	Scale

B.2.1.5 Scale information

73.	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 74-75
74.	equivalentScale	equScale	level of detail expressed as the scale of a comparable hardcopy map or chart	M	1	Class	MD_RepresentativeFraction (B.2.1.4)
75.	distance	scaleDist	ground sample distance	M	1	Class	Distance (B.5)

B.2.1.6   Usage information

76.	MD_Usage	Usage	brief description of ways in which the resource is currently used	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Identification)	Lines 77-80
77.	specificUsage	specUsage	brief description of the resource and/or resource series usage	M	1	CharacterString	Free text
78.	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.5)
79.	userDeterminedLimitations	usrDetLim	applications, determined by the user for which the resource and/or resource series is not suitable	O	1	CharacterString	Free text
80.	userContactInfo	usrCntInfo	identification of means of communicating with person(s) and organisation(s) using the resource and/or resource series	M	N	Class	CI_ResponsibleParty <<DataType>> (B.3.2)

B.2.2 Resource constraint information (includes legal and security)

- UML model shown in A.2.2

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
81.	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 82
82.	useLimitation	useLimit	any limitation affecting the fitness for use of the resource Example, "not to be used for navigation"	O	N	CharacterString	Free text
83.	MD_LegalConstraints	LegConsts	restrictions and legal prerequisites for accessing and using the resource	O	N	Specified Class (MD_Constraints)	Lines 84-86
84.	propertyRightsCode	prpRtsCode	access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on obtaining the resource	O	N	Class	MD_Restrictions <<CodeList>> (B.6.27)

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
85.	useConstraintsCode	useConsts	constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations or warnings on using the resource	O	N	Class	MD_Restrictions <<CodeList>> (B.6.27)
86.	otherConstraints	othConsts	other restrictions and legal prerequisites for accessing and using the resource	O	N	CharacterString	Free text
87.	MD_SecurityConstraints	SecConsts	handling restrictions imposed on the resource for national security or similar security concerns	O	Use maximum occurrence from referencing object	Specified Class (MD_Constraints)	Lines 88-9179
88.	classificationCode	classCode	name of the handling restrictions on the resource	M	1	Class	MD_Classification <<CodeList>> (B.6.17)
89.	userNote	userNote	additional information about the classification	O	1	CharacterString	Free text
90.	classificationSystem	classSys	name of the classification system	O	1	CharacterString	Free text
91.	handlingDescription	handDesc	additional information about the restrictions on handling the resource	O	1	CharacterString	Free text

B.2.3 Data quality information

• UML model shown in Figures A.4, A.5 (Lineage) and A.6 (CodeLists)'

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
92.	DQ_DataQuality	DatQual	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 93-97
93.	scope	dqScope	the specific data to which the data quality information applies	M	1	Class	DQ_Scope <<DataType>> (B.2.3.7)
94.	*Role name:* overviewElement	dqOverEle	non-quantitative quality information for the data specified by the scope's additional data quality overview element(s)	O	N	Association	DQ_OverviewElement (B.2.3.5)
95.	*Role name:* report	dqReport	quantitative quality information for the data specified by the scope's applicable data quality elements and data quality subelements	C / Required if DQ_Scope.level = "dataset"	N	Association	DQ_ElementSubelement (B 2.3.4)

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
96.	*Role name:* lineage	datLineage	non-quantitative quality information for the data specified by the scope's 'lineage' data quality overview element	C / DQ_Scope.level = "dataset"	1	Association	LI_Lineage (B 2.3.1)
97.	*Role name:* usage	resUsage	brief description of ways in which the resource has been or is currently being used	C / DQ_Scope.level = "dataset"	N	Association	MD_Usage (B 2.1.6)

B.2.3.1   Lineage information

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
98.	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 98-101
99.	statement	statement	explanation of the lack of a data producer's knowledge about the lineage of a dataset	C / Required if DQ_DataQuality.scope.level = "dataset" or "series" and source and processStep are not provided	1	CharacterString	Free text
100.	*Role name:* source	datSource	information about the source data used in creating the data specified by the scope	C / Required if statement and processStep are not provided	N	Association	LI_Source (B.2.3.1.2)
101.	*Role name:* processStep	prcStep	information about an event in the creation process for the data specified by the scope	C / Required if statement and source are not provided	N	Association	LI_ProcessStep (B.2.3.1.1)

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B.2.3.1.1   Process step information

102.	LI_ProcessStep	PrcessStep	information about an event in the creation process for the data specified by the scope	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (LI_Lineage)	Lines 103-106
103.	description	stepDesc	description of the events including related parameters or tolerances	M	1	CharacterString	Free Text
104.	rationale	stepRat	requirement or purpose for the process step	O	1	CharacterString	Free Text
105.	dateTime	stepDateTm	date and time or range of date and time on or over which the process step occurred	O	1	Class	DateTime (B.5)
106.	processor	stepProc	identification of, and means of communication with, person(s) and organisation(s) associated with the process step	O	N	Class	CI_ResponsibleParty <<DataType>> (B.3.2)

B.2.3.1.2   Source information

107.	LI_Source	Source	information about an event in the creation process for the data specified by the scope	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (LI_Lineage)	Lines 108-113
108.	description	srcDesc	detailed description of the level of the source data	C / Required if sourceExtent is not provided	1	CharacterString	Free Text
109.	scaleDenominator	srcScale	denominator of the representative fraction on a source map	O	1	Integer	Integer > 0
110.	datum	srcDatum	spatial reference system used by the source data	O	1	Class	MD_ReferenceSystem (B.2.6)
111.	sourceCitation	srcCitatn	recommend reference to be used for the source data	O	1	Class	CI_Citation <<DataType>> (B.3.2)
112.	sourceExtent	srcExt	information about the spatial, vertical and temporal extent of the source data	C / Required if description is not provided	N	Class	EX_Extent <<DataType>> (B.3.1)
113.	*Role name:* sourceStep	srcStep	information about an event in the creation process for the source data	O	N	Association	LI_ProcessStep (B.2.3.1.1)

B.2.3.2 Additional information

114.	DQ_AdditionalInformation	AddInfo	information describing an additional item (data quality overview element, data quality element or data quality subelement)	Use obligation from referencing object	Use maximum occurrence from referencing object	Class	Lines 115-116
115.	name	addName	name given by the data producer to the additional item	M	1	CharacterString	Free text
116.	description	addDesc	Definition given by the data producer to the additional item	M	1	CharacterString	Free text

B.2.3.3 Data quality measure information

117.	DQ_DataQualityMeasure	DQMeasure	type of test applied to the data specified by a data quality scope	Use obligation from referencing object	Use maximum occurrence from referencing object	Class	Lines 118-123
118.	nameOfMeasure	measName	name of the test applied to the data	O	1	CharacterString	Free text
119.	domainOfMeasure	measDom	value type or unit for reporting a data quality result	O	1	Class	TypeName (B.5)
120.	description	measDesc	description of the measure being determined	O	1	CharacterString	Free text
121.	evaluationProcedure	evalProc	reference to the procedure information	O	1	Class	CI_Citation <<DataType>> (B 3.2)
122.	dateTime	measDateTm	date or range of dates on which a data quality measure was applied	O	1	Class	DateTime (B.5)
123.	result	measResult	value (or set of values) resulting from applying a data quality measure or the out come of evaluating the obtained value (or set of values) against a specified acceptable quality level	M	2	Class	DQ_Result <<DataType>> (B.2.3.6)

B.2.3.4   Element and subelement information

124.	DQ_ElementSubelement	EleSubEle	quantitative quality information for the data specified by the scope's applicable data quality elements and data quality subelements	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (DQ_DataQuality)	Lines 125-129
125.	elementTypeCode	eleTypCode	component of quantitative quality identified by the data producer as applicable to the data specified by the scope	M	1	Class	DQ_ElementType <<enumeration>> (B.6.5)
126.	subelementTypeCode	subEleCode	an aspect of elementTypeCode further identified by the data producer as applicable to the data specified by the scope	M	1	Class	DQ_SubelementType<elementTypeCode> <<CodeList>> (B.6.6-11)
127.	*Role Name:* additionalElement	addEle	information describing an additional data quality element	C / Required if elementTypeCode = "additional"	1	Class	DQ_AdditionalInformation (B.2.3.2)
128.	*Role Name:* additionalSubelement	addSubEle	information describing an additional data quality subelement	C / Required if subelementTypeCode = "additional"	1	Class	DQ_AdditionalInformation (B.2.3.2)
129.	*Role Name:* dataQualityResult	dqResult	quantitative quality information for the scope's data quality subelement, including quality evaluation procedures and quality result	M	1	Class	DQ_DataQualityMeasure (B.2.3.3)

B.2.3.5   Overview element information

130.	DQ_OverviewElement	OverEle	non-quantitative quality information for the data specified by the scope's additional data quality overview element(s) that are not named in ISO 19113	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (DQ_DataQuality)	Lines 131-132
131.	information	oeInfo	the quality information for the data specified by the scope's additional data quality overview element	M	1	CharacterString	Free text
132.	*Role name:* additionalOverviewElement	addOE	information describing an additional data quality overview element	M	1	CharacterString	DQ_AdditionalInformation (B.2.3.2)

B.2.3.6   Result information

133.	DQ_Result	Result	generalisation of more specific result classes	Use obligation from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	
134.	DQ_ConformanceResult	ConResult	conformance quality information for the data being evaluated with this measure	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Result)	Lines 135-137
135.	specification	conSpec	citation of product specification or user requirement against which is being evaluated	M	1	Class	CI_Citation <<DataType>> (B.3.2)
136.	explanation	conExpl	explanation of the meaning of conformance for this result	M	1	CharacterString	Free text
137.	pass	conPass	the conformance result where 0 = fail and 1 = pass	M	1	Boolean	(0, 1)
138.	DQ_QuantitativeResult	QuanResult	quantitative quality information for the data being evaluated with this measure	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DQ_Result)	Lines 139-140
139.	valueDomain	quanValDom	quantitative conformance quality level value or range of values	O	1	Class	RecordType <<DataType>> (B.5)
140.	result	quanRes	quantitative result or results, content determined by the evaluation procedure used	M	N	Class	Record <<DataType>> (B.5)

B.2.3.7   Scope information

141.	DQ_Scope	DQScope	description of the data specified by the scope	Use obligation from referencing object	Use maximum occurrence from referencing object	Class <<Datatype>>	Lines 142-144
142.	level	scpLvl	hierarchical level of the data specified by the scope	M	1	Class	MD_Scope <<CodeList>> (B.6.28)

				Obligation / Condition	Maximum occurrence	Data type	Domain
143.	extent	scpExt	information about the spatial, vertical and temporal extent of the data specified by the scope	O	1	Class	EX_Extent <<DataType>> (B.3.1)
144.	levelDescription	scpLvlDesc	detailed description about the level of the data specified by the scope	C / Required if level • "dataset" or "series"	N	Class	MD_ScopeDescription <<Union>> (B.2.4.1)

B.2.4 Maintenance information

- UML model shown in Figure A.7

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
145.	MD_MaintenanceInformation	MaintInfo	information about the scope and frequency of updating	Use obligation from referencing object	Use maximum occurrence from referencing object	Class	Lines 146-151
146.	maintenanceAndUpdateFrequencyCode	maintCode	frequency with which changes and additions are made to the resource after the initial resource is completed	M	1	Class	MD_MaintenanceFrequency <<CodeList>> (B.6.22)
147.	dateOfNextUpdate	dateNext	scheduled revision date for resource	O	1	Class	Date (B.5)
148.	userDefinedMaintenanceFrequency	usrDefFreq	maintenance period other than those defined	O	1	Class	TM_Period (B.5)
149.	updateScope	maintScp	scope at which maintenance is applied	O	1	Class	MD_Scope <<CodeList>> (B.6.28)
150.	updateScopeDescription	upScpDesc	additional information about the range or extent of the resource	O	1	Class	MD_ScopeDescription <<Union>> (B.2.4.1)
151.	maintenanceNote	maintNote	Information regarding specific requirements for maintaining the resource	O	N	CharacterString	Free text

B.2.4.1   Scope description information

152.	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 153-158
153.	attributes	attribSet	attributes to which the information applies	M	1	Set	GF_AttributeType (B.5)
154.	features	featSet	features to which the information applies	M	1	Set	GF_FeatureType (B.5)
155.	featureInstances	featIntSet	feature instances to which the information applies	M	1	Set	FE_Feature (B.5)
156.	attributeInstances	attribIntSet	attribute instances to which the information applies	M	1	Set	FE_FeatureAttribute (B.5)
157.	dataset	datasetSet	dataset to which the information applies	M	1	Class	DS_Dataset (B.4.1)
158.	other	other	class of information that does not fall into the other categories	M	1	CharacterString	Free text

B.2.5 Spatial representation information (includes raster and vector representation)

- UML model shown in Figure A.8

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
159.	MD_SpatialRepresentation	SpatRep	digital mechanism used to represent spatial information	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<Abstract>>	
160.	MD_RasterSpatialRepresentation	RastSpatRep	information about raster spatial objects in the dataset	C / MD_DataIdentification.spatialRepresentationTypeCode equals "raster"?	Use maximum occurrence from referencing object	Specified Class (MD_SpatialRepresentation)	Lines 161-164
161.	numberOfDimensions	numDims	number of independent axes	M	1	Integer	Integer
162.	axisDimensionsProperties	axDimProps	axis properties	M	1	Sequence	MD_Dimension <<DataType>> (B.2.5.1)
163.	cellGeometry	cellGeo	identification of raster data as pixel or matrix	M	1	Class	MD_CellGeometry <<CodeList>> (B.6.14)
164.	transformationParameterAvailability	tranParaAv	code which indicates whether or not transformation algorithm exists	M	1	Boolean	Boolean

165.	MD_Georectified	Georect	raster 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 raster can be geolocated given its raster coordinate and the raster origin, cell spacing, and orientation	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified (MD_RasterSpatialRepresentation)	Lines 166-172
166.	checkPointAvailability	chkPtAv	code which indicates whether or not geographic position are available to test the accuracy of the georeferenced raster data	M	1	Boolean	Boolean
167.	checkPointDescription	chkPtDesc	description of geographic position points used to test the accuracy of the georeferenced raster data	M	1	CharacterString	Free text
168.	cornerPoints	cornerPts	both the earth location in the coordinate system defined by SRS and the raster coordinate of the cells at opposite ends of raster coverage along two diagonals in the raster spatial dimensions. There are four corner points in a georectified raster, at least two corner points along one diagonals are required	M	1	Sequence	GM_Point <<DataType>> (B.5)
169.	centerPoint	centerPt	both the earth location in the coordinate system defined by SRS and the raster coordinate of the cell halfway between opposite ends of raster in the spatial dimensions	O	1	Class	GM_Point <<DataType>> (B.5)
170.	pointInPixel	ptInPixel	point in a pixel corresponding to the earth location of the pixel	M	1	Class	MD_PixelOrientation <<Enumeration>> (B.6.25)
171.	transformationDimensionDescription	transDimDesc	description of the information on which raster dimensions are the spatial dimensions	O	1	CharacterString	Free text
172.	transformationDimensionMapping	transDimMap	information on which raster dimensions are the spatial dimensions	O	2	Integer	Integer
173.	MD_Georeferenceable	Georef	Raster with cells irregularly spaced in any given geographic/map projection coordinate systems whose individual cells can be geolocated using geolocation information supplied with the data but cannot be geolocated from the raster properties alone	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (MD_RasterSpatialRepresentation)	Lines 174-178
174.	controlPointAvailability	ctrlPtAv	code which indicates whether or not a control point exists	M	1	Boolean	Boolean
175.	orientationParameterAvailability	orieParaAv	code which indicates whether or not interior and exterior parameters used to orient a sensor are available	M	1	Boolean	Boolean
176.	orientationParameterDescription	orieParaDs	description of the interior and exterior parameters used to orient a sensor	O	1	CharacterString	Free text

177.	parameters	georefPars	terms which support raster data georeferencing	M	1	Class	Record (B.5)
178.	parameterCitation	paraCit	reference providing description of the parameters				CI_Citation <<DataType>> (B.3.2)
179.	MD_VectorSpatialRepresentation	VectSpatRep	information about the vector spatial objects in the dataset	C / MD_DataIdentification.SpatialRepresentationTypeCode equals "vector"?	Use maximum occurrence from referencing object	Specified Class (MD_SpatialRepresentation)	Lines 180-182
180.	geometricObjectTypeCode	geometTypCde	name of point and vector spatial objects used to locate zero-, one-, and two-dimensional spatial locations in the dataset	M	1	Set	MD_GeometricObjectTypes <<CodeList>> (B.6.19)
181.	geometricObjectCount	geometObjCnt	total number of the point or vector object type occurring in the dataset	O	1	Integer	> 0
182.	topologyLevelCode	topLvlCode	code which identifies the degree of complexity of the spatial relationships	O	1	Class	MD_TopologyLevel <<CodeList>> (B.6.31)

B.2.5.1   Dimension information

183.	MD_Dimension	Dimen	axis properties	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 184-186
184.	dimensionName	dimName	name of the axis	M	1	Class	MD_DimensionNameType <<CodeList>> (B.6.18)
185.	dimensionSize	dimSize	number of elements along the axis	M	1	Integer	Integer
186.	resolution	dimResol	degree of detail visible in an image	O	1	Class	Measure (B.5)

B.2.6 Reference system information (includes temporal, coordinate and using geographic identifiers)

- UML model shown in Figure A.9

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
187.	MD_ReferenceSystem	RefSystem	information about the reference system.	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class	Lines 188-189
188.	rsID	refSysID	name of reference system	M	1	Class	RS_Identifier (B.2.6.2)
189.	*role name: /Reference System*	derRefSys	relationship indicating that MD_ReferenceSystem (as well as its attributes and aggregates) is derived from RS_ReferenceSystem	M	1	Derived Association	RS_ReferenceSystem (B.2.6)
190.	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	Class	Lines 191-195
191.	projection	projection	identity of the projection used	O	1	Class	RS_Identifier (B.2.6.2)
192.	ellipsoid	ellipsoid	identity of the ellipsoid used	O	1	Class	RS_Identifier (B.2.6.2)
193.	datum	datum	Identity of the datum used	O	1	Class	RS_Identifier (B.2.6.2)
194.	*role name:* ellipsoidParameters	ellParas	set of parameters that describe the ellipsoid	O	1	Association	MD_EllipsoidParameters (B.2.6.1)
195.	*role name:* projectionParameters	projParas	set of parameters that describe the projection	O	1	Association	MD_ProjectionParameters (B.2.6.5)
196.	*RS_ReferenceSystem*	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 197-198
197.	name	refSysName	name of reference system used	M	1	Class	RS_Identifier (B.2.6.2)
198.	domainOfValidity	domOValid	range which is valid for the reference system	O	N	Class	EX_Extent <<DataType>> (B 3.1)
199.	TM_ReferenceSystem	TMRefSys	documented in ISO 19108 – Temporal schema	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (RS_ReferenceSystem)	

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
200.	SI_SpatialReferenceSystemUsingGeographicIdentifiers	SIRefSys	documented in ISO 19112 – Spatial referencing by geographic identifiers	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (RS_ReferenceSystem)	
201.	*SC_CRS*	SCRefSys	documented in ISO 19111 – Spatial reference by coordinates	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (RS_ReferenceSystem) <<Abstract>>	

B.2.6.1   Ellipsoid parameter information

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
202.	MD_EllipsoidParameters	EllParas	set of parameters that describe the ellipsoid	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class	Lines 203-204
203.	semiMajorAxis	semiMajAx	radius of the equatorial axis of the ellipsoid	O	1	Real	> 0,0
204.	denominatorOfFlatteningRatio	denFlatRat	denominator of the ratio of the difference between the equatorial and polar radii of the ellipsoid when the numerator is set to 1	O	1	Real	> 0,0

B.2.6.2   Identifier information

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
205.	MD_Identifier	MdIdent	class providing the unique coded value 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	CI_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 | Class | |

B.2.6.3 Oblique line azimuth information

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	Class	Lines 210-211
210.	azimuthAngle	aziAngle	angle measured clockwise from north, and expressed in degrees	M	1	Real	Real
211.	azimuthMeasurePointLongitude	aziPtLong	longitude of the map projection origin	M	1	Real	Real

B.2.6.4 Oblique line point information

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	Class	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.2.6.5 Projection parameter information

215.	MD_ProjectionParameters	ProjParas	set of parameters that describe the projection	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class	Lines 215-230
216.	zoneNumber	zoneNum	unique identifier for 100,000 metre grid zone	O	1	Integer	Integer
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	>= -180,0 and <= 180,0
219.	latitudeOfProjectionOrigin	latProjOri	latitude chosen as the origin of rectangular coordinates for a map projection	O	1	Real	>= -90,0 and <= 90,0
220.	falseEasting	falEastng	the 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	falNorthng	the 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.	scaleFactorAtEquator	sclFacEqu	multiplier for reducing a distance obtained from a map by computation or scaling to the actual distance along the equator	O	1	Real	> 0,0
223.	heightOfProspectivePointAboveSurface	hgtProsPt	height of viewpoint above the earth, expressed in metres	O	1	Real	>0,0
224.	longitudeOfProjectionCenter	longProjCnt	longitude of the point of projection for azimuthal projections	O	1	Real	>= -180,0 and <= 180,0
225.	latitudeOfProjectionCenter	latProjCnt	latitude of the point of projection for azimuthal projections	O	1	Real	>= -90,0 and <= 90,0
226.	scaleFactorAtCenterLine	sclFacCnt	multiplier for reducing a distance obtained from a map by computation or scaling to the actual distance along the centre line	O	1	Real	Real
227.	straightVerticalLongitudeFromPole	stVrLongPl	longitude to be orientated straight up from the North or South Pole	O	1	Real	Real
228.	scaleFactorAtProjectionOrigin	sclFacPrOr	multiplier for reducing a distance obtained from a map by computation or scaling tot he actual distance at the projection origin	O	1	Real	Real

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
229.	*role name:* obliqueLineAzimuthParameter	obLnAziPars	parameters describing the oblique line azimuth	O	1	Association	MD_ObliqueLineAzimuth (B.2.6.3)
230.	*role name:* obliqueLinePointParameter	obLnPtPars	parameters describing the oblique line point	O	2	Association	MD_ObliqueLinePoint (B.2.6.4)

B.2.7 Content information (includes Feature catalogue and Raster descriptions)

- UML model shown in Figure A.10

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
231.	MD_ContentDescription	ContDesc	Description of the content of a dataset	O	N	Class	
232.	MD_FeatureCatalogueDescription	FetCatDesc	information identifying the feature catalogue	C / MD_DataIdentification.spatialRepresentationType = "vector"?	Use maximum occurrence from referencing object	Specified Class (MD_ContentDescription)	Lines 233-237
233.	complianceCode	compCode	indicates whether or not the cited feature catalogue complies with ISO 19110	M	1	Boolean	0-not compliant 1-compliant
234.	languageCode	catLangCode	language(s) used within the catalogue	M	N	Class	LanguageCode <<CodeList>> (ISO 639)
235.	includedWithDataset	incWithDS	indicates whether or not the feature catalogue is included with the dataset	M	1	Boolean	0=no 1=yes
236.	featureTypes	catFetTyps	subset of feature types from cited feature catalogue occurring in dataset	O	N	Class	GenericName (B.5)
237.	featureCatalogueCitation	catCitation	complete bibliographic reference to one or more external feature catalogues	M	N	Class	CI_Citation <<DataType>> (B.3.2)
238.	MD_RasterDescription	RasDesc	information about the content of a raster data cell	C / MD_DataIdentification.spatialRepresentationTypeCode = "raster"?	Use maximum occurrence from referencing object	Specified Class (MD_ContentDescription)	Lines 239-245
239.	toneGradation	toneGrad	number of colours present in the image	O	1	Integer	Integer
240.	bitsPerValue	bitsPerVal	maximum number of significant bits for the value in each band of each pixel without compression	O	1	Integer	Integer
241.	cellAttributeDescription	cellAttDesc	description of the attribute described by the measurement value	M	1	CharacterString	Free text
242.	cellValueUnits	cellUnit	units of the cell attribute	M	1	CharacterString	Free text

243.	cellValueType	cellValTyp	type of information represented by the cell value	M	1	Class	MD_CellValueType <<CodeList>> (B.6.15)
244.	scaleFactor	sclFac	scale factor which has been applied to the cell value	M	1	Real	Real
245.	offset	offset	delta applied to the cell value	M	1	Real	Real
246.	MD_ImageDescription	ImgDesc	information about an image's suitability for use	O	Use maximum occurrence from referencing object	Specified Class (MD_RasterDescription)	Lines 248-259
247.	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	0,00 – 90
248.	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
249.	imagingConditionCode	imagCond	code which indicates conditions which affect the quality of the image	O	1	Class	MD_ImagingConditionCode <<CodeList>> (B.6.20)
250.	imageQualityCode	imagQuCode	specifies the image quality	O	1	Class	MD_Identifier (B.2.6.2)
251.	cloudCoverPercentage	cloudCovPer	area of the dataset obscured by clouds, expressed as a percentage of the spatial extent	O	1	Real	0,0 – 100,0
252.	processingLevelCode	prcTypCde	image distributor's code that identifies the level of radiometric and geometric processing that has been applied "	O	1	Class	MD_Identifier (B.2.6.2)
253.	compressionGenerationQuantity	cmpGenQuan	counts the number of lossy compression cycles performed on the image	O	1	Integer	Integer
254.	triangulationIndicator	trianInd	code which indicates whether or not triangulation has been performed upon the image	O	1	Boolean	0-no 1-yes
255.	radiometricCalibrationDataAvailability	radCalDatAv	code which indicates whether or not the radiometric calibration information for generating the radiometrically-calibrated standard data product is available	O	1	Boolean	0-no 1-yes
256.	cameraCalibrationInformationAvailability	camCalInAv	code which indicates whether or not constants are available which allow for camera calibration corrections	O	1	Boolean	0-no 1-yes
257.	filmDistortionInformationAvailability	filmDistInAv	code which indicates whether or not Calibration Reseau information is available	O	1	Boolean	0-no 1-yes

258.	lensDistortionInformationAvailability	lensDistInAv	code which indicates whether or not lens aberration correction information is available	O	1	Boolean	0-no 1-yes
259.	bandDescription	bandDesc	describes the band(s) used in an image	O	N	Association	MD_Band (B.2.7.1)

B.2.7.1   Band information

260.	MD_Band	Band	set of adjacent wavelengths in the electro-magnetic spectrum with a common characteristic, such as the visible band	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_ImageDescription)	Lines 261-265
261.	sequenceIdentifier	bandSeqID	number that uniquely identifies instances of bands of wavelengths on which a sensor operates	O	1	CharacterString	Free text
262.	maxWavelength	mxWavlen	highest wavelength that the sensor is capable of collecting within a designated band	O	1	Real	Real
263.	minWavelength	mnWavlen	lowest wavelength that the sensor is capable of collecting within a designated band	O	1	Real	Real
264.	wavelengthUnits	wavlenUnit	units in which sensor wavelengths are expressed	C / minWavelength and/or maxWavelength provided?	1	Class	UomLength <<DataType>> (B.5)
265.	peakResponse	pkResp	wavelength at which the response is the highest	O	1	Real	Real

B.2.8 Portrayal catalogue information

- UML model shown in Figure A.11

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
266.	MD_PortrayalCatalogueReference	PortCatRef	information identifying the portrayal catalogue used	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class	Line 267
267.	portrayalCatalogueCitation	portCatCit	bibliographic reference to the portrayal catalogue cited	M	N	Class	CI_Citation <<DataType>> (B.3.2)

B.2.9 Distribution information

- UML model shown in Figure A.12

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
268.	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	Class	Lines 268-271
269.	*Role name:* distributionFormat	distFormat	provides a description of the format of the data to be distributed	M	N	Association	MD_Format (B.2.9.3)
270.	*Role name:* distributor	distributor	provides information about the distributor	O	N	Association	MD_Distributor (B.2.9.2)
271.	*Role name:* transferOptions	distTranOps	provides information about technical means and media by which a resource is obtained from the distributor	O	N	Association	MD_DigitalTransferOptions (B.2.9.1)

B.2.9.1   Digital transfer options information

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
272.	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)	Lines 273-276
273.	unitsOfDistribution	unitsODist	tiles, layers, geographic areas, etc., in which data is available	O	1	CharacterString	Free text
274.	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
275.	onLine	onLine	information about online sources from which the resource can be obtained	O	N	Class	CI_OnLineResource <<DataType>>
276.	*Role name:* offLine	offLineRes	information about offline sources from which the resource can be obtained	O	1	Association	MD_Medium (B 2.9.4)

B.2.9.2 Distribution information

277.	MD_Distributor	Distributor	information about the distributor	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Distribution)	Lines 278-281
278.	distributorContact	distCont	party from whom the resource may be obtained. This list need not be exhaustive	M	1	Class	CI_ResponsibleParty <<DataType>> (B.3.2)
279.	*Role name:* distributionOrderProcess	distOrdProc	provides information about how the resource may be obtained, and related instructions and fee information	O	N	Association	MD_StandardOrderProcess (B.2.9.5)
280.	*Role name:* distributorFormat	distorFormat	Provides information about the format in which the resource may be obtained	M	N	Association	MD_Format (B.2.9.3)

B.2.9.3 Format information

281.	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)	Lines 283-288
282.	name	formatName	name of the data transfer format(s)	M	1	CharacterString	Free text
283.	version	formatVer	version number of the format	M	1	CharacterString	Free text
284.	amendmentNumber	formatAmdNum	amendment number of the format version	O	1	CharacterString	Free text
285.	specification	formatSpec	name of a subset, profile, or product specification of the format	O	1	CharacterString	Free text
286.	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
287.	*Role name:* formatDistributor	formatDist	provides information about the distributor's format	O	N	Association	MD_Distributor (B.2.9.2)

B.2.9.4 Medium information

288.	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	Aggregated Class (MD_DigitalTransferOptions)	Lines 290-295
289.	nameCode	medNameCode	name of the medium on which the resource can be received	O	1	Class	MD_MediumNameCode <<CodeList>> (B.6.24)
290.	density	medDensity	density at which the data is recorded	O	N	Real	> 0,0
291.	densityUnits	medDenUnits	units of measure for the recording density	C / is density given?	1	CharacterString	Free text
292.	volumes	medVol	number of items in the media identified	O	1	Integer	Integer
293.	mediumFormatCode	medFormat	method used to write to the medium	O	N	Class	MD_MediumFormatCode <<CodeList>> (B.6.23)
294.	mediumNote	medNote	description of other limitations or requirements for using the medium	O	1	CharacterString	Free text

B.2.9.5 Standard order process information

295.	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 297-300
296.	fees	resFees	fees and terms for retrieving the resource. Include monetary units	O	1	CharacterString	Free text
297.	plannedAvailableDateTime	planAvDtTm	date and time when the dataset will be available	O	1	Class	DateTime (B.5)
298.	orderingInstructions	ordInstr	general instructions , terms and services provided by the distributor	O	1	CharacterString	Free text
299.	turnaround	ordTurn	typical turnaround time for the filling of an order	O	1	CharacterString	Free text

B.2.10　Metadata extension information

- UML model shown in Figure A.13

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
300.	MD_MetadataExtensionInformation	MdExtInfo	information describing metadata extensions	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Metadata)	Lines 301-302
301.	extensionOnLineResource	extOnRes	information about on-line sources containing the community profile name and the extended metadata elements. Information for all new metadata elements	M	1	Class	CI_OnLineResource <<DataType>> (B.3.2.4)
302.	*Role name:* 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_ExtendedElementInformation (B.2.10.1)

B.2.10.1　Extended element information

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
303.	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_MetadataExtensionInformation)	Lines 304-316
304.	name	extEleName	name of the extended metadata element. NOTE: Do not duplicate any other Standard element name	M	1	CharacterString	Free text
305.	shortName	extShortName	short form suitable for use in an implementation method, such as XML or SGML. NOTE: other methods may be used	C / is dataType not "codeList"	1	CharacterString	Free text
306.	domainCode	extDomCode	three digit code assigned to the extended element	C / is dataType "codeList"?	1	Integer	Integer
307.	definition	extEleDef	definition of the extended element	M	1	CharacterString	Free text
308.	obligation	extEleOb	obligation of the extended element	M	1	CharacterString	Mandatory, Optional or Conditional
309.	condition	extEleCond	condition of the extended element	C / is obligation = "Conditional"?	1	CharacterString	Free text
310.	dataType	eleDatType	code which identifies the kind of value provided in the extended element	M	1	Class	TypeName (B.5)

311.	domainValue	extEleDomVal	valid values that can be assigned to the extended element	M	1	CharacterString	Free text
312.	maximumOccurrence	extEleMxOc	maximum occurrence of the extended element	M	1	CharacterString	N or any integer
313.	parentEntity	extEleParEnt	full name of the metadata entity(s) under which this extended metadata element may appear. The name(s) may be standard or other extended metadata element(s). (Must be the name of an existing standard or extended element)	M	N	CharacterString	Free text
314.	rule	extEleRule	specifies how the extended element relates to other existing elements and entities	M	1	CharacterString	Free text
315.	rationale	extEleRat	reason for creating the extended element	O	N	CharacterString	Free text
316.	source	extEleSrc	name of the person or organisation creating the extended element	M	N	Class	CI_ResponsibleParty <<DataType>> (B.3.2)

B.2.11 Application schema information

- UML model shown in Figure A.14

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
317.	MD_ApplicationSchemaInfo	AppSchInfo	information about the application schema used to build the dataset	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class	Lines 318-325
318.	name	asName	name of the application schema used	M	1	Class	CI_Citation <<DataType>> (B.3.2)
319.	schemaLanguage	asSchLang	identification of the schema language used	M	1	CharacterString	Free text
320.	constraintLanguage	asCstLang	formal language used in Application Schema	M	1	CharacterString	Free text
321.	schemaAscii	asAscii	full application schema given as an ASCII file	M	1	CharacterString	Free text
322.	graphicsFile	asGraFile	full application schema given as a graphics file	M	1	CharacterString	Free text
323.	softwareDevelopmentFile	asSwDevFile	full application schema given as a software development file	M	1	Binary	Binary
324.	softwareDevelopmentFileFormat	asSwDevFiFt	software dependent format used for the application schema software dependent file	M	1	CharacterString	Free text

325.	*Role name:* featureCatalogueSupplement	featCatSup	information about the spatial attributes in the application schema for the feature types	M	1	Association	MD_SpatialAttributeSupplement (B.2.11.2)

B.2.11.1 Feature type list information

326.	MD_FeatureTypeList	FeatTypList	list of names of feature types with the same spatial representation (same as spatial attributes)	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_SpatialAttributeSupplement)	Lines 327-328
327.	spatialObject	spatObj	instance of a type defined in the spatial schema	M	1	CharacterString	Free text
328.	spatialSchemaName	spatSchName	name of the spatial schema used	M	1	CharacterString	Free text

B.2.11.2 Spatial attribute supplement information

329.	MD_SpatialAttributeSupplement	SpatAttSup	spatial attributes in the application schema for the feature types	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_ApplicationSchemaInfo)	Line 330
330.	*Role name:* theFeatureTypeList	featTypeList	provides information about the list of feature types with the same spatial representation	M	N	Association	MD_FeatureTypeList (B.2.11.1)

B.3 Data type information

B.3.1 Extent information

- UML model shown in Figure A.15

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
331.	EX_Extent	Extent	information about spatial, vertical, and temporal extent	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 332-335
332.	description	exDesc	spatial and temporal extent for the referring object	C / count (description + geographicElement + temporalElement + verticalElement) > 0	1	CharacterString	Free text
333.	*Role name:* geographicElement	geoEle	provides geographic component of the extent of the referring object	C / count (description + geographicElement + temporalElement + verticalElement) > 0	N	Association	EX_GeographicExtent <<Abstract>> (B.3.1.1)
334.	*Role name:* temporalElement	tempEle	provides temporal component of the extent of the referring object	C / count (description + geographicElement + temporalElement + verticalElement) > 0	N	Association	EX_TemporalExtent (B.3.1.2)
335.	*Role name:* verticalElement	vertEle	provides vertical component of the extent of the referring object	C / count (description + geographicElement + temporalElement + verticalElement) > 0	N	Association	EX_VerticalExtent (B.3.1.3)

B.3.1.1 Geographic extent information

				Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (EX_Extent) <<Abstract>> Aggregated Class (EX_SpatialTemporal Extent)	Line 337
336.	*EX_GeographicExtent*	GeoExtent	geographic area of the dataset				
337.	extentTypeCode	exTypeCode	identifies whether the bounding polygon encompasses an area covered by the data or an area where data is not present	C/extentTypeCode equals "0"?	1	Boolean	0 – exclusion 1 – inclusion
338.	EX_BoundingPolygon	BoundPoly	boundary enclosing the dataset expressed as the closed set of (x,y) coordinates of the polygon (last point replicates first point)	C/EX_GeographicBounding Box or SI_LocationInstance not provided?	Use maximum occurrence from referencing object	Specified Class (EX_GeographicExten t)	Line 339
339.	polygon	polygon	sets of points in a particular coordinate reference system	M	N	GM_Object	-90 to 90 latitude -180 to 180 longitude
340.	EX_GeographicBoundingB ox	GeoBndBox	geographic area of the entire dataset referenced to WGS 84	C/EX_BoundingPolygon or SI_LocationInstance not provided?	Use maximum occurrence from referencing object	Specified Class (EX_GeographicExten t)	Lines 341-344
341.	westBoundLongitude	westBL	western-most coordinate of the limit of the dataset extent expressed in longitude, in decimal degrees	M	1	Angle	-180,0 <= West Bounding Longitude Value <= 180,0
342.	eastBoundLongitude	eastBL	eastern-most coordinate of the limit of the dataset extent expressed in longitude, in decimal degrees	M	1	Angle	-180,0 <= East Bounding Longitude Value <= 180,0
343.	southBoundLatitude	southBL	southern-most coordinate of the limit of the dataset extent expressed in latitude, in decimal degrees	M	1	Angle	-90,0 <= South Bounding Latitude Value <= 90,0; South Bounding Latitude Value <= North bounding Latitude Value
344.	northBoundLatitude	northBL	northern-most coordinate of the limit of the dataset extent expressed in latitude, in decimal degrees	M	1	Angle	-90,0 <= North Bounding Latitude Value <= 90,0; North Bounding Latitude Value >= South Bounding Latitude Value
345.	Set <SI_LocationInstance>	SetLocInst	documented in ISO 19112 – Spatial referencing by geographic identifiers	C / EX_BoundingPolygon or EX_GeographicBoundin gBox not provided?	Use maximum occurrence from referencing object	Specified Class (EX_GeographicExten t)	Line 346
346.	*Role name:* elements	elements	documented in ISO 19112 – Spatial referencing by geographic identifiers	M	1	Association	SI_LocationInstance (B.5)

B.3.1.2   Temporal extent information

347.	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 348
348.	extent	exTemp	date and time for the content of the dataset	M	1	Class	TM_Primitive (B.5) \
349.	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 350
350.	*role name:* spatialExtent	exSpat	Spatial extent component of composite spatial and temporal extent	M	N	Association	EX_GeographicExtent <<Abstract>> (B.3.1.1)

B.3.1.3   Vertical extent information

351.	EX_VerticalExtent	VertExtent	vertical domain of dataset	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (EX_Extent)	Lines 352-355
352.	minimumValue	vertMinVal	lowest vertical extent contained in the dataset	M	1	Real	Real
353.	maximumValue	vertMaxVal	highest vertical extent contained in the dataset	M	1	Real	Real
354.	unitOfMeasure	vertUoM	vertical units used for vertical extent information Examples: metres, feet, millimetres	M	1	CharacterString	UomLength (B.5)
355.	*role name:* verticalDatum	vertDatum	provides information about the origin from which the maximum and minimum elevation values are measured	M	1	Association	SC_VerticalDatum (B.5)

B.3.2 Citation and responsible party information

- UML model shown in Figure A.16

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
356.	CI_Citation	Citation	standardised resource reference	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 357-372
357.	title	resTitle	name by which the cited resource is known	M	1	CharacterString	Free text
358.	alternateTitle	resAltTitle	short name or other language name by which the cited information is known. –Example: "Digital Chart of the World" or "DCW"	O	N	CharacterString	Free text
359.	date	resRefDate	reference date for the cited resource	M	N	Class	CI_Date(B.3.2.3) <<DataType>>
360.	edition	resEd	version of the cited resource	O	1	CharacterString	Free text
361.	editionDate	resEdDate	date of the edition	O	1	Class	Date (B.5)
362.	identifier	citId	unique identifier for the data referenced by the metadata EXAMPLE: Universal Product Code (UPC), National Stock Number (NSN)	O	N	CharacterString	Free text
363.	identifierType	citIdType	reference form of the unique identifier (ID) Example: NSN, URC	O	N	CharacterString	Free text
364.	citedResponsibleParty	citRespParty	name and position information for an individual or organisation that is responsible for the resource	O	N	Class	CI_ResponsibleParty <<DataType>> (B.3.2)
365.	presentationFormCode	presFormCd	mode in which the resource is represented	O	N	Class	CI_PresentationFormCode <<CodeList>> (B.6.3)
366.	seriesName	seriesName	name of the series of which the dataset is a part	O	1	CharacterString	Free text
367.	issueIdentification	issId	information identifying the issue of the series	O	1	CharacterString	Free text
368.	otherCitationDetails	otherCitDet	other information required to complete the citation, like a URL	O	1	CharacterString	Free text
369.	collectiveTitle	collTitle	common title with holdings note	O	1	CharacterString	Free text
370.	page	artPage	details on which pages of the periodical the article was published	O	1	CharacterString	Free text
371.	ISBN	isbn	international Standard Book Number	O	1	CharacterString	Free text
372.	ISSN	issn	international Standard Serial Number	O	1	CharacterString	Free text

373.	CI_ResponsibleParty	RespParty	identification of, and means of communication with, person(s) and organisations associated with the dataset	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 374-378
374.	individualName	rpIndName	name of the responsible person-SURNAME, given name, title separated by a delimiter	C / count (individualName + organisationName + positionName) > 0	N	CharacterString	Free text
375.	organisationName	rpOrgName	name of the responsible organisation	C / count (individualName + organisationName + positionName) > 0	N	CharacterString	Free text
376.	positionName	rpPosName	role or position of the responsible person	C / count (individualName + organisationName + positionName) > 0	N	CharacterString	Free text
377.	contactInfo	rpCntInfo	address of the responsible party	O	N	Class	CI_Contact <<DataType>> (B.3.2.2)
378.	roleCode	roleCode	function performed by the responsible party	M	N	Class	CI_RoleCode <<CodeList>> (B.6.4)

B.3.2.1   Address information

379.	CI_Address	Address	location of the responsible individual or organisation	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 380-385
380.	deliveryPoint	delPoint	address line for the location (Street name, box number, suite)	O	N	CharacterString	Free text
381.	city	city	city of the location	O	1	CharacterString	Free text
382.	administrativeArea	adminArea	state, province of the location	O	1	CharacterString	Free text
383.	postalCode	postCode	ZIP or other postal code	O	1	CharacterString	Free text
384.	country	country	country of the physical address	O	1	CharacterString	ISO 3166
385.	electronicMailAddress	eMailAdd	address of the electronic mailbox of the responsible organisation or individual	O	N	CharacterString	Free text

B.3.2.2 Contact information

386.	CI_Contact	Contact	information required enabling contact with the responsible person and/or organisation	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 387-391
387.	phone	cntPhone	telephone numbers at which the organisation or individual may be contacted	O	1	Class	CI_Telephone <<DataType>> (B.3.2.5)
388.	address	cntAddress	physical and email address at which the organisation or individual may be contacted	O	1	Class	CI_Address <<DataType>> (B.3.2.1)
389.	onLineResource	cntOnlineRes	on-line information that can be used to contact the individual or organisation	O	1	Class	CI_OnLineResource <<DataType>> (B.3.2.4)
390.	hoursOfService	cntHours	time period (including time zone) when individuals can contact the organisation or individual	O	1	CharacterString	Free text
391.	contactInstructions	cntInstr	supplemental instructions on how or when to contact the individual or organisation	O	1	CharacterString	Free text

B.3.2.3 Date information

392.	CI_Date	Date	reference date and event used to describe it	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 393-394
393.	date	refDate	reference date for the cited resource	M	1	Class	Date (B.5)
394.	dateTypeCode	refDateType	event used for reference date	M	1	CharacterString	CI_DateType <<CodeList>> (B.6.1)

B.3.2.4   OnLine resource information

395.	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 396-401
396.	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)
397.	protocol	protocol	connection protocol to be used	O	1	CharacterString	Free text
398.	applicationProfile	appProfile	name of an application profile that can be used with the resource	O	1	CharacterString	Free text
399.	name	orName	name of the resource	O	1	CharacterString	Free text
400.	description	orDesc	description of what the resource is/does	O	1	CharacterString	Free text
401.	functionCode	orFunctCode	function performed by the resource	O	1	Class	CI_OnLineFunction <<CodeList>> (B.6.2)

B.3.2.5   Telephone information

402.	CI_Telephone	Telephone	telephone numbers for contacting the responsible individual or organisation	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 403-406
403.	voice	voiceNum	telephone number by which individuals can speak to the responsible organisation or individual	O	N	CharacterString	Free text
404.	facsimile	faxNum	telephone number of a facsimile machine for the responsible organisation or individual	O	N	CharacterString	Free text
405.	other	otherNum	telephone number for contacting the responsible individual or organisation	C / voice and facsimile not used?	N	CharacterString	Free text
406.	otherType	othType	description of telephone number provided in "other" phone element	C / other is documented?	N	CharacterString	Free text

B.4 Metadata application information

• UML model shown in Figure 3

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
407.	DS_Aggregate	DSAgg	identifiable collection of datasets	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<Abstract>>	Lines 408-411
408.	*Role name:* aggregateDatasetMetadata	aggDSMet	provides metadata for the associated dataset	M	N	Association	MD_Metadata (B.2)
409.	*Role name:* composedOf	compOf	aggregate dataset composed of a datasets constituent parts	M	N	Association	DS_Dataset (B.4.1)
410.	*Role name: superset*	superSet	aggregate dataset that is a superset of other aggregate datasets	O	N	Association	DS_Aggregate <<Abstract>> (B.4)
411.	*Role name: subset*	subSet	aggregate dataset that is a subset of other aggregate datasets. Describes lower level aggregations, which are contained within a superset	O	N	Association	DS_Aggregate <<Abstract>> (B.4)

B.4.1 Dataset information

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
412.	DS_Dataset	DSDataset	identifiable collection of data	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated class (DS_Aggregate), and Associated to MD_Metadata	Lines 413-414
413.	*Role name:* part of	partOf	dataset is part of an aggregate dataset	O	N	Association	DS_Aggregate <<Abstract>> (B.4)
414.	*Role name:* has	hasMeta	dataset has metadata	M	N	Association	MD_Metadata (B.2)

B.4.2 Dataset series information

415.	DS_Series	DSSer	datasets adhering to the same product specification	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (DS_Aggregate)	
416.	DS_Platform	Platform	vehicle or other support base that holds a sensor. EXAMPLE: satellite, airplane, weather station	M	Use maximum occurrence from referencing object	Specified Class (DS_Series)	
417.	DS_ProductionSeries	ProdSer	datasets derived from the same production procedures	M	Use maximum occurrence from referencing object	Specified Class (DS_Series)	
418.	DS_Sensor	Sensor	device or piece of equipment which detects and records information	M	Use maximum occurrence from referencing object	Specified Class (DS_Series)	

B.4.3 Initiative information

419.	DS_Initiative	DSInit	activity in which datasets are aggregated	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (DS_Aggregate)	Line 420
420.	initiativeTypeCode	initTypeCd	type of aggregation activities	M	1	Class	DS_InitiativeType <<CodeList>> (B.6.13)

B.4.4 Other dataset association information

421.	DS_OtherAssociation	DSOthAssoc	datasets related by other than series or initiative	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (DS_Aggregate)	Lines 422
422.	associationTypeCode	assocTypeCd	justification for the correlation of two datasets	M	1	Class	DS_AssociationTypeCode <<CodeList>> (B.6.12)
423.	DS_StereoMate	SterMate	set of imagery that when used together, provides three-dimensional images	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (DS_OtherAssociation)	Line 424
424.	imageSpatialRepresentati on	imgSpatRep	relevant data about the image stereo mate	C / MD.DataIdentification.sp atialRepresentationType Code equals "image"?	N	CharacterString	Free text

B.5 Externally referenced entities

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

B.5.1 Date and DateTime informationser

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, *Data elements and interchange formats — Information interchange — Representation of dates and times.* This class is documented in full in ISO 19103, *Geographic information — Conceptual schema language*.

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 19103, *Geographic information — Conceptual schema language*.

B.5.2 Distance, measure, number, record, recordType, scale and UoMLength information

Distance: This class is documented in full in ISO 19103, *Geographic information — Conceptual schema language*.

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 19103, *Geographic information — Conceptual schema language*.

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 19103, *Geographic information — Conceptual schema language*.

Record: This class is documented in full in ISO 19103, *Geographic information — Conceptual schema language*.

RecordType: This class is documented in full in ISO 19103, *Geographic information — Conceptual schema language*.

Scale: This class is documented in full in ISO 19103, *Geographic information — Conceptual schema language*.

UoMLength: any of the measuring systems to measure the length, distance between two entities. This class is documented in full in ISO 19103, *Geographic information — Conceptual schema language*.

B.5.3 Feature and feature attribute information

FE_Feature: abstraction of real world phenomena. Defined in full in 19109, *Geographic information — Rules for application schema*.

FE_FeatureAttribute: characteristic(s) of a feature. Defined in full in 19109, *Geographic information — Rules for application schema*.

B.5.4 Feature type, property type and feature attribute type information

GF_AttributeType: class of attribute definitions of a feature type. This class is fully documented in ISO 19109, *Geographic information — Rules for application schema*.

GF_FeatureType: textual information describing the concept of a feature type, containing all feature types. This class is documented in full in ISO 19109, *Geographic information — Rules for application schema*.

GF_PropertyType: 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, *Geographic information — Rules for application schema*.

B.5.5 Location instance information

SI_LocationInstance: represents an instance of each location type in a spatial referencing system that is recorded in a gazetteer. This class is fully documented in ISO 19112, *Geographic information — Spatial referencing by geographic identifiers.*

B.5.6 Period and primitive information

TM_Period: a one-dimensional geometric primitive that represents extent in time. Its location in time is described in terms of the temporal positions at which it begins and ends; its duration equals the temporal distance between those two temporal positions. This class is fully documented in ISO 19108, *Geographic information — Temporal schema.*

TM_Primitive: an abstract class representing a non-decomposed element of geometry or topology. This class is fully documented in ISO 19108, *Geographic information — Temporal schema.*

B.5.7 Point information

GM_Point: 0-dimensional geometric primitive, representing a position, but not having extent. This class if fully documented in ISO 19107, *Geographic information — Spatial schema.*

B.5.8 Service type property information

ServiceTypeProperty: queriable attributes for a service type. Envisioned as being standardized in a service type registry. This class is documented in full in ISO 19119, *Geographic information — Services.*

B.5.9 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 19103, *Geographic information — Conceptual schema language.*

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. In other words, a sequence can be thought of as an ordered set. This class is documented in full in ISO 19103, *Geographic information — Conceptual schema language.*

B.5.10 Type name information

DistinguishedName: a service type name from a registry of services. This class is documented in full in ISO 191119, *Geographic information — Services.*

GenericName: This class is documented in full in ISO 19103, *Geographic information — Conceptual schema language.*

TypeName: This class is documented in full in ISO 19103, *Geographic information — Conceptual schema language.*

B.5.11 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, *Geographic information — Spatial reference by coordinates.*

B.6 CodeLists and enumeration's

The stereotype classes <<CodeList>> and <<Enumeration>> are separated and 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 H for information about how to extend <CodeList>>'s.

B.6.1 CI_DateType <<CodeList>>

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

B.6.2 CI_OnLineFunction <<CodeList>>

	Name	Domain code	Definition
1.	CI_OnLineFunction	OnFunction	function performed by the resource
2.	access	001	on-line instructions providing the ability to request data from the provider
3.	additionalInformation	002	on-line instructions providing more information about the data
4.	download	003	on-line instructions providing the ability to transfer data from one storage device or system to another
5.	order	004	on-line instructions providing the ability to acquire data
6.	search	005	on-line instructions providing the ability to seek out information about a dataset

B.6.3 CI_PresentationFormCode <<CodeList>>

	Name	Domain code	Definition
1.	CI_PresentationFormCode	PresFormCode	mode in which the data is represented
2.	document	001	character or graphic that provides a record
3.	hardcopyMap	002	representation of a map which is printed on paper, photographic material, or other media and can be interpreted directly by the human user
4.	image	003	permanent record of the likeness of any natural or man-made features, objects, and activities reproduced on photographic materials. This image can be acquired through the sensing of visual or any other segment of the electromagnetic spectrum by sensors, such as thermal infrared, and high resolution radar
5.	model	004	representation in multiple dimensions
6.	profile	005	vertical cross-section
7.	rasterMap	006	presented in raster form
8.	table	007	set of geographic facts or figures systematically displayed, especially in columns
9.	vectorMap	008	presented in vector form
10.	view	009	way of looking at something

B.6.4 CI_RoleCode <<CodeList>>

	Name	Domain code	Definition
1.	CI_RoleCode	RoleCode	function performed by the responsible party
2.	contentProvider	001	party that supplies the data
3.	custodianSteward	002	party that accepts accountability and responsibility for the data and ensures appropriate care and maintenance of the data
4.	owner	003	party that owns the data
5.	user	004	party who uses the data
6.	distributor	005	partywho distributes the data
7.	metadataProvider	006	responsible party who provides information about the metadata for a dataset
8.	originator	007	responsible party who created the dataset or metadata
9.	pointOfContact	008	responsible party who can be contacted for acquiring knowledge about or acquisition of the data
10.	principalInvestigator	009	key party responsible for gathering information and conducting research
11.	processor	010	responsible party who has processed the data in a manner in which the data has been modified
12.	publisher	011	responsible party who published the data

B.6.5 DQ_ElementType <<Enumeration>>

	Name	Domain code	Definition
1.	DQ_ElementType	EleType	component of quantitative quality identified by the data producer as applicable to the data specified by the scope
2.	completeness	001	presence and absence of features, their attributes and their relationships
3.	logicalConsistency	002	degree of adherence to logical rules of data structure, attribution and relationships (data structure can be conceptual, logical or physical)
4.	positionalAccuracy	003	accuracy of the position of features
5.	temporalAccuracy	004	accuracy of the temporal attributes and temporal relationships of features
6.	thematicAccuracy	005	accuracy of quantitative attributes and the correctness of non-quantitative attributes and of the classifications of features and their relationships
7.	additional	006	aspect of quantitative quality not specifically addressed and named as a data quality subelement

B.6.6 DQ_Subelement<completeness> <<CodeList>>

	Name	Domain code	Definition
1.	DQ_SubelementType <Completeness>	SubComplete	realised by DQ_ElementType
2.	additional	001	aspect of quantitative quality not specifically addressed and named as a data quality subelement for the data quality element 'completeness' in ISO 19113
3.	commission	002	excess data present in the scope
4.	omission	003	data absent from the scope

B.6.7 DQ_Subelement<logicalConsistency> <<CodeList>>

	Name	Domain code	Definition
1.	DQ_SubelementType <logicalConsistency>	SubLogCon	realised by DQ_ElementType
2.	additional	001	aspect of quantitative quality not specifically addressed and named as a data quality subelement for the data quality element 'logical consistency' in ISO 19113
3.	conceptualConsistency	002	adherence to rules of the conceptual schema
4.	domainConsistency	003	adherence of values to the value domains
5.	formatConsistency	004	degree to which data is stored in accordance with the physical structure of the scope
6.	topologicalConsistency	005	correctness of the explicitly encoded topological characteristics of the scope

B.6.8 DQ_Subelement<positionalAccuracy> <<CodeList>>

	Name	Domain code	Definition
1.	DQ_Subelements <positionalAccuracy>	SubPosAcc	realised by DQ_ElementType
2.	additional	001	aspect of quantitative quality not specifically addressed and named as a data quality subelement for the data quality element 'positional accuracy' in ISO 19113
3.	absoluteExternalAccuracy	002	closeness of reported coordinate values to values accepted as or being true
4.	relativeInternalAccuracy	003	closeness of the relative positions of features in the scope to their respective relative positions accepted as or being true
5.	griddedDataPositionAccuracy	004	closeness of gridded data position values to values accepted as or being true

B.6.9 DQ_Subelement<temporalAccuracy> <<CodeList>>

	Name	Domain code	Definition
1.	DQ_SubelementType <temporalAccuracy>	SubTempAcc	realised by DQ_ElementType
2.	additional	001	aspect of quantitative quality not specifically addressed and named as a data quality subelement for the data quality element 'temporal accuracy' in ISO 19113
3.	accuracyOfATimeMeasurement	002	correctness of the temporal references of an item (reporting of error in time measurement)

	Name	Domain code	Definition
4.	temporalConsistency	003	correctness of ordered events or sequences, if reported
5.	temporalValidity	004	validity of data specified by the scope with respect to time

B.6.10 DQ_Subelement<thematicAccuracy> <<CodeList>>

	Name	Domain code	Definition
1.	DQ_SubelementType <thematicAccuracy>	SubThemAcc	realised by DQ_ElementType
2.	additional	001	aspect of quantitative quality not specifically addressed and named as a data quality subelement for the data quality element 'thematic accuracy' in ISO 19113
3.	classificationCorrectness	002	comparison of the classes assigned to features or their attributes to a universe of discourse
4.	nonQuantitativeAttributeCorrectness	003	correctness of non-quantitative attributes
5.	quantitativeAttributeCorrectness	004	accuracy of quantitative attributes

B.6.11 DQ_Subelement<additional> <<CodeList>>

	Name	Domain code	Definition
1.	DQ_SubelementType<additional>	SubAdd	realised by DQ_ElementType
2.	additional	001	specific aspect of quantitative quality identified by a data producer for an additional data quality element not specifically listed in ISO 19113

B.6.12 DS_AssociationTypeCode <<Codelist>>

	Name	Domain code	Definition
1.	DS_AssociationTypeCode	AscTypeCode	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.6.13 DS_InitiativeType <<CodeList>>

	Name	Domain code	Definition
1.	DS_InitiativeType	InitType	type of aggregation activity in which datasets are related
2.	campaign	001	series of organised 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, investigation, or systematic inquiry
7.	mission	006	specific operation of a data collection system
8.	nonImageSensor	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	organised 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.6.14 MD_CellGeometry <<CodeList>>

	Name	Domain code	Definition

	Name	Domain code	Definition
1.	MD_CellGeometry	CellGeo	code indicating whether raster data is matrix or pixel
2.	matrix	001	each cell represents a point
3.	pixel	002	each cell represents an area or picture element

B.6.15   MD_CellValueType <<CodeList>>

	Name	Domain code	Definition
1.	MD_CellValueType	CellValType	specific type of information represented in the cell
2.	coded	001	cell contains a code which represents a real value
3.	values	002	actual measure
4.	HIS	003	Hue Intensity Saturation
5.	HLS	004	Hue Luminance Saturation
6.	RGB	005	Red, Green, Blue
7.	tekHVC	006	Hue-Value-Chroma (model Tektronic, DTP)

B.6.16   MD_CharacterSetCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_CharacterSetCode	CharSetCode	name of the character coding standard used for the resource
2.	ucs2	001	16-bit fixed size Universal Character Set
3.	ucs4	002	32-bit fixed size Universal Character Set
4.	utf8	003	8-bit variable size UCS Transfer Format
5.	utf16	004	16-bit variable size UCS Transfer Format
6.	isoIec8859oneTo15	005	structure of codes defined in terms of row and columns, where ther row was represented by the first 3 or 4 bits and the column by the last 4 bits of each bit combination of 7- or 8-bit character sets
7.	isoIec2022jp	006	character code structure and extension techniques
8.	shiftJIS	007	code set used in Japan
9.	eucJP	008	japanese code set

B.6.17   MD_Classification <<CodeList>>

	Name	Domain code	Definition
1.	MD_Classification	Classcation	name of the handling restrictions on the dataset
2.	unclassified	001	available for general disclosure
3.	codeWord	002	compartmentalised disclosure
4.	confidential	003	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.	restricted	005	not for general disclosure
7.	topsecret	006	of the highest secrecy

B.6.18   MD_DimensionNameType <<CodeList>>

	Name	Domain code	Definition
1.	MD_DimensionNameType	DimNameType	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

B.6.19   MD_GeometricObjectTypes <<CodeList>>

	Name	Domain code	Definition

1.	MD_GeometricObjectTypes	GeoObjType	name of point and vector spatial objects used to locate zero-, one-, and two-dimensional spatial locations in the dataset
2.	complexes	001	set of geometric primitives such that their boundaries can be represented as a union of other primitives
3.	composites	002	connected set of curves, solids or surfaces
4.	curves	003	bounded, 1-dimensional geometric primitive, representing the continuous image of a line
5.	points	004	0-dimensional geometric primitive, representing a position but not having an extent
6.	solids	005	bounded, connected 3-dimensional geometric primitive, representing the continuous image of a region of space
7.	surfaces	006	bounded, connected 2-dimensional geometric, representing the continuous image of a region of a plane

B.6.20 MD_ImagingConditionCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_ImagingConditionCode	ImgCondCode	code which indicates conditions which may affect the quality of 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 elliptic (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.6.21 MD_KeywordType <<CodeList>>

	Name	Domain code	Definition
1.	MD_KeywordType	KeyType	methods used to group similar keywords
2.	discipline	001	keyword identifies a branch of instruction or specialised learning
3.	place	002	keyword identifies a place
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.6.22 MD_MaintenanceFrequency <<CodeList>>

	Name	Domain code	Definition
1.	MD_MaintenanceFrequency	MaintFreq	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.	monthly	004	data is updated each month
6.	biannually	005	data is updated twice each year
7.	annually	006	data is updated every year
8.	asNeeded	007	data is updated as deemed necessary
9.	irregular	008	data is updated in intervals that are uneven in duration
10.	notPlanned	009	there are no plans to update the data
11.	unknown	998	frequency of maintenance for the data is not known

B.6.23 MD_MediumFormatCode <<CodeList>>

	Name	Domain code	Definition

	Name	Domain code	Definition
1.	MD_MediumFormatCode	MedFormCode	method used to write to the medium
2.	cpio	001	CoPy In / Out (UNIX file format and command)
3.	tar	002	Tap 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.6.24   MD_MediumNameCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_MediumNameCode	MedNameCode	name of the medium
2.	cdRom	001	read-only optical disk
3.	3halfInchFloppy	002	3,5 inch magnetic disk
4.	5quarterInchFloppy	003	5,25 inch magnetic disk
5.	9trackTape	004	9 track magnetic tape
6.	4mmCartridgeTape	005	4 millimetre magnetic tape
7.	8mmCartridgeTape	006	8 millimetre magnetic tape
8.	1quarterInchCartridgeTape	007	0,25 inch magnetic tape
9.	onLine	008	direct computer linkage
10.	satellite	009	linkage through a satellite communication system
11.	telephoneLink	010	communication through a telephone network
12.	brochure	011	pamphlet or leaflet giving descriptive information

B.6.25   MD_PixelOrientation <<Enumeration>>

	Name	Domain code	Definition
1.	MD_PixelOrientation	PixOrient	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.	upperLeft	003	next corner counterclockwise from the upper right
5.	lowerRight	004	next corner counterclockwise from the lower left
6.	upperRight	005	next corner counterclockwise from the lower right

B.6.26   MD_ProgressCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_ProgressCode	ProgCode	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 continuously being updated
6.	planned	005	fixed date has been established upon 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.6.27   MD_Restrictions <<CodeList>>

	Name	Domain code	Definition
1.	MD_Restrictions	Restrict	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	produced or sold as a proprietary product
4.	patentPending	003	produced or sold information awaiting a patent

	Name	Domain code	Definition
5.	license	004	formal permission to do something
6.	intellectualPropertyRights	005	non-tangible property that is a result of creativity
7.	trademark	006	a name, symbol, or other device identifying a product, officially registered and legally restricted to the use of the owner or manufacturer

B.6.28   MD_Scope <<CodeList>>

	Name	Domain code	Definition
1.	MD_Scope	ScopeCode	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.	featureAttribute	003	information applies to the feature attribute class
5.	collectionHardware	004	information applies to the collection hardware class
6.	collectionSession	005	information applies to the collection session
7.	dataset	006	information applies to the dataset
8.	series	007	information applies to the series
9.	nonGeographicDataset	008	information applies to non-geographic data
10.	dimensionGroup	009	information applies to a dimension group
11.	featureCollection	010	information applies to a feature collection
12.	feature	011	information applies to a feature
13.	featureType	012	information applies to a feature type
14.	propertyType	013	information applies to a property type
15.	fieldSession	014	information applies to a field session
16.	software	015	computer program or routine
17.	service	016	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
18.	model	017	copy or imitation of an existing or hypothetical object

B.6.29   MD_SpatialRepresentationType <<CodeList>>

	Name	Domain code	Definition
1.	MD_SpatialRepresentationType	SpatRepType	method used to represent geographic information in the dataset
2.	image	001	an image is used to represent geographic data
3.	matrix	002	a matrix is used to represent geographic data
4.	raster	003	raster data is used to represent geographic data
5.	TIN	004	triangulated irregular network used to represent geographic data
6.	text	005	textual data is used to represent geographic data
7.	vector	006	vector data is used to represent geographic data
8.	stereoModel	007	three-dimensional view formed by the intersecting homologous rays of an overlapping pair of images is used to represent geographic data
9.	video	008	scene from a video recording is used to represent geographic data

B.6.30   MD_TopicCategoryCode <<CodeList>>

	Name	Domain code	Definition
1.	MD_TopicCategoryCode	TopicCatCode	high-level geographic data thematic classification to assist in the grouping and search of available geographic data sets
2.	agricultureFarming	001	rearing of animals and/or cultivation of plants Examples: agriculture, irrigation, aquaculture, plantations, herding, fisheries, pests and diseases affecting crops and livestock
3.	biota	002	flora and/or fauna in natural environment Examples: wildlife, vegetation, biological sciences, ecology
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 and atmospheric conditions

6.	communications	005	communications infrastructure and services Examples: postal services, computer networks, telecommunications, radio
7.	economy	006	economic activities, conditions and employment Examples: production, labour, revenue, commerce, industry, tourism and ecotourism, forestry, fisheries, commercial or subsistence hunting, resource exploration and exploitation such as mining, oil and gas
8.	elevationAndDerivedProducts	007	height above or below sea level Examples: altitude, bathymetry, digital elevation models, digital terrain elevation models
9.	environment	008	environmental resources, protection and conservation Examples: environmental pollution, waste storage and treatment, environmental impact assessment, risk of bush fires
10.	geoscientificInformation	009	information pertaining to earth sciences Examples: geophysical features and processes, geology, sciences dealing with the composition, structure and origin of the earth's rocks, risks of earthquakes, volcanic activity, and landslides, gravity information
11.	health	010	health, health services, human ecology, and safety Examples: disease and illness, factors affecting health, hygiene, substance abuse, mental and physical health, health services
12.	imageryBaseMapsEarthCover	011	remotely sensed information Examples: land cover, hydrographic charts, topographic maps, imagery
13.	intelligenceMilitary	012	military bases, structures, activities Examples: barracks, training grounds, military transportation, information collection
14.	inlandWaters	013	inland water features and characteristics Examples: rivers and glaciers, salt lakes, water utilisation plans, ground water, dams, swamps, currents, floods
15.	location	014	positional information Examples: addresses, geodetic networks, control points
16.	oceans	015	features and characteristics of salt water bodies (excluding inland waters) Examples: tides, tidal waves, coastal information
17.	planningCadastre	016	geographic information used for a process for determining appropriate future actions through a sequence of choices for the betterment of human settlements Examples: plat maps, quarter-section maps, land use maps, zoning maps, cadastre
18.	society	017	characteristics of society and cultures Examples: settlements, anthropology, archaeology, education, traditional beliefs, manners and customs, demographic data, recreational activities, social impact assessments, crime and justice
19.	structure	018	permanent construction Examples: buildings
20.	transportation	019	means of conveying persons or goods Examples: roads, airports/airstrips, shipping routes, tunnels, nautical aids, vehicle or vessel location
21.	utilities	020	energy, water and waste systems Examples: hydroelectricity, solar and nuclear sources, water purification and distribution, sewage collection and disposal, electricity and gas distribution

B.6.31   MD_TopologyLevel <<CodeList>>

	Name	Domain code	Definition
1.	MD_TopologyLevel	TopLevel	degree of complexity of the spatial relationships
2.	geometryOnly	001	geometry objects without any additional structure which describes topology
3.	nonPlanarGraph	002	1-dimensional topological complex
4.	planarGraph	003	1-dimensional topological complex which is isomorphic to a subset of a plane

	Name	Domain code	Definition
5.	fullPlanarGraph	004	2-dimensional topological complex which is isomorphic to a subset of a plane
6.	surfaceGraph	005	1-dimensional topological complex which is isomorphic to a subset of a surface
7.	fullSurfaceGraph	006	2-dimensional topological complex which is isomorphic to a subset of a surface
8.	fullTopology3D	007	3-dimensional topological complex
9.	abstract	008	complex does not represent a geometry in the usual manner, but an abstract topology, such as a utility graph

Annex C
(normative)

Metadata extensions and profiles

C.1 Background

Annexes A, B and clause 6 of this 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 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. If an existing metadata element is included in an extended metadata entity, no components of the existing metadata element are changed.

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 standard defines over 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 the ISO 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 the ISO 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 must also 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, *Geographic information — Profiles* for more information on community profiles.

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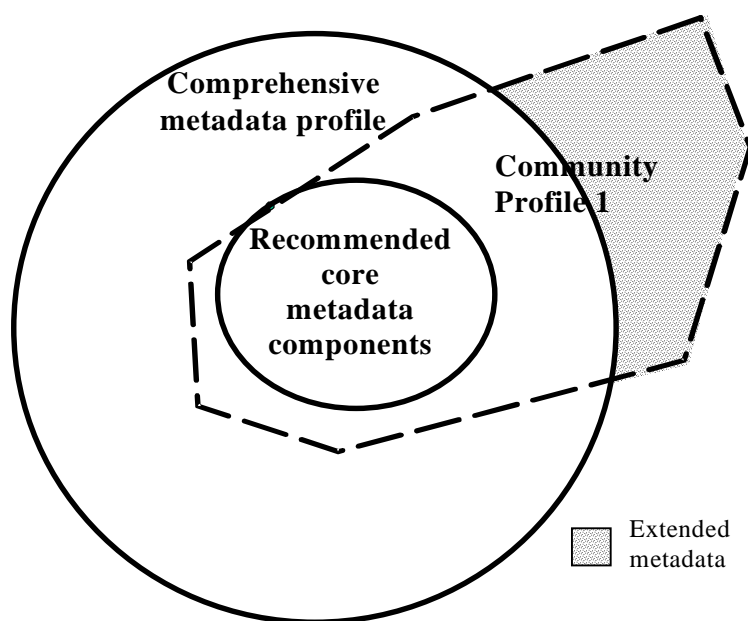
Figure C.1 — Metadata community profile

The inner circle contains the recommended core metadata components. The comprehensive metadata includes the recommended core metadata components. A community profile shall contain the recommended 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 existing 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 elemen.

4) A profile shall include:

— the basic, minimum set of 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 standard.

D.2 ISO 19115 Geographic Information – 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.

b) Test Method: a comparison between this 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 standard apply.

c) Reference: ISO 19115, 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 the 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: ISO 19115, 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 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 standard.

c) Reference: ISO 19115, 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: ISO 19115, 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: ISO 19115, 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 the standard.

b) Test Method: test each metadata element and ensure it is contained within the specified metadata entity.

c) Reference: ISO 19115, 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 the 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: ISO 19115, 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 standard.

b) Test Method: each user-defined metadata entity and metadata element is tested to ensure that all attributes have been defined.

c)   Reference: ISO 19115, 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 subclause 2.3.2 of this standard.

c)   Reference: ISO 19115, subclause 2.3.2.

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 which 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 Profile is comprised of the packages, classes, attributes, and relationships defined Annexes A and B.

E.2 Comprehensive profile – UML model

The Comprehensive Profile is presented in a UML metadata application schema. The attributes within each class and codelist have not been displayed in the model in order to simplify the diagram.
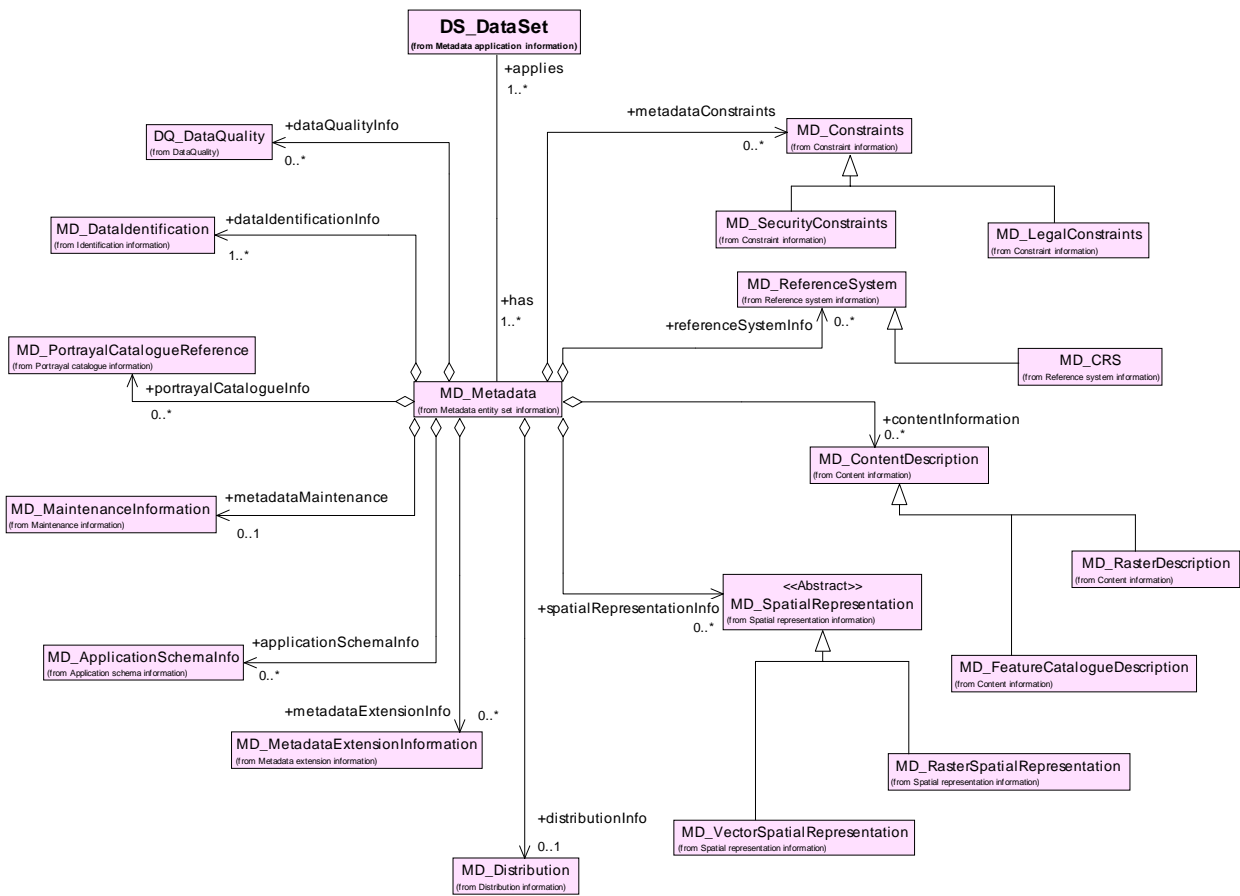
Figure E.1 — Comprehensive metadata profile

E.3 Comprehensive profile – XML DTD

```
<?xml version="1.0" encoding="UTF-8"?>

<!—Geographic Dataset Metadata-->

<!—Metadata Information-->
<!ELEMENT Metadata (mdFileID?, mdLangCode?, mdCharCode?, mdParentID?, mdHrLvCode?, mdHrLvName?,
mdContact, mdTimeSt, mdStanName?, mdStanVer?, spatRepInfo*, refSysInfo*, mdExtInfo*, dataIdInfo+, contInfo*,
distInfo?, dqInfo*, porCatInfo*, mdConst*, appSchInfo*, mdMaint?, applies*, propType*, featType*, featAtt*, feat*,
aggDS*)>
<!--Conditional statements:
mdLangCode: documented if not defined by the enconding standard
mdCharCode: documented if "utf8" not used and not defined by the encoding standard
mdHrLvCode: documented if mdHrLvCode not equal to "dataset"?
mdHrLvName: documented if mdHrLvCode not equal to "dataset"?-->
<!ELEMENT mdFileID (#PCDATA)>
<!ELEMENT mdLangCode (#PCDATA)>
<!ELEMENT mdCharCode (CharSetCode)>
<!ELEMENT mdParentID (#PCDATA)>
<!ELEMENT mdHrLvCode (ScopeCode)>
<!ELEMENT mdHrLvName (#PCDATA)>
<!ELEMENT mdContact (RespParty)>
<!ELEMENT mdTimeSt (#PCDATA)>
<!ELEMENT mdStanName (#PCDATA)>
<!ELEMENT mdStanVer (#PCDATA)>
<!ELEMENT spatRepInfo (SpatRep)>
<!ELEMENT refSysInfo (RefSystem)>
<!ELEMENT mdExtInfo (MdExtInfo)>
<!ELEMENT dataIdInfo (DataIdent)>
<!ELEMENT contInfo (ContDesc)>
<!ELEMENT distInfo (Distrib)>
<!ELEMENT dqInfo (DatQual)>
<!ELEMENT porCatInfo (PortCatRef)>
<!ELEMENT mdConst (Consts)>
<!ELEMENT appSchInfo (AppSchInfo)>
<!ELEMENT mdMaint (MaintInfo)>
<!ELEMENT applies (DSDataset)>
<!ELEMENT propType ANY>
<!ELEMENT featType ANY>
<!ELEMENT featAtt ANY>
<!ELEMENT feat ANY>
<!--"propType", "featType", "featAtt" and "feat" are all defined in another standard-->
<!ELEMENT aggDS (DSAgg)>

<!--Data Identification-->
<!ELEMENT DataIdent (idCitation, idAbs, idPurp?, idCredit?, idStatCode*, idPoC*, spatRpType*, datScale*,
datLangCode+, datCharCode?, tpCatCode+, geoBox*, geoDesc*, envirDesc?, datExt*, suppInfo?, passSeqID*,
imagOrbID*, orbNum*, resMaint*, graphOver*, dsFormat*, descKeys*, idSpecUse*, resConst*)>
<!--datCharCode: documented if "utf8" is not used
{Metadata.mdHrLvCode = "dataset" implies count (geoBox) + count (geoDesc) >=1}-->
<!ELEMENT idCitation (Citation)>
<!ELEMENT idAbs (#PCDATA)>
<!ELEMENT idPurp (#PCDATA)>
<!ELEMENT idCredit (#PCDATA)>
<!ELEMENT idStatCode (ProgCode)>
<!ELEMENT idPoC (RespParty)>
<!ELEMENT spatRpType (SpatRepType)>
<!ELEMENT datScale (Resol*)>
<!ELEMENT datLangCode (#PCDATA)>
<!ELEMENT datCharCode (CharSetCode)>
<!ELEMENT tpCatCode (TopicCatCode)>
```

```
<!ELEMENT geoBox (GeoBndBox)>
<!ELEMENT geoDesc (#PCDATA)>
<!--"geoDesc" has a domain of SI_LocationInstance which is defined in another standard-->
<!ELEMENT envirDesc (#PCDATA)>
<!ELEMENT datExt (Extent)>
<!ELEMENT suppInfo (#PCDATA)>
<!ELEMENT passSeqID (#PCDATA)>
<!ELEMENT imagOrbID (#PCDATA)>
<!ELEMENT orbNum (#PCDATA)>
<!ELEMENT resMaint (MaintInfo)>
<!ELEMENT graphOver (BrowGraph)>
<!ELEMENT dsFormat (Format)>
<!ELEMENT descKeys (Keywords)>
<!ELEMENT idSpecUse (Usage)>
<!ELEMENT resConst (Consts)>
<!ELEMENT Resol (equScale*, scaleDist*)>
<!ELEMENT equScale (RepFract)>
<!ELEMENT scaleDist (Distance)>
<!ELEMENT RepFract (rfDenom, derScale)>
<!--"derScale" is meant to indicate that RepFract is derived from Scale which is defined in another standard-->
<!-- RepFract.rfDenom = 1/Scale.measure And Scale.targetUnits = Scale.sourceUnits-->
<!ELEMENT rfDenom (Number)>
<!ELEMENT derScale ANY>
<!ELEMENT BrowGraph (bgFileName, bgFileDesc?, bgFileType?)>
<!ELEMENT bgFileName (#PCDATA)>
<!ELEMENT bgFileDesc (#PCDATA)>
<!ELEMENT bgFileType (#PCDATA)>
<!ELEMENT Keywords (keyword+, keyTypCode?, thesaName?)>
<!ELEMENT keyword (#PCDATA)>
<!ELEMENT keyTypCode (KeyType)>
<!ELEMENT thesaName (#PCDATA)>
<!ELEMENT Usage (specUsage, usageDate?, usrDetLim?, usrCntInfo+)>
<!ELEMENT specUsage (#PCDATA)>
<!ELEMENT usageDate (#PCDATA)>
<!ELEMENT usrDetLim (#PCDATA)>
<!ELEMENT usrCntInfo (RespParty)>
<!ELEMENT Distance (#PCDATA)>
<!ELEMENT Number (#PCDATA)>
<!--"Distance" and "Number" are defined in another standard-->
<!--Resource Constraint Information-->
<!ELEMENT Consts (useLimit*, LegConsts*, SecConsts*)>
<!ELEMENT useLimit (#PCDATA)>
<!ELEMENT LegConsts (prpRtsCode*, useConsts*, othConsts*, Consts)>
<!ELEMENT prpRtsCode (Restrict)>
<!ELEMENT useConsts (Restrict)>
<!ELEMENT othConsts (#PCDATA)>
<!ELEMENT SecConsts (classCode, userNote?, classSys?, handDesc?, Consts)>
<!ELEMENT classCode (Classcation)>
<!ELEMENT userNote (#PCDATA)>
<!ELEMENT classSys (#PCDATA)>
<!ELEMENT handDesc (#PCDATA)>

<!--Data Quality Information-->
<!ELEMENT DatQual (dqScope, dqOverEle*, dqReport*, datLineage?, resUsage*)>
<!--dqReport and resUsage roles are mandatory if DQScope.scpLvl = 'dataset'-->
<!ELEMENT dqScope (DQScope)>
<!ELEMENT dqOverEle (OverEle)>
<!ELEMENT dqReport (EleSubEle)>
<!ELEMENT datLineage (Lineage)>
<!ELEMENT resUsage (Usage)>
<!ELEMENT DQScope (scpLvl, scpExt?, scpLvlDesc*)>
<!--scpLvlDesc is mandatory if scpLvl notEqual 'dataset' or 'series'-->
<!ELEMENT scpLvl (ScopeCode)>
```

```
<!ELEMENT scpExt (Extent)>
<!ELEMENT scpLvlDesc (ScpDesc)>
<!ELEMENT OverEle (oeInfo, addOE)>
<!ELEMENT oeInfo (#PCDATA)>
<!ELEMENT addOE (AddInfo)>
<!ELEMENT EleSubEle (eleTypeCode, subEleCode, addEle?, addSubEle?, dqResult)>
<!--addSubEle role is mandatory if subEleCode = "additional"
addEle role is mandatory if eleTypeCode = "additional"-->
<!ELEMENT eleTypeCode (EleType)>
<!ELEMENT subEleCode (SubComplete | SubLogCon | SubPosAcc | SubTempAcc | SubThemAcc)>
<!ELEMENT addEle (AddInfo)>
<!ELEMENT addSubEle (AddInfo)>
<!ELEMENT dqResult (DQMeasure)>
<!ELEMENT Lineage (statement?, datSource*, prcStep*)>
<!--If(count(datSource) + count(prcStep) =0) and (DatQual.DQScope.scpLvl = 'dataset' or 'series') then
statement is mandatory-->
<!--datSource role is mandatory if Lineage.statement and prcStep role are not documented
prcStep role is mandatory if Lineage.statement and datSource role are not documented-->
<!ELEMENT statement (#PCDATA)>
<!ELEMENT datSource (Source)>
<!ELEMENT prcStep (PrcessStep)>
<!ELEMENT Source (srcDesc?, srcScale?, srcDatum?, srcCitatn?, srcExt*, srcStep*)>
<!--srcDesc is mandatory if srcExt is not documented
srcExt is mandatory if srcDesc is not documented-->
<!ELEMENT srcDesc (#PCDATA)>
<!ELEMENT srcScale (#PCDATA)>
<!ELEMENT srcDatum (RefSystem)>
<!ELEMENT srcCitatn (Citation)>
<!ELEMENT srcExt (Extent)>
<!ELEMENT srcStep (PrcessStep)>
<!ELEMENT PrcessStep (stepDesc, stepRat?, stepDateTm?, stepProc*)>
<!ELEMENT stepDesc (#PCDATA)>
<!ELEMENT stepRat (#PCDATA)>
<!ELEMENT stepDateTm (#PCDATA)>
<!--"stepDateTm" has a domain of DateTime which is defined in another standard-->
<!ELEMENT stepProc (RespParty)>
<!ELEMENT AddInfo (addName, addDesc)>
<!ELEMENT addName (#PCDATA)>
<!ELEMENT addDesc (#PCDATA)>
<!ELEMENT DQMeasure (measName?, measDom?, measDesc?, evalProc?, measDateTm?, measResult*)>
<!--Each of the optional attributes measName and measDom, and the element/subelement pair must be specified
either at the instance level or in a containing object-->
<!ELEMENT measName (#PCDATA)>
<!ELEMENT measDom (#PCDATA)>
<!--"measDom" has a domain of TypeName which is defined in another standard-->
<!ELEMENT measDesc (#PCDATA)>
<!ELEMENT evalProc (Citation)>
<!ELEMENT measDateTm (#PCDATA)>
<!--"measDateTm" has a domain of DateTime which is defined in another standard-->
<!ELEMENT measResult (Result)>
<!ELEMENT Result (ConResult?, QuanResult?)>
<!ELEMENT ConResult (conSpec, conExpl, conPass, Result)>
<!ELEMENT conSpec (Citation)>
<!ELEMENT conExpl (#PCDATA)>
<!ELEMENT conPass (#PCDATA)>
<!ELEMENT QuanResult (quanValDom?, quanRes+, Result)>
<!--content of the result Record will be determined by the evaluation procedure used-->
<!ELEMENT quanValDom (#PCDATA)>
<!ELEMENT quanRes (#PCDATA)>
<!--"quanValDom" has a domain of RecordType which is defined in another standard-->
<!--"quanRes" has a domain of Record which is defined in another standard-->

<!--Maintenance Information-->
```

```
<!ELEMENT MaintInfo (maintCode, dateNext, usrDefFreq, maintScp, upScpDesc, maintNote)>
<!ELEMENT maintCode (MaintFreq)>
<!ELEMENT dateNext (#PCDATA)>
<!--"dateNext" has a domain of Date which is defined in another standard-->
<!ELEMENT usrDefFreq (#PCDATA)>
<!--"usrDefFreq" has a domain of TM_Period which is defined in another standard-->
<!ELEMENT maintScp (ScopeCode)>
<!ELEMENT upScpDesc (ScpDesc)>
<!ELEMENT maintNote (#PCDATA)>
<!ELEMENT ScpDesc (attribSet | featSet | featIntSet | attribIntSet | dataset | other)>
<!ELEMENT attribSet ANY>
<!ELEMENT featSet ANY>
<!ELEMENT featIntSet ANY>
<!ELEMENT attribIntSet ANY>
<!--"attribSet", "featSet", "featIntSet" and attribIntSet have domains defined in other standards-->
<!ELEMENT dataset (DSDataset)>
<!ELEMENT other (#PCDATA)>


<!--Spatial Representation Information-->
<!ELEMENT SpatRep (RastSpatRep*, VectSpatRep*)>
<!ELEMENT RastSpatRep (numDims, axDimProps, cellGeo, tranParaAv, SpatRep, Georect, Georef+)>
<!ELEMENT numDims (#PCDATA)>
<!ELEMENT axDimProps (Dimen)>
<!ELEMENT cellGeo (CellGeo)>
<!ELEMENT tranParaAv (#PCDATA)>
<!ELEMENT Dimen (dimName, dimSize, dimResol)>
<!ELEMENT dimName (DimNameType)>
<!ELEMENT dimSize (#PCDATA)>
<!ELEMENT dimResol (#PCDATA)>
<!--"dimResol" has a domain of Measure which is defined in another standard-->
<!ELEMENT Georect (chkPtAv, chkPtDesc, cornerPts, centerPt?, ptInPixel, transDimDesc?, transDimMap*,
RastSpatRep)>
<!ELEMENT chkPtAv (#PCDATA)>
<!ELEMENT chkPtDesc (#PCDATA)>
<!ELEMENT cornerPts (#PCDATA)>
<!ELEMENT centerPt (#PCDATA)>
<!--"cornerPts" and "centerPt" are both defined in another standard-->
<!ELEMENT ptInPixel (PixOrient)>
<!ELEMENT transDimDesc (#PCDATA)>
<!ELEMENT transDimMap (#PCDATA)>
<!ELEMENT Georef (ctrlPtAv, orieParaAv, orieParaDs?, georefPars, paraCit, RastSpatRep)>
<!ELEMENT ctrlPtAv (#PCDATA)>
<!ELEMENT orieParaAv (#PCDATA)>
<!ELEMENT orieParaDs (#PCDATA)>
<!ELEMENT georefPars (#PCDATA)>
<!--"georefPars" has a domain of Record which is defined in another standard-->
<!ELEMENT paraCit (Citation)>
<!ELEMENT VectSpatRep (geometTypCode, geometObjCnt, topLvlCode, SpatRep)>
<!ELEMENT geometTypCode (GeoObjType+)>
<!ELEMENT geometObjCnt (#PCDATA)>
<!ELEMENT topLvlCode (TopLevel)>


<!--Reference System Information-->
<!ELEMENT RefSystem (refSysID, derRefSys, MdCoRefSys*)>
<!ELEMENT refSysID (RsIdent)>
<!ELEMENT derRefSys (#PCDATA)>
<!ELEMENT MdCoRefSys (projection, ellipsoid, datum, ellParas?, projParas?, RefSystem)>
<!--The "RefSysem" element of MdCoRefSys is meant to indicate a derived assocation. All the element and
aggregates of MdCoRefSys are derived from RefSystem-->
<!ELEMENT projection (RsIdent)>
<!ELEMENT ellipsoid (RsIdent)>
<!ELEMENT datum (RsIdent)>
<!ELEMENT ellParas (EllParas)>
```

```
<!ELEMENT projParas (ProjParas)>
<!ELEMENT EllParas (semiMajAx, denFlatRat)>
<!ELEMENT semiMajAx (#PCDATA)>
<!ELEMENT denFlatRat (#PCDATA)>
<!ELEMENT ProjParas (zoneNum?, stanParal*, longCntMer?, latProjOri?, falEastng?, falNorthng?, sclFacEqu?,
hgtProsPt?, longProjCnt?, latProjCnt?, sclFacCnt?, stVrLongPl?, sclFacPrOr?, obLnAziPars?, obLnPtPars*)>
<!ELEMENT zoneNum (#PCDATA)>
<!ELEMENT stanParal (#PCDATA)>
<!ELEMENT longCntMer (#PCDATA)>
<!ELEMENT latProjOri (#PCDATA)>
<!ELEMENT falEastng (#PCDATA)>
<!ELEMENT falNorthng (#PCDATA)>
<!ELEMENT sclFacEqu (#PCDATA)>
<!ELEMENT hgtProsPt (#PCDATA)>
<!ELEMENT longProjCnt (#PCDATA)>
<!ELEMENT latProjCnt (#PCDATA)>
<!ELEMENT sclFacCnt (#PCDATA)>
<!ELEMENT stVrLongPl (#PCDATA)>
<!ELEMENT sclFacPrOr (#PCDATA)>
<!ELEMENT obLnAziPars (ObLineAzi)>
<!ELEMENT obLnPtPars (ObLinePt)>
<!ELEMENT ObLineAzi (aziAngle, aziPtLong)>
<!ELEMENT aziAngle (#PCDATA)>
<!ELEMENT aziPtLong (#PCDATA)>
<!ELEMENT ObLinePt (obLineLat, obLineLong)>
<!ELEMENT obLineLat (#PCDATA)>
<!ELEMENT obLineLong (#PCDATA)>
<!ELEMENT MdIdent (identAuth?, identCode, RsIdent*)>
<!ELEMENT identAuth (Citation)>
<!ELEMENT identCode (#PCDATA)>
<!ELEMENT RsIdent (MdIdent)>
<!ELEMENT RefSys (refSysName, domOValid, TMRefSys*, SIRefSys*, SCRefSys*)>
<!ELEMENT refSysName (RsIdent)>
<!ELEMENT domOValid (Extent)>
<!ELEMENT TMRefSys (#PCDATA)>
<!ELEMENT SIRefSys (#PCDATA)>
<!ELEMENT SCRefSys (#PCDATA)>
<!--TMRefSys, SIRefSys, and SCRefSys are part of ISO 19108, ISO 19112, and ISO 19111 respectively-->

<!--Content Information-->
<!ELEMENT ContDesc (FetCatDesc*, RasDesc*)>
<!--"FetCatDesc" must be documented if DataIdent.spatRpTyp = "vector"-->
<!--"RasDesc" must be documented if DataIdent.spatRpTyp = "raster"-->
<!ELEMENT FetCatDesc (compCode, catLangCode+, incWithDS, catFeatTyps*, catCitation+, ContDesc)>
<!ELEMENT compCode (#PCDATA)>
<!ELEMENT catLangCode (#PCDATA)>
<!ELEMENT incWithDS (#PCDATA)>
<!ELEMENT catFeatTyps (#PCDATA)>
<!--"catFeatTyps" has a domain of GenericName which is defined in another standard-->
<!ELEMENT catCitation (Citation)>
<!ELEMENT RasDesc (toneGrad?, bitsPerVal?, cellAttDesc, cellUnit, cellValTyp, sclFac, offset, ImgDesc*,
ContDesc)>
<!ELEMENT toneGrad (#PCDATA)>
<!ELEMENT bitsPerVal (#PCDATA)>
<!ELEMENT cellAttDesc (#PCDATA)>
<!ELEMENT cellUnit (#PCDATA)>
<!ELEMENT cellValTyp (CellValType)>
<!ELEMENT sclFac (#PCDATA)>
<!ELEMENT offset (#PCDATA)>
<!ELEMENT bandSeqID (#PCDATA)>
<!ELEMENT mxWavlen (#PCDATA)>
<!ELEMENT mnWavlen (#PCDATA)>
<!ELEMENT wavlenUnit (#PCDATA)>
```

```
<!--"wavlenUnit" has a domain of UoMLength which is defined in another standard-->
<!ELEMENT pkResp (#PCDATA)>
<!ELEMENT ImgDesc (illElevAng?, illAziAng?, imagCond*, cloudCovPer?, prcTypCde?, cmpGenQuan?, trianInd?,
radCalDatAv?, camCalInAv?, filmDistInAv?, lensDistInAv?, bandDesc*)>
<!ELEMENT illElevAng (#PCDATA)>
<!ELEMENT illAziAng (#PCDATA)>
<!ELEMENT imagCond (ImgCondCode)>
<!ELEMENT cloudCovPer (#PCDATA)>
<!ELEMENT prcTypCde (MdIdent)>
<!ELEMENT cmpGenQuan (#PCDATA)>
<!ELEMENT trianInd (#PCDATA)>
<!ELEMENT radCalDatAv (#PCDATA)>
<!ELEMENT camCalInAv (#PCDATA)>
<!ELEMENT filmDistInAv (#PCDATA)>
<!ELEMENT lensDistInAv (#PCDATA)>
<!ELEMENT bandDesc (Band)>
<!ELEMENT Band (bandSeqID?, mxWavlen?, mnWavlen?, wavlenUnit?, pkResp?, RasDesc)>
<!--"wavlenUnit" is mandatory if "mxWavlen" or "mnWavlen" are provided-->

<!--Portrayal Catalogue Information-->
<!ELEMENT PortCatRef (portCatCit+)>
<!ELEMENT portCatCit (Citation)>

<!--Distribution Information-->
<!ELEMENT Distrib (distFormat*, distributor*, distTranOps*)>
<!ELEMENT distFormat (Format)>
<!ELEMENT distributor (Distributor)>
<!ELEMENT distTranOps (DigTranOps)>
<!ELEMENT Format (formatName, formatVer, formatAmdNum?, formatSpec?, fileDecmTech?, formatDist*)>
<!ELEMENT formatName (#PCDATA)>
<!ELEMENT formatVer (#PCDATA)>
<!ELEMENT formatAmdNum (#PCDATA)>
<!ELEMENT formatSpec (#PCDATA)>
<!ELEMENT fileDecmTech (#PCDATA)>
<!ELEMENT formatDist (Distributor)>
<!ELEMENT Distributor (distCont, distOrdProc*, distorFormat+)>
<!ELEMENT distCont (RespParty)>
<!ELEMENT distOrdProc (StanOrdProc)>
<!ELEMENT distorFormat (Format)>
<!ELEMENT DigTranOps (unitsODist?, transSize?, onLineRes*, offLineRes?)>
<!ELEMENT unitsODist (#PCDATA)>
<!ELEMENT transSize (#PCDATA)>
<!ELEMENT onLineRes (OnlineRes)>
<!ELEMENT offLineRes (Medium)>
<!ELEMENT Medium (medNameCode?, medDensity*, medDenUnits?, medVol?, medFormat*, medNote?)>
<!--"medDenUnits" is mandatory if "medDensity" is provided-->
<!ELEMENT medNameCode (MedNameCode)>
<!ELEMENT medDensity (#PCDATA)>
<!ELEMENT medDenUnits (#PCDATA)>
<!ELEMENT medVol (#PCDATA)>
<!ELEMENT medFormat (MedFormCode)>
<!ELEMENT medNote (#PCDATA)>
<!ELEMENT StanOrdProc (resFees?, planAvDtTm?, ordInstr?, ordTurn?)>
<!ELEMENT resFees (#PCDATA)>
<!ELEMENT planAvDtTm (#PCDATA)>
<!--"planAvDtTm" has a domain of DateTime which is defined in another standard-->
<!ELEMENT ordInstr (#PCDATA)>
<!ELEMENT ordTurn (#PCDATA)>

<!--Metadata Extension Information-->
<!ELEMENT MdExtInfo (extOnRes, extEleInfo*)>
<!ELEMENT extOnRes (OnlineRes)>
<!ELEMENT extEleInfo (ExtEleInfo)>
```

```
<!ELEMENT ExtEleInfo (extEleName, extShortName?, extDomCode?, extEleDef, extEleOb, extEleCond,
eleDatType, extEleDomVal, extEleMxOc, extEleParEnt+, extEleRule+, extEleRat?, extEleSrc+)>
<!--if "eleDatType" = 'codelist' then "extEleDomCode" is mandatory
if "eleDatType" notEqual 'codelist' then "eleShortName" is mandatory
if "extEleOb" = 'conditional' then "extEleCond" is mandatory-->
<!ELEMENT extEleName (#PCDATA)>
<!ELEMENT extShortName (#PCDATA)>
<!ELEMENT extDomCode (#PCDATA)>
<!ELEMENT extEleDef (#PCDATA)>
<!ELEMENT extEleOb (#PCDATA)>
<!ELEMENT extEleCond (#PCDATA)>
<!ELEMENT eleDatType (#PCDATA)>
<!--"eleDatType" has a domain of TypeName which is defined in another standard-->
<!ELEMENT extEleDomVal (#PCDATA)>
<!ELEMENT extEleMxOc (#PCDATA)>
<!ELEMENT extEleParEnt (#PCDATA)>
<!ELEMENT extEleRule (#PCDATA)>
<!ELEMENT extEleRat (#PCDATA)>
<!ELEMENT extEleSrc (RespParty)>

<!--Application Schema Information-->
<!ELEMENT AppSchInfo (asName, asSchLang, asCstLang, asAscii, asGraFile, asSwDevFile, asSwDevFiFt,
featCatSup)>
<!ELEMENT asName (Citation)>
<!ELEMENT asSchLang (#PCDATA)>
<!ELEMENT asCstLang (#PCDATA)>
<!ELEMENT asAscii (#PCDATA)>
<!ELEMENT asGraFile (#PCDATA)>
<!ELEMENT asSwDevFile (#PCDATA)>
<!ELEMENT asSwDevFiFt (#PCDATA)>
<!ELEMENT featCatSup (SpatAttSup)>
<!ELEMENT SpatAttSup (featTypeList+)>
<!ELEMENT featTypeList (FeatTypeList)>
<!ELEMENT FeatTypeList (spatObj, spatSchName)>
<!ELEMENT spatObj (#PCDATA)>
<!ELEMENT spatSchName (#PCDATA)>

<!--Extent Information-->
<!ELEMENT Extent (exDesc?, geoEle*, tempEle*, vertEle*)>
<!--count("geoEle" + "tempEle" + "vertEle") + count("exDesc") >0-->
<!ELEMENT exDesc (#PCDATA)>
<!ELEMENT geoEle (GeoExtent)>
<!ELEMENT tempEle (TempExtent)>
<!ELEMENT vertEle (VertExtent)>
<!ELEMENT GeoExtent (exTypeCode?, BoundPoly*, GeoBndBox*, SetLocInst*)>
<!--count ("BoundPoly" + "GeoBndBox" + "SetLocInst") > 0-->
<!--"exTypeCode" is mandatory if "exTypeCode" = '0'-->
<!ELEMENT exTypeCode (#PCDATA)>
<!ELEMENT BoundPoly (polygon+, GeoExtent)>
<!ELEMENT polygon (#PCDATA)>
<!ELEMENT GeoBndBox (westBL, eastBL, southBL, northBL, GeoExtent)>
<!ELEMENT westBL (#PCDATA)>
<!ELEMENT eastBL (#PCDATA)>
<!ELEMENT southBL (#PCDATA)>
<!ELEMENT northBL (#PCDATA)>
<!ELEMENT SetLocInst (elements, GeoExtent)>
<!ELEMENT elements (#PCDATA)>
<!--"elements" has a domain of SI_LocationInstance which is defined in another standard-->
<!ELEMENT TempExtent (exTemp, SpatTempEx*)>
<!ELEMENT exTemp ANY>
<!--"exTemp" has a domain of TM_Primitive which is defined in another standard-->
<!ELEMENT SpatTempEx (exSpat)>
<!ELEMENT exSpat (GeoExtent)>
```

```
<!ELEMENT VertExtent (vertMinVal, vertMaxVal, vertUoM, vertDatum)>
<!ELEMENT vertMinVal (#PCDATA)>
<!ELEMENT vertMaxVal (#PCDATA)>
<!ELEMENT vertUoM ANY>
<!--"vertUoM" has a domain of UomLength which is defined in another standard-->
<!ELEMENT vertDatum ANY>
<!--"vertDatum" has a domain of SC_VerticalDatum which is defined in another standard-->

<!--Citation and Responsible Party Information-->
<!ELEMENT Citation (resTitle, resAltTitle*, resRefDate+, resEd?, resEdDate?, citId*, citIdType*, citRespParty*,
presFormCd*, seriesName?, issId?, otherCitDet?, collTitle?, artPage?, isbn?, issn?)>
<!ELEMENT resTitle (#PCDATA)>
<!ELEMENT resAltTitle (#PCDATA)>
<!ELEMENT resRefDate (Date)>
<!ELEMENT resEd (#PCDATA)>
<!ELEMENT resEdDate (#PCDATA)>
<!--"resEdDate" has a domain of Date which is defined in another standard-->
<!ELEMENT citId (#PCDATA)>
<!ELEMENT citIdType (#PCDATA)>
<!ELEMENT citRespParty (RespParty)>
<!ELEMENT presFormCd (PresFormCode)>
<!ELEMENT seriesName (#PCDATA)>
<!ELEMENT issId (#PCDATA)>
<!ELEMENT otherCitDet (#PCDATA)>
<!ELEMENT collTitle (#PCDATA)>
<!ELEMENT artPage (#PCDATA)>
<!ELEMENT isbn (#PCDATA)>
<!ELEMENT issn (#PCDATA)>
<!ELEMENT Date (refDate, refDateType)>
<!ELEMENT refDate (#PCDATA)>
<!ELEMENT refDateType (DateType)>
<!ELEMENT RespParty (rpIndName*, rpOrgName*, rpPosName*, rpCntInfo*, roleCode+)>
<!--count of ("rpIndName" + "rpOrgName" + "rpPosName") > 0-->
<!ELEMENT rpIndName (#PCDATA)>
<!ELEMENT rpOrgName (#PCDATA)>
<!ELEMENT rpPosName (#PCDATA)>
<!ELEMENT rpCntInfo (Contact)>
<!ELEMENT roleCode (RoleCode)>
<!ELEMENT Contact (cntPhone?, cntAddress?, cntOnlineRes?, cntHours?, cntInstr?)>
<!ELEMENT cntPhone (Telephone)>
<!ELEMENT cntAddress (Address)>
<!ELEMENT cntOnlineRes (OnlineRes)>
<!ELEMENT cntHours (#PCDATA)>
<!ELEMENT cntInstr (#PCDATA)>
<!ELEMENT Telephone (voiceNum*, faxNum*, otherNum*, othType*)>
<!--"otherNum" is mandatory if "voiceNum" and "faxNum" not provided
"othType" is mandatory if "otherNum" is provided-->
<!ELEMENT voiceNum (#PCDATA)>
<!ELEMENT faxNum (#PCDATA)>
<!ELEMENT otherNum (#PCDATA)>
<!ELEMENT othType (#PCDATA)>
<!ELEMENT Address (delPoint*, city?, adminArea?, postCode?, country?, eMailAdd*)>
<!ELEMENT delPoint (#PCDATA)>
<!ELEMENT city (#PCDATA)>
<!ELEMENT adminArea (#PCDATA)>
<!ELEMENT postCode (#PCDATA)>
<!ELEMENT country (#PCDATA)>
<!ELEMENT eMailAdd (#PCDATA)>
<!ELEMENT OnlineRes (linkage, protocol?, appProfile?, orName?, orDesc?, orFunctCode?)>
<!ELEMENT linkage (#PCDATA)>
<!ELEMENT protocol (#PCDATA)>
<!ELEMENT appProfile (#PCDATA)>
<!ELEMENT orName (#PCDATA)>
```

```
<!ELEMENT orDesc (#PCDATA)>
<!ELEMENT orFunctCode (#PCDATA)>

<!--Metadata Application Information-->
<!ELEMENT DSAgg (aggDSMet+, compOf+, superSet*, subSet*, DSSer*, DSInit*, DSOthAssoc)>
<!ELEMENT aggDSMet (Metadata)>
<!ELEMENT compOf (DSDataset)>
<!ELEMENT superSet (DSAgg)>
<!ELEMENT subSet (DSAgg)>
<!ELEMENT DSDataset (partOf, hasMeta)>
<!ELEMENT partOf (DSAgg)>
<!ELEMENT hasMeta (Metadata)>
<!ELEMENT DSSer (Platform*, ProdSer*, Sensor*, DSAgg*)>
<!ELEMENT Platform (DSSer)>
<!ELEMENT ProdSer (DSSer)>
<!ELEMENT Sensor (DSSer)>
<!ELEMENT DSInit (initTypeCd, DSAgg)>
<!ELEMENT initTypeCd (InitType)>
<!ELEMENT DSOthAssoc (assocTypeCd, SterMate*, DSAgg)>
<!ELEMENT assocTypeCd (AscTypeCode)>
<!ELEMENT SterMate (imgSpatRep*)>
<!--"imgSpatRep" mandatory if DataIdent.spatReTyp = "image"-->
<!ELEMENT imgSpatRep (#PCDATA)>

<!--Codelist and Enumeration Information-->
<!ELEMENT DateType (#PCDATA)>
<!ATTLIST DateType
    value (creation | publication | revision) #REQUIRED
>
<!ELEMENT OnFunction (#PCDATA)>
<!ATTLIST OnFunction
    value (access | additionalInformation | download | order | search) #REQUIRED
>
<!ELEMENT PresFormCode (#PCDATA)>
<!ATTLIST PresFormCode
    value (document | hardcopyMap | image | model | profile | rasterMap | table | vectorMap | view) #REQUIRED
>
<!ELEMENT RoleCode (#PCDATA)>
<!ATTLIST RoleCode
    value (contentProvider | custodianSteward | owner | user | distributor | metadataProvider | originator |
pointOfContact | principalInvestigator | processor | publisher) #REQUIRED
>
<!ELEMENT EleType (#PCDATA)>
<!ATTLIST EleType
    value (completeness | logicalConsistency | positionalAccuracy | temporalAccuracy | thematicAccuracy |
additional) #REQUIRED
>
<!ELEMENT SubComplete (#PCDATA)>
<!ATTLIST SubComplete
    value (additional | commission | omission) #REQUIRED
>
<!ELEMENT SubLogCon (#PCDATA)>
<!ATTLIST SubLogCon
    value (additional | conceptualConsistency | domainConsistency | formatConsistency | topologicalConsistency)
#REQUIRED
>
<!ELEMENT SubPosAcc (#PCDATA)>
<!ATTLIST SubPosAcc
    value (additional | absoluteExternalAccuracy | relativeInternalAccuracy | griddedDataPositionAccuracy)
#REQUIRED
>
<!ELEMENT SubTempAcc (#PCDATA)>
<!ATTLIST SubTempAcc
```

```
       value (additional | accuracyOfATimeMeasuremet | temporalConsistency | temporalValidity) #REQUIRED
>
<!ELEMENT SubThemAcc (#PCDATA)>
<!ATTLIST SubThemAcc
       value (additional | classificationCorrectness | nonQuantitativeAttributeCorrectness |
quantitativeAttributeCorrectness) #REQUIRED
>
<!ELEMENT SubAdd (#PCDATA)>
<!ATTLIST SubAdd
       value (additional) #REQUIRED
>
<!ELEMENT AscTypeCode (#PCDATA)>
<!ATTLIST AscTypeCode
       value (crossReference | largerWorkCitation | partOfSeamlessDatabase | source | stereomate) #REQUIRED
>
<!ELEMENT InitType (#PCDATA)>
<!ATTLIST InitType
       value (campaign | collection | exercise | experiment | investigation | mission | nonImageSensor | operation |
platform | process | program | project | study | task | trial) #REQUIRED
>
<!ELEMENT CellGeo (#PCDATA)>
<!ATTLIST CellGeo
       value (matrix | pixel) #REQUIRED
>
<!ELEMENT CellValType (#PCDATA)>
<!ATTLIST CellValType
       value (coded | values | HIS | HLS | RGB | tekHVC) #REQUIRED
>
<!ELEMENT CharSetCode (#PCDATA)>
<!ATTLIST CharSetCode
       value (ucs2 | ucs4 | utf8 | utf16 | isoIec8859oneTo15 | isoIec2022jp | shiftJIS | eucJP) #REQUIRED
>
<!ELEMENT Classcation (#PCDATA)>
<!ATTLIST Classcation
       value (unclassified | codeWord | confidential | secret | restricted | topsecret) #REQUIRED
>
<!ELEMENT DimNameType (#PCDATA)>
<!ATTLIST DimNameType
       value (row | column | vertical | track | crossTrack | line | sample) #REQUIRED
>
<!ELEMENT GeoObjType (#PCDATA)>
<!ATTLIST GeoObjType
       value (complexes | composites | curves | points | solids | surfaces) #REQUIRED
>
<!ELEMENT ImgCondCode (#PCDATA)>
<!ATTLIST ImgCondCode
       value (blurredImage | clud | degradingObliquity | fog | heavySmokeOrDust | night | rain | semiDarkness |
shadow | snow | terrainMasking) #REQUIRED
>
<!ELEMENT KeyType (#PCDATA)>
<!ATTLIST KeyType
       value (discipline | place | stratum | temporal | theme) #REQUIRED
>
<!ELEMENT MaintFreq (#PCDATA)>
<!ATTLIST MaintFreq
       value (continual | daily | weekly | monthly | biannually | annually | asNeeded | irregular | notPlanned | unknown)
#REQUIRED
>
<!ELEMENT MedFormCode (#PCDATA)>
<!ATTLIST MedFormCode
       value (cpio | tar | highSierra | iso9660 | iso9660RockRidge | iso9660AppleHFS) #REQUIRED
>
<!ELEMENT MedNameCode (#PCDATA)>
```

```
<!ATTLIST MedNameCode
     value (cdRom | 3halfInchFloppy | 5quartherInchFloppy | 9trackTape | 4mmCartridgeTape | 8mmCartridgeTape
| 1quarterInchCartridgeTape | online | satellite | telephonLink | brochure) #REQUIRED
>
<!ELEMENT PixOrient (#PCDATA)>
<!ATTLIST PixOrient
     value (center | lowerLeft | upperLeft | lowerRight | upperRight) #REQUIRED
>
<!ELEMENT ProgCode (#PCDATA)>
<!ATTLIST ProgCode
     value (completed | historicalArchive | obsolete | onGong | planned | required | underdevelopment)
#REQUIRED
>
<!ELEMENT Restrict (#PCDATA)>
<!ATTLIST Restrict
     value (copyright | patent | patentPending | license | intellectualPropertyRights | trademark) #REQUIRED
>
<!ELEMENT ScopeCode (#PCDATA)>
<!ATTLIST ScopeCode
     value (attribute | attributeType | featureAttribute | collectionhardware | collectionSession | dataset | series |
nonGeographicDataset | dimensionGroup | featureCollection | feature | featureType | propertyType | fieldSession |
software | service | model) #REQUIRED
>
<!ELEMENT SpatRepType (#PCDATA)>
<!ATTLIST SpatRepType
     value (image | matrix | raster | TIN | text | vector | stereomodel | video) #REQUIRED
>
<!ELEMENT TopicCatCode (#PCDATA)>
<!ATTLIST TopicCatCode
     value (agricultureFarming | biota | boundaries | climatologyMeteorologyAtmosphere | communications |
economy | elevationAndDerivedProducts | environment | geoscientificInformation | health |
imageryBaseMapsEarthCover | IntelligenceMilitary | inlandWaters | location | oceans | planningCadastre | society |
structure | transportation | utilities) #REQUIRED
>
<!ELEMENT TopLevel (#PCDATA)>
<!ATTLIST TopLevel
     value (geometryOnly | nonPlanarGraph | planarLineGraph | fullPlanarGraph | surfaceGraph | fullTopology)
#REQUIRED
>
```

Annex F
(informative)

Metadata extension methodology

F.1 Metadata extensions methodology

The following eight-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 5.

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 2.

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 3.

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 7.

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 the ISO standard. The metadata

obligations defined in the ISO 19115 standard cannot be relaxed in a profile. ACTION - Go to Stage 8.

VIII) An existing metadata element meets the requirements, but the domain required by the profile is a sub-set of the ISO 19115 domain. ACTION - Go to Stage 7.

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 11179-3).

METHOD:

I) Go to Sage 5 to define the new metadata elements required to populate the section.

II) Go to Stage 3 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 11179-3).

METHOD:

I) Define the new metadata codelist in terms of text definition, short name, obligation maximum number of occurrences, data type and domain. The definition of the codelist should be done so as to be consistent with the existing domain entities which can be found in clause B.6 of annex B.

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.6 of annex B.

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 elements 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 11179-3).

METHOD:

I)   Using the metadata schema described in annex A and the metadata for geographic data 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 a Name (B.1.2), Domain code and Short Name (B.1.3), Definition (B.1.4), Obligation / Condition (B.1.5), Maximum occurrence (B.1.6), Data type (B.1.7) and Domain (B.1.8). Identify any excluded metadata relationships with the newly defined element. See annex A for the ISO schema diagrams.

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 11179-3).

METHOD:

I)   Using the schema described in annex A and the metadata for geographic data 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	Metadata entity set
6.3.2.1	Identification
6.3.2.2	Constraints
6.3.2.3	Data quality
6.3.2.4	Maintenance
6.3.2.5	Spatial representation
6.3.2.6	Reference system
6.3.2.7	Content
6.3.2.8	Portrayal catalogue
6.3.2.9	Distribution
6.3.2.10	Metadata extension
6.3.2.11	Application schema
6.3.3	Extent
6.3.3	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 a Name (B.1.2), Domain code and Short Name (B.1.3), Definition (B.1.4), Obligation / Condition (B.1.5), Maximum occurrence (B.1.6), Data type (B.1.7) and Domain (B.1.8). 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 8

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.

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 entity be a restricted sub-set 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 (subclause 6.3.2.10).

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 of ISO 19115.

III) IF new metadata entities defined:

In accordance with ISO 11179 and using annex B as a template, record the new metadata entity description in terms of Name (B.1.2), Domain code and Short Name (B.1.3), Definition (B.1.4), Obligation/Condition (B.1.5), Maximum occurrence (B.1.6), Data type (B.1.7) and Domain (B.1.8).

Update the appropriate UML schemas in annex A.

IV) IF new metadata elements defined:

In accordance with ISO 11179 and using annex B as a template, record the new metadata elements description in terms of Name (B.1.2), Domain code and Short Name (B.1.3), Definition (B.1.4), Obligation/Condition (B.1.5), Maximum occurrence (B.1.6), Data type (B.1.7) and Domain (B.1.8).

Update the appropriate UML schemas in annex A.

V) IF an existing metadata codelist expanded:

In accordance with ISO 11179 and using annex B identify the metadata code list and record the new domain elements in terms of Domain code and Short Name (B.1.3), Data type (B.1.7) and Domain (B.1.8).

VI) IF new metadata codelist created:

In accordance with ISO 11179 and using clause B.4 as a template, record the new metadata codelist in terms of Name (B.1.2) and Definition (B.1.4). Record any new metadata codelist elements in terms of Name (B.1.2), Domain code (B.1.3) and Definition (B.1.4).

VII) IF an existing metadata element domain restricted:

In accordance with ISO 11179 and using annex B identify the metadata element and record the modified domain set in terms of Domain code and Short Name (B.1.3), Data type (B.1.7) and Domain (B.1.8).

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

In accordance with ISO 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.

Annex G
(informative)

Metadata implementation

G.1 Background

G.1.1 Problem statement

The body of this 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 the 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 follows:
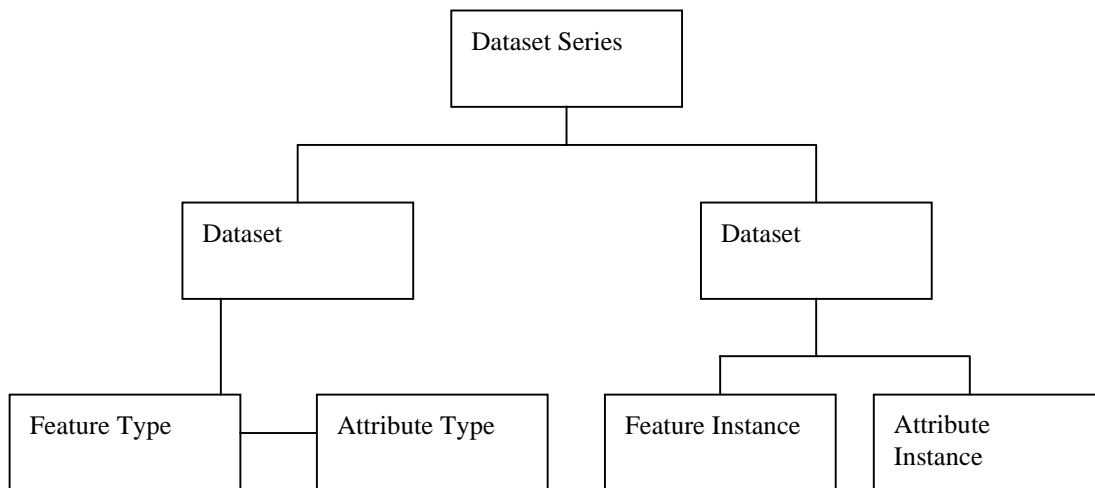
Figure G.1 — Metadata hierarchy

G.2 Metadata hierarchy levels

G.2.1 Data series metadata (optional)

A series or collection of spatial data which share 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 data 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 "data 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 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 Metadata Entry Level is listed are interpreted to be "dataset" metadata, by default.

G.2.3 Feature type metadata (optional)

Spatial constructs known as features are grouped spatial primitives (0-, 1- and 2-dimensional geometric objects) that have a common identity. 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 roads 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 subclause G.1.2.1.2. 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- and 2-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 subclause G.1.2.1.2. Examples of attribute type metadata entries may include:

⎯ Overhead clearances associated with bridges.

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 subclause G.1.2.1.2. 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 geospatial data.

H.2 Example

1) Consider a geospatial 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 counties.

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

    Dataset series – Administrative areas A, B & C

    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

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 date 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
    Resource constraints
    Data quality
    Maintenance
    Spatial representation
    Reference system
    Content
    Portrayal catalogue
    Distribution
    Metadata extension
    Application schema
    Extent
    Citation and responsible party

    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
    Resource constraints
    Data quality
    Maintenance
    Spatial representation
    Reference system
    Content
    Portrayal catalogue
    Distribution
    Metadata extension
    Application schema
    Extent
    Citation and responsible party

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
> Resource constraints
> Data quality
> Maintenance
> Spatial representation
> Reference system
> Content
> Portrayal catalogue
> Distribution
> Metadata extension
> Application schema
> Extent
> Citation and responsible party

> 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 geospatial 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
> Resource constraints
> Data quality
> Maintenance
> Spatial representation
> Reference system
> Content
> Portrayal catalogue
> Distribution
> Metadata extension
> Application schema
> Extent
> Citation and responsible party
>
>
> 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
Resource constraints
Data quality
Maintenance
Spatial representation
Reference system
Content
Portrayal catalogue
Distribution
Metadata extension
Application schema
Extent
Citation and responsible party

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   Example 1 – Recommended core metadata

```xml
<?xml version="1.0" encoding="UTF-8"?>

<!DOCTYPE Metadata SYSTEM "C:\My Documents\comprehensive.dtd">
<Metadata>
    <mdFileID>19115-example</mdFileID>
    <mdLangCode>en</mdLangCode>
    <mdCharCode>
        <CharSetCode value="ucs2"/>
    </mdCharCode>
    <mdContact>
        <RespParty>
            <rpOrgName>National Imagery and Mapping Agency</rpOrgName>
            <rpCntInfo>
                <Contact>
                    <cntAddress>
                        <Address>
                            <delPoint>4600 Sangamore Road</delPoint>
                            <city>Bethesda</city>
                            <adminArea>Maryland</adminArea>
                            <postCode>20816-5003</postCode>
                            <country>United States</country>
                        </Address>
                    </cntAddress>
                    <cntOnlineRes>
                        <OnlineRes>
                            <linkage>http://www.nima.mil</linkage>
                        </OnlineRes>
                    </cntOnlineRes>
                </Contact>
            </rpCntInfo>
            <roleCode>
                <RoleCode value="pointOfContact"/>
            </roleCode>
        </RespParty>
    </mdContact>
    <mdTimeSt>20000526</mdTimeSt>
    <mdStanName>ISO 19115</mdStanName>
    <mdStanVer>CD 3</mdStanVer>
    <refSysInfo>
        <RefSystem>
            <refSysID>
                <RsIdent>
                    <MdIdent>
                        <identCode>WGS 84</identCode>
                    </MdIdent>
                </RsIdent>
            </refSysID>
            <derRefSys/>
        </RefSystem>
    </refSysInfo>
```

```
<dataIdInfo>
    <DataIdent>
        <idCitation>
            <Citation>
                <resTitle>Digital Chart of the World</resTitle>
                <resRefDate>
                    <Date>
                        <refDate>199208</refDate>
                        <refDateType>
                            <DateType value="publication"/>
                        </refDateType>
                    </Date>
                </resRefDate>
                <citRespParty>
                    <RespParty>
                        <rpOrgName>Defense Mapping Agency</rpOrgName>
                        <rpCntInfo>
                            <Contact>
                                <cntAddress>
                                    <Address>
                                        <delPoint>8613 Lee Highway</delPoint>
                                        <city>Fairfax</city>
                                        <adminArea>Virginia</adminArea>
                                        <postCode>22031</postCode>
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                                </cntAddress>
                            </Contact>
                        </rpCntInfo>
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                        </roleCode>
                    </RespParty>
                </citRespParty>
                <citRespParty>
                    <RespParty>
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                        <rpCntInfo>
                            <Contact>
                                <cntAddress>
                                    <Address>
                                        <delPoint>4600 Sangamore Road</delPoint>
                                        <city>Bethesda</city>
                                        <adminArea>Maryland</adminArea>
                                        <postCode>20816-5003</postCode>
                                        <country>United States</country>
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                                </cntAddress>
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                                    </OnlineRes>
                                </cntOnlineRes>
                            </Contact>
                        </rpCntInfo>
                        <roleCode>
                            <RoleCode value="owner"/>
                        </roleCode>
                    </RespParty>
                </citRespParty>
                <presFormCd>
                    <PresFormCode value="vectorMap"/>
                </presFormCd>
```

```
            </Citation>
        </idCitation>
        <idAbs>The Digital Chart of the World is a comprehensive 1:1,000,000 scale vector basemap of
the world. It consists of cartographic, attribute, and textual data stored on compact disc
read only memory (CD-ROM). The primary source  for the database is the Defense
Mapping Agency's (DMA) Operational Navigation Chart (ONC) series. This is the
largest scale unclassified map series in existence that provides consistent, continuous
global coverage of essential basemap features. The database contains more than 1,500
megabytes of vector data and is organized into 17 thematic layers. The data includes
major road and rail networks, major hydrologic drainage systems, major utility networks
(cross-country pipelines and communication lines), all major airports, elevation contours
(1000 foot(ft), with 500ft and 250ft supplemental contours), coastlines, international
boundaries and populated places. The DCW also has an index of geographic names to aid
in locating areas of interest. The database can be accessed directly from the four optical
CD-ROMs that store the database or can be transferred to a magnetic media.
        </idAbs>
        <idPoC>
            <RespParty>
                <roleCode>
                    <RoleCode value="contentProvider"/>
                </roleCode>
            </RespParty>
        </idPoC>
        <spatRpType>
            <SpatRepType value="vector"/>
        </spatRpType>
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                        </rfDenom>
                        <derScale/>
                    </RepFract>
                </equScale>
            </Resol>
        </datScale>
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        </datCharCode>
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        </tpCatCode>
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                <southBL>-90.0</southBL>
                <northBL>90.0</northBL>
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            </GeoBndBox>
        </geoBox>
        <datExt>
            <Extent>
                <tempEle>
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                        <exTemp>199208</exTemp>
                    </TempExtent>
                </tempEle>
            </Extent>
        </datExt>
```

```
                    <dsFormat>
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                            <formatVer>1.0</formatVer>
                        </Format>
                    </dsFormat>
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            </dataIdInfo>
            <distInfo>
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                    <distTranOps>
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                                <OnlineRes>
                                    <linkage>http://www.nima.mil</linkage>
                                </OnlineRes>
                            </onLineRes>
                        </DigTranOps>
                    </distTranOps>
                </Distrib>
            </distInfo>
            <dqInfo>
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                    <dqScope>
                        <DQScope>
                            <scpLvl>
                                <ScopeCode value="dataset"/>
                            </scpLvl>
                        </DQScope>
                    </dqScope>
                    <datLineage>
                        <Lineage>
                            <statement>The DCW was compiled from the following sources:  the entire series of
Operational Navigatinal Charts (primary source), Joint Navigational Charts (geographic features - Antartica),
AVHRR (Vegetation), and NIMA Digital Flight Information File (airport information).</statement>
                        </Lineage>
                    </datLineage>
                </DatQual>
            </dqInfo>
        </Metadata>
```

I.2   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 an hierarchical classification-based taxonomy.

MD_Identification
(from ISO 19115 - Metadata)

+descriptiveKeywords

0..*

MD_Keywords
(from ISO 19115 - Metadata)

+ keywords [1..*] : CharacterString
+ typeCode [0..1] : MD_KeywordType
+ thesaurusName [0..1}] : CharacterString

+theTaxonomySystem

0..1

TaxonomySystem

+ classificationSystemAuthority : CI_Citation
+ classificationSystemModifications [0..1] : CharacterString
+ generalTaxonomicScope [0..1] : CharacterString
+ identificationReference : CI_Citation
+ observer [0..*] : CI_ResponsibleParty
+ identificationTaxonomicProcedures : CharacterString
+ identificationTaxonomicCompleteness [0..1] : Characterstring

MD_KeywordType (modified)

+ discipline
+ placed
+ stratum
+ temporal
+ theme
+ taxon (new)

+theVouchers

0..*

Vouchers

+ specimen : CharacterString
+ repository : CI_ResponsibleParty

+theTaxonomicClassification

1

TaxonomicClassification

+ commonName [0..*] : CharacterString
+ taxonRankName : CharacterString
+ taxonRankValue : CharacterString
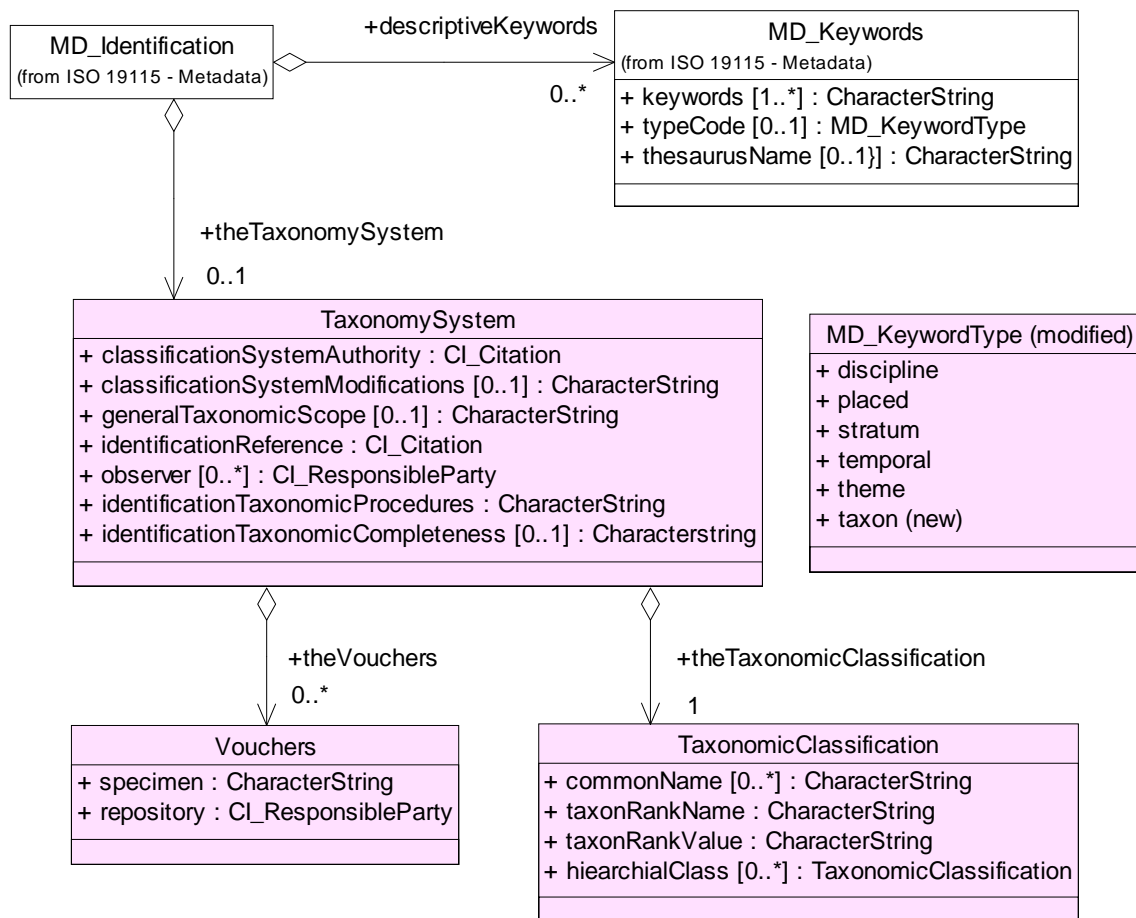+ hiearchialClass [0..*] : TaxonomicClassification

Figure I.1 — Examples of extended metadata

I.3   Data dictionary for the extended elements

Name	Short Name	Definition	Data Type	Parent Entity	Obligation/Condition	Max Occur.	Domain Value	Rationale	Source
Role name: theTaxonomySystem	taxonomy	Information on the taxa (1 or more) included in the data set, including keywords, taxonomic system and coverage information, and taxonomic classification system.	Association	MD_Identification	O	1		To provide for documentation of taxonomic information	National Biological Information Infrastructure (NBII)
TaxonomySystem	Taxonsys	Documentation of taxonomic sources, procedures, and treatments.	Class	MD_Identification	O	1		The set of data elements contained within this class element represents an attempt to provide better documentation of taxonomic sources, procedures, and treatments as strongly recommended in the American Institute of Biological Sciences Review to the National Biological Service on the Content Standard for Non-Geospatial Metadata Workshop, 1995	National Biological Information Infrastructure (NBII)
classificationSystemAuthority	classsys	Information about the Classification system or authority used	Class	TaxonomySystem	M	N	CI_Citation	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)

classificationSystemModifications	classmod	A description of any modifications or exceptions made to the Classification system or authority used	Character string	classificationSystemAuthority	O	1	Free text	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)
generalTaxonomicScope	taxogen	A 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."	Character string	TaxonomySystem	O	1	Free text	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)
identificationReference	idref	Information on any non-authroitative materials (e.g. field guides) useful for reconstructing the actual process	Class	TaxonomySystem	M	N		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.	Class	TaxonomySystem	O	N	CI_ResponsibleParty	If there are any questions on the identification oa specimens or field sightings, this should provide some insight into the data creator.	National Biological Information Infrastructure (NBII)
identificationTaxonomicProcedures	taxonpro	Description of the methods used for taxonomic identification. Could include specimen processing, comparison with museum materials, keys, and ket characters, chemical or genetic analyses, etc.	Character string	TaxonomySystem	M	1	Free text		National Biological Information Infrastructure (NBII)

identificationTaxonomicCompleteness	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.	Character string	TaxonomySystem	O	1	Free text		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.	Class	TaxonomicSystem	O	N			National Biological Information Infrastructure (NBII)
specimen	specimen	A 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	Character string	Vouchers	M	1	free text		National Biological Information Infrastructure (NBII)

repository	reposit	Information about the curator or contact person and/or agency responsible for the specimens.	Class	Vouchers	M	1	CI_Responsib leParty	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	theTaxClas s	Information about the taxonomic classification			M	1			
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 Acer rubrum var. rubrum, then the contents might look like the following:	Class	TaxonomicClassificati on	M	1		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.)	Character string	TaxonomicClassification	O	N	ree text	To provide the capability to describe precisely the taxa addressed in the data set or collection.	National Biological Information Infrastructure (NBII)
taxonRankName	taxonrn	The 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"	Character string	TaxonomicClassification	M	1	free text	To provide the capability to describe precisely the taxa addressed in the data set or collection.	National Biological Information Infrastructure (NBII)
taxonRankValue	taxonry	The name representing the taxonomic rank of the taxon being described. See the example included in the definition of TaxonomicClassification.	Character string	TaxonomicClassification	M	1	Free text	To provide the capability to describe precisely the taxa addressed in the data set or collection.	National Biological Information Infrastructure (NBII)
hierachicalClass	hiclass			TaxonomicClassification		N			

I.4 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 place
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 (new)	006	Keyword identifies a taxonomy of the dataset

Bibliography

[1]   ISO 690:1996, *Documentation —— Bibliographic references —— Content, form and structure*

[2]   ISO 8601:1988, *Data elements and interchange formats —— Information interchange —— Representation of dates and times*

[3]   ISO 19119, *Geographic information —— Services*

[4]   ISO 19123, *Geographic information —— Schema for coverage geometry and functions*

[5]   ISO 23950:1998, *Information and documentation —— Information retrieval (Z39.50) —— Application service definition and protocol specification*