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(Incorporating Amendments up to and including No. 2)

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Australian/New Zealand Standard™

Geographic information — Metadata

Part 1: Fundamentals

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AS/NZS ISO 19115.1:2015

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Australian Bureau of Statistics
Australian Hydrographic Office
CSIRO
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Department of Communications (Australia)
Department of Defence (Australia)
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Land Information New Zealand
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Australian/New Zealand Standard™

Geographic information — Metadata

Part 1: Fundamentals

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Preface

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee IT-004, Geographical Information/Geomatics, to supersede AS/NZS ISO 19115:2005, *Geographic information—Metadata* and its Amendment 1.

[A1] Amendment 1 to this Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee IT-004. [A1]

[A2] Amendment 2 to this Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee IT-004. [A2]

This Standard incorporates Amendment No. 1 (June 2018) and (July 2021). The start and end of changes introduced by the Amendment are indicated in the text by tags including the amendment number.

The objective of this Standard is to define the schema required for describing geographic information and services by means of metadata. It provides information about the identification, the extent, the quality, the spatial and temporal aspects, the content, the spatial reference, the portrayal, distribution, and other properties of digital geographic data and services.

[A2] This Standard is identical with, and has been reproduced from, ISO 19115-1:2014, *Geographic information—Metadata*, Part 1: *Fundamentals*, and its Amendment 1 (2018) and Amendment 2 (2020) which have been added at the end of the source text. [A2]

As this Standard is reproduced from an International Standard, the following applies:

(a) In the source text 'this part of ISO 19115' should read 'this Australian/New Zealand Standard'.

(b) A full point substitutes for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian or Australian/New Zealand Standards, as follows:

Reference to International Standard	*Australian/New Zealand Standard*
ISO 3166, Codes for the representation of names of countries and their subdivisions (series)	AS/NZS 2632, Codes for the representation of names of countries and their subdivisions (series)
ISO 8601, Data elements and interchange formats—Information interchange—Representation of dates and times	AS ISO 8601, Data elements and interchange formats—Information interchange—Representation of dates and times
ISO/TS 19103, Geographic information—Conceptual schema language	AS/NZS ISO 19103, Geographic information—Conceptual schema language
ISO 19106, Geographic information—Profiles	AS/NZS ISO 19106, Geographic information—Profiles
ISO 19107, Geographic information—Spatial schema	AS/NZS ISO 19107, Geographic information—Spatial schema
ISO 19108, Geographic information—Temporal schema	AS/NZS ISO 19108, Geographic information—Temporal schema
ISO 19109, Geographic information—Rules for application schema	AS/NZS ISO 19109, Geographic information—Rules for application schema
ISO 19110, Geographic information—Methodology for feature cataloguing	AS/NZS ISO 19110, Geographic information—Methodology for feature cataloguing

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ISO 19111-2, Geographic information—Spatial referencing by coordinates, Part 2: Extension for parametric values	AS/NZS ISO 19111.2, Geographic information—Spatial referencing by coordinates, Part 2: Extension for parametric values
ISO 19112, Geographic information—Spatial referencing by geographic identifiers	AS/NZS ISO 19112, Geographic information—Spatial referencing by geographic identifiers
ISO 19119, Geographic information—Services	AS/NZS ISO 19119, Geographic information—Services
ISO 19157, Geographic information—Data quality	AS/NZS ISO 19157, Geographic information—Data quality

Only normative references that have been adopted as Australian or Australian/New Zealand Standards have been listed.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the annexes to which they apply. A ‘normative’ annex is an integral part of a Standard, whereas an ‘informative’ annex is only for information and guidance.

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Contents

Preface ii
Foreword vi
Introduction vii
1 Scope 1
2 Conformance 1
2.1 Conformance requirements 1
2.2 Abstract test suite 2
3 Normative references 2
4 Terms and definitions 2
5 Symbols and abbreviated terms 4
5.1 Abbreviated terms 4
5.2 Abbreviated terms — Package 5
6 Metadata requirements 5
6.1 Metadata for resources 5
6.2 Metadata application information 5
6.3 Metadata fundamentals package and dependencies 6
6.4 Citation and responsible party, Metadata application information, Language-characterset localisation information, and Extent information package relationships 7
6.5 Resource metadata class diagrams by package 8
6.5.1 Introduction 8
6.5.2 Metadata information (MD_Metadata) 9
6.5.3 Identification information (MD_Identification) 10
6.5.4 Constraint information (MD_Constraints) 12
6.5.5 Lineage information (LI_Lineage) 13
6.5.6 Maintenance information (MD_MaintenanceInformation) 14
6.5.7 Spatial representation information (MD_SpatialRepresentation) 15
6.5.8 Reference system information (MD_ReferenceSystem) 16
6.5.9 Content information (MD_ContentInformation) 17
6.5.10 Portrayal catalogue information (MD_PortrayalCatalogueReference) 18
6.5.11 Distribution information (MD_Distribution) 19
6.5.12 Metadata extension information (MD_MetadataExtensionInformation) 20
6.5.13 Application schema information (MD_ApplicationSchemaInformation) 21
6.5.14 Service metadata information 22
6.6 Extent, Citation and Common information packages 23
6.6.1 Extent information (EX_Extent) 23
6.6.2 Citation, responsibility and party information (CI_Citation, CI_Responsibility, and CI_Party) classes 24
6.6.3 Citation, responsibility and party information (CI_Citation, CI_Responsibility, and CI_Party) and codelists 25
6.6.4 Commonly used classes 26
6.7 Multilingual support for free text fields 27
6.7.1 Free text metadata elements 27
6.7.2 Management of localised strings 28
6.8 Implementation examples 29
6.9 Metadata implementation 29
6.10 Discovery metadata 29
6.11 Revisions 29
Annex A (normative) **Abstract test suite** 30
Annex B (normative) **Data dictionary for geographic metadata** 33
Annex C (normative) **Metadata extensions and profiles** 125

Documents
Document Sharing Hub
Full document details: AS NZS ISO 19115.1-2015 (2021)

Annex D (informative) **Implementation examples** **128**
Annex E (informative) **Metadata implementation** **141**
Annex F (normative) **Discovery metadata for geographic resources** **149**
Annex G (informative) **Revisions** **152**
Bibliography **162**
AMENDMENT 1 ..... **163**
AMENDMENT 2 ..... **173**
Amendment control sheet **178**

Documents
Document Sharing Hub
Full document details: AS NZS ISO 19115.1-2015 (2021)

Foreword

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

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www .org/directives

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

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

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

This first edition of ISO 19115-1 cancels and replaces ISO 19115:2003, which has been technically revised. It also incorporates the Technical Corrigendum ISO 19115:2003/Cor 1:2006.

ISO 19115 consists of the following parts, under the general title *Geographic information — Metadata*:

— *Part 1: Fundamentals*

— *Part 2: Extensions for imagery and gridded data*

— *Part 3: XML schema implementation of metadata fundamentals* [Technical Specification][1)]

1) To be published.

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Introduction

Recent advancement of computer software and hardware for managing and analysing data, particularly fusing with geographically referenced observations, has resulted in a vast increase in the use of digital information solutions worldwide. The resulting awareness of the importance of geography and how things relate spatially is impacting almost all aspects of society. Increasingly, individuals from a wide range of disciplines outside of geographic information science and information technology are producing, enhancing, and modifying digital geographic information. As the number, complexity, and diversity of geographic information resources grow, a method for providing an understanding of all aspects of these resources increases in importance.

A digital geographic dataset is a representation of some model of the world for use in computer analysis and graphic display of information. The underlying model is an abstraction, requiring approximation, simplification, and omission of some aspects, and is always just one of many possible "views". To ensure that data are not misused, the assumptions and limitations affecting the creation of data must be fully documented. Typically, data are used by many people other than the producer. Metadata allows a producer to describe resources so that users can understand the assumptions and limitations and evaluate the resources' applicability for their intended use. Proper documentation will provide those unfamiliar with the data with a better understanding, and enable them to use it properly. Good quality documentation will also provide data producers with a keener knowledge of their holdings and will allow them to better manage data production, storage, updating, and reuse.

A geographic dataset is typically thought of as structured, tabular data with a location associated with each row in a table or pixel in a grid. For the purposes of the evolving web-based information cloud, the concept of dataset can be usefully extended to include any packaged information product that is intended to be treated as a unit, defined by its scope, authorship, and intended purpose. In this broader view, any document containing geographically located observations or interpretations can be considered a geographic dataset, whether it is structured or unstructured.

The evolving distributed information system enabled by the Internet is fostering the development of service-oriented architectures in which web services are becoming important as sources of information or processing capability, and many of these services provide location-based information or functionality. Description of these services for discovery and utilization has become an important function of metadata.

A significant body of information with geographic reference is contained in resources that are not in digital form. These resources include maps and documents of various sorts, as well as specimens or other artefacts collected to characterize some aspect of the Earth — physical, biological, or cultural. The metadata schema presented in this part of ISO 19115 is also applicable to such resources.

The objective of this part of ISO 19115 is to provide a model for describing information or resources that can have geographic extents. This part of ISO 19115 is intended to be used by information system analysts, program planners, and developers of information systems, as well as others in order to define basic principles and requirements for standardized description of information resources. This part of ISO 19115 defines metadata elements, their properties, and the relationships between elements, and establishes a common set of metadata terminology, definitions, and extension procedures.

Although the primary purpose of this part of ISO 19115 is to describe digital information that has a geographic extent, it can be used to describe all types of resources including textual documents, initiatives, software, non-geographic information, product specifications and repositories, i.e. it can be used to describe information resources that do not have geographic extent. Some domains have their own metadata standards, such as the Dublin Core for libraries. If necessary such standards and this part of ISO 19115 could be profiled to create a Community Schema.

When implemented by a resource provider, this part of ISO 19115 will:

1) Enable information resource providers to effectively and completely characterize their resources.

   Facilitate the organisation and management of metadata for information resources.

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3) Enable appropriate use of information resources through accurate understanding of their characteristics.

4) Facilitate resource discovery, access, retrieval and reuse.

5) Enable users to determine whether an information resource will be of use to them.

This part of ISO 19115 defines general-purpose metadata. More detailed models for some aspects of resource description, including quality, data-structure or imagery, are defined in other ISO geographic information standards. The metadata model described herein enables implementation of domain-specific user extensions based on a common pattern to facilitate implementation of software using those extensions.

This part of ISO 19115 is a revision of ISO 19115:2003 and ISO 19115:2003/Cor 1:2006. This revision was driven by advances in Information Technology and a shift toward the use of the Internet for access, use and management of metadata as well as revisions to reference documents and individual user provided suggestions based on eight years of experience in its use.

This part of ISO 19115 is fully independent from the previous version with a new name and date. Its UML packages, classes, and elements have different identifiers from the previous version. The UML from ISO 19115:2003/Cor 1:2006 will remain available in the ISO/TC 211 Harmonized Model Management Group repository. Backward compatibility is to be provided using a transformation service. Past metadata instances can continue to reference/use the previous version.

The purpose of metadata is to describe resources. This description may remain with the data and does not change. It can be used both to interpret the data and to search for (discover) the data. Large amounts of older data exists compliant with ISO 19115:2003, and newer data exists (which is still being produced) to national or regional profiles of ISO 19115:2003. This data will remain as it is currently defined. New data production to new product specifications will build upon the revision of ISO 19115 making use of the expanded descriptive capabilities. With the introduction of this revision of ISO 19115, a mixed data environment exists. Systems that support data discovery in compliance with the revision of ISO 19115 need to also be able to also recognize and interpret metadata in the ISO 19115:2003 form so that all data in a mixed environment can be discovered. Systems that support data interpretation in compliance with the revision of ISO 19115 need to also be able to also recognize and interpret metadata in the ISO 19115:2003 form so that all data is interpreted. The use of separate identifiers for the revised elements and the manner in which the metadata standard has been revised facilitates this.

To aid in ensuring backward compatibility and ease the transformation of metadata instances to this revised version of ISO 19115:

— No new mandatory elements were created;

— If the definition of a metadata element required changing it was deleted and replaced by a new metadata element; metadata element names were not reused for other concepts;

— Definitions of some metadata elements were broadened;

— Metadata elements were reused when their datatype changed but name and definition remained the same;

— Remaining attributes were kept in the same order as in the replaced standard;

— A list of deleted elements, new elements, and a mapping between old elements and their replacement is provided in Annex G;

— Restructuring of the UML was kept to a minimum.

Summary of major changes:

— The concept of “Core metadata” was removed;

— Metadata for services was added, derived from ISO 19119:2005 and ISO 19119:2005/Amd 1:2008;

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— Data quality was moved to ISO 19157;

— Annex F was added to describe metadata for the discovery of service and non-service resources;

— Many codelists were extended;

— The use of “Short name” and “Domain code” was dropped for metadata elements and codes respectively.

A full description of changes is provided in Annex G.

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Geographic information — Metadata

Part 1: Fundamentals

1 Scope

This part of ISO 19115 defines the schema required for describing geographic information and services by means of metadata. It provides information about the identification, the extent, the quality, the spatial and temporal aspects, the content, the spatial reference, the portrayal, distribution, and other properties of digital geographic data and services.

This part of ISO 19115 is applicable to:

— the cataloguing of all types of resources, clearinghouse activities, and the full description of datasets and services;

— geographic services, geographic datasets, dataset series, and individual geographic features and feature properties.

This part of ISO 19115 defines:

— mandatory and conditional metadata sections, metadata entities, and metadata elements;

— the minimum set of metadata required to serve most metadata applications (data discovery, determining data fitness for use, data access, data transfer, and use of digital data and services);

— optional metadata elements to allow for a more extensive standard description of resources, if required;

— a method for extending metadata to fit specialized needs.

Though this part of ISO 19115 is applicable to digital data and services, its principles can be extended to many other types of resources such as maps, charts, and textual documents as well as non-geographic data. Certain conditional metadata elements might not apply to these other forms of data.

2 Conformance

2.1 Conformance requirements

Any metadata claiming conformance with this part of ISO 19115 shall pass the requirements described in the abstract test suite presented in Annex A.

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

If a discrepancy exists between the UML models provided in Clause 6 and Annex B, the UML models shall be considered authoritative.

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

Any profile conforming to this part of ISO 19115 shall conform to the rules in C.6.

This part of ISO 19115 defines metadata used to describe data. Datasets defined in accordance with this part of ISO 19115 may coexist with other datasets that conform to earlier versions of this International Standard. Domain specific or regional profiles of this part of ISO 19115 are responsible for establishing the details of backward compatibility in their domains. Conformance clauses for services that operate using metadata defined in accordance with this part of ISO 19115 or profiles developed based on this part of ISO 19115 need to be defined in those profiles or service specifications in order to permit backward compatibility in their domain.

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2.2 Abstract test suite

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

3 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 639 (all parts), *Codes for the representation of names of languages*

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

ISO 4217:2008, *Codes for the representation of currencies and funds*

ISO 8601:2004, *Data elements and interchange formats — Information interchange — Representation of dates and times*

ISO/TS 19103:2005, *Geographic information — Conceptual schema language*

ISO 19106:2004, *Geographic information — Profiles*

ISO 19107:2003, *Geographic information — Spatial schema*

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

ISO 19109:2005, *Geographic information — Rules for application schema*

ISO 19110:2005, *Geographic information — Methodology for feature cataloguing*

ISO 19111:2007, *Geographic information — Spatial referencing by coordinates*

ISO 19111-2:2009, *Geographic information — Spatial referencing by coordinates — Part 2: Extension for parametric values*

ISO 19112:2003, *Geographic information — Spatial referencing by geographic identifiers*

ISO 19119, *Geographic information — Services*

ISO 19157:2013, *Geographic information — Data Quality*

IETF RFC 3986:2005, *Uniform Resource Identifier (URI): Generic Syntax*

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TS 19103:2005 and the following apply.

4.1
citation
information object containing information that directs a reader's or user's attention from one *resource* (4.17) to another

[SOURCE: ISO 24619:2011, 3.1.16]

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4.2
data type
specification of a value domain with *operations* (4.15) allowed on values in this domain

[SOURCE: ISO/TS 19103:2005, 4.1.5]

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

Note 1 to entry: A data type is identified by a term, e.g. Integer.

4.3
dataset
identifiable collection of data

Note 1 to entry: A dataset can 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 can be as small as a single *feature* (4.5) or feature attribute contained within a larger dataset. A hardcopy map or chart can be considered a dataset.

4.4
dataset series
collection of *datasets* (4.3) sharing common characteristics

4.5
feature
abstraction of real world phenomena

[SOURCE: ISO 19101:2002, 4.11]

4.6
free text
textual information that can be expressed in one or many languages

4.7
grid
network composed of two or more sets of curves in which the members of each set intersect the members of the other sets in an algorithmic way

[SOURCE: ISO 19123:2005, 4.1.23]

4.8
interface
named set of *operations* (4.15) that characterize the behaviour of an entity

[SOURCE: ISO 19119:2005, 4.2]

4.9
lineage
provenance, (4.16) source(s) and production process(es) used in producing a *resource* (4.17)

4.10
metadata
information about a *resource* (4.17)

4.11
metadata element
discrete unit of *metadata* (4.10)

Note 1 to entry: Metadata elements are unique within a metadata class.

Note 2 to entry: Equivalent to an attribute and/or an association in UML terminology.

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Note 3 to entry: Class attributes and relationships are referred to collectively as metadata elements.

4.12
metadata entity
set *of metadata elements* (4.11) describing the same aspect of data

Note 1 to entry: Can contain one or more metadata entities.

Note 2 to entry: Equivalent to a class in UML terminology.

4.13
metadata section
subset of *metadata* (4.10) which consists of a collection of related *metadata entities* (4.12) and *metadata elements* (4.11)

Note 1 to entry: Equivalent to a package in UML terminology.

4.14
model
abstraction of some aspects of reality

[SOURCE: ISO 19109:2005, 4.14]

4.15
operation
specification of a transformation or query that an object may be called to execute

Note 1 to entry: An operation has a name and a list of parameters.

[SOURCE: ISO 19119:2005, 4.3]

4.16
provenance
organization or individual that created, accumulated, maintained and used records

[SOURCE: ISO 5127:2001, 4.1.1.10]

4.17
resource
identifiable asset or means that fulfils a requirement

EXAMPLE *Dataset* (4.3), *dataset series* (4.4), *service* (4.18), document, initiative, software, person or organization.

4.18
service
distinct part of the functionality that is provided by an entity through *interfaces* (4.8)

[SOURCE: ISO 19119:2005, 4.1]

5 Symbols and abbreviated terms

5.1 Abbreviated terms

OCL Object Constraint Language

OGC Open Geospatial Consortium

UML Unified Modelling Language

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XML Extensible Markup Language

5.2 Abbreviated terms — Package

Two letter abbreviated terms are used to denote the package that contains a class. Those abbreviated terms precede class names, connected by a "_".The International Standard in which those classes are located is indicated in parentheses. A list of those abbreviated terms follows.

CI Citation (ISO 19115-1)

DQ Data Quality (ISO 19157)

DS Dataset (ISO 19115-1)

EX Extent (ISO 19115-1)

FC Feature Catalogue (ISO 19110)

GF General Feature (ISO 19109)

GM Geometry (ISO 19107)

LI Lineage (ISO 19115-1)

LE Lineage extended (ISO 19115-2)

MD Metadata (ISO 19115-1)

PT Polylinguistic Text (ISO/TS 19103)

RS Reference System (ISO 19115-1)

SC Spatial Coordinates (ISO 19111)

SV Metadata for Services (ISO 19115-1)

TM Temporal (ISO 19108)

6 Metadata requirements

6.1 Metadata for resources

This part of ISO 19115 identifies the metadata required to describe all types of resources. Metadata is applicable to: collections of resources and their components, (e.g. series); datasets and their components (e.g. feature and feature property types); software; hardware; services; non-geographic datasets; and other types of resources. Metadata shall be provided for geographic datasets and may, optionally, be provided for other types of resources.

6.2 Metadata application information

Figure 1 is a Unified Modelling Language (UML) class diagram defining the classes of information to which metadata applies. It specifies that a resource (DS_Resource) and aggregations of resources must have one or more related Metadata sets (MD_Metadata). Metadata may optionally relate to a Feature, Feature Attribute, Feature Type, Feature Property Type (Metaclass' instantiated by Feature association role, Feature attribute type, and Feature operation). The method for relating metadata to feature and attribute instances is defined in ISO 19109. A dataset (DS_Dataset), aggregate (DS_Aggregate), and a service (SV_Service) are specializations (subtypes) of a resource (DS_Resource). Resource aggregations may be specified (subclassed) as a general association (DS_OtherAggregate), a dataset series (DS_

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Series), or a specific activity (DS_Initiative). Aggregate resources which are specified (subtyped) as a series (DS_Series) are related by the fact that they have a common heritage, e.g. they may be datasets that have been derived from the same sensor (DS_Sensor), platform (DS_Platform) or adhere to a common production specification (DS_ProductionSeries). MD_Metadata applies to a wide variety of resources and services which are specified in MD_ScopeCode (B.3.28). The data dictionary for this model is located in Table B.1.

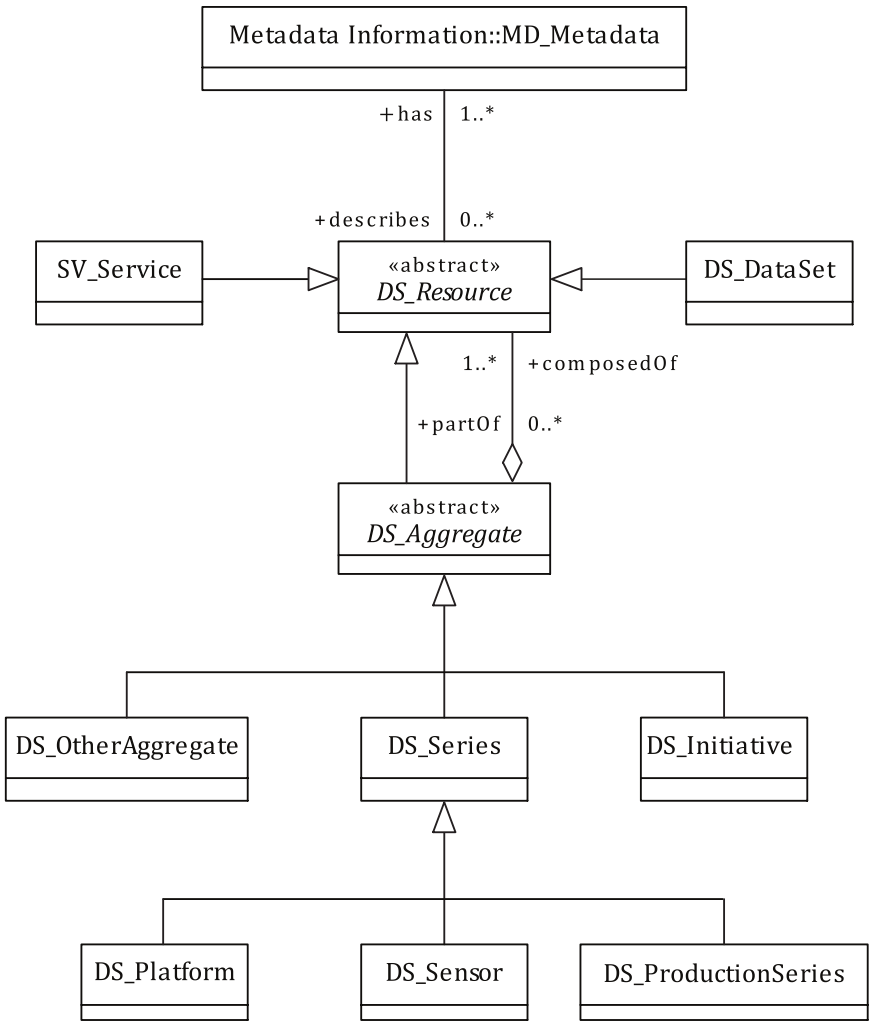

Figure 1 — Metadata application

6.3 Metadata fundamentals package and dependencies

The ISO geographic information series of standards are defined using one or more UML packages and are maintained in a single integrated UML model. This part of ISO 19115 utilizes concepts defined in several of these other standards' packages. Figure 2 illustrates the ISO/TC 211 packages upon which this part of ISO 19115 is dependent. Metadata-Fundamentals are defined and provided by one or more packages; each package provides a separate component of metadata information. There are 13 packages that are used to define and provide the metadata that is defined in this part of ISO 19115: Metadata information, Identification information, Constraint information, Lineage information, Content information, Distribution information, Reference system information, Spatial representation information, Portrayal catalogue information, Metadata application information, Application Schema information, Metadata extension information, and Service metadata information. There are four packages: Citation information, Responsible party information, Language-characterset localisation information, and Extent information which are used by other packages. Individual packages may be used alone to provide separate components of metadata to meet specific use case requirements but a minimum of the

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Metadata and Identification information packages must be used when providing a complete metadata set. The additional packages shall be added when providing supplementary metadata.

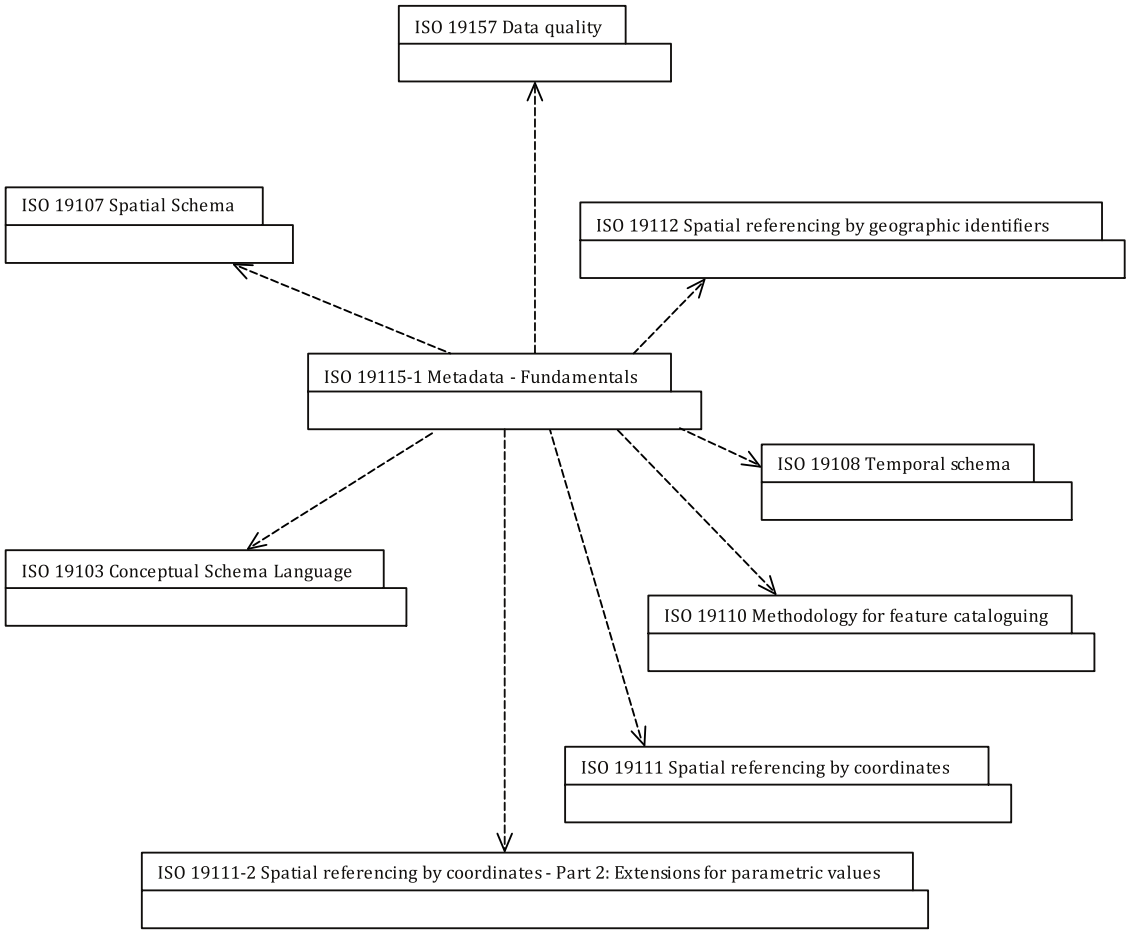

Figure 2 — Metadata fundamentals package and dependencies

6.4 Citation and responsible party, Metadata application information, Language-characterset localisation information, and Extent information package relationships

Four packages: Citation and responsible party information, Language-characterset localisation information, Extent information, and Metadata application information are used by the other packages when providing metadata (see Figure 3).

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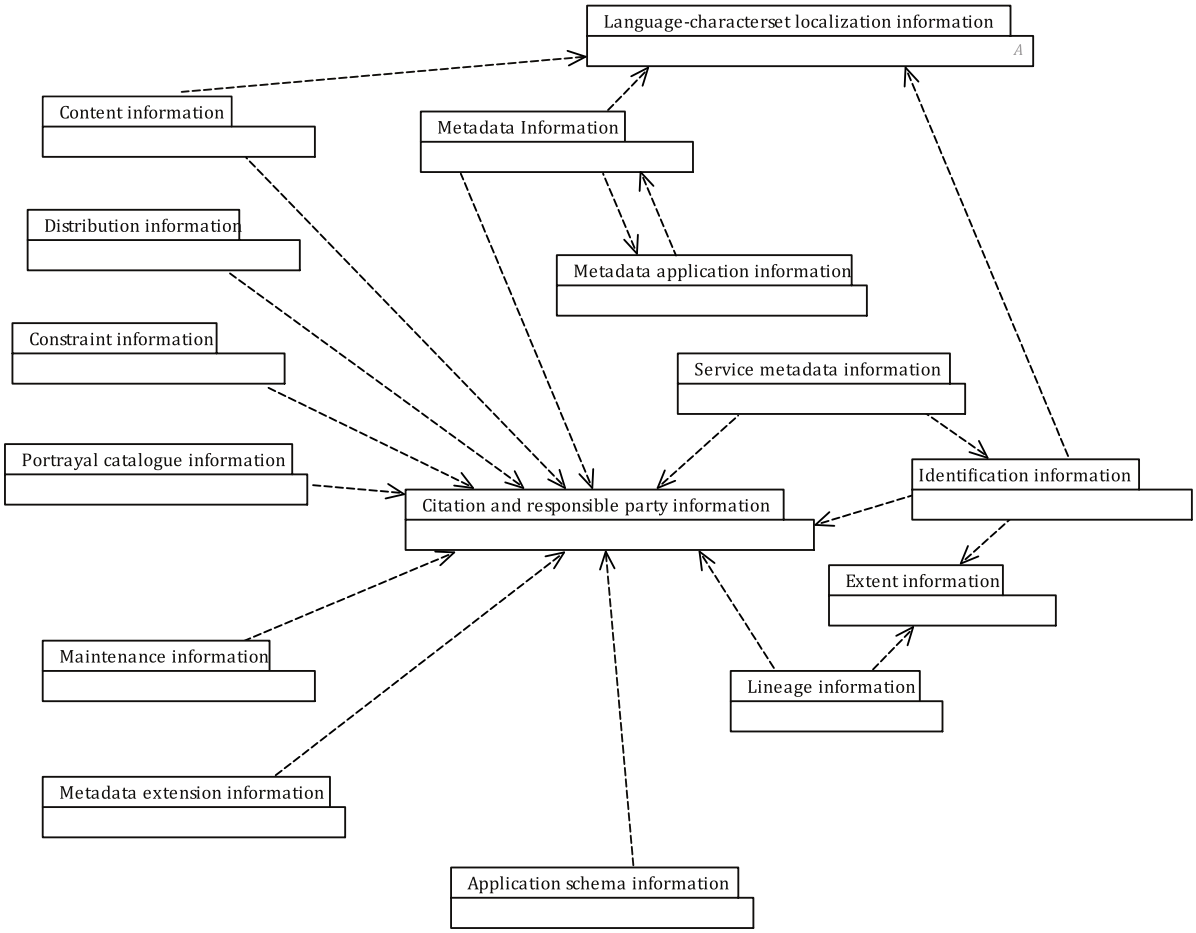

Figure 3 — Citation and responsible party information, Language-characterset localisation information, Metadata application information, and Extent information package relationships

6.5 Resource metadata class diagrams by package

6.5.1 Introduction

Metadata is composed of one or more metadata packages containing one or more metadata classes containing attributes. The relationships between metadata packages and between metadata classes are specified by composition and aggregation relationship symbols. Class attributes and relationships are referred to collectively as metadata elements. The diagrams in 6.5.2 to 6.6.3 provide "views", which are portions of the total abstract model for metadata. Each diagram defines a metadata UML package of related classes, elements, data types, and code lists. Related classes, which are defined in another diagram, are shown with attributes suppressed and the package where they are fully specified identified by the package name proceeding a double colon (::). The metadata is fully specified by the UML model diagrams and an associated data dictionary for each package in Annex B. Abstract classes (which are classes which are defined for schematic organisation purposes, i.e. only their subclasses are implemented) are identified with their names in italic.

NOTE In some cases, optional classes can have mandatory elements; those elements become mandatory only if the optional element is used.

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6.5.2 Metadata information (MD_Metadata)

6.5.2.1 General

The MD_Metadata package defines the schema for describing the complete metadata about a resource and metadata about the metadata itself. The data dictionary for this diagram (Figure 4) is located in Table B.2.

6.5.2.2 Metadata schema

Full metadata is provided by MD_Metadata and an aggregate of 12 additional metadata classes as specified in Figure 4. The DQ_DataQuality class is defined in ISO 19157.

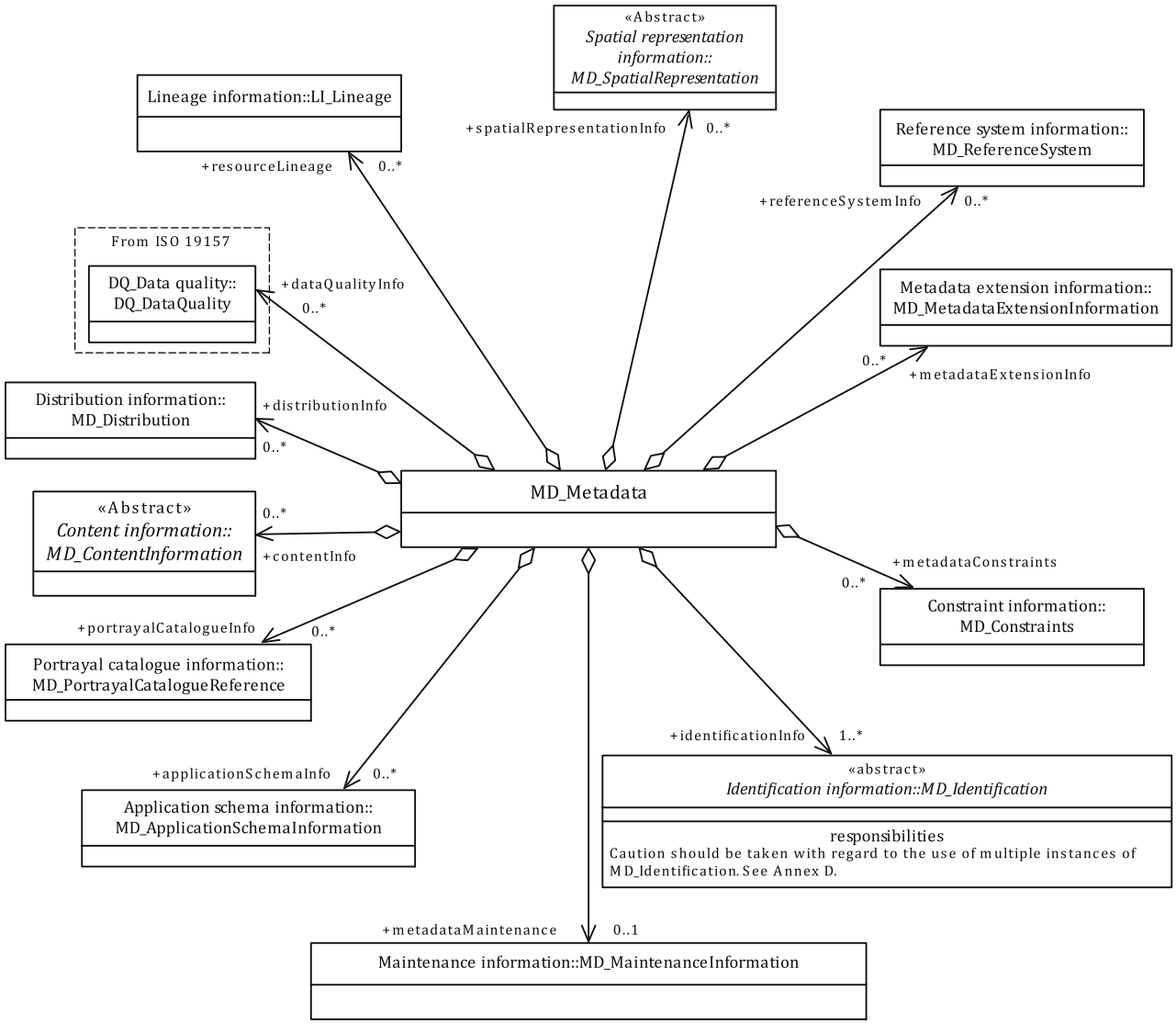

Figure 4 — Metadata schema classes

6.5.2.3 Metadata about metadata

The MD_Metadata class contains attributes providing information about the metadata as specified in Figure 5. The data dictionary for this diagram is located in Table B.2.

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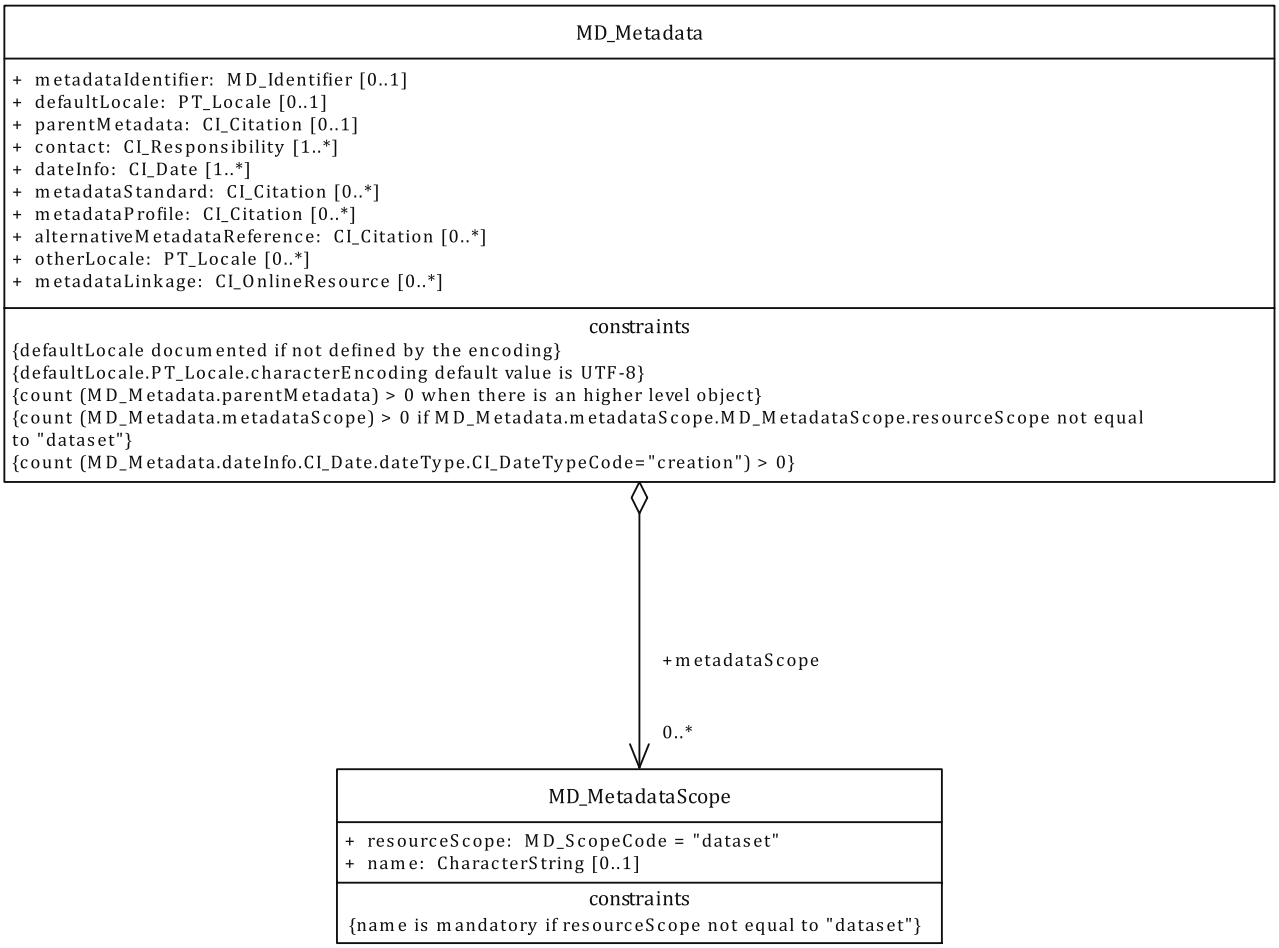

Figure 5 — Metadata on metadata classes

6.5.3 Identification information (MD_Identification)

6.5.3.1 General

Identification information supports the provision of information to uniquely identify a resource. MD_Identification can be specified as MD_DataIdentification or SV_ServiceIdentification and is an aggregate of seven classes of metadata which aid in resource identification. The full package is specified in Figure 6. The data dictionary for this diagram is located in Table B.3.

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6.5.3.2 Identification information classes

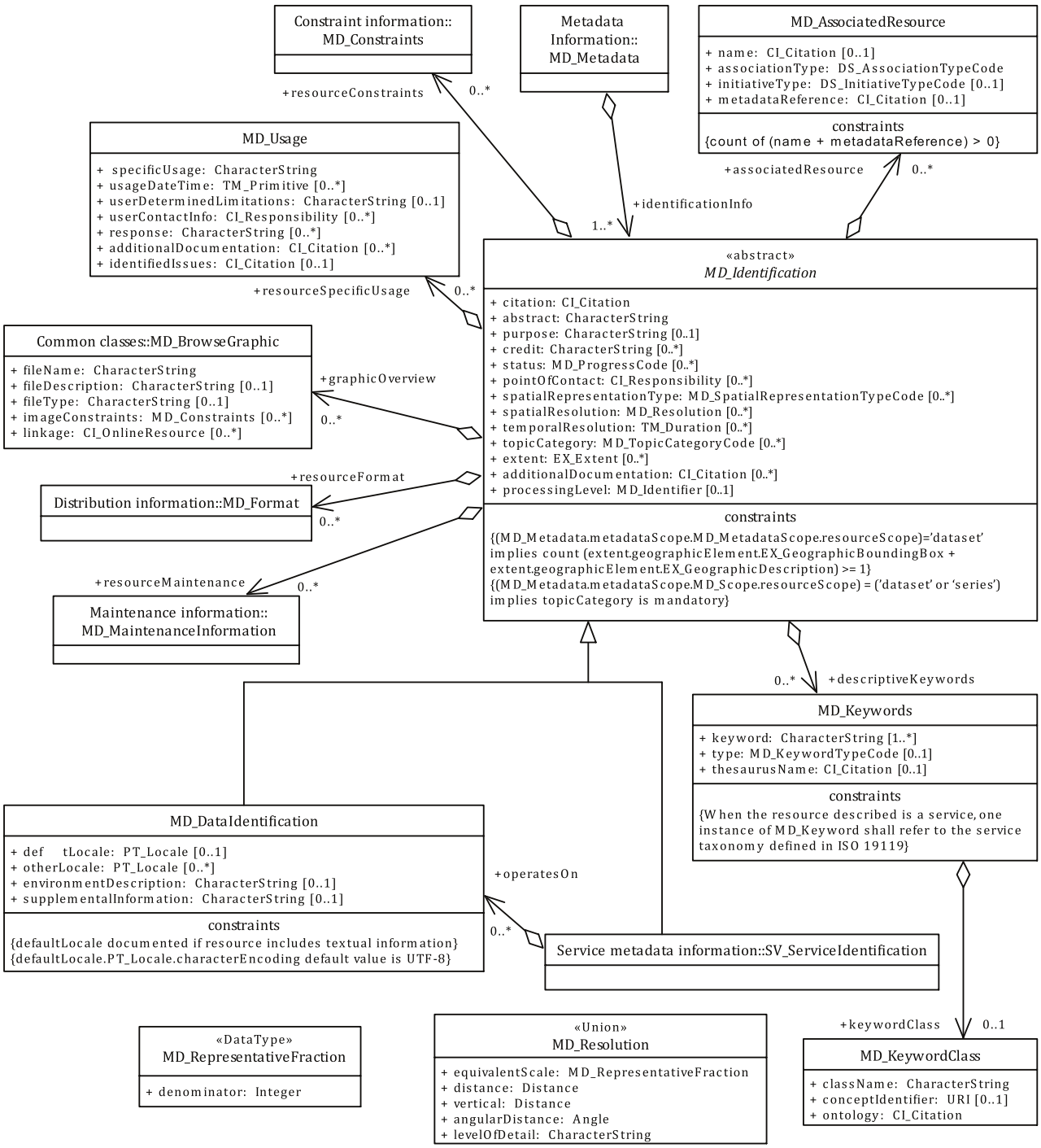

Figure 6 — Identification information classes

6.5.3.3 Identification information codelists

The Identification package uses the codelists specified in Figure 7. The data dictionary for these codelists is located in B.3.

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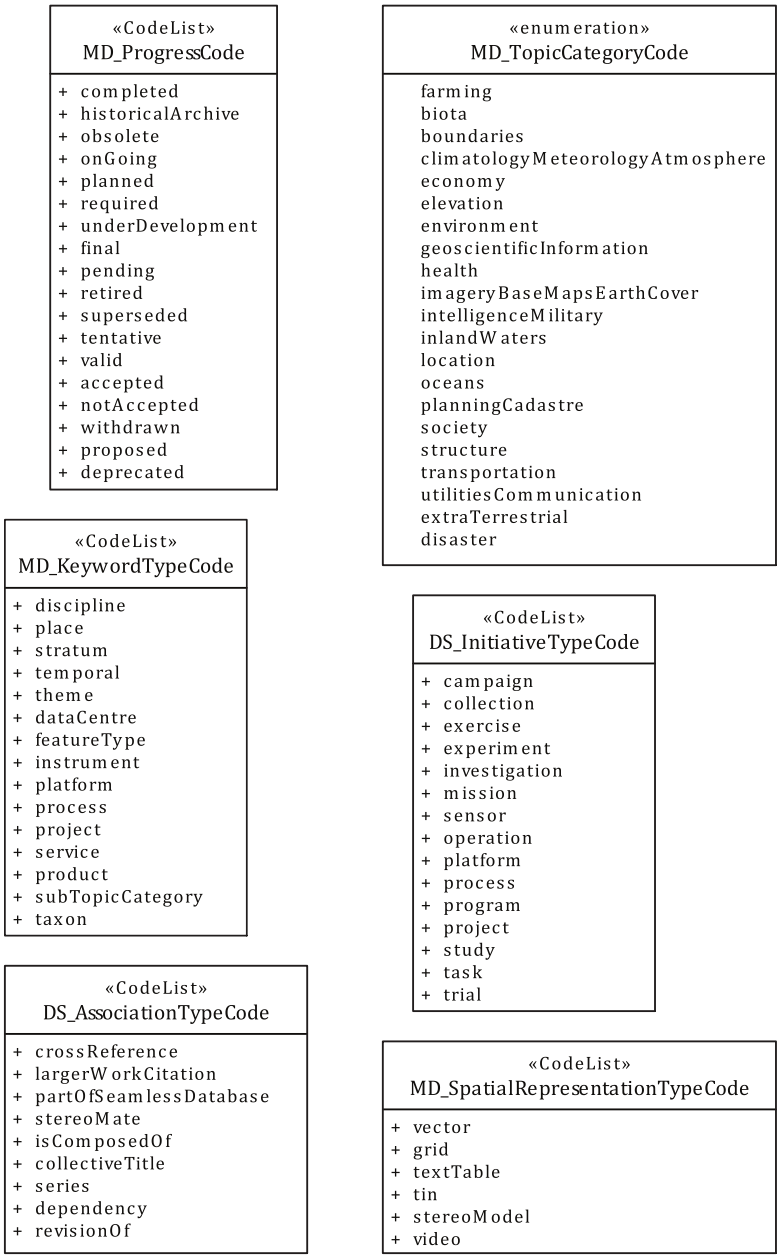

Figure 7 — Identification information codelists

6.5.4 Constraint information (MD_Constraints)

This package supports the provision of metadata concerning the legal and security constraints placed on resources and metadata about resources. It consists of MD_Constraints which can also be specified as MD_LegalConstraints and/or MD_SecurityConstraints. The full package is specified in Figure 8. The data dictionary for this diagram is located in Table B.4.

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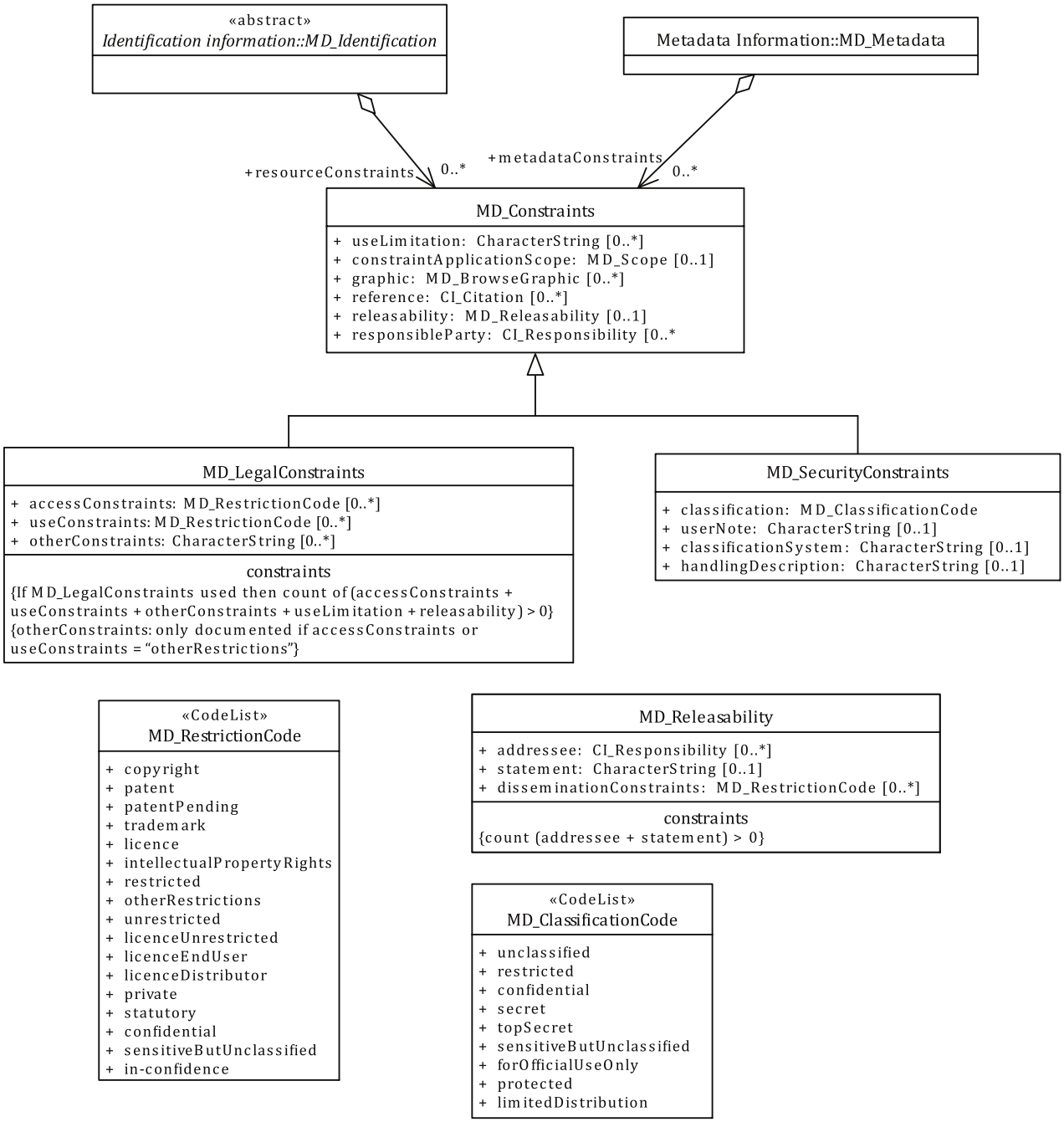

Figure 8 — Constraint information classes

6.5.5 Lineage information (LI_Lineage)

This package supports the provision of metadata concerning the sources and production processes used in producing a resource. LI_Lineage is an aggregate of two classes LI_Source, LI_ProcessStep. The full package is specified in Figure 9. The classes with the suffix "LE" are defined in ISO 19115-2 and are shown here for reference and to provide a complete view of the lineage model. The data dictionary for this diagram is located in Table B.5.

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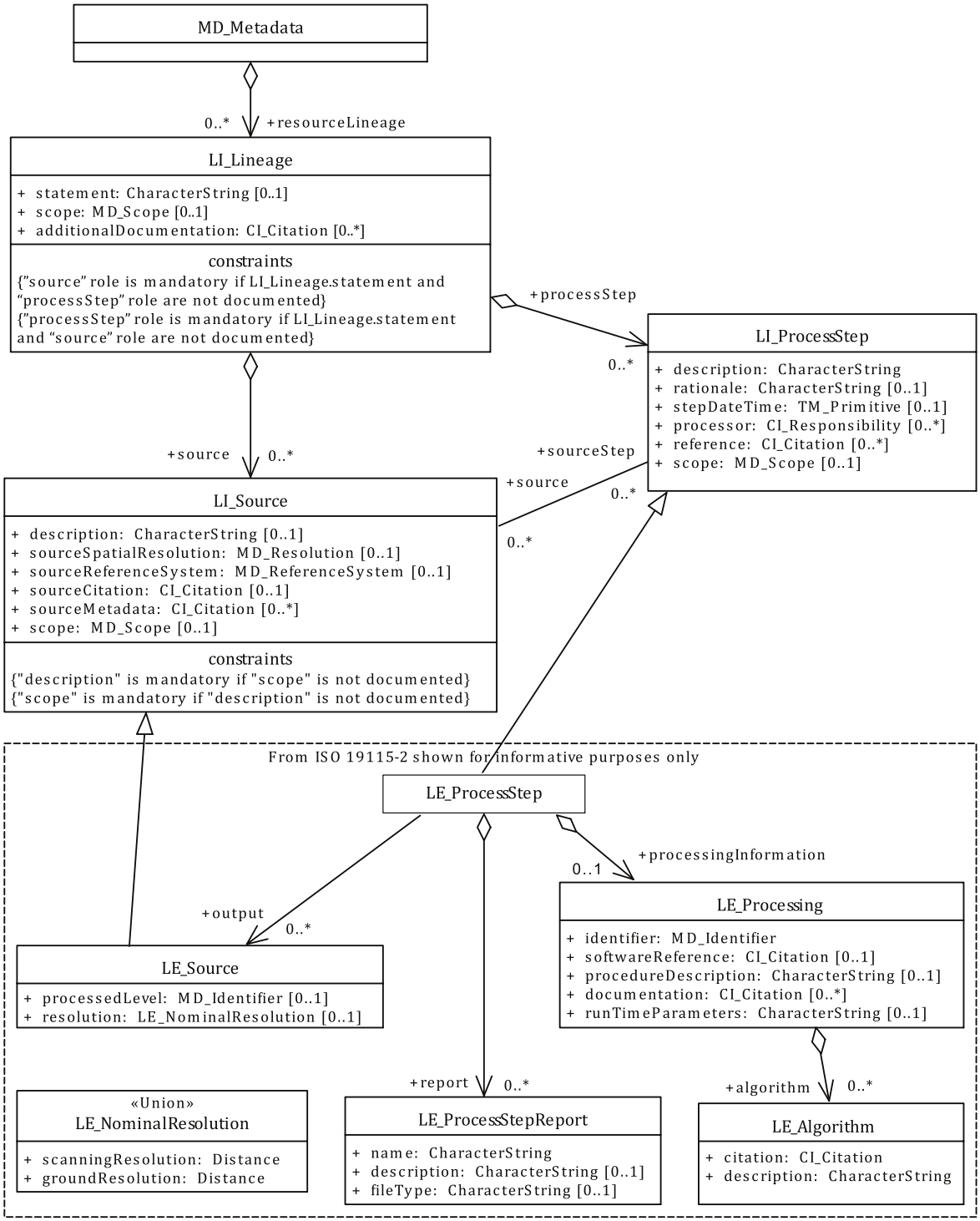

Figure 9 — Lineage information classes

6.5.6 Maintenance information (MD_MaintenanceInformation)

This package supports the provision of metadata related to the scope and frequency of maintenance for a resource or of metadata about a resource in a single class, MD_MaintenanceInformation. The full package is specified in Figure 10. The data dictionary for this diagram is located in Table B.6.

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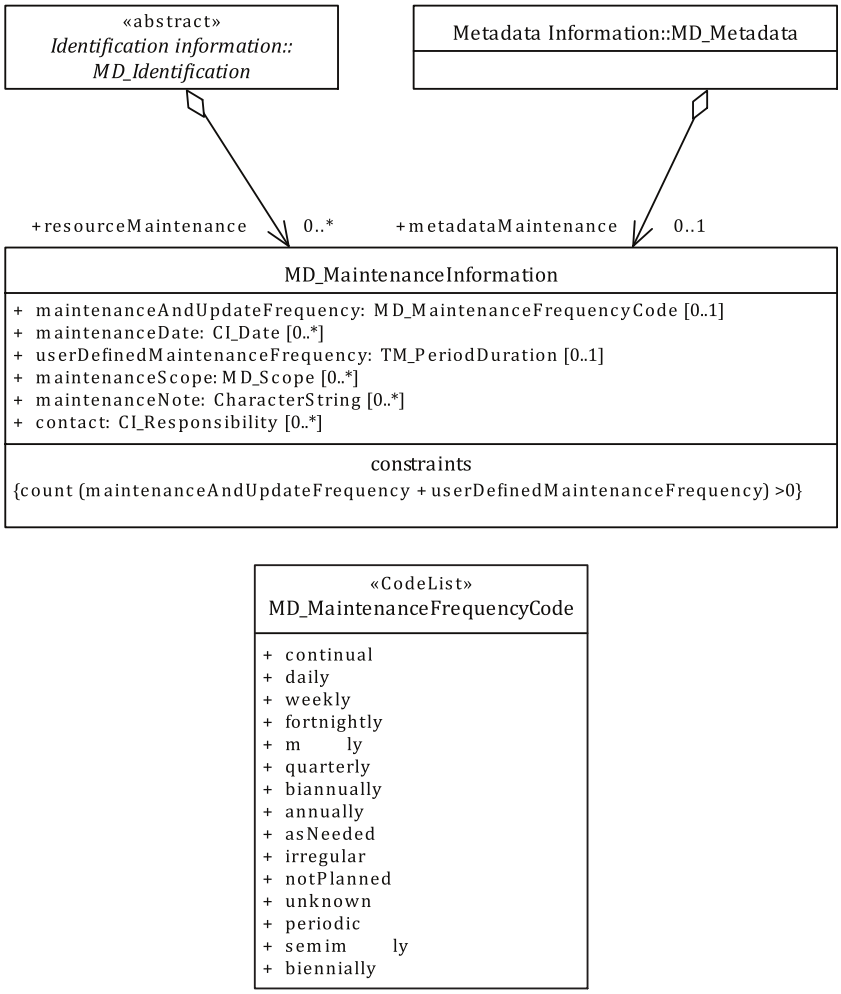

Figure 10 — Maintenance information classes

6.5.7 Spatial representation information (MD_SpatialRepresentation)

This package supports the provision of metadata identifying the spatial primitives used by a resource and the mechanisms used to model real world phenomena in a digital information system. It consists of the MD_SpatialRepresentation which can be specified as either MD_VectorSpatialRepresentation or MD_GridSpatialRepresentation. MD_GridSpatialRepresentation can be further specified as MD_Georectified or MD_Georeferencable. The full package is specified in Figure 11. The data dictionary for this diagram is located in Table B.7.

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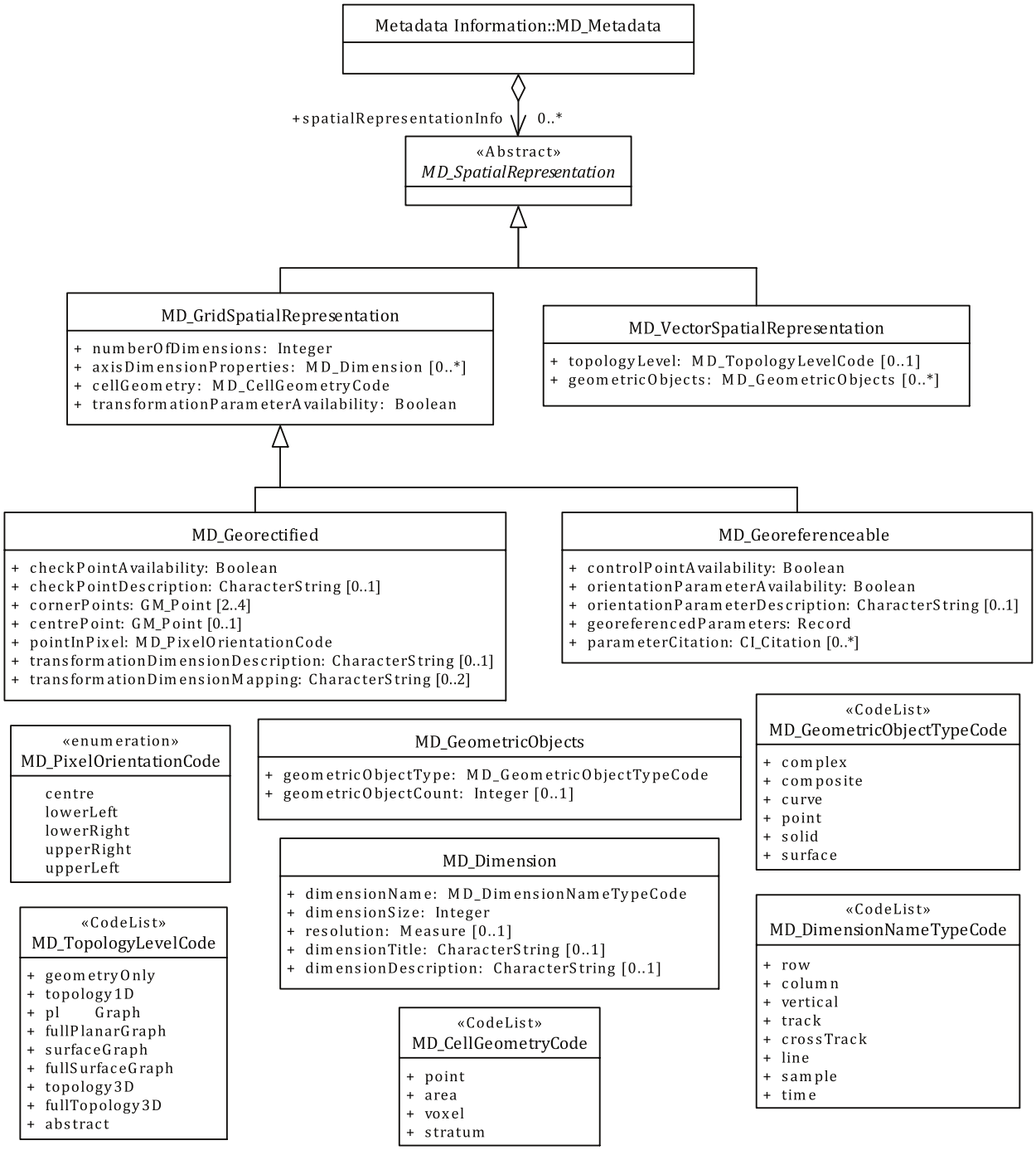

Figure 11 — Spatial representation information classes

6.5.8 Reference system information (MD_ReferenceSystem)

This package supports the metadata identifying the spatial, temporal and parametric reference system(s) used by a resource in one class, MD_ReferenceSystem. The full package is specified in Figure 12. The data dictionary for this diagram is located in Table B.8.

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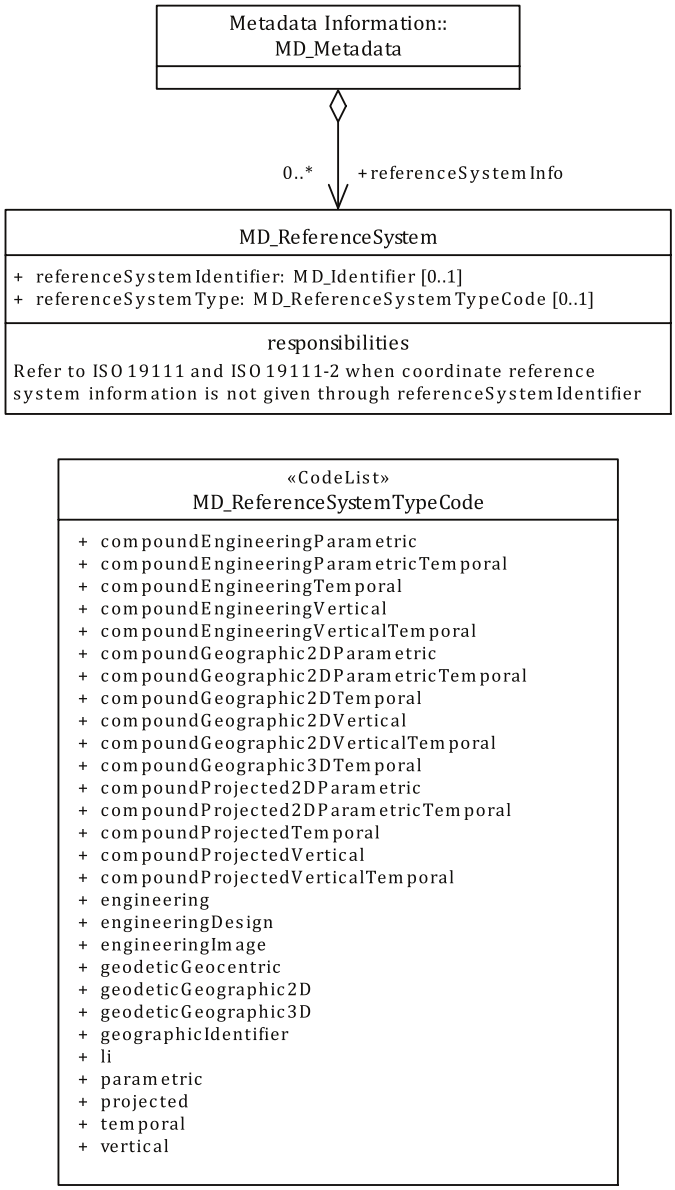

Figure 12 — Reference system information classes

6.5.9 Content information (MD_ContentInformation)

This package supports the provision of metadata identifying the content of a resource by: citing the feature catalogue used to define the content (MD_FeatureCatalogueDescription); incorporating the feature catalogue (MD_FeatureCatalogue – defined in ISO 19110); or describing the content of a coverage resource (MD_CoverageDescription) which also may be specified as MD_ImageDescription. The full package is specified in Figure 13. The data dictionary for this diagram is located in Table B.9.

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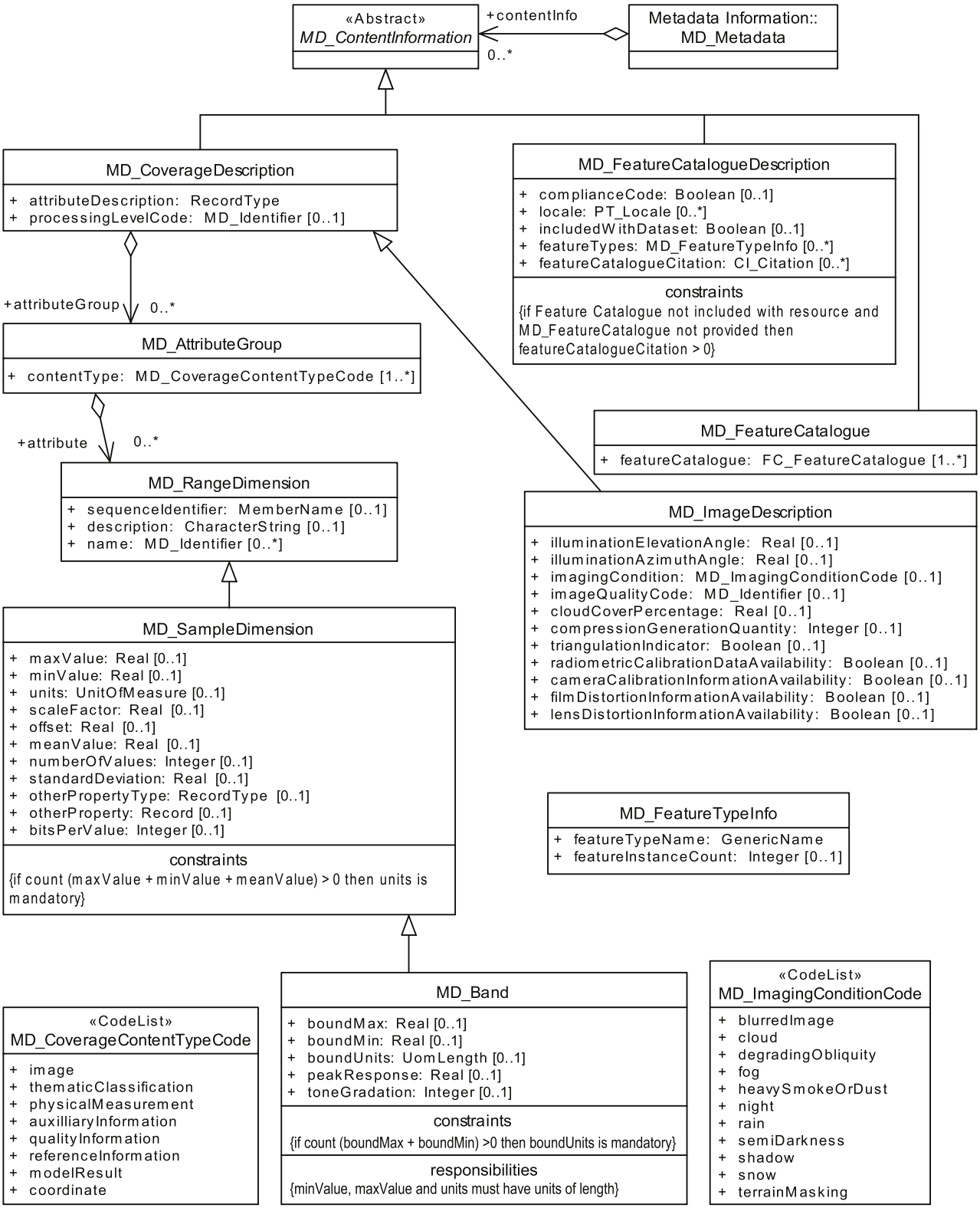

Figure 13 — Content information classes

6.5.10 Portrayal catalogue information (MD_PortrayalCatalogueReference)

This package supports the provision of metadata identifying the portrayal catalogue used. The portrayal catalogue describes how the resource can be rendered for human visualisation. The full package is specified in Figure 14. The data dictionary for this diagram is located in Table B.10.

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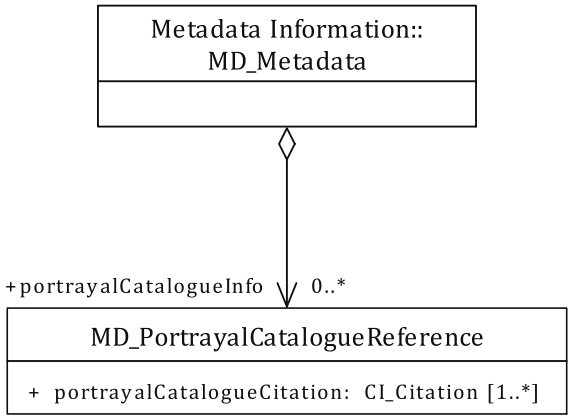

Figure 14 — Portrayal catalogue information classes

6.5.11 Distribution information (MD_Distribution)

This package supports the provision of metadata about the distributor of and options for obtaining a resource. MD_Distribution is an aggregate of three additional classes. The full package is specified in Figure 15. The data dictionary for this diagram is located in Table B.11.

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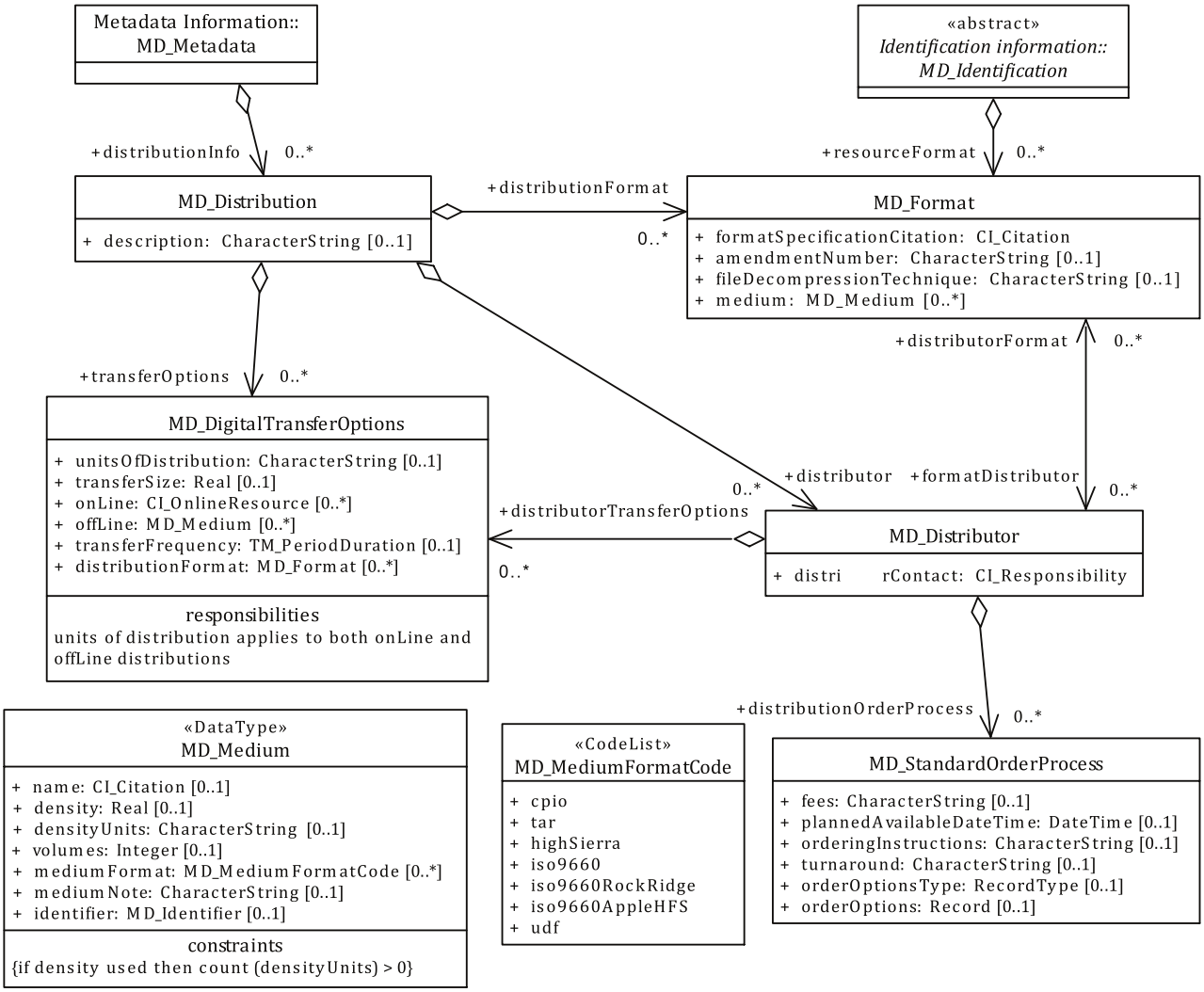

Figure 15 — Distribution information classes

6.5.12 Metadata extension information (MD_MetadataExtensionInformation)

This package supports the provision of information about user specified metadata extensions. MD_MetadataExtensionInformation is an aggregate of one other class. The full package is specified in Figure 16. The data dictionary for this diagram is located in Table B.12.

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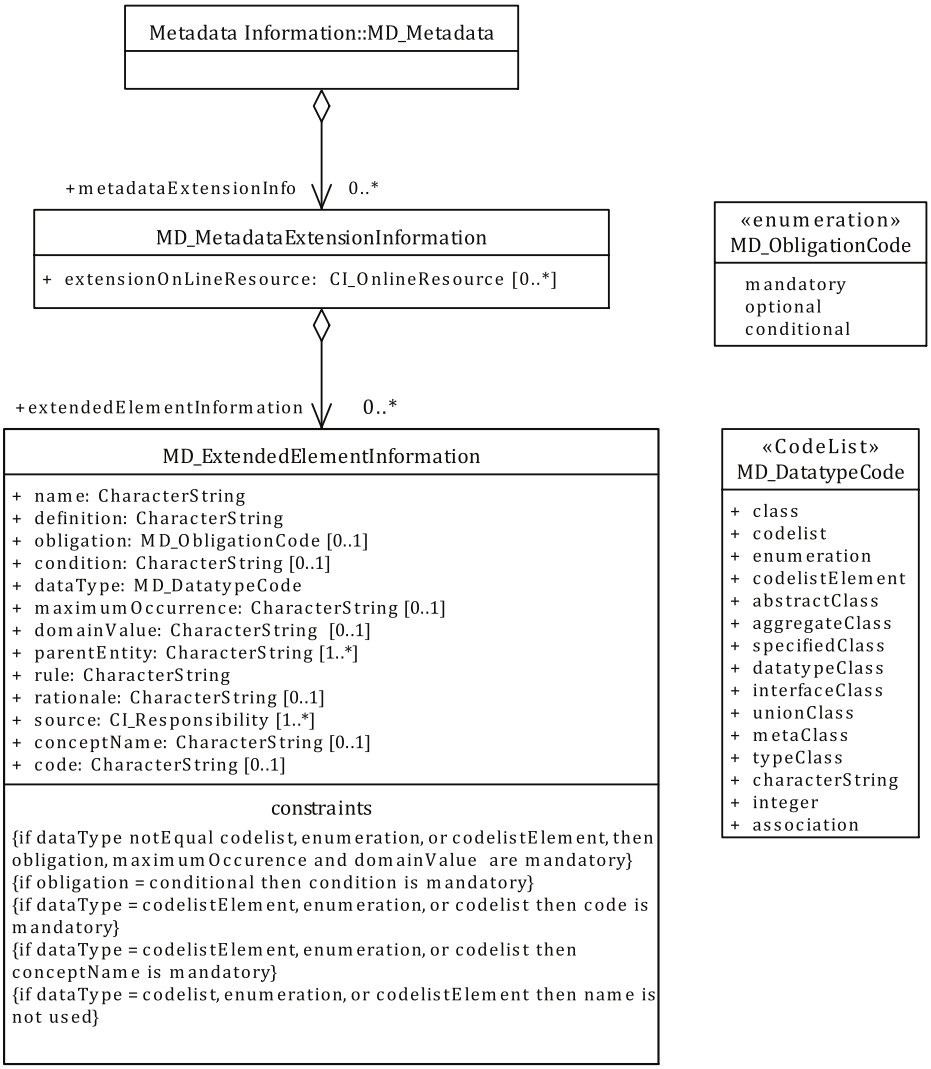

Figure 16 — Metadata extension information classes

6.5.13 Application schema information (MD_ApplicationSchemaInformation)

This package supports the provision of metadata describing the application schema used to define and expose the structure of a resource. The application schema is the model and/or data dictionary that represents the resource. MD_ApplicationSchemaInformation is specified in Figure 17. The data dictionary for this diagram is located in Table B.13.

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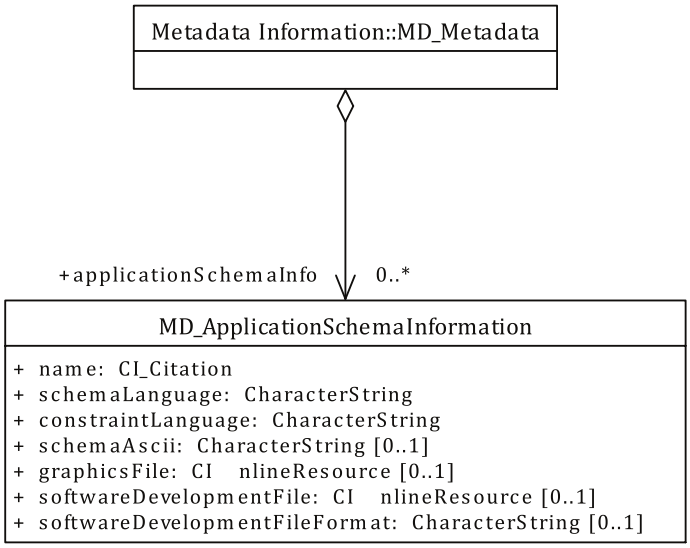

Figure 17 — Application schema information class

6.5.14 Service metadata information

This package supports the provision of metadata about services. The structure of service metadata includes three major classes: a section of basic **service** metadata (SV_ServiceIdentification class) that provides a general description of the functionality provided by the service and two sections that describe the **operations** (SV_OperationMetadata) and **data** (MD_DataIdentification) available from a particular service.

SV_ServiceIdentification has an aggregation relationship with multiple instances of SV_ OperationMetadata. While it is known that the service structure may be more complicated than this aggregation, the additional detail of services-aggregating services is not needed in a service metadata record.

A service instance may be either tightly coupled with a dataset instance, loosely coupled (i.e. non associated with specific dataset instances), or it may be "mixed coupled."

— In the tightly coupled case, the service metadata shall describe both the service and the geographic dataset. The permitted values for the description of operations shall be constrained by the values defined by the datasets associated with the service.

— Loosely coupled services may have an association with data types through the service type definition (SV_ServiceIdentification.serviceType). Dataset metadata need not be provided in the service metadata for the loosely coupled case (i.e. operatedDataset:CI_Citation or operatesOn:MD _DataIdentification optional).

— A single service instance may be associated to both kinds of data associated, loosely and tightly coupled. This is the case of "mixed coupled" instance. The coupling type is specified from the SV_ CouplingType codelist, which includes {tight, loose, mixed}.

The class SV_CoupledResource enables the description of the link between an operation, and the data on which it is based. This class requires that a given operation, resource and scopedName shall refer respectively to an existing operation (instance of SV_OperationMetadata), a resource metadata (instance of MD_DataIdentification or a CI_Citation), and a scopedName providing the name of the data in the context of the operation. The full service metadata package is specified in Figure 18. The data dictionary for this diagram is located in Table B.14.

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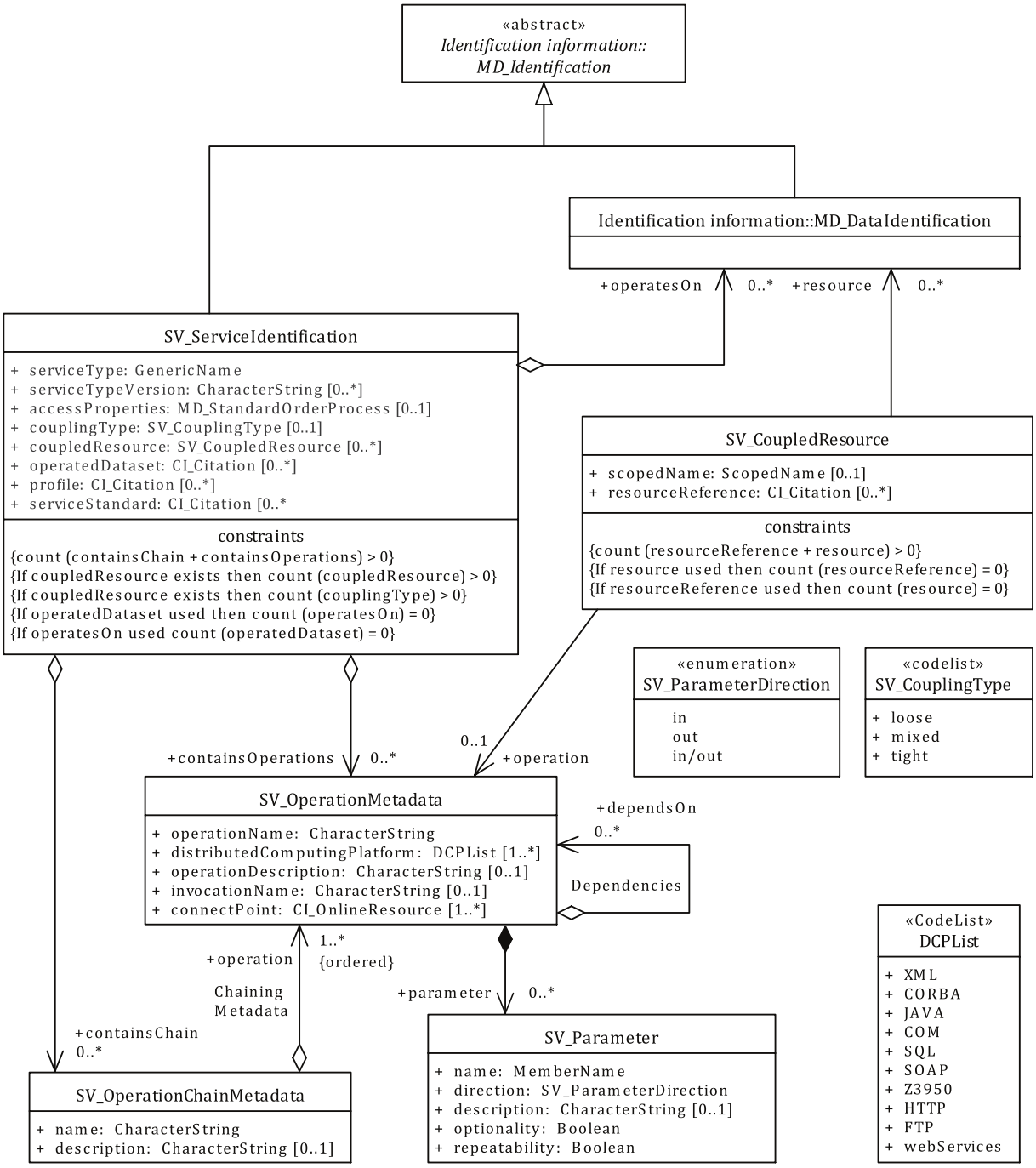

Figure 18 — Service metadata information classes

6.6 Extent, Citation and Common information packages

6.6.1 Extent information (EX_Extent)

The datatype in this package is an aggregate of the metadata elements that describe the spatial and temporal extent of resources, objects, events, or phenomena. The EX_Extent class contains information about the geographic (EX_GeographicExtent), temporal (EX_TemporalExtent) and the vertical (EX_VerticalExtent) extent of something. EX_GeographicExtent can be subclassed as EX_BoundingPolygon, EX_GeographicBoundingBox and EX_GeographicDescription. The combined spatial and temporal extent

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(EX_SpatialTemporalExtent) is an aggregate of EX_GeographicExtent. EX_SpatialTemporalExtent is a subclass of EX_TemporalExtent. The full package is specified in Figure 19.

The EX_Extent class has three optional roles named “geographicElement”, “temporalElement”, and “verticalElement” and an element called “description”. At least one of the four shall be used. The data dictionary for this diagram is located in Table B.15.

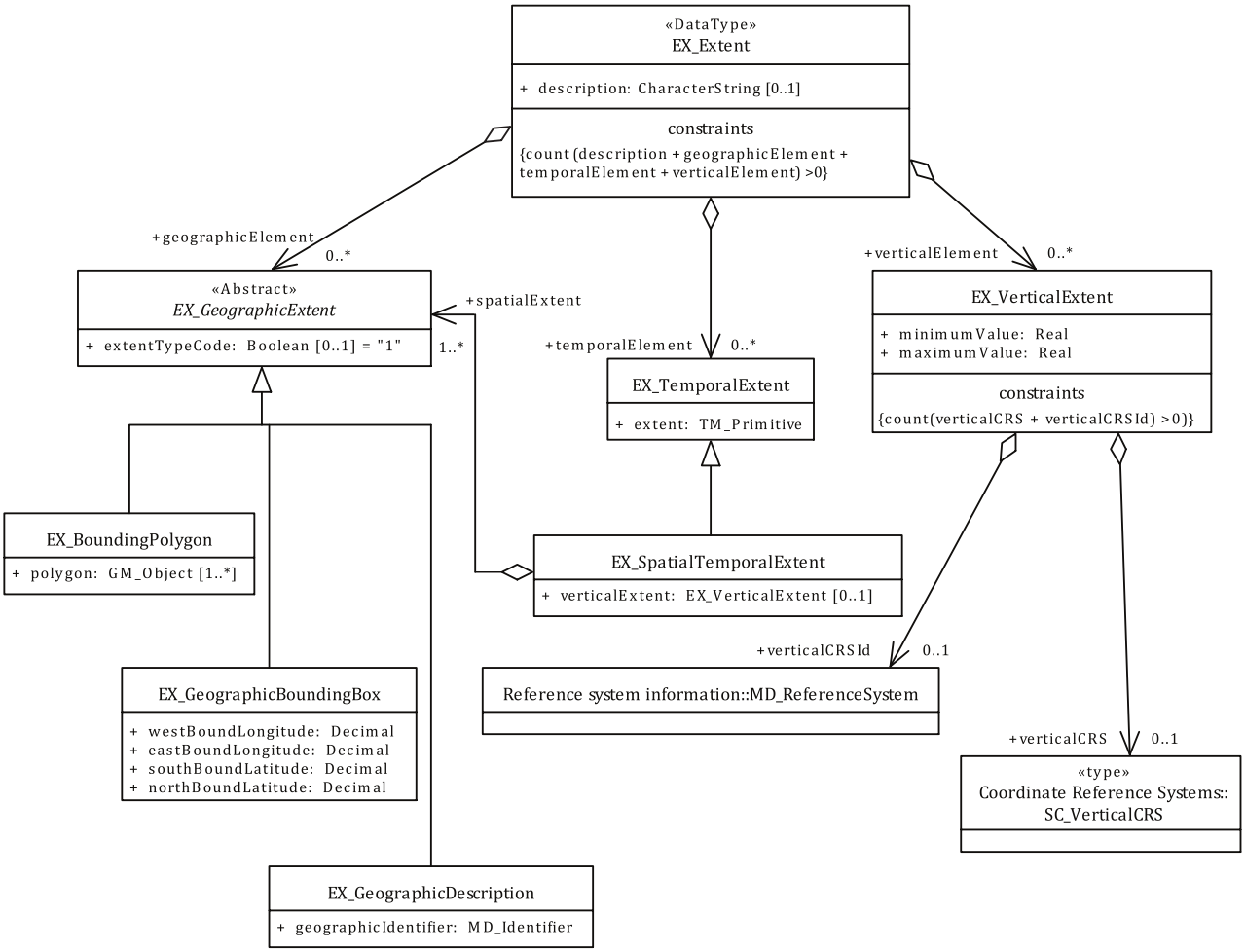

Figure 19 — Extent information classes

6.6.2 Citation, responsibility and party information (CI_Citation, CI_Responsibility, and CI_Party) classes

This package provides a standardized method for citing a resource, as well as information about the party responsible for a resource. Citations use CI_Citation and cite the party responsible using CI_Responsibility. CI_Responsibility may be used without CI_Citation. CI_Responsibility is an aggregate of one or more parties (CI_Party). CI_Party may be specified as CI_Individual and/or CI_Organisation. The full package is specified in Figure 20. The data dictionary for this diagram is located in Table B.16.

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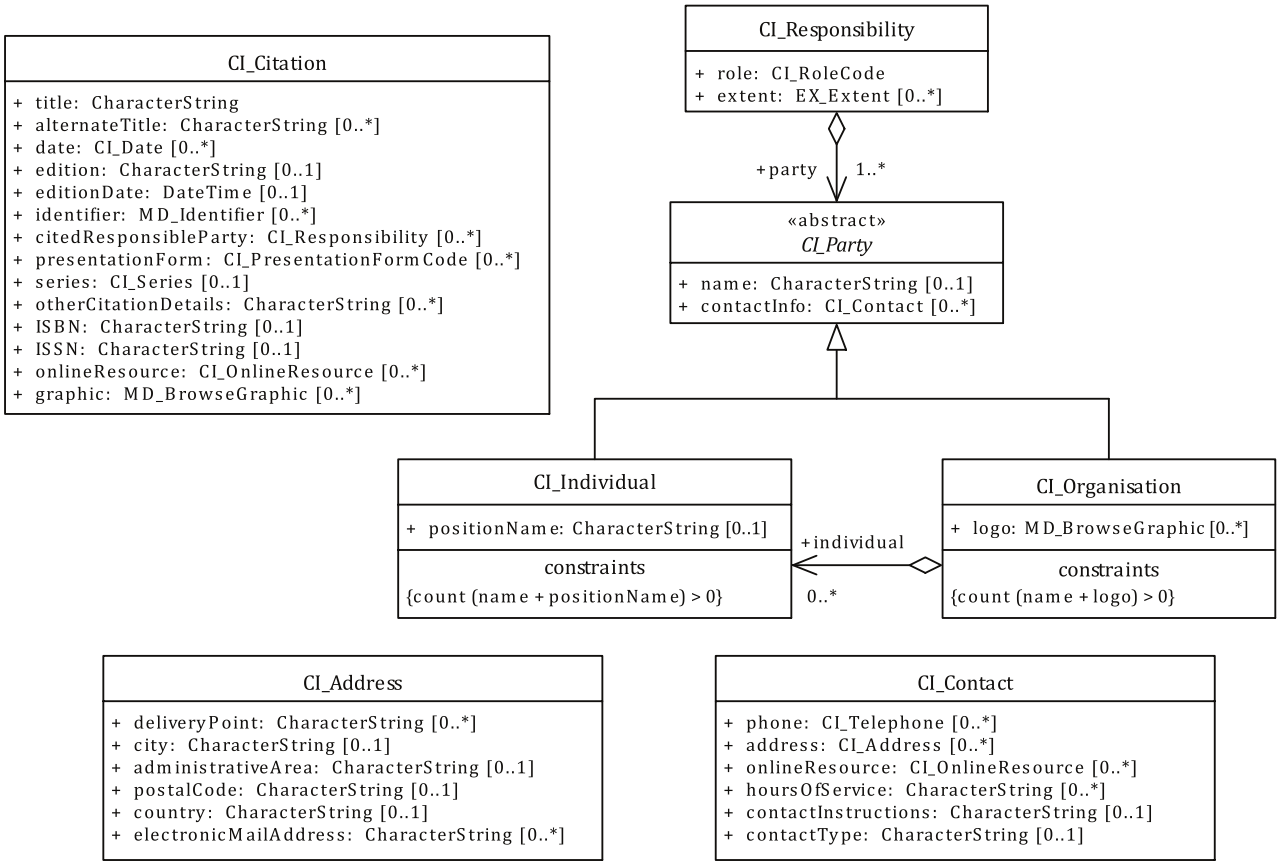

Figure 20 — Citation and responsible party information classes

6.6.3 Citation, responsibility and party information (CI_Citation, CI_Responsibility, and CI_Party) and codelists

The classes and codelists used by Citation and responsible party information are specified in Figure 21. The data dictionary for this diagram is located in Table B.16.

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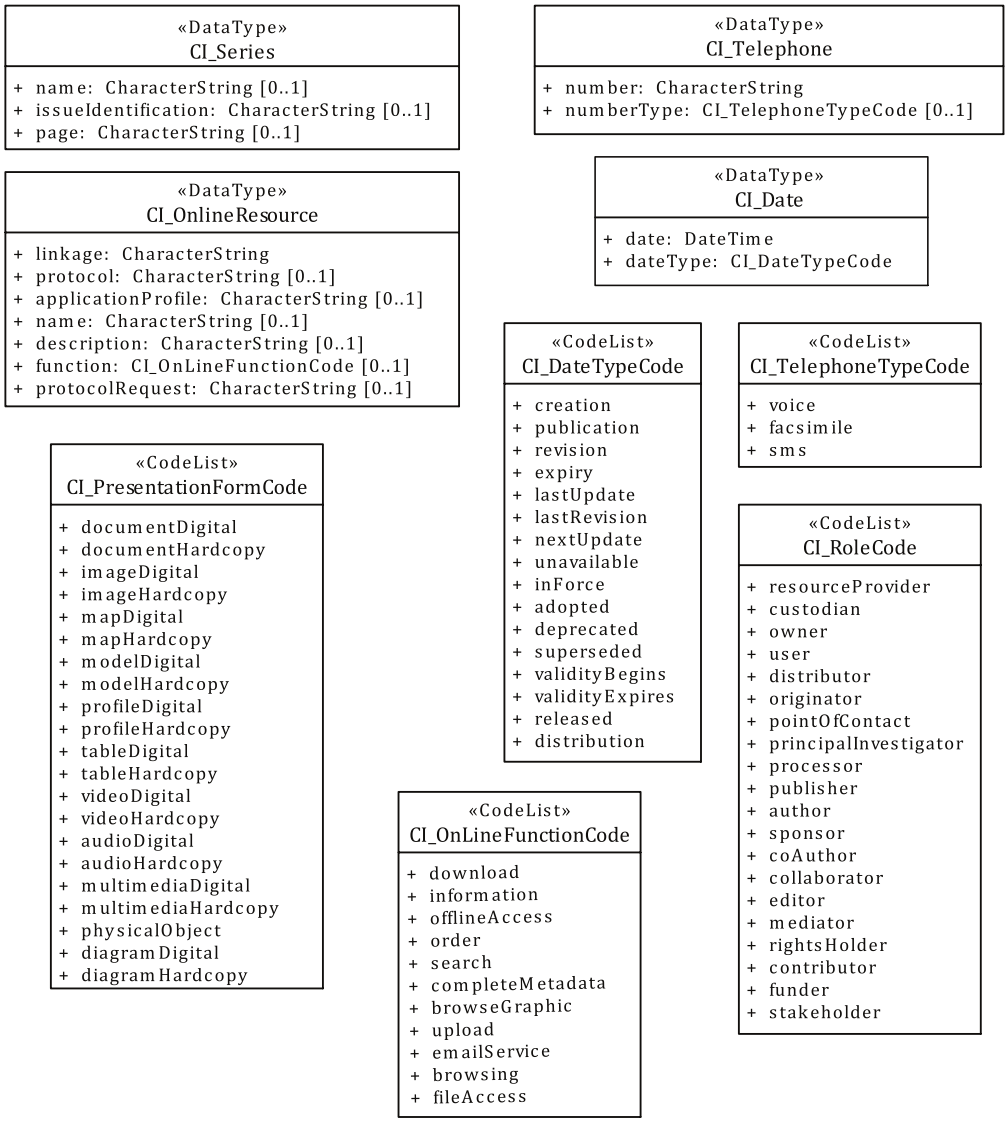

Figure 21 — Citation and responsible party information codelists

6.6.4 Commonly used classes

This package contains classes that are commonly used by the other packages in all parts of ISO 19115. It provides the MD_Identifier, URI, MD_Scope, MD_BrowseGraphic and related classes. The package is specified in Figure 22. The data dictionary for this diagram is located in Table B.17.

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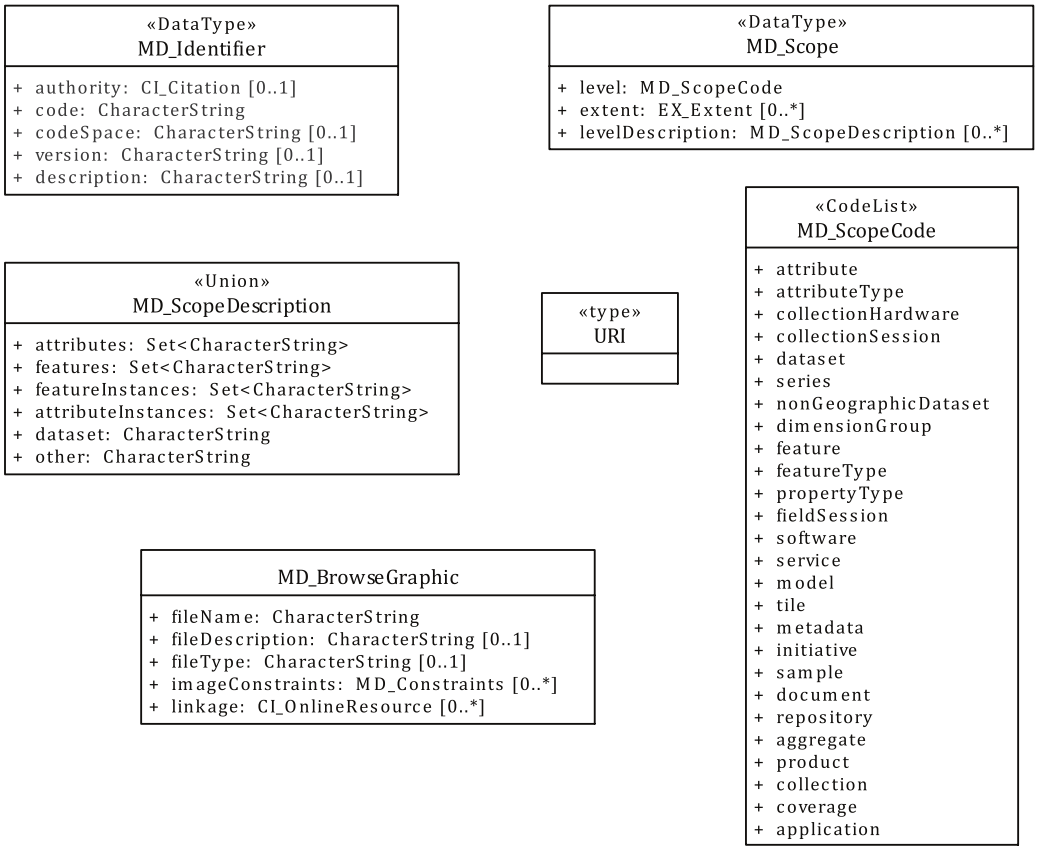

Figure 22 — Commonly used classes

6.7 Multilingual support for free text fields

6.7.1 Free text metadata elements

In this part of ISO 19115 a free text element can include multiple instances of information in different languages. Where the language is different from the language defined for the whole dataset, it may be identified, along with an optional attribute that specifies the variant of the language used in a particular country, and the character set used when that differs from the default for the whole dataset. Optionally, everywhere in this part of ISO 19115 where “free text” is specified as the domain the class PT_FreeText can be used. A locale (identified as PT_Locale) is a combination of language, potentially a country, and a character encoding (i.e., character set) in which localised character strings are expressed. LocalisedCharacterString is a subtype of CharacterString whose value is expressed in a single locale. An instance of a Free Text consequently is a CharacterString (with its value expressed in a default language and character set that could be defined in an instance of MD_Metadata). Annex D provides a multi-lingual example. The PT_Locale schema is specified in Figure 23. The data dictionary for this diagram is located in Table B.18.2.

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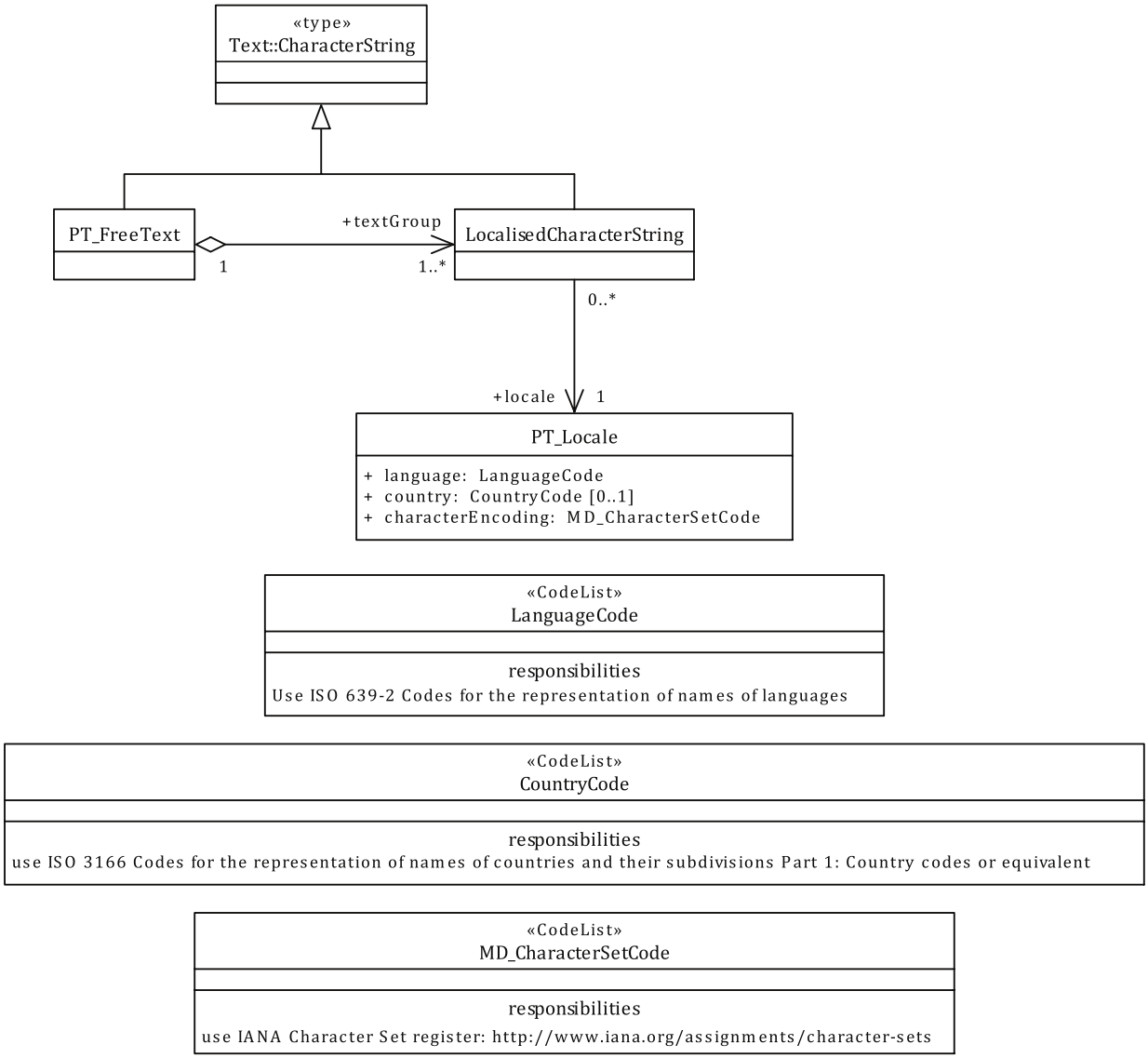

Figure 23 — PT_Locale schema

6.7.2 Management of localised strings

An instance of free text is composed of default character strings and their translations in different locales through the use of localised strings. This construct implies a distribution of localised strings throughout any given multilingual metadata set. However a more common way of managing multilingual sets of information consists of grouping the localised strings per their locales. In order to ease the management of localised strings, this part of ISO 19115 describes the concept of locale container (identified as PT_LocaleContainer). A locale container aggregates a set of localised strings related to a given locale (locale attribute of PT_LocaleContainer). There is no direct relationship between a locale container and a metadata set except that a locale container may aggregate localised strings of a metadata set.

This translation container concept is particularly useful in terms of the XML Implementation of this and other parts of ISO 19115, but it is applicable to any other implementation. Indeed, an XML file can only support data expressed in a single character set, which is generally declared in the XML File Header.

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Having all the localised strings stored in a single XML File would limit the use of a single character set such as UTF-8. In order to avoid this:

— The LocalisedCharacterString class is implemented specifically to allow a by reference containment of the PT_FreeText.textGroup property.

— The PT_LocaleContainer is the recommended root element to be instantiated in a dedicated XML File.

The localised string related to a given locale can be stored in a corresponding locale container (i.e., XML File) and referenced from the PT_FreeText.textGroup property instances. The Translation container is specified in Figure 24. The data dictionary for this diagram is located in B.2.

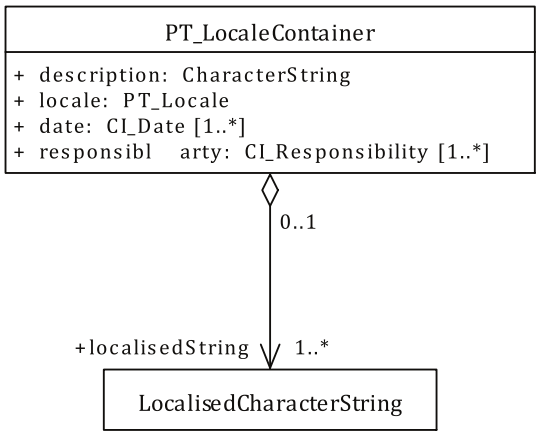

Figure 24 — Translation containerMetadata extensions and profiles

Annex C provides guidance on extending metadata and rules for creating profiles to better serve special user needs.

6.8 Implementation examples

Annex D provides an example of the use of this part of ISO 19115 for a geographic dataset. An example of extended metadata elements, as may be developed by a specific information community, is provided.

6.9 Metadata implementation

Annex E 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.

6.10 Discovery metadata

Annex F provides a list of metadata elements that facilitate the discovery of geospatial resources.

6.11 Revisions

Annex G provides a list of revisions to this part of ISO 19115.

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Annex A
(normative)

Abstract test suite

A.1 Abstract test suite

Metadata provided as specified in Clause 6 and Annex B shall meet the requirements specified in this abstract test suite. This abstract test suite applies to any profile derived from this part of ISO 19115. User-defined metadata shall be defined and provided as specified in Annex C and shall satisfy the requirements as stated in A.3.

A.2 Metadata test suite

A.2.1 Test case identifier: Completeness test

a) Test Purpose: to determine conformance by the inclusion of all metadata packages, metadata classes, and metadata elements that are specified with an obligation of "mandatory" or mandatory under the conditions specified.

NOTE 1 Many elements designated as mandatory are contained within optional classes. These elements become mandatory only when their containing class is used.

b) Test Method: a comparison between this part of ISO 19115 and a subject metadata set to be tested shall be performed to determine if all metadata defined as mandatory in Clause 6 and Annex B are present. A comparison test shall also be performed to determine if all metadata elements defined as conditional in Clause 6 and Annex B are present if the conditions set out in this part of ISO 19115 apply.

c) Reference: Clause 6 and Annex B.

d) Test Type: Basic.

NOTE 2 The test cases in A.2.2 to A.2.5, A.3 and A.4 apply at all levels of obligation – mandatory, conditional, and optional.

A.2.2 Test case identifier: Maximum occurrence test

a) Test Purpose: to ensure each metadata element occurs no more than the number of times specified in this part of ISO 19115.

b) Test Method: examine a subject metadata set for the number of occurrences of each metadata package, metadata class, and metadata element provided. The number of occurrences for each shall be compared with its "Maximum Occurrences" attribute specified in Clause 6 and Annex B.

c) Reference: Clause 6 and Annex B.

d) Test Type: Basic.

A.2.3 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.

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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: Clause 6 and Annex B.

d) Test Type: Basic.

A.2.4 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: Clause 6 and Annex B.

d) Test Type: Basic.

A.2.5 Test case identifier: Schema test

a) Test Purpose: to determine if a subject metadata set follows the schema specified in this part of ISO 19115.

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

c) Reference: Clause 6 and Annex B.

d) Test Type: Basic.

A.3 User-defined extension metadata test suite

A.3.1 Test case identifier: Exclusiveness test

a) Test Purpose: to verify that each user-defined metadata package, metadata class, and metadata element is unique and not already defined in this part of ISO 19115.

b) Test Method: each user-defined metadata class and metadata element is tested to ensure it is unique and not previously used.

c) Reference: Clause 6 and Annex B.

d) Test Type: Basic.

A.3.2 Test case identifier: Definition test

a) Test Purpose: to verify that user-defined metadata classes and metadata elements have been defined as specified in this part of ISO 19115.

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

c) Reference: C.3.

d) Test Type: Basic.

A.3.3 Test case identifier: Standard metadata test

a) Test Purpose: to verify that user-defined metadata within a metadata set fulfils the same test requirements as the metadata of this part of ISO 19115.

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b) Test Method: all user-defined metadata in a subject metadata set is tested in accordance with A.2 of this part of ISO 19115.

c) Reference: 2.3.

d) Test Type: Basic.

A.4 Metadata profiles — Test case identifier: Metadata profiles

a) Test Purpose: to verify that a profile follows the rules specified in this part of ISO 19115.

b) Test Method: apply tests defined in A.2 and A.3 of this part of ISO 19115.

c) Reference: 2.2.

d) Test Type: Basic.

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Annex B
(normative)

Data dictionary for geographic metadata

B.1 Data dictionary overview

B.1.1 Introduction

This data dictionary describes the characteristics of the metadata defined in 6.2 to 6.7. The dictionary is specified in a hierarchy to establish relationships and an organisation for the information. The dictionary is categorised into sections equivalent to the UML model package diagrams. The table titles have been expanded to reflect class specification within the respective diagram. Each model diagram from 6.2, 6.5, 6.6 and 6.7 has a set of tables within the data dictionary. Each UML model class along with its sub-class equates to a table in this data dictionary. The classes and metadata elements within the data dictionary are defined by six attributes (those attributes are in B.1.2 to B.1.7).

B.1.2 Name/role name

A label assigned to a metadata class or to a metadata element. Metadata class names start with an upper case letter. Spaces do not appear in a metadata class name. Instead, multiple words are concatenated, with each new subword starting with a capital letter (example: XnnnYmmm). Metadata class names are unique within the entire data dictionary of this part of ISO 19115. Metadata element names are unique within a metadata class, not the entire data dictionary of this part of ISO 19115. Metadata element names are made unique, within an application, by the combination of the metadata class and metadata element names (example: MD_Metadata.characterSet). Role names are used to identify metadata abstract model associations and are preceded by “Role name:” to distinguish them from other metadata elements.

B.1.3 Definition

The metadata class/element description.

B.1.4 Obligation/Condition

B.1.4.1 General

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

B.1.4.2 Mandatory (M):

The metadata class or metadata element shall be documented.

B.1.4.3 Conditional (C):

Specifies a condition that can be processed by a machine under which at least one metadata class or a metadata element is mandatory. ‘Conditional’ is used for one of the three following possibilities:

— Expressing a choice between two or more options. At least one option is mandatory and must be documented.

— Documenting a metadata class or a metadata element if another element has been documented.

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— 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 (e.g. Table B.2, row 17 “C / not defined by encoding and UFT-8 not used?”). If the answer to the condition is true, then the metadata class or the metadata element shall be mandatory.

B.1.4.4 Optional (O):

The metadata class or the metadata element may or may not be documented. Optional metadata classes 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 information users and producers world-wide.) If an optional class is not used, the elements contained within that class (including mandatory elements) will also not be used.

NOTE Optional classes can have mandatory elements; those elements only become mandatory if the optional class is used.

B.1.5 Maximum occurrence

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

B.1.6 Data type

Specifies a set of distinct values for representing the metadata elements; for example, integer, real, string, DateTime, and Boolean.

B.1.7 Domain

For a class, the domain indicates the line numbers covered by that class.

For a metadata element, the domain specifies the values allowed. The use of free text indicating unrestricted textual information in one or many languages are used for the content of the field, or “unspecified domain” which may be any alpha- numeric set of characters.

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Table B.1 — Metadata application information

	Name / Role name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
1.	***DS_Resource***	**an identifiable asset or means that fulfils a requirement**	**Use obligation from referencing object**	**Use maximum occurrence from referencing object**	**Class <<Abstract>>**	**Lines 2-3**
2.	*Role name:* has	resource has related metadata	M	N	Association	MD_Metadata (Table B.2)
3.	*Role name:* partOf	resource is a component of an aggregate resource	O	N	Association	*DS_Aggregate* (Table B.1)
4.	**DS_DataSet**	**identifiable collection of data**	**Use obligation from referencing object**	**Use maximum occurrence from referencing object**	**Specified Class (DS_ Resource)**	**Lines 2-3**
5.	**SV_Service**	**capability which a service provider entity makes available to a service user entity through a set of interfaces that define a behaviour**	**Use obligation from referencing object**	**Use maximum occurrence from referencing object**	**Specified Class (DS_ Resource)**	**Lines 2-3**
6.	***DS_Aggregate***	**collection of resources**	**Use obligation from referencing object**	**Use maximum occurrence from referencing object**	**Specified Class (DS_ Resource) <<Abstract>>**	**Lines 2-3**
7.	*Role name:*composedOf	aggregate is composed of multiple resources	M	N	Association	*DS_Resource* (Table B.1)
8.	**DS_OtherAggregate**	**collection of resource associated through unspecified means**	**Use obligation from referencing object**	**Use maximum occurrence from referencing object**	**Specified Class (DS_ Aggregate)**	**Lines 2-3 and 7**
9.	**DS_StereoMate**	**collection of image datasets covering the same subject from different perspectives providing a stereo view**	**Use obligation from referencing object**	**Use maximum occurrence from referencing object**	**Specified Class (DS_ OtherAggregate)**	**Lines 2-3 and 7**
10.	**DS_Initiative**	**collection of associated resources related by their participation in a common initiative**	**Use obligation from referencing object**	**Use maximum occurrence from referencing object**	**Specified Class (DS_ Aggregate)**	**Lines 2-3 and 7**

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Table B.1 *(continued)*

	Name / Role name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
11.	DS_Series	collection of resource related by a common heritage adhering to a common specification	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DS_ Aggregate)	Lines 2-3 and 7
12.	DS_Platform	collection of associated resources produced from the same sensor platform	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DS_ Series)	Lines 2-3 and 7
13.	DS_Sensor	collection of associated resources produced by the same sensor	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DS_ Series)	Lines 2-3 and 7
14.	DS_ProductionSeries	collection of associated resources produced to the same production specification	Use obligation from referencing object	Use maximum occurrence from referencing object	Specified Class (DS_ Series)	Lines 2-3 and 7
NOTE: The UML model for this table is shown in Figure 1.						

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Table B.2 — Metadata information

	Name / Role name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
15.	**MD_Metadata**	**root entity which defines metadata about a resource or resources**	**M**	**Use maximum occurrence from referencing object if referenced from DS_ Resource**	**Class**	**Lines 16-38**
16.	metadataIdentifier	unique Identifier for this metadata record	O	1	Class	MD_Identifier (Table B.17.2)
17.	defaultLocale	language and character set used for documenting metadata	C / not defined by encoding and UTF-8 not used?	1	Class	PT_Locale (Table B.18.2)
18.	parentMetadata	identification of the parent metadata record	C / If there is an upper level object	1	Class	CI_Citation (Table B.16)
19.	contact	party responsible for the metadata information	M	N	Class	CI_Responsibility (Table B.16.1)
20.	dateInfo	date(s) associated with the metadata NOTE Creation" date must be provided, others can also be provided.	M	N	Class	CI_Date (Table B.16.5)
21.	metadataStandard	citation for the standard to which the metadata conforms NOTE Metadata standard citations should include an identifier.	O	N	Class	CI_Citation (Table B.16)
22.	metadataProfile	citation for the profile(s) of the metadata standard to which the metadata conforms NOTE Metadata profile citations should include an identifier.	O	N	Class	CI_Citation (Table B.16)
23.	alternativeMetadataReference	reference to alternative metadata, e.g Dublin Core, FGDC, or metadata in a non-ISO standard for the same resource	O	N	Class	CI_Citation (Table B.16)
24.	otherLocale	provides information about alternatively used localised character strings	O	N	Class	PT_Locale (Table B.18.2)
25.	metadataLinkage	online location where the metadata is available	O	N	Class	CI_OnlineResource (Table B.16.6)
26.	*Role name*:spatialRepresentationInfo	digital representation of spatial information in the resource	O	N	Association	MD_SpatialRepresentation <<Abstract>> (Table B.7)
27.	*Role name:*referenceSystemInfo	description of the spatial and temporal reference systems used in the resource	O	N	Association	MD_ReferenceSystem (Table B.8)

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Table B.2 *(continued)*

28.	*Role name*:metadataExtensionInfo	information describing metadata extensions	O	N	Association	MD_MetadataExtension Information (Table B.12)
29.	*Role name*:identificationInfo	basic information about the resource(s) to which the metadata applies	M	N	Association	*MD_Identification* (Table B.3) <<Abstract>> NOTE Caution should be taken regarding the use of multiple instances of MD_Identification. See Annex E.
30.	*Role name*:contentInfo	information about feature and coverage characteristics	O	N	Association	MD_ContentInformation <<Abstract>> (Table B.9)
31.	*Role name*:distributionInfo	information about the distributor of and options for obtaining the resource(s)	O	N	Association	MD_Distribution (Table B.11)
32.	*Role name*:dataQualityInfo	overall assessment of quality of a resource(s)	O	N	Association	DQ_DataQuality (ISO 19157)
33.	*Role name*:portrayalCatalogueInfo	information about the catalogue of rules defined for the portrayal of a resource(s)	O	N	Association	MD_PortrayalCatalogue Reference (Table B.10)
34.	*Role name:*metadataConstraints	restrictions on the access and use of metadata	O	N	Association	MD_Constraints (Table B.4)
35.	*Role name:*applicationSchemaInfo	information about the conceptual schema of a resource	O	N	Association	MD_ApplicationSchema Information (Table B.13)
36.	*Role name:*metadataMaintenance	information about the frequency of metadata updates, and the scope of those updates	O	1	Association	MD_MaintenanceInformation (Table B.6)
37.	*Role name:*resourceLineage	information about the provenance, source(s), and/or the production process(es) applied to the resource	O	N	Association	LI_Lineage (Table B.5)
38.	*Role name:*metadataScope	the scope/type of resource for which metadata is provided	C / Metadata is about a resource other than a dataset?	N	Association	MD_MetadataScope (Table B.2.1)
NOTE: The UML model for this table is shown in Figures 4 and 5.						

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