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ISO/TC 211**/SC**

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Geographic information - Metadata

Title (French)

Information géographique – Métadonnées

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Introductory note

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ISO TC 211 N 831

Date: 1999-11-30

ISO/CD 19115.2

ISO TC 211/WG 3

Secretariat: NSF

Geographic information — Metadata

Information géographique — Métadonnées

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Contents

Foreword vii

Introduction viii

1 Scope 1

2 Conformance 1
2.1 Conformance requirements 1
2.1.1 ISO 19115 Geographic Information – Metadata 1
2.1.2 User-defined (extended) metadata 1

3 Normative references 2

4 Terms and definitions 3

5 Symbols and abbreviated terms 4
5.1 Abbreviations 4
5.2 UML notations 5
5.3 UML model stereotypes 6
5.4 Package abbreviations 7

6 Geographic metadata requirement 8
6.1 Metadata application 8
6.2 Metadata packages 9
6.2.1 Metadata package and entity relationship 10
6.2.2 Metadata entity set information 10
6.2.2.1 Identification information 10
6.2.2.2 Data constraint information 10
6.2.2.3 Maintenance information 11
6.2.2.4 Spatial representation information 11
6.2.2.5 Reference system information 11
6.2.2.6 Feature catalogue information 11
6.2.2.7 Portrayal catalogue information 11
6.2.2.8 Distribution information 11
6.2.2.9 Metadata extension information 11
6.2.2.10 Application schema information 12
6.3 Metadata datatypes 12
6.3.1 Extent information 12
6.3.2 Citation and responsible party information 12
6.4 Data quality information 12
6.4.1 Lineage 12
6.5 ISO 23950 standard cross reference (Informative annex E) 12
6.6 Essential metadata application profile (Normative annex F) 12
6.7 Comprehensive metadata application profile (Normative annex G) 12
6.8 Metadata extension methodology (Informative annex H) 13
6.9 Metadata implementation (Informative annex I) 13
6.10 Hierarchical levels of metadata (Informative annex J) 13
6.11 Implementation examples (Informative annex K) 13

Annex A (normative) **Metadata schemas** 14
A.1 Metadata UML models 14
A.2 Metadata entity set information 14
A.2.1 Identification information 15
A.2.2 Data constraint information 16
A.2.3 Maintenance information 17
A.2.4 Spatial representation information 18

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A.2.5 Reference system information 19
A.2.6 Feature catalogue information 20
A.2.7 Portrayal catalogue information 21
A.2.8 Distribution information 22
A.2.9 Metadata extension information 23
A.2.10 Application schema information 24
A.2.11 Extent information 25
A.2.12 Citation and responsible party information 26

Annex B (normative) Geographic metadata data dictionary 27
B.1 Data dictionary overview 27
B.1.1 Introduction 27
B.1.2 Name 27
B.1.3 Short name and domain code 27
B.1.4 Definition 27
B.1.5 Obligation 27
B.1.5.1 Mandatory (M): 27
B.1.5.2 Conditional (C): 28
B.1.5.3 Optional (O): 28
B.1.6 Condition 28
B.1.7 Maximum occurrence 28
B.1.8 Data type 28
B.1.9 Domain 28
B.2 Metadata entity set information 29
B.3 Identification information (includes image identification) 31
B.3.1 Browse graphic information 32
B.3.2 Keyword information 33
B.3.3 Location instance information 33
B.3.4 Use information 33
B.4 Data constraint information (includes legal and security) 33
B.5 Maintenance information 34
B.5.1 Scope description information 35
B.6 Spatial representation information (includes image, raster and vector representation) 35
B.6.1 Cell value domain information 37
B.6.2 Ground spacing information 37
B.6.3 Ground spacing resolution information 37
B.6.4 Image suitability description information 38
B.6.5 Pixel resolution information 39
B.6.6 Scan resolution information 39
B.6.7 Sensor parameter information 39
B.6.8 Sensor band information 40
B.7 Reference system information (includes temporal, by coordinates and using geoIDs) 40
B.8 Feature catalogue information 41
B.9 Portrayal catalogue information 42
B.10 Distribution information 42
B.10.1 Digital transfer options information 42
B.10.2 Distributor information 43
B.10.3 Format information 43
B.10.4 Medium information 43
B.10.5 Standard order process information 44
B.11 Metadata extension information 44
B.11.1 Extended element information 45
B.11.2 Local and type name information 46
B.12 Application schema information 46
B.12.1 Feature type list information 46
B.12.2 Spatial attribute supplement information 46
B.13 Extent information 47
B.13.1 Geographic extent information 47
B.13.2 Temporal extent information 48
B.13.3 Vertical extent information 48

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B.13.4 Vertical datum information **49**
B.14 Citation and responsibility information **49**
B.14.1 Address information **50**
B.14.2 Contact information **51**
B.14.3 Mandatory party information **51**
B.14.4 Online resource information **51**
B.14.5 Telephone information **52**
B.15 Metadata application information **52**
B.15.1 Dataset series information **53**
B.15.2 Other dataset association information **53**
B.16 Data quality information **53**
B.17 CodeLists and enumerations **54**
B.17.1 CI_OnLineFunction <<CodeList>> **54**
B.17.2 CI_PresentationFormCode <<CodeList>> **54**
B.17.3 CI_ResponsibilityCode <<CodeList>> **54**
B.17.4 DS_AssociationTypeCode <<Codelist>> **55**
B.17.5 DS_InitiativeType <<CodeList>> **55**
B.17.6 EX_ExtentType <<CodeList>> **55**
B.17.7 MD_Category <<CodeList>> **56**
B.17.8 MD_Classification <<CodeList>> **59**
B.17.9 MD_GeometricObjectTypes <<CodeList>> **59**
B.17.10 MD_ImagingConditionCode <<CodeList>> **60**
B.17.11 MD_KeywordType <<CodeList>> **60**
B.17.12 MD_LengthUnit <<Enumeration>> **60**
B.17.13 MD_MaintenanceFrequency <<CodeList>> **61**
B.17.14 MD_ProgressCode <<CodeList>> **61**
B.17.15 MD_RasterCellType << Codelist>> **61**
B.17.16 MD_Restrictions <<Codelist>> **62**
B.17.17 MD_Scope <<CodeList>> **62**
B.17.18 MD_SpatialRepresentationType <<Enumeration>> **63**
B.17.19 MD_TopologyLevel <<Enumeration>> **63**
B.17.20 MD_TypeName <<CodeList>> **63**
B.17.21 MD_UomLength <<CodeList>> **63**

Annex C (normative) **Metadata extensions and profiles** **64**
C.1 Background **64**
C.1.1 Types of extensions **64**
C.1.2 Creating an extension **64**
C.1.2.1 Rules for creating an extension: **64**
C.1.3 Community profile **65**
C.1.3.1 Rules for creating a profile **65**

Annex D (normative) **Abstract test suite** **66**
D.1 Abstract test suite **66**
D.1.1 ISO 19115 Geographic Information – Metadata test suite **66**
D.1.1.1 Test case identifier: Completeness test **66**
D.1.1.2 Test case identifier: Maximum occurrence test **66**
D.1.1.3 Test case identifier: Identifier test **66**
D.1.1.4 Test case identifier: Data type test **67**
D.1.1.5 Test case identifier: Domain test **67**
D.1.1.6 Test case identifier: Schema test **67**
D.1.2 User-defined extension metadata test suite **67**
D.1.2.1 Test case identifier: Exclusiveness test **67**
D.1.2.2 Test case identifier: Definition test **67**
D.1.2.3 Test case identifier: Standard metadata test **68**

Annex E (informative) **ISO 23950 standard cross reference** **69**
E.1 Metadata ISO 23950 cross reference **69**

Annex F (normative) **Essential metadata application profile** **70**
F.1 Essential metadata application schema **70**
F.2 Essential metadata application schema – Datatypes and Codelists **71**

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F.3 Essential metadata application schema – Element list 72

Annex G (normative) **Comprehensive metadata application profile 75**
G.1 Comprehensive metadata application schema 75
G.1.1 Comprehensive metadata application schema-Data Quality 1 76
G.1.2 Comprehensive metadata application schema-Data Quality 2 77

Annex H (informative) **Metadata extension methodology 78**
H.1 Metadata extensions methodology 78
H.1.1 Review of existing metadata elements. (Stage 1) 78
H.1.2 Definition of new metadata domain element. (Stage 2) 79
H.1.3 Definition of new metadata element. (Stage 3) 79
H.1.4 Definition of new metadata entity. (Stage 4) 80
H.1.5 Definition of new metadata characteristics section. (Stage 5) 80
H.1.6 Definition of more stringent metadata obligation. (Stage 6) 81
H.1.7 Definition of more stringent metadata domain set. (Stage 7) 81
H.1.8 Documentation of metadata extensions. (Stage 8) 81

Annex I (informative) **Metadata implementation 83**
I.1 Background 83
I.1.1 Problem statement 83
I.1.2 Scope and objectives 83
I.1.2.1 Granularity of spatial data supported 83
I.1.3 Geographic data service attributes 85
I.2 Methods overview 86
I.2.1 General metadata management model 86
I.2.1.1 Metadata storage 87
I.2.1.2 Metadata structure and encoding 88
I.2.1.3 Linkages between metadata and spatial data 88
I.3 Functional overview 88
I.3.1 Input functions 88
I.3.1.1 Input structure 88
I.3.1.2 Input metadata 89
I.3.1.3 Input spatial data (optional) 89
I.3.1.4 Reference standards for input 89
I.3.2 Query functions 89
I.3.2.1 Initiate query 89
I.3.2.2 Receive result list 89
I.3.2.3 Reference standards for query 89
I.3.3 Retrieval and presentation functions 90
I.3.3.1 Request metadata 90
I.3.3.2 Retrieve metadata 90
I.3.3.3 Retrieve structure 90
I.3.3.4 Request spatial data (optional) 90
I.3.3.5 Retrieve spatial data (optional) 90
I.3.3.6 Reference standards for retrieval 90
I.3.4 Presentation of metadata entries 91

Annex J (informative) **Hierarchical levels of metadata 92**
J.1 Levels of metadata 92
J.2 Example 92

Annex K (informative) **Implementation examples 97**
K.1 Example 1 — Metadata for a vector dataset - essential profile 97
K.2 Example 2—Metadata for a vector dataset - comprehensive profile 98

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Foreword

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

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 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 eleven annexes. Annexes A, B, C, F and G are normative; Annexes D, E, and H through K are informative.

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Introduction

A revival in the awareness of the importance of geography and how things relate spatially, combined with the advancement in the use of electronic technology, have caused an expansion in the use of digital geographic information and geographic information systems world-wide. 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 organisation 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 the standard is to provide a structure for describing digital geographic datasets and a procedure to extend the existing structure so that users will be able to locate, select, purchase, and access geographic data, determine whether the data in a holding will be of use to them, and use it in the most efficient way. By establishing a common set of metadata terminology, definitions, and extension procedures, this standard will promote the proper use and effective retrieval of geographic data. Supplementary benefits of this standard for metadata are to facilitate the organisation and management of geographic data and to provide information about an organisation's dataset to others. This standard for the documentation of data furnishes data producers the appropriate information for them to characterise geographic data, and it makes possible dataset cataloguing enabling data discovery, retrieval and reuse.

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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 specialised 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 Conformance

2.1 Conformance requirements

Any product claiming conformance with this International Standard shall pass the requirements described in the abstract test suite presented in Normative 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.

2.1.1 ISO 19115 Geographic Information – Metadata

Metadata shall be provided as specified in clause 6 and Normative Annexes A and B. It shall meet the requirements in the Abstract Test Suite (Normative Annex D) sub-clause D.1.1.

2.1.2 User-defined (extended) metadata

User-defined metadata must be defined and provided as specified in Normative Annex D. It must satisfy the requirements in the Abstract Test Suite (Normative Annex D) sub-clause D.1.2.

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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 690:1996, *Documentation — Bibliography references — Content, form and structure*

ISO 3166:1993 (all parts), *Code for the representation of names of countries*.

ISO 8859:1987, *Information processing — 8 bit single byte coded graphic character sets - Parts 1 to 10*.

ISO 8879:1986, *Standard Generalised Markup Language*

ISO/IEC 10179:1995, *Document Style Semantics Specification Language*

ISO/IEC 10646-1:1993, *Information technology — Universal Multiple-Octet Coded Character Set (UCS) — Part 1: Architecture and basic multilingual plane*.

ISO/IEC 11179:1996 (all parts), *Specification and Standardisation 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 19118, *Geographic information — Encoding* [1)]

ISO/DIS 23950, *Information and documentation — Information retrieval*

1) To be published

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4 Terms and definitions

For the purposes of this International standard, the terms and definitions given in ISO 19104 and the following apply.

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 that, 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
geographic dataset
dataset with a spatial aspect

4.5
metadata
data about data

4.6
metadata element
discrete unit of metadata

4.7
metadata entity
group of metadata elements and other metadata entities describing the same aspect of data

NOTE 1 A metadata entity may contain one or more metadata entities

NOTE 2 A metadata entity is equivalent to a class in UML terminology

4.8
metadata package
subset of metadata which defines a collection of related metadata entities and elements

4.9
model
abstraction of some aspects of reality

4.10
temporal reference system
reference system against which time is measured

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5 Symbols and abbreviated terms

5.1 Abbreviations

ASCII	American Standard Code for Information Interchange
AVHRR	Advanced Very High Resolution Radiometer
BPS	Bits-Per-Second
CD-ROM	Compact Disk - Read Only Memory
CGM	Computer Graphics Metafile
CIB	Controlled Image Base
CPIO	CoPy In/Out
DAFIF	Digital Aeronautical Flight Information File
DCW	Digital Chart of the World
DOS	Disk Operating System
DSSSL	Document Style Semantic and Specification Language
DSSSL-O	Document Style Semantic and Specification Language - On-line Application Profile
DTD	Document Type Definition
EPS	Encapsulated Postscript Format
EROS	Earth Resources Observation Systems
ESD	Exploitation Support Data
GEO	Geospatial Metadata Application Profile
GIF	Graphic Interchange Format
GRS-1	General Record Syntax
GSD	Ground Sample Distance
HFS	Hierarchical File System
HIS	Hue Intensity Saturation
HLS	Hue, Lightness, Saturation
HTML	HyperText Markup Language
HVC	Hue, Value, Chroma
JNC	Joint Navigation Chart
JPEG	Joint Photographic Experts Group Format

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MARC	Machine Readable Cataloguing
MSL	Mean Sea Level
NATO	North Atlantic Treaty Organization
NB	Narrow Band
OCL	Object Constraint Language
ONC	Operational Navigation Chart
OSI	Open Systems Interconnection
PBM	Portable Bit Map Format
PS	Adobe PostScript Format
RGB	Red, Green, Blue
RPF	Raster Product Format
SGML	Standard Generalised Markup Language
SPOT	Satellite Pour L'observation De La Terre
SRP	Standard Radiometric Product
SUTRS	Simple Unstructured Text Record Syntax
TAR	Tape ARchiver
TCP/IP	Transmission Control Protocol/Internet Protocol
TR	Task Register
UML	Unified Modeling Language
URC	Uniform Resource Citation (Characteristic)
URL	Uniform Resource Locator
UTC	Universal Time Coordinate
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 Definiton Language (IDL) basic type definitons and the UML Object Constraint Language (OCL) as the conceptual schema language. The UML notations used in this standard are described in the diagram below.

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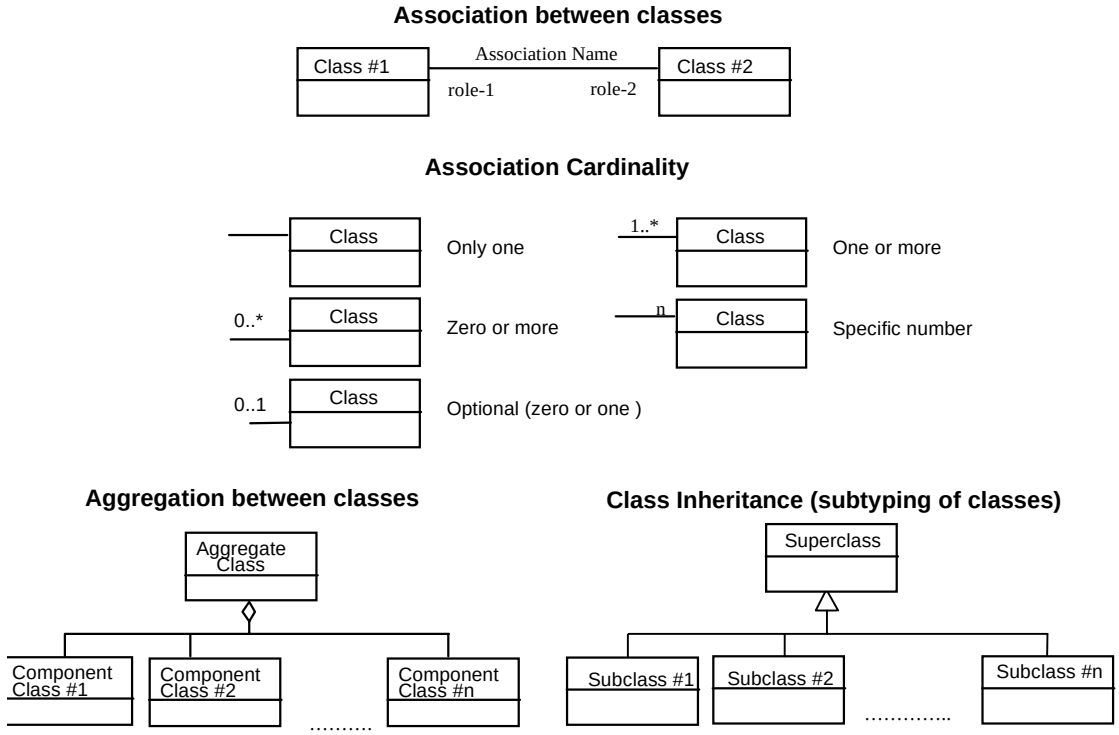

5.3 UML model stereotypes

A *UML stereotype* is an extension mechanism for existing UML concepts. It is an 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 – Conceptual Schema Language.

In this standard the following stereotypes are used:

a) <<Interface>> a definition of a set of operations that is supported by objects having this interface.

b) <<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.

c) <<Entity>> meaning a class that represent information-carrying, potentially persistent objects. A standard UML extension from the Unified Software Development Process.

d) <<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.

e) <<MetaClass>> A class whose instances are classes. Metaclasses are typically used in the construction of metamodels.

f) <<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.

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g) <<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.

h) <<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 supertype/class.

i) <<Feature>> - a special kind of <<Entity>> which represents an abstraction of a real world phenomena (as opposed to any kind of information-carrying object) – used for the development of application schemas (see ISO 19109).

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

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

l) <<Leaf>> - A package that contains definitions, without any sub-packages.

5.4 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 – Spatial referencing by geographic identifiers)

CI – Citation (ISO 19115 - Metadata)

DQ – Data quality (ISO 19113 – Quality principles)

DS – Dataset (ISO 19115 – Metadata)

EX – Extent (ISO 19115 – Metadata)

FC – Feature Catalogue (ISO 19115 Metadata)

GF – General Feature (ISO 19109- Rules for application schema)

GM – Geometry (ISO 19107 – Spatial schema)

LI – Lineage (ISO 19113 – Quality principles)

MD – Metadata (ISO 19115 – Metadata)

PF – Feature Portrayal (ISO 19117 – Portrayal)

PS – Positioning Services (ISO 19116 – Positioning services)

SC – Spatial Reference by Coordinates (ISO 19111 – Spatial referencing by coordinates)

SI – Spatial Identification (ISO 19112 – Spatial referencing by geographic identifiers)

TM – Temporal (ISO 19108 – Temporal Schema)

TP – Topology (ISO 19107 – Spatial Schema)

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6 Geographic metadata requirement

This 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 which compose a feature. Metadata is mandatory (required) for each geographic dataset and may, optionally, be provided for aggregations of datasets, features, and parts of features. Metadata is composed of one or more Metadata Sections (UML Packages) containing one or more Metadata Entities (UML classes).

6.1 Metadata application

Figure 6-1 is a UML class diagram defining the classes of geographic information to which metadata applies. This diagram defines a dataset (DS_DataSet) as a subclass of the generalized class - Feature Collection. It specifies that a dataset must have one or more related Metadata entity sets. Metadata may optionally relate to a Feature, Feature Attribute, Feature Type, Feature Property Type (a Metaclass instantiated by - Feature relation role type, Feature relation 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 by a special activity (DS_Initiative). This UML model and the associated data dictionary, Figure 6-1 and Annex B.14 respectively, further define this requirement.

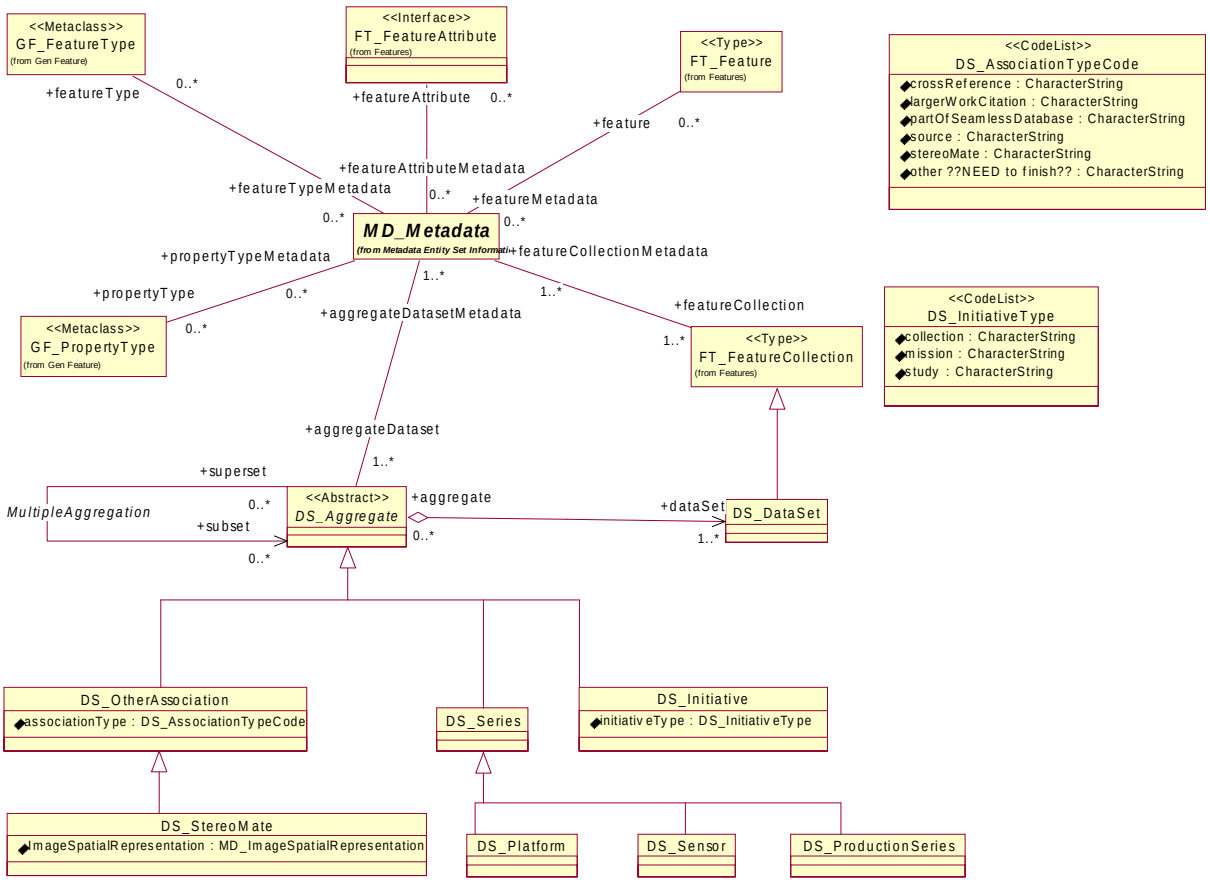

Figure 6-1 Metadata Application

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6.2 Metadata packages

In this standard geographic metadata is presented in UML Packages. Each package contains one or more entities (UML Classes), which may 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 6-2 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 Normative Annexes A and B repectively.

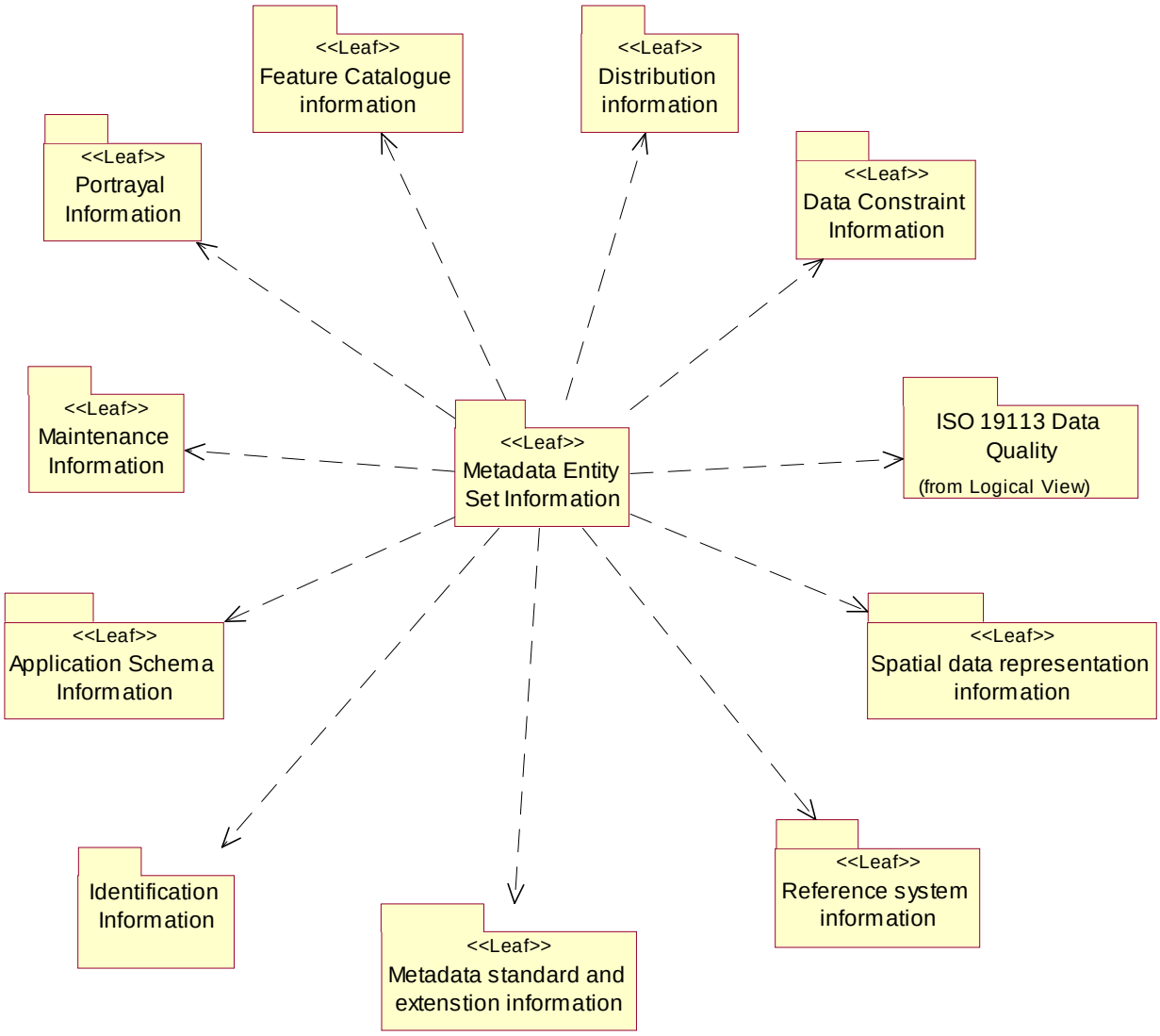

Figure 6-2 Metadata Packages

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6.2.1 Metadata package and entity relationship

The relationship between packages of metadata and metadata entities is shown in the list below. 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 6.2.2 through 6.2.12. Each package has a corresponding sub-clause, which is listed in the sub-clause name column.

Sub-Clause Name	Package	Entity	UML Diagram	Data Dictionary
6.2.2	Metadata Entity Set Information	MD_Metadata	A.2	B.2
6.2.2.1	Identification Information	MD_Identification	A.2.1	B.3
6.2.2.3	Maintenance Information	MD_MaintenanceInformation	A.2.3	B.5
6.2.2.9	Metadata Extension Information	MD_MetadataExtensionInformation	A.2.9	B.11
6.2.2.5	Reference System Information	RS_ReferenceSystem	A.2.5	B.7
6.2.2.4	Spatial Representation	MD_SpatialRepresentation	A.2.4	B.6
6.4	Data Quality (from ISO 19113)	DQ_DataQuality	(ISO 19113)	(ISO 19113)
6.2.2.2	Data Constraint Information	MD_DataConstraints	A.2.2	B.4
6.2.2.8	Distribution Information	MD_Distribution	A.2.8	B.10
6.2.2.6	Feature Catalogue Information	FC_FeatureCatalogue	A.2.6	B.8
6.2.2.7	Portrayal Catalogue Information	MD_PortrayalCatalogueRef	A.2.7	B.9
6.2.2.10	Application Schema Information	MD_ApplicationSchemaInfo	A.2.10	B.12

6.2.2 Metadata entity set 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 entities listed in subclause 6.2.1.

6.2.2.1 Identification information

Identification Information contains information to uniquely identifythe data. The MD_Identification entity is mandatory. It contains mandatory, conditional, and optional elements (UML attributes). The MD_Identification entity may be specified (sub-classed) as MD_ImageIdentification when used to identify images. MD_Identification is an aggregate of the following entities:

- MD_Format, format of the data
- MD_BrowseGraphic, graphic overview of the data
- MD_Use, specific uses of the data
- MD_DataConstraints, constraints placed on the data
- MD_Keywords, keywords used to search for the data
- MD_MaintenanceInformation, how often the data is to be updated and the scope of the update

The geographicBox and geographicDescription attributes of MD_Identification are optional, one of them must be included. If necessary both may be used. However, if the dataset is nongeographic neither geographicBox and geographicDescription are required.

6.2.2.2 Data constraint information

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

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.

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6.2.2.3 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.

6.2.2.4 Spatial representation information

This package contains information concerning the mechanisms used to represent spatial information in a dataset. The MD_SpatialRepresenation entity is optional and can be specified as MD_RasterSpatialRepresentation, MD_VectorSpatialRepresentation and MD_ImageSpatialRepresentation. Each of the specified entities contains mandatory and optional metadata elements. MD_RasterSpatialRespresentation is an aggregate of the domain of the cell (MD_CellValueDomain). MD_ImageSpatialRepresentation is an aggregate of the description of the suitability of the image (MD_ImageSuitabilityDescription) and the parameters of the sensor (MD_SensorParameters). MD_SensorParameters is composed of the sensor band used (MD_SensorBand). Metadata for Spatial data representation are derived from ISO 19107, Spatial schema.

If the heirarchyLevel attribute of MD_Metadata is “datasetSeries” then the imageIdentifier attribute of MD_ImageSpatialRepresentation must be non-zero.

The meanGroundSampleDistance attribute of MD_ImageSpatialRepresentation is to be expressed in units of meters.

6.2.2.5 Reference system information

This package contains the description of the spatial and temporal reference used in a dataset. RS_ReferenceSystem contains mandantory and optional elements. RS_ReferenceSystem contains the attribute allowing for the identification of the reference system. RS_ReferenceSystem can be specified as SC_CRS, SI_SpatialReferenceSystemUsingGeographicIdentifers and TM_ReferenceSystem. Metadata for Reference system information are derived from ISO 19108 (Temporal schema), ISO 19111 (Spatial referencing by coordinates), and ISO 19112 (Spatial referencing by geographic identifiers).

6.2.2.6 Feature catalogue information

This package contains information identifying the feature catalogue used. It consists of the optional entity FC_FeatureCatalogueDescription. This entity contains mandatory and optional elements elements and supports the listing of feature types used in a dataset.

6.2.2.7 Portrayal catalogue information

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

6.2.2.8 Distribution information

This package contains information about the distributor of, and options for obtaining a dataset. 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_DigitalTranserOptions 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).

6.2.2.9 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).

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6.2.2.10 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 mandatory and optional elements.

6.3 Metadata datatypes

6.3.1 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) is contained within EX_GeographicExtent. EX_TemporalExtent can be sub-classed as EX_SpatialTemporalExtent.

The EX_Extent entity has three optional roles named “element”. One of them must be used.

6.3.2 Citation and responsible party information

This package of datatypes provides a standardised 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 organisation(s) associated with the dataset. The location (CI_Address) of the responsible person or organisation is also contained here.

6.4 Data quality information

This package contains a general assessment of the quality of the dataset. Data quality entities are defined in ISO 19113 and 19114.

6.4.1 Lineage

This package contains information about the usage, sources, and production processes used in producing a dataset. Lineage metadata entities are defined in ISO 19113.

6.5 ISO 23950 standard cross reference (Informative annex E)

This Annex provides cross-reference tables which define standardised codes for the metadata entities and elements. These codes shall be used for implementation of this standard with ISO/DIS 23950 or other similar implementation techniques.

6.6 Essential metadata application profile (Normative annex F)

This Essential metadata application schema provides an implementable metadata profile. It is the minimum set of metadata elements required to provide basic documentation of geographic resources. It contains metadata elements answering the following questions: “Does a dataset on a specific topic exist (‘what’)?”, “For a specific place (‘where’)?”, “For a specific period (‘when’)?” and “A point of contact to order or learn more about the dataset (‘who’)?”. Every derived metadata profile shall include this essential metadata profile in order to be conformant with this ISO standard.

6.7 Comprehensive metadata application profile (Normative annex G)

This Comprehensive metadata application schema 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

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metadata required to identify, evaluate, extract, employ, and manage geographic information. Data producers typically provide comprehensive metadata.

6.8 Metadata extension methodology (Informative annex H)

Contains the methodology to be used to define extensions to existing metadata elements.

6.9 Metadata implementation (Informative annex I)

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 Hierarchical levels of metadata (Informative annex J)

Provides methods for efficiently handling metadata for datasets with metadata requirements at different levels.

6.11 Implementation examples (Informative annex K)

Vector dataset examples using both the essential and comprehensive schemas.

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Annex A
(normative)

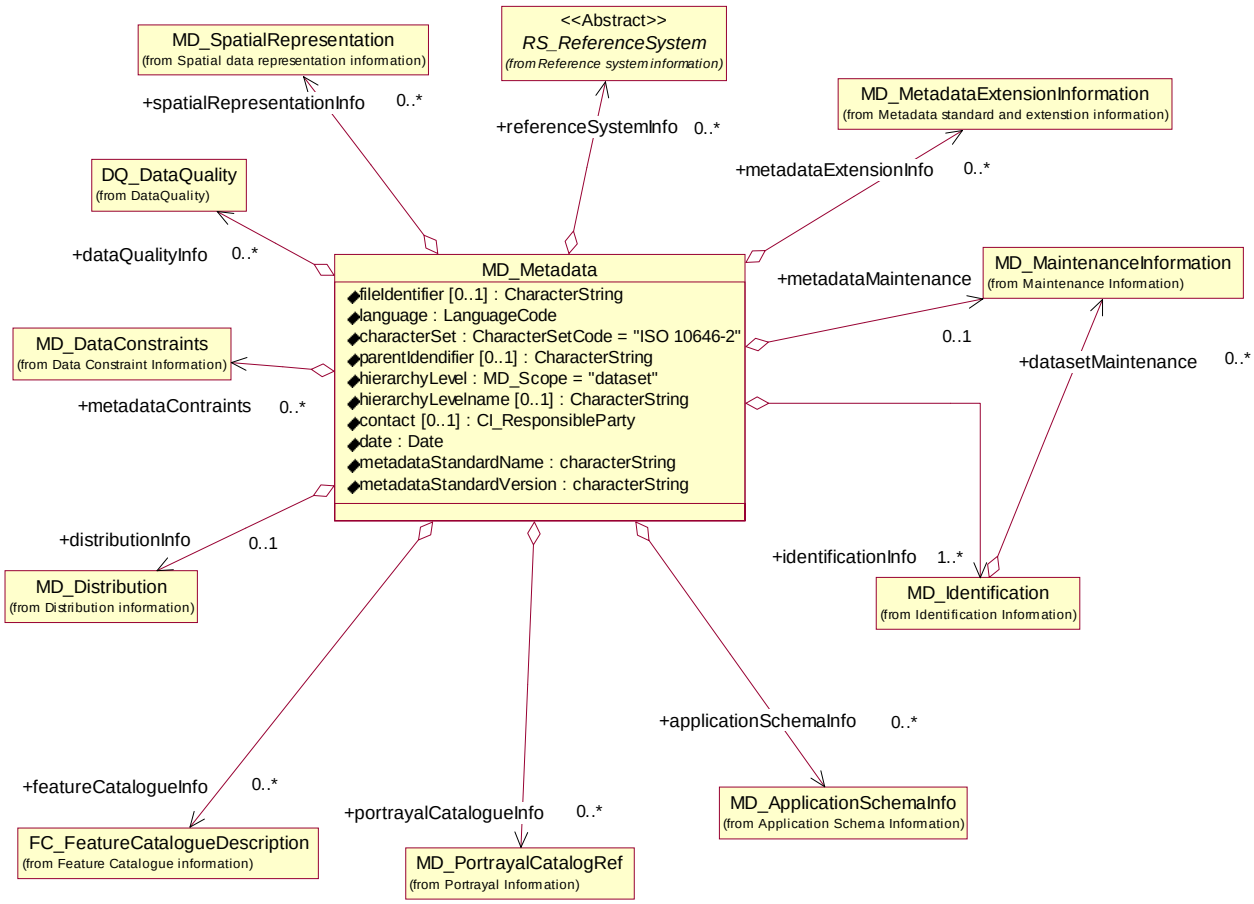
Metadata schemas

A.1 Metadata UML models

Metadata for describing geographic data is defined using an abstract object model in the Unified Modeling Language (UML). The diagrams in the following sub-clauses provide "views," portions, of the total abstract model for metadata. Each diagram defines a metadata section (UML package) of related entity classes, data types, and code lists. Related entity classes, which are defined in another diagram, are shown with attributes suppressed and the defining diagram specified under the class name in parenthesis. The entire set of diagrams define the full range of metadata with the exception of data quality metadata which is defined in ISO 19113 and ISO 19114. . Throughout the following models, entities may have mandatory and/or optional elements and associations. In some cases optional entites may have mandatory elements, those elements only become mandatory if the optional entity is used.

A.2 Metadata entity set information

This diagram defines the class "Metadata" and shows containment relationships with the other metadata classes which, in aggregate, define geographic metadata. The other metadata class diagrams can be found on the following pages.



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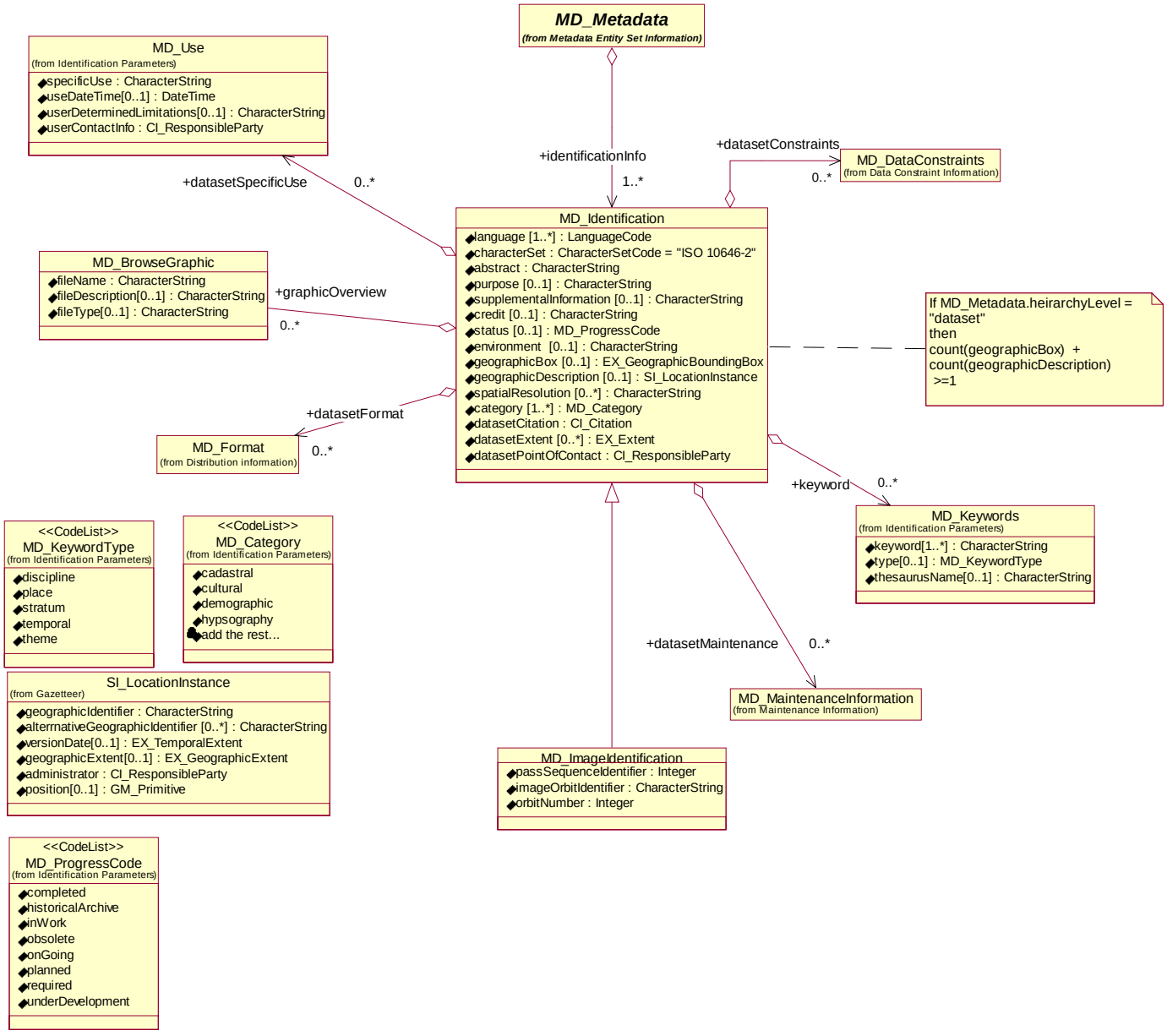
A.2.1 Identification information

This diagram defines the metadata classes required to identify a dataset. It also defines a specialization subclass for identifying images.



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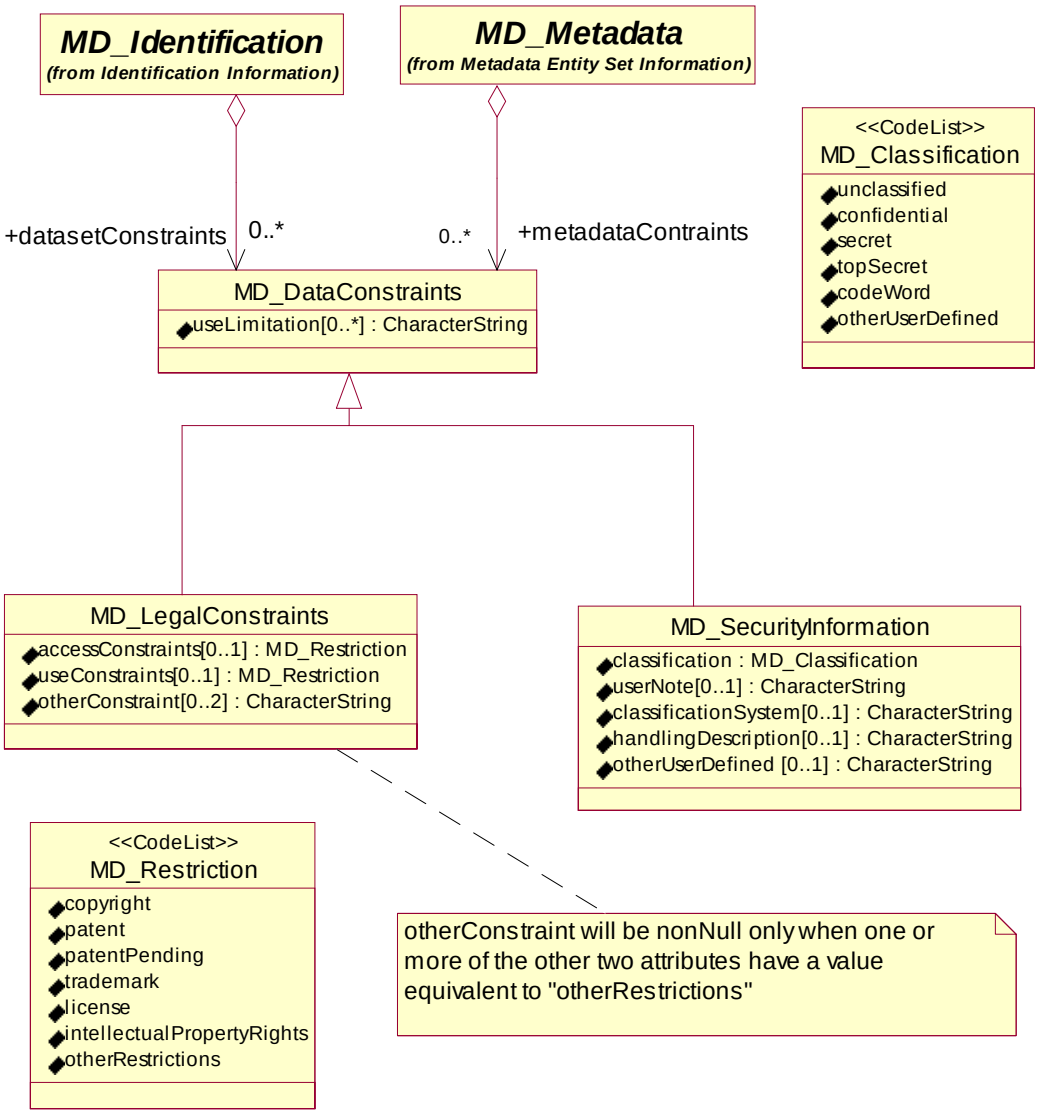
A.2.2 Data constraint information

This diagram defines the metadata required for managing rights to information including restrictions on access and use.



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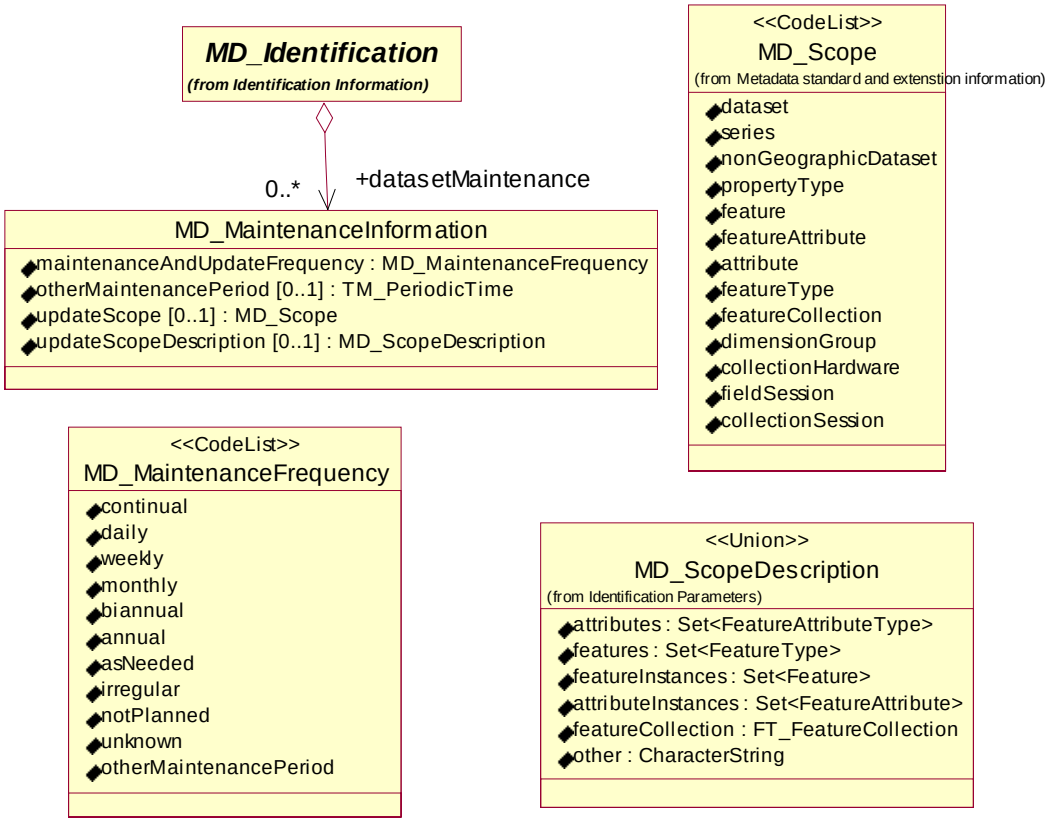
A.2.3 Maintenance information

This diagram defines the metadata required to describe the maintenance and update practices for information.



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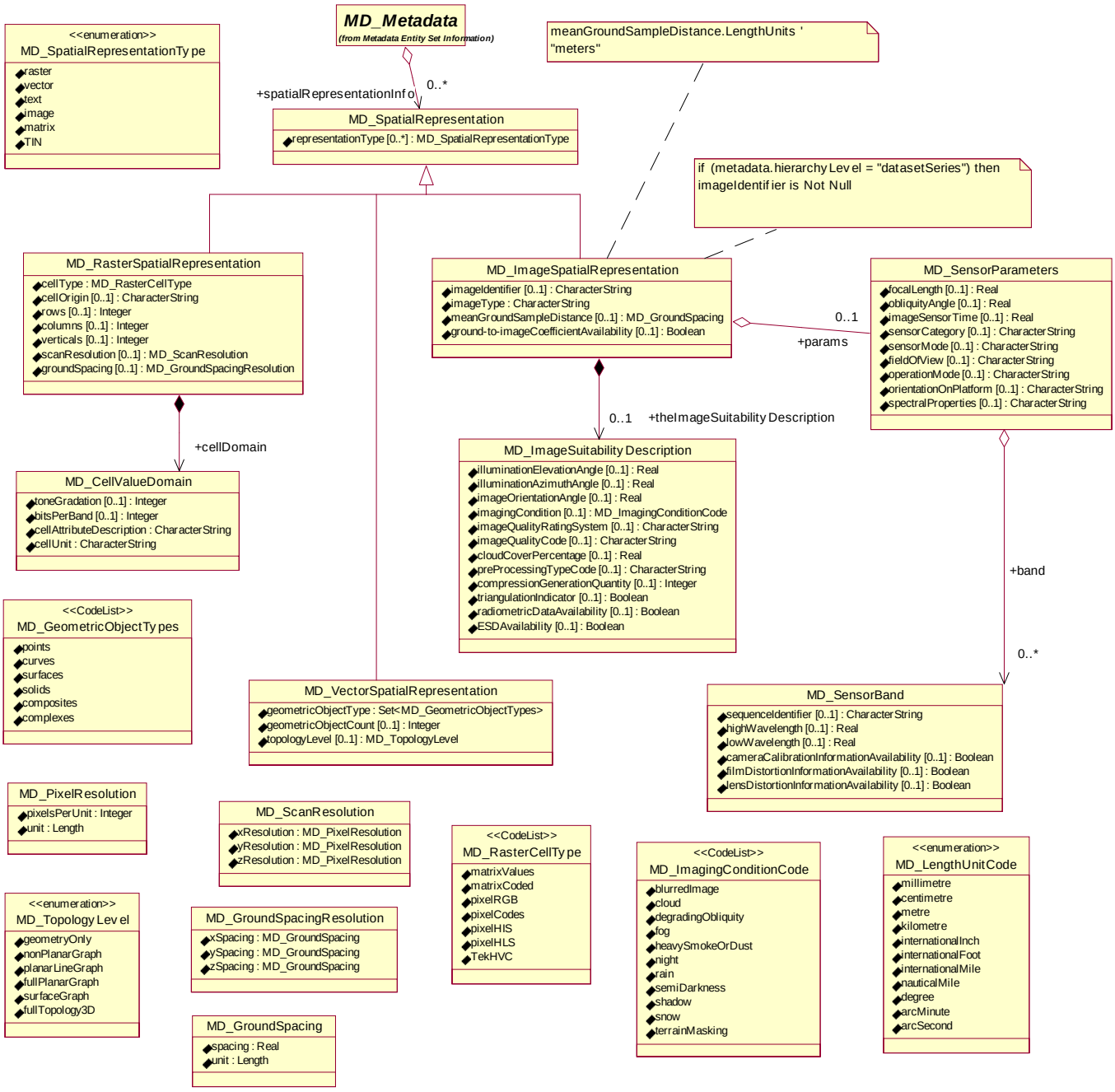
A.2.4 Spatial representation information

This diagram defines metadata required to describe the mechanism used to represent spatial information.



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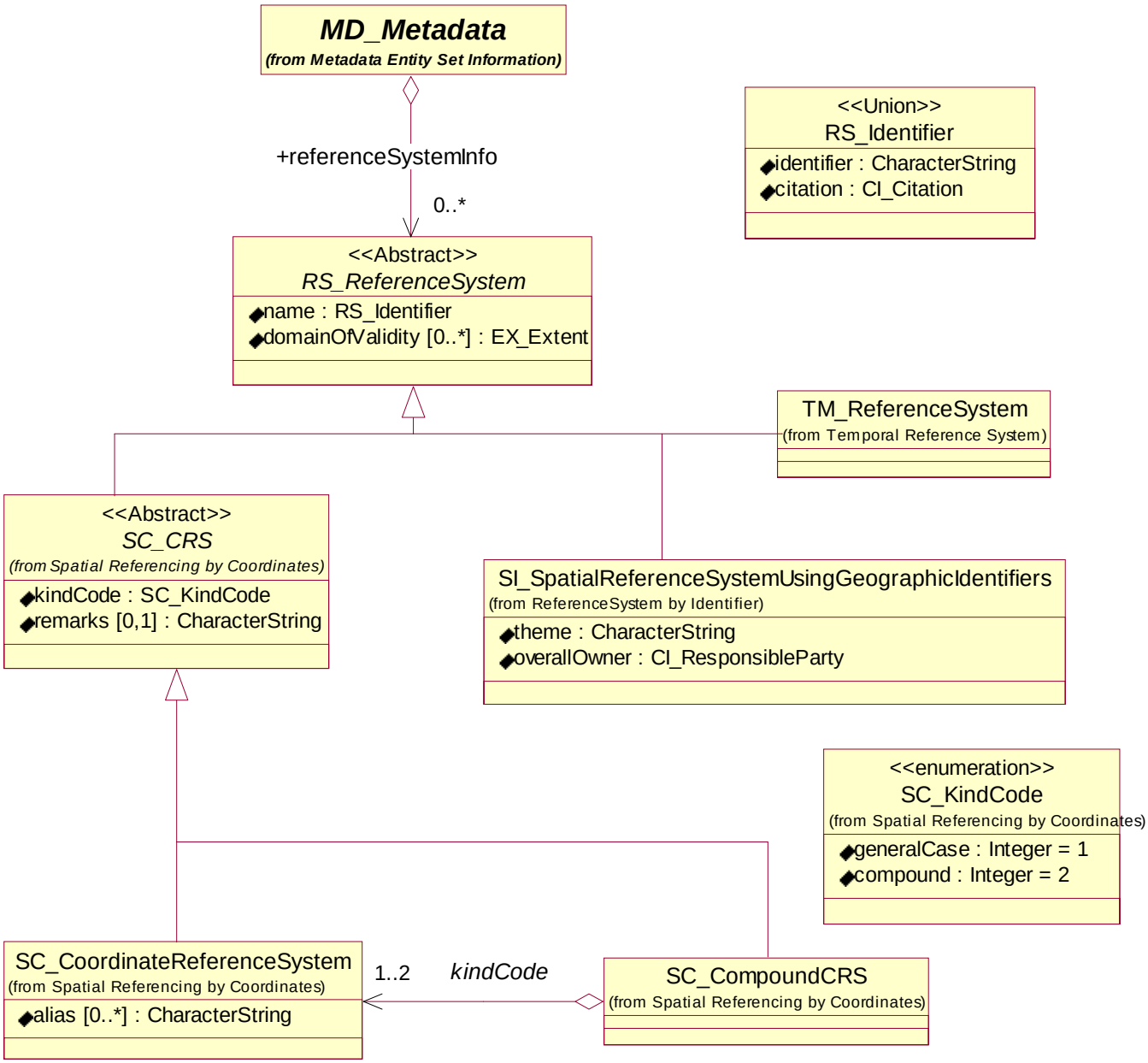
A.2.5 Reference system information

This diagram defines metadata required to describe the spatial and temporal reference system used.



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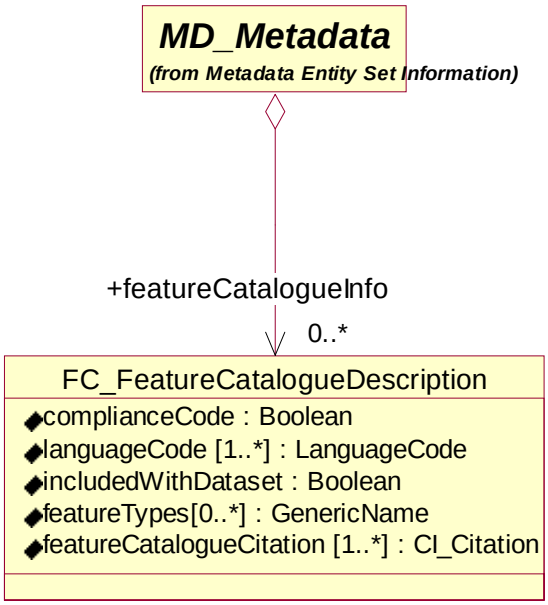
A.2.6 Feature catalogue information

This diagram defines metadata about the feature catalogue(s) used to define features.



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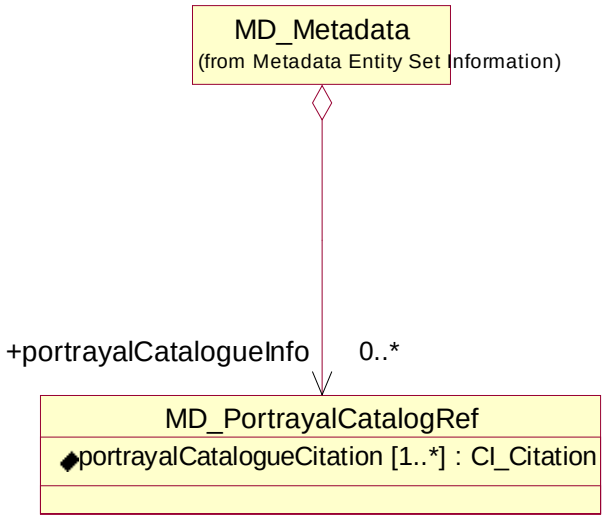
A.2.7 Portrayal catalogue information

This diagram defines metadata about the portrayal catalogue(s) used to display data.



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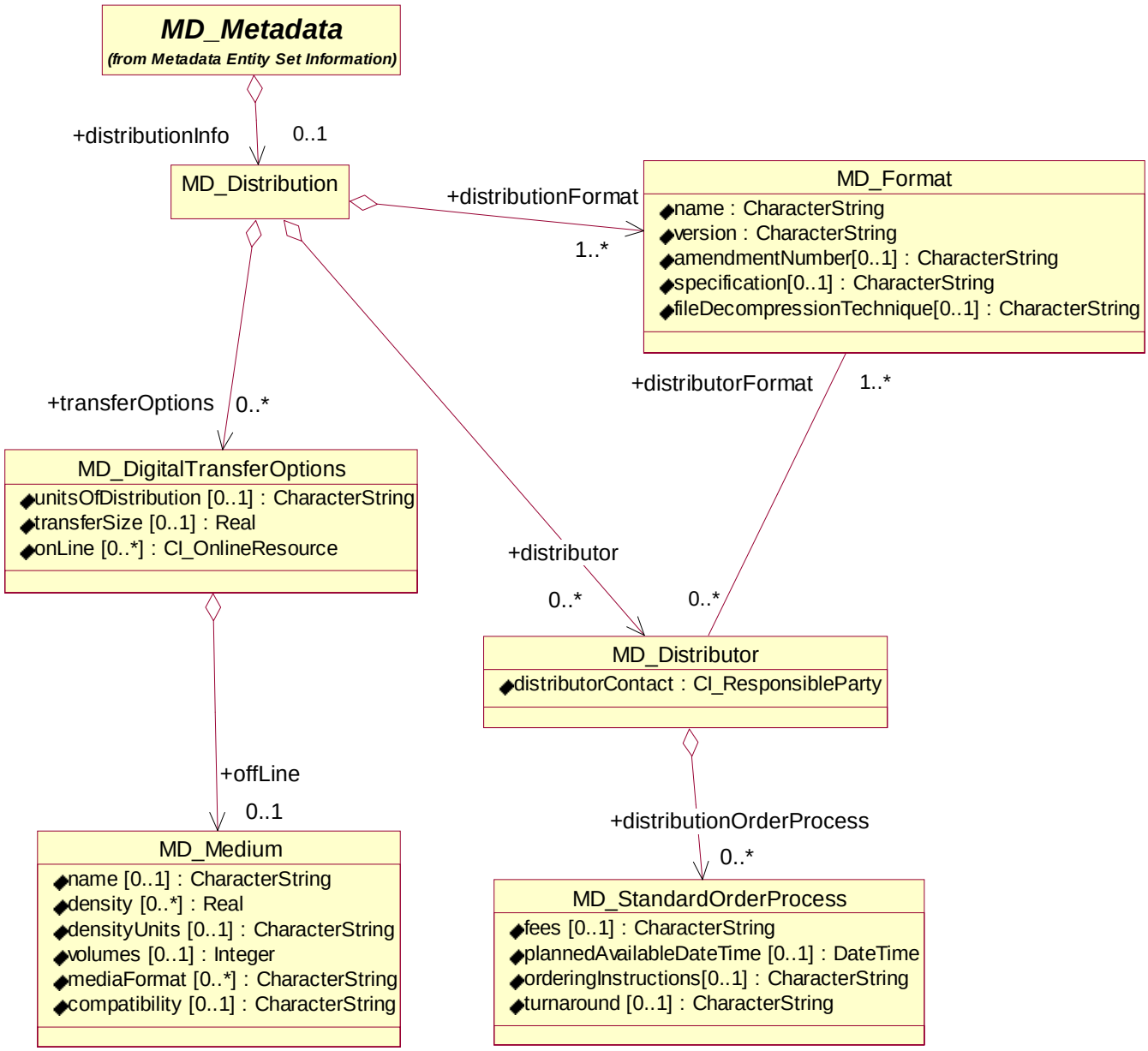
A.2.8 Distribution information

This diagram defines metadata required for accessing a dataset.



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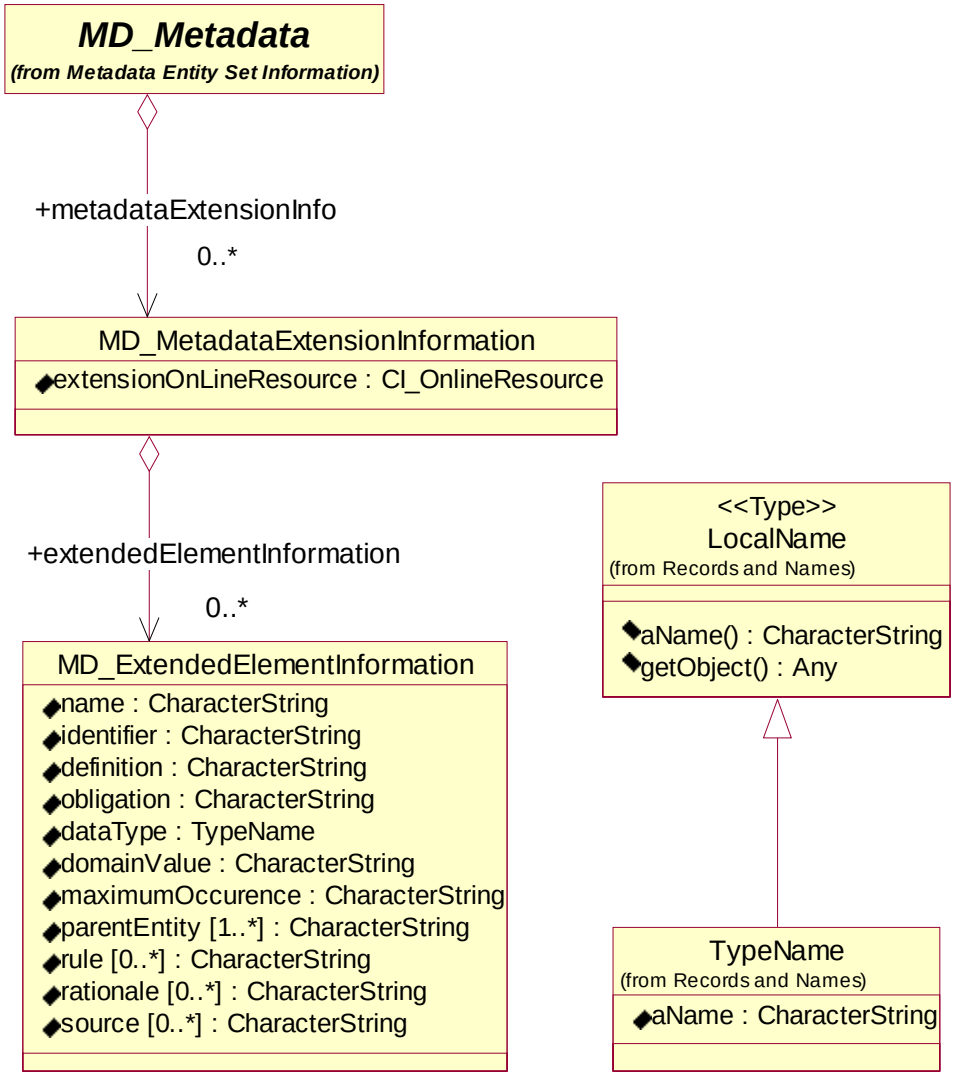
A.2.9 Metadata extension information

This diagram defines the metadata standard used and extended metadata elements.



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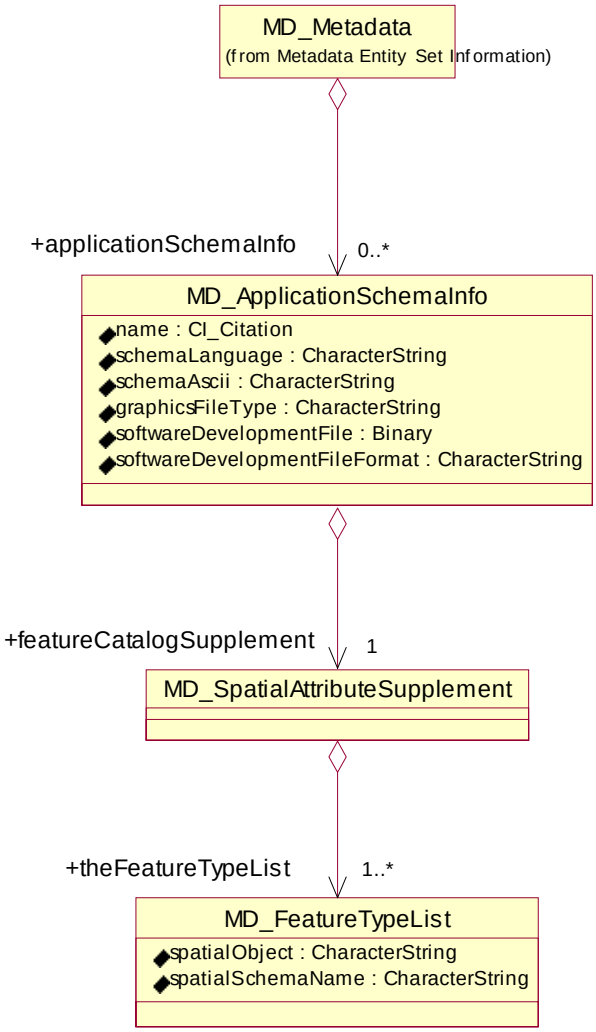
A.2.10 Application schema information

This diagram defines the application schema used.



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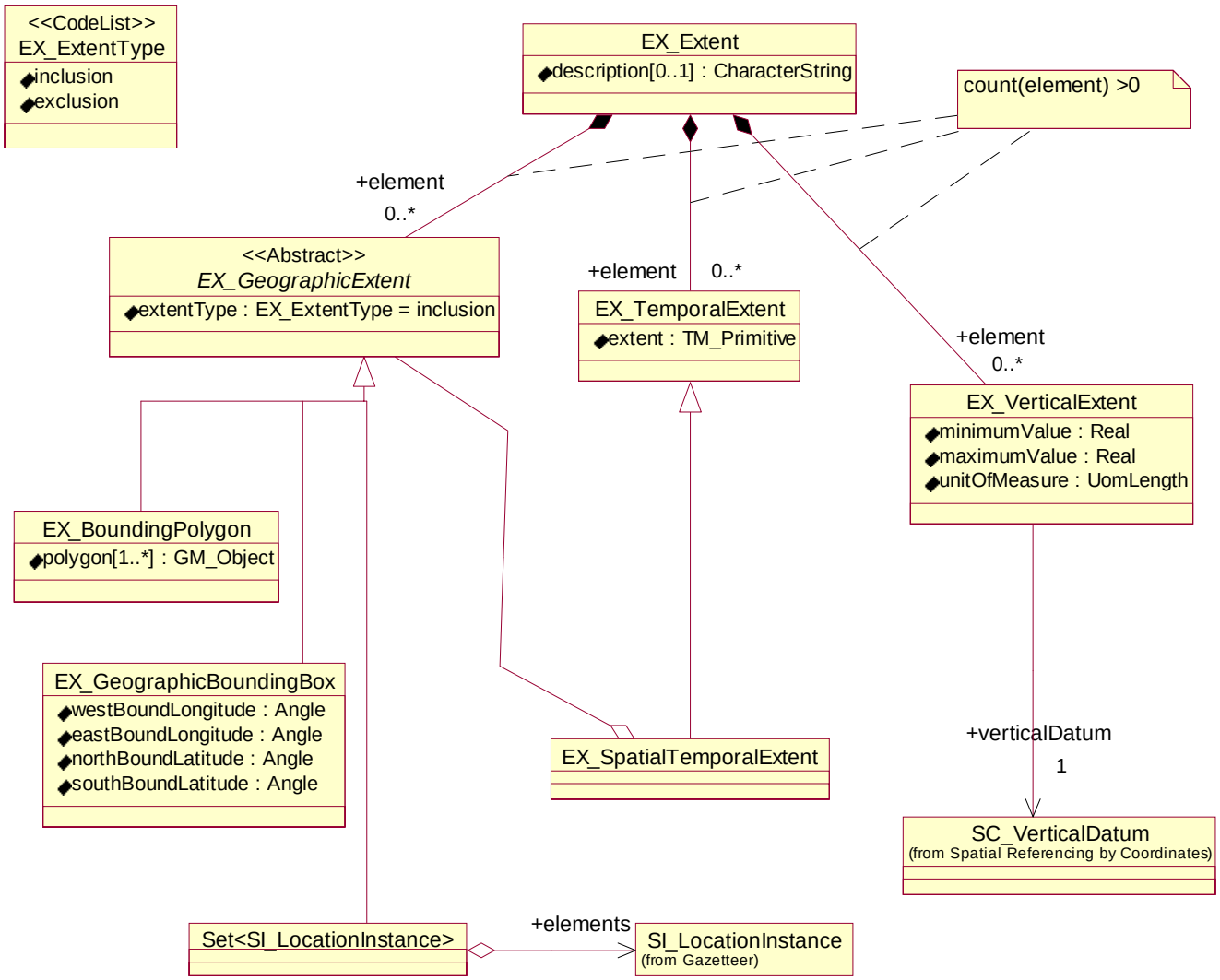
A.2.11 Extent information

This diagram defines metadata describing the spatial and temporal extent covered by a dataset.



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A.2.12 Citation and responsible party information

This diagram defines metadata describing authoritative reference information, including responsible party and contact information.

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Annex B
(normative)

Geographic metadata 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 Normative Annex A. The dictionary is specified in a hierarchy to establish relationships and an organisation for the information. The dictionary is categorised into packages by UML model diagram: Metadata Entity Set, Identification, Data Constraints, Maintenance, Spatial Representation, Reference System, Feature Catalogue, Portrayal Catalogue, Distribution, Metadata Extension, Application Schema, Extent, Citation and Responsible Party, Metadata Application, and Data Quality. The clause names of several of the tables have been expanded to reflect class specification within the respective diagram. Each model diagram from Normative Annex A, as well as the diagram in 6.1, has a section within the data dictionary. In accordance with ISO 11179, 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). The term “dataset” when used as part of a definition is synonymous with all types of geospatial data resources (aggregations of datasets, individual geographic features and the various classes that compose a feature). The stereotype classes <<CodeList>> and <<Enumeration>> are seperated and can be found after the hierarchial listings of entities and elements. Those two stereotype classes do not contain “obligation / condition”, “maximum occurrence”, “data type” and "domain" attributes.

B.1.2 Name

A unique label assigned to a metadata entity or to a metadata element. Role names are used to identify metadata abstract model associations. Element names are unique within an entity, not the entire dictionary.

B.1.3 Short name and domain code

Those classes that are not CodeList or Enumeration classes are provided with a Short Name for each element. These short names may be used with the Extensible MarkUp Language (XML) and ISO 8879 (SGML) or other similar implementation techniques. NOTE: Implemention using SGML and XML is not mandatory; other implementation methods may be accommodated. For domain selections that are incorporated in CodeList and Enumeration classes, a code is provided for each possible selection.

B.1.4 Definition

The metadata element description.

B.1.5 Obligation

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.

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B.1.5.2 Conditional (C):

The metadata entity or metadata element shall be documented if the condition attribute (table column 'Obligation/condition') defined in subclauses B.3 through B.17 is met.

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.

B.1.6 Condition

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 allowed value for another metadata element has been documented.

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.1.7 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.1.8 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, Encoding, subclause 8.2.2.

B.1.9 Domain

The domain indicates the line numbers covered by the 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 in restricted (closed) domains.

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B.2 Metadata entity set information

- graphically shown in Figure 6.1 and A.2

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
1	MD_Metadata	Metadata	Information about the metadata	M	1	Class	Lines 2-22
2	fileIdentifier	fileID	Unique identifier for this metadata file	O	1	CharacterString	Free text
3	language	lang	Language used for documenting metadata	C / not defined by encoding?	1	Class	LanguageCode (ISO 639)
4	characterSet	charSet	Full name of the ISO character coding standard used for the metadata set	C/ISO 10646-2 not used?	1	Class	CharacterSetCode (ISO 10646-2 ISO 8859)
5	parentIdentifier	parID	Unique identifier of the parent metadata file	O	1	CharacterString	Free text
6	hierarchyLevel	hierLev	Scope to which the metadata applies (see informative Annex J for more information about metadata heirarchy levels)	C/ Scope is not equal to “dataset”?	1	Class	MD_Scope <<CodeList>>
7	hierarchyLevelName	hierLevName	Name of the hierarchy level	C/ Scope is not equal to “dataset”?	1	CharacterString	Free text
8	contact	contact	Party responsible for the metadata information	O	1	Class	CI_ResponsibleParty <<DataType>>
9	date	date	Date that the metadata were created or last updated	O	1	Date	ISO 19108
10	metadataStandardName	mdStanName	Name of the metadata standard used	O	1	CharacterString	Free text
11	metadataStandardVersion	mdStanVer	Version 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
13	*Role name:* referenceSystemInfo	refSysInfo	Description of the spatial and temporal reference systems used in the dataset	O	N	Association	*RS_ReferenceSystem* <<Abstract>>
14	*Role name:* metadataExtensionInfo	metExtensInf	Information describing metadata extensions	O	N	Association	MD_MetadataExtensionInformation
15	*Role name:* identificationInfo	idInfo	Basic information about the resource for which the matadata is about	M	N	Association	MD_Identification
16	*Role name:* featureCollection	featColl	A collection of geographic data to which metadata applices	M	N	Association	FT_FeatureCollection
17	*Role name:* featureCatalogueInfo	featCatInfo	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	FC_FeatureCatalogueDescription
18	*Role name:* distributionInfo	distInfo	Provides information about the distributor of and options for obtaining the dataset	O	1	Association	MD_Distribution

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	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
19	*Role name:* dataQualityInfo	dataQualInfo	Provides overall assessment of quality of data..	O	N	Association	DQ_DataQualityInformation (ISO 19113)
20	*Role name:* portrayalCatalogueInfo	portCatInfo	Provides information about the catalogue of rules defined for the portrayal of data.	O	N	Association	MD_PortrayalCatalogueRef
21	*Role name:* metadataConstraints	metConst	Provides restrictions on the acess and use of data	O	N	Association	MD_DataConstraints
22	*Role name:* applicationSchemaInfo	appSchInf	Provides informaiton about the conceptual schema of a dataset.			Association	MD_ApplicationSchemaInfo
23	*Role name:* metadataMaintenance	metaMaint	Provides information about the frequency of metadata updates, and the scope of those updates.	O	1	Association	MD_MaintenanceInformation
24	*Role name:* propertyType	propTyp	Metadata is associated with the property of a feature.	O	N	Association	GF_PropertyType
25	*Role name:* featureType	featTyp	Metadata is associated with feature types.	O	N	Association	GF_FeatureType
26	*Role name:* featureAttribute	featAtt	Metadata is associated with the characteristic(s) of a feature.	O	N	Association	FT_FeatureAttribute
27	*Role name:* feature	feat	Metadata is associated with an abstraction of real world phenomena	O	N	Association	FT_Feature
28	*Role name:* aggregateDataset	aggDS	Metadata is associated with multiple datasets.	M	N	Association	DS_Aggregate

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B.3 Identification information (includes image identification)

- graphically shown in A.2.1

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
29	MD_Identification	ID	Basic information about data	Use obligation from referencing object	Use maximum occurrence from referencing object	Class	Lines 23-48
30	language	lang	Language(s) used within the dataset	M	N	Class	LanguageCode (ISO 639)
31	characterSet	charSet	Full name of the ISO character coding standard used for the data	C/ISO 10646-2 not used?	1	Class	CharacterSetCode (ISO 10646-2 ISO 8859-1)
32	abstract	abstract	Brief narrative summary of the content of the dataset	M	1	CharacterString	Free text
33	purpose	purpose	Summary of the intentions with which the dataset was developed	O	1	CharacterString	Free text
34	supplementalInformation	suppInfo	Other descriptive information about the dataset. Example; Data Model	O	1	CharacterString	Free text
35	credit	credit	Recognition of those who contributed to the dataset	O	1	CharacterString	Free text
36	status	status	Status of dataset	O	1	Class	MD_ProgressCode <<CodeList>>
37	environment	envir	Description of the dataset in the producer's processing environment, including items such as the name of the software, the computer operating system, file name, and the dataset size	O	1	CharacterString	Free text
38	geographicBox	geoBox	Geographic areal domain of the dataset	C / used if geographicDescription is not used	N	Class	EX_GeographicBoundingBox
39	geographicDescription	geoDesc	Commonly used or well known name of a place, area or region which describes a spatial domain of the dataset	C / used if geographicBox is not used	N	Class	SI_LocationInstance
40	spatialResolution	spatRes	Factor which provides a general understanding of the density of spatial data in the dataset. Example: The denominator of the representative fraction or the mean ground sample distance	O	N	CharacterString	Free text
41	category	category	Keywords, describing a subject of a dataset	M	N	Class	MD_Category
42	datasetCitation	dsCitation	Recommended reference to be used for the dataset	M	1	Class	CI_Citation

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	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
43	datasetExtent	dsExt	Additional information about the bounding polygon, vertical, and temporal extent of the dataset	O	N	Class	EX_Extent
44	datasetPointOfContact	dsPOC	Identification of, and means of communication with, person(s) and organisations(s) associated with the dataset	O	N	Class	CI_ResponsibleParty <<DataType>>
45	*Role name:* datasetMaintenance	dsMaint	Provides information about the scope and frequency of updating	O	N	Association	MD_MaintenanceInformation
46	*Role name:* graphicOverview	graphOver	Provides a graphic that illustrates the dataset (should include a legend for the graphic)	O	N	Association	MD_BrowseGraphic
47	*Role name:* datasetFormat	dsFormat	Provides a description of the form of the data to be distributed	O	N	Association	MD_Format
48	*Role name:* descriptiveKeywords	descKey	Provides keywords, their type, and reference source	O	N	Association	MD_Keywords
49	*Role name:* datasetSpecificUse	dsSpecUse	Provides basic information about specific application(s) for which the dataset has been or is being used by different users.	C/is use different than purpose?	N	Association	MD_Use
50	*Role name: datasetConstraints*	dsConst	Provides information about constraints which the dataset must fall under	O	N	Association	MD_DataConstraints
51	MD_ImageIdentification	ImageID	Information required identifying a series of images.	C/ Image series exists?	1	Specified Class (MD_Identification)	Lines 24-26
52	passSequenceIdentifier	passSeqID	Number that uniquely identifies the pass performed by a platform	M	1	Integer	Integer
53	imageOrbitalIdentifier	imagOrbID	Unique identifier for the orbital path of a platform and the row along an orbital path of a platform	M	1	CharacterString	Free text
54	orbitNumber	orbNum	Numer of the orbit in which the image was taken	M	1	Integer	Integer

B.3.1 Browse graphic information

55	MD_BrowseGraphic	BrowGraph	Graphic that provides an illustration of the dataset (should include a legend for the graphic)	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Identification)	Lines 49-52
56	fileName	fileName	Name of the file that contains a graphic that provides an illustration of the dataset	M	1	CharacterString	Free text
57	fileDescription	fileDesc	Text description of the illustration	O	1	CharacterString	Free text
58	fileType	fileType	Graphic file type of a related graphic file Examples: CGM, EPS, GIF, JPEG, PBM, PS, TIFF, XWD	O	1	CharacterString	Free text

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B.3.2 Keyword information

59	MD_Keywords	Keywords	Keywords, their type and reference source	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Identification)	Lines 53-56
60	keyword	keyword	Common-use word(s) or phrase(s) used to describe the subject	M	N	CharacterString	Free text
61	type	type	Method used to group similar keywords	O	1	Class	MD_KeywordType <<CodeList>>
62	thesaurusName	thesaName	Name of the formally registered thesaurus or a similar authoritative source of keywords	O	1	CharacterString	Free text

B.3.3 Location instance information

The data dictionary for Location Instance information is documented in ISO 19112, Location By Identifier.

B.3.4 Use information

63	MD_Use	Use	Brief description of ways in which the dataset is currently used.	Use obligation from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Identification)	Lines 57-61
64	specificUse	specUse	Brief description of the dataset and/or dataset series use	M	1	CharacterString	Free text
65	useDateTime	useDatTim	Date and time of the first occurrence or range of occurrences of the dataset and/or dataset series	O	1	DateTime	ISO 19108
66	userDefinedLimitations	usrDefLims	Applications for which the dataset and/or dataset series is not suitable	O	1	CharacterString	Free text
67	userContactInfo	usrContInfo	Identification of means of communicating with person(s) and organisation(s) using the dataset and/or dataset series	O	N	Class	CI_ResponsibleParty <<DataType>>

B.4 Data constraint information (includes legal and security)

- graphically shown in A.2.2

	Name	**Short Name**	**Definition**	**Obligation / Condition**	**Maximum occurrence**	**Data type**	**Domain**
68	MD_DataConstraints	DataConst	Restrictions on the access and use of a dataset or metadata	Use obligation from referencing object	Use maximum occurrence from referencing object	Class	Line 70
69	useLimitation	useLimit	Any limitation affecting the fitness for use of the dataset. Example, “not to be used for navigation”	O	N	CharacterString	Free text

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	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
70	MD_LegalConstraints	LegalConst	Restrictions and legal prerequisites for accessing and using the dataset.	O	N	Specified Class (MD_DataConstraints)	Lines 72-74
71	accessConstraints	accConst	Access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on obtaining the dataset.	O	1	CharacterString	MD_Restrictions
72	useConstraints	useConst	Constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations or warnings on using the dataset –Examples: “copyright”, “license”, “non-commercial”, “none”	O	1	CharacterString	MD_Restrictions
73	otherConstraints	othConst	Other restrictions and legal prerequisites for accessing and using the dtaset			CharacterString	Free text
74	MD_SecurityInformation	SecInfo	Handling restrictions imposed on the dataset because of national security, privacy, or other concerns	O	N	Specified Class (MD_DataConstraints)	Lines 75-80
75	classification	class	Name of the handling restrictions on the dataset	M	1	Class	MD_Classification <<CodeList>>
76	userNote	userNote	Additional information about the classification	O	1	CharacterString	Free text
77	classificationSystem	classSys	Name of the classification system	O	1	CharacterString	Free text
78	handlingDescription	handDesc	Additional information about the restrictions on handling the dataset	O	1	CharacterString	Free text
79	otherUserDefined	otherUserDef	Handling restriction which is not defined in MD_Classification	C/classification equals “other”?	1	CharacterString	Free text

B.5 Maintenance information

- graphically shown in A.2.3

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
80	MD_MaintenanceInformation	MaintInfo	Information about the scope and frequency of updating	Use obligation from referencing object	Use maximum occurrence from referencing object	Class	Lines 2-5
81	maintenanceAndUpdateFreq	maintUpFreq	Frequency with which changes and additions are made to the dataset after the initial dataset is completed.	M	1	Class	MD_MaintenanceFrequency <<CodeList>>
82	otherMaintenancePeriod	othMaintPer	Maintenance period other than those defined	C/maintenanceAndUpdateFrequency = otherMaintenancePeriod	1	Class	TM_PeriodicTime

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	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
83	updateScope	upScp	Scope at which changes are applied	O	1	Class	MD_Scope <<CodeList>>
84	updateScopeDescription	upScpDesc	Additional information about the range or extent of the dtataset	O	1	Class	MD_ScopeDescription <<Union>>

B.5.1 Scope description information

85	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 7-12
86	attributes	attribs	Attributes to which the information applies	M	1	Set	GF_FeatureAttributeType
87	features	feats	Features to which the information applies	M	1	Set	GF_FeatureType
88	featureInstances	featInsts	Feature instances to which the information applies	M	1	Set	FT_Feature
89	attributeInstances	attribInsts	Attribute instances to which the information applies	M	1	Set	FT_FeatureAttribute
90	featureCollection	featColl	Feature collection to which the information applies	M	1	Class	FT_FeatureCollection
91	other	other	Class of information that does not fall into the other categories	M	1	CharacterString	Free text

B.6 Spatial representation information (includes image, raster and vector representation)

- graphically shown in A.2.4

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
92	MD_SpatialRepresentation	SpatRep	Digital mechanism used to represent spatial information	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class	Line 2
93	representationType	repType	Method used to represent geographic information	O	N	Class	MD_SpatialRepresentationType <<enumeration>>
94	MD_ImageSpatialRepresentation	ImgSpatRes	Relevant data about the image used to represent geographic information	C / SpatialRepresentationType equals “matrix”?	N	Specified Class (MD_SpatialRepresenation)	Lines 4-7
95	imageIdentifier	imageID	Unique discriptor for an image within a dataset series	C/hierarchyLevel equals datasetSeries?	1	CharacterString	Free text

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	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
96	imageType	imageType	Identifies the general kind of image represented by the data –Examples: visible, hyperspectral, multispectral, infrared, thermal infrared, radar	M	1	CharacterString	Free text
97	meanGroundSampleDistance	meanGrSampDst	Geometric mean of the across and along scan centre-to-centre distance between continuous ground samples in metres	O	1	Class	MD_GroundSpacing
98	groundToImageCoefficientAvailability	grToImgCoAvl	Code which indicates whether or not Ground-to-Image coefficients are available and contained within the product data	O	1	Boolean	0-no 1-yes
99	*Role name:* params	params	Provides the parameters defining the sensor that captured the image	O	1	Association	MD_SensorParameters
100	*Role name:* theImageSuitabilityDescription	imgSuitDesc	Provides information about the image's suitability for use	O	1	Association	MD_ImageSuitabilityDescription
101	MD_RasterSpatialRepresentation	RastSpatRep	Types and numbers of raster spatial objects in the dataset	C / SpatialRepresentationType equals "raster"?	N	Specified Class (MD_SpatialRepresentation)	Lines 9-16
102	cellType	cellType	Raster spatial objects used to locate zero-, two-, or three-dimensional locations in the dataset	M	1	Class	MD_RasterCellType <<Enumeration>>
103	cellOrigin	cellOrig	Location of pixel 1,1 (example NW corner)	O	1	CharacterString	Free text
104	rows	rows	Maximum number of raster objects along the ordinate (y) axis	O	1	Integer	> 0
105	columns	cols	Maximum number of raster objects along the abscissa (x) axis	O	1	Integer	> 0
106	verticals	verts	Maximum number of raster objects along the vertical (z) axis	O	1	Integer	> 0
107	ScanResolution	scanRes	Units used to express data density along the axes	O	1	Class	MD_ScanResolution
108	groundSpacing	grSpac	Unit of measurement used to describe the distance	O	1	Class	MD_GroundSpacingResolution
109	*Role name:* cellDomain	cellDom	Provides information about the domain of a raster cell	M	1	Association	MD_CellValueDomain
110	MD_VectorSpatialRepresentation	VectSpatRep	Information about the vector spatial objects in the dataset	C / SpatialRepresentationType equals "vector"?	N	Specified Class (MD_SpatialRepresentation)	Lines 18-20
111	geometricObjectType	geometObjTyp	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>>

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	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
112	geometricObjectCount	geometObjCnt	Total number of the point or vector object type occurring in the dataset	O	1	Integer	> 0
113	topologyLevel	topLevel	Code which identifies the degree of complexity of the spatial relationships	O	1	Class	MD_TopologyLevel <<Enumeration>>

B.6.1 Cell value domain information

114	MD_CellValueDomain	CellValDom	Information about the domain of the raster cell	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_RasterSpatialRepresentation)	Lines 22-25
115	toneGradation	toneGrad	Number of colours present in the image	O	1	Integer	Integer
116	bitsPerBand	bitsPB	Maximum number of significant bits for the value in each band of each pixel without compression	O	1	Integer	Integer
117	cellAttributeDescription	cellAttDesc	Description of the attribute described by the measurement value	M	1	CharacterString	Free text
118	cellUnit	cellUnit	Units of the cell attribute	M	1	CharacterString	Free text

B.6.2 Ground spacing information

119	MD_GroundSpacing	GrSpac	Geometric mean of the distance between continuous ground samples	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class	Lines 55-56
120	spacing	spac	Center to center distance between continuous samples	M	1	Real	Real
121	unit	unit	Unit of measurement used to depict ground spacing	M	1	Class	MD_Length <<Enumeration>>

B.6.3 Ground spacing resolution information

122	MD_GroundSpacingResolution	GrSpacRes	The distance represented by a pixel in ground space units in up to 3 dimensions	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class	Lines 58-60
123	xSpacing	xSpac	The distance represented by a pixel in the x direction on the ground	M	1	Class	MD_GroundSpacing
124	ySpacing	ySpac	The distance represented by a pixel in the y direction on the ground	M	1	Class	MD_GroundSpacing

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125	zSpacing	zSpac	The distance represented by a pixel in a direction perpindicular to the x-y plane	M	1	Class	MD_GroundSpacing

B.6.4 Image suitability description information

126	MD_ImageSuitabilityDescription	ImagSuitDsc	Information about an image's suitability for use	O	1	Aggregated Class (MD_ImageSpatialRepresentation)	Lines 27-38
127	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	O	1	Real	0.00 – 89.99
128	illuminationAzimuthAngle	illAziAng	Illumination azimuth measured in degrees clockwise from true north at the time the image is taken	O	1	Real	0,00 – 359,99
129	imageOrientationAngle	imgOrieAng	Angle from the first row of the image to true North in degrees, clockwise	O	1	Real	0 – 360
130	imagingCondition	imagCond	Code which indicates conditions which affect the quality of the image	O	1	Class	MD_ImagingConditionCode <<CodeList>>
131	imageQualityRatingSystem	imgQualRatSys	Rating system on which the Image Quality Code is based	O	1	CharacterString	Free text
132	imageQualityCode	imagQualcode	Specifies the image quality	O	1	CharacterString	Free text
133	cloudCoverPercentage	cloudCovPer	Area of the dataset obscured by clouds, expressed as a percentage of the spatial extent	O	1	Real	0.0 – 100.0
134	preProcessingTypeCode	prePrcTypCde	Image distributor's code that identifies the level of radiometric and geometric processing applied against the image –Examples: "LEVEL1A", "LEVEL1B", "SPOTVIEWORTHO", "SPOTVIEWPRECISIO"	O	1	CharacterString	Free text
135	compressionGenerationQuantity	compGenQuan	Counts the number of lossy compression cycles performed on the image	O	1	Integer	Integer
136	triangulationIndicator	triID	Code which indicates whether or not triangulation has been performed upon the image	O	1	Boolean	0-no 1-yes
137	radiometricDataAvailability	radDatAvail	Code which indicates whether or not Standard Radiometric Product data is available	O	1	Boolean	0-no 1-yes

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138	ESDAvailability	ESDAvail	Indicates whether or not Image Exploitation Support Data (ESD) is available such as position and attitude information	O	1	Boolean	0-no 1-yes

B.6.5 Pixel resolution information

139	MD_PixelResolution	PixRes	Average unit of information in a grid cell	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class	Lines 62-63
140	pixelsPerUnit	pixPerUnit	Number of pixels contained in one unit of measurement	M	1	Integer	Integer
141	unit	unit	Units of measure used to describe pixels \per unit	M	1	Class	MD_Length <<Enumeration>>

B.6.6 Scan resolution information

142	MD_ScanResolution	ScanRes	Units used to express data density along the axes	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class	Lines 65-67
143	xResolution	xRes	Units used to express data density along the x axis.	M	1	Class	MD_PixelResolution
144	yResolution	yRes	Units used to express data density along the y axis.	M	1	Class	MD_PixelResolution
145	zResolution	zRes	Units used to express data density along the z axis.	M	1	Class	MD_PixelResolution

B.6.7 Sensor parameter information

146	MD_SensorParameters	SenPara	Identifies the parameters defining the sensor	O	1	Aggregated Class (MD_ImageSpatialRepresentation)	Lines 4-46
147	focalLength	focLen	Focal length of the lens in millimetres	O	1	Real	Real
148	obliquityAngle	oblAng	Angle off vertical of image in degrees	O	1	Real	Real
149	imageSensorTime	imgSenTime	The precise time at which the image was captured in the sensor's time system	O	1	Real	Real
150	sensorCategory	senCat	Identifies the specific category of imagery	O	1	CharacterString	Free text
151	sensorMode	senMode	Identifies the sensor mode used in capturing the image –Examples: FRAMING PUSHBROOM SPOT SWATH WHISKBROOM	O	1	CharacterString	Free text

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152	spectralProperties	spectProp	Electromagnetic spectrum sensitivity of sensor	O	1	CharacterString	Free text
153	fieldOfView	fieldOView	Area of measurement of sensor	O	1	CharacterString	Free text
154	orientationOnPlatform	orieOnPlat	Orientation of instrument relative to platform	O	1	CharacterString	Free text
155	operationMode	opMode	Sensor status Examples: launch, survival, initialization, safe, diagnostic, standby, crosstrack, biaxial, solar calibration	O	1	CharacterString	Free text
156	*Role name:* band	band	Set of wavelengths that the sensor operates in	O	N	Association	MD_SensorBand

B.6.8 Sensor band information

157	MD_SensorBand	SenBand	Set of adjacent wavelengths in the electro-magnetic spectrum with a common characteristic, such as the visible band	O	N	Aggregated Class (MD_SensorParameters)	Lines 48-53
158	sequenceIdentifier	seqId	Number that uniquely identifies instances of bands of wavelengths on which a sensor operates	O	1	CharacterString	Free text
159	highWavelength	hiWavelen	Highest wavelength that the sensor is capable of collecting within a designated band in metres	O	1	Real	Real
160	lowWavelength	lowWavelen	Lowest wavelength that the sensor is capable of collecting within a designated band in metres	O	1	Real	Real
161	cameraCalibrationInfoAvailability	camCalInfAvl	Code which ndicates whether or not constants are available which allow for camera calibration corrections.	O	1	Boolean	0-no 1-yes
162	filmDistortionInfoAvailability	filmDistrtInfAvl	Code which indicates whether or not Calibration Reseau information is available	O	1	Boolean	0-no 1-yes
163	lensDistortionInfoAvailability	lensDistrtInfAvl	Code which indicates whether or not lens aberration correction information is available	O	1	Boolean	0-no 1-yes

B.7 Reference system information (includes temporal, by coordinates and using geoIDs)

- graphically shown in A.2.5

	Name	**Short Name**	**Definition**	**Obligation / Condition**	**Maximum occurrence**	**Data type**	**Domain**
164	*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>>	Line 9-10
165	name	name	Name of reference system used	M	1	Class	RS_Identifier

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	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
166	domainOfValidity	domOValid	Range which is valid for the reference system	O	N	Class	EX_Extent
167	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)	Lines 12
168	SI_SpatialReferenceSystemUsingGeographicIdentifiers	SISpatRefSysGeoID	Documented in ISO 19112 – Location by identifier	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (RS_ReferenceSystem)	Lines 14-16
169	theme	theme	Documented in ISO 19112 – Location by identifier	M	1	CharacterString	Free text
170	overallOwner	overOwner	Documented in ISO 19112 – Location by identifier	M	1	Class	CI_ResponsiblePartY
171	*SC_CRS*	CRS	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>>	Line 18
172	kindCode	kindCode	Documented in ISO 19111 – Spatial reference by coordinates	M	1	Class	SC_KindCode
173	remarks	remarks	Documented in ISO 19111 – Spatial reference by coordinates	O	1	CharacterString	Free text

B.8 Feature catalogue information

- graphically shown in A.2.6

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
174	FC_FeatureCatalogueDescription	FeatCatDesc	Information identifing the feature catalogue	C/ does dataset contain feature types?	N	Class	Lines 2-6
175	complianceCode	compCode	Indicates whether or not the cited feature catalogue complies with ISO 19110	M	1	Boolean	0-not compliant 1-compliant
176	languageCode	langCode	Language(s) used within the dataset	M	N	Class	LanguageCode (ISO 639)
177	includedWithDataset	incWithDS	Indicates whether ro not the feature catalogue is included with the dataset	M	1	Boolean	0=no 1=yes
178	featureTypes	featType	Subset of feature types from cited feature catalogue occurring in dataset	C/ dataset does not include all features contained in feature catalogue?	1	Class	GenericName
179	featureCatalogCitation	featCatCit	Complete bibliographic reference to one or more external feature catalogues	M	N	Class	CI_Citation

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B.9 Portrayal catalogue information

- graphically shown in A.2.7

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
180	MD_PortrayalCatalogRef	PortCatRef	Information identifing the portrayal catalogue used	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class	Lines 2-6
181	portrayalCatalogueCitation	portCatcit	Recommended reference to be used for the referring entity	M	N	Class	CI_Citation

B.10 Distribution information

- graphically shown in A.2.8

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
182	MD_Distribution	Dist	Information about the distributor of and options for obtaining the dataset	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class	Lines 2-4
183	*Role name:* distributionFormat	distFormat	Provides a description of the form of the data to be distributed	M	N	Association	MD_Format
184	*Role name:* distributor	distributor	Provides information about the distributor	O	N	Association	MD_Distributor
185	*Role name:* transferOptions	distribTrnsOps	Provides information about technical means and media by which a dataset is obtained from the distributor	C / dataset will be transferred digitally?	N	Association	MD_DigitalTransferOptions

B.10.1 Digital transfer options information

186	MD_DigitalTransferOptions	DigTransOpts	Technical means and media by which a dataset is obtained from the distributor	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Distribution)	Lines 6-9
187	unitsOfDistribution	unitsODist	Tiles, layers, geographic areas, etc., in which data is available	O	1	CharacterString	Free text
188	transferSize	transSize	Estimated size of the transferred dataset in megabytes. The transfer size is > 0.0	O	1	Real	> 0.0
189	onLine	onLine	Information about online sources from which the dataset can be obtained	O	N	Class	CI_OnLineResource <<DataType>>
190	*Role name:* offLine	offLine	Information about offline sources from which the dataset can be obtained	O	1	Association	MD_Medium

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B.10.2 Distributor information

191	MD_Distributor	Distributor	Information about the distributor	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Distribution)	Lines 11-13
192	*Role name:* distributionOrderProcess	distOrdProc	Provides information about how the dataset may be obtained, and related instructions and fee information	O	N	Association	MD_StandardOrderProcess
193	distributorContact	distCont	Party from whom the dataset may be obtained	M	1	Class	CI_ResponsibleParty <<DataType>>
194	*Role name:* distributorFormat	distFormat	Provides information about the Format in which the dataset may be obtained	M	N	Association	MD_Format

B.10.3 Format information

195	MD_Format	Format	Description of the form of the data to be distributed	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Distribution)	Lines 15-21
196	name	name	Name of the data transfer format(s) offered by the distributor for an available dataset. Example: SDTS	M	1	CharacterString	Free text
197	version	verNum	Version number of the format	M	1	CharacterString	Free text
198	amendmentNumber	amendNum	Amendment number of the format version	O	1	CharacterString	Free text
199	specification	spec	Name of a subset, profile, or product specification of the format	O	1	CharacterString	Free text
200	fileDecompressionTechnique	filDecmTech	Recommendations of algorithms or processes that can be applied to read or expand datasets to which data compression techniques have been applied	O	1	CharacterString	Free text
201	*Role name:* distributorFormat	distFormat	Provides information about the distributor's Format	O	N	Association	MD_Distributor

B.10.4 Medium information

202	MD_Medium	Medium	Information about the media on which the data can be distributed	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_DigitalTransferOptions)	Lines 23-28

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203	name	name	Name of the media on which the dataset can be received –Examples:"CD-ROM", "3.5 inch floppy disk", "5.25 inch floppy disk", "9-track tape", "4 mm cartridge tape", "8 mm cartridge tape", "1/4 inch cartridge tape", "on-line", " satellite", "telephone link", "brochure"	O	1	CharacterString	Free text
204	density	density	Density in which the dataset can be recorded	O	N	Real	> 0.0
205	densityUnits	densityUn	Units of measure for the recording density	O	1	CharacterString	Free text
206	volumes	vols	Number of items in the media identified	C/are number of volumes >1?	1	Integer	Integer
207	mediaFormat	medFormat	Options available or method used to write the dataset to the medium –Examples: "cpio", "tar", "High Sierra", "ISO 9660", "ISO 9660 with Rock Ridge extensions", "ISO 9660 with Apple HFS extensions"	O	N	CharacterString	Free text
208	compatibility	compat	Description of other limitations or requirements for using the medium	O	1	CharacterString	Free text

B.10.5 Standard order process information

209	MD_StandardOrderProcess	StanOrdPrc	Common ways in which the dataset 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 30-33
210	fees	fees	Fees and terms for retrieving the dataset. Include monetary units.	O	1	CharacterString	Free text
211	plannedAvailableDateTime	plnAvlDatTim	Date and time when the dataset will be available.	O	1	DateTime	ISO 19108
212	orderingInstructions	ordInstr	General instructions , terms and services provided by the distributor when ordering the dataset	O	1	CharacterString	Free text
213	turnaround	turnaround	Typical turnaround time for the filling of an order	O	1	CharacterString	Free text

B.11 Metadata extension information

- graphically shown in A.2.9

214	MD_MetadataExtensionInformation	MetExtnsInf	Information describing metadata extensions	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Aggregated Class (MD_Metadata)	Lines 8-9

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215	*Role name:* extendedElementInformation	extnsEelInf	Provides information about a new metadata element, not found in ISO 19115, which is required to describe geographic data	O	N	Association	MD_ExtendedElementInformation
216	extensionOnlineResource	extnsOnliRes	Information about online sources containing the community profile name and the extended metadata elements. Information for all new metadata elements.	M	1	Class	CI_OnlineResource <<DataType>>

B.11.1 Extended element information

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
217	MD_ExtendedElementInformation	ExtendEleInf	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 11-21
218	name	name	Name of the extended metadata element. NOTE: Do not duplicate any other Standard element name.	M	1	CharacterString	Free text
219	identifier	identifier	Unique numeric identifier of the extended element NOTE: Do not duplicate another identifier used by the standard.	M	1	CharacterString	Free text
220	definition	defin	Definition of the extended element	M	1	CharacterString	Free text
221	obligation	oblig	Obligation and condition of the extended element	M	1	CharacterString	Free text
222	dataType	datType	Code which identifies the kind of value provided in the extended element	M	1	Class	TypeName
223	domainValue	domVal	Valid values that can be assigned to the extended element. The same rules as those for standard elements are applied here	M	1	CharacterString	Free text
224	maximumOccurrence	maxOcc	Maximum occurrence of the extended element within the "…"	M	1	CharacterString	Free text
225	parentEntity	parEnt	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
226	rule	rule	Relationship rule for the element, specified using the form given in this standard.	C /is this an extended element?	N	CharacterString	Free text
227	rationale	rationale	Reason for creating the extended element	O	N	CharacterString	Free text
228	source	source	Name of the entity creating the extended element	C/is this an extended element?	N	CharacterString	Free text

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B.11.2 Local and type name information

The Local and Type Name Information data dictionary is documented in ISO 19103 – Conceptual Schema Language

B.12 Application schema information

- graphically shown in A.2.10

	Name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
229	MD_ApplicationSchemaInfo	AppSchInfo	Information about the application schema used to build the dataset			Class	Lines 2-8
230	name	name	Name of the application schema used	M	1	Class	CI_Citation
231	shemaLanguage	schLang	Identification of the schema language used	M	1	CharacterString	Free text
232	constraintLanguage	constrLang	Formal language used in Application Schema	M	1	CharacterString	Free text
233	schemaAscii	schAsc	Full application schema given as an ASCII file.	M	1	CharacterString	Free text
234	graphicsFileType	graFilTyp	Full application schema given as a graphics file.	M	1	CharacterString	Free text
235	softwareDevelopmentFile	swDevFile	Full application schema given as a software defelopment file.	M	1	Binary	
236	softwareDevelopmentFormat	swDevFormat	Software dependent format used for the application schema software dependent file.	M	1	CharacterString	Free text
237	*Role name:* featureCatalogSupplement	featCatSup	Information about the spatial attributes in the application schema for the feature types	M	1	Association	MD_SpatialAttributeSupplement

B.12.1 Feature type list information

238	MD_FeatureTypeList	FeatTypList	List of names of feature types witht eh same spatial representation (same as spatial attribute)			Aggregated Class (MD_SpatialAttributeSupplement)	Line 12-13
239	spatialObject	spatObj	Instance of a type defined in the spatial schema	M	1	CharacterString	Free text
240	spatialSchemaName	spatSchName	Name of the spatial schema used	M	1	CharacterString	Free text

B.12.2 Spatial attribute supplement information

241	MD_SpatialAttributeSupplement	SpatAttSup	Spatial attributes in the application schema for the feature types.			Aggregated Class (MD_ApplicationSchemaInfo)	Line 10
242	*Role name:* theFeatureTypeList	featTypList	Provides information about the list of feature types with the same spatial representation.	M	N	Association	MD_FeatureTypeList

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B.13 Extent information

- graphically shown in A.2.11

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
243	EX_Extent	Extent	Information about spatial, vertical, and temporal extent	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class	Lines 2-3
244	description	desc	Spatial and temporal extent for the referring object	O	1	CharacterString	Free text
245	*Role name:* element	ele	Provides a component of the extent	O	N	Association	EX_GeographicExtent <<Abstract>> EX_TemporalExtent EX_VerticalExtent

B.13.1 Geographic extent information

246	*EX_GeographicExtent*	GeoExt	Geographic area of the dataset	O	N	Aggregated Class (EX_Extent) <<Abstract>>	EX_BoundingPolygon Or EX_GeographicBoundingBox or SI_LocationInstance
247	extentType	extType	Identifies whether the bounding polygon encompasses an area covered by the data or an area where data is not present	C/ExtentType equals exclusion?	1	Class	EX_ExtentType <<CodeList>>
248	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/GeographicBoundingBox or LocationInstanceno t provided?	N	Specified Class (EX_Geographic Extent)	Line 14
249	polygon	poly	Sets of points in a particular coordinate reference system.	M	N	GM_Object	-90 to 90 latitude -180 to 180 longitude
250	EX_GeographicBoundingBox	GeoBndBox	Geographic area of the entire dataset referenced to WGS 84	C/BoundingPolygon or LocationInstanceno t provided?	N	Specified Class (EX_Geographic Extent)	Lines 16-19
251	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
252	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

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253	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
254	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
255	Set <SI_LocationInstance>	SetLocInst	Documented in ISO 19112 – Location by identifier	M	1	Specified Class (EX_Geographic Extent)	Line 21
256	*Role name:* elements	elements	Documented in ISO 19112 – Location by identifier	M	1	Association	SI_LocationInstance

B.13.2 Temporal extent information

257	EX_TemporalExtent	TempExt	Time period covered by the content of the dataset	O	N	Aggregated Class (EX_Extent)	Line 7
258	extent	extent	Date and time for the content of the dataset.	M	1	Class	TM_Primitive (ISO 19108)
259	EX_SpatialTemporalExtent	SpatTempExt	Extent with respect to date and time	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specified Class (EX_TemporalExtent) Aggregated Class (EX_Geographic Extent)	

B.13.3 Vertical extent information

260	EX_VerticalExtent	VertExt	Vertical domain of dataset	O	1	Aggregated Class (EX_Extent)	Lines 9-12
261	minimumValue	minVal	Lowest vertical extent contained in the dataset	M	1	Real	Real
262	maximumValue	maxVal	Highest vertical extent contained in the dataset	M	1	Real	Real
263	unitOfMeasure	uOfMeas	Vertical units used for vertical extent information Examples: metres, feet, millimetres	M	1	CharacterString	UomLength

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264	*role name:* verticalDatum	vetDat	Provides information about the origin from which the maximum and minimum elevation values are measured	M	1	Association	SC_VerticalDatum

B.13.4 Vertical datum information

The Vertical Datum Information data dictionary is documented in ISO 19111 – Spatial reference by coordinates

B.14 Citation and responsibility information

- graphically shown in A.2.12

	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
265	CI_Citation	Citation	Standardized resource reference	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<DataType>>	Lines 2-14
266	title	title	Name by which the cited information is known	M	1	CharacterString	Free text
267	alternateTitle	altTitle	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
268	date	date	Reference date for the cited information	M	1	Date	ISO 19108
269	dateType	dateType	Event used for reference data –Examples: "publication date", creation date", "revision date"	O	1	CharacterString	Free text
270	edition	edition	Version of the dataset	C/ edition other than first ?	1	CharacterString	Free text
271	editionDate	edDate	Date of the edition	O	1	Date	ISO 19108
272	identifier	citID	Unique identifier for the data referenced by the metadata EXAMPLE: Universal Price Code (UPC), National Stock Number (NSN)	O	N	CharacterString	Free text
273	identifierType	idType	Reference form of the unique identifier (ID) Example: NSN, URC	O	N	CharacterString	Free text
274	presentationForm	presForm	Mode in which the data is represented	O	N	Class	CI_PresentationFormCode <<CodeList>>
275	seriesName	serName	Name of the series of which the dataset is a part	C/ member of series ?	1	CharacterString	Free text
276	issueIdentification	issID	Information identifying the issue of the series publication of which the dataset is a part	C/ multiple issues ?	1	CharacterString	Free text
277	otherCitationDetails	otherCitDet	Other information required to complete the citation	O	1	CharacterString	Free text

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	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
278	citedResponsibleParty	citRespParty	Name and position information for an individual or organisation that is responsible for the resource.	O	N	Class	CI_ResponsiblePart y <<DataTy pe>>
279	collectiveTitle	collTitle	Common title with holdings note.	O	1	CharacterString	Free text
280	page	page	Details on which pages of the periodical the article was published.	O	1	CharacterString	Free text
281	ISBN	ISBN	International Standard Book Number.	O	1	CharacterString	Free text
282	ISSN	ISSN	International Standard Serial Number.	O	1	CharacterString	Free text

283	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 16-21
284	mandatoryPartyInfo	mandPartyInfo	Individual, organisation, or position that is knowledgable about the dataset	M	1	Class	CI_Mand atoryParty <<Union> >
285	individualName	rpIndName	Name of the responsible person- SURNAME, given name, title separated by a delimiter	O	1	CharacterString	Free text
286	organisationName	rpOrgName	Name of the responsible organisation	O	1	CharacterString	Free text
287	positionName	rpPosName	Role or position of the responsible person	O	1	CharacterString	Free text
288	responsibility	resp	Function performed by the responsible party	O	N	Class	CI_Respo nsibilityCo de <<CodeLi st>>
289	contactInfo	contactInfo	Address of the responsible party	M	N	Class	CI_Conta ct

B.14.1 Address information

290	CI_Address	Address	Location of the responsible individual or organisation	C/Telephone or OnlineResource not provided?	1	Class <<DataType>>	Lines 29-34
291	deliveryPoint	postAdd	Address line for the physical address (Street name, box number, suite)	O	N	CharacterString	Free text
292	city	city	City of the physical address	O	1	CharacterString	Free text
293	administrativeArea	adminArea	State, province of the physical address	O	1	CharacterString	Free text
294	postalCode	postCode	ZIP or other postal code	O	1	CharacterString	Free text
295	country	country	Country of the physical address	O	1	CharacterString	ISO 3166
296	electronicMailAddress	electMailAdd	Address of the electronic mailbox of the responsible organisation or individual	O	N	CharacterString	Free text

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B.14.2 Contact information

297	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 23-27
298	hoursOfService	hrsOfServ	Time period (including time zone) when individuals can contact the organisation or individual	O	1	CharacterString	Free text
299	contactInstructions	contInstr	Supplemental instructions on how or when to contact the individual or organisation	O	1	CharacterString	Free text
300	phone	phone	Telephone numbers at which the organisation or individual may be contacted	O	1	Class	CI_Telephone <<DataType>>
301	address	address	Physical and email address at which the organisation or individual may be contacted	O	1	Class	CI_Address <<DataType>>
302	onlineResource	onlineRes	Online information that can be used to contact the individual or organisation	O	1	Class	CI_OnlineResource <<DataType>>

B.14.3 Mandatory party information

303	CI_MandatoryParty	MandParty	Individual, organisation, or position that is knowledgeable about the resource	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<Union>>	Lines 36-38
304	individualName	mpIndName	Name of the responsible person- SURNAME, given name, title separated by a delimiter	C/organisation or position not identified?	1	CharacterString	Free text
305	organisationName	mpOrgName	Name of the responsible organisation	C/individual name or position not identified?	1	CharacterString	Free text
306	positionName	mpPosName	Role or position of the responsible person	C/individual name or organisation name not identified?	1	CharacterString	Free text

B.14.4 Online resource information

307	CI_OnlineResource	OnlinRes	Information about online 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 40-45
308	linkage	linkage	Method, source, or location for online access. Example: a Uniform Resource Locator (URL) such as http://www,gii.getty.edu/tgn_browser/	M	1	Class	URL (IETF RFC1738 IETF RFC 2056)

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309	functionCode	functCode	Function performed by the resource	O	1	Class	CI_OnLineFunction <<CodeList>>
310	protocol	protocol	Connection protocol to be used	O	1	CharacterString	Free text
311	applicationProfile	appProfile	Name of an application profile that can be used with the resource	O	1	CharacterString	Free text
312	name	name	Name of the resource	O	1	CharacterString	Free text
313	description	desc	Description of what the resource is/does	O	1	CharacterString	Free text

B.14.5 Telephone information

314	CI_Telephone	Telephone	Telephone numbers for contacting the responsible individual or organisation	C/Address or OnlineResource not provided?	N	Class <<DataType>>	Lines 47-50
315	voice	voice	Telephone number by which individuals can speak to the responsible organisation or individual	O	N	CharacterString	Free text
316	facsimile	fax	Telephone number of a facsimile machine for the responsible organisation or individual	O	N	CharacterString	Free text
317	other	other	Telephone number for contacting the responsible individual or organisation	C / phone other than voice or fax?	N	CharacterString	Free text
318	otherType	othType	Description of telephone number provided in “other” phone element	C / phone other than voice or fax?	N	CharacterString	Free text

B.15 Metadata application information

- graphically shown in Figure 6.1

	Name / Role name	**Short Name**	**Definition**	**Obligation / Condition**	**Maximum occurrence**	**Data type**	**Domain**
319	DS_Aggregate	DSAgg	Identifiable collection of datasets	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Class <<Abstract>>	Lines 2-7
320	*Role name:* aggregateDatasetMetadata	aggDSMet	Provides metadata for the associated dataset	M	N	Association	MD_Metadata
321	*Role name: aggregate*	agg	Aggregate dataset composed of a datasets constitutent part	M	N	Association	DS_Dataset
322	*Role name: superset*	super	Aggregate dataset that is a superset of other aggregate datasets.	O	N	Association	DS_Aggregate
323	*Role name: subset*	sub	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

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	Name / Role name	Short Name	Definition	Obligation / Condition	Maximum occurrence	Data type	Domain
324	DS_Dataset	DSDataset	Identifiable collection of data	Use obligation/condition from referencing object	Use maximum occurrence from referencing object	Specialisation Class (FT_FeatureCollection)	Line 10
325	*Role name:* dataSet	dataset	Dataset is part of an aggregate dataset	M	N	Association	DS_Aggregate <<Abstract>>
326	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 12-13
327	initiativeType	initType	Type of aggregation activities	M	1	Class	DS_InitiativeType

B.15.1 Dataset series information

328	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)	
329	DS_Platform	Plat	Vehicle or other support base that holds a sensor. EXAMPLE: satellite, airplane, weather station	M	1	Specified Class (DS_Series)	
330	DS_ProductionSeries	ProdSer	Datasets derived from the same production procedures	M	1	Specified Class (DS_Series)	
331	DS_Sensor	Sen	Device or piece of equipment which detects and records information	M	1	Specified Class (DS_Series)	

B.15.2 Other dataset association information

332	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 15
333	associationType	assocType	Justification for the correlation of two datasets	M	1	Class	DS_AssociationTypeCode
334	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 20
335	imageSpatialRepresentation	imgSpatRep	Relevant data about the image stereo mate	C / Type equals “image”?	N	**This was not defined in the UML diagrams**	**This was not defined in the UML diagrams**

B.16 Data quality information

The data dictionary for DataQuality information is documented in ISO 19113, Quality Principles.

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B.17 CodeLists and enumerations

B.17.1 CI_OnLineFunction <<CodeList>>

	Name	Domain code	Definition
1	CI_OnLineFunction		Function performed by the resource
2	access	001	Online instructions provide the information necessary to acquire data
3	additionalInformation	002	Online instructions provide more information about the data
4	download	003	Online instructions provide the ability to transfer data from one storage device or system to another
5	order	004	Online instructions provide the ability to acquire data
6	search	005	Online instructions provide the ability to seek out information about a dataset

B.17.2 CI_PresentationFormCode <<CodeList>>

	Name	Domain code	Definition
1	CI_PresentationFormCode		Mode in which the data is represented
2	document	001	Piece of written or printed matter that provides a record or evidence of events, an agreement, ownership, identification, etc..
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 three dimensions of geospatial data
6	profile	005	Vertical cross-section of geospatial data
7	rasterMap	006	Geospatial data that has been digitized into a form that can be displayed on a cathode ray tube or printed.
8	table	007	Set of geospatial facts or figures systematically displayed, especially in columns.
9	vectorMap	008	Term used to describe an electronic map display product, in vector form.
10	view	009	

B.17.3 CI_ResponsibilityCode <<CodeList>>

	Name	Domain code	Definition
1	CI_ResponsibilityCode		Function performed by the responsible party
2	contentProvider	001	Party that supplies the data
3	custodian/Steward	002	Guardian or keeper responsible for maintaining the data
4	owner	003	Person who owns the data

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	Name	Domain code	Definition
5	user	004	Person who uses the data
6	distributor	005	Person or organisation who 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 person 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.17.4 DS_AssociationTypeCode <<Codelist>>

	Name	Domain code	Definition
1	DS_AssociationTypeCode		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 a structured set of data held in a computer
5	source	004	Mapping and charting information from which the dataset ccontent originates
6	stereomate	005	Part of a set of imagery that when used together, provides three-dimensional images.
7	other	000	Association type different from the others listed in this class

B.17.5 DS_InitiativeType <<CodeList>>

	Name	Domain code	Definition
1	DS_InitiativeType		Type of aggregation activity
2	collection	001	Obtaining information in any manner, to include direct observation, liasion with offical agencies, or solicitation from offical, unofficiall, or public sources. The process of arranging for and obtaining existing data libraries.
3	mission	002	Sending out or being sent out with authority to perform a special service
4	study	003	Careful attention to, and critical examination and investigation of, any subject, event, etc.

B.17.6 EX_ExtentType <<CodeList>>

	Name	Domain code	Definition
1	EX_ExtentType		Identifies whether an extent type (geographic, temporal, or vetical extent) was included or excluded from the dataset

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	Name	Domain code	Definition
2	inclusion	001	Indicates that an extent type was included within the dataset
3	exclusion	002	Indicates that an extent type was not inlcuded within the dataset

B.17.7 MD_Category <<CodeList>>

	Name	Domain code	Definition
1	MD_Category		High-level geospatial data thematic classification to assist in the grouping and search of available geospatial datasets
2	Agriculture / Farming	001	agriculture (cultivation of crops, rearing or raising animals); herding; irrigation; aquaculture (cultivation or rearing of aquatic plants or animals); pests and diseases affecting crops and livestock; plantations
3	**Aquaculture / Fishery**	002	Cultivation or rearing of aquatic plants or animals, fishing areas, fishing limits
4	Biota	003	biology (living organisms); botany (physiology, structure, genetics, distribution of plants); zoology (animals, animal behaviour, physiology, structure, and distribution of fauna); pests and diseases affecting natural flora and fauna (see farming for pests and diseases affecting agricultural crops and livestock); wildlife (non-domesticated birds, insects, fish, animals, etc.); ecology (relation of organisms to one another and their physical environment) Biozones; Biomes
5	Cadastral and legal land descriptions	004	Cadastral boundaries; addresses, land restrictions/easements; land inventory; crime and justice;
6	Climatology / Meteorolgy / Atmosphere	005	processes and phenomena of the atmosphere (cloud cover, precipitation, temperature); changes in climate
7	Communications	006	postal service, telecommunications (including artificial satellite), telegraph, radio, television, telephone, computer networks (local area networks, wide area networks)

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	Name	Domain code	Definition
8	Economy	007	Historical, conditions, production, labour and revenue, unemployment, taxes; Econmic Activities: commerce (insurance, financial transactions, buying and selling on a large scale); industry; tourism; manufacturing (making of articles, including leather, tobacco, animal products, rubber, packaging); mining and metallurgy (exploration, extraction and processing of minerals); oil and gas (exploration, extraction and processing); forestry; hunting (other than for recreation); fishing; trade (including domestic and foreign trade); property valuation; business management boundaries (or sales territories)
9	Elevation and Derived Products	008	altitude (elevation, height above or below sea level);
10	Environment	009	protection (areas protected from industrial or domestic development to protect the flora, fauna and other resources, nature conservancy plans, environmental conseration); pollution (areas in which the environment has been contaminated or the sources of environmental contaminants); waste (unwanted of unusable remains or by-products, storage sites for waste); ecotourism; Environmental Impat Assessments; risks of veld/bush fires
11	Geoscientific information	010	geography (topography, toponomy); geomorphology (geophysical features of the surface of the earth including erosion and other processes); general geology (mineralogy, petrology, dynamic and structural geology, stratigraphic geology, palaeontology, composition, structure and origin of the earth's rocks, quarternary geology, glacial geology, engineering geology, hydrogeology); economic geology (ore, metals, industrial minerals, natural ston, gravel & crush, thermal energy); geophysics (properties and interactions of the earth's matter and energy, seismology, isostasy); soils; geochemistry (natural occurance of elements, ecogeochemistry); permafrost; geological processes (erosion, tectonics, depostion, metamorphism, volcanism, isostatic uplift/subsidence) palaeontology (paleobotany, paleobiology, paleozoology, paleoantopology, fossils); risks of earthquakes, volcanoes, sinkholes, landslides, avalanches

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	Name	Domain code	Definition
12	Health	011	disease; illness; factors affecting health; geomedicine; human ecology; hygiene; public safety; substance abuse; mental and physical health; health services and medicine
13	Imagery / Base maps / Earth cover	012	remotely sensed information such as ground cover R.g. scans of the earth by satellite, aerial photographs and imagery; topographic maps, aeronautical, topocadastral maps, hydrographic charts; land use (land cover, public lands, land tenure, urban and regional land use plans)
14	Infrastructure	013	transportation (roads, highways, streets, airports, airstrips, air routes, water transportation, shipping routes, railways, automotive transportation, stage lines, ferries, systems of conveyance, tunnels); mines (opencast, oil platforms, etc.); buildings and structues; factories navigational aids (beacons, lights, satellites) nautical aids
15	Inland waters	014	rivers, lakes, glaciers, continental icesheets, snow; ground water; water utilisation plans; movement of water in relation to land; floods; dams; pans; vleis; swamps; reservoirs; marshes; drainage regions; swimming pools
16	Military infrastructure	015	military bases and installations
17	Oceans	016	salt water bodies and their features (excluding inland waters); bathymetry, tides, currents, tidal waves, nautical aids
18	Planning	017	Regional or local use plans, local authority plans. Projecting.
19	Political boundaries	018	Political and administrative boundaries

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	Name	Domain code	Definition
20	Society	019	human settlements; development, structure and functioning of human society; anthropology (physical anthropology, ethnology, social and cultural anthropology); archaeology (human history and prehistory studied through excavation of sites and analysis of physical remains); education; traditional beliefs, manners and customs; language; population (demographic and census data); recreation (outdoor recreation, camping, hiking, wilderness experience parks and other locations for recreational activities (see economy for tourism); memorials; social impact assessments
21	Utilities	020	electricity, gas, sewage collection and disposal systems, saline water conversion systems, water purification and distribution); energy (hydrocarbons, wood, solar and nuclear energy, hydroelectrictiy, thermal energy); production and distribution (pipline routes)

B.17.8 MD_Classification <<CodeList>>

	Name	Domain code	Definition
1	MD_Classification		Name of the handling restrictions on the dataset
2	codeWord	001	Compartmentalised disclosure
3	confidential	002	Entrusted with information
4	secret	003	Kept or meant to be kept private, unknown, or hidden from all but a select group of people
5	topsecret	004	Of the highest secrecy
6	unclassified	005	Available for general disclosure
7	otherUserDefined	000	Classification other than those listed as a part of this class.

B.17.9 MD_GeometricObjectTypes <<CodeList>>

	Name	Domain code	Definition
1	MD_GeometricObjectTypes		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 the ir boundaries can be represented as a union of other primitives
3	composites	002	Connected set of curves, solids or surfaces.
4	curves	003	Bouncded, 1-dimensional geometric primitive, representing the continous image of a line
5	points	004	0-dimensional geometric primitive, representingj a positon but not having an extent

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	Name	Domain code	Definition
6	solids	005	Bounded, connected 3-dimensional geometric primitive, prepresenting 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.17.10 MD_ImagingConditionCode <<CodeList>>

	Name	Domain code	Definition
1	MD_ImagingConditionCode		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 eliptic (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.17.11 MD_KeywordType <<CodeList>>

	Name	Domain code	Definition
1	MD_KeywordType		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.17.12 MD_LengthUnit <<Enumeration>>

	Name	Domain code	Definition
1	MD_LengthUnit		Information about the image used to represent geographic information
2	arcMinute	001	One sixtieth of a degree
3	arcSecond	002	One sixtieth of an arcMinute
4	centimetre	003	Metric unit of length equal to one-hundredth of a metre

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	Name	Domain code	Definition
5	degree	004	Unit of measurement of angles subtended by one-three-hundred-and-sixtieth of the circumference of a circle.
6	internationalFoot	005	Unit of linear measure equal to 12 inches (30.48 centimetres)
7	internationalInch	006	Unit of linear measure equl to 1/12 of a foot (2.54 centrimetres)
8	internationalMile	007	Unit of linear measure equal to 1760 yards (approx. 1.609 kilometres)
9	kilometre	008	Metric unit of measure equal to 1,000 metres.
10	metre	009	Metric unit and the base SI unit of linear measure, equal to 100 centimetres. (about 39.4 inches)
11	millimetre	010	Metric unit of measure equal to one-thousandth of a metre.
12	nauticalMile	011	Unit of measure approximately equal to 2,025 yards (1,852 metres)

B.17.13 MD_MaintenanceFrequency <<CodeList>>

	Name	Domain code	Definition
1	MD_MaintenanceFrequency		Frequency with which modifications and deletations are made to the data after it is first produced
2	annually	001	Data is updated every year
3	asNeeded	002	Data is updated as deemed necessary
4	biannually	003	Data is updated twice each year
5	continual	004	Data is updated on a continuous basis
6	daily	005	Data is update each day
7	irregular	006	Data is updated in intervals that are uneven in duration
8	monthly	007	Data is updated each month
9	notPlanned	008	There are no plans to update the data
10	weekly	009	Data is updated on a weekly basis.
11	unknown	998	Frequency of maintenance for the data is not known.
12	otherMaintenancePeriod	000	Maintenance period is other than those defined in the MaintenanceFrequencyCode class.

B.17.14 MD_ProgressCode <<CodeList>>

	Name	Domain code	Definition
1	MD_ProgressCode		Status of the dataset or progress of a review
2	completed	001	Collection 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	inWork	007	Data is currently in the process of being created or updated.

B.17.15 MD_RasterCellType << Codelist>>

	Name	Domain code	Definition

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	Name	Domain code	Definition
1	MD_RasterCellType		Raster spatial objects used to locate zero-, two-, or three-dimensional locations in the dataset
2	matrixCoded	001	Particular format of spatial data which consists of a matrix of evenly spaced rows and columns of data points. The position within the rows and columns represents the geographic position, while the data point is the value of some spatial variable at that position.
3	matrixValues	002	Values of data which consists of a matrix of evenly spaced rows and columns of data points
4	pixelCodes	003	Data is captured in minute areas of uniform illumination of which an image on a display screen is composed.
5	pixelHSI	004	Hue Saturation Intensity
6	pixelHLS	005	Hue Luminance Saturation
7	pixelRGB	006	Red, Green, Blue
8	TekHVC	007	Hue-Value-Chroma (model Tektronic, DTP)

B.17.16 MD_Restrictions <<Codelist>>

	Name	Domain code	Definition
1	MD_Restrictions		Limitation(s) placed upon the access or use of the data
2	copyright	001	Exclusive right to the publication, prduction, or sale of the rights to a literary, dramatic, musical, or artistic work, or to the used 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
5	license	004	Formal permission to do something
6	intellectualPropertyRights	005	Non-tangible property that is a result of creativity.
7	otherRestrictions	000	Other limitations not covered

B.17.17 MD_Scope <<CodeList>>

	Name	Domain code	Definition
1	MD_Scope		Class of information to which the referencing entity applies
2	attribute	001	Information applies to the attribute class
3	featureAttribute	002	Information applies to the feature attribute class
4	collectionHardware	003	Information applies to the collection hardware class
5	collectionSession	004	Information applies to the collection session
6	dataset	005	Information applies to the dataset
7	series	006	Information applies to the series
8	nonGeographicDataset	007	Information applies to non-geographic data
9	dimensionGroup	008	Information applies to a dimension group
10	featureCollection	009	Information applies to a feature collection
11	feature	010	Information applies to a feature
12	featureType	011	Information applies to a feature type.

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	Name	Domain code	Definition
13	propertyType	012	Information applies to a property type
14	fieldSession	013	Information applies to a fiels session

B.17.18 MD_SpatialRepresentationType <<Enumeration>>

	Name	Domain code	Definition
1	MD_SpatialRepresentationType		Method used to represent geographic information in the dataset
2	matrix	001	Rectangular array of elements in rows and columns that is treated as a single entity.
3	raster	002	Pattern of scanning lines for a cathode ray tube picture.
4	text	003	Data in written form, especially as stored, processed, or displayed in a word processor.
5	vector	004	Quantity having direction as well as magnitude, especially as determining the position of one point in space relative to another.

B.17.19 MD_TopologyLevel <<Enumeration>>

	Name	Domain code	Definition
1	MD_TopologyLevel		Degree of complexity of the spatial relationships
2	fullTopology3D	001	Three dimensional toplogical complex whose geometric realisation is a subset of a plane
3	geometryOnly	002	Geometry objects only without any additional structure which describes topology
4	nonPlanarGraph1D	003	Topological complex with no restrictions on its realisation
5	planarGraph1D	004	One dimensional toplogical complex whose geometric realisation is a subset of a plane
6	planarGraph2D	005	Two dimensional toplogical complex whose geometric realisation is a subset of a plane

B.17.20 MD_TypeName <<CodeList>>

	Name	Domain code	Definition
1	MD_TypeName		Kind of value to be provided in the extended element

B.17.21 MD_UomLength <<CodeList>>

	Name	Domain code	Definition
1	MD_UomLength		Vertical units used for vertical extent information

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Annex C
(normative)

Metadata extensions and profiles

C.1 Background

Normative Annexes A, B and clause 6 of this standard provide standard metadata and an associated structure that will serve a wide variety of digital geospatial 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 subclause provides the rules for defining and applying additional metadata to better serve special user needs.

C.1.1 Types of extensions

The following types of extensions shall be allowed:

1) adding to the domain of an existing data element that has “free text” listed as a domain value

2) adding a new metadata element

3) adding a new metadata entity type

4) imposing a more stringent obligation on an existing metadata element

5) imposing a more restrictive domain on an existing metadata element

C.1.2 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, identifier, definition, obligation, condition, maximum occurrence, data type, and set of domain values shall be defined. Relationships as provided in Normative Annex B shall be defined so a structure and schema can be determined.

C.1.2.1 Rules for creating an extension:

6) Extended metadata elements shall not be used to change the name, definition or type of an existing element.

7) 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.

8) 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.)

9) 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.)

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10) 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.)

11) Coded domains shall use the convention that 7 or 97 = not applicable, 8 or 98 = unknown, and 9 or 99 = other.

12) An extension shall not permit anything not allowed by the standard. (If the standard metadata element has a domain of three values, without a free text value, the extension shall not allow the user to enter anything other than those three values.)

C.1.3 Community profile

If the information to be added is extensive, involving the creation of many metadata elements within a metadata entity type, specific to a discipline or application, co-ordination of the proposed extension via users 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 organisations 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. Standardising selected domains within a community is important to allow more efficient searches and better system control. See ISO 19106—Profiles for more information on community profiles.

C.1.3.1 Rules for creating a profile

13) Before creating a profile, the user shall check existing profiles.

14) A profile must adhere to the rules for defining an extension

15) A profile shall not change the name, definition, or data type of a metadata element.

16) A profile shall include:

- the basic, minimum set of metadata collected for a digital geospatial dataset (essential profile)
- 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

17) Relationships as provided in Annex A shall be defined so that a structure and schema can be determined.

18) A profile shall be made available to anyone receiving metadata that was created according to that profile.

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Annex D
(normative)

Abstract test suite

D.1 Abstract test suite

This abstract test suite applies to the essential and comprehensive profiles.

D.1.1 ISO 19115 Geographic Information – Metadata test suite

D.1.1.1 Test case identifier: Completeness test

m) 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.

n) 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 Normative Annex B are present. A comparison test shall also be performed to determine if all metadata elements defined as conditional in subclauses Normative Annex B are present if the conditions set out in this standard apply.

o) Reference: ISO 19115, Normative Annex B.

p) Test Type: Basic

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

D.1.1.2 Test case identifier: Maximum occurrence test

q) Test Purpose: to ensure each metadata element occurs no more than the number of times specified in the standard

r) 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 Normative Annex B.

s) Reference: ISO 19115, Normative Annex B.

t) Test Type: Basic

D.1.1.3 Test case identifier: Identifier test

u) Test Purpose: to determine if identifiers used in a subject metadata set fall within the domain specified within this standard. **(THIS SOUNDS LIKE A REWORDING OF THE DOMAIN TEST SUBCLAUSE. IS THIS REALLY NEEDED ANYMORE ?)**

v) Test Method: the identifier for each metadata element in a subject metadata set is examined to determine if it is defined in this standard.

w) Reference: ISO 19115, Normative Annex B.

x) Test Type: Basic

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D.1.1.4 Test case identifier: Data type test

y) Test Purpose: to determine if each metadata element within a subject metadata set uses the specified data type.

z) Test Method: the value of each provided metadata element is tested to ensure its data type adheres to the data type specified.

aa) Reference: ISO 19115, Normative Annex B.

bb) Test Type: Basic

D.1.1.5 Test case identifier: Domain test

cc) Test Purpose: to determine if each provided metadata element within a subject metadata set falls within the specified domain.

dd) Test Method: the values of each metadata element are tested to ensure they fall within the specified domain.

ee) Reference: ISO 19115, Normative Annex B.

ff) Test Type: Basic

D.1.1.6 Test case identifier: Schema test

gg) Test Purpose: to determine if a subject metadata set follows the schema specified in the standard.

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

ii) Reference: ISO 19115, Normative Annex B.

jj) Test Type: Basic

D.1.2 User-defined extension metadata test suite

D.1.2.1 Test case identifier: Exclusiveness test

kk) Test Purpose: to verify that each user-defined metadata section, metadata entity, and metadata element is unique and not already defined in the standard.

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

mm) Reference: ISO 19115, Normative Annex B.

nn) Test Type: Basic

D.1.2.2 Test case identifier: Definition test

oo) Test Purpose: to verify that user-defined metadata entities and metadata elements have been defined as specified in this standard.

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

qq) Reference: ISO 19115, Normative Annex B.

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rr) Test Type: Basic

D.1.2.3 Test case identifier: Standard metadata test

ss) Test Purpose: to verify that user-defined metadata within a subject metadata set fulfils the same requirements as ISO 19115 standard metadata.

tt) Test Method: all user-defined metadata in a subject metadata set is tested in accordance with Subclause 2.1.2 of this standard.

uu) Reference: ISO 19115, subclause 2.1.2.

vv) Test Type: Basic

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Annex E
(informative)

ISO 23950 standard cross reference

E.1 Metadata ISO 23950 cross reference

The table in this annex provides a cross reference to codes found in the ISO/DIS 23950, Information and documentation—Information retrieval (Z39.50)—Application service definition and protocol specification. This information is provided to facilitate the implementation of this metadata standard in other ISO standards. Entity and element names are listed in alphabetical order.

Name	ISO/DIS 23950 code
Abstract	62
Administrative area	2027
City	2026
Country	2029
Distribution format name	3608
Distribution identifier	2016
Distribution media	3632
East bounding longitude value	2039
Edition	3807
Electronic mail address	2030
Geographic extent - coordinates	2059
Geographic extent name	2042
Geographic extent name reference	2043
Issue identification	3808
Language of dataset code	4044
Language of metadata code	4042
Metadata date	1012
Maximum elevation value	4029
Minimum elevation value	4030
North bounding latitude value	2040
Postal address	2025
Postal code	2028
Process date/time	4106
Progress code	3108
Purpose	2003
Resolution level code	4115
Series name	5
Source description	4113
South bounding latitude value	2041
Spatial data representation information	3302
Title	4
Type of association code	4020
Use constraints	2005
User defined dataset association	4036
Voice telephone	2032
West bounding longitude value	2038

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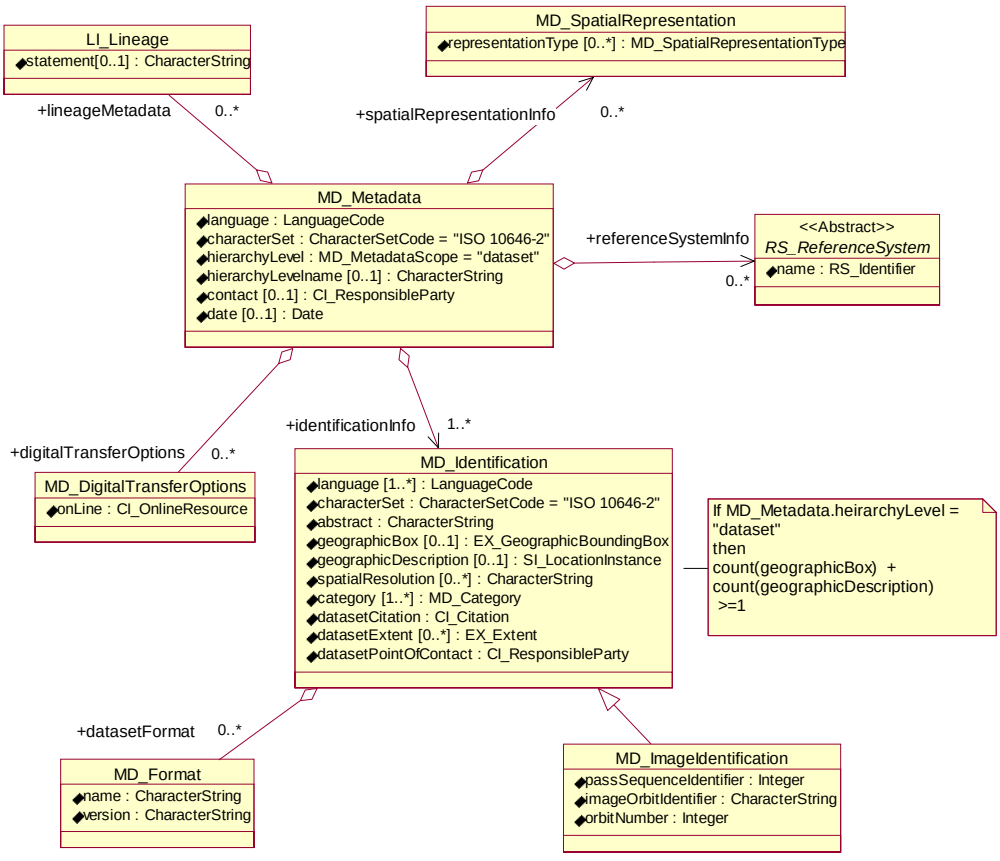
Annex F
(normative)

Essential metadata application profile

F.1Essential 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 Essential 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. This Essential Profile contains the minimum set of metadata necessary to document a dataset. It contains both mandatory and optional metadata. The mandatory metadata must be included to conform to this profile; the optional metadata is highly recommended to properly document geographic datasets. The Essential Profile is presented in a UML metadata application schema. The full definition of the metadata in this profile is found in the data dictionary in Annex B of this standard. All other profiles of metadata must be built upon this Essential Profile with the additional metadata selected from the data dictionaries in this standard, and other parts of this series of standards.



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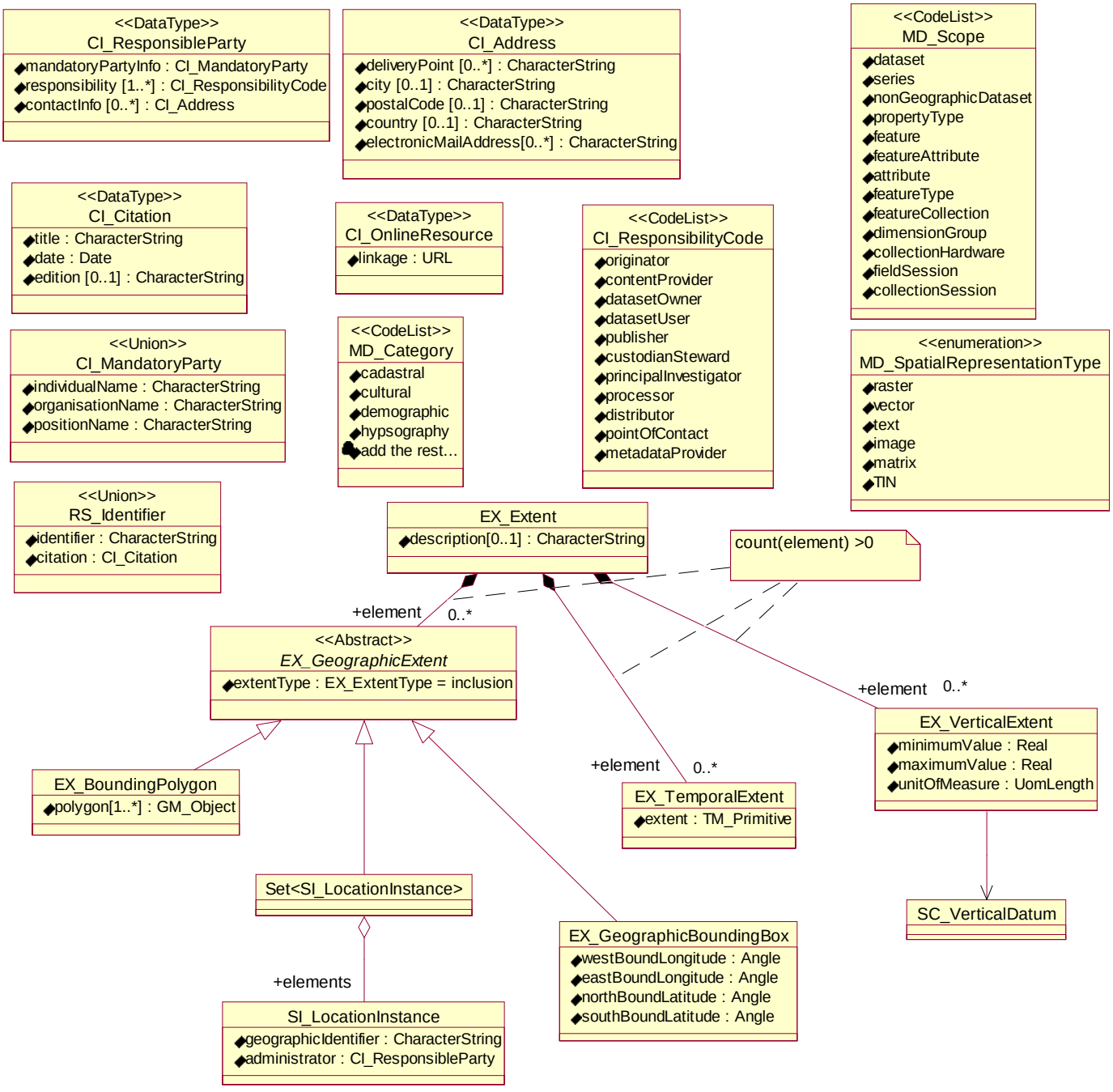
F.2Essential metadata application schema – Datatypes and Codelists



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F.3Essential metadata application schema – Element list

MD_Metadata
language: LanguageCode
characterSet: CharacterSetCode
hierarchyLevel: MD_Scope
hierarchyLevelName: CharacterString
contact: (optional)
CI_ResponsibleParty
mandantoryParty:
CI_MandantoryParty
organisationName: CharacterString
responsibility: CI_ResponsibilityCode
contactInfo: (optional)
CI_Contact
phone:
CI_Telephone
voice: CharacterString
facimile: CharacterString
address:
CI_Address
deliveryPoint: CharacterString
city: CharacterString
administrativeArea: CharacterString
postalCode: CharacterString
country: CharacterString
electronicMailAddress: CharacterString
onlineResource:
CI_OnlineResource
linkage: URL
date: Date (optional)
+ identificationInfo
MD_Identification
language: LanguageCode
characterSet: CharacterSetCode
abstract: CharacterString
geographicBox: (and/or geographicDescription)
EX_GeographicBoundingBox
westBoundLongitude: Angle
eastBoundLongitude: Angle
northBoundLatitude: Angle
soundBoundLatitude: Angle
geographicDescription: (and/or geographicBox)
SI_LocationInstance
geographicIdentifier: CharacterString
spatialResolution: (optional) CharacterString
category: MD_Category
datasetCitation:
CI_Citation
title: CharacterString
date: Date
edition: CharacterString
datasetExtent: (optional)
EX_Extent
description: CharacterString
+element (may sub-type as either EX_BoundingPolygon, EX_GeographicBoundingBox
or Set<SI_LocationInstance)
EX_BoundingPolygon
extentType: EX_ExtentType
polygon: GM_Object
+element

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```
                                    EX_GeographicBoundingBox
                        extentType:  EX_ExtentType
                        westBoundLongitude:  Angle
                        eastBoundLongitude:  Angle
                        northBoundLatitude:  Angle
                        soundBoundLatitude:  Angle
                    +element
                                    Set<SI_LocationInstance>
                        SI_LocationInstance
                        geographicIdentifier: CharacterString
                    +element
                        EX_TemporalExtent
                        extent:  TM_Primitive
                    +element
                        EX_VerticalExtent
                        minimumValue:  Real
                        maximumValue:  Real
                        unitOfMeasure:  UomLength
                        +verticalDatum
                            SC_VerticalDatum
            datasetPointOfContact:
                CI_ResponsibleParty
                            mandantoryParty:
                                    CI_MandantoryParty
                                    individualName:  CharacterString
                                    organisationName: CharacterString
                                    positionName:  CharacterString
                            responsibility:  CI_ResponsibilityCode
                            contactInfo: (optional)
                                    CI_Contact
                        phone:
                            CI_Telephone
                            voice:  CharacterString
                            facimile:  CharacterString
                        address:
                                            CI_Address
                            deliveryPoint:  CharacterString
                            city:  CharacterString
                            administrativeArea: CharacterString
                            postalCode:  CharacterString
                            country:  CharacterString
                            electronicMailAddress:  CharacterString
                        onlineResource:
                            CI_OnlineResource
                            linkage:  URL
+ referenceSystemInfo  (optional)
    RS_ReferenceSystem
    name:
        RS_Identifier (one element required, may use both)
        identifier:  CharacterString
        citation:
            CI_Citation
            title:  CharacterString
            date:  Date
            edition:  CharacterString
+ spatialRepresentationInfo  (optional)
    MD_SpatialRepresentation
    representationType:  MD_SpatialRepresentationType
+ lineageMetadata  (optional)
    LI_Lineage
    statement:  CharacterString
+digitalTransferOptions  (optional)
    MD_DigitalTransferOptions
```

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onLine:
CI_OnlineResource
linkage: URL
+datasetFormat (optional)
MD_Format
name: CharacterString
version: CharacterString

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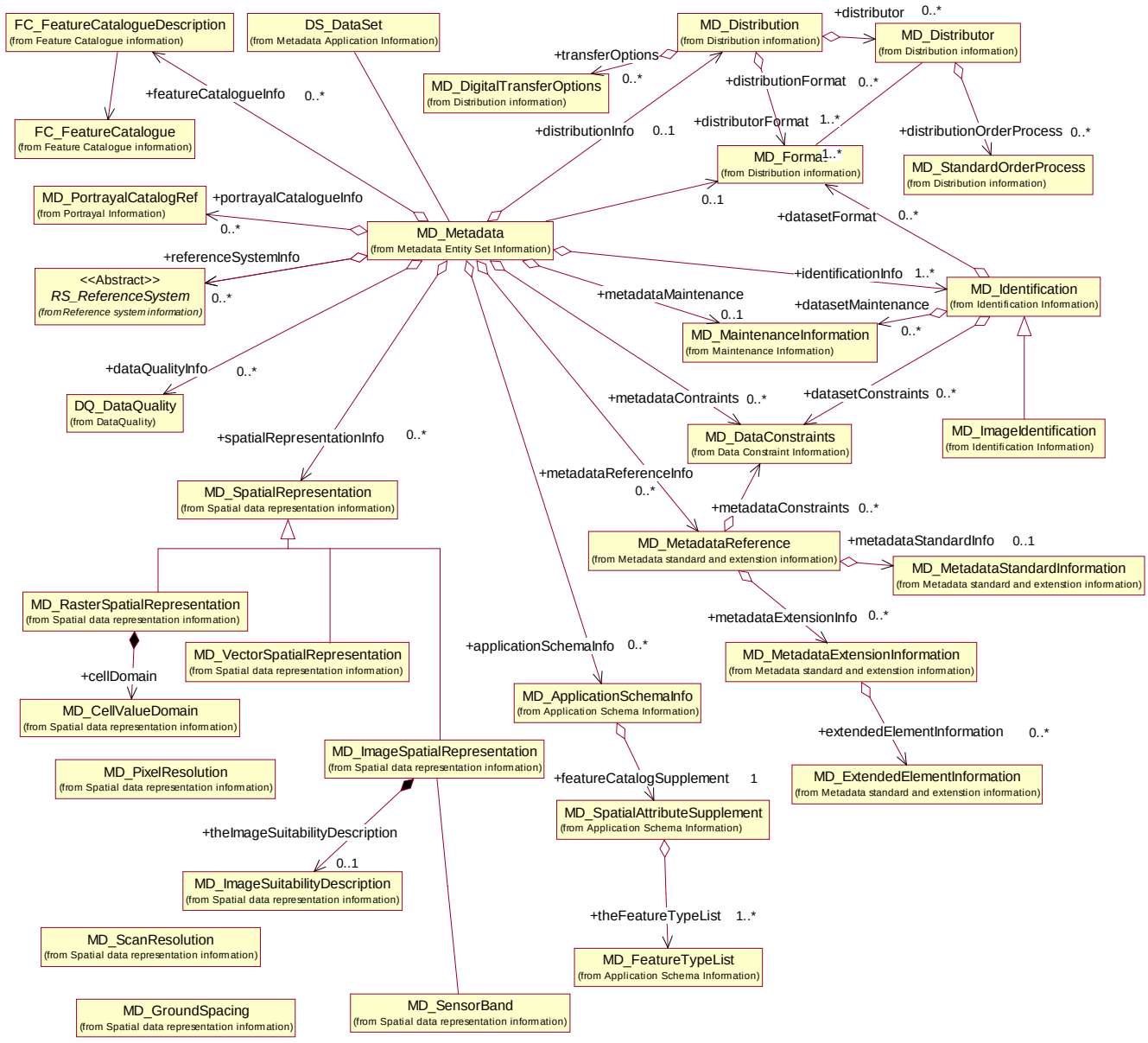
Annex G
(normative)

Comprehensive metadata application profile

G.1 Comprehensive metadata application schema

The Comprehensive Profile is comprised of the packages, classes, attributes, and relationships defined Annex A. 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 (except Data Quality) in order to simplify the diagram. Data Quality is fully defined in ISO 19113 using an abstract model. The data quality presented in this annex implements data quality in a metadata application schema. An XML DTD file may be developed directly from this model.



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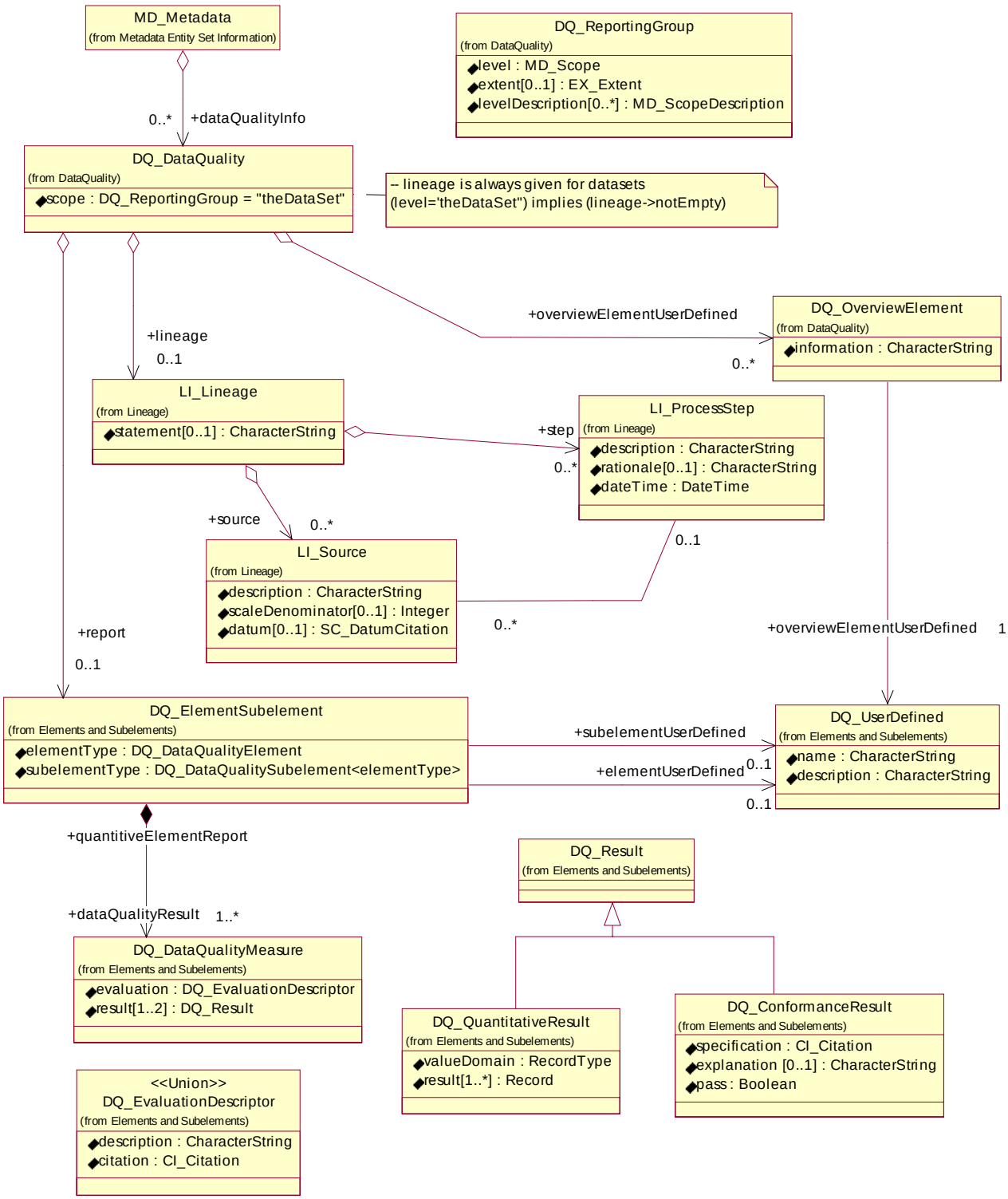
G.1.1 Comprehensive metadata application schema-Data Quality 1



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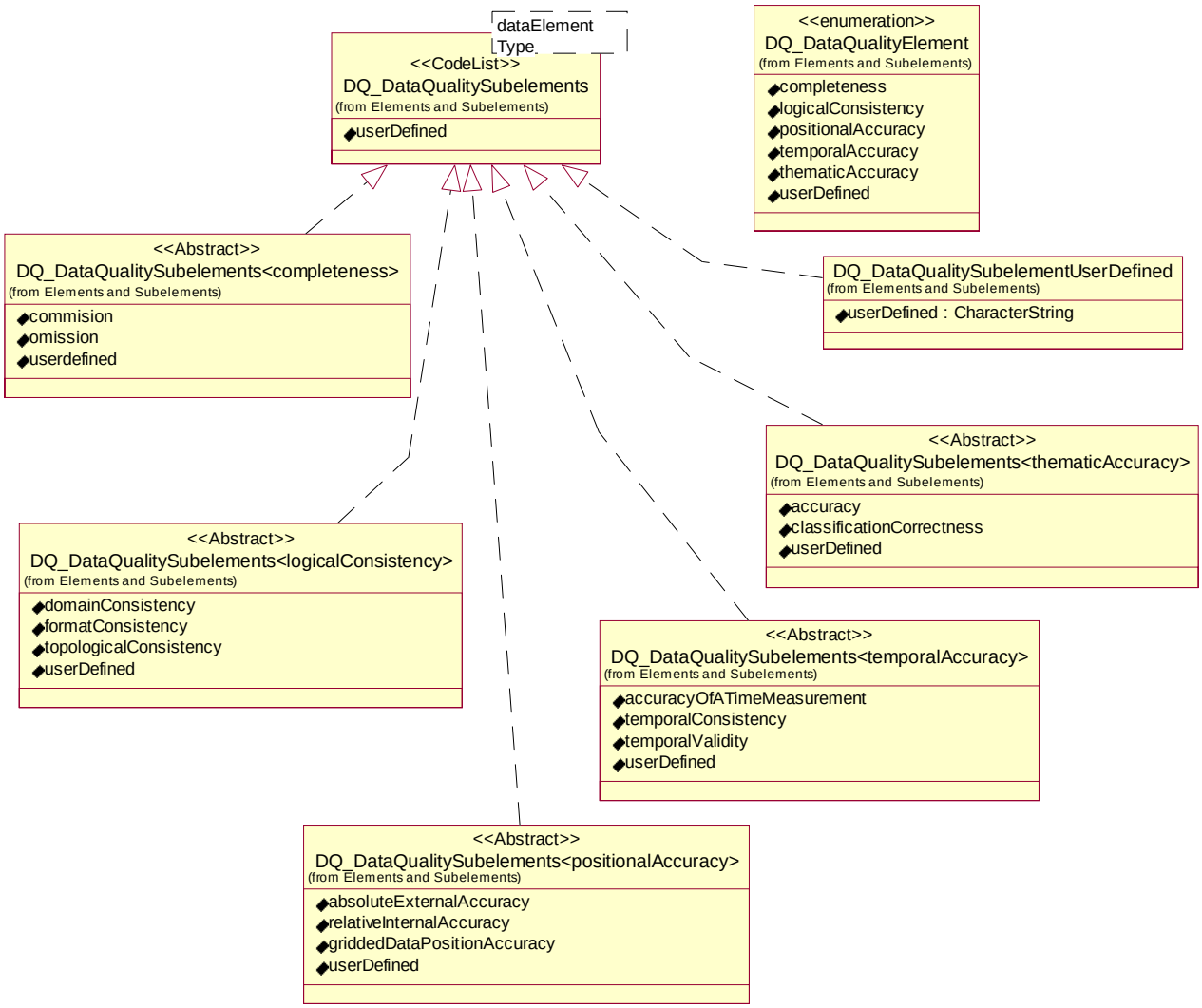
G.1.2 Comprehensive metadata application schema-Data Quality 2



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Annex H
(informative)

Metadata extension methodology

H.1 Metadata extensions methodology

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

H.1.1 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 elements described in Normative Annex B, should be conducted. This review should not only cover the metadata element name, but also the definition, data type, maximum number of characters allowed, obligation, domain, the maximum number of occurrences and the indexes. It is possible that a new element is not required as an existing element meets the requirements.

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

METHOD:

EITHER

I An existing metadata element or entity is identified as meeting the requirement. ACTION - Utilise the existing metadata element, no metadata extensions required.

OR

II 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 domain list AND the ISO domain includes the ‘free text’ option. ACTION - Go to Stage 2.

OR

III 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

OR

IV 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 4

OR

V A whole new section of metadata elements is needed to meet the new requirement. ACTION - Go to Stage 5.

OR

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VI 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. NB: The metadata obligations defined in the ISO 19115 standard cannot be relaxed in a profile. ACTION - Go to Stage 6.

OR

VII An existing metadata element meets the requirements, but the domain required by the profile is a sub-set of the ISO 15046 domain. ACTION - Go to Stage 7

H.1.2 Definition of new metadata domain element. (Stage 2)

An existing metadata element is suitable, given that the domain of the identified element is restricted. The new domain values should be defined with reference to the existing set of values. The restricted domain must be a logical restriction of the standard set of values.

If the proposed new elements do 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.

H.1.3 Definition of new metadata element. (Stage 3)

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 the 19115 standard.

METHOD:

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

6.2.1	Metadata Entity Set
6.2.2	Dataset Identification
6.2.3	Data Constraints
6.2.4	Maintenance
6.2.5	Spatial Representation
6.2.6	Reference System
6.2.7	Feature Catalogue Description
6.2.8	Portrayal Catalogue
6.2.9	Distribution
6.2.10	Metadata Reference
6.2.11	Application Schema
6.3	Extent
6.4	Citation and Responsible Party
6.5	Data Quality
6.5.1	Lineage

If no suitable grouping can be found then go to Stage 5

II Define the new metadata element in terms of a text definition, identifier, obligation, maximum number of occurrences, data type, and domain.

III Identify any excluded metadata relationships with the newly defined element. See Annex A for the ISO schema diagrams.

IV Utilise the new metadata element to meet the requirement.

V Go to Stage 8

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H.1.4 Definition of new metadata entity. (Stage 4)

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 the 19115 standard.

METHOD:

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

6.2.1	Metadata Entity Set
6.2.2	Dataset Identification
6.2.3	Data Constraints
6.2.4	Maintenance
6.2.5	Spatial Representation
6.2.6	Reference System
6.2.7	Feature Catalogue Description
6.2.8	Portrayal Catalogue
6.2.9	Distribution
6.2.10	Metadata Reference
6.2.11	Application Schema
6.3	Extent
6.4	Citation and Responsible Party
6.5	Data Quality
6.5.1	Lineage

If no suitable grouping can be found then go to Stage 5

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 (B.1.5), Condition (B.1.6), Maximum occcurence (B.1.7), Data type (B.1.8) and Domain (B.1.9). Data type is ‘Class’ for a metadata entity..

III Identify the elements that form the metadata entity, by following the steps outlined in stage 3.

IV Identify any excluded metadata relationships with the newly defined entity. See Normative Annex A for the UML metadata schema models..

V Utilise the new metadata entity to meet the requirement.

VI Go to Stage 8

H.1.5 Definition of new metadata characteristics section. (Stage 5)

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

METHOD:

I Identify the elements to define the new metadata section (class) in terms of Name (B.1.2), Domain code and Short Name (B.1.3), Definition (B.1.4), Obligation (B.1.5), Condition (B.1.6) and Maximum occcurence (B.1.7).). Data type is ‘Class’ for a metadata section.

II Go to Stage 4 to define the new metadata entities required to populate the section.

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III Go to Stage 8

H.1.6 Definition of more stringent metadata obligation. (Stage 6)

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 (B.1.5) and Condition (B.1.6) values 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 8

H.1.7 Definition of more stringent metadata domain set. (Stage 7)

An existing metadata element meets the requirement, but the profile requires that the domain defined for the element is a restricted sub-set of the standard domain defined in the ISO standard.

METHOD:

I Identify the restricted domain values needed to meet the new requirement.

II Go to Stage 8

H.1.8 Documentation of metadata extensions. (Stage 8)

Once new metadata 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 from the ISO 19115 metadata set.

Six possible types of extensions may be documented:

- Definition of new metadata characteristics section.
- Definition of new metadata entity.
- Definition of new metadata domain element to replace free text.
- Definition of a restricted metadata domain set.
- Definition of more stringent metadata domain set.
- 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 new metadata characteristics section defined:

> Using Annex B as a template, record the new metadata section description in terms of Name (B.1.2), Domain code and Short Name (B.1.3), Definition (B.1.4), Obligation (B.1.5), Condition (B.1.6), Maximum occcurence (B.1.7), Data type (B.1.8) and Domain (B.1.9).
>
> Create a UML schema for the new metadata section (class) based on those from Normative Annex A of ISO 19115.

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III IF new metadata entities defined:

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 (B.1.5), Condition (B.1.6), Maximum occcurence (B.1.7), Data type (B.1.8) and Domain (B.1.9).

Update the appropriate UML schemas in Normative Annex A.

IV IF new metadata elements defined:

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 (B.1.5), Condition (B.1.6), Maximum occcurence (B.1.7), Data type (B.1.8) and Domain (B.1.9).

Update the appropriate UML schemas in Normative Annex A.

V IF an existing metadata element domain expanded:

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.1.8) and Domain (B.1.9).

VI IF an existing metadata element domain restricted:

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.1.8) and Domain (B.1.9).

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

Using Annex B identify the metadata element and record the modified obligation characteristics in terms of Obligation (B.1.5) and Condition (B.1.6),

Update the appropriate UML schemas in Normative Annex A.

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Annex I
(informative)

Metadata implementation

I.1 Background

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 geographic metadata 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 geographic metadata.

I.1.1 Problem statement

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.

I.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 standardising the understanding of geographic metadata. The intent of this implementation annex is to provide guidance on the creation of a geographic metadata service (Clearinghouse) on a local or wide-area network.

I.1.2.1 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 organisation. 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 geographic metadata 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:

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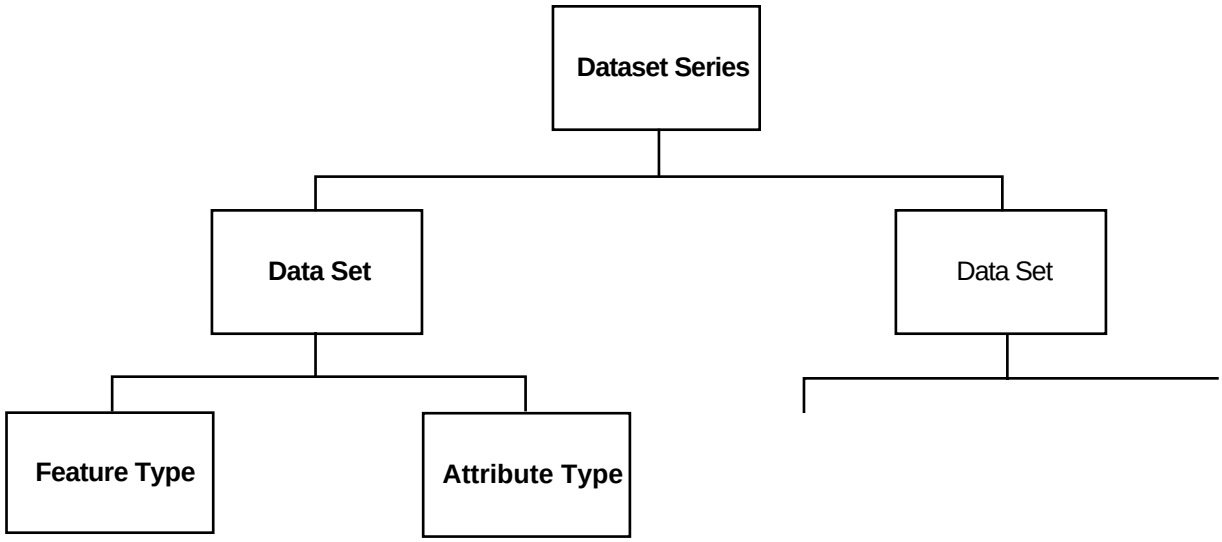

Figure I.1 — Metadata hierarchy

Considering each of the metadata hierarchy levels in turn:

I.1.2.1.1 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 characterisation of available spatial data, but may not be adequate for detailed assessment of data quality of specific datasets.

I.1.2.1.2 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.

I.1.2.1.3 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

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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.

I.1.2.1.4 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 I.1.2.1.2. Examples of feature instance metadata entries may include:

— The Sydney harbour bridge.

— The Golden Gate bridge, in San Francisco.

I.1.2.1.5 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 I.1.2.1.2. Examples of attribute type metadata entries may include:

— Overhead clearances associated with bridges.

I.1.2.1.6 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 I.1.2.1.2. Examples of attribute instance metadata entries may include:

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

I.1.3 Geographic data service attributes

Where a server supplies multiple levels of metadata, a set of additional non-repeating attributes should be managed at the metadata entry level. These optional elements include:

- Metadata Entry Level — the level of abstraction used to describe the generality of the entry. The list of values for this attribute includes:
  - Data Series
  - Dataset (default)
  - Feature type
  - Attribute type
- Metadata Identifier — the numeric identifier of the current metadata entry that will be equivalent to the Metadata Series Object Identifier, Metadata Dataset Object Identifier, or the Metadata Feature Object Identifier in order to provide a unique key for retrieval.

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— Metadata Series Object Identifier — The numeric identifier of the Data Series entry, unique to this server. Number used as an internal key to relate data series to datasets.

— Metadata Dataset Object Identifier — The numeric identifier of the Dataset entry, unique to this server. Number used as an internal key to relate datasets to features and data series. A dataset object may reference zero or one metadata series object identifier.

— Metadata Feature Object Identifier — The numeric identifier of a Feature metadata entry, unique to this server. Number used as an internal key to relate features to datasets. A feature object must reference only one dataset object identifier.

These elements are to be used as internal keys used by client and server software and should not be displayed to the user except to generate links between metadata information objects. This model of inheritance does not support "multiple inheritance" (e.g., a feature can belong to only one dataset and a dataset can belong to only one data series). More elaborate internal methods may be devised to navigate metadata exhibiting multiple inheritance.

I.2 Methods overview

To provide for the management and sharing of metadata, any software system must provide methods for the input and output of geographic metadata and for query and presentation. This premise is equally valid for a small collection of digital geographic–metadata entries managed as structured text files or for large collections of metadata entries encoded in a distributed database management system. This subclause specifies the basic requirements for metadata encoding and accesses.

I.2.1 General metadata management model

Metadata may be implemented and stored using a variety of methods that are dictated by the practices, existing systems, and requirements of a given organisation. A generalised logical model of metadata, with an emphasis on basic functionality is shown in Figure H.2. This design does not assume any particular implementation of metadata and applies equally well to a single user preparing and browsing text files on a personal computer and to multiple users accessing linked spatial data and metadata in a geographic information system linked to a query server on a network.

Metadata is stored and managed within the central square shown in the figure, with optional links to spatial data and related attributes. The connection between the metadata and the actual spatial data is shown as optional in this diagram, as some on-line systems only reference off-line spatial data and serve ordering instructions to client software. The management of spatial data, its attributes, and publicly accessible metadata may optionally be done within one integrated system to promote the synchronisation of the metadata and the data contents, particularly important in dynamic data collections. The boundary between the metadata and data compartments is intentionally drawn as fuzzy to denote the difficulty in defining the division between metadata and data. Where metadata and spatial data elements need to be synchronised, an arrow shows that linkages and triggers should be supported to propagate the values reported in metadata.

Around the spatial data and metadata collection box are arrayed a series of basic functions that can be performed against the collection. The collection is wrapped by a shaded region labelled as "application interface". This interface is where programs may be written (or accessed if they already exist) to service specific functions against the data and metadata collection. For implementations that utilise a robust data management system, services for these functions should already exist.

Specific functions that can be performed against metadata (and spatial data) stored in the collection are shown by name spanning the L-shaped grey region outside the application interface. This grey region marks the location of the communications interface -- a capability that enables access to the collection by users or clients on an individual computer or across a network. Required functions are shown in solid boxes, whereas optional functions are shown in dashed boxes, given that spatial data service is an optional feature of metadata service. Arrows are shown to denote the flow of information in and out of the collection. These functions are grouped into general function categories listed on the outside of the diagram.

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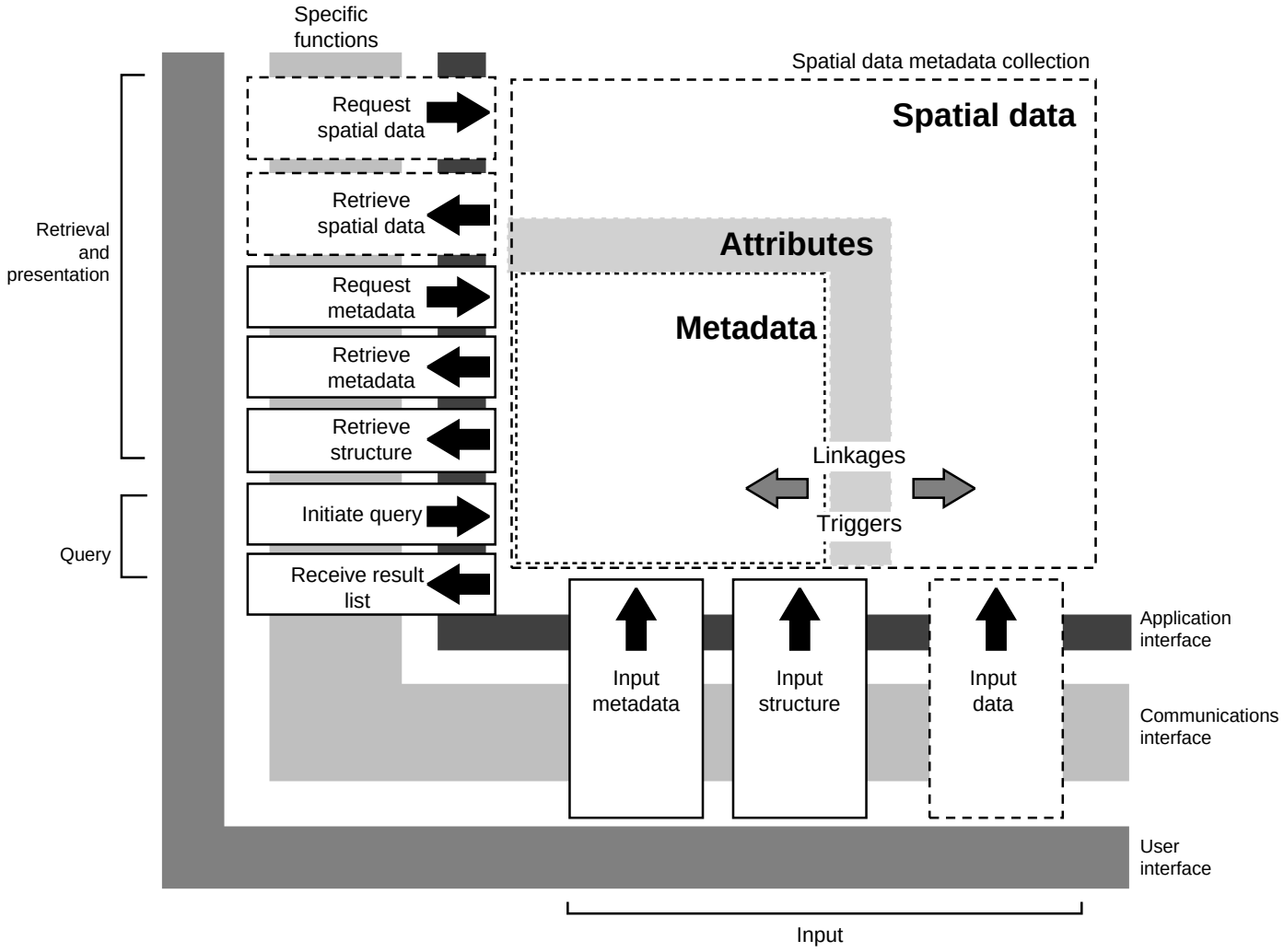

Figure I.2 — Generalised logical model of metadata

The user interface is shown as an outer, shaded "L" to mark the location of internal or external users and their client software used to access the information stored in the collection. For the purposes of this specification, this interface layer denotes a functional or programmatic interface to the information that can be used by client software and does not specify the look or feel of a graphical user interface.

I.2.1.1 Metadata storage

As depicted in the generalised logical model, the storage and management of geographic metadata are not specified. Two forms of implementations could be used for the storage and management of digital geographic metadata. These two forms of implementation are:

- A flat-file metadata system is one in which the metadata are entered as fielded and potentially repeating elements within a structured text file. Such systems include full-text and fielded text document indexing software.

- A database metadata system is one in which the metadata are stored within a self-contained database management system and the metadata entries are only accessible via database methods. Such systems include relational, hierarchical, and object-oriented database management software.

Additional implementations or variations may be developed to integrate and serve metadata from existing spatial data systems. Although the storage method itself is not defined by the standard, any storage and internal encoding method must support the dependencies and structure specified by the standard.

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I.2.1.2 Metadata structure and encoding

Regardless of implementation, the metadata elements, as described in the UML models of Normative Annex A and the Metadata data dictionary of Normative Annex B, must be managed in such a way as to preserve the hierarchical or dependent relationships defined by this standard to preserve the context of the information. Such metadata structure is required to correctly formulate complex queries against elements within repeating groups of metadata and to generate properly formatted metadata reports for display. Metadata may be encoded internally using any relevant data structure that supports these formal metadata element relationships.

For the purpose of data transfer and presentation, metadata software will support the input and output of metadata entries using Standard Generalised Markup Language (SGML), as defined by the International Standards Organisation (ISO 8879:1985). Each metadata entry will be encoded as an SGML document entity, as in definition 4.283 of ISO 8879:1985:

> SGML document entity: The SGML entity that begins with an SGML document. It contains, at a minimum, an SGML declaration, a base Document Type Definition (DTD) and the start and end (if not all) of a base document element.

I.2.1.3 Linkages between metadata and spatial data

Implementation of the metadata standard does not require the active management of spatial data and related, accessible metadata, although it should be encouraged. Metadata elements should reflect the current state of the spatial data they describe. Relatively static spatial data collections may be described by static, user-edited metadata, provided that the metadata is updated as the data changes. The relation of spatial data to metadata may be one of the following:

— Spatial data are off-line. Metadata entries are made using written and derived information for the off-line information. Off-line data is often large or is managed on external systems or media. No direct linkages between the off-line data and on-line metadata are possible.

— Spatial data are on-line and local to the metadata server. Metadata will be derived from managed characteristics of the spatial data and from producer-developed metadata elements. Changes to spatial data will be reflected in the public metadata through scheduled or dynamic reference procedures.

— Spatial data are on-line but remote from the metadata server. Metadata will be input locally or forwarded as complete entries from or with consent of the originating organisation. Linkages to the data may be made through the "Distribution on-line resource" metadata entity (Distribution Information) as Uniform Resource Locators (URL) to provide direct access to remotely held data on the network. Changes to public metadata will be made periodically as changes to remote data are made, requiring agreement between the provider and metadata service.

I.3 Functional overview

The specific functions required for interaction with metadata fall in the four general categories: input, query, retrieval and presentation. This annex provides specifications to enable systematic support for these functions.

I.3.1 Input functions

This subclause describes the general requirements for the input of information to a spatial data and metadata collection. Input is the entry of persistent and retrievable information into the collection and does not include processing of queries or submission of requests of the collection.

I.3.1.1 Input structure

This function allows for the detailed description of a schema to be created in the database into which metadata will be loaded. The definition of this schema may be specified in any internal data description language used by the metadata software system.

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To permit the decoding of documents managed by this system by client software, a document type definition (DTD) will be created for the system that reflects the union of the contents of the metadata entries that are available for query and delivery.

I.3.1.2 Input metadata

Metadata may be entered using any available method including, but not limited to, text editors, templates for word processing programs, standalone metadata entry software, batch upload of metadata, or database forms interfaces. The entry of geographic metadata will support the inherent structure and dependency of the metadata as described in the Metadata UML schema (Normative Annex A) and as reflected in the server-specific DTD referenced in Subclause I.3.1.1.

I.3.1.3 Input spatial data (optional)

Software supporting the loading of spatial data to a spatial data and metadata collection should ensure that metadata elements are linked to or are derived from the spatial data being entered. The loading of spatial data from encoding formats that include metadata should ensure that the values of these transferred metadata elements are preserved. This provides for life-cycle management of spatial data and related metadata.

I.3.1.4 Reference standards for input

For the purpose of loading a remotely prepared metadata entry, software will support the encoding and decoding of an ASCII metadata text file as an ISO 8879:1985 SGML document entity as described in the DTD.

I.3.2 Query functions

Query functions support the submission of a detailed metadata element specific question about available spatial data. These services may run on a local computer, but to provide wide-area access, the support of metadata query will be provided across a wide-area network.

I.3.2.1 Initiate query

This function establishes a connection between a client process and a server process and negotiates supported attributes and operators that can be used to build queries. A query string will be passed from the client to the server using numbered attributes and operators in Reverse Polish Notation Form as specified in ISO 10163:1995. Collection of query information on the client side may be done using a variety of available tools including forms written in HyperText Markup Language (HTML), a subset of ISO 8879:1985 (SGML).

I.3.2.2 Receive result list

After receiving a query from a client, the server will translate the components of the query into the local query or access language used by the spatial data and metadata collection management software. An essential set of metadata is defined in Annex F of this standard and is expected to be made available for query by all servers supporting this implementation profile. The server will return a list of metadata entries to the client to include, at a minimum, the following attributes as "headlines" for each found record: Metadata_Identifier, Title, East_Bounding_Coordinate, West_Bounding_Coordinate, North_Bounding_Coordinate, South_Bounding_Coordinate. The Title element will be presented as the name of the entry, whereas the coordinates are to be made available to the client for optional visualisation of dataset extent. The Metadata_Identifier is a key defined by the service to provide for the unambiguous retrieval of a full metadata record at a later time and should not be presented to the client except as a hidden key for retrieval.

I.3.2.3 Reference standards for query

Query applications running across local or wide-area networks will operate using the following standard transport protocols: Transport Communications Protocol/Internet Protocol (TCP/IP) or Open Standards Interconnection (OSI) protocol.

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Search and retrieval of references to metadata entries will be performed using Search/Retrieve ISO 10163:1995 with reference to the Geospatial Metadata Application Profile (GEO).

I.3.3 Retrieval and presentation functions

These functions specify the methods by which one requests specific metadata, structure file, or spatial dataset from a server process.

I.3.3.1 Request metadata

This function allows a client process to request metadata by unique Metadata Identifier. The request information may also include the preferred record syntax, language for tags, and preferred presentation format style where such style sheets are provided by the server. This function will cause the server to request the assembly or retrieval of metadata from the metadata/data collection management system.

I.3.3.2 Retrieve metadata

Once the metadata records have been assembled the metadata will be encoded using ISO 8879:1985. The ISO 10163:1995 supported record syntax Generic Record Syntax (GRS-l) will be used to encapsulate the metadata written in SGML, the Document Type Definition describing the data contents, and the style sheet, if available, to specify presentation. The encapsulated metadata will be returned to the client application for use. Metadata requested using other conventions, such as Machine Readable Cataloguing (MARC) or Simple Unstructured Text Record Syntax's (SUTRS), will encode the elements using a formal structure or name-tagged and indented format.

I.3.3.3 Retrieve structure

The logical structure of the metadata stored within the collection is defined by the Document Type Definition (DTD) of Annex K with modifications to reflect the actual metadata served. This DTD will be available for request by client software. In addition, the Explain functionality of the ISO 10163:1995 protocol can be used to discover the schema and operators available from a given service.

Presentation structure, in the form of a DSSSL style sheet (See Subclause I.3.4), will also be made available from a server to provide standardised presentations of the metadata. Within a user community, common style sheets may be shared to encourage common or preferred views of the metadata.

I.3.3.4 Request spatial data (optional)

Through links specified in the entity "Distribution on-line resource" in the format of a Uniform Resource Locator, spatial data may be requested from the server. This initiates a process to assemble or make available the requested data. The request may include special qualifications as supported by the server to clip a required dataset, select a retrieval format, service protocol, or otherwise specify a subset of the spatial data described by the metadata.

Where spatial data does not exist or is not made available for network download, an order form or referral document will be sent to the client detailing the order parameters.

I.3.3.5 Retrieve spatial data (optional)

Once requested, the server will make available the digital spatial data requested. This task may be dynamic, automatically returning the spatial data to the client or it may initiate a delayed delivery of the spatial data via electronic means or by alternate media.

I.3.3.6 Reference standards for retrieval

The ISO 8879:1985 protocol will be used in the definition of metadata structure for retrieval.

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I.3.4 Presentation of metadata entries

The Standard Generalised Markup Language, ISO 8879:1985, provides for the structured markup of documents. Metadata entries can be readily distributed using the markup language, and with a reference DTD, the structured format of the data is known. The presentation standard for taking information marked up in SGML and displaying the contents consistently is known as Document Style Semantics and Specification Language (DSSSL). An international standard, DSSSL (ISO/IEC 10179:1995) was written to specify a general-purpose document style sheet syntax in a platform-neutral and vendor-neutral manner. DSSSL can be used with any document format for which a property set can be defined according to the Property Set Definition Requirements of ISO/IEC 10744. In particular, it can be used to specify the presentation of documents marked up using SGML.

A profile of DSSSL, known as DSSSL On-line Application Profile (DSSSL-O), is in draft status and is intended to specify a subset of DSSSL with specific support for the on-line presentation of information.

For the purpose of display, geographic metadata clients will support extensions to read and format SGML documents using DSSSL or equivalent style sheets.

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Annex J
(informative)

Hierarchical levels of metadata

J.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.

J.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
   Dataset Identification
   Data Constraints
   Maintenance
   Spatial Representation
   Reference System
   Feature Catalogue Description
   Portrayal Catalogue
   Distribution
   Metadata Extension
   Application Schema
   Extent
   Citation and Responsible Party
   Data Quality
   Lineage

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

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Metadata Entity Set
Dataset Identification
Data Constraints
Maintenance
Spatial Representation
Reference System
Feature Catalogue Description
Portrayal Catalogue
Distribution
Metadata Extension
Application Schema
Extent
Citation and Responsible Party
Data Quality
Lineage

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
Dataset Identification
Data Constraints
Maintenance
Spatial Representation
Reference System
Feature Catalogue Description
Portrayal Catalogue
Distribution
Metadata Extension
Application Schema
Extent
Citation and Responsible Party
Data Quality
Lineage

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 meter. 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.

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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
Dataset Identification
Data Constraints
Maintenance
Spatial Representation
Reference System
Feature Catalogue Description
Portrayal Catalogue
Distribution
Metadata Extension
Application Schema
Extent
Citation and Responsible Party
Data Quality
Lineage

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

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Metadata Entity Set
Dataset Identification
Data Constraints
Maintenance
Spatial Representation
Reference System
Feature Catalogue Description
Portrayal Catalogue
Distribution
Metadata Extension
Application Schema
Extent
Citation and Responsible Party
Data Quality
Lineage

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

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Metadata Entity Set
Dataset Identification
Data Constraints
Maintenance
Spatial Representation
Reference System
Feature Catalogue Description
Portrayal Catalogue
Distribution
Metadata Extension
Application Schema
Extent
Citation and Responsible Party
Data Quality
Lineage

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

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Annex K
(informative)

Implementation examples

K.1 Example 1 — Metadata for a vector dataset - essential profile

MD_Metadata
language: en
characterSet: ISO 10646-2
hierarchyLevel: dataset
+identificationInfo
MD_Identification
language: en
characterSet:: ISO 10646-2
abstract: 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's) 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 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.
geographicBox:
EX_GeographicBoundingBox
extentType: inclusion
westBoundLongitude: -180.0
eastBoundLongitude: 180.0
northBoundLatitude: 90.0
southBoundLatitude: -90.0
spatialResolution: 1,000,000
category: **MD_Category (haven't finalized this list yet)**
datasetCitation:
CI_Citation
title: Digital Chart of the World
date: 199208
edition: 1
datasetPointOfContact:
CI_Responsibility
mandantoryParty:
CI_MandantoryParty
organisationName: National Imagery and Mapping Agency
responsibility: 010 (pointOfContact)
contactInfo:
CI_Contact
phone:
CI_Telephone
voice: 1-301-XXX-XXXX
facimile: 1-301-XXX-XXXX
address:
CI_Address
deliveryPoint: 4600 Sangamore Road
city: Bethesda

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administrativeArea: Maryland
postalCode: 20816-5003
country: US
onlineResource:
CI_OnlineResource
linkage: http://www.nima.mil
+ referenceSystemInfo
RS_ReferenceSystem
name:
RS_Identifier
identifier: WGS 84
+ spatialRepresentationInfo
MD_SpatialRepresentation
representationType: 002 (vector)
+ lineageMetadata
LI_Lineage
statement:: The DCW was compiled from the following sources: the entire series of Operational Navigational Charts (primary source), Joint Navigation Charts (geographic features - Antarctica), AVHRR imagery (Vegetation), and NIMA Digital Flight Information File (airport information)
+digitalTransferOptions
MD_DigitalTransferOptions
onLine:
CI_OnlineResource
linkage: http://www.nima.mil
+datasetFormat
MD_Format
name: VPF
version: 1.0

K.2 Example 2—Metadata for a vector dataset - comprehensive profile

MD_Metadata
fileIdentifier: 19115-Case2
language: en
characterSet: ISO 10646-2
heirarchyLevel: dataset
contact:
CI_ResponsibileParty
mandantoryPartyInfo:
CI_MandantoryParty
organisationName: National Imagery and Mapping Agency
contactInfo:
CI_Contact
address:
CI_Address
deliveryPoint: 4600 Sangamore Road
city: Bethesda
administrativeArea: Maryland
postalCode: 20816-5003
country: US
onlineResource:
CI_OnlineResource
linkage: http://www.nima.mil
responsibility: 010 (pointOfContact)
metadataStandardName: ISO 19115
metadataStandardVersion: CD 2.0
date: 19991102
+identificationInfo
MD_Identification
language: en
characterSet: ISO 10646-2
abstract: The Digital Chart of the World is a comprehensive 1:1,000,000 scale vector basemap of

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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.

purpose: The Digital Chart of the World is a general purpose global database designed to support Geographic Information Systems applications.

status: 001 (completed)

spatialResolution: 1,000,000

category: 013 (Base map)

datasetCitation:

CI_Citation

title: Digital Chart of the World

alternateTitle: DCW

date: 199208

dateType: publication date

citedResponsibleParty:

CI_ResponsibleParty

mandatoryPartyInfo:

CI_MandatoryParty

organisationName: Defense Mapping Agency

contactInfo:

CI_Contact

address:

CI_Address

deliveryPoint: 8613 Lee Highway

city: Fairfax

administrativeArea: Virginia

postalCode: 22031

country: US

responsibility: 001 (originator)

citedResponsibleParty(2):

CI_ResponsibleParty

mandatoryPartyInfo

CI_ MandatoryParty

organisationName: National Imagery and Mapping Agency

contactInfo:

CI_Contact

address:

CI_Address

deliveryPoint: 4600 Sangamore Road

city: Bethesda

adminstrativeArea: Maryland

postalCode: 20816-5003

country: US

onlineResource:

CI_OnlineResource

linkage: http://www.nima.mil

responsibility: 003 (datasetOwner)

presentationForm: 008 (vectorMap)

datasetExtent:

EX_Extent

+element

EX_GeographicBoundingBox

westBoundLongitude: -180.0

eastBoundLongitude: 180.0

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northBoundLongitude: 90.0
southBoundLongitude: -90.0
+element
EX_TemporalExtent
extent: 199208
datasetPointOfContact:
CI_ResponsibleParty
mandantoryPartyInfo:
organisationName: National Imagery and Mapping Agency
contactInfo:
CI_Contact
address:
CI_Address
deliveryPoint: 4600 Sangamore Road
city: Bethesda
administrativeArea: Maryland
postalCode: 20816-5003
country: US
onlineResource:
CI_OnlineResource
linkage: http://www.nima.mil
responsibility: 010 (pointOfContact)
+datasetConstraints
MD_SecurityInformation
classification: 001 (unclassified)
classificationSystem: United States Department of Defense
useLimitation: Not to be used for navigation.
+datasetMaintenance
MD_MaintenanceInformation
maintenanceAndUpdateFrequency: 005 (biannual)
+keyword (1)
MD_Keywords
keyword: roads, railroads, rivers, lakes, streams, utility networks, airports, elevation contours, coastlines, international boundaries, populated places, geographic names
type: 005 (theme)
+keyword (2)
MD_Keywords
keyword: DCW, Global digital database, global coverage, world coverage
type: 002 (place)
+referenceSystemInfo (1)
SC_CompoundCRS
name:
RS_Identifier
identifier: WGS 84
citation:
CI_Citation
title: NATO STANAG 2211, edition 5
date: 1998
citedResponsibleParty:
CI_ResponsibleParty
mandatoryPartyInfo:
CI_MandatoryParty
organisationName: NATO
kindCode: 002 (compound)
+featureCatalogueInfo
FC_FeatureCatalogueDescription
complianceCode: 1
languageCode: en
includedWithDataset: 1
featureCatalogueCitation:
CI_Citation
title: Military Specification-Digital Chart of the World

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alternateTitle: MIL-D-89009
date: 1992
citedResponsibleParty:
CI_ResponsibleParty
mandatoryPartyInfo:
CI_MandatoryParty
organisationName: US Department of Defense, Defense Printing Service Detachment Office
contactInfo:
CI_Contact
address:
CI_Address
city: Philadelphia
country: US
responsibility: 001 (originator)

+distributionInfo
MD_Distribution
+distributor (1)
MD_Distributor
distributorContact:
CI_ResponsibleParty
mandatoryPartyInfo:
CI_MandatoryParty
organisationName: National Imagery and Mapping Agency
contactInfo:
CI_Contact
address:
CI_Address
deliveryPoint: 4600 Sangamore Road
city: Bethesda
administrativeArea: Maryland
postalCode: 20816-5003
country: US
responsibility: 009 (distributor)
+distributionOrderProcess
MD_StandardOrderProcess
orderInstructions: US DoD customers only.
+distributorFormat
MD_Format
name: Vector Product Format
version: 19920413
specification: MIL-D-89009
+transferOptions(1)
MD_DigitalTransferOptions
+offLine
MD_Medium
name: CD-ROM
volumes: 4
mediaFormat: ISO 9660
+distributor (2)
MD_Distributor
distributorContact:
CI_ResponsibleParty
mandatoryPartyInfo:
CI_MandatoryParty
organisationName: USGS Open File Section
contactInfo:
CI_Contact
address:
CI_Address
city: Denver
adminstrativeArea: Colorado
Country: US

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+distributionOrderProcess
MD_StandardOrderProcess
fees: $200
orderingInstructions: Payment (check, money order, purchase order, or Government account) must accompany order. Make all drafts payable to Dept. of the Interior - US Geological Survey.
+distributorFormat
MD_Format
name: Vector Product Format
version: 19920413
specification: MIL-D-89009
+transferOptions (2)
MD_DigitalTransferOptions
+offline
MD_Medium
name: CD-ROM
volumes: 4
mediaFormat: ISO 9660
+spatialRepresentationInfo
MD_VectorSpatialRepresentation
representationType: 002 (vector)
geometricObjectType (1): 001 (points)
geometricObjectType (2): 002 (curves)
geometricObjectType (3): 003 (surfaces)
topologyLevel: 004 (fullPlanarGraph)
+dataQualityInfo
DQ_DataQuality
scope: dataset
+report(1)
DQ_ElementSubelement
elementType: 005 (thematic accuracy)
subelementType: 004 (userDefined)
+subelementUserDefined
DQ_UserDefined
name: Qualitative narrative report
description: attribute comparison
+dataQualityResult
DQ_Measure
result:
DQ_ConformanceResult
specification:
CI_Citation
title: MIL-D-89009
date: 19920413
explanation: 100 percent of attribute codes were reviewed against the source manuscripts
pass: 1
+report(2)
DQ_ElementSubelement
elementType: 003 (positionalAccuracy)
subelementType: 001 (absoluteExternalAccuracy)
+dataQualityResult
DQ_Measure
evaluation:
DQ_EvaluationDescriptor
evaluation: The horizontal positional accuracy value represents overall

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accuracy. Source chart-specific accuracy's are available as area feature attributes in the DCW data quality coverage. The primary accuracy analysis was performed on one chart only in the prototyping phase of the project. Detailed horizontal accuracy figures were developed by comparing the positions of well-defined points in the roads, railroads, utility lines, and drainage coverage's against sources of higher accuracy, measuring the offsets, and expressing differences as a Circular Map Accuracy figure at a 90% confidence interval. This figure was independently verified by adding known production errors to source chart accuracy's in a root mean square calculation.

citation:
CI_Citation
title: MIL-D-89009
date: 19920413

result:
DQ_QuantitativeResult
valueDomain: meters
result: 2040

+report(3)
DQ_ElementSubelement
elementType: 003 (positionalAccuracy)
subelementType: 001 (absoluteExternalAccuracy)
+dataQualityResult
DQ_Measure
evaluation:
DQ_EvaluationDescriptor
evaluation: Vertical accuracy figures were developed by comparing elevation contour locations on 1:24,000 scale maps to elevation values at the same location within the digital database. Some manual interpolation was necessary to complete this test. The analysis results are expressed as linear error at a 90% confidence interval.
citation:
CI_Citation
title: MIL-D-89009
date: 19920413

result:
DQ_QuantitativeResult
valueDomain: meters
result: 610

+lineage
LI_Lineage
+source(1)
LI_Source
description: stable-base material
scaleDenominator: 1000000
datum: Eurpoean 1950
sourceExtent:
EX_Extent
+element
EX_TemporalExtent
extent:
TM_Period
begin: 1974
end: 1999

sourceCitation:
CI_Citation
title: Operational Navigational Chart
alternateTitle: ONC
citedResponsibleParty:
CI_ResponsibleParty
mandatoryParty:
CI_MandatoryParty

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organisationName: Defense Mapping Agency
contactInfo:
CI_Contact
address:
CI_Address
city: St. Louis
administrativeArea: MO
country: US
date: 199111
dateType: publication date
presentationFormCode: 001 (document)
+step(1)
LI_ProcessStep
description: Stable-based positives were produced from the original reproduction negatives (up to 35 per ONC sheet) these were digitized either through a scanning-raster to vector conversion or hand digitised into vector form. The vector data was then tagged with attribute information using ARC-INFO software. Transformation to geographic coordinates was performed using the projection graticules for each sheet. Digital information was edge matched between sheets to create large regional datasets. These were then subdivided into 5 x 5 tiles and converted from ARC/INFO to VPF. The data was then pre-mastered for CD-ROM. QC was performed by a separate group for each step in the production process.
dateTime: 199112
processor:
CI_ResponsibleParty
mandatoryParty:
CI_MandantoryParty
organisationName: Environmental Systems Research Institute, Applications Division
contactInfo:
CI_Contact
phone:
CI_Telephone
voice: (909) 793-2853
facsimile: (909) 793-5953
address:
CI_Address
deliveryPoint: 380 New York Street
city: Redlands
administrativeArea: California
postalCode: 92373
country: US
+source(2)
LI_Source
description: magnetic, Airport records (name, ICAO, position, elevation, and type)
sourceExtent: 1991
sourceCitation:
CI_Citation
title: Digital Aeronautical Flight Information File
alternateTitle: DAFIF
citedResponsibleParty:
CI_ResponsibleParty
mandatoryParty:
CI_MandatoryParty
organisationName: Defense Mapping Agency
contactInfo:
CI_Contact
address:
CI_Address
city: St. Louis
administrativeArea: MO
country: US
date: 199111

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dateType: publication date
presentationFormCode: 008 (vector map)
+step(2)
LI_ProcessStep
description: Transferred digitally directly into the VPF files.
dateTime: 199111
processor:
CI_ResponsibleParty
mandatoryParty:
CI_Mandatoryparty
organisationName: Environmental Systems Research Institute, Applications Division
contactInfo:
CI_Contact
phone:
CI_Telephone
voice: (909) 793-2853
facsimile: (909) 793-5953
address:
CI_Address
deliveryPoint: 380 New York Street
city: Redlands
administrativeArea: California
postalCode: 92373
country: US
+source(3)
LI_Source
description: stable-base material, All information found on the source with the exception of aeronautical data. JNCs were used as the souce for the Antarctica region only.
scaleDenominator: 2000000
datum: unknown
sourceExtent:
EX_Extent
+element
EX_TemporalExtent
extent:
TM_Period
begin: 1974
end: 1999
sourceCitation:
CI_Citation
title: Jet Navigational Chart
alternateTitle: JNC
citedResponsibleParty:
CI_ResponsibleParty
mandatoryParty:
CI_MandatoryParty
organisationName: Defense Mapping Agency
contactInfo:
CI_Contact
address:
CI_Address
city: St. Louis
administrativeArea: MO
country: US
responsibility: 001 (originator)
date: 199111
dateType: publication date
presentationFormCode: 001 (document)
+step(3)
LI_ProcessStep
description: Stable-based positives were produced from the original reproduction

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negatives (up to 35 per JNC sheet) these were digitized either through a scanning-raster to vector conversion or hand digitized into vector form. The vector data was then tagged with attribute information using ARC-INFO software. Transformation to geographic coordinates was performed using the projection graticules for each sheet. Digital information was edge matched between sheets to create large regional datasets. These were then subdivided into 5 x 5 tiles and converted from ARC/INFO to VPF. The data was then pre-mastered for CD-ROM. QC was performed by a separate group for each step in the production process.

dateTime: 199112
processor:
CI_ResponsibleParty
mandatoryParty:
CI_MandatoryParty
organisationName: Environmental Systems Research Institute, Applications Division
contactInfo:
CI_Contact
phone:
CI_Phone
voice: (909) 793-2853
facsimile: (909) 793-5953
address:
CI_Address
deliveryPoint: 390 New York Street
city: Redlands
administrativeArea: California
postalCode: 92373
country: US

+source(4)
LI_Source
description: Six vegetation types covering the contintental United States
scaleDenominator: 1000000
datum: WGS 84
sourceExtent:
EX_Extent
+element
EX_TemporalExtent
extent:
TM_Period
begin: 199003
end: 199011
sourceCitation:
CI_Citation
title: Advanced Very High Resolution Radiometer
alternateTitle: AVHRR
citedResponsibleParty:
CI_ResponsibleParty
mandatoryParty:
CI_MandatoryParty
organisationName: USGS EROS Data Centre
contactInfo:
CI_Contact
address:
CI_Address
city: Sioux Falls
administrativeArea: SD
country: US
responsibility: 001 (originator)
date: 1991
dateType: publication date
presentationFormCode: 004 (model)

+step(4)
LI_ProcessStep

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description: Daily AVHRR images were averaged for two week time periods over the entire US growing season. These averaged images, their rates of change, elevation information, and other data were used to produce a single land classification image of the continental US.
dateTime: 199108
processor:
CI_ResponsibleParty
mandatoryParty:
CI_MandatoryParty
organisationName: USGS EROS Data Centre
contactInfo:
CI_Contact
address:
CI_Address
city: Sioux Falls
adminstrativeArea: SD
country: US

+step(5)
LI_ProcessStep
description: The Eros data (raster files) were converted to vector polygon, splined (remove stairstepping), thinned (all polygons under 2km^2 were deleted), and tied to existing DCW polygons (water bodies, built-up areas). The resulting file was tiled and converted to a VPF Vegetation coverage for use in the DCW. All processing was performed using ARC-INFO software.
dateTime: 199110
processor:
CI_ResponsibleParty
mandatoryparty:
CI_MandatoryParty
organisationName: Environmental Systems Research Institute, Applications Division
contactInfo:
CI_Contact
phone:
CI_Telephone
voice: (909) 793-2853
facsimile: (909) 793-5953
address:
CI_Address
deliveryPoint: 380 New York Street
city: Redlands
administrativeArea: California
postalCode: 92373
country: US

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