
**Geographic information —
Metadata —**

**Part 1:
Fundamentals**

Information géographique — Métadonnées —

Partie 1: Principes de base
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Foreword

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

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

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

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

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

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

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

- *Part 1: Fundamentals*
- *Part 2: Extensions for imagery and gridded data*
- *Part 3: XML schema implementation of metadata fundamentals [Technical Specification]¹⁾*

1) To be published.

Introduction

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

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

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

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

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

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

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

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

- 1) Enable information resource providers to effectively and completely characterize their resources.
- 2) Facilitate the organisation and management of metadata for information resources.

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- 3) Enable appropriate use of information resources through accurate understanding of their characteristics.
- 4) Facilitate resource discovery, access, retrieval and reuse.
- 5) Enable users to determine whether an information resource will be of use to them.

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

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

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

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

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

- No new mandatory elements were created;
- If the definition of a metadata element required changing it was deleted and replaced by a new metadata element; metadata element names were not reused for other concepts;
- Definitions of some metadata elements were broadened;
- Metadata elements were reused when their datatype changed but name and definition remained the same;
- Remaining attributes were kept in the same order as in the replaced standard;
- A list of deleted elements, new elements, and a mapping between old elements and their replacement is provided in [Annex G](#);
- Restructuring of the UML was kept to a minimum.

Summary of major changes:

- The concept of “Core metadata” was removed;
- Metadata for services was added, derived from ISO 19119:2005 and ISO 19119:2005/Amd 1:2008;

- Data quality was moved to ISO 19157;
- [Annex F](#) was added to describe metadata for the discovery of service and non-service resources;
- Many codelists were extended;
- The use of “Short name” and “Domain code” was dropped for metadata elements and codes respectively.

A full description of changes is provided in [Annex G](#).

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Geographic information — Metadata —

Part 1: Fundamentals

1 Scope

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

This part of ISO 19115 is applicable to:

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

This part of ISO 19115 defines:

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

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

2 Conformance

2.1 Conformance requirements

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

Metadata shall be provided as specified in [Clause 6](#) and [Annex B](#).

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

User-defined metadata shall be defined and provided as specified in [Annex C](#).

Any profile conforming to this part of ISO 19115 shall conform to the rules in [C.6](#).

This part of ISO 19115 defines metadata used to describe data. Datasets defined in accordance with this part of ISO 19115 may coexist with other datasets that conform to earlier versions of this International Standard. Domain specific or regional profiles of this part of ISO 19115 are responsible for establishing

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the details of backward compatibility in their domains. Conformance clauses for services that operate using metadata defined in accordance with this part of ISO 19115 or profiles developed based on this part of ISO 19115 need to be defined in those profiles or service specifications in order to permit backward compatibility in their domain.

2.2 Abstract test suite

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

3 Normative references

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

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

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

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

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

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

ISO 19106:2004, *Geographic information — Profiles*

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

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

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

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

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

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

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

ISO 19119, *Geographic information — Services*

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

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

4 Terms and definitions

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

4.1**citation**

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

[SOURCE: ISO 24619:2011, 3.1.16]

4.2**data type**

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

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

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

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

4.3**dataset**

identifiable collection of data

Note 1 to entry: A dataset can be a smaller grouping of data which, though limited by some constraint such as spatial extent or feature type, is located physically within a larger dataset. Theoretically, a dataset can be as small as a single *feature* (4.5) or feature attribute contained within a larger dataset. A hardcopy map or chart can be considered a dataset.

4.4**dataset series**

collection of *datasets* (4.3) sharing common characteristics

4.5**feature**

abstraction of real world phenomena

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[SOURCE: ISO 19101:2002, 4.11]

4.6**free text**

textual information that can be expressed in one or many languages

4.7**grid**

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

[SOURCE: ISO 19123:2005, 4.1.23]

4.8**interface**

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

[SOURCE: ISO 19119:2005, 4.2]

4.9**lineage**

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

4.10**metadata**

information about a *resource* (4.17)

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4.11 metadata element

discrete unit of *metadata* (4.10)

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

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

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

4.12 metadata entity

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

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

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

4.13 metadata section

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

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

4.14 model

abstraction of some aspects of reality

[SOURCE: ISO 19109:2005, 4.14]

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4.15 operation

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

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

[SOURCE: ISO 19119:2005, 4.3]

4.16 provenance

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

[SOURCE: ISO 5127:2001, 4.1.1.10]

4.17 resource

identifiable asset or means that fulfils a requirement

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

4.18 service

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

[SOURCE: ISO 19119:2005, 4.1]

5 Symbols and abbreviated terms

5.1 Abbreviated terms

OCL	Object Constraint Language
OGC	Open Geospatial Consortium
UML	Unified Modelling Language
XML	Extensible Markup Language

5.2 Abbreviated terms — Package

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

CI	Citation (ISO 19115-1)
DQ	Data Quality (ISO 19157)
DS	Dataset (ISO 19115-1)
EX	Extent (ISO 19115-1)
FC	Feature Catalogue (ISO 19110)
GF	General Feature (ISO 19109) ISO 19115-1:2014
GM	Geometry (ISO 19107) https://standards.iteh.ai/catalog/standards/sist/1d9e3baf-33a7-48ee-82c0-f5cb23322073/iso-19115-1-2014
LI	Lineage (ISO 19115-1)
LE	Lineage extended (ISO 19115-2)
MD	Metadata (ISO 19115-1)
PT	Polylinguistic Text (ISO/TS 19103)
RS	Reference System (ISO 19115-1)
SC	Spatial Coordinates (ISO 19111)
SV	Metadata for Services (ISO 19115-1)
TM	Temporal (ISO 19108)

6 Metadata requirements

6.1 Metadata for resources

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

6.2 Metadata application information

Figure 1 is a Unified Modelling Language (UML) class diagram defining the classes of information to which metadata applies. It specifies that a resource (DS_Resource) and aggregations of resources must have one or more related Metadata sets (MD_Metadata). Metadata may optionally relate to a Feature, Feature Attribute, Feature Type, Feature Property Type (Metaclass' instantiated by Feature association role, Feature attribute type, and Feature operation). The method for relating metadata to feature and attribute instances is defined in ISO 19109. A dataset (DS_Dataset), aggregate (DS_Aggregate), and a service (SV_Service) are specializations (subtypes) of a resource (DS_Resource). Resource aggregations may be specified (subclassed) as a general association (DS_OtherAggregate), a dataset series (DS_Series), or a specific activity (DS_Initiative). Aggregate resources which are specified (subtyped) as a series (DS_Series) are related by the fact that they have a common heritage, e.g. they may be datasets that have been derived from the same sensor (DS_Sensor), platform (DS_Platform) or adhere to a common production specification (DS_ProductionSeries). MD_Metadata applies to a wide variety of resources and services which are specified in MD_ScopeCode (B.3.28). The data dictionary for this model is located in Table B.1.

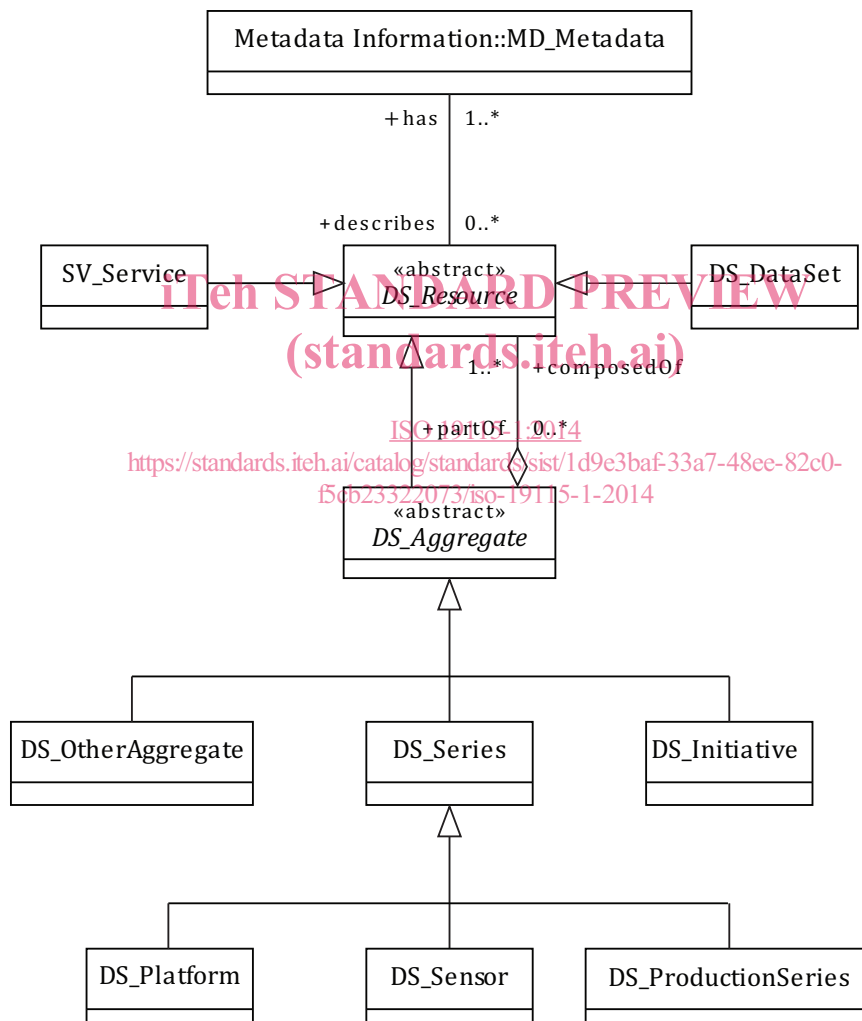


Figure 1 — Metadata application

6.3 Metadata fundamentals package and dependencies

The ISO geographic information series of standards are defined using one or more UML packages and are maintained in a single integrated UML model. This part of ISO 19115 utilizes concepts defined in several of these other standards' packages. Figure 2 illustrates the ISO/TC 211 packages upon which this part of ISO 19115 is dependent. Metadata-Fundamentals are defined and provided by one or

more packages; each package provides a separate component of metadata information. There are 13 packages that are used to define and provide the metadata that is defined in this part of ISO 19115: Metadata information, Identification information, Constraint information, Lineage information, Content information, Distribution information, Reference system information, Spatial representation information, Portrayal catalogue information, Metadata application information, Application Schema information, Metadata extension information, and Service metadata information. There are four packages: Citation information, Responsible party information, Language-character set localisation information, and Extent information which are used by other packages. Individual packages may be used alone to provide separate components of metadata to meet specific use case requirements but a minimum of the Metadata and Identification information packages must be used when providing a complete metadata set. The additional packages shall be added when providing supplementary metadata.

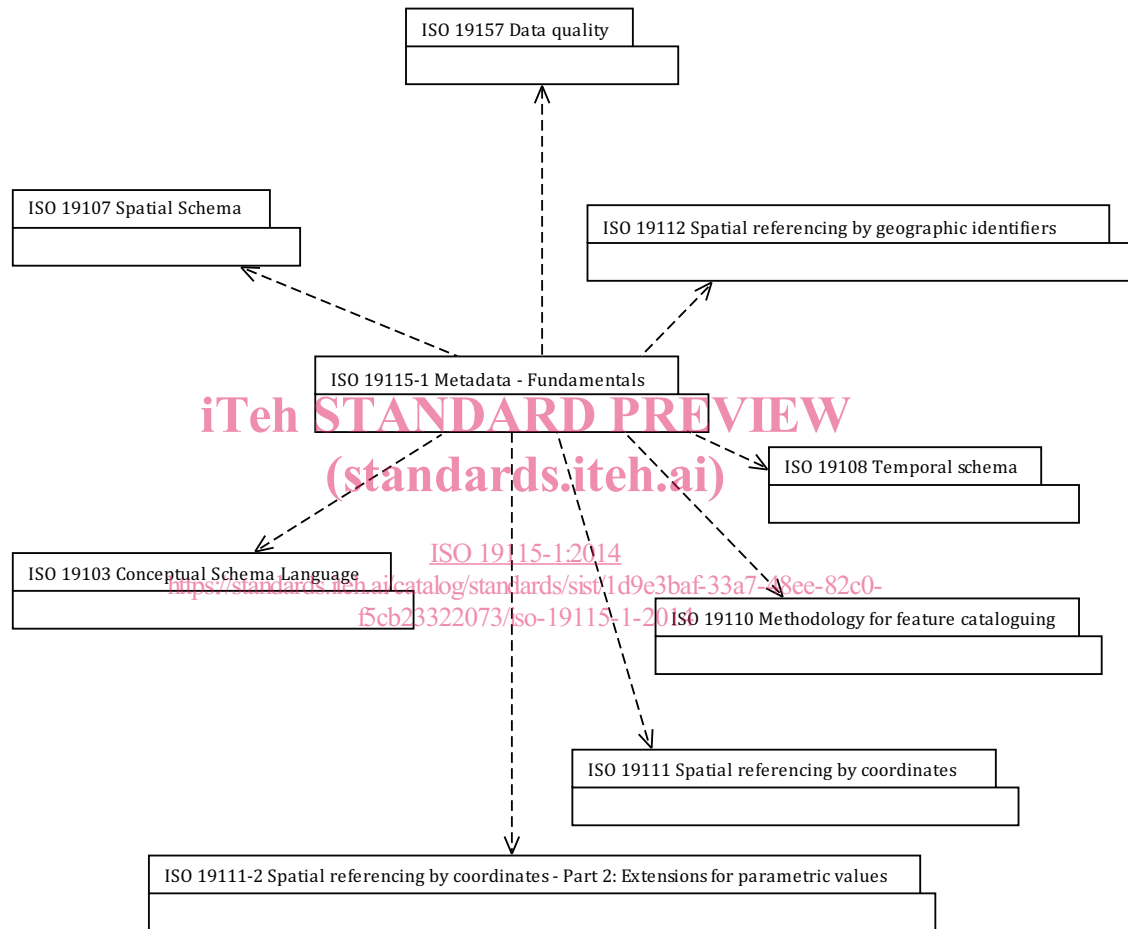


Figure 2 — Metadata fundamentals package and dependencies

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

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