
**Geographic information — Metadata —
Part 2:
Extensions for imagery and gridded data**

Information géographique — Métadonnées —

Partie 2: Extensions pour les images et les matrices

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Foreword

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

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

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

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 19115-2 was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*.

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

— *Geographic information — Metadata* (standards.iteh.ai)

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

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Introduction

Imagery and gridded data are important information sources and products used within a geospatial environment by geographic information systems. The production of imagery and gridded data follows one or more process chains that begin with remote sensing data, scanned maps, field data collection or other sensing methods and end with the creation of the end data products. The production process needs to be documented in order to maintain quality control over the end products. In addition, metadata about the geometry of the measuring process and the properties of the measuring equipment need to be retained with the raw data in order to support the production process.

Within the suite of ISO geographic information standards, ISO 19115 defines the guidelines for describing geographic information and services. While the ISO 19115 metadata model does provide some provisions for imagery and gridded data, the requirements were not fully developed at the time ISO 19115:2003 was drafted. To permit the development of ISO 19115 to proceed, inclusion of metadata definitions for imagery and gridded data was deferred until the framework for these data was more fully specified within the suite of ISO geographic information standards. Additionally, other standards that implement metadata for imagery and gridded data have been surveyed and are described in ISO/TR 19121.

The object of this part of ISO 19115 is to provide the additional structure to more extensively describe the derivation of geographic imagery and gridded data. This structure is intended to augment ISO 19115.

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Geographic information — Metadata —

Part 2: Extensions for imagery and gridded data

1 Scope

This part of ISO 19115 extends the existing geographic metadata standard by defining the schema required for describing imagery and gridded data. It provides information about the properties of the measuring equipment used to acquire the data, the geometry of the measuring process employed by the equipment, and the production process used to digitize the raw data. This extension deals with metadata needed to describe the derivation of geographic information from raw data, including the properties of the measuring system, and the numerical methods and computational procedures used in the derivation. The metadata required to address coverage data in general is addressed sufficiently in the general part of ISO 19115.

2 Conformance

2.1 Conformance requirements

Metadata shall be provided as specified in Clause 6 and Annexes A and B of this part of ISO 19115 and ISO 19115:2003, Clause 6 and Annexes A and B.

User-defined metadata extensions to this part of ISO 19115 shall be defined and provided as specified in ISO 19115:2003, Annex C.

Any metadata claiming conformance with this part of ISO 19115 shall pass the requirements described in Annex C of this part of ISO 19115 and the abstract test suite presented in ISO 19115:2003, Annex D.

2.2 Metadata profiles

Any profile conforming to this part of ISO 19115 shall conform to the rules for creating a profile given in ISO 19115:2003, C.6.

3 Normative references

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

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

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

ISO 19115:2003, *Geographic information — Metadata*

ISO/TS 19139:2007, *Geographic information — Metadata — XML schema implementation*

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 19115:2003 and the following apply.

- 4.1 attribute**
named property of an entity
[ISO/IEC 2382-17:1999]
NOTE Describes a geometrical, topological, thematic, or other characteristic of an entity.
- 4.2 band**
range of wavelengths of electromagnetic radiation that produce a single response by a sensing device
[ISO/TS 19101-2:2008]
- 4.3 class**
description of a set of objects that share the same **attributes**, operations, methods, relationships, and semantics
[ISO/TS 19103:2005]
- 4.4 coverage**
feature that acts as a function to return **values** from its range for any direct position within its spatial, temporal or spatiotemporal **domain**
[ISO 19123:2005]
EXAMPLE Examples include a raster **image**, polygon overlay, or digital elevation matrix
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- 4.5 data**
reinterpretable representation of information in a formalised manner suitable for communication, interpretation, or processing
[ISO/IEC 2382-1:1993]
- 4.6 data type**
specification of a **value domain** with operations allowed on **values** in this **domain**
[ISO/TS 19103:2005]
- 4.7 dataset**
identifiable collection of **data**
[ISO 19115:2003]
- 4.8 dataset series**
collection of **datasets** sharing the same product specification
[ISO 19115:2003]
- 4.9 domain**
well-defined set
[ISO/TS 19103:2005]

4.10 event

action which occurs at an instant

[ISO 19108:2002]

4.11 geolocation information

information used to determine geographic location corresponding to **image** location

4.12 georectified

corrected for positional displacement with respect to the surface of the earth

4.13 georeferencing

process of determining the relation between the position of **data** in the image coordinates and its geographic or map location

4.14 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

[ISO 19123:2005]

NOTE The curves partition a space into **grid** cells.

4.15 grid coordinate system

coordinate system in which a position is specified relative to the intersection of curves

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4.16 grid coordinates

sequence of two or more numbers specifying a position with respect to its location on a **grid**

4.17 gridded data

data whose **attribute values** are associated with positions on a **grid coordinate system**

4.18 ground control point

point on the earth that has an accurately known geographic position

4.19 image

gridded **coverage** whose **attribute values** are a numerical representation of a physical parameter

NOTE The physical parameters are the result of measurement by a **sensor** or a prediction from a model.

4.20 imagery

representation of phenomena as **images** produced by electronic and/or optical techniques

[ISO 19101-2:2008]

NOTE In this part of ISO 19115, it is assumed that the objects and phenomena have been sensed or detected by camera, infrared and multispectral scanners, radar and photometers, or similar devices.

4.21

metadata

data about data

[ISO 19115:2003]

4.22

pass

single instance of a remote, mobile measuring system going by a target of interest

NOTE In this part of ISO 19115, the measuring system will usually be a remote sensing platform. In a navigation context, the measuring system might be a GPS satellite.

4.23

pixel

smallest element of a digital image to which attributes are assigned

[ISO/TS 19101-2:2008]

NOTE It is the smallest unit of display for a visible image.

4.24

platform

structure which supports a **sensor**, or sensors

4.25

polarization

restricting radiation, especially light, vibrations to a single plane

4.26

remote sensing

collection and interpretation of information about an object without being in physical contact with the object

4.27

resolution (of a **sensor**)

smallest difference between indications of a **sensor** that can be meaningfully distinguished

NOTE For imagery, resolution refers to radiometric, spectral, spatial and temporal resolutions.

[ISO/TS 19101-2:2008]

4.28

sensor

element of a measuring system that is directly affected by a phenomenon, body, or substance carrying a quantity to be measured

[ISO/IEC GUIDE 99:2007]

4.29

sensor model

description of the radiometric and geometric characteristics of a **sensor**

[ISO 19101-2:2008]

4.30

spectral resolution

specific wavelength interval within the electromagnetic spectrum

EXAMPLE Band 1 of Landsat TM lies between 0,45 and 0,52 μm in the visible part of the spectrum.

4.31

value

element of a type **domain**

[ISO/TS 19103:2005]

4.32**value domain**set of accepted **values**

[ISO/TS 19103:2005]

EXAMPLE The range 3-28, all integers, any ASCII character, enumeration of all accepted values (green, blue, white).

5 Symbols and abbreviated terms**5.1 Abbreviations**

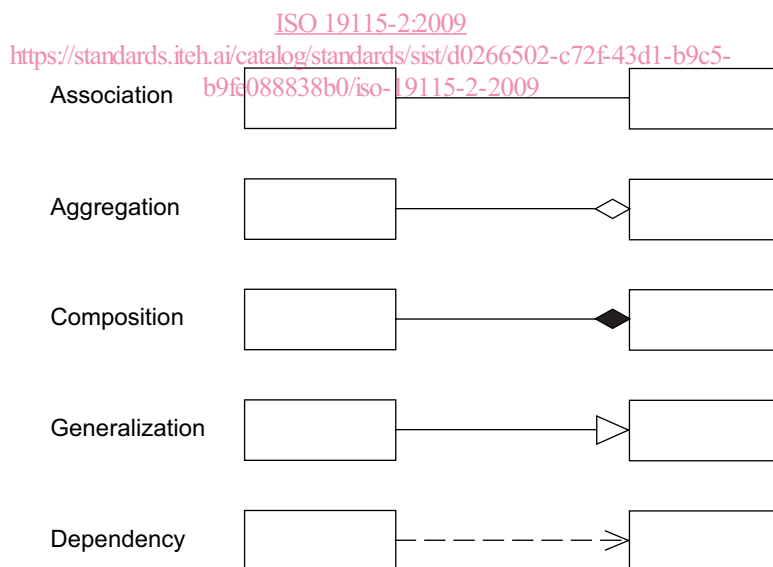
IDL Interface Definition Language

OCL Object Constraint Language

UML Unified Modeling Language

5.2 UML notations

The diagrams that appear in this part of ISO 19115 are presented using the Unified Modelling Language (UML) static structure diagram with the ISO Interface Definition Language (IDL) basic type definitions and the UML Object Constraint Language (OCL) as the conceptual schema language. The UML notations used in this part of ISO 19115 are described in Figure 1.

**Figure 1 — UML notation**

5.3 UML model relationships

5.3.1 Associations

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

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

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

5.3.2 Generalization

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

5.3.3 Instantiation/Dependency

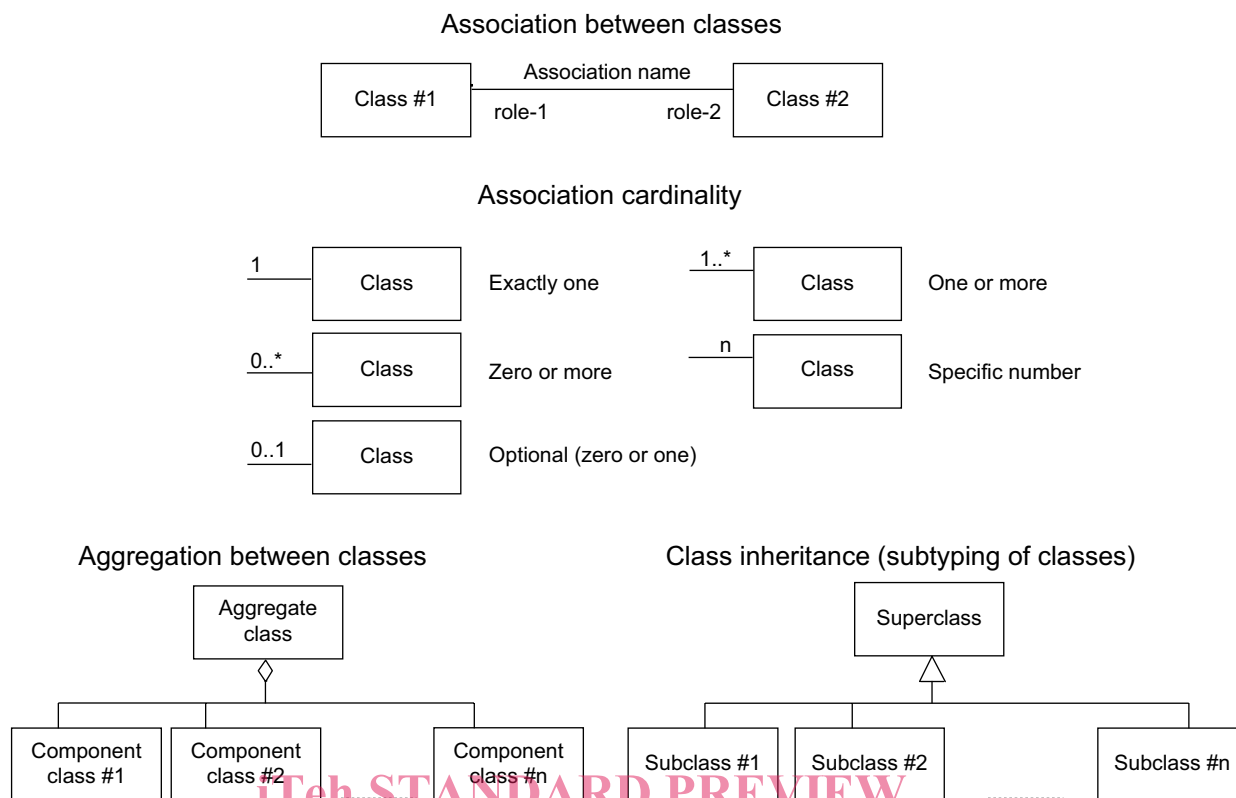
A dependency relationship shows that the client class depends on the supplier class/interface to provide certain services, such as:

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

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

5.3.4 Roles

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



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Figure 2 — UML roles

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5.4 UML model stereotypes

A UML stereotype is an extension mechanism for existing UML concepts. It is a model element that is used to classify (or mark) other UML elements so that they in some respect behave as if they were instances of new virtual or pseudo metamodel classes whose form is based on existing base metamodel classes. Stereotypes augment the classification mechanisms on the basis of the built-in UML metamodel class hierarchy. Below are brief descriptions of the stereotypes used in this part of ISO 19115. For more detailed descriptions consult ISO/TS 19103.

In this part of ISO 19115 the following stereotypes are used.

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

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

6 Imagery and gridded data metadata

6.1 Metadata for geospatial imagery and gridded data requirement

ISO 19115 identifies the metadata required to describe digital geographic data. This part of ISO 19115 extends the metadata identified in ISO 19115 and identifies the metadata required to describe digital geospatial imagery and gridded data. ISO 19115 identifies some of the metadata for imagery and gridded data and this part of ISO 19115 builds upon that foundation. The extended metadata shall be provided for geographic images and gridded datasets which include the geospatial imagery and gridded data and may optionally be provided for aggregations of datasets.

6.2 Imagery and gridded data metadata packages

6.2.1 Introduction

Figure 3 illustrates the relationships among the packages described in this part of ISO 19115 and the relevant packages specified in ISO 19115. The ISO 19115 UML model diagrams and data dictionary for each package are fully specified in ISO 19115. The additional metadata for geospatial imagery and gridded data is fully specified in the UML model diagrams and data dictionary for each additional package, which is given in Annex A and Annex B, respectively. If a discrepancy between the two annexes exists, Annex A shall be considered authoritative.

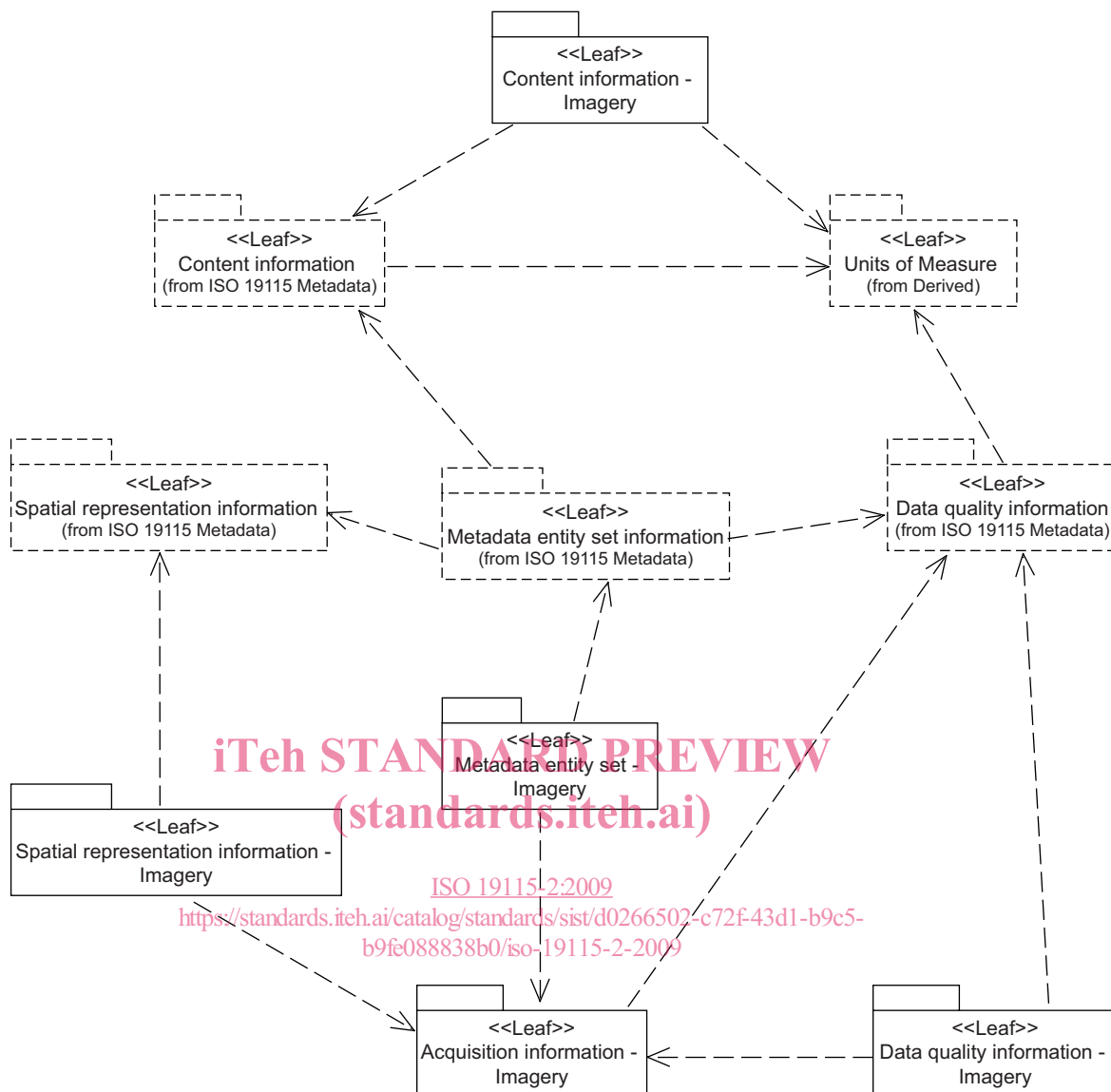


Figure 3 — Metadata packages

To ensure global uniqueness of class names, ISO/TS 19103 requires that all class names be defined with a bi-alpha prefix that identifies the package in which the class is defined. ISO 19115 uses the prefixes MD (Metadata), CI (Citation), DQ (Data quality), EX (Extent), and LI (Lineage). To differentiate between ISO 19115 and entities of this part of ISO 19115, this part uses different prefixes. The prefixes used are MI (Metadata for imagery and gridded data), LE (Lineage extended) and QE (Data quality extended). Table 1 contains the list of package identifiers for the classes used in this part of this part of ISO 19115.