INTERNATIONAL STANDARD

ISO
19112

Geographic information — Spatial referencing by geographic identifiers

Information géographique — Système de références spatiales par identificateurs géographiques

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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 19112 was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*.

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Introduction

Geographic information contains geospatial references that relate the features and information represented in the data or text to positions in geographic space. Spatial references fall into two categories:

a)   those using coordinates;

b)   those using geographic identifiers.

This International Standard deals only with spatial referencing by geographic identifiers. This type of spatial reference is sometimes called "indirect". Spatial referencing by coordinates is the subject of ISO 19111.

Spatial reference systems using geographic identifiers are not based explicitly on coordinates but on a relationship with a location defined by a geographic feature or features. The relationship of the position to the feature may be as follows:

a)   containment, where the position is within the geographic feature, for example in a country;

b)   based on local measurements, where the position is defined relative to a fixed point or points in the geographic feature or features, for example at a given distance along a street from a junction with another street;

c)   loosely related, where the position has a fuzzy relationship with the geographic feature or features, for example adjacent to a building or between two buildings.

The purpose of this International Standard is to specify ways to define and describe systems of spatial references using geographic identifiers. However, it only covers the definition and recording of the referencing feature, and does not consider the forms of the relationship of the position relative to that feature.

Geographic information — Spatial referencing by geographic identifiers

1 Scope

This International Standard defines the conceptual schema for spatial references based on geographic identifiers. It establishes a general model for spatial referencing using geographic identifiers, defines the components of a spatial reference system and defines the essential components of a gazetteer.

Spatial referencing by coordinates is addressed in ISO 19111. However, a mechanism for recording complementary coordinate references is included.

This International Standard enables producers of data to define spatial reference systems using geographic identifiers and assists users in understanding the spatial references used in datasets. It enables gazetteers to be constructed in a consistent manner and supports the development of other standards in the field of geographic information.

This International Standard is applicable to digital geographic data, and its principles may be extended to other forms of geographic data such as maps, charts and textual documents.

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2 Conformance

Two classes of conformance are defined for this International Standard:

⎯ any spatial reference system for which conformance with this document is claimed shall pass all the requirements described in the abstract test suite given in Clause A.1.

⎯ any gazetteer for which conformance with this document is claimed shall pass all the requirements described in the abstract test suite given in Clause A.2.

The definition of an abstract test suite is given in ISO 19105.

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 19105:2000, *Geographic information — Conformance and testing*

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

ISO 19111:2003, *Geographic information — Spatial referencing by coordinates*

ISO 19115:2003, *Geographic information — Metadata*

4   Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4.1
feature
abstraction of real world phenomena

NOTE   A feature may occur as a type or an instance. Feature type or instance shall be used when only one is meant.

[ISO 19101: 2002]

4.2
gazetteer
directory of instances of a class or classes of features containing some information regarding position

NOTE   The positional information need not be coordinates, but could be descriptive.

4.3
geographic identifier
spatial reference in the form of a label or code that identifies a location

EXAMPLE   "Spain" is an example of a country name; "SW1P 3AD" is an example of a postcode.

4.4
location
identifiable geographic place

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EXAMPLE   "Eiffel Tower", "Madrid", "California"

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4.5
spatial reference
description of position in the real world

NOTE   This may take the form of a label, code or set of coordinates.

4.6
**spatial reference system**
system for identifying position in the real world

5   Notation

5.1   Unified Modelling Language (UML)

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

Association between classes
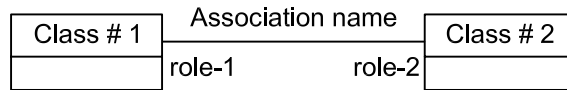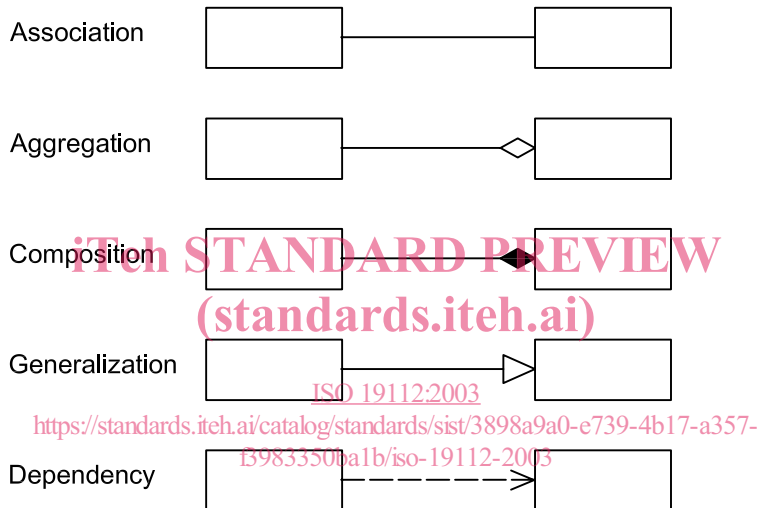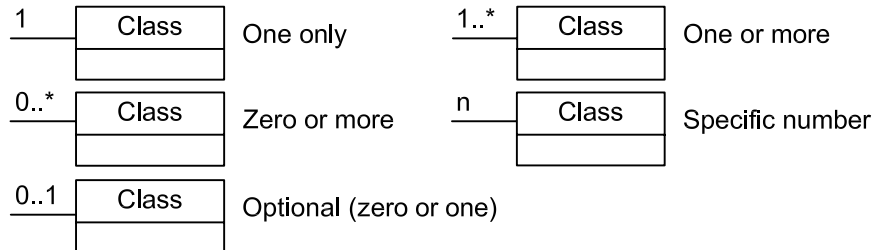

Association cardinality

Figure 1 — UML notation

This International Standard defines the following UML packages:

— SI_Gazetteer;

— SI_LocationInstance;

— SI_LocationType.

Reference is made to the following UML packages defined in other International Standards:

— EX_GeographicExtent, defined in the Extent package in ISO 19115:2003;

— EX_TemporalExtent, defined in the Extent package in ISO 19115:2003;

— CI_ResponsibleParty, defined in Citation in ISO 19115:2003;

— GM_Point, defined in the Geometry package in ISO 19107:2003;

— SC_CRS, defined in ISO 19111:2003.

5.2   Attribute tables

The tables of attributes that appear in this International Standard show the following elements:

— element name: a label assigned to the element;

— description: the element description;

— obligation: whether the element shall always be recorded (M), or is optional (O), or is
                                            conditional on the stated condition being met (C);

— maximum occurrence: the number of instances that the element may have, one (1) or many (N);

— data type: a set of distinct values representing the element;

— domain: the values allowed or the use of free text.

6   Concepts of spatial referencing using geographic identifiers

6.1   Spatial referencing using geographic identifiers

The position of a feature is identified by a spatial reference. Where a geographic identifier is used as this spatial reference, it uniquely identifies a location. This location is a feature used to reference other features.

NOTE   The spatial reference of a feature in a geographic dataset is usually held as an attribute of the feature, and defines an association with a location. The relationship with the location is usually that of containment within. However, more complex spatial references may be constructed using relationships such as "adjacent to" and "distance along" together with a measured distance and direction from the location identified. Reference systems for roads and railways are often based on a measured distance from one node (end point or intersection) along a link (road or track). The spatial reference system used in a dataset forms part of the metadata for that dataset, as defined in ISO 19115.

These concepts are illustrated in Figure 2, which applies at both the type and instance level.
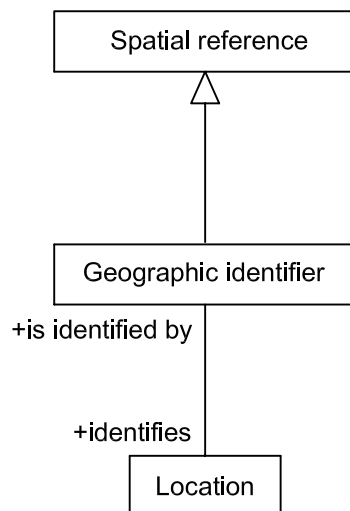

Figure 2 — The concepts of spatial referencing using geographic identifiers

6.2   Spatial reference systems using geographic identifiers

A spatial reference system using geographic identifiers comprises a related set of one or more location types, together with their corresponding geographic identifiers. These location types may be related to each other through aggregation or disaggregation, possibly forming a hierarchy.

Examples of spatial reference systems using geographic identifiers are shown in Table 1.

Table 1 — Examples of spatial reference systems

Spatial reference system	Location type	Geographic identifiers
countries as defined in ISO 3166-1	country	country name country code
set of population centres in a region	town	town name
addresses in a town	property	property address
hydrological hierarchy	river basin river river reach	river basin name river name river reach reference
link – node	link	link code

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6.3   Gazetteers

A gazetteer is a directory of geographic identifiers describing location instances. It will contain additional information regarding the position of each location instance. It may include a coordinate reference, but it may also be purely descriptive. If it contains a coordinate reference, this will enable transformation from the spatial reference system using geographic identifiers to the coordinate reference system. If it contains a descriptive reference, this will be a spatial reference using a different spatial reference system with geographic identifiers, for example the postcode of a property. For any location type, there may be more than one gazetteer.

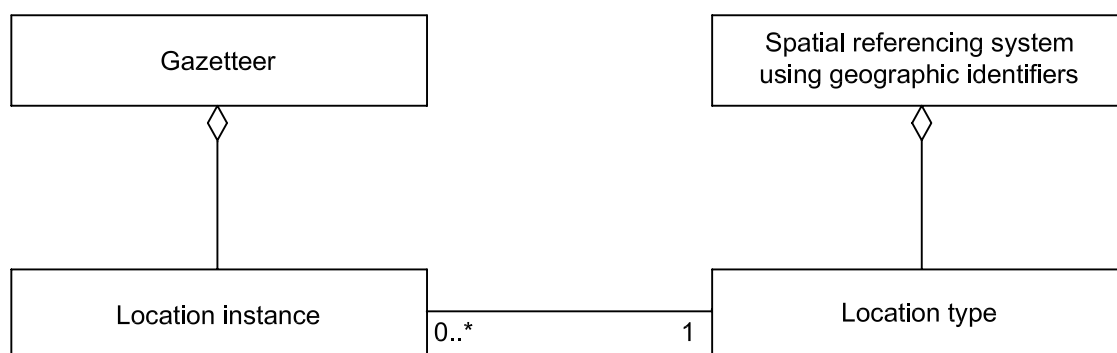The relationships among spatial reference system, location and gazetteer are shown in Figure 3.

Figure 3 — Spatial reference system using geographic identifiers