INTERNATIONAL STANDARD

**ISO 19145**

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# Geographic information — Registry of representations of geographic point location

*Information géographique — Registre de représentations de localisation de point géographique*



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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 19145 was prepared by Technical Committee ISO/TC 211, *Geographic information/Geomatics*.

# Introduction

ISO 6709:2008 standardizes the mechanisms for the interoperability of geographic point location representations. However, the representation of geographic point locations takes various schemes (e.g. ISO 6709:1983, DCMI Point encoding scheme, KML, GeoVRML, Natural Area Coding System, ISO 8211, GML Point Profile) depending of the application in which they are used. Accordingly, ISO 6709:2008 recognizes and supports flexibility in the representation of geographic point locations and the requirement for universal interpretation. In order to support the use of a variety of geographic point location representations, ISO 6709:2008 introduces the requirement of a registry of geographic point location representations. A registry of representations of geographic point location gives access to the description of the format in which a geographic point location is encoded and also identifies conversion services to transform the representation of the geographic point location to another representation. As such, knowing in which format a geographic point location is encoded and the format in which it must be encoded for its use by a specific application, it can be possible to perform the appropriate transformation of the representation of a geographic point location. However, this requires that encoding formats and their descriptions need to be made accessible either as part of the geographic point location representation itself or from a registry of representations of geographic point locations. As such, the definition of a standard structure for a registry of representations of geographic point location is required. Such a registry will support the required flexibility identified in ISO 6709:2008 for efficient syntactic interoperability of geographic point location information.

This International Standard defines a standard structure of a register in Unified Modelling Language (UML) that supports the description of geographic point location representation (Clause 7). It also defines the XML implementation of the register's UML structure by extending ISO/TS 19135-2, Annex A. Although the structure for the description of geographic point location representation takes its roots in ISO 19135, it extends that International Standard with specific requirements to an extent that it goes beyond the definition of a profile of ISO 19135.

# Geographic information — Registry of representations of geographic point location

## 1 Scope

This International Standard specifies the process for establishing, maintaining and publishing registers of representation of geographic point location in compliance with ISO 19135. It identifies and describes the information elements and the structure of a register of representations of geographic point location including the elements for the conversion of one representation to another.

This International Standard also specifies the XML implementation of the required XML extension to ISO/TS 19135-2, for the implementation of a register of geographic point location representations.

A registry of geographic point location representations differs from a coordinate reference system (CRS) registry as it is not intended to describe the parameters of a CRS including datum, projections, units of measure, and order of coordinates but is concerned by the manner a geographic point location according to ISO 6709 is physically represented in a record or part of it.

## 2 Conformance



To conform to this International Standard, a register of geographic point location representations shall satisfy all of the conditions specified in the abstract test suite (Annex B).



## 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 19115:2003, *Geographic information — Metadata*

ISO 19118:2011, *Geographic information — Encoding*

ISO 19135:2005, *Geographic information — Procedures for item registration*

ISO/TS 19135-2:2012, *Geographic information - Procedures for item registration — Part 2: XML schema implementation*

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

W3C XMLName, *Namespaces in XML 1.0 (Second Edition).* W3C Recommendation (16 August 2006)

W3C XMLSchema-1, *XML Schema Part 1: Structures Second Edition. W3C Recommendation* (28 October 2004)

W3C XMLSchema-2, *XML Schema Part 2: Datatypes Second Edition. W3C Recommendation* (28 October 2004)

W3C XML, *Extensible Markup Language (XML) 1.0 (Fourth Edition), W3C Recommendation* (16 August 2006)

W3C XLink, *XML Linking Language (XLink) Version 1.0. W3C Recommendation* (27 June 2001)

# 4 Terms, definitions and abbreviations

## 4.1 Terms and definitions

**4.1.1**
**compression**
technique used for the reduction of space used by data

**4.1.2**
**compression service**
*service* (4.1.16) that accomplishes *compression* (4.1.1)

**4.1.3**
**conversion**
transformation from one *format* (4.1.9) to another

**4.1.4**
**conversion service**
*service* (4.1.16) that invokes a *converter* (4.1.5)

**4.1.5**
**converter**
resource that performs *conversion* (4.1.3)

Note 1 to entry: The resource can be a device or software.



**4.1.6**
**coordinate**
one of a sequence of *n* numbers designating the position of a point in *n*-dimensional space



Note 1 to entry: In a coordinate reference system, the coordinate numbers are qualified by units.

[SOURCE: ISO 19111:2007, 4.5]

**4.1.7**
**coordinate tuple**
*tuple* (4.1.18) composed of a sequence of *coordinates* (4.1.6)

Note 1 to entry: In a coordinate reference system, the coordinate numbers are qualified by units.

[SOURCE: ISO 19111:2007, 4.12, modified — Note 1 to entry has been added.]

**4.1.8**
**dynamic conversion**
online and real time *conversion* (4.1.3) of data

**4.1.9**
**format**
language construct that specifies the representation, in character form, of data objects in a record, file, message, storage device, or transmission channel

[SOURCE: ISO/IEC 2382-15:1999, 15.04.35]

**4.1.10**
**geographic information**
information concerning phenomena implicitly or explicitly associated with a location relative to the Earth

[SOURCE: ISO 19101:2002, 4.16]

**4.1.11**
**geographic point location**
well defined geographic place described by one *coordinate tuple* (4.1.7)

**4.1.12**
**geographic point location representation**
syntactic description of a *geographic point location* (4.1.11) in a well known *format* (4.1.9)

**4.1.13**
**identifier**
linguistically independent sequence of characters capable of uniquely and permanently identifying that with which it is associated

[SOURCE: ISO 19135:2005, 4.1.5]

**4.1.14**
**register**
set of files containing *identifiers* (4.1.13) assigned to items with descriptions of the associated items

[SOURCE: ISO 19135:2005, 4.1.9]

**4.1.15**
**registry**
information system on which a *register* (4.1.14) is maintained

[SOURCE: ISO 19135:2005, 4.1.13]

**4.1.16**
**service**
distinct part of the functionality that is provided by an entity through interfaces

[SOURCE: ISO 19119:2005, 4.1]



**4.1.17**
**static conversion**
offline process to perform a global *conversion* (4.1.3) of a large amount of data



**4.1.18**
**tuple**
ordered list of values

[SOURCE: ISO 19136:2007, 4.1.63]

## 4.2 Abbreviations

| | |
|---|---|
| CRS | coordinate reference system |
| DCMI | Dublin Core Metadata Initiative |
| GeoVRML | Geo- Virtual Reality Modelling Language |
| GIS | geographic information system |
| GML | Geography Markup Language |
| GPL | geographic point location |
| GPLR | geographic point location representation |
| KML | Keyhole Markup Language |
| RFID | radio frequency identification |
| UML | Unified Modelling Language |
| XML | eXtensible Markup Language |

# 5 Role of a register of representations of geographic point location



## 5.1 Overview

The exchange of geographic point locations (GPLs) described by coordinates might use various representations or formats. To use such information properly in applications, a GPL must be clear about the representation with which it complies. Then, conversion mechanisms can be applied to transform exchanged GPLs into systems' internal representations for their appropriate usage assuming that the internal representation is also registered and services are available.

Registers give the flexibility to manage geographic point location representations (GPLRs). Registers of GPLRs made publicly available as a file or web service enhance the interoperability of GPLs by clearly identifying how one GPL is represented and how it can be converted in another representation.

This clause highlights the role of registers of GPLRs for geographic information interoperability, especially for the conversion of one GPLR into another through different environments, including static vs. dynamic.

## 5.2 User's environment and registers

The role of a register invoked by a user's environment is depicted in Figure 1. In a user's environment, a *GIS* application typically gets its input data from an *external data* repository. Usually, that data needs to be converted into the internal representation of the user's GIS environment. This is made possible through a *geographic point location converter* service, which first searches in a register environment for possible transformation (i.e. *search for specifications*) and requests to the register environment the required information to transform the GPLR into the user's GIS environment (i.e. *request for specification*). To this end, the *geographic point location converter* service passes the identification of the GPLR from the external data source to the register's environment.

In the register's environment, it is the *register* service that receives the request. Using the identification of the GPLR passed by the conversion service, it gets the specification of the representation from the register (i.e. *database of geographic point location representation*) including the possible conversions into other representations and replies to the conversion service. Finally, the conversion service gets the description information (i.e. *geographic point location specifications*) of the representation including

known conversions to other representation and the *geographic point location converter* service will decide which one bests fit the user's GIS environment.

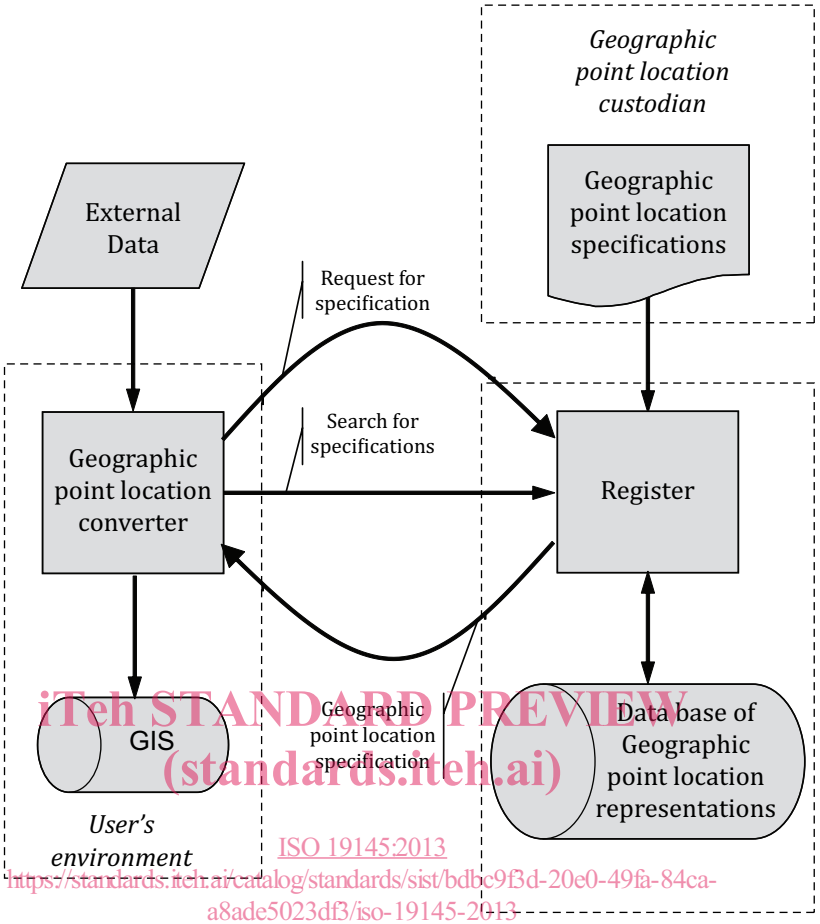




**Figure 1 — User's environment and register**

## 5.3 Static and dynamic data conversion

Two types of data conversion mechanism are recognized: static conversion and dynamic conversion.

Static data conversion consists usually in an offline process to perform a global conversion of a large amount of data. One such conversion is performed in batch conversion of static geographic data sets such as digital maps from one format to another. Another consists in the fusion process that integrates multiple geographic data sets represented by various formats in a common data set under a unique format.

Dynamic data conversion refers to an online and real-time processing mechanism. This means that a GPL can be imported or exported through a wireless network, converted, and used by a mobile terminal such as in telematics. For example, the location of moving features can be tracked globally by RFID sensors passing through the distributed RFID gateways where the various GPL may be managed in and converted from various coordinate systems and representations.

Consequently, a register of representations of geographic point locations serves in static and dynamic conversions as a resource to identify the representation format in which a GPL is encoded, to support the decoding of the GPL by the application (online or offline), and to support the encoding process in another format representation as required.

# 6 Management of registries and registers

Several actors are needed in the maintenance of registers, each one playing specific roles. ISO 19135 identifies and describes the following actors:

— Control body;

— Register manager;

— Register owner;

— Registry manager;

— Submitting organization.

The management of registries and registers shall be as specified in ISO 19135.

# 7 Schema of the register

## 7.1 Context

Clause 7 specifies the content and structure of the register of GPLR in a UML schema (see Annex C for a summary of UML notation). The schema includes only one package but refers to classes from the ISO/TS 19103 Conceptual Schema Language package, the ISO 19115 Metadata package, and the ISO 19135 Procedures for registration package (Figure 2). It includes information about the register itself and information about representations of geographic point locations (Figure 3).



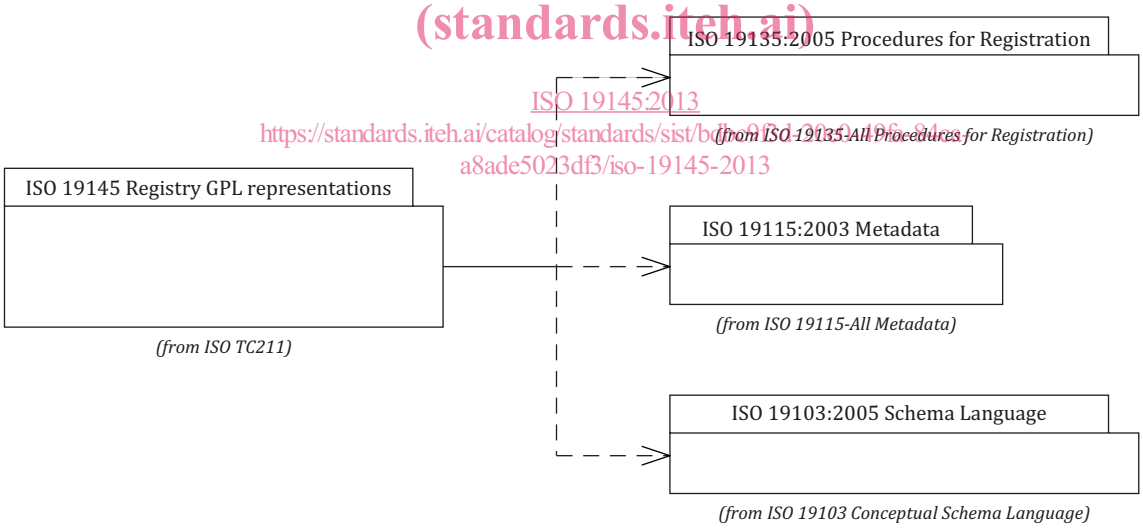


**Figure 2 — GPLR package dependencies**