ISO 19100 Geographic Information Standards

The ISO/TC211 is responsible for the development of international standards in the area of digital Geographic Information. The standards specify methods, tools, and services for data management, acquiring, processing, analysing, accessing, presenting and transferring such data between different users, systems and locations.

These standards can be organised into themes for a Geographic Information Technology Framework.

Architecture & Framework

ISO 19101 – Reference Model

ISO 19101-2 – Reference Model-Imagery

ISO 19103 – Conceptual Schema Language

ISO 19104 – Terminology

ISO 19105 – Conformance and Testing

ISO 19106 – Profiles

ISO 19146 – Cross-domain Vocabularies

ISO 19150 – Ontology

ISO 19155 – Place Identifier Architecture

Metadata, Data Content & Definitions

ISO 19110 – Methodology for Feature Cataloguing

ISO 19115 – Metadata

ISO 19115-2 – Metadata for Imagery and Gridded Data

ISO 19126 – Feature Concept Dictionaries and Registers

ISO 19131 – Data Product Specifications

ISO 19139 – Metadata XML Schema Implementation

ISO 19144-1 – Classification Systems-Part 1: Classification System Structure

ISO 19144-2 – Classification Systems-Part 2: Land Cover Classification System

Core Data Model

ISO 19107 – Spatial Schema

ISO 19108 – Temporal Schema

ISO 19109 – Rules for Application Schema

ISO 19115 – Metadata

ISO 19137 – Core Profile of the Spatial Schema

ISO 19141 – Schema for Moving Features

ISO 19149 – Rights Expression Language for Geographic Information

ISO 19152 – Land Administration Domain Model

ISO 19153 – Geospatial Digital Rights Management Reference Model

ISO 19156 – Observations & Measurements

Data Exchange Formats

ISO 19115 – Metadata

ISO 19115-2 – Metadata for Imagery and Gridded Data

ISO 19118 – Encoding

ISO 19136 – Geography Markup Language

Data Interchange and Services

ISO 19116 – Positioning Services

ISO 19117 – Portrayal

ISO 19119 – Services

ISO 19125-1 – Simple Feature Access-Common Architecture

ISO 19125-2 – Simple Feature Access-SQL Option

ISO 19128 – Web Map Server Interface

ISO 19132 – Location Based Service-Reference Model

ISO 19133 – Location Based Service-Tracking and Navigation

ISO 19134 – Location Based Services-Multimodal Routing and Navigation

ISO 19135 – Procedures for Item Registration

ISO 19142 – Web Feature Service

ISO 19143 – Filter Encoding

ISO 19145 – Registry of Representations of Geographic Point Locations

ISO 19147 – Location Based Services-Transfer Nodes

Data Quality

ISO 19113 – Quality Principles

ISO 19114 – Quality Evaluation Procedures

ISO 19115 – Metadata

ISO 19138 – Data Quality Measures

ISO 19157 – Data Quality

ISO 19158 – Quality Assurance of Data Supply

Spatial Referencing

ISO 19111 – Spatial Referencing by Coordinates

ISO 19112 – Spatial Referencing by Geographic Identifiers

ISO 19127 – Geodetic Codes and Parameters

ISO 19130 – Imagery Sensor Models for Geopositioning

ISO 19148 – Linear Referencing System

ISO 19151 – Dynamic Position Identification Scheme for Ubiquitous Space

Imagery

ISO 19101-2 – Reference Model-Imagery

ISO 19115-2 – Metadata for Imagery and Gridded Data

ISO 19123 – Schema for Coverage Geometry and Functions

ISO 19129 – Imagery, Gridded and Coverage Data Framework

ISO 19130 – Imagery Sensor Models for Geopositioning

ISO 19159 – Calibration and Validation of Remote Sensing Imagery Sensors & Data

Further information on ISO/TC211 Standards

Introduction

The ISO/TC211 has developed a group of International Standards called 19100 series that supports data management, acquiring, processing, analysing, accessing, presenting and transferring data between different users, systems and locations for geographic information.

The Standards

» ***19101:2002 Geographic Information – Reference Model***
is a guide to structuring geographic information standards in a way that will enable the universal usage of digital geographic information. This reference model describes the overall requirements for standardisation and the fundamental principles that apply in developing and using standards for geographic information. This standard is currently under revision

» ***19101-2:2008 Geographic Information – Reference Model – Part 2: Imagery***
extends the first part of ISO 19101 to specify a reference model for geographic imagery processing.

» ***19103:2005 Geographic Information – Conceptual Schema Language***
covers the adoption and use of a conceptual schema language (CSL) for developing computer interpretable models, or schemas, of geographic information. Standardisation of geographic information requires the use of a formal CSL to specify unambiguous schemas that can serve as a basis for data interchange and the definition of interoperable services. The chosen conceptual schema language is the Unified Modeling Language (UML). This standard is currently under revision

» ***19104:2008 Geographic Information – Terminology***
provides the guidelines for collection and maintenance of terminology, establishes criteria for selection of concepts to be included in other standards concerning geographic information developed by ISO/TC 211 and specifies the structure of the terminological record.

» ***19105:2000 Geographic Information – Conformance and Testing***
specifies the framework, concepts and methodology for testing and criteria to be achieved to claim conformance to the family of ISO geographic information standards.

» ***19106:2004 Geographic Information – Profiles***
defines the concept of a profile of the ISO geographic information standards developed by ISO/TC 211 and to provide guidance for the creation of such profiles.

» ***19107:2003 Geographic Information – Spatial Schema***
specifies conceptual schemas for describing the spatial characteristics of geographic features, and a set of spatial operations consistent with these schemas. It treats vector geometry and topology up to three dimensions. It defines standard spatial operations for use in access, query, management, processing, and data exchange of geographic information for spatial (geometric and topological) objects of up to three topological dimensions embedded in coordinate spaces of up to three axes.

» ***19108:2002 Geographic Information – Temporal Schema***
defines the standard concepts needed to describe the temporal characteristics of geographic information as they are abstracted from the real world. Temporal characteristics of geographic information include feature attributes, feature operations, feature associations, and metadata elements that take a value in the temporal domain.

» ***19109:2005 Geographic Information – Rules for Application Schema***
outlines the rules for creating and documenting application schemas, including principles for the definition of features. An application schema provides the formal description of the data structure and content required by one or more applications. An application schema contains the descriptions of both geographic data and other related data.

» ***19110:2005 Geographic Information – Methodology for Feature Cataloguing***
defines the methodology for cataloguing feature types. It specifies how a classification of feature types is organized into a feature catalogue and presented to the users of a set of geographic data. It also applies specifically to the cataloguing of feature types that are represented in digital form but its principles can be extended to the cataloguing of other forms of geographic data.

» ***19111:2007 Geographic Information – Spatial Referencing by Coordinates***
defines the conceptual schema for the description of spatial referencing by coordinates, optionally extended to spatio-temporal referencing and specifies the data elements, relationships and associated metadata required. It describes the minimum data required to define one-, two- and three-dimensional spatial coordinate reference systems with an extension to merged spatial-temporal reference systems.

» ***19111-2:2009 Geographic Information – Spatial Referencing by Coordinates – Part 2: Extension for Parametric Value***
specifies the conceptual schema for the description of spatial referencing using parametric values or functions. It applies the schema of ISO 19111 to combine a position referenced by coordinates with a parametric value to form a spatio-parametric coordinate reference system (CRS). The spatio-parametric CRS can optionally be extended to include time.

» ***19112:2003 Geographic Information – Spatial Referencing by Geographic Identifiers***
defines the conceptual schema for spatial references based on geographic identifiers and 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.

19113:2002 Geographic Information – Quality Principles, 19114:2003 Geographic Information – Quality Evaluation Procedures and 19138:2006 Geographic Information – Data Quality Measures will be withdrawn once 19157 Geographic Information – Data Quality is published.

» ***19115:2003 Geographic Information – Metadata***
defines metadata elements, provides a schema and establishes a common set of metadata terminology, definitions, and extension procedures. It also defines the schema required for describing geographic information and services and provides information about the identification, the extent, the quality, the spatial and temporal schema, spatial reference, and distribution of digital geographic data. This standard is currently under revision.

» ***19115-2:2009 Geographic Information – Metadata – Part 2: Extensions for Imagery and Gridded Data***
identifies the metadata required to describe digital geospatial imagery and gridded data.

» ***19116:2004 Geographic Information – Positioning Services***
specifies the data structure and content of an interface that permits communication between position-providing device(s) and position-using device(s) so that the position-using device(s) can obtain and unambiguously interpret position information and determine whether the results meet the requirements of the use.

» ***19117:2005 Geographic Information – Portrayal***
defines a schema for describing the portrayal of geographic information in a form understandable by humans. It includes the methodology for describing symbols and mapping of the schema to an application schema. This standard is currently under revision.

» ***19118:2005 Geographic Information – Encoding***
specifies the requirements for defining encoding rules to be used for interchange of geographic data within the ISO 19100 series of International Standards. An encoding rule allows geographic information defined by application schemas and standardized schemas to be coded into a system-independent data structure suitable for transport and storage. This standard is currently under revision.

» ***19119:2005 Geographic Information – Services***
identifies and defines the architecture patterns for service interfaces used for geographic information, defines its relationship to the Open Systems Environment model, and presents geographic services taxonomy and a list of example geographic services placed in the services taxonomy.

» ***19123:2005 Geographic Information – Schema for Coverage Geometry and Functions***
defines a conceptual schema for the spatial characteristics of coverages. Coverages support mapping from a spatial, temporal or spatiotemporal domain to feature attribute values where feature attribute types are common to all geographic positions within the domain.

» ***19125-1:2004 Geographic Information – Simple Feature Access – Part 1: Common Architecture***
describes the common architecture for simple feature geometry. The simple feature geometry object model is Distributed Computing Platform neutral and uses UML notation. This standard is currently under revision.

» ***19125-2:2004 Geographic Information – Simple Feature Access – Part 2: SQL Option***
define a standard Structured Query Language (SQL) schema that supports storage, retrieval, query and update of feature collections via the SQL Call-Level Interface (SQL/CLI) (ISO/IEC 9075-3:2003). This standard is currently under revision.

» ***19126:2009 Geographic Information – Feature Concepts Dictionaries and Registers***
specifies a schema for geographic feature concept dictionaries managed as registers.

» ***19127:2005 Geographic Information – Geodetic Codes and Parameters***
defines rules for the population and maintenance of registers of geodetic codes and parameters and identifies the data elements, in compliance with ISO 19111 and ISO 19135, required within these registers.

» ***19128:2005 Geographic Information – Web Map Server Interface***
specifies the behaviour of a Web Map Service (WMS) that produces spatially referenced maps dynamically from geographic information. It specifies operations to retrieve a description of the maps offered by a server to retrieve a map, and to query a server about features displayed on a map.

» ***19129:2009 Geographic Information – Imagery, Gridded and Coverage Data Framework***
defines a content model for the content type imagery and for other specific content types that can be represented as coverage data. These content models are represented as a set of generic UML patterns for application schemas.

» ***19130:2010 Geographic Information – Imagery Sensor Models for Geopositioning***
identifies the information required to determine the relationship between the position of a remotely sensed pixel in image coordinates and its geoposition. It supports exploitation of remotely sensed images and defines the metadata to be distributed with the image to enable user determination of geographic position from the observations.

» ***19131:2007 Geographic Information – Data Product Specifications***
describes requirements for the specification of geographic data products, based upon the concepts of other ISO 19100 International Standards. It describes the content and structure of a data product specification and it also provides help in the creation of data product specifications, so that they are easily understood and fit for their intended purpose.

» ***19132:2007 Geographic Information – Location-based Services – Reference Model***
defines a reference model and a conceptual framework for location-based services (LBS), and describes the basic principles by which LBS applications may interoperate.

» ***19133:2005 Geographic Information – Location-based Services – Tracking & Navigation***
is a description of the data and services needed to support tracking and navigation applications for mobile clients. It's designed to specify web services that can be made available to wireless devices through web-resident proxy applications, but is not restricted to that environment.

» ***19134:2007 Geographic Information – Location-based Services – Multimodal Routing and Navigation***
provides a conceptual schema for describing the data and services needed to support routing and navigation application for mobile clients who intend to reach a target position using two or more modes of transportation. It provides a description of a service type to support routing and navigation for a mode that operates either on a fixed route or with a fixed schedule, a description of data type for transfers, and a description of data type for schedule information and route information of a mode with a fixed route and/or schedule.

» ***19135:2005 Geographic Information – Procedures for Item Registration***
specifies procedures to be followed in establishing, maintaining and publishing registers of unique, unambiguous and permanent identifiers and meanings that are assigned to items of geographic information.

» ***19136:2007 Geographic Information – Geography Markup Language (GML)***
is an XML grammar written in XML Schema for the description of application schemas as well as the transport and storage of geographic information.

» ***19137:2007 Geographic Information – Core Profile of the Spatial Schema***
defines a core profile of the spatial schema specified in ISO 19107 that specifies, in accordance with ISO 19106, a minimal set of geometric elements necessary for the efficient creation of application schemata.

» ***19139:2007 Geographic Information – Metadata – XML Schema Implementation***
defines Geographic MetaData XML (gmd) encoding, an XML schema implementation derived from ISO 19115. It provides Extensible Markup Language (XML) schemas that enhances interoperability by providing a common specification for describing, validating and exchanging metadata about geographic datasets, dataset series, individual geographic features, feature attributes, feature types, feature properties, etc.

» ***19141:2008 Geographic Information – Schema for Moving Features***
specifies a conceptual schema that addresses moving features, i.e., features whose locations change over time. This schema includes classes, attributes, associations and operations that provide a common conceptual framework that can be implemented to support various application areas that deal with moving features.

» ***19142 Geographic Information – Web Feature Service***
specifies the behaviour of a service that provides transactions on and access to geographic features in a manner independent of the underlying data store. It specifies discovery operations, query operations, locking operations, transaction operations and operations to manage stored parameterized query expressions. To be published in 2010.

» ***19143 Geographic Information – Filter Encoding***
describes an XML and KVP encoding of a system neutral syntax for expressing projections, selection and sorting clauses collectively called a query expression. To be published in 2010.

» ***19144-1:2009 Geographic Information – Classification Systems – Part 1: Classification System Structure***
establishes the structure of a geographic information classification system, together with the mechanism for defining and registering the classifiers for such a system. It specifies the use of discrete coverages to represent the result of applying the classification system to a particular area and defines the technical structure of a register of classifiers in accordance with ISO 19135.

» ***19144-2 Geographic Information – Classification Systems – Part 2: Land Cover Meta Language (LCML)***
specifies a Land Cover Meta Language (LCML) expressed as a UML metamodel that allows different land cover classification systems to be described based physiognomic aspects. The standard also specifies the detailed structure of a register for the extension of LCML but does not specify the maintenance of the register and recognizes that there exist a number of land cover classification systems. It provides a common reference structure for the comparison and integration of data for any generic land cover classification system but does not intended to replace those classification systems. To be published in 2012.

» ***19145 Geographic Information – Registry of Representations of Geographic Point Locations***
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. To be published in 2011.

» ***19146 Geographic Information – Cross Domain Vocabularies***
defines a methodology for cross-mapping technical vocabularies that have been adopted by industry-specific geospatial communities. It also specifies an implementation of ISO 19135 for the registration of geographic information concepts for the purpose of integrating multiple domain-based vocabularies. To be published in 2011

» ***19147 Geographic Information – Location-based Services – Transfer Nodes***
specifies the data types, and operations associated with those types, for the implementation of Transfer Nodes and their services in transport modelling and location based services. To be published in 2013.

» ***19148 Geographic Information – Linear Referencing***
specifies a conceptual schema for locations relative to a one-dimensional object as measurement along (and optionally offset from) that object. It defines a description of the data and operations needed to use and support linear referencing. The standard is applicable to transportation, utilities, location-based services and other applications which define locations relative to linear objects. To be published 2011

» ***19149 Geographic Information – Rights Expression Language for Geographic Information – GeoREL***
defines a XML-based vocabulary or language to express rights for geographic information in order that digital licenses may be created for such information and related services. This language, an extension of the rights expression language in ISO/IEC 21000-5, is to be used to compose digital licenses. Each digital license will unambiguously express those particular rights that the owners (or their agent) of a digital geographic resource extends to the holders of that license. The digital rights management system in which these licenses are used can then offer ex ante (before the fact) protection for all such resources. To be published in 2011.

» ***19150 Geographic Information – Ontology***
aims at identifying how the concept of ontology and the Semantic Web can support and facilitate the work of ISO/TC 211 as well as how ISO/TC 211 may contribute to the Semantic Web in the perspective of improving the interoperability of geographic information. The project intends also to investigate the translation of some UML models into OWL and other structure for ontology.

» ***19151 Geographic Information – Logical Location Identification Scheme***
proposes a logical position identification scheme, u-Position to be used for referencing spatial information in any distributed environments without physical position data such as coordinates. To be published in 2012.

» ***19152 Geographic Information – Land Administration Domain Model (LADM)***
defines a reference Land Administration Domain Model (LADM) covering basic information-related components of Land Administration (including those over water as well as land, and elements above and below the surface of the earth). To be published 2011.

» ***19153 Geospatial Digital Rights Management Reference Model (GeoDRM RM)***
is a reference model for digital rights management (DRM) functionality for geospatial resources (GeoDRM). As such, it is connected to the general DRM market in that geospatial resources must be treated as nearly as possible like other resources, such as music, text, or services. It is not the intention here to reinvent a market nor the existing technology that already exists and is thriving, but to make sure that a larger market has access to geospatial resources through a mechanism that it understands and that is similar to and consistent with the ones already in use. To be published in 2011.

» ***19155 Geographic Information – Place Identifier (PI) Architecture***
defines an architecture which specifies the concept, structure and encoding of a "Place Identifier." The standard also includes a defined set of related service interfaces, collectively referred to as the PI Platform. These service interfaces handle the registration, and conversion of the Place Identifiers. To be published in 2012.

» ***19156 Geographic Information – Observations and Measurements***
defines a conceptual schema for observations, and for features involved in sampling when making observations. These provide models for the exchange of information describing observation acts and their results, both within and between different scientific and technical communities. To be published in 2011.

» ***19157 Geographic Information – Data Quality***
provides the principles for describing the quality for geographic data and concepts for handling quality information for geographic data, and a consistent and standard manner to determine and report a dataset's quality information. It aims also to provide guidelines for evaluation procedures of quantitative quality information for geographic data. To be published in 2012.

» ***19158 Geographic Information – Quality Assurance of Data Supply***
provides a framework for quality assurance specific to geographic information. It is based upon the quality principles and quality evaluation procedures of geographic information identified in ISO 19157 and is based upon general quality management principles as defined in ISO 9000:2005. To be published in 2011.

» ***19159 Geographic Information – Calibration and Validation of Remote Sensing Imagery Sensors and Data***
defines the calibration and validation of identified airborne and space borne remote sensing imagery sensors and data.
The term calibration refers to geometry and radiometry, and includes the instrument calibration in a laboratory as well as in-situ calibration methods. The validation methods are split into process- and product-validation, and include the prerequisites for installing a validation environment.
The standard will also cover the associated metadata that has not been defined in other ISO geographic information standards. The identified sensors will include at least frame cameras, pushbroom, and whisk broom type sensors. To be published in 2012.