SLOVENSKI STANDARD
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Geografske informacije - Standardi, specifikacije, tehnična poročila in smernice, potrebni za implementacijo infrastruktur za prostorske podatke

Geographic information - Standards, specifications, technical reports and guidelines, required to implement Spatial Data Infrastructures

Geoinformation - Normen, Spezifikationen, technische Berichte und Leitfäden zur Einführung von Geodateninfrastrukturen

Information géographique - Normes, spécifications, rapports techniques et lignes directrices, nécessaires à la mise en oeuvre d'une infrastructure d'information spatiale

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TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

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Supersedes CEN/TR 15449:2006

English Version

Geographic information - Standards, specifications, technical reports and guidelines, required to implement Spatial Data Infrastructures

Information géographique - Normes, spécifications, rapports techniques et lignes directrices, nécessaires à la mise en oeuvre d'une infrastructure d'information spatiale bonne fin de journée

Geoinformation - Normen, Spezifikationen, technische Berichte und Leitfäden zur Einführung von Geodateninfrastrukturen

This Technical Report was approved by CEN on 8 November 2010. It has been drawn up by the Technical Committee CEN/TC 287.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document has been prepared by Technical Committee CEN/TC 287 "Geographic information", the secretariat of which is held by BSI.

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

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0   Introduction

0.1 Spatial Data Infrastructures

Spatial data infrastructure (SDI) is a general term for the computerised environment for handling data that relates to a position on or near the surface of the earth. It may be defined in a range of ways, in different circumstances, from the local up to the global level.

For example, the Group on Earth Observations (GEO) in the context of the Global Earth Observation System of Systems (GEOSS) refers to the definition adopted by the Global Spatial Data Infrastructure (GSDI) Association, in which a SDI

> *"encompasses the policies, organizational remits, data, technologies, standards, delivery mechanisms, and financial and human resources necessary to ensure that those working at the global and regional scale are not impeded in meeting their objectives".*

Likewise, the United Nations SDI (UNSDI) initiative defines SDI as an "umbrella" of policies, standards and procedures under which organizations and technologies interact to foster more efficient use, management and production of geo-spatial data.

The European Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE) defines a SDI as:

> *"the metadata, spatial data sets and spatial data services; network services and technologies; agreements on sharing, access and use; and coordination and monitoring mechanisms, processes and procedures, established, operated or made available in an interoperable manner".*

This Technical Report adopts the INSPIRE definition. It focuses on the technical aspects of a SDI, thereby limiting the term SDI to mean an implementation-neutral technological infrastructure for geospatial data and services, based upon standards and specifications. This report does not consider a SDI as a carefully designed and dedicated information system; rather, it is viewed as a collaborative framework of disparate information systems that contain resources that stakeholders desire to share. The common denominator of SDI resources, which can be data or services, is their spatial nature. It is understood that the framework is in constant evolution, and that therefore the requirements for standards and specifications supporting SDI implementations evolve.

0.2 Intended readership

The intended readership of this report are those people who are responsible for creating frameworks for SDI, experts contributing to INSPIRE, experts in information and communication technologies and e-government that need to familiarize themselves with geographic information and SDI concepts, and standards developers and writers.

0.3 Aim of the report

The aims of this report are three-fold:

— to identify the standards, specifications, technical reports and guidelines, required to implement a SDI in Europe;

— to give recommendations as to whether any of these items should become European standards (ENs), and to propose a roadmap for future work items;

— to provide recommendations for measures to be taken in order to support implementation and maintenance of a SDI.

Existing material about SDIs abounds. The criteria used for determining if a given standard or specification is referred to in this report are:

— the publication addresses an aspect of the SDI; and

— the publication is non- proprietary in nature.

Based on these considerations, the following reports have been taken into account:

— legal texts and guidelines produced in the context of INSPIRE;

— documents produced by ISO/TC 211;

— documents produced by the Open Geospatial Consortium (OGC), including the OpenGIS Reference Model (ORM) (OGC, 2003);

— the European Interoperability Framework and related documents;

— deliverables from the European Union-funded projects (GIGAS, SANY);

— existing national guidelines based on the (EN) ISO 19100 series of standards.

The report covers the main concerns of a SDI in Europe:

— a data-centric and a service-centric view on SDI, brought together in a Reference Model;

— concerns related to multi-lingual and cultural adaptability;

— geo-portals;

— implementation;

— SDI aspects currently not covered by standards.

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1   Management summary

In order for standards and specifications to be useful for implementing a SDI in Europe, it needs to be straightforward to identify which standards are relevant in a particular situation, and the interpretation of standards should be unambiguous. This Technical Report provides a framework for the identification of standards, and makes recommendations with the aim of enhancing interoperability between information systems that provide data and services in support of a SDI. The following paragraphs summarize the recommendations of this Technical Report.

For the realisation of SDI in Europe, it is recommended that a number of registration authorities are established. A SDI needs, like any other distributed information system, a reference frame. This is the aggregation of the data needed by different components of the information systems. In a SDI context, the reference frame includes:

— units of measures;

— coordinate reference systems;

— codelist definitions;

— encoding schemas;

— feature data dictionaries (see EN ISO 19126);

— feature catalogues (see EN ISO 19110);

— portrayal catalogues and related symbology registers.

Registries are required for these information elements and geographical items, and for:

— cultural and linguistic adaptability of metadata elements;

— European common data models;

— national data which are of interest in a cross-border community or in a multilingual community.

Registries should be conformant to EN ISO 19135, *Geographic information — Procedures for item registration (ISO 19135:2005)* where applicable. Organisations which implement a SDI should have a content registration authority which provides a control body (to decide on the acceptability of proposals for changes to the content of a register).

In order to enable the cultural and linguistic adaptability (CLA) of metadata and common data models, it is recommended to use unique names and codes for the information elements and the geographical items (e.g. feature type). A number of practical suggestions related to CLA are given in Clause 10.

All services should be categorized based around the EN ISO 19119 taxonomy.

Service-oriented architecture or resource-oriented architectures should be applied when the following issues are considered to be important:

— components of information systems run on different platforms;

— the system consists of components from different vendors;

— the service is to be published and available on the internet;

— wrapping of existing services where these are exposed as web services;

— making existing functionality available for other applications on other platforms.

The use of UML according to ISO/TS 19103 should be used as an SDI conceptual schema language. Object Constraint Language (OCL) should be used to define requirements and apply constraints to a UML model.

If an information community applies a Conceptual Schema Language other than UML, it is the responsibility of that information community to map the ISO general feature model to the meta-model of the Conceptual Schema Language of choice, and to maintain the mapping rules, following the ISO/TS 19103 conformance statement:

> *Non-UML schemas shall be considered conformant if there is a well-defined mapping from a model in the source language into an equivalent model in UML and that this model in UML is conformant.*

In order to provide a GML application schema, an application schema should be made by applying a conceptual schema language, and the GML application schema should be derived from that conceptual model, applying the rules for mapping from UML as described in Annex E of EN ISO 19136:2009.

It is recommended that CEN/TC 287, in collaboration with ISO/TC 211 and OGC, start to initiate work on the following items:

— catalogue service;

— XML encoding of portrayal;

— quality aspects of services;

— support for cultural and linguistic adaptability.

It is further recommended that before a given standard or specification be made mandatory in a European or national legislation, the standard be implemented and tested.

Practical experience with the implementation of a given standard may reveal that a European profile thereof is needed.

During the period of time that this TR has been under development, a significant amount of work has been undertaken to develop the semantic web using linked data and related approaches. This will have a significant impact on this technical report, for example to assess the additional relevant W3C standards and their relation to CEN/TC 287 and related standards work. It is expected that this will be addressed in a subsequent release of this TR.

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Summary of recommendations

1. Portrayal service standardisation should be developed (in co-operation of ISO/TC 211 and OGC) especially for view and download services (WMS, WFS and WCS).

2. The registry service of Geodetic codes and parameters should be clearly defined in order to be used in view and download services of geographic information (in Europe).

3. The document "INSPIRE Metadata Implementing Rules: Technical Guidelines based on EN ISO 19115 and EN ISO 19119" should be used as the SDI metadata standard for discovery.

4. EN ISO 19109 and referred standards are adopted as SDI rules for specifying data structures and semantics.

5. The use of UML according to ISO/TS 19103 should be used as an SDI conceptual schema language. Object Constraint Language (OCL) should be used to define requirements and apply constraints to a UML model.

6. EN ISO 19136 (GML) is adopted as the encoding method when transferring geographic data.

7. CEN ISO/TS 19139 is adopted as the encoding method when transferring information related to geographic data such as metadata, feature catalogues and data dictionaries.

8. The extension for metadata based transfers of geospatial information defined in CEN ISO/TS 19139 is adopted for transfer of geospatial datasets.

9. There should be transparent access to data through services on the web for SDIs in Europe.

10. Unique identifiers for use in a European SDI should consist of a namespace and an identifier which is unique within its namespace.

11. Web Service Architecture (WSA), either service-oriented or resource-oriented, should be applied as appropriate within the overall technical architecture.

12. Key performance indicators should be established for the measurement of the state of standards in a SDI.

13. Organisations which implement an SDI should have a content registration authority which provides a conformance role for content (applying the concept of the Registration authority – as defined in EN ISO 19135, *Geographic information — Procedures for item registration (ISO 19135:2005)*).

2 Scope

This Technical Report identifies and describes standards that are required for a spatial data infrastructure (SDI).

This Technical Report describes a reference model for a spatial data infrastructure, covering framework standards, metadata and catalogue services and geospatial reference systems. It provides both data-centric and service-centric views.

This Technical Report discusses issues associated with implementation of a spatial data infrastructure, in particular cultural and linguistic adaptability and geo-portals, and identifies the standards, technical specifications, technical reports and guidelines, required to implement a spatial data infrastructure in Europe.

This Technical Report proposes a roadmap for future standards work items, and makes recommendations for measures to be taken in order to support implementation and maintenance of a spatial data infrastructure.

3 Normative references

Not applicable.

4 Terms and definitions

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

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4.1
conceptual formalism
set of modelling concepts used to describe a conceptual model

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[EN ISO 19101:2005]

EXAMPLE   UML meta model, EXPRESS meta model.

NOTE   One conceptual formalism can be expressed in several conceptual schema languages.

4.2
conceptual model
model that defines concepts of a universe of discourse

[EN ISO 19101:2005]

4.3
conceptual schema
formal description of a conceptual model

[EN ISO 19101:2005]

4.4
conceptual schema language
formal language based on a conceptual formalism for the purpose of representing conceptual schemas

[EN ISO 19101:2005]

EXAMPLE   UML, EXPRESS, IDEF1X.

NOTE   A conceptual schema language may be lexical or graphical. Several conceptual schema languages can be based on the same conceptual formalism.

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4.5
conformance
fulfilment of specified requirements

[EN ISO 19113:2005]

4.6
component
physical, replaceable part of a system that packages implementation and provides the realization of a set of interfaces

[ISO/TS 19103:2005]

4.7
identifier
linguistically independent sequence of characters capable of uniquely and permanently identifying that with which it is associated

[ISO/IEC 11179-3:2003]

4.8
interoperability
capability to communicate, execute programs, or transfer data among various functional units in a manner that requires the user to have little or no knowledge of the unique characteristics of those units

[ISO/IEC 2382-1:1993]

4.9
reference frame
aggregation of the data needed by different components of an information system

4.10
resource
asset or means that fulfils a requirement

[EN ISO 19115:2005]

4.11
Spatial Data Infrastructure
SDI
metadata, spatial data sets and spatial data services; network services and technologies; agreements on sharing, access and use; coordination and monitoring mechanisms, processes and procedures, established, operated or made available in an interoperable manner

[INSPIRE]

NOTE   In the context of this report the term SDI is restricted to a platform- and implementation-neutral technological infrastructure for geospatial data and services, based upon standards and specifications.

4.12
Use Case
specification of a sequence of actions, including variants, that a system (or other entity) can perform, interacting with actors of the system

[ISO/IEC 19501:2005]

5 Abbreviated terms

API   application programming interface

CLA   cultural and linguistic adaptability

CORBA   Common Object Request Broker Architecture

DCE   Distributed Computing Environment

DRM   digital rights management

ebXML   Electronic business using eXtensible Markup Language

EOSE   Extended Open System Environment

EN   European Standard (CEN deliverable)

ESDI   European Spatial Data Infrastructure

INSPIRE   Infrastructure for Spatial Information in Europe

GI   geographic information

GIRM   Geospatial Interoperability Reference Model

GML   Geography Markup Language

ISO   International Organization for Standardization

ICT   information and communications technology

IT   information technology

NSDI   National Spatial Data Infrastructure

OASIS   Organization for the Advancement of Structured Information Standards

OCL   Object Constraint Language

ODP   Open Distributed Processing

OGC   Open Geospatial Consortium

OLE/COM   Object linking and embedding/ Component Object Model

OMG   Object Management Group

ORM   OpenGIS Reference Model

RM-ODP   Reference Model of Open Distributed Processing

SDI   Spatial Data Infrastructure

SLD   Styled Layer Descriptor

SOA   Service Oriented Architecture