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Geographic information - Spatial data infrastructures - Part 3: Data centric view

Geoinformation - Geodateninfrastrukturen - Teil 3: Datenzentrierte Sicht

Information géographique - Infrastructures de données spatiales - Partie 3: vue centrée sur les données d'une infrastructure de données spatiales (IDS)

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Geoinformation - Geodateninfrastrukturen - Teil 3: Datenzentrierte Sicht

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Foreword

This document (CEN/TR 15449-3:2012) 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.

This document supersedes CEN/TR 15449:2011.

The present standard comprises the following parts:

— CEN/TR 15449-1, *Geographic information — Spatial data infrastructures — Part 1: Reference model*

— CEN/TR 15449-2, *Geographic information — Spatial data infrastructures — Part 2: Best practices*

— CEN/TR 15449-3, *Geographic information — Spatial data infrastructures — Part 3: Data centric view* (the present part);

— CEN/TR 15449-4, *Geographic information — Spatial Data Infrastructure — Part 4: Service centric view*

Introduction

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.

This Technical Report focuses on the technical aspects of SDIs, thereby limiting the term SDI to mean an implementation neutral technological infrastructure for geospatial data and services, based upon standards and specifications. It does not consider an 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 continuously.

SDIs are becoming more and more linked and integrated with systems developed in the context of e-Government. Important drivers for this evolution are the Digital Agenda for Europe, and related policies (see Part 1). By sharing emerging requirements at an early stage with the standardization bodies, users of SDIs can help influence the revision of existing or the conception of new standards.

The users of an SDI are considered to be those individuals or organisations that, in the context of their business processes, need to share and access geo-resources in a meaningful and sustainable way. Based on platform- and vendor-neutral standards and specifications, an SDI aims at assisting organisations and individuals in publishing, finding, delivering, and eventually, using geographic information and services over the internet across borders of information communities in a more cost-effective manner.

Existing material about SDIs abounds. The criteria used for determining if a given standard or specification is referred to in this report are that the publication addresses an aspect of SDI, and that it 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 (and co-published by CEN);
- documents produced by the Open Geospatial Consortium (OGC), including the OpenGIS Reference Model (ORM);
- the European Interoperability Framework and related documents;
- deliverables from the European Union-funded projects (e.g. GIGAS, SANY).

Considering the complexity of the subject and the need to capture and formalise different conceptual and modelling views, CEN/TR 15449 is comprised of multiple parts:

- Part 1: Reference model: this provides a general context model for the other Parts, applying general IT architecture standards;
- Part 2: Best Practice: this provides best practices guidance for implementing SDI, through the evaluation of the projects in the frame of the European Union funding programmes;
- Part 3: Data centric view: this addresses concerns related to the data, which includes application schemas and metadata;

- Part 4: Service centric view (in preparation): this includes the taxonomy of services, concepts of interoperability, service architecture, service catalogue, and the underlying IT standards.

Further parts may be added in the future.

1 Scope

Part 3 of the Technical Report describes a data-centric view of a Spatial Data Infrastructure (SDI). The Data Centric view addresses the concepts of semantic interoperability, the methodology for developing data specifications through the application of the relevant International Standards, and the content of such specifications including Application Schemas, Feature Catalogues, General Feature Model, Data Lifecycle Management and Data Quality, Data Access and Data Transformation.

The intended readership of this Technical 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 familiarise themselves with geographic information and SDI concepts, and standards developers and writers.

2 Normative references

Not applicable.

3 Terms and definitions

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

3.1
conceptual formalism
set of modelling concepts used to describe a conceptual model

EXAMPLE UML meta model, EXPRESS meta model.

Note 1 to entry: One conceptual formalism can be expressed in several conceptual schema languages.

[SOURCE: EN ISO 19101:2005]

3.2
conceptual model
model that defines concepts of a universe of discourse

[SOURCE: EN ISO 19101:2005]

3.3
conceptual schema
formal description of a conceptual model

[SOURCE: EN ISO 19101:2005]

3.4
conceptual schema language
formal language based on a conceptual formalism for the purpose of representing conceptual schemas

EXAMPLE UML, EXPRESS, IDEF1X.

Note 1 to entry: A conceptual schema language may be lexical or graphical. Several conceptual schema languages can be based on the same conceptual formalism.

[SOURCE: EN ISO 19101:2005]

3.5
conformance
fulfilment of specified requirements

[SOURCE: EN ISO 19113:2005]

3.6
component
physical, replaceable part of a system that packages implementation and provides the realisation of a set of interfaces

[SOURCE: ISO/TS 19103:2005]

3.7
identifier
linguistically independent sequence of characters capable of uniquely and permanently identifying that with which it is associated

[SOURCE: ISO/IEC 11179-3:2003]

3.8
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

[SOURCE: ISO/IEC 2382-1:1993]

3.9
reference frame
aggregation of the data needed by different components of an information system

3.10
resource
asset or means that fulfils a requirement

[SOURCE: EN ISO 19115:2005]

3.11
spatial data infrastructure
SDI
policies, standards and procedures under which organisations and technologies interact to foster more efficient use, management and production of geo-spatial data

[SOURCE: United Nations SDI initiative (UNSDI)]

3.12
Use Case
specification of a sequence of actions, including variants, that a system (or other entity) can perform, interacting with actors of the system

[SOURCE: OMG UML Specification]

4 Abbreviated terms

API	Application Programming Interface
ATS	Abstract Test Suite

CEN	European Committee for Standardization / Comité Européen de Normalisation
CRS	Coordinate Reference System
DCE	Distributed Computing Environment
DPS	Data Product Specification
ebXML	Electronic Business using eXtensible Markup Language
EDR	Entity Relationship Diagrams
EN	European Standard (CEN deliverable)
EPSG	European Petroleum Survey Group
ESDIN	European Spatial Data Infrastructure Best Practice Network
INSPIRE	Infrastructure for Spatial Information in Europe
IT	Information Technology
GEOSS	Global Earth Observation System of Systems
GIGAS	GEOSS, INSPIRE and GMES an Action in Support
gmd	Geographic MetaData
GMES	Global Monitoring for Environment and Security
GML	Geography Markup Language
GSDI	Global Spatial Data Infrastructure Association
IEC	International Electrotechnical Commission
ISO	International Organisation for Standardization
NMA	National Mapping Agency
OCL	Object Constraint Language
ODP	Open Distributed Processing
OGC	Open Geospatial Consortium
OMG	Object Management Group
OSI	Open System Interconnection
RM-ODP	Reference Model of Open Distributed Processing
REST	Representational State Transfer
SDI	Spatial Data Infrastructure
SOA	Service Oriented Architecture

SOAP	Simple Object Access Protocol
SQL	Standard Query Language
TC	Technical Committee
TR	Technical Report
TS	Technical Specification
UML	Unified Modelling Language
UNSDI	United Nations SDI
URI	Uniform Resource Identifier
UUID	Universally Unique Identifier
WSDL	Web Service Description Language
XMI	eXtensible Markup Interface
XML	eXtensible Markup Language

5 Data-centric view on SDI

5.1 Introduction

Exchange of and access to spatial data is the principal objective of an SDI. The data are at the heart of an SDI. The spatial data in an SDI are a model of the real world. This model is developed according to well defined methodologies described in different standards. The model is made explicit through a concise description of data specifications in data specification documents. These specifications can then be used to develop new datasets or to transform existing datasets to the specifications by mapping the existing model to the model described in the specifications. In this way, semantic interoperability can be achieved: i.e. different datasets can be used together and be understood by different users in the same way. Metadata are part of the datasets and should get proper attention during the data modelling. Metadata will play a crucial role in documenting and understanding the content of the data model and data product specification, in achieving technical interoperability.

On top of the data, and by making use of the metadata, services can be built to make the data accessible through the web and to use them in any information system by viewing, downloading or processing them. This is often referred to as a Service Oriented Architecture (SOA). A SOA enables new and existing enterprise systems to share services, information and data across technical platforms, departments and ultimately across organisational, regional and national boundaries. The benefit is that this leads from a stand-alone system-centric view to an enterprise data-centric view of IT. The transition to a data-centric SOA allows an SDI to better leverage new and existing IT investments to support such an infrastructure. The data-centric transition builds a strategy around the organisations and their geospatial data infrastructure both to preserve the IT investment and to provide better access to authoritative data sources.

In the next clauses and sub-clauses the data modelling approach, the different aspects and role of data specifications, as well as the data management aspects are elaborated. The service centric view and SOA will be further developed in a separate part of this Technical Report. Where appropriate, the relevant international standards will be summarised and examples of implementations are given, as well as existing tools for implementation.