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Intelligent transport systems — Geographic Data Files (GDF) — GDF5.0

Systèmes intelligents de transport — Fichiers de données géographiques (GDF) — GDF5.0

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Contents

Page

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 14825 was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

This second edition cancels and replaces the first edition (ISO 14825:2004), which has been technically revised.

Introduction

By the late 1980s, producers and users of digital road map data became increasingly aware of the need for a common data interchange standard. Lack of such a standard was seen as an impediment to the commercial growth and success of industries using such data. Before the advent of the Intelligent Transport Systems (ITS) industry, development of spatial data interchange standards was done mostly on a regional basis and not designed for the specialised requirements of road-transport-related applications. The establishment of ISO/TC 204 in 1993 sought to remedy the lack of international standards for ITS. The technical committee is divided into 16 working groups. Working Group 3 (WG 3) was charged with the responsibility of developing standards to promote interchangeability of map data and interoperability of systems using map databases.

The work of WG 3 started in 1994 with a review of the available regional standards documents, including standards developed by the Japan Digital Road Map Association (JDRMA) and developments in the US that resulted in the Spatial Data Transfer Standard (SDTS). European standardization efforts resulted in a standard called GDF3.0 (Geographic Data Files), which eventually was adopted as the basis for internationalized developments, leading to the publication of GDF4.0 in 2004.

In the 1990s, the GDF standard was instrumental in enabling the European business-to-business (B2B) market for in-vehicle navigation in that it provided interoperability for exchanging digital map data between map manufacturers and navigation system integrators. The GDF specifications provided a base for both the capturing of geographic content and the exchanging of it. Its original design foresaw a powerful, application-independent model, while its initial rendition as a standard specifically addressed the requirements for the richness of navigable map databases. Since then, GDF has evolved in terms of boosted data modelling capabilities, broadened international applicability, expanded geographic domains, and diversified exchange formats. As a result, GDF covers a wide range of application domains and has been adapted to many geospatial technologies

The current document presents the specification for GDF5.0, resulting from approximately 30 rounds of meetings held between 2001 and 2008 and involving experts from Australia, Canada, the Czech Republic, France, Germany, Japan, the Republic of Korea, the Netherlands, and the United States of America. Extensive activities towards harmonization with ISO/TC 211 standards were undertaken. Major GDF5.0 enhancements include UML model migration and refinements, harmonization with linear referencing and geospatial web standards, support for 3-D content and time coordinates, comprehensive character set and phonetic representations, and new XML- and SQL-based delivery formats.

The specification of this International Standard is divided into several parts.

After the introductory clauses, the overall conceptual data model is specified. In it, the basic building blocks of GDF and their interrelations are explained. It contains a specification of the different types of topology supported by this International Standard. It furthermore describes how database representations of real world objects, referred to as Features, are defined. It describes the characteristics of Features, called Attributes, and the topological and non-topological interrelations between Features. Finally, it describes the organization of the Features in GDF. Semantically, Features are organized in different Feature Themes. Logically and physically, Features are organized in Sections by area or in Layers by contents.

In the Feature Catalogue, the different Features supported by this International Standard are defined. A special case is the Features from the Services Feature Theme. Because the requirements for this Feature Theme are highly market-oriented, the Services Feature Theme does not contain any normative Features, but contains an annex comprising an informative list of service definitions to assist users of this International Standard (see Annex C).

In the Attribute Catalogue, the different characteristics of Features, called Attributes, are defined. A usage matrix outlines applicability of Attributes per Feature Theme and per Relationship.

In the Relationship Catalogue, the different non-topological (i.e. semantic) Relationships which Features can have are defined. Relationships can relate Features of different Feature Themes, or those from the same or different Section and/or Layer.

In the Feature representation rules, the possible geometrical ways in which the individual Features can be represented are specified for each topology type. This International Standard supports zero-, one- and two-dimensional primitives and up to four-dimensional coordinates.

The specification of Features, Attributes and Relationships by no means dictates mandatory inclusion. The actual contents of GDF, apart from a minimum set of metadata elements as specified in the delivery formats, is not specified by this International Standard since this is considered to be an issue between clients and vendors. This International Standard allows the introduction of user-defined Features, Attributes and Relationships.

In certain cases, different alternative ways of modelling and representation are offered. Representing Features in different geographical areas also may require the use of different basic representation mechanisms such as character sets, projection systems, etc. It is important that all these individual choices associated with GDF are specified. Furthermore, GDF should essentially be self-contained and be readable without any external specification. In order to make this possible, this International Standard specifies ways of describing GDF by means of metadata, captured by the Metadata Catalogue.

Apart from providing a standard for the definition of geographic road databases, this International Standard also specifies mechanisms for data exchange and delivery. In order to facilitate the definition and exchange of data, a logical view of the data organization is important. This logical view is presented in the Logical Data Structures. The data structures are specified using the data description language ESN.

Three physical realisations for data exchange and delivery are specified; the Media Record Specifications (ASCII flat file), the XML schema specifications, and the SQL encoding specifications. These specifications support the explicit registration of updated information, thereby allowing map databases to continue to reflect ground truth over time.

Features, Attributes and Relationships appear in the physical GDF as codes. These codes are specified in Annex A. Codes used in the metadata are given in Annex B, which is an informative part of this International Standard. In order to access the most up-to-date information, the user is referred to the original source organization. Annex C contains the specification of Features of the theme Services as an informative part of this International Standard. In Annex D, the syntax for specifying temporal aspects of geographic information is described. The specific rules for organizing GDF in different spatial subdivisions (Sections) is described in Annex E. As informative parts of this International Standard, guidelines for the formation of Level 2 Features from the Feature Theme Roads and Ferries are given in Annex F. A list of local Administrative Area names in different countries is provided in Annex G, as well as illustrative examples for the description of the (non-hierarchical) geopolitical structures and their components in a number of countries. Finally, the use of notation and phonetic Attributes for character strings are illustrated in the informative Annex H. Annex H provides a range of examples showing how the different notation- and phoneme-related Attribute properties can be used to qualify name strings, in both their written and their pronounced form.

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IMPORTANT — The colours represented in the electronic file of this document can be neither viewed on screen nor printed as true representations. For the purposes of colour matching, see ISO 3864-1 which provides colorimetric and photometric properties together with, as a guideline, references from colour order systems.

1 Scope

This International Standard specifies the conceptual and logical data model and physical encoding formats for geographic databases for Intelligent Transport Systems (ITS) applications and services. It includes a specification of potential contents of such databases (data dictionaries for Features, Attributes and Relationships), a specification of how these contents shall be represented, and of how relevant information about the database itself can be specified (metadata).

The focus of this International Standard is on ITS applications and services and it emphasizes road and road-related information. ITS applications and services, however, also require information in addition to road and road-related information.

EXAMPLE 1 ITS applications and services need information about addressing systems in order to specify locations and/or destinations. Consequently, information about the administrative and postal subdivisions of an area is essential.

EXAMPLE 2 Map display is an important component of ITS applications and services. For proper map display, the inclusion of contextual information such as land and water cover is essential.

EXAMPLE 3 Point-of-Interest (POI) or service information is a key feature of traveller information. It adds value to end-user ITS applications and services.

Typical ITS applications and services targeted by this International Standard are in-vehicle or portable navigation systems, traffic management centres, or services linked with road management systems, including the public transport systems.

The Conceptual Data Model has a broader focus than ITS applications and services. It is application independent, allowing for future harmonization of this International Standard with other geographic database standards.

2 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 690, *Information and documentation — Guidelines for bibliographic references and citations to information resources*

ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes*. Codes are available at http://unstats.un.org/unsd/methods/m49/m49alpha.htm