Intelligent transport systems - Geographic Data Files (GDF) - Overall data specification

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EESTI STANDARDIKESKUS

EESTI STANDARDI EESSÕNA **NATIONAL FOREWORD**

Käesolev Eesti standard EVS-EN ISO 14825:2004 sisaldab Euroopa standardi EN ISO 14825:2004 ingliskeelset teksti. Käesolev dokument on jõustatud 18.05.2004 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes. Standard on kättesaadav Eesti standardiorganisatsioonist.	This Estonian standard EVS-EN ISO 14825:2004 consists of the English text of the European standard EN ISO 14825:2004. This document is endorsed on 18.05.2004 with the notification being published in the official publication of the Estonian national standardisation organisation. The standard is available from Estonian standardisation organisation.

Käsitlusala: This International Standard specifies the conceptual and logical data model and the exchange format for geographic data bases for Intelligent Transportation Systems (ITS) applications. It includes a specification of potential contents of such data bases (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 (meta data).	**Scope:** This International Standard specifies the conceptual and logical data model and the exchange format for geographic data bases for Intelligent Transportation Systems (ITS) applications. It includes a specification of potential contents of such data bases (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 (meta data).

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Intelligent transport systems - Geographic Data Files (GDF) - Overall data specification (ISO 14825:2004)

Systèmes de transport intelligents - Fichiers de données géographiques - Spécification des données globales (ISO 14825:2004)

This European Standard was approved by CEN on 16 January 2004.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (EN ISO 14825:2004) has been prepared by Technical Committee ISO/TC 204 "Transport information and control systems" in collaboration with Technical Committee CEN/TC 278 "Road transport and traffic telematics", the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2004, and conflicting national standards shall be withdrawn at the latest by August 2004.

This document supersedes ENV ISO 14825:1996.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

NOTE FROM CMC The foreword is susceptible to be amended on reception of the German language version. The confirmed or amended foreword, and when appropriate, the normative annex ZA for the references to international publications with their relevant European publications will be circulated with the German version.

Endorsement notice

The text of ISO 14825:2004 has been approved by CEN as EN ISO 14825:2004 without any modifications.

INTERNATIONAL STANDARD

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Intelligent transport systems — Geographic Data Files (GDF) — Overall data specification

Systèmes de transport intelligents — Fichiers de données géographiques — Spécification des données globales

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

Its cancels and replaces ISO/TR 14825:1996, which has been technically revised.

Introduction

By the late 1980's, 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 Traffic Information and Control Systems (TICS) industry, development of spatial data interchange standards was done mostly on a regional basis and not designed for the specialized requirements of road transport-related applications. Furthermore, the 1990s saw the expansion of the number of TICS applications developers who needed map data vendors to supply their products in an economical, efficient and non-ambiguous manner. Moreover, the TICS applications suppliers and developers were largely deploying systems in Europe, Japan, and the USA, marking the essential need for standardization on a global level.

The industry looked to ISO as a logical forum for standards development. The establishment of ISO TC204 in 1993 sought to remedy the lack of international standards for the TICS industry now also known as Intelligent Transportation Systems (ITS). The technical committee is divided into 16 working groups. Working Group 3 (WG3) was charged with the responsibility of developing standards to promote interchangeability of map data and interoperability of systems using map databases.

The work of WG3 started in 1994 with a review of the available regional standards documents. Considerable differences were identified. The Japanese standard developed by the Japan Digital Road Map Association (JDRMA) was oriented towards navigation applications with much emphasis placed on access speed and file size. The developments in the US had resulted in the Spatial Data Transfer Standard (SDTS), a highly generalized approach that provided a standard way of describing the contents of a geographic data set rather than on standardizing its content. The work in Europe resulted in a standard called GDF3.0 (Geographic Data Files), featuring an application independent data model, traffic and transport related extensions, flexibility, and extendibility.

The review of available standards led to an agreement that the European input represented the most comprehensive source of input and would be used as the basis for further development. The work was initially divided into 8 task groups, each dealing with a specific clause of the final document. In these task groups, delegates from Australia, Canada, Germany, Japan, Korea, the Netherlands, and the United States worked together to identify and incorporate the requirements of the different member states in the base documents. In the course of this process, the number of issues which spanned more than the base task group documents increased. Consequently, it was decided to continue the work in one joint task group in order to finalize the standard document. This change also enabled the merging of the component work into a single document.

Approximately 30 rounds of meetings were held between 1994 and 2000. This document contains the result of this activity.

The current document presents the specification for the GDF4.0, a standard for the definition and exchange of geographic road databases. 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 a GDF and their interrelations are explained. It contains a specification of the different types of topology supported by this International Standard. It addresses the different levels on which the data are defined. It furthermore describes how database representations of real world objects, referred to as features, are defined. This International Standard further defines simple features and complex features. Simple features are defined using the basic building blocks. Complex Features are defined as aggregations of other features. This International Standard describes the characteristics of features, called attributes, and the topological and non-topological interrelations between features. Attributes can be either simple, i.e. consisting of one atomic value, or composite, i.e. consisting of a number of values, each represented by a separate Sub-Attribute. Non-topological interrelations between features are called Relationships. This International Standard specifies that Feature Representations can be of zero, one, or two dimensions. Finally, this International Standard describes the organization of the features in a GDF. Conceptually, features are organized in different feature themes. 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. This International Standard also supports the inclusion of features which are not defined in this International Standard. These are called user-defined features. This specification of features by no means dictates mandatory inclusion. The actual contents of a GDF, apart from a minimum set of records [See Media Record Specifications], is not specified by this International Standard since this is considered to be an issue between clients and vendors. A special case is the Features from the Services Feature Theme. Because the requirements for this feature theme are highly market-oriented, it has been decided that the Services Feature Theme does not contain any predefined Features. Although they all are user-defined, the annex contains an informative list of service definitions to assist users of this International Standard.

In the Attribute Catalogue the different characteristics of features, called Attributes, are defined per feature theme. Also, in the case of Attributes, this International Standard supports the ability to define Attributes not defined by this International Standard. These are called user-defined attributes. The attributes defined do not specify the contents of a proper GDF.

In the Relationship Catalogue the different non-topological relations which features can have are defined. Within GDF these are called Relationships. Relationships can relate features of different Feature Themes. Thus they are not defined per feature theme. Also in the case of Relationships, this International Standard supports the ability to define user-defined Relationships. Again, the Relationships defined do not specify the contents of a proper GDF.

In the Feature Representation Rules the possible geometrical ways in which the individual Features can be represented are specified. This International Standard supports zero-, one- and two-dimensional representation. Three-dimensional representation is supported by this International Standard but not geometrically.

As stated above, this International Standard does not specify the actual contents of a GDF. It furthermore allows the introduction of user-defined features. 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 a GDF are specified. Furthermore, a 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 a specific GDF by means of meta data. The Metadata Catalogue contains a specification of the components of this meta data.

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

The exchange format itself is specified in the Media Record Specifications. The different records in the sequential record structures are described in addition to the specification of specific physical constraints. As mentioned above, a GDF is a representation of (part of) the real world, which in itself is dynamic. The process of bringing a GDF in line with the changed reality is called updating. The specification allows for 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 to most up-to-date information, the user is referred to the original source organisation. 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 organising a GDF in different areal subsets (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 given in Annex G.

Quality of a GDF is addressed in the informative Annex H. Quality is an important aspect of geographic information. Since a GDF is a representation of a part of the real world, which is in itself subject to change, a certain number of misrepresentations can never be excluded. It is important to be able to specify these.

Annex H contains a methodology with which this notion of quality can be measured statistically. It should be noted that the annex describes how to describe and express quality characteristics but does not specify what the quality should be.

Finally, Annex I contains an informative overview of the possible combination of attributes with the respective Feature and Relationship Types.

Intelligent transport systems — Geographic Data Files (GDF) — Overall data specification

1 Scope

This International Standard specifies the conceptual and logical data model and the exchange format for geographic data bases for Intelligent Transportation Systems (ITS) applications. It includes a specification of potential contents of such data bases (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 (meta data).

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

EXAMPLE 1 ITS applications 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. 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.

The Conceptual Data Model has a broader focus than ITS applications. It is application independent. This allows 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/IEC 8859-1, *Information technology — 8-bit single-byte coded graphic character sets — Part 1: Latin alphabet No.1*

3 Terms and definitions

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

3.1 General terms

3.1.1
accuracy
closeness of results of observations, computations or estimates to the true values or the values as accepted as being true [2]

3.1.2
cartographic primitive
atomic construction element in a cartographic representation, i.e. Node, Edge and Face