SLOVENSKI STANDARD
SIST EN 12896-1:2017

01-januar-2017

Nadomešča:
SIST EN 12896:2006

Javni prevoz - Referenčni podatkovni model - 1. del: Splošni pojmi

Public transport - Reference data model - Part 1: Common concepts

Öffentlicher Verkehr - Datenreferenzmodell - Teil 1: Gemeinsame Konzepte

Transports publics - Modèle de données de référence - Partie 1: Concepts communs

Ta slovenski standard je istoveten z: EN 12896-1:2016

ICS:

35.240.60	Uporabniške rešitve IT v prometu	IT applications in transport

SIST EN 12896-1:2017 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12896-1

September 2016

ICS 35.240.60

Supersedes EN 12896:2006

English Version

Public transport - Reference data model - Part 1: Common concepts

Transports publics - Modèle de données de référence - Partie 1: Concepts communs

Öffentlicher Verkehr - Datenreferenzmodell - Teil 1: Gemeinsame Konzepte

This European Standard was approved by CEN on 5 May 2016.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Ref. No. EN 12896-1:2016 E

Contents

Page

European foreword

This document (EN 12896-1:2016) has been prepared by Technical Committee CEN/TC 278 “Intelligent transport systems”, 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 March 2017, and conflicting national standards shall be withdrawn at the latest by March 2017.

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

This document together with documents EN 12896-2:2016 and EN 12896-3:2016 supersedes EN 12896:2006.

The series comprises the following documents:

Public transport - Reference data model - Part 1: Common concepts

Public transport - Reference data model - Part 2: Public transport network

Public transport - Reference data model - Part 3: Timing information and vehicle scheduling

Public transport - Reference data model - Part 4: Operations monitoring and control

Public transport - Reference data model - Part 5: Fare management

Public transport - Reference data model - Part 6: Passenger information

Public transport - Reference data model - Part 7: Driver management

Public transport - Reference data model - Part 8: Management information and statistics

Together these create version 6 of the European Standard EN 12896, known as “Transmodel” and thus replace Transmodel V5.1.

The split into several documents is intended to ease the task of users interested in particular functional domains. Modularisation of Transmodel undertaken within the NeTEx project has contributed significantly to this new edition of Transmodel.

In addition to the eight Parts of this European Standard an informative Technical Report (Public Transport – Reference Data Model – Informative Documentation) is also being prepared to provide additional information to help those implementing projects involving the use of Transmodel. It is intended that this Technical Report will be extended and republished as all the eight parts are completed.

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

0 Introduction

0.1 Rationale for the Transmodel Standard

Public transport services rely increasingly on information systems to ensure reliable, efficient operation and widely accessible, accurate passenger information. These systems are used for a range of specific purposes: setting schedules and timetables, managing vehicle fleets, issuing tickets and receipts, providing real time information on service running, and so on.

This standard will improve a number of features of public transport information and service management: in particular, the standard will facilitate interoperability between information processing systems of the transport operators and agencies by using similar definitions, structures and meanings for their data for the systems being part of one solution. This applies both to connecting different applications within an organization, and also to connecting applications between interworking organizations (for instance, a public authority and a transport operator).

The Transmodel standard presented in this European Standard provides a framework for defining and agreeing data models, and covers the whole area of public transport operations. By making use of this European Standard, and of data models derived from it, it will be possible for operators, authorities and software suppliers to work together much more easily towards integrated systems. Moreover, the breadth of the standard will help to ensure that future systems' developments can be accommodated with the minimum of difficulty.

0.2 Use of the Transmodel Standard

This European Standard presents version **6.0** of the European Standard EN 12896, known as "Transmodel". Transmodel **6.0** is a reference standard which provides a conceptual data model for use by organizations with an interest in information systems for the public transport industry.

As a reference standard, it is not necessary for individual systems or specifications to implement Transmodel as a whole.

It needs to be possible to describe (for those elements of systems, interfaces and specifications which fall within the scope of Transmodel):

— the aspects of Transmodel that they have adopted;

— the aspects of Transmodel that they have chosen not to adopt.

Transmodel may prove of value to:

— organizations within the public transport industry that specify, acquire and operate information systems;

— organizations that design, develop and supply information systems for the public transport industry.

For an organization within the public transport industry wishing to specify, acquire and operate information systems, Transmodel may be distilled, refined, or adapted to form a comprehensive data model for the organization. This will enable the organization to specify its database structures and/or its system interfaces, in such a way that separate modules can be openly tendered but will still integrate easily. The organization also has a greater likelihood that information exchange interfaces with external organizations will be easily achieved.

For an organization wishing to design, develop and supply information systems for the public transport industry, Transmodel may be distilled, refined, or adapted to form a comprehensive data model for the product suite. This will enable the organization to develop its products in such a way that separate

modules will integrate easily, but also so that they may be sold separately to clients seeking Transmodel-compliant systems.

Transmodel is a large and complex model, and allows for great flexibility. Consequently it takes some skills and resource to apply it effectively in order to develop the physical data model and its implementations for a particular aspect, e.g. one particular functional domain, such as vehicle scheduling or fare management or for a particular interface, as between a ticket machine and a management system, or a particular organizational boundary, as between two connecting transport operators.

For such situations, Transmodel provides a wider setting and a starting point. The specific elements of Transmodel have to be refined, attributes and data formats will have to be completed, for a specific sub-model of the Transmodel data model. The resulting specification, although specific, will facilitate the built of a coherent overall systems framework, since it will coexist more readily with other Transmodel-based specifications.

For all of these potential users, the adoption of Transmodel as a basis for development means that a common language is being used. Thus, users will understand and assess the claims of suppliers better, and specification developers will be more likely to be working in alignment with each other.

0.3 Applicability of the Transmodel Standard

0.3.1 General

Transmodel may be applied to any framework for information systems within the public transport industry, but there are three circumstances to which it is particularly suited:

— specification of an organization's 'information architecture';

— specification of a database;

— specification of a data exchange interface.

0.3.2 Specification of information architecture

An 'information architecture' refers to the overall structure of information used by an information system, which is used to determine:

— the structure of data held in system databases;

— the structure of data exchanged across interfaces between systems.

It may be used as a strategic guide to system planning and evolution, and as the basis for the specification and acquisition of individual systems.

An information architecture made up of independent modules with well-defined interfaces is easier to maintain. A malfunctioning module can be taken out of service or completely replaced without disrupting the rest of the system. This is particularly beneficial for online or safety critical systems. The modules can also be more easily reconfigured on to hardware located elsewhere on the network to fit in with changes in organizational arrangements for managing the business and data administration processes.

The information architecture itself should be evaluated from time to time to make sure that it is still meeting the needs of the organization. Technological changes in communications and computing are continuously bringing forward new opportunities for evolving the systems supporting the business.

0.3.3 Specification of a database

At a more technical level, an organization's systems will have a collection of data in one or more databases, which may be associated with individual applications or may be common to many applications.

In either case, Transmodel can serve as a starting point for the definition of a database schema, which will be used for the physical implementation of databases. Whether applications access a common database built to this schema, or have their own databases and exchange data built to consistent schemas, the use of an overall reference data model assists integration.

Technical constraints (such as memory capacity restrictions of smart cards) may affect the detail and complexity of the data models that can be used in particular data storage devices. Transmodel does not itself specify a level of detail to adopt.

0.3.4 Specification of an interface

Public transport organizations may require different applications to exchange data with each other. Also, public transport organizations may exchange data with other organizations. In either case, the reference data model can be used to help design the interfaces.

Again, technical constraints (such as bandwidth limitations of radio communications links) may affect the detail and complexity of the data models that can be used for particular interfaces. Transmodel does not itself specify a level of detail to adopt.

0.4 Conformance statement

A specification which cites Transmodel needs to include comparisons of the specification against the Transmodel reference data model in at least two conformance levels:

— level 1 (the global level) identifies which data domains within the specification are drawn from the Transmodel data domains, and which are not;

— level 2 (the detailed level) compares the data model within the specification against the Transmodel entities.

The level 1 conformance statement should be presented as a table based on one of the following:

— the Transmodel data domains as described in the normative part of the document: description of the network, versions/validity/layers, tactical planning components, vehicle scheduling, driver scheduling, schedules and versions, rostering, personnel disposition, operations monitoring and control, passenger information, fare collection, management information, multi-modal operation, multiple operators' environment;

— alternatively, the corresponding UML diagrams as presented in this document.

The level 2 conformance statement shall be presented as a table in which the data concepts used in the specification are described as:

— "Unmodified": concepts in the specification which have the same definition, properties and relationships as in the corresponding Transmodel domain;

— "Modified": concepts in the specification which are similar to a Transmodel concept but which differ in the details of certain attributes and/or relationships (e.g. attributes added);

— "Alternative": concepts or groups of concepts in the specification which model the same concepts as Transmodel but in a significantly different way;

— "Additional": concepts in the specification which are not drawn from Transmodel;

— "Omitted": concepts in Transmodel which are not used in the specification.

0.5 Transmodel origins

0.5.1 ENV 12896

The prestandard ENV 12896 was prepared by the work area Transmodel of the EuroBus project (1992-1994) and by the DRIVE II task force Harpist (1995). The EuroBus/Transmodel and Harpist kernel team was established as a subgroup (SG4) of CEN TC278 Working Group 3 (WG3) and led by TransExpert (F). The results of these projects were based upon earlier results reached within the Drive I Cassiope project and the ÖPNV data model for public transport, a German national standard. The prestandard reflected the contents of deliverable C1 of the Harpist task force, published in May 1995, with modifications resulting from the discussion process in CEN TC278/WG3 between May and October 1995.

The different organizations that have technically contributed to the preparation of the prestandard ENV 12896 were the partners of EuroBus/Transmodel and the Harpist task force: Beachcroft Systems (UK), CETE-méditerranée (F), CTA Systems (NL), Ingénieur Conseil Bruno Bert (F), Koninklijk Nederlands Vervoer (NL), Leeds University (UK), Régie des Transports de Marseille (F), SNV Studiengesellschaft Verkehr (D), Stuttgarter Straßenbahnen AG (D), TransExpert (F), TransTeC (D) and VSN Groep (NL).

The sponsors of the project were the European Communities (EC, DG XIII, F/5, Drive Programme, 1992-94), the French Ministry of Transportation, the Dutch Ministry of Transportation and the German Federal Ministry of Research and Technology.

0.5.2 Titan

The EC project Titan concerned validation and further development of ENV 12896. The different organizations that have technically contributed to the Titan project were: CETE-Méditerranée (F), Üstra (D), OASA (GR), RATP (F), SLTC (F), Salzburger Stadtwerke AG (A), TransExpert (F), TransTeC (D), Synergy (GR), TRUST EEIG (D).

The sponsoring partner was the French Ministry of Transport (DTT/SAE). The project was co-funded by the European Communities and some of the partners, in particular the pilot sites – Lyon (F), Hanover (D) and Salzburg (A).

0.5.3 SITP and SITP2

The French-led project SITP (Système d'Information Transport Public) was sponsored by the French Ministry of Transport (Direction des Transports Terrestres – DTT), the companies Gemplus (F) and Setec ITS (F), and the Transmodel Users' Support Team EEIG (F and D).

SITP built on the prestandard ENV 12896 (issued May 1997) and the results of the EC project Titan (1996-1998). SITP produced the extensions requested of ENV 12896; these were validated during 1999-2000. A successor project, SITP2, developed the standard further during 2001-2002.

0.5.4 CEN TC 278 WG 3 SG 4

During 2002-2003, CEN continued to convene SG4 of TC 278 WG3 to consider how Transmodel should be taken forward. It considered responses to previous drafts of Transmodel as well as the work of SITP/SITP2, the German VDV specifications, and a range of UK projects.

SG4 was led by the UK Department for Transport, with participants from VDV (D), RATP (F), HÜR (DK), Setec (F), TRUST E.E.I.G. (Transmodel Users' Support Team) (F and D) and Centaur Consulting (UK). This group completed the work required for Transmodel v5.1 to be adopted as EN 12896.

Related documentation can be found (in French) at http://www.billettique.fr/spip.php?rubrique18.

0.6 Reference to the previous version and other projects and documents

0.6.1 General

Transmodel was published in 2006 as Transmodel V5.1 under the number EN 12896. It has been the basis for the development of the SIRI, IFOPT and NeTEx standards and specifications.

0.6.2 SIRI

The project SIRI has used EN 12896:2006 as an input to develop standard interfaces as regards exchanges of real-time data for passenger information. The present document does not intend to consider the task to establish the link between SIRI data model and the evolution of EN 12896, as at the time updates of Transmodel are under way, SIRI is proceeding to updates as well. However, possible extension requests formulated by the SIRI group are intended to be taken into account in the relevant parts of Transmodel 6.0.

0.6.3 IFOPT

The project IFOPT has used EN 12896:2006 as an input to develop a logical data model for the fixed objects, relevant for public transport, in particular for stops and points of interest. IFOPT has established an implicit link to EN 12896:2006 and has been published as EN 28701.

0.6.4 NeTEx

The project NeTEx developed 2009-2013 standard interfaces between systems aiming at the exchanges of network topology and timetable data based on the models EN 12896:2006 and EN 28701.

One of the tasks of NeTEx was to bring together both models (Transmodel V5.1 and IFOPT). The result of this task is one single conceptual model covering the domains network topology, timing information and information on fares.

The part of Transmodel diagrams that relate to the scope of the NeTEx project have been modularised within NeTEx. In some cases extensions or enhancements of the model have taken place. In order to keep the coherence between the standards, the NeTEx *conceptual diagrams* have been incorporated in the present version of the Public Transport Reference Data Model, generally without changes. The informative Annex B clarifies the status of the changes in comparison to the NeTEx conceptual diagrams.

The *textual descriptions* of this present version of the Public Transport Reference Data Model rely on one hand on the textual descriptions as in Transmodel V5.1, and on the other hand on the new descriptions as in NeTEx – Parts 1 and 2 and 3. The informative Annex B indicates the sources of the textual description.

0.7 Typographic conventions

This Standard makes use of specific typographic conventions that have been adopted for previous and related Standards and Technical Specifications. Unless the context dictates otherwise:

— Terms wholly in CAPITAL LETTERs refer to a concept which is defined in the Data dictionary in the relevant part or in a part with a lower number, i.e. capitalised concepts in Part 1 are defined in the Data dictionary of Part 1, capitalised concepts in Part 2 are defined either in the Data dictionary of

Part 2 or of Part 1, etc. Note that pluralisation of such an entity is indicated by the addition of a lower case "s". It is planned that a complete Data dictionary will be issued as a separate document, updated as additional Parts of this Standard are published;

— Terms wholly in CAPITAL LETTERs and in *italic characters* appearing mainly in the diagrams concern abstract classes, i.e. classes which cannot be instantiated directly. They represent common characteristics of all their sub-classes (specializations);

— Terms wholly in lower case letters refer to the use of those words in their normal everyday context;

— Terms in *italic characters* are used for explanatory text, particularly related to the context in which a defined entity may be found;

— Terms in UpperCamelCase are class attributes, such as PersonCapacity, AtCentre, IsExternal, etc.;

— The use of colours helps the reader to link the different classes with similar semantical meaning to a particular package;

— The word "model" is written either "model", or "Model", or "MODEL". The diagram notes marked MODEL refer to the corresponding conceptual diagrams of the NeTEx documentation.

0.8 Methodology for conceptual modelling

0.8.1 General

Notation UML 2 is object–oriented modelling notation and is used for describing (specifying, documenting and visualizing) the conceptual data model in Transmodel. The UML specification has proved efficient because it facilitates common understanding and use of conceptual data model.

Transmodel uses a notation that bears some features of UML 1 (or E/R conceptual modelling), in particular as regards the labelling of roles/relationship names.

The following section summarizes the UML features used in Transmodel and illustrates them with corresponding example diagrams. Diagrams in Transmodel documents are designed with the modelling tool Enterprise Architect version[1] 10.0 (EA).

0.8.2 Packages

Transmodel EA model is structured into main packages corresponding to the different parts (Part 1, Part 2, etc) containing sub-packages (models), which group classes according to a common functional objective. Specific packages "Explicit Frames" in the different parts are created and details of the models contained in them will be discussed in the relevant parts. The hierarchical modular structure is shown in Figure 1.

[1] A useful reference may be found at the following address:

http://www.sparxsystems.eu/resources/project-development-with-uml-and-ea/

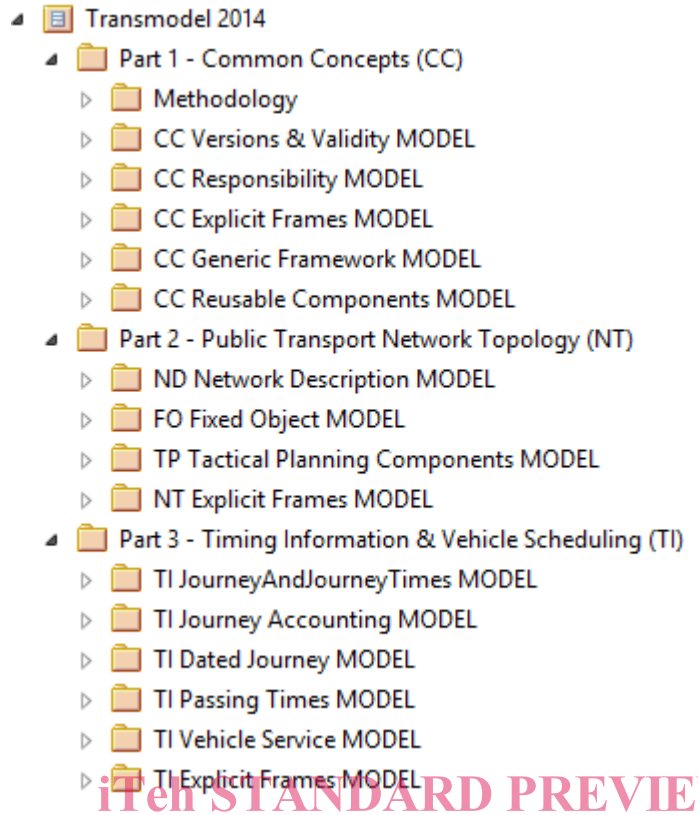

Figure 1 — Transmodel hierarchy of packages

A prefix in front of each package name indicates the part if the standard where this package has been introduced and described first, e.g.:

CC stands for common concepts

NT stands for network topology

ND stands for network description

FO stands for fixed objects

TP stands for tactical planning components

TI: timing information and vehicle scheduling

Etc

The classes are grouped together in a package for a specific task or functional purpose. Figure 2 shows content of the package “generic organization model”, which contains 8 classes. Each class has one and only one “home” package.

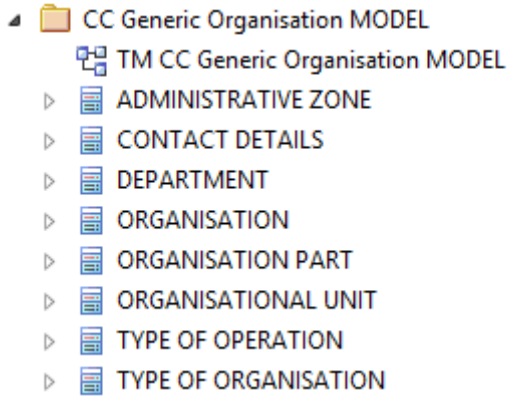

Figure 2 — Package content example

0.8.3 Class diagrams

Class diagram is a visual representation of the structure of a system by showing the system's classes, their attributes, operations and the relationships among the classes. Class diagram shows how objects in a system interact with each other. Figure 3 shows an example class diagram from the package “generic organization model” (described in the common concepts part).