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EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 12896-7:2018) has been prepared by Technical Committee CEN/TC 278 “Intelligent transport systems”, the secretariat of which is held by NEN.

This document is currently submitted to the CEN Enquiry.

The series composed of 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; and

— 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 EN 12896:2006, known as “Transmodel v5.1”.

In comparison with the previous edition, the technical modifications made are presented in the Technical Report TR 12896-9 “Public transport - reference data model - Part 9: Informative Documentation”.

Introduction

Part 1 of this standard presents the following items:

— Rationale for the Transmodel Standard;

— Use of the Transmodel Standard;

— Applicability of the Transmodel Standard;

— Conformance Statement;

— Transmodel Origins;

— Reference to the Previous Version and Other Documents.

The data structures represented in Part 1 are generic patterns that are referenced by different other parts.

Part 2 of this standard presents space-related data structures.

Part 3 presents time-related data structures and replaces the sections of EN 12896:2006 referring to the time-related Tactical Planning Components and to Vehicle Scheduling.

Part 4 presents data referring to daily operations (i.e. to operational days), different from those planned for day types (space-related data structures and tactical planning components) and including operational raw data referring to operations follow-up.

Part 5 presents fares structures including sales, validation and control.

Part 6 (this part) presents Passenger Information (planned and real-time).

Part 7 presents Driver Management including Driver Scheduling (day-type related driver schedules), Rostering (ordering of driver duties into sequences according to some chosen methods) and Driving Personnel Disposition (assignment of logical drivers to physical drivers and recording of driver performance).

Part 8 presents Management Information and Statistics.

1 Scope

1.1 General scope of the standard

The main objective of the present document is to present the Reference Data Model for Public Transport, based on:

— the Reference Data Model, EN12896, known as Transmodel V5.1;

— EN 28701:2012, *Identification of Fixed Objects in Public Transport (IFOPT)*, although note that this particular standard has been withdrawn as it is now included within Parts 1 and 2 of this standard (EN 12896-1:2016 and EN 12896-2:2016) following their successful publication,

incorporating the requirements of:

— EN 15531-1 to −3 and CEN/TS 15531-4 and −5: Service interface for real-time information relating to public transport operations (SIRI);

— CEN/TS 16614-1 and -2: Network and Timetable Exchange (NeTEx), in particular the specific needs for long distance train operation.

Particular attention is drawn to the data model structure and methodology:

— the data model is described in a modular form in order to facilitate the understanding and the use of the model;

— the data model is entirely described in UML.

The following functional domains are considered:

— Network Description: routes, lines, journey patterns, timing patterns, service patterns, scheduled stop points and stop places;

— Timing Information and Vehicle Scheduling (runtimes, vehicle journeys, day type-related vehicle schedules);

— Passenger Information (planned and real-time);

— Fare Management (fare structure, sales, validation, control);

— Operations Monitoring and Control: operating day-related data, vehicle follow-up, control actions;

— Driver Management:

  — Driver Scheduling (day-type related driver schedules),

  — Rostering (ordering of driver duties into sequences according to some chosen methods),

  — Driving Personnel Disposition (assignment of logical drivers to physical drivers and recording of driver performance);

— Management Information and Statistics (including data dedicated to service performance indicators).

The data modules dedicated to cover most functions of the above domains will be specified.

Several concepts are shared by the different functional domains. This data domain is called “Common Concepts”.

1.2 Functional Domain Description

The different functional domains (enumerated above) taken into account in the present standard, and of which the data have been represented as the reference model, are described in “Public Transport Reference Data Model – Part 1: Common Concepts”.

1.3 Particular Scope of this document

The present European Standard entitled “Reference Data Model for Public Transport – Part 6: Passenger Information” incorporates the following main data packages:

— Trip Description;

— Passenger Queries.

This document itself is composed of the following parts:

— Main document (normative) representing the data model for the concepts shared by the different fare domains covered by Transmodel;

— Annex A (normative), containing the data dictionary, i.e. the list of all the concepts and attribute tables present in the main document together with the definitions;

— Annex B (normative), providing a complement to EN12896-1:2016, particularly useful for parts 4 to 8 of the Public Transport Reference Data Model;

— Annex C (informative), indicating the data model evolutions;

— Annex D (informative), indicating the high-level equivalences of the example passenger information functional requests to the capabilities of other standards;

— Annex E (informative), providing an example set of commonly found passenger information functional requests and data dictionary for the elements used in the examples.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN 12896:2006, *Public Transport Reference Data Model (“Transmodel v5.1”)*

EN 12896-1:2016, *Public transport — Reference data model — Part 1: Common concepts*

EN 12896-2:2016, *Public transport — Reference data model — Part 2: Public transport network*

EN 12896-3:2016, *Public transport — Reference data model — Part 3: Timing information and vehicle scheduling*

EN 12896-4,[1] *Public Transport Reference Data Model — Part 4: Operations Monitoring and Control (“Transmodel v6”)*

[1] Under preparation

EN 12896-5,[2] *Public Transport Reference Data Model — Part 5: Fare Management ("Transmodel v6")*

EN 12896-7,[3] *Public Transport Reference Data Model — Part 7: Driver Management ("Transmodel v6")*

EN 12896-8,[4] *Public Transport Reference Data Model — Part 8: Management Information and Statistics ("Transmodel v6")*

EN 15531-1:2015, *Public transport — Service interface for real-time information relating to public transport operations — Part 1: Context and framework*

EN 15531-2:2015, *Public transport — Service interface for real-time information relating to public transport operations — Part 2: Communications*

EN 15531-3:2015, *Public transport — Service interface for real-time information relating to public transport operations — Part 3: Functional service interfaces*

CEN/TS 15531-4:2011, *Public transport — Service interface for real-time information relating to public transport operations — Part 4: Functional service interfaces: Facility Monitoring*

CEN/TS 15531-5:2016, *Public transport - Service interface for real-time information relating to public transport operations — Part 5: Functional service interfaces situation exchange: Situation Exchange*

CEN/TS 16614-1, *Public transport — Network and Timetable Exchange (NeTEx) — Part 1: Public transport network topology exchange format*

CEN/TS 16614-2, *Public transport — Network and Timetable Exchange (NeTEx) — Part 2: Public transport scheduled timetables exchange format*

CEN/TS 16614-3, *Public transport — Network and Timetable Exchange (NeTEx) — Part 3: Public transport fares exchange format*

CEN/TS 17118:2017, *Intelligent transport systems — Public transport — Open API for distributed journey planning*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1 General terms and definitions

The following generic terms and definitions are used.

3.1.1
attribute
property of an entity

[2] Under preparation

[3] Under preparation

[4] Under preparation

3.1.2
conceptual data model
description of a real-world domain in terms of entities, relationships and attributes in an implementation independent manner in order to provide a structure on which the rest of the development of an application system can be based

3.1.3
conceptual level
in the context of data modelling, the conceptual data model

3.1.4
database
collection of data; often used in the sense of the physical implementation of a data model

3.1.5
data domain
data structure (in this European Standard, a part of the Reference Data Model for Public Transport) made up of data related to each other, through the fact that there is a functional area or group of functions using this data set as a whole.

3.1.6
data model
description of a real-world domain in terms of data and relationships

3.1.7
entity
object (data) that has its own existence (as opposed to an attribute)

3.1.8
fare management
all activities related to the collection of money from passengers

3.1.9
function
activity

Note 1 to entry: In this European Standard, a sub-activity of a functional area.

3.1.10
functional area
arbitrarily defined set of activities, used, in this European Standard, to define the objectives and limits of the data model

3.1.11
interoperability
ability of (sub)systems to interact with other (sub)systems according to a set of predefined rules (interface)

3.1.12
logical data model
data design that takes into account the type of database to be used but which does not consider means of utilization of space or access.

3.1.13
logical denormalised model
relational data model that is not fully normalized, i.e. does not completely follow the normalization rules and thus may be redundant

3.1.14
logical level
in the context of data modelling, the logical data model

3.1.15
management information
all activities allowing the company management to collect the information necessary to meet problem-solving needs

3.1.16
object-oriented data model
data structure expressed according to principles that allow for a direct implementation as an object-oriented database, where information is represented in form of objects, i.e. respecting the principle of encapsulation meaning in particular that each data are accessed or modified through operations (methods) belonging to it

3.1.17
operations monitoring and control
all activities related to the transportation process, i.e. real-time functions related to the driving and transportation of passengers according to given instructions, including the monitoring of the driving process and its control in case of deviations, as well as all activities that support the driving process such as traffic light priority, track switching, bay selection, advance/delay advice, etc.

3.1.18
passenger information
all activities related to informing the users either on the planned or on the actual transportation services

3.1.19
personnel disposition
all activities related to the mid-term and short-term management of drivers

3.1.20
real-time control
see operations monitoring and control

3.1.21
relational data model
type of logical data model giving the information as series of tables (relations) and attributes, and possessing the following characteristics: a) all attribute values are atomic; b) all “tuples” (rows/occurrences) are distinct; c) no part of the primary key may be null; and d) foreign key values must correspond to an existing primary key in another relation or be null

3.1.22
scheduling
see tactical planning.

3.1.23
tactical planning
all activities related to the tactical planning of transportation, splitting into vehicle scheduling, driver scheduling, rostering.

3.2 Domain specific terms and definitions

The following terms specific to the passenger information domain are used. Terms which are also data entity names are defined in the data dictionary in Annex A and are not repeated here.

3.2.1
distributed journey planner
trip planner that computes its results by delegating planning to other systems for those parts of the trip covering specific areas or modes

3.2.2
exchange point
agreed handover point for linking distributed journey planning systems

3.2.3
observer
someone who looks at Passenger Information

3.2.4
repeated trip
same trip made over the same route multiple times, for example to commute to work or school

3.2.5
single trip
trip that goes direct from an origin to a destination without breaks in the journey

3.2.6
text to speech
automatic generation of speech from a textual representation

3.2.7
trip repair
activity of looking for travel advice regarding a specific trip in order to recover a from a disruption to services

4 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

ABT	Account Based Ticketing
API	Application Program Interface
DJP	Distributed Journey Planner
FQ	Fare Query
GIS	Geographic Information System
GTFS	General (sometimes “Google”) Transit Feed Specification
IFM	Interoperable Fare Management
FM	Fare Management
IFOPT	Identification of Fixed Objects in Public Transport
ISO	International Standards Organization
IT	Information Technology
NeTEx	Network and Timetable Exchange
NFC	Near Field Communication
OADJP	Open API for Distributed Journey Planner
PI	Passenger Information
PT	Public Transport

QR	Query Request
TD	Trip Description
TTS	Text to Speech
SIRI	Service Interface for Real-time Information
UML	Unified Modelling Language
URL	Universal Resource Locator
VDV	Verband Deutscher Verkehrsunternehmen (D)
WGS	World Geodetic Standard

5 Passenger Information Domain

5.1 Scope and overview

The passenger information part of Transmodel describes the data which are presented to passengers by applications that can interact directly with passengers. This covers both data on the planned and actual services, but also data resulting from the planning and control processes which may result in service modifications.

Classically, passenger information was published as printed timetables or shown on electro mechanical boards in stations. Earlier generations of electronic display were typically available only in stations using localized systems.

Modern passenger information systems are generally provided through service interfaces that access online data and may be used from web and mobile internet devices anywhere.

Applications providing data to customers typically use an optimized API to fetch the data from a back-end system. The standard does not aim to define an actual API for such services, but rather to provide a mapping that shows how the data elements of the reference model relate to the different possible types of passenger Information service.

Two other CEN standards provide concrete API's;

— SIRI (*Server Interface for Real Time Information* - EN 15531-1:2015, EN 15531-2:2015, EN 15531-3:2015, CEN/TS 15531-4:2011 and CEN/TS 15531-5:2016), which provides real-time status information; and

— OADJP (*Open API for Distributed Journey Planning* - CEN/TS 17118:2017) describes stop finding, trip planning, schedule, and related APIs.

All of the following are relevant for delivering passenger information;

— Passenger information facilities and their utilization for passenger queries;

— Detailed descriptions of all the conceptual components of a passenger *trip*, as possibly needed by an interactive passenger information system when answering a PI REQUEST;

— Basic definitions of run times and wait times needed to calculate trip duration;

— Planned, predicted, and actual passing times of journeys at individual stops;

— Service modifications decided by the schedulers or the control staff, resulting in changes of the vehicle journeys and blocks, compared to the original plan;

— Fare structures, fareProducts and prices along with distribution and fulfilment options.

Most types of passenger information make use of many underlying elements from the topological network definition, such as the lines and journeys which form the service offer, the definition of run and wait times, and other fundamental definitions. Geographical information may possibly be provided in some cases if corresponding application systems are available, for example to show the route of a bus. Specific types of passenger queries may be related to fares, where the relevant information elements are included in the fare collection sub-model of the reference data model.

Thus, the information basis for passenger information systems is widely spread over the whole reference data model, and the genuine passenger information data model covers only those elements which cannot be derived from, and are not explicitly included in, other parts of the model. It is also useful to indicate how such data may be assembled into specific services corresponding to commonly-made passenger queries.

5.2 Passenger Information

5.2.1 Provision of Information

5.2.1.1 General

In early generations of information systems used for public transport, the passenger information functions were often designed as sub-functions of other systems. For instance, printed timetables were simply an end product of the scheduling process, dynamic displays at stop points were incorporated in monitoring and control systems, etc. More and more, the trend is to gather all data likely to be used for passenger information functions into specific databases, independent of the operation and control systems. The required data are then put at the disposal of information applications interfaced with such databases, which make appropriate requests to collect the data. This approach gives the necessary scalability and security need to support mass consumer applications without compromising the operation of the transport network.

It is therefore necessary to distinguish the data handled by passenger information functions from the management of the operation and control systems and the distribution of information to in-station and onboard devices. Besides all the data forming the basis for passenger information (e.g. network description, planned schedules, monitored passing times, etc.), some data structures are necessary to organize the distribution of this information. The present part describes some important concepts referring to the ways of to delivering such information to the customers.

5.2.1.2 Passenger Information Types

Information for passengers can be communicated to the passengers using a large variety of equipment, such as:

— printed material such as leaflets at stops, information booklets, etc.;

— passive terminals, such as displays at stop points or onboard vehicles, delivering information on planned or actual service, e.g. information on the arrival times;

— interactive terminals, delivering information on request regarding planned or actual service, such as home internet terminals, personal mobile devices, an information desk terminal operated by the staff, etc.

Data for the last two will be obtained from servers that aggregate and distribute data.

In spite of this variety of media and techniques, some common data features exist to describe the characteristics of the provided information. For instance, the location of a display (e.g. at a stop point) or