SLOVENSKI STANDARD
oSIST prEN 12896-5:2019

01-januar-2019

Javni prevoz - Referenčni podatkovni model - 5. del: Upravljanje voznin

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

Ta slovenski standard je istoveten z: **prEN 12896-5**

ICS:

35.240.60	Uporabniške rešitve IT v prometu	IT applications in transport

oSIST prEN 12896-5:2019 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 12896-5

November 2018

ICS 35.240.60

English Version

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

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Ref. No. prEN 12896-5:2018 E

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European foreword

This document (prEN 12896-5:2018) 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 is 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 CEN/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 (this part) presents fares structures including sales, validation and control.

Part 6 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 standard is to present the Reference Data Model for Public Transport, based on:

— the Reference Data Model, EN 12896, 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 EN 12896-1:2016 “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 5: Fare Management” addresses Fare Information for Public Transport and incorporates the following data packages:

— Fare Structure

— Access Right Assignment

— Fare Pricing

— Sales Description

— Sales Transaction

— Fare Roles

— Validation and Control

— Explicit Frames for Fares

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 the "Common Concepts" domain, particularly useful for parts 4 to 8 of the Public Transport Reference Data Model.

— Annex C (informative), indicating the data model evolutions from previous versions of Transmodel (EN 12896:2016).

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 12896-1:2016, *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*

EN 12896-6[2], *Public transport — Reference data model — Part 6: Passenger information*

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 16614-1:2014, *Public transport — Network and Timetable Exchange (NeTEx) — Part 1: Public transport network topology exchange format*

CEN/TS 16614-2:2014, *Public transport — Network and Timetable Exchange (NeTEx) — Part 2: Public transport scheduled timetables exchange format*

CEN/TS 16614-3:2016, *Public transport — Network and Timetable Exchange (NeTEx) — Part 3: Public transport fares exchange format*

[1] Under preparation

[2] Under preparation

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 are used.

3.1.1
attribute
property of an entity

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. 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 utilisation of space or access

3.1.13
logical denormalised model
relational data model that is not fully normalised, i.e. does not completely follow the normalisation 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 is 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 fares domain are used. Terms which are also data entity names are defined in the data dictionary in Annex A and are mostly not repeated here.

3.2.1
access right
right to consume a Public Transport service or other service provided along with the transport

3.2.2
account based ticketing
fare collection paradigm which manages ticket issuing and validation through individual customer accounts held online and controlled by means of a token used on paper or electronic materialisations of a travel document

3.2.3
activation
triggering of the use of access rights and initiation of consumption

3.2.4
anonymous customer
CUSTOMER whose identity is not visible from their TRAVEL DOOCUMENT, but who may be nevertheless be a registered customer using an anonymous token, in contrast to an impersonal customer, of whom the service operator has no individual knowledge

3.2.5
automated fare collection system
fare collection system capable of automatically determining which products the customer must purchase according to the travel they consume

3.2.6
base price
price that is provided as an absolute amount and from which other prices may be derived

3.2.7
blacklist
revenue protection mechanism taking the form of a security list identifying travel documents, media, etc. for which the validity has been cancelled temporarily (denial) or permanently (refusal) and which will be used to block access to services for customers bearing documents associated with items on the list

3.2.8
booking
placing of a reservation to use a specific transport service, but not necessarily entailing a purchase of a ticket

3.2.9
cancellation
marking of a TRAVEL DOCUMENT as having been used

3.2.10
capping
setting of an upper limit on the price of the consumption of access rights

3.2.11
card centric
form of media centric ticketing where the media is a smart card

3.2.12
classical ticketing
non-electronic fare management and ticketing using paper and passive media travel documents, usually for a single operator

3.2.13
control
checking of a passenger's entitlement to consume access rights, involving identification of the traveller and/or the travel rights

3.2.14
consumption
using up of access right by a transport customer as a result of travel

3.2.15
credentials
data or other mechanisms used to authenticate an actor to a system as a legitimate participant

3.2.16
derived price
price that can be computed from another base price using pricing parameters

3.2.17
distributor
party who sells products on behalf of other product owners

3.2.18
dynamic price
price that is fetched at run time from a pricing engine as opposed to a static or derived price