SLOVENSKI STANDARD
oSIST prEN 12896-8:2019

01-januar-2019

Javni prevoz - Referenčni podatkovni model - 8. del: Informacije o upravljanju in statistika

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

Ta slovenski standard je istoveten z: **prEN 12896-8**

ICS:

35.240.60	Uporabniške rešitve IT v prometu	IT applications in transport

oSIST prEN 12896-8:2019 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

DRAFT
prEN 12896-8

November 2018

ICS 35.240.60

English Version

Public transport - Reference data model - Part 8 : Management information & satistics

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 278.

If this draft becomes a European Standard, 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.

This draft European Standard was established by CEN 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Warning : This document is not a European Standard. It is distributed for review and comments. It is subject to change without notice and shall not be referred to as a European Standard.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents

Page

European foreword

This document (prEN 12896-8:2018) 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 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 document 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 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 (this part) presents Management Information and Statistics.

1 Scope

1.1 General Scope of the document

The main objective of the present document 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 document, 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 8: Management Information and Statistics” describes how to structure data which refers to the planning stages (e.g. timetables, run times, driver rosters etc.) and/or to the daily actual production, and which is registered for different purposes, in particular to build service performance indicators. The data model is based on a generic design pattern, Generic Loggable Objects Model (provided in the Additional Common Concepts part – Annex B), and incorporates the following data packages:

— Logging Time and Place, providing additions to the Generic Loggable Objects Model,

— Recorded Objects

— Recorded Use of Services

— Service Journey Performance.

The last three packages show how the recorded data contributes to the implementation of indicators.

This document itself is composed of the following parts:

— Main document (normative),

— 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 EN 12896-1:2016, particularly useful for parts 4 to 8 of the Public Transport Reference Data Model;

— Annex C (informative), indicating the data model evolution from the previous version.

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*

ISO 4217:2015, *Codes for the representation of currencies*

ISO 80000-1:2009, *Quantities and units — Part 1: General*

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

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
conceptual data model in the context of data modelling,

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 which, in this European Standard, is 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
logical data model in the context of data modelling

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 Management Information and Statistics 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
aggregation frame
data structure within which the data values are grouped and used for a formula to provide an indicator

3.2.2
indicator
set of data (calculated or measured) which may be either qualitative or quantitative that is used to provide information on the status (may be a measure, a functional state, etc.) or the quality of a service or a function.

3.2.3
indicator type
category of a given indicator, e.g. time, length, passenger count, price, vehicle, etc.

3.2.4
indicator unit
measurement unit (e.g. metres, seconds, passengers, etc.) in which a specific indicator is measured.

3.2.5
formula
method to calculate indicators that are based on other indicators or on a set of raw data.

3.2.6
granularity
input for calculation processes representing the smallest unit(s) to generate output indicator(s).

3.2.7
O/D matrix
tabular structure describing data by origin/destination parameters (e.g. daily traffic volume between zones)

3.2.8
indicator parameter type
category of a given indicator parameter, e.g. time, length, passenger count, price, vehicle, etc.

3.2.9
indicator parameter unit
measurement unit (e.g. meters, seconds, passengers, etc.) in which a specific indicator parameter is measured.

4 Symbols and Abbreviations

IFOPT	Identification of Fixed Objects in Public Transport.
ISO	International Standards Organization.
IT	Information Technology.
O/D	Origin / Destination
PT	Public Transport.
PTO	Public Transport Operator.
SI	International System of Units (abbreviated from the French *Système international)*
SIRI	Service Interface for Real-time Information.
TM	Transmodel
UML	Unified Modelling Language.

5 Management Information and Statistics Domain

5.1 Introduction

5.1.1 Information Needs

Management information deals with functions analysing production data in order to evaluate the service quality or to take corrective measures in planning and managing operations. In public transport, for instance, the study of operational data (e.g. observed run times, passenger load) collected during service operations is an input for strategic planning (e.g. how and when to amend the schedules), tactical planning (e.g. when to undertake a certain control action), quality follow-up, etc.

Management information uses therefore two main types of data:

— data resulting from the planning stages, i.e. theoretical data on the production orders (e.g. timetables, run times, driver rosters etc.);

— data describing the daily actual production (e.g. observed passing times, actual number of passengers, missed interchanges, modifications operated to the plan etc.).

Advances in technology, in particular as regards to data storage, allow the provision of the necessary data in production databases, against which the desired requests can be made by public transport managers.

Consistent data structures make the design of such requests easier, and offer the flexibility required to meet a large variety of needs.

5.1.2 Calculation of indicators

The number of different ways of processing PT data in order to issue relevant and synthetic information reports for managers is almost infinite. The criteria for doing so will depend on local conditions, on the level of management, on the time scale of the analysis, etc. The objective of the reference model is not to describe the processing methods, but to offer data structures able to fulfil their manifold requirements.

The result of raw data processing provides different types of indicators, each specialized for reporting information on a specific aspect of public transport. (Service Demand, Commercial Speed, etc.).

An *indicator* relates to a set of data (planned, measured, or a combination of both) and may be either qualitative or quantitative. Indicators of lower level objects may be overridden by higher level objects (e.g. an indicator related to the ROUTE can override the aggregation - summary, average, etc. - of indicators related to ROUTE LINK).

Indicators may be of several *indicator types*, for example, they may describe the time, length, passenger count, price, vehicle, etc.

An *indicator unit* is used to describe the measurement unit of quantitative indicators. Unit names shall follow standards ISO 4217:2015 for currency codes, and ISO 80000:2009 for SI units.

A set of parameters may be associated with any indicator to represent the scope of that particular indicator (for example, a TIME BAND and a DAY TYPE for a passenger count indicator).

Indicator parameter type describes categories of the indicator parameter: time, length, passenger count, price, vehicle, etc.

Indicator parameter unit describes the measurement unit of quantitative indicator parameters. Unit names shall follow standards ISO 4217:2015 for currency codes, and ISO 80000:2009 for SI units.

A *formula* describes the method to calculate indicators that are based on other indicators and/or on a set of raw data.

An *aggregation frame* describes a data structure within which the data values are grouped and used for a formula to provide an indicator.

A *granularity* entity determines the smallest unit(s) in a calculation process which generates indicator(s).

A calculation process that generates the indicators is characterized by indicator parameters, formula, aggregation frame and granularity unit.

The main elements used to calculate indicators are presented in the figure below.

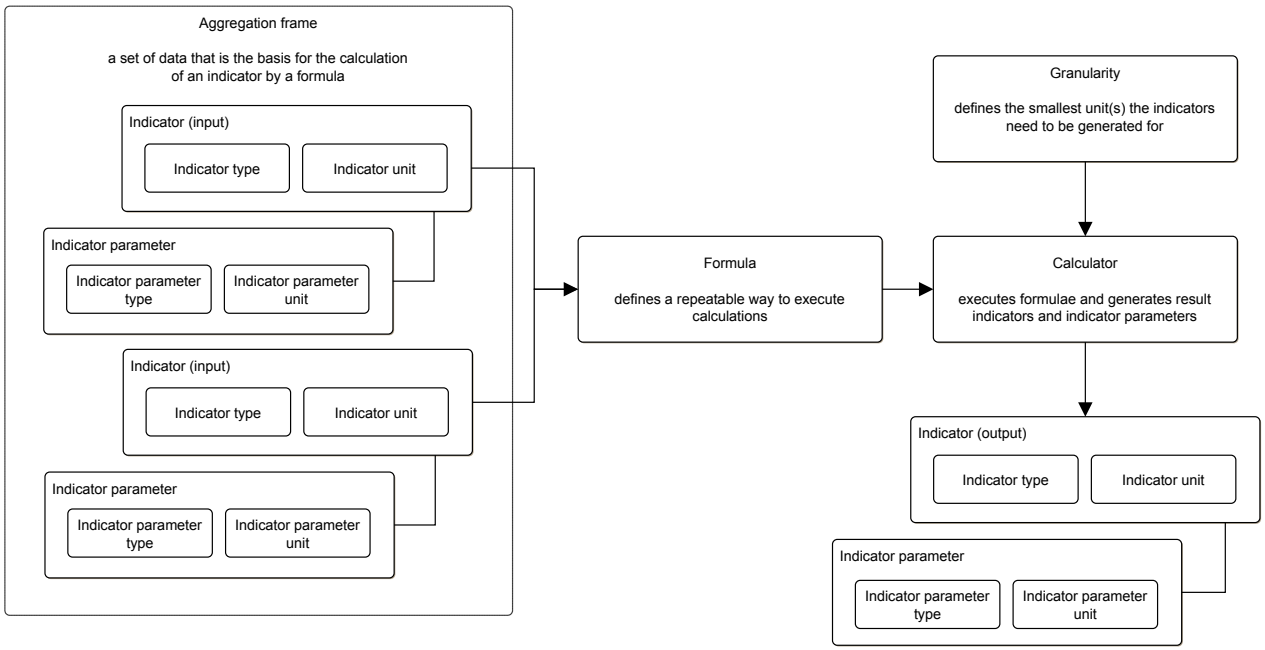

Figure 1 — Calculation of indicators

This figure also indicates that indicators might be generated by a previous (nested) calculation, and might be used in another calculation process.

For example, the calculation of the length of a tram network for each infrastructure operator (assuming there are more than one) may be modelled as follows:

— indicator (input): length of the projection of ROUTE LINKs on the infrastructure, parameterized by infrastructure operator;

— aggregation frame: defines a set of ROUTE LINKs that make up the network;

— granularity: defines that the indicators shall be grouped by infrastructure operator;

— formula: calculates the sums of the length of each item in the aggregation frame;

— calculator: executes the formula for each infrastructure operator;

— indicator (output): total length of the network, parameterized by infrastructure operator.

A typical use of indicators is when the actual service has to be compared to the planned service. To ensure the same indicator parameters are used in the comparison, a common granularity definition might be needed to govern the calculation processes and provide the same level of detail for both actual (measured) and planned service indicators. This is illustrated by the figure below.

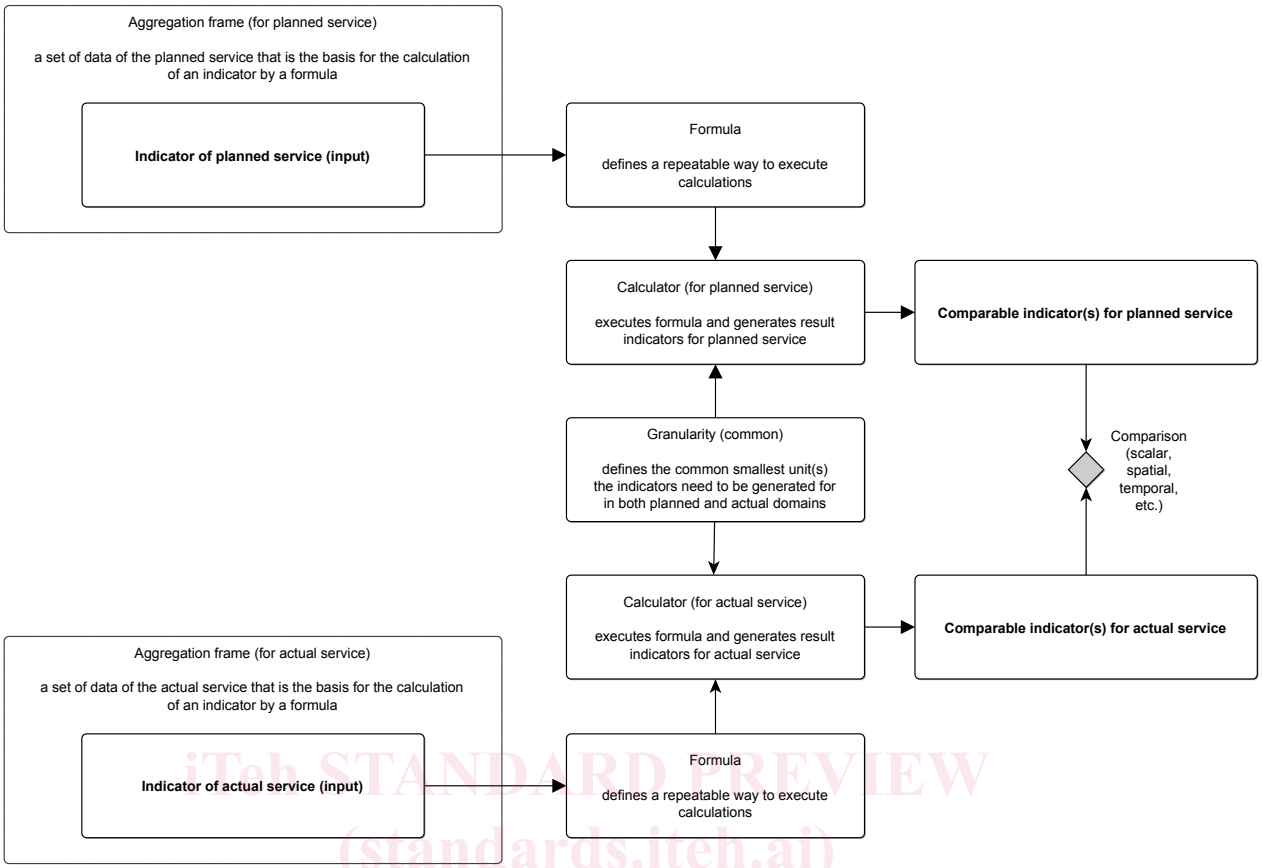

Figure 2 — Comparison of planned and actual service indicators

5.1.3 Functions Covered

The following functions as defined in Operating Raw data and statistics exchange are covered by Transmodel v6:

a) Service dimensions: this function considers all the information to evaluate the dimension of the service in terms of number of lines, journeys, available seats, etc.

b) Commercial speed: this function considers all the information needed to evaluate the commercial speed of the fleet

c) Service spatial coverage: this function considers all the information relevant to the characteristics of the service offer in terms of spatial coverage of the territory where the service is performed.

d) Service temporal coverage: this function considers all the information relevant to the characteristics of the service offer in terms of temporal coverage of the territory where the service is performed.

e) Service interchange nodes: this function considers all the information relevant to the characteristics of the service offer to evaluate the interchanges at specific PLACEs.

f) O/D zones connections: this function considers all the information relevant to the characteristics of the service demand to evaluate connections among different ZONEs.