

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

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN 12896-2:2016 sisaldab Euroopa standardi EN 12896-2:2016 ingliskeelset teksti.	This Estonian standard EVS-EN 12896-2:2016 consists of the English text of the European standard EN 12896-2:2016.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 28.09.2016.	Date of Availability of the European standard is 28.09.2016.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile [standardiosakond@evs.ee](mailto:standardiosakond@evs.ee).

ICS 35.240.60

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:

Aru 10, 10317 Tallinn, Eesti; koduleht [www.evs.ee](http://www.evs.ee); telefon 605 5050; e-post [info@evs.ee](mailto:info@evs.ee)

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Aru 10, 10317 Tallinn, Estonia; homepage [www.evs.ee](http://www.evs.ee); phone +372 605 5050; e-mail [info@evs.ee](mailto:info@evs.ee)

English Version

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

Transports publics - Modèle de données de référence -  
Partie 2: Réseau de transports en commun

Öffentlicher Verkehr - Datenreferenzmodell - Teil 2:  
Netzwerk des öffentlichen Verkehrs

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**

# Contents

Page

European foreword.....	4
Introduction .....	5
1 Scope .....	6
1.1 General scope of the Standard.....	6
1.2 Functional domain description.....	7
1.3 Particular Scope of this Document.....	7
2 Normative references .....	8
3 Terms and definitions .....	8
4 Symbols and Abbreviations.....	8
5 The Network Topology Domain .....	8
5.1 Introduction .....	8
5.2 Model and document structure.....	9
5.3 Network description model.....	10
5.3.1 Model overview.....	10
5.3.2 Infrastructure Network .....	11
5.3.3 Network restriction.....	15
5.3.4 Main tactical planning points and links .....	18
5.3.5 Activation .....	20
5.3.6 Vehicle and crew point.....	22
5.3.7 Lines and routes .....	23
5.3.8 Line Network .....	28
5.3.9 Flexible network.....	31
5.4 Fixed object model.....	37
5.4.1 Model overview.....	37
5.4.2 Site .....	38
5.4.3 Stop place .....	44
5.4.4 Flexible stop place .....	54
5.4.5 Associating equipment with site components.....	56
5.4.6 Equipment description overview .....	57
5.4.7 Waiting and luggage equipment.....	58
5.4.8 Point of interest .....	59
5.4.9 Passenger service equipment.....	64
5.4.10 Ticketing equipment.....	65
5.4.11 Site access equipment.....	66
5.4.12 Local service.....	69
5.4.13 Parking Equipment.....	70
5.4.14 Site equipment – Examples.....	72
5.4.15 Path links and navigation paths.....	76
5.4.16 Path links – Examples .....	78
5.4.17 Navigation paths – Examples .....	81
5.4.18 Check constraint.....	87
5.4.19 Parking.....	89
5.4.20 Vehicle stopping.....	92
5.4.21 Accessibility coverage .....	92
5.4.22 Accessibility coverage of site elements.....	92

5.4.23	Accessibility coverage of paths.....	93
5.5	Tactical planning components model .....	94
5.5.1	Model overview.....	94
5.5.2	Journey pattern .....	95
5.5.3	Common section.....	99
5.5.4	Timing pattern.....	100
5.5.5	Service pattern .....	104
5.5.6	Service connection .....	112
5.5.7	Routing constraints.....	116
5.5.8	Time demand type.....	118
5.5.9	Passenger stop assignment.....	119
5.5.10	Train stop assignment .....	124
5.5.11	Path assignment.....	126
5.5.12	Notice assignment .....	127
5.5.13	Passenger information display assignment.....	128
5.6	Explicit frames .....	129
5.6.1	General .....	129
5.6.2	Infrastructure frame .....	130
5.6.3	Service frame.....	130
5.6.4	Site frame.....	131
	Bibliography .....	199

## European foreword

This document (EN 12896-2:2016) 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 12896-1:2016 and EN 12896-3:2016 supersedes EN 12896:2006.

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

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 intends 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.

## 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. This particular document (Part 2) represents a new edition of EN 12896:2006 of the chapter “description of the network”. Moreover, it incorporates the major part of the IFOPT standard model of stop places and related concepts as updated and harmonized within the NeTEx project.

# 1 Scope

## 1.1 General scope of the Standard

The main objective of the present Standard is to present the public transport reference data model based on:

- the public transport reference data model published 2006 as EN 12896 and known as Transmodel V5.1;
- the model for the Identification of Fixed Objects for Public transport, published 2009 as EN 28701 and known as IFOPT;

incorporating the requirements of

- EN 15531-1 to 3 and CEN/TS 15531-4 and CEN/TS 15531-5, *Service interface for real-time information relating to public transport operations (SIRI)*;
- CEN/TS 16614-1 and CEN/TS 16614-2, *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 understanding and use of the model;
- the data model is entirely described in UML.

In particular, a reference data model kernel is described, referring to the data domain:

- network description: routes, lines, journey patterns, timing patterns, service patterns, scheduled stop points and stop places.
- This part corresponds to the network description as in Transmodel V5.1 extended by the relevant parts of IFOPT.
- Furthermore, the following functional domains are considered:
  - timing information and vehicle scheduling (runtimes, vehicle journeys, day type-related vehicle schedules);
  - passenger information (planned and real-time);
  - operations monitoring and control: operating day-related data, vehicle follow-up, control actions;
  - fare management (fare structure and access rights definition, sales, validation, control);
  - management information and statistics (including data dedicated to service performance indicators);
  - 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).

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 taken into account in the present Standard and of which the data have been represented as the reference data model are described in “Public transport reference data model - Part 1: Common concepts”.

They are:

- public transport network and stop description;
- timing information and vehicle scheduling;
- passenger information;
- fare management;
- operations monitoring and control;
- management information;
- personnel management: driver scheduling, rostering, personnel disposition.

The aspects of multi-modal operation and multiple operators’ environment are also taken into account.

## **1.3 Particular Scope of this Document**

The present European Standard entitled “Reference data model for Public transport – Part 2: Public transport network” incorporates data structures which form the network topology description of Transmodel V5.1 and the major part of the fixed objects model of IFOPT. It is composed of three data packages:

- network description;
- fixed objects;
- tactical planning components.

The data structures represented in this part form network topology descriptions. They typically reference to structures as described in the “Public transport - Reference data model - Part 1: Common concepts”, such as version frames or generic grouping mechanisms.

This document itself is composed of the following parts:

- Main document (normative) representing the data model for the concepts shared by the different 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 (informative), indicating the data model evolutions.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12896-1:2016 apply.

## 4 Symbols and Abbreviations

DRT	Demand responsive transport
FTS	Flexible transport service
GIS	Geographic information system
IFOPT	Identification of fixed objects in public transport
ISO	International standards organization
IT	Information technology
NeTEx	Network and Timetable Exchange
PT	Public transport
PTO	Public transport operator
SIRI	Service Interface for Real-time Information
UML	Unified modelling language
URI	Uniform resource identifier
URL	Universal resource locator
VDV	Verband Deutscher Verkehrsunternehmen (D)
WGS	World geodetic standard

## 5 The Network Topology Domain

### 5.1 Introduction

The reference data model includes entity definitions for different types of points and links as the building elements of the topological network. Stop points, timing points and route points, for instance, reflect the different roles one point may have in the network definition: whether it is used for the definition of (topological or geographical) routes, as a point served by vehicles when operating on a line, or as a location against which timing information like departure, passing, or wait times are stored in order to construct the timetables.

The line network is the fundamental infrastructure for the service offer, to be provided in the form of vehicle journeys which passengers may use for their trips. The main entities describing the line network in the reference data model are the line, the route and the journey pattern, which refer to the concepts of an identified service offer to the public, the possible variants of itineraries vehicles would follow when serving the line, and the (possibly different) successions of stop points served by the vehicles when operating on the route.