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Javni prevoz - Izmenjava omrežnih in voznorednih podatkov (NeTEx) - 5. del: Izmenjavni format za alternativne načine

Public transport - Network and timetable exchange (NeTEx) - Part 5: Alternative modes exchange format

Öffentlicher Verkehr - Netzwerk- und Fahrplan-Austausch (NeTEx) - Teil 5: Austauschformate für alternative Modi

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English Version

Public transport - Network and timetable exchange (NeTEx) - Part 5: Alternative modes exchange format

Öffentlicher Verkehr - Netzwerk- und Fahrplan-Austausch (NeTEx) - Teil 5: Austauschformate für alternative Modi

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The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

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European foreword

This document (CEN/TS 16614-5:2022) has been prepared by Technical Committee CEN/TC 278 "Intelligent Transport Systems", the secretariat of which is held by NEN.

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 has been prepared under a Standardization Request given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EU Directive(s) /Regulation(s).

In addition, it supports the fundamental requirements for Urban Rail of CEN-CENELEC Guide 26.

This document presents Part 5 of the European Technical Specification known as "NeTEx". NeTEx provides a framework for specifying communications and data exchange protocols for organisations wishing to exchange scheduled information relating to public transport operations.

The full NeTEx Technical Specification is made up of five parts defining a single European Standard series, which provides a complete exchange format for public transport networks, timetable description and fare information.

- Part 1 is the description of the public transport network topology exchange format. It also contains use cases shared with part 2, and modelling rules and the description of a framework shared by all parts.

- Part 2 is the description of the scheduled timetables exchange format.

- Part 3 is the description of the fare information exchange format.

- Part 4 is the description of the passenger information European profile.

- Part 5 (this document) is the description of the alternative modes exchange format.

Part 1 is fully standalone, and parts 2 and 3, 4 and 5 rely on part 1.

The XML schema can be downloaded from http://netex-cen.eu, along with available guidance on its use, example XML files, and case studies of national and local deployments.

This document is highly technical, and a special care has been taken to keep the text readable. In particular a set of formatting conventions is followed that enhances the usual CEN writing rules in order to distinguish references to elements of the formal models within text:

- Transmodel terms and NeTEx conceptual model elements are in capital letters (JOURNEY PATTERN for example).

- NeTEx physical model names are in bold italic font and use CamelCase style with no spaces (**JourneyPattern,** for example).

- NeTEx physical model attribute types are in italic font and use CamelCase style with no spaces (*TypeOfEntity,* for example).

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

0   Introduction

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; publicising fares, issuing tickets and receipts; providing real-time information on service running, and so on.

Services already present in the urban environment such as multimodal information and traffic management and control are already well understood. Reference data models and data exchange formats for the use of these services, in particular data sets describing the public transport offer, are already standardised and available. However, there is a need for reference data models to accommodate emerging modes of transport to allow seamless transitions for the traveller between all available modes. Examples of these new modes include car and cycle sharing, car-pooling, and intelligent parking (Park & Ride).

The first three parts of the European Technical Specification NeTEx specify a Network, Timetable, and Fare Exchange format for Public Transport. The purpose of NeTEx is to exchange data relating to scheduled public transport between the systems of PT organisations. It can be seen as complementary to the SIRI (Service Interface for Real-time Information) standard, as SIRI needs a prior exchange of reference data from NeTEx's scope to provide the necessary context for the subsequent exchange of a real-time data. A fourth part describes a profile for using NeTEx for the cross-border exchange of timetable data (European Passenger Information profile – EPIP).

This document (NeTEx – Part 5) specifies exchanges of data for alternative transport modes between systems and organisations. It encompasses alternative (i.e. non-traditional) modes of personal use of transport (such as cycle sharing, car-pooling, rental, etc.) often provided as mobility services. Such services may be provided by organisations other than conventional transport operators and use of them may involve the passengers themselves steering the vehicles and determining the exact route. Part 5 describes some extensions and additions to the prior NeTEx model. It is a complement to Parts 1, 2, 3 in the sense that it uses a subset of the concepts defined there.

Well-defined, open interfaces have a crucial role in improving the economic and technical viability of Public Transport Information Systems of all kinds. Using standardised interfaces, systems can be implemented as discrete pluggable modules that can be chosen from a wide variety of suppliers in a competitive market, rather than as monolithic proprietary systems from a single supplier. Different data sets can be integrated and systems linked together to provide services that cover a wide area and proved advanced multimodal function for travellers. Interfaces also allow the systematic automated testing of each functional module, vital for managing the complexity of increasing large and dynamic systems. Furthermore, individual functional modules can be replaced or evolved, without unexpected breakages of obscurely dependent function.

This standard will improve the ease of integration of public transport information with other modes of transport making it easier to provide service that allow passengers to plan and make multi-modal journeys that seamlessly combine legs made on both conventional public transport and self-guided modes.

By generalising and extending a standard already in place, the standard is able to reuse an existing context and many existing components, minimizing the effort required to deploy it.

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1 Scope

1.1 General

NeTEx is dedicated to the exchange of scheduled data (network, timetable and fare information). It is based on Transmodel European reference model for PT data. The most recent version of NeTEx v1.1 is based on the most recent version of Transmodel, V6.0 (EN 12986 1/2/3/4/5/6), which now incorporates the prior IFOPT (EN 28701). NeTEx also relates to SIRI (CEN 15531-1/2/3/4) and supports the exchange of information of relevance for passenger information about public transport services and also for running Automated Vehicle Monitoring Systems (AVMS).

NOTE   NeTEx is an implementation of a subset of Transmodel (including IFOPT); the definitions and explanations of its concepts are extracted directly from Transmodel and reused in NeTEx, sometimes with adaptations in order to fit the NeTEx context. Although the data exchanges targeted by NeTEx Parts 1 to 5 are predominantly oriented towards provisioning passenger information systems, AVMS and fare systems with data from transit scheduling systems, it is not restricted to this purpose and NeTEx can also provide an effective solution to many other use cases for transport data exchange.

1.2 Alternative Modes Scope

This Part 5 of NeTEx is specifically concerned with the exchange of reference data to support "new" alternative modes for mobility services, adding certain new concepts to the NeTEx schema (indicated as NeTEx v1.2.2), but also to a high degree making use of existing schema elements defined in NeTEx Parts 1, 2 and 3.

The high-level design for alternative modes support is derived from a conceptual model for alternative modes CEN PT1711 (CEN/TS 17413:2020) prepared by CEN working group TC278 WG17. This CEN Technical Specification describes a conceptual model for alternative modes as an extension to Transmodel V6.0 and based on a detailed set of use cases taken from CEN PT1711 and given in Appendix A.

The NeTEx format is concerned with a subset of the use cases for reference data (real-time use cases are covered by dynamic protocols such as SIRI and DATEX II). Overall, it is concerned with data for the following purposes:

- to be able to integrate legs made on alternative modes with conventional mode legs in seamless trip plans;

- to describe the coverage areas of alternative mode mobility services so that trip planning engines and others can make passengers aware of the possibility of using them, and provide appropriate links to invoke the dynamic services;

- to be able to find the locations of access points for alternative mode services, such as parking points, pooling stations, etc. including their relation to access points for conventional modes;

- to be able to indicate the costs of the mobility services for specific trip legs. Where operators offer a bundle of modes services (for example free cycle use with metro use) to be able to include the "fare product" for alternative mode legs in the sales offer;

- to be able to indicate how to book, purchase and pay for mobility services, and how to access them.

NeTEx is primarily concerned with the exchange of reference data to allow the integration of new modes with other data; it does not describe dynamic services. The PT1711 specification indicates the nature of some of these services such as trip planning.

1.3 Transport modes

All mass public transport modes are taken into account by NeTEx, including train, bus, coach, metro, tramway, ferry, air, and their submodes. Such modes are provided by transport operators, who may operate one or more modes.

NeTEx part 5 widens the concept of an operator to include providers of other forms of transport, and introduces the separate concept of a "mode of operation" to classify the way services are provided: conventional, flexible, pooling, sharing, etc.

1.4 Products and prices

The overall approach for the definition of products for alternative modes within NeTEx Part 5 Alternative modes) follows the approach used by Transmodel v6.0 Part5 (Fare Management data model), namely through the definition of access rights rather than of just products. Prices are separated from the things they price. The existing model also allows for dynamic prices to be fetched from a pricing engine.

This approach of using the access rights related to the urban public transport (for all urban modes) can be applied to any mode, including long-distance rail and alternative modes.

Exchange protocols

The exchange of data in NeTEx format can be undertaken using a variety of protocols. For example: through dedicated web services, through data file exchanges by FTP or otherwise, or by using the SIRI exchange protocol as described in part 2 of the SIRI documentation. NeTEx adds additional services using the common SIRI transport mechanisms.

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.

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 timetable exchange format*

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

CEN/TS 17413:2020[1], *Intelligent transport systems — Urban ITS — Models and definitions for new modes*

prEN 12896-10, *Public transport — Reference data model — Part 10: Alternative modes*

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[1] This TS has been drafted by the Project Team PT1711 and is often referred to as PT1711; note that this TS is currently being integrated in Transmodel Part 10, and will be replaced.

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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 https://www.electropedia.org/

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

3.1
access mode
characterization of the traveller's movement (e.g. walking, cycling, etc.) enabling the traveller to reach a public transport stop or to carry out a leg of a trip

3.2
alternative mode
publicly advertised mode of operation different from the conventional mode of operation, in particular vehicle sharing, vehicle rental and vehicle pooling

3.3
car pooling
vehicle pooling applied to cars, consisting in sharing a privately owned car for a trip between a defined driver who is already engaged in the trip and at least another traveller

3.4
car rental
vehicle rental applied to cars, consisting in making car(s) available at specified agencies with the constraint to bring them back at specified agencies

3.5
car sharing
vehicle sharing applied to cars, consisting of the short-term use of a vehicle for a specific journey or time where the car might be taken from and parked at different places in an urban area

3.6
conventional mode (of operation)
legacy mode of operation which is provided as a scheduled and/or flexible publicly advertised transport offer relying on a set of features:

- drivers are employees;

- the fleet is owned by an authority, or owned or run by an operator

- the network topology is defined well in advance and is based on lines and journey patterns

Note 1 to entry: The distinction between alternative and conventional mode of operation relies on the fact that one or more of the conditions as above may not be fulfilled. Moreover, the difference is in the mode of operation rather than the way the traveller is served.

3.7

cycle rental

vehicle rental applied to cycles (e.g. bikes, e-bikes, motorcycles, scooters, etc.), consisting in making cycle(s) available at specified agencies with the constraint to bring them back at specified agencies

3.8

cycle sharing

vehicle sharing applied to cycles (e.g. bikes, e-bikes, motorcycles, scooters, etc.), consisting of short-term cycle rental where the cycle can be taken from and parked at different places in the urban area

3.9

flexible transport mode (of operation)

passenger transport operation linked to a fixed network/schedule but offering flexibility, in order for instance, to optimize the service or to satisfy passenger demand

3.10

operational service

activities performed by actors in charge of operation of a service

3.11

mobility service

alternative mode transport service available over a widespread area, for example car-pooling, rental, etc.

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3.12

park and ride

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activity allowing travellers to transfer between personal/alternative mode and conventional mode

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3.13

park and ride facility

location dedicated to travellers allowing them a modal transfer, in particular to leave/pick up their personal vehicles before/after a trip on public transport

3.14

personal mode

private mode of operation excluding any publicly advertised use

3.15

public transport

means of transport advertised and available for use by the general public

3.16

scheduled mode

passenger transport operation following a fixed schedule and fixed routes

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3.17

taxi

type of vehicle pooling operation where the vehicle is driven by a driver providing services to travellers for commercial reasons

3.18

taxi stand

set of spots where any taxi is able to safely stop for a short period of time to load passengers

3.19

traveller information provision

activity consisting in the provision of information on the rules/conditions related to a traveller service and concerning the available transportation means

3.20

traveller service

activity (in general, initiated by users) in view of facilitating/enabling a trip

3.21

walking mode

walking as considered as an access mode so the traveller walks to a stop point to get to the transport option

3.22

vehicle pooling

particular mode of operation of a privately-owned vehicle (car, motorcycle, etc.) consisting in sharing the vehicle for a trip between a defined driver who is already engaged in the trip and at least one other traveller

3.23

vehicle rental

particular mode of operation of a vehicle fleet (in general privately owned) consisting in making it available at specified agencies with the constraint to bring them back at specified agencies

3.24

vehicle sharing

short term vehicle rental where the vehicle can be taken from and parked at different places in the urban area, often without the constraint of bringing the vehicle back to a dedicated specific location

3.25

vehicle with driver

vehicle operating on demand such as a taxi, chauffeured car or dispatched mini-cab

10

4 Symbols and abbreviations

ABT	Account Based Ticketing
CCAM	Cooperative, Connected and Automated Mobility
EU	European Union
EPIP	European Passenger Information Profile for NeTEx
GBFS	General Bicycle feed specification
GDF	Geographic Data Files
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GTFS	General Transit Feed specification
INSPIRE	Infrastructure for Spatial Information in Europe
iOS	iPhone Operating System
IXSI	Interface for X-Sharing Information
ITS	Intelligent Transport Systems
JSON	JavaScript Object Notation
MaaS	Mobility as a Service
RDEX	Ridesharing Data Exchange
SPDX	Software Package Data Exchange
U-ITS	Urban Intelligent Transport Systems

NOTE   In this document, alternative mode of operation, alternative mode and new mode are used as synonyms (with a preference to alternative mode). Conventional mode of operation is used as synonym of conventional mode, flexible mode of operation is synonymous to flexible mode, scheduled mode of operation as synonymous to scheduled mode.

5 Use Cases for Alternative Modes of Operation

5.1 General

NeTEx support for alternative modes is intended to include the exchange of reference data to support integrated passenger information for all modes. It is assumed that dynamic data exchange such as real-time statuses and predictions, real time trip-offers, etc, will be covered by other APIs – see Annexes – for alternative mode dynamic functions that are outside of the scope of NeTEx but are in the Transmodel scope, and mostly covered by SIRI for data exchange. The scope of NeTEx coverage includes the following use cases.

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5.2 Network Description

Location Search

Table 1 — location search use cases

Use Case	Description	Contributing elements in this document
Location Search: Park and Ride	Finding the Park and Ride location	PARKING model.
Location Search: Bike Sharing Stations	Finding a Bike Sharing Station	STOP PLACE, SITE Model.
Location Search: Car Sharing Stations	Finding a Car Sharing Station	PARKING model.
Location Search: Publicly accessible refuelling stations for combustion, charging stations for electric vehicles	Finding publicly accessible refuelling stations.	Via PARKING MODEL, REFUELLING EQUIPMENT, PARKING EQUIPMENT, NB – details are outside of scope.
Location Search: Secure Vehicle Parking	Finding Secure Bike and other Vehicle type Parking, including opening times and permitted stay lengths.	PARKING model.
Available vehicles	Provisioning services with registered vehicles	FLEET and VEHICLE MODE MODEL.
Service Coverage	Availability of an alternative service in a given e area	MOBILITY SERVICE.
Service Discovery	Available online services	ON-LINE SERVICE.

5.3 Integrated all Mode Trip Planning

Trip plan computation may be monomodal or intermodal and be for alternative modes only, conventional model only, or both. Computation may include finding legs, estimated travel times by day type and time-band by transport mode/combination of transport modes.

Table 2 — integrated modes use cases

Use Case	Description	Contributing elements in this document
Alternative Mode legs for trip planning.	Legs for all alternative modes including meeting points, available single journeys. Can include timings and estimated trip times.	SINGLE JOURNEY, VEHICLE MEETING POINT.
Costs of Alternative Mode legs and	Cost of using an alternative mode to make journey or to travel within an area.	DISTANCE MATRIX ELEMENT, TARIFF, FARE

		STRUCTURE ELEMENT, FARE PRICE.
Spatial route plots.	Spatial route plots for alternative mode legs.	VEHICLE MEETING LINK, ROUTE PATH.
Traveller profile for car sharing	User preferences for car sharing.	USER PROFILE, INDIVIDUAL TRAVELLER.
Product prerequisites and entitlements.	Information on any prerequisite products for alternative mode products and any entitlements to other travel services given by alternative mode products.	SALES DISCOUNT RIGHT, ENTITLEMENT GIVEN, ENTITLEMENT REQUIRED.
Network priorities and restrictions.	Where some restriction or priority for ALTERNATIVE MODEs occurs: lane priority for carpooling, reserved lane for bikes, two-way for bike and one-way for cars, etc. This information is mainly for traveller information purpose.	MODE RESTRICTION ASSESSMENT. NB data may be integrated from INSPIRE etc.

services. appears in the top-left cell.

5.4 Trip Information

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Table 3 — Trip information use cases

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Use Case	Description	Contributing elements in this document
Information Service: Where and how to buy tickets for demand responsive modes.	Includes retail channels, fulfilment methods, payment methods, location of the retail devices.	DISTRIBUTION ASSIGNMENT. DISTRIBUTION CHANNEL, FULFILMENT METHOD, RETAIL DEVICE
Vehicle facilities such as classes of carriage, on-board Wi-Fi.	Facilities that a traveller might find on the alternative mode.	FACILITY SET, FACILITY, EQUIPMENT.
How to book car sharing, taxis, cycle hire etc.	Includes retail channels, fulfilment methods, payment methods.	BOOKING ARRANGEMENTS.
How to access a vehicle.	How to access a rented or shared vehicle.	VEHICLE RELEASE EQUIPMENT SERVICE ACCESS CODE, VEHICLE ACCESS ASSIGNMENT.
Where how to pay for car parking, hydrogen, petrol and diesel recharging.	Includes retail channels, fulfilment methods, payment methods.	BOOKING ARRANGEMENTS, TICKETING EQUIPMENT, REFUELLING.