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Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 6: Parking publications

Intelligente Verkehrssysteme - Datex II Datenaustauschspezifikationen für Verkehrsmanagement und Verkehrsinformationen - Teil 6: Publikation von Parkinformationen

Systèmes de transport intelligents - Spécifications DATEX II d'échange de données pour la gestion du trafic et l'information routière - Partie 6: Publication de parking

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This Technical Specification (CEN/TS) was approved by CEN on 10 July 2022 for provisional application.

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.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

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

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European foreword

This document (CEN/TS 16157-6:2022) 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 supersedes CEN/TS 16157-6:2015.

EN 16157 series consists several parts under the general title “Intelligent transport systems — DATEX II data exchange specifications for traffic management and information”. Other parts may be developed in the future.

In comparison with this previous edition, the specified data model changed significantly due to the following major modifications:

- Update of the data model to support EN 16157-1:2018 (known as DATEX II, Version 3)
- Integrating the formerly published Level B-Approved extension approach into the core model, specified by a new namespace "Parking" (see Clause 7).
- Using the core model elements of [4], also known as Alliance for Parking Data Standards (APDS) model, as base for the new model approach.

EN 16157 series consists of several parts under the general title “Intelligent transport systems — DATEX II data exchange specifications for traffic management and information”. Other parts may be developed in the future.

As a user of this document, attention is drawn to the resources of www.datex2.eu. This web site contains related software tools and software resources that aid the implementation of EN 16157 DATEX II.

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.

Introduction

This document defines a common set of data exchange specifications to support the vision of a seamless interoperable exchange of traffic and travel information across boundaries, including national, urban, interurban, road administrations, infrastructure providers and service providers. Standardisation in this context is a vital constituent to ensure interoperability, reduction of risk, reduction of the cost base, promotion of open marketplaces and many social, economic and community benefits to be gained from more informed travellers, network managers and transport operators.

Delivering European Transport Policy in line with the White Paper issued by the European Commission requires co-ordination of traffic management and development of seamless pan European services. With the aim to support sustainable mobility in Europe, the European Commission has been supporting the development of information exchange mainly between the actors of the road traffic management domain for a number of years. In the road sector, DATEX II has been long in fruition, with the European Commission being fundamental to its development through an initial contract and subsequent co-funding through the Euro-Regional projects. With this standardisation of DATEX II, there is a real basis for common exchange between the actors of the traffic and travel information sector.

This document includes the framework and context for exchanges, the modelling approach, data content, data structure and relationships.

This document supports a methodology that is extensible.

The sixth part of the CEN/TS 16157- EN 16157 series (this document) deals with the publication of parking information. It specifies the structures and definitions of information that may be exchanged to convey urban parking information or truck parking information.

In normative Annex A, the data dictionary for the «D2Namespace» "Parking" is specified.

In normative Annex B, the referenced XML schema for the «D2Namespace» Parking is specified.

The European Committee for Standardisation (CEN) draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning procedures, methods and/or formats given in this document.

CEN takes no position concerning the evidence, validity and scope of patent rights.

1 Scope

This document specifies a publication sub-model supporting the exchange and shared use of data and information in the field of traffic and travel. It includes the framework and context for exchanges, the modelling approach, data content, data structure and relationships.

This document is applicable to:

- Traffic and travel information which is of relevance to road networks (non-urban and urban),
- Public transport information that is of direct relevance to the use of a road network (e.g. road link via train or ferry service),
- Traffic and travel information in the case of Cooperative intelligent transport systems (C-ITS).

This document establishes specifications for data exchange between any two instances of the following actors:

- Traffic Information Centres (TICs),
- Traffic Control Centres (TCCs),
- Service Providers (SPs),
- Use of this document may be applicable for use by other actors.

This document series covers, at least, the following types of informational content:

- Road traffic event information – planned and unplanned occurrences both on the road network and in the surrounding environment,
- Operator initiated actions,
- Road traffic measurement data, status data, and travel time data,
- Travel information relevant to road users, including weather and environmental information,
- Road traffic management information and instructions relating to use of the road network.

This part of the CEN/TS 16157 specifies the informational structures, relationships, roles, attributes and associated data types required for publishing parking information including static content (description and attribution of parking places and spaces as well as campus information) and dynamic content (occupancy and vehicle measurement information). It covers urban parking information as well as truck parking information.

This document specifies a DATEX II Parking namespace, which is part of the DATEX II platform independent model following EN 16157-1 (published as DATEX II, Version 3.x).

This Part excludes elements that are specified in other parts of the standard series, such as EN 16157-2 (Location referencing), EN 16157-7 (Common data elements) or CEN/TS 16157-12 (Facilities publications).

CEN/TS 16157-6:2022 (E)**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 16157-1:2018, *Intelligent transport systems — DATEX II data exchange specifications for traffic management and information – Part 1: Context and framework*

EN 16157-2:2019, *Intelligent transport systems — DATEX II data exchange specifications for traffic management and information – Part 2: Location referencing*

EN 16157-7:2018, *Intelligent transport systems — DATEX II data exchange specifications for traffic management and information – Part 7: Common data elements*

CEN/TS 16157-12:2022, *Intelligent transport systems — DATEX II data exchange specifications for traffic management and information – Part 12: Facilities publications*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16157-1, EN 16157-2, EN 16157-7 and the following apply.

3.1 campus

large facility (such as a university campus, or an airport), or a large geographic zone (such as a city or a town), which can contain numerous places that can be logically reported together

3.2 dynamic part [of the parking publications model]

Parking Status Publication model based on a ParkingStatusPublication class

3.3 EU truck parking regulation

short form for the “COMMISSION DELEGATED REGULATION (EU) No 885/2013 of 15 May 2013 supplementing ITS Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of information services for safe and secure parking places for trucks and commercial vehicles” [1]

3.4 hierarchy element general

generalised component of a place hierarchy that forms one element in the tree-like hierarchy

3.5 identifiedArea

identifiable discrete bounded geographic zone that shares common characteristics and is used for parking and mobility related operations or other purposes

3.6 parking publications model

entirety of the Parking Table Publication model and the Parking Status Publication model

3.7**place**

place or location used for parking, loading, unloading, standing, or some other mobility or transport related activity

3.8**place hierarchy**

method to build a hierarchy of place records, in on-street, off-street, and zone environments

Note 1 to entry: Zone environments as specified in this document.

3.9**space**

single space for parking or other mobility related purposes, usually designed for one vehicle, which may, but not necessarily, be denoted by painted or other road surface marker

3.10**static part [of the parking publications model]**

Parking Table Publication model based on the ParkingTablePublication class

3.11**subplace element**

sub-division of a place for the convenience of the operator to segment the place and identify varied uses for parking and mobility related operations or other purposes

3.12**truck parking site**

urban or interurban parking site which is assigned to trucks

Note 1 to entry: Other vehicles might be allowed as well.

4 Symbols and abbreviations

EU	European Union
ITS	Intelligent Transport Systems
UML	Unified Modeling Language
URL	Uniform Resource Locator
VMS	Variable Message Sign

5 Conformance

The DATEX II platform independent data model of which the Parking Publications models are a part, corresponds to the Level A model as defined in EN 16157-1.

Conformance with this Part shall require platform independent models from which platform specific models are generated to comply with the UML modelling rules defined in EN 16157-1 and with the following requirements of the models which are expressed in this part.

CEN/TS 16157-6:2022 (E)**6 UML notation**

The UML notation used in these Technical Specifications shall be as described in ISO/IEC 19505:2012 and in compliance with the methodology specified in EN 16157-1.

In line with normal UML practice, diagrams may be elided for clarity, with some model features described across multiple Clauses.

7 «D2Namespace» Parking**7.1 Overview**

The «D2Namespace» "Parking" may be used to specify parking infrastructure related information, i.e. information about parking places, spaces, their structure, appearance and equipment and their capabilities to park vehicles as well as their dynamic status information.

This «D2Namespace» "Parking" shall contain all required or necessary elements to specify truck parking information in accordance with the EU Truck Parking Regulation (see 3.3) as well. A corresponding profile is intended to be developed.

The «D2Namespace» "Parking" shall be immediately subordinate to the "PayloadPublication" package defined in EN 16157-7 and shall comprise

- the «D2Package» "ParkingTablePublication" (see 7.2 "The Parking Table Publication model")
- the «D2Package» "ParkingStatusPublication" (see 7.3 "The Parking Status Publication model")
- and, in addition, the classes, data types and enumerations specific for these payload publications.

The prefix of the namespace shall be "prk".

Some of the packages and individual classes used within the "Parking" namespace reside in the «D2Namespace» "Common", defined in EN 16157-7, in «D2Namespace» "LocationReferencing", defined in EN 16157-2 and in «D2Namespace» "Facilities", defined in CEN/TS 16157-12.

The classes, attributes, data types and enumerations that are specific to the namespace "Parking" are defined in the normative Annex A. The XML schema corresponding to this namespace is provided in the normative Annex B.

In informative Annex C, namespace dependencies with other namespaces are explained.

In informative Annex D, details on overcrowding information and threshold configuration are explained.

In informative Annex E, the specification of electric charging in combination with parking and the specification of rates/tariffs is explained.

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Each of the component data concepts is mentioned in this Clause, but further details and descriptions follow in subsequent Clauses. These component data concepts are: Place (see 7.2.4), SubplaceElement (see 7.2.5), IdentifiedArea (see 7.2.6), Space (see 7.2.7), Campus, VehicularAccess and PedestrianAccess (see 7.2.12), EquipmentServiceFacilityArea (see 7.2.6) and SpecificArea (see 7.2.6).

Place is a term introduced in the specification to define where a vehicle may park, stand, rest, or briefly transit to allow a person to change modes of transport (i.e. taxi drop-off/pickup, ride share drop-off/pickup, valet stand, etc.). Place is instantiated via the Place class. Place can also be used to define entry and exit roadways, driveways, and acceleration/deceleration zones for vehicles. Place supports both on-street and off-street operating environments. Place also defines specific areas to be defined for mobility or other related uses such as bike storage, e-scooter enclosures, etc. where it is useful to share operating parameters or assign RightSpecifications, Rates, or other data domains.

A Place is an aggregation of instances of SubplaceElement, IdentifiedArea and Space. In this specification, the lowest mandatory class instance to define a Place is the IdentifiedArea. Note: Space is lower data concept instance that can exist below IdentifiedArea data concept instance but it is not required.

An aggregation of IdentifiedAreas can create an instance of a SubplaceElement or a Place. Specific attributes are associated to each of the three specialization types of IdentifiedAreas.

An aggregation of instances of SubplaceElements can be linked to an instance of a higher level SubplaceElement or a Place.

At the highest level of the place hierarchy, an aggregation of instances of Place can be linked to an instance of a Campus. An instance of Campus is not required within an implemented place hierarchy.

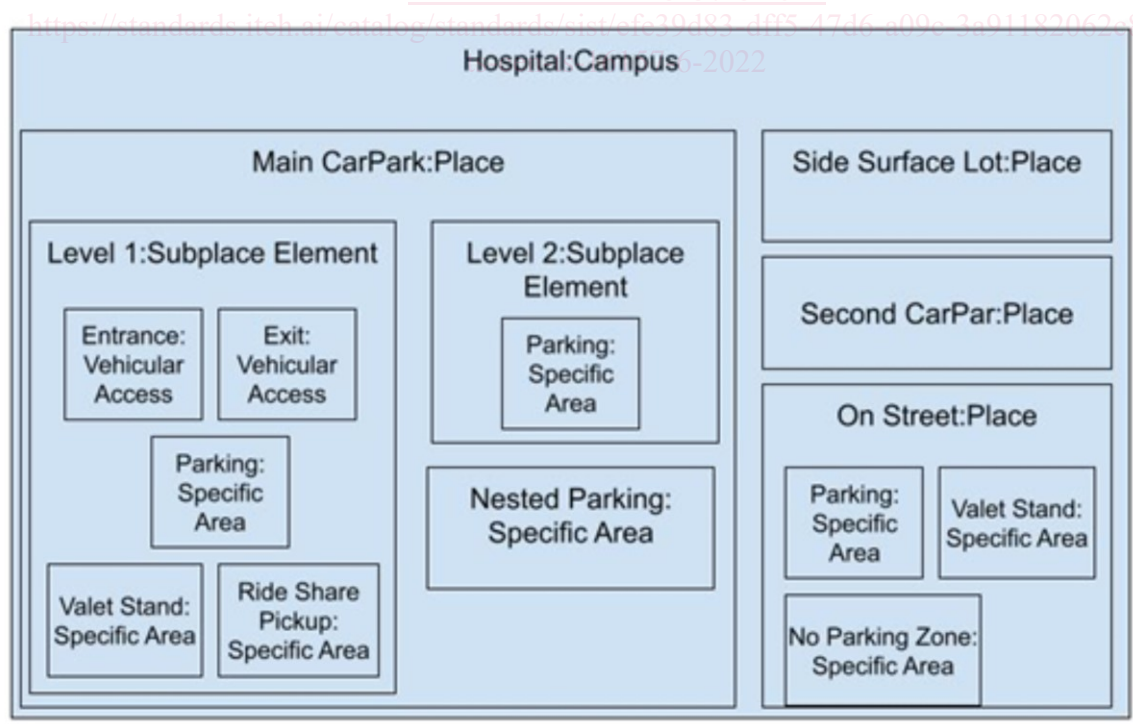


Figure 2 – Place Hierarchy Example – User oriented

Figure 2 illustrates how the instances of the various place hierarchy data concepts are combined to construct instances of nested parking hierarchy data concepts within one campus as a use case example.

To support parking, mobility or kerbside management operations, the `IdentifiedArea` class can be refined, through specialization, as one of four specialization types: `VehicularAccess`, `PedestrianAccess`, `SupplementalFacility` and `SpecificArea`.

The `IdentifiedArea` data concept collects general operating information such as operating hours, operating restrictions, space information, and payment information. If the data is absent at the specific instance of an `IdentifiedArea`, it is assumed the data for this information exists at a higher level in the hierarchy, encapsulated in either instances of `Place` or any level instance of `SubplaceElement` above the instance of `IdentifiedArea`. This allows for customization of operations at lower levels while relying on default data.

A place is synonymous with the structure or area a consumer associates with where a vehicle parks or a mobility service is delivered. It can be an entire parking structure or an aggregation of streets supporting on-street parking (also sometimes called a zone). General operating information such as operating hours, operating restrictions, space information, payment information, etc. is associated to a place and any parts of the hierarchy underneath it as appropriate.

A core component of this model defines a hierarchy that supports the identification of parts of locations that may be related to parking and other types of operations. Use of this hierarchy enables data suppliers to provide a structured mechanism to refer to related zonal and place concepts with an ordered hierarchy.

Figure 1 shows concepts within the place hierarchy:

- `HierarchyElementGeneral` - a generalised component of a place hierarchy that forms one element in the tree-like hierarchy. This forms a reusable block of the hierarchy, with relations to its parent element (if one exists) and any child elements. Each place in the hierarchy shall have a name, and may support a free-text description and an operator/property owner defined reference (e.g. location number/identifier).
- Note that a `HierarchyElementGeneral` is a specialisation of `Facility`, defined in CEN/TS 16157-12 which offers a couple of general properties like rates, operation hours or owner/operator information.
- There are five specializations of the place hierarchy (`HierarchyElementGeneral` class), which conceptually defines different scales of hierarchy elements. From largest to smallest, they are:
 - `Campus` - the highest level in the hierarchy, it typically defines a large facility (such as a university campus, or an airport), or a large geographic zone (such as a city or a town), which may contain numerous places. A campus combines and encompasses a number of `Places` that can be logically reported together. Different entities sharing data may create their own aggregation of places. Thus, a place may appear in different campuses if a receiving party receives data from different sending parties. Example: a parking operator may group five (5) places together that it operates and call it a campus to reflect the five (5) operations in a city. Three of the same places may be associated with a property management firm that created a campus with the three places.
 - `Place` - a place or location used for parking, loading, unloading, standing, or some other mobility or transport related activity. `Place` typically identifies a parking structure, surface lot or on street parking zone.