



SLOVENSKI STANDARD

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Inteligentni transportni sistemi - Specifikacije za izmenjavo podatkov DATEX II pri upravljanju prometa in informiranju - 1. del: Skladnost in okvir

Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 1: Context and framework

Intelligente Verkehrssysteme - DATEX II Datenaustauschspezifikation für Verkehrsmanagement und Verkehrsinformation - Teil 1: Kontext und Rahmenwerk

Systèmes de transport intelligents — Spécifications DATEX II d'échange de données pour la gestion du trafic et l'information routière — Partie 1: Contexte et cadre général

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Intelligent transport systems - DATEX II data exchange specifications for traffic management and information - Part 1: Context and framework

Systèmes de transport intelligents - Spécifications DATEX II d'échange de données pour la gestion du trafic et l'information routière - Partie 1: Contexte et cadre général

Intelligente Verkehrssysteme - DATEX II Datenaustauschspezifikation für Verkehrsmanagement und Verkehrsinformation - Teil 1: Kontext und Rahmenwerk

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.

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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.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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European foreword

This document (EN 16157-1:2024) 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.

This document will supersede EN 16157-1:2017.

EN 16157-1:2024 includes the following significant technical changes with respect to EN 16157-1:2017:

- Introduction of a new stereotype for entities
- Introduction of a new stereotype for codelists
- New reference mechanism with graphical representation in UML
- Complex datatypes can be set as type of UML attributes
- Bugfixes and improvements of phrasing

EN 16157-1 is the first part of a multi-part standard under the general title “Intelligent transport systems — DATEX II data exchange specifications for traffic management and information”.

This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

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Introduction

This document defines a common set of data exchange specifications to support the vision of a seamless interoperable exchange of road traffic and travel information across boundaries, including national, urban, interurban, road administrations, infrastructure providers and service providers. Standardization 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.

Deploying Intelligent Transport Systems in line with European Sustainable and Smart Mobility Strategy in achieving connected and automated multimodal mobility as issued by the European Commission requires co-ordination of traffic management operation and development of seamless pan European information services. These jointly aim at contributing to the transformation of the European transport system to the objectives of efficient, safe, sustainable, smart and resilient mobility.

In this context the European Commission has been supporting the development of information exchange between the actors of the road traffic management - and related services- domain for a several 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 of the further evolution of the standard and user support ecosystem. With this standardization of DATEX II, there is a real basis for common exchange between the actors of the traffic and travel information sector both in the collaboration between traffic management organisations and theirs systems, as well as in the coherent way of information provision to service providers. DATEX II supports the requirements of the stakeholder organisations involved in the road traffic and travel domain in compliance with the EU policy and legal frameworks aimed at the sector.

The European Committee for Standardization (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.

This part of EN 16157 is targeted towards all stakeholders that want to understand the modelling methodology applied throughout the DATEX II specifications. While this is potentially a wide range of readers, the document addresses specifically those users that intend to extend the DATEX II data model and therefore need to understand – and conform with – the modelling principles, the use of the Unified Modelling Language (UML) and other conventions for DATEX II modelling.

Further to the UML modelling, this document also defines the mapping of this model to the eXtensible Markup Language (XML), used for formatting data in DATEX II data exchanges. XML, being a widely used method nowadays of formatting data for business-to-business data exchange over the Internet, is one of the possible solutions for mapping the UML modelling into formatted data. Other methods like UPER based on ASN.1 defined by ISO/IEC 8825-2 and JSON Schema defined by <https://json-schema.org/draft/2020-12/json-schema-core.html> can also be considered and will potentially be specified in further standards in this series. It should also be noted that this standard describes a framework for DATEX II data that is usable for dynamic data messaging services. Other use cases like for example map update exchange may benefit from other frameworks like e.g. Geography Markup Language (GML). Thus, not all parts of the EN 16157 series will conform to all requirements of this document.

1 Scope

This document specifies and defines components required to support the exchange and shared use of data and information in the field of traffic and travel.

The components include the framework and context for 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 content to be exchanged 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.

The 16157 series of European Standards cover, 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,
- Information about operator initiated actions – including both advisory and mandatory measures,
- 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 information and advice relating to use of the road network.
- Traffic Regulations

This part of EN 16157 specifies the DATEX II framework of all parts of this document, the context of use and the modelling approach taken and used throughout these European Standards. This approach is described using formal methods and provides the mandatory reference framework for all other parts.

prEN 16157-1:2024 (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.

ISO/IEC 19505-1:2012, *Information technology — Object Management Group Unified Modeling Language (OMG UML) — Part 1: Infrastructure*

ISO/IEC 14977:1996, *Information technology — Syntactic metalanguage — Extended BNF*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

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

— IEC Electropedia: available at <https://www.electropedia.org/>

NOTE Some Definitions in this clause have been taken from ISO/IEC 19505-1:2012 but have been adapted to meet the particular use of UML within this specification.

3.1**association**

semantic relationship between classes

3.2**attribute**

named slot within a class that describes a range of values that instances of the class may hold

3.3**class**

description of a set of objects that share the same attributes, relationships, and semantics

3.4**composition**

association between two classes, where one class is a composite and the other is a part

Note 1 to entry: This characteristic is expressed in UML with an attribute named “isComposite” on the part end of the Association being set to “true”.

3.5**dependency**

implementation or functioning of one or more elements that requires the presence of one or more other elements

3.6**enumeration**

data type whose range is a list of predefined values, called enumeration literals

3.7**enumeration literal**

element of the value space of an enumeration data type

3.8

generalization

taxonomic relationship between a more general element and a more specific element

3.9

multiplicity

range of integers specifying the allowable cardinalities for an instantiation of an element

Note 1 to entry: The upper bound of the range cannot be below the lower bound. The lower bound is a nonnegative integer. The upper bound is a nonnegative integer or the special value unlimited, which indicates there is no upper bound on the range.

3.10

package

grouping of model elements

3.11

UML profile

mechanism that allows metaclasses from existing metamodels to be extended to adapt them for different purposes

Note 1 to entry: The term profile within the term UML profile has a different meaning than the term profile defined in 3.27.

3.12

stereotype

concept provides a way of branding (classifying) model elements so that they behave in some respects as if they were instances of new virtual metamodel constructs

3.13

binary (association)

association that connects exactly two classes

3.14

extension

set of data model elements not in the Level A domain and following the extension rules of DATEX II

3.15

Universally Unique Identifier

identifier that is unique in space and time, i.e. no other object will ever have the same identifier at any other place and at any time

3.16

Lower Camel Case

description of the practice of concatenating compound phrases without whitespace in between where phrases are delimited by upper case letters

Note 1 to entry: Lower Camel Case describes the case where the initial letter is lower case, e.g. as in lowerCamelCase.

3.17

model element

generic term for any construct of metadata used within a model to specify a particular aspect or element of this model

prEN 16157-1:2024 (E)**3.18****Platform Independent Model**

model of aspects of an information system (e.g. the data model) that is independent of any technical platform used to implement the model

Note 1 to entry: Concrete implementations can be derived from the platform independent model by platform specific models or mappings.

3.19**Platform Specific Model**

model of aspects of an information system (e.g. the data model) that is linked to a specific technological platform (e.g. a specific programming language or data transfer syntax)

3.20**publication**

traffic related information or associated management information created at a specific point in time that can be exchanged via a DATEX II interface

Note 1 to entry: The "PayloadPublication" class is the top level root class for DATEX II Level A.

3.21**Upper Camel Case**

description of the practice of concatenating compound phrases without whitespace in between where phrases are delimited by upper case letters

Note 1 to entry: Upper Camel Case describes the case where the initial letter is upper case, e.g. as in UpperCamelCase.

3.22**Unique Resource Identifier**

character string of well defined structure used to uniquely identify a resource

3.23**Unique Resource Locator**

Unique Resource Identifier actually pointing at a resource accessible via the Internet

3.24**eXtensible Markup Language**

set of rules for encoding electronic documents defined by the World Wide Web Consortium W3C

Note 1 to entry: Although developed for documents, it is today widely used for data exchange in general, usually in conjunction with an XML Schema Definition.

3.25**XML Metadata Interchange**

XML based specification for the interoperable exchange of metadata

Note 1 to entry: It is today most commonly used to exchange UML models between UML tools. XMI is specified in ISO/IEC 19508:2014.

3.26**XML Schema Definition**

formal description of the allowed content of an XML document that claims to conform with the schema

Note 1 to entry: XML Schema Definitions allow for formal validation of syntactical conformity of instance documents.

3.27**profile**

selection of possible, optional elements

3.28**superclass**

class directly related to the class of interest by a UML generalisation

3.29**namespace**

identifier that specifies a set of unique names

3.30**facet**

defining aspect of a value space

4 Symbols and abbreviations

UUID Universally Unique identifier

LCC Lower Camel Case

PIM Platform Independent Model

PSM Platform Specific Model

UCC Upper Camel Case

UML Unified Modelling Language

URI Unique Resource Identifier

URL Unique Resource Locator

W3C World Wide Web Consortium

XML eXtensible Markup Language

XMI XML Metadata Interchange

XSD XML Schema Definition

5 General conventions and requirements**5.1 Metamodelling**

The DATEX II data modelling methodology uses the Unified Modelling Language (UML), version 2 as specified in ISO/IEC 19505-1:2012. More accurately the release 2.4.1 of UML 2 is used.

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UML provides a vast set of modelling elements that are not all used for DATEX II data modelling. In fact, DATEX II uses a fairly small UML profile, based on the following metaclasses from the Core::Basic and Core:Constructs packages specified in ISO/IEC 19505-1:2012:

- Association (stereotypes: D2Relation)
- Attribute (stereotypes: D2Attribute, D2Literal)
- Class (stereotypes: D2Class, D2Entity, D2EntityIdentifiable, D2EntityVersionedIdentifiable, D2Identifiable, D2VersionedIdentifiable, D2ModelRoot, ExternalClass)
- DataType (stereotypes: D2Codelist, D2Datatype, ExternalType)
- Enumeration (stereotype: D2Enumeration)
- Generalization (some of them having the stereotype: D2LevelBExtension)
- Package (stereotypes: D2Package, D2Namespace, ExternalNamespace)

DATEX II specifies metadata for the metaclasses in a UML profile with stereotypes which are assigned to the metaclasses, as listed above.

Simple types that may be assigned to attributes are defined as datatypes or enumerations.

Complex types (data structures) are defined as classes and may also be assigned to attributes as type. Alternatively, they may be connected via a composition.

Generalization between classes is allowed, but multiple inheritance is prohibited, i.e. each class shall have either zero or one superclass.

Classes, datatypes and enumerations may be structured in namespace packages, which define a namespace for their contained classes, datatypes, enumerations and sub-packages. They may also be structured simply in packages, which have no further semantics in DATEX II, they simply serve to structure DATEX II models and make them more accessible.

Namespaces, classes and datatypes also have an option to refer to an external namespace, class or datatype. The stereotypes defined for this purpose contain only the metadata required to refer to the external entity. The specification of such external model elements is entirely out of the scope of this document.

For readers not familiar with using UML or its graphical notations there is plenty of introductory material available to learn about UML in general and we would like to refer the reader to these resources for further study (e.g. to [1] or [2]). It should be noted that this document uses only the default graphical representation of all UML elements used.

Note that no provisions are made regarding the existence and use of other UML elements. Thus, compliant models may use these other elements, but they have no defined semantics in the framework of DATEX II.

The stereotypes of the DATEX II UML profile related to the platform independent model have defined properties which are used in subsequent clauses to specify metamodel aspects. The allocation of which properties are used by which stereotypes is depicted in the diagrams in clause 6. Further to that, additional properties have been defined to govern the platform specific mapping to XML schema definitions (ref. Annex A). Other property sets may be added to generate an alternative platform specific model. Models that claim to conform with this specification may use these UML elements but shall conform with all provisions regarding the use of these elements.