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**Intelligente Verkehrssysteme –
Datex-II-Datenaustauschspezifikationen für Verkehrsmanagement und
Verkehrsinformationen –
Teil 12: Publikationen von Anlagen und Einrichtungen;
Englische Fassung CEN/TS 16157-12:2022**

Intelligent transport systems –
DATEX II data exchange specifications for traffic management and information –
Part 12: Facility related publications;
English version CEN/TS 16157-12:2022

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Nationales Vorwort

Dieses Dokument (CEN/TS 16157-12:2022) wurde vom Technischen Komitee CEN/TC 278 „Intelligente Verkehrssysteme“ ausgearbeitet, dessen Sekretariat von NEN (Niederlande) gehalten wird.

Das zuständige deutsche Normungsgremium ist der Gemeinschaftsarbeitsausschuss NA 052-02-71 GA „Gemeinschaftsarbeitsausschuss NAAutomobil/DKE: Intelligente Verkehrssysteme“ des DIN-Normenausschusses Automobiltechnik.

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Dieser Teil der Normenreihe behandelt Informationen für Anlagen und Einrichtungen. Das Dokument legt in DATEX II den Namensraum "Facilities", sowie entsprechende Untermodelle fest. Auf diese Untermodelle kann direkt über Namensräume zugegriffen werden, die in andern DATEX-Normenteilen festgelegt wurden, indem Klassen für Anlagen und Einrichtung oder deren Status definiert werden.

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Nationaler Anhang NA (informativ)

Begriffe

Die Benummerung der folgenden Begriffe und Abkürzungen ist identisch mit der Benummerung in der englischen Fassung.

Für die Anwendung dieses Dokuments gelten die Begriffe aus EN 16157-1, EN 16157-2, EN 16157-7 und die folgenden Begriffe.

ISO und IEC stellen terminologische Datenbanken für die Verwendung in der Normung unter den folgenden Adressen bereit:

- ISO Online Browsing Platform: verfügbar unter <https://www.iso.org/obp>
- IEC Electropedia: verfügbar unter <http://www.electropedia.org/>

3.1

Anlage

Einrichtung

en facility

jede Art von Standort, Gebäude oder Bauwerk, einschließlich Serviceeinrichtungen oder ergänzender Anlagen und Ausrüstung

— Leerseite —

English Version

Intelligent transport systems —
DATEX II data exchange specifications for traffic
management and information —
Part 12: Facility related publications

Intelligente Verkehrssysteme —
Datex-II-Datenaustauschspezifikationen für
Verkehrsmanagement und Verkehrsinformationen —
Teil 12: Publikationen von Anlagen und Einrichtungen

This Technical Specification (CEN/TS) was approved by CEN on 20 March 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.

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Contents

European foreword	5
Introduction	6
1 Scope.....	7
2 Normative references.....	8
3 Terms and definitions	8
4 Symbols and abbreviations	8
5 Conformance.....	8
6 UML notation	9
7 «D2Namespace» Facilities	9
7.1 Overview	9
7.2 «D2Package» Facilities	9
7.2.1 Overview	9
7.2.2 Semantics	12
7.3 «D2Package» Dimension.....	12
7.3.1 Overview	12
7.3.2 Semantics	13
7.4 «D2Package» OrganisationPublication	13
7.4.1 Overview	13
7.4.2 Semantics	15
7.5 «D2Package» RatesPublication	16
7.5.1 Overview	16
7.5.2 Semantics	19
7.6 «D2Package» SupplementalFacility	21
7.6.1 Overview	21
7.6.2 Semantics	22
7.7 «D2Package» OperatingHoursPublication	25
7.7.1 Overview	25
7.7.2 Semantics	26
7.8 Data types	27
7.9 Duration value	28
8 LocationExtension and EmissionsExtension in «D2Namespace» Extension.....	28
8.1 FacilityLocation (Address)	28
8.2 EmissionsExtension	29
Annex A (normative) Data Dictionary for «D2Namespace» Facilities	30
A.1 Overview	30
A.2 Data Dictionary for "Facilities"	31
A.2.1 "DataValue" package.....	31
A.2.2 "Dimension" package	32
A.2.3 "Eligibility" package.....	33
A.2.4 "Facility" package	36
A.2.5 "OperatingHoursPublication" package.....	40
A.2.6 "OrganisationPublication" package	45
A.2.7 "PaymentMethod" package	51

A.2.8	"Rates" package.....	53
A.2.9	"Right" package	64
A.2.10	"SupplementalFacility" package	67
A.3	Data Dictionary of $\leq D2Datatype \geq$ for "Facilities"	71
A.3.1	Introduction.....	71
A.3.2	The $\leq D2Datatype \geq$ "AmountOfMoney"	71
A.3.3	The $\leq D2Datatype \geq$ "CurrencyCode"	71
A.3.4	The $\leq D2Datatype \geq$ "Duration"	71
A.3.5	The $\leq D2Datatype \geq$ "IndexReference"	71
A.3.6	The $\leq D2Datatype \geq$ "SquareMetres"	71
A.3.7	The $\leq D2Datatype \geq$ "TimeZone"	71
A.4	Data Dictionary of $\leq D2Enumeration \geq$ for "Facilities"	71
A.4.1	Introduction.....	71
A.4.2	The $\leq D2Enumeration \geq$ "AccessibilityEnum"	71
A.4.3	The $\leq D2Enumeration \geq$ "AvailabilityEnum"	72
A.4.4	The $\leq D2Enumeration \geq$ "CredentialTypeEnum"	72
A.4.5	The $\leq D2Enumeration \geq$ "EnergySourceEnum"	73
A.4.6	The $\leq D2Enumeration \geq$ "EquipmentTypeEnum"	74
A.4.7	The $\leq D2Enumeration \geq$ "FacilityTypeEnum"	76
A.4.8	The $\leq D2Enumeration \geq$ "ImageFormatEnum"	77
A.4.9	The $\leq D2Enumeration \geq$ "MeansOfPaymentEnum"	77
A.4.10	The $\leq D2Enumeration \geq$ "OpeningStatusEnum"	78
A.4.11	The $\leq D2Enumeration \geq$ "OperationStatusEnum"	79
A.4.12	The $\leq D2Enumeration \geq$ "OrganisationTypeEnum"	79
A.4.13	The $\leq D2Enumeration \geq$ "PaymentBrandsEnum"	79
A.4.14	The $\leq D2Enumeration \geq$ "PaymentTimingEnum"	80
A.4.15	The $\leq D2Enumeration \geq$ "RateAvailabilityTypeEnum"	80
A.4.16	The $\leq D2Enumeration \geq$ "RateLineTypeEnum"	81
A.4.17	The $\leq D2Enumeration \geq$ "RateTypeEnum"	81
A.4.18	The $\leq D2Enumeration \geq$ "RateUsageConditionsTypeEnum"	81
A.4.19	The $\leq D2Enumeration \geq$ "RefundTypeEnum"	81
A.4.20	The $\leq D2Enumeration \geq$ "ReservationTypeEnum"	82
A.4.21	The $\leq D2Enumeration \geq$ "RightTypeEnum"	82
A.4.22	The $\leq D2Enumeration \geq$ "ServiceFacilityTypeEnum"	83
A.4.23	The $\leq D2Enumeration \geq$ "SurchargeTypeEnum"	84
A.4.24	The $\leq D2Enumeration \geq$ "UserTypeEnum"	84
Annex B	(normative) Data Dictionary for «D2Namespace» Extension	86
B.1	Overview	86
B.2	Data Dictionary for "Extension"	87
B.2.1	"CommonExtension" package	87
B.2.2	"LocationExtension" package.....	88
B.3	Data Dictionary of $\leq D2Datatype \geq$ for "Extension"	91
B.3.1	Introduction.....	91
B.3.2	The $\leq D2Datatype \geq$ "TimeZone"	91
B.4	Data Dictionary of $\leq D2Enumeration \geq$ for "Extension"	91
B.4.1	Introduction.....	91
B.4.2	The $\leq D2Enumeration \geq$ "AddressLineTypeEnum"	91

Annex C (normative) Referenced XML Schema 92

C.1 Overview 92

C.2 Schema for «D2Namespace» Facilities 92

C.3 Schema for «D2Namespace» CommonExtension 149

C.4 Schema for «D2Namespace» LocationExtension 149

Annex D (informative) Differences from prISO 5206-1 152

D.1 Differences from prISO 5206-1 152

Bibliography..... 154

European foreword

This document (CEN/TS 16157-12:2022) 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.

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.

For users 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.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EU Directive(s).

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 12th part of the CEN/TS 16157 - EN 16157 series (this document) deals with information on facilities. It defines a new DATEX II namespace “Facilities” and sub-models on the following facility related topics:

- Dimensions;
- Equipment or service facilities;
- Operating hours;
- Organisations;
- Rates.

These sub-models can be directly accessed and used by namespaces defined in other parts of the DATEX standard series by specialising the Facility or the FacilityStatus class, as for example, by the energy infrastructure publication or the parking publications. By providing a couple of Publications within this new Part 12 (for example, "OperatingHoursPublication"), it is also possible to specify and publish stand-alone information on the above-mentioned topics and just reference this data elsewhere.

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

In normative Annex C, the referenced XML schema for the «D2Namespace» Facilities 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.

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1 Scope

This document specifies and defines component facets supporting the exchange and shared use of data and information in the field of traffic and travel.

The component facets include 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 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 CEN/TS 16157 specifies the informational structures, relationships, association ends, attributes and associated data types required for publishing information about facilities within the DATEX II framework. This is specified as a DATEX II "Facilities" namespace, which is part of the DATEX II platform independent model, but this Part excludes those elements that are specified in EN 16157-2 (Location referencing) and EN 16157-7 (Common data elements).

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

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

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

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

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.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1 facility

any kind of site, building, structure, including also service- or supplemental facilities and equipment

4 Symbols and abbreviations

ETRS89	European Terrestrial Reference System 1989
EU	European Union
GUID	Globally Unique Identifier
HTML	Hyper text mark-up language
IP	Internet Protocol
PDF	Portable document format created by Adobe
UML	Unified Modeling Language
URL	Uniform Resource Locator

5 Conformance

The DATEX II platform independent data model of which the Facilities 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.

6 UML notation

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

7 «D2Namespace» Facilities

7.1 Overview

This namespace shall define a facility class structure with properties that are related to all kind of facilities, for example, parking sites or energy stations.

For some of the elements it shall be possible to specify a separate publication. By this construct, it will be possible to predefine sets and to reference them later.

The following elements are included in this namespace:

- «D2Package» Facility – An abstract facility class structure that utilises the elements of the hereafter following packages;
- «D2Package» Dimension – Dimensions of facilities;
- «D2Package» OrganisationPublication – Organisation data with contact information;
- «D2Package» RatesPublication – A generic structure for tariffs and payment;
- «D2Package» SupplementalFacility – Equipment and service facilities supplemental to some origin facility, offering all facility properties theirselves;
- «D2Package» OperatingHoursPublication – Operating hours of facilities.

The namespace includes further data types, data values and enumerations that are integral part of the above model parts.

The prefix of the namespace shall be "fac".

Some of the packages and individual classes used within the "Facilities" namespace reside in the namespaces "Common" and "Location" defined in EN 16157-7 and EN 16157-2.

The classes, attributes, data types and enumerations that are specific to the namespace "Facilities" are defined in the normative Annex A.

The classes, attributes, data types and enumerations that are specific to two additional extensions specified in clause 8 are defined in the normative Annex B.

The XML schema corresponding to this namespace is provided in the normative Annex C.

7.2 «D2Package» Facilities

7.2.1 Overview

The "Facility" and "FacilityObject" class shall form an abstract class structure that utilises the elements of the hereafter following clauses. Classes from other namespaces may specialise the Facility class to inherit the features of a facility described in this document – see Figure 1.

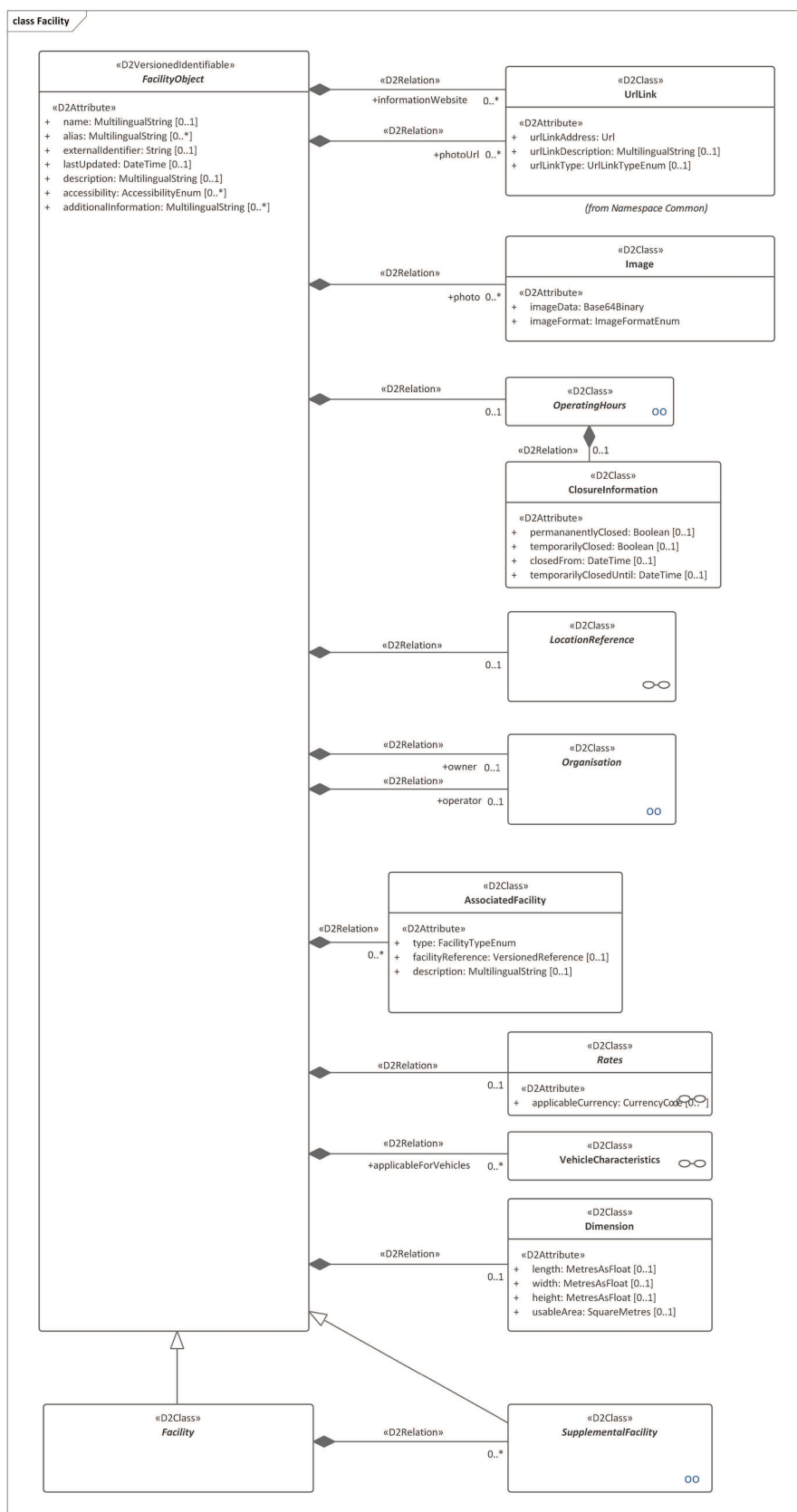


Figure 1 — The facility class structure

Example: An EnergyInfrastructureSite from Namespace EnergyInfrastructure (specified in CEN/TS 16157-10) is a specialisation of a Facility, and thus information on its location, operating hours, specific images and more can be specified.

The distinction between FacilityObject and Facility (which is a specialisation of FacilityObject) shall avoid recursion by the means of a SupplementalFacility, which is a specialisation of a FacilityObject itself.

The "FacilityStatus" and "FacilityObjectStatus" class shall form an abstract class structure in the same sense described above, focussing on dynamic status information for a facility – see Figure 2.

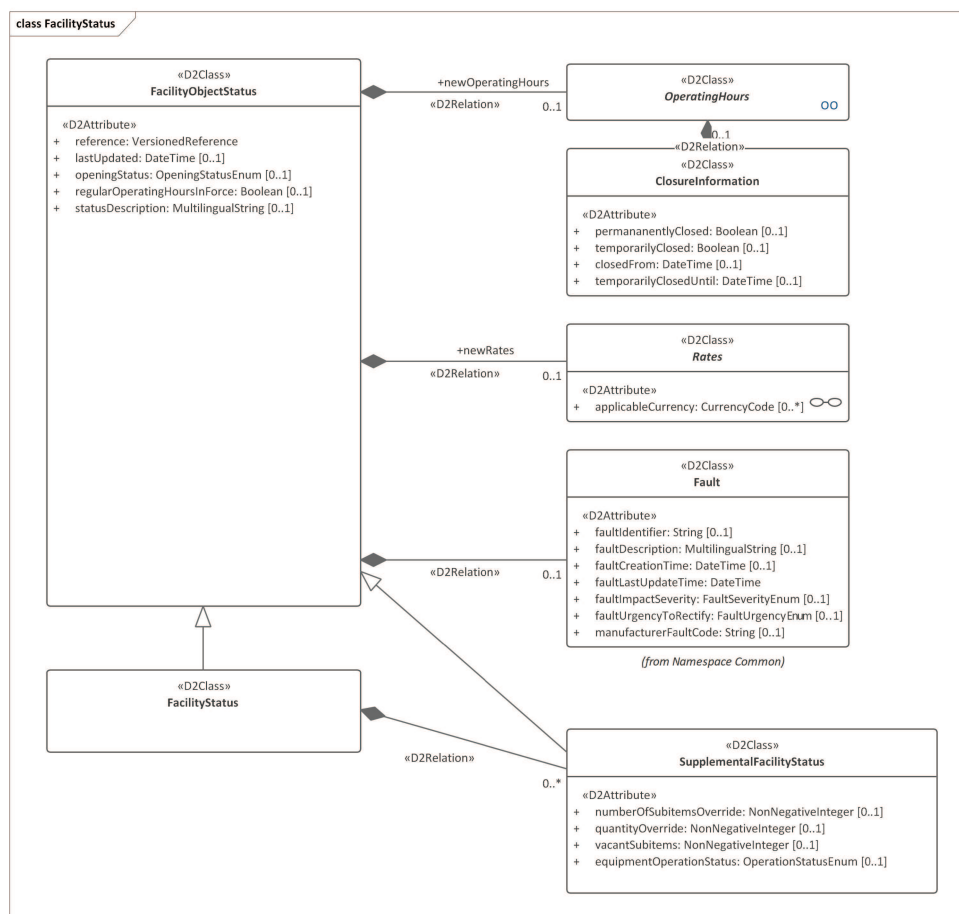


Figure 2 — The facility status class structure

Example: The class EnergyInfrastructureSiteStatus from Namespace EnergyInfrastructure (specified in CEN/TS 16157-10) is a specialisation of FacilityStatus, and thus status information on updated operating hours, faults and more can be specified.

The distinction between FacilityObjectStatus and FacilityStatus (which is a specialisation of FacilityObjectStatus) shall avoid recursion by the means of a SupplementalFacilityStatus, which is a specialisation of FacilityObjectStatus itself.

The class FacilityObject shall be of type «D2VersionedIdentifiable». Thus, each facility may be referenced by id and version. In class FacilityObjectStatus, the mandatory attribute reference of type VersionedReference shall form the link between static and the dynamic part of the facility model.

NOTE All further classes depicted in Figure 1 and Figure 2 that are not denoted in 7.2.2 will be described in the later clauses.

7.2.2 Semantics

7.2.2.1 «D2Class» Facility and «D2VersionedIdentifiable» FacilityObject

By the Facility class and its inheritance of the FacilityObject class, a facility may be described with the following features:

- Basic information: A name, alias, external identifier, timestamp of last update, a description, information on accessibility and some additional information;
- URLs of information websites and photos;
- Photos (in binary format);
- Operating hours (including closure information), see 7.7;
- Location reference, as specified in EN 16157-2;
- Owner and operator information, using the Organisation structure, see 7.4;
- Associated facility: A reference to another facility or a short indication of it;
- Rates: Tariffs and payment information, see 7.5;
- Applicable vehicles, as specified by VehicleCharacteristics in EN 16157-7;
- Dimension, i.e. basic information on height, width, length or usable area;
- Supplemental facility: Some associated service facility or equipment, being itself characterised as a facility, see 7.6.

7.2.2.2 «D2Class» FacilityStatus and «D2Class» FacilityObjectStatus

By the FacilityStatus class and its inheritance of the FacilityObjectStatus class, a facility status may be described with the following features:

- Basic status information: The reference to the static facility object, timestamp of last update, the opening status, a status description;
- Operating hours (will replace formerly defined operating hours);
- Rates (will replace formerly defined rates);
- A fault;
- Supplemental facility status. As this is a facility itself, each supplemental facility can be addressed and referenced by the versioned-identifiable mechanism of the FacilityObject.

7.3 «D2Package» Dimension

7.3.1 Overview

The “Dimension” class (see Figure 1) shall support provision of dimension information for a facility or object.

7.3.2 Semantics

7.3.2.1 «D2Class» Dimension

Each instance of the “Dimension” class may be used to define dimensions (length, width, height, usable area) of some facility or object, including length, width, height and the usable area.

7.4 «D2Package» OrganisationPublication

7.4.1 Overview

The “OrganisationPublication” package shall support the specification of organisation related information such as organisation unit and contact information. The information may be specified directly or by reference (see Figure 3).

By using the «D2Class» "OrganisationPublication", it shall be possible to define tables of organisation information in advance and reference them later (see Figure 4).

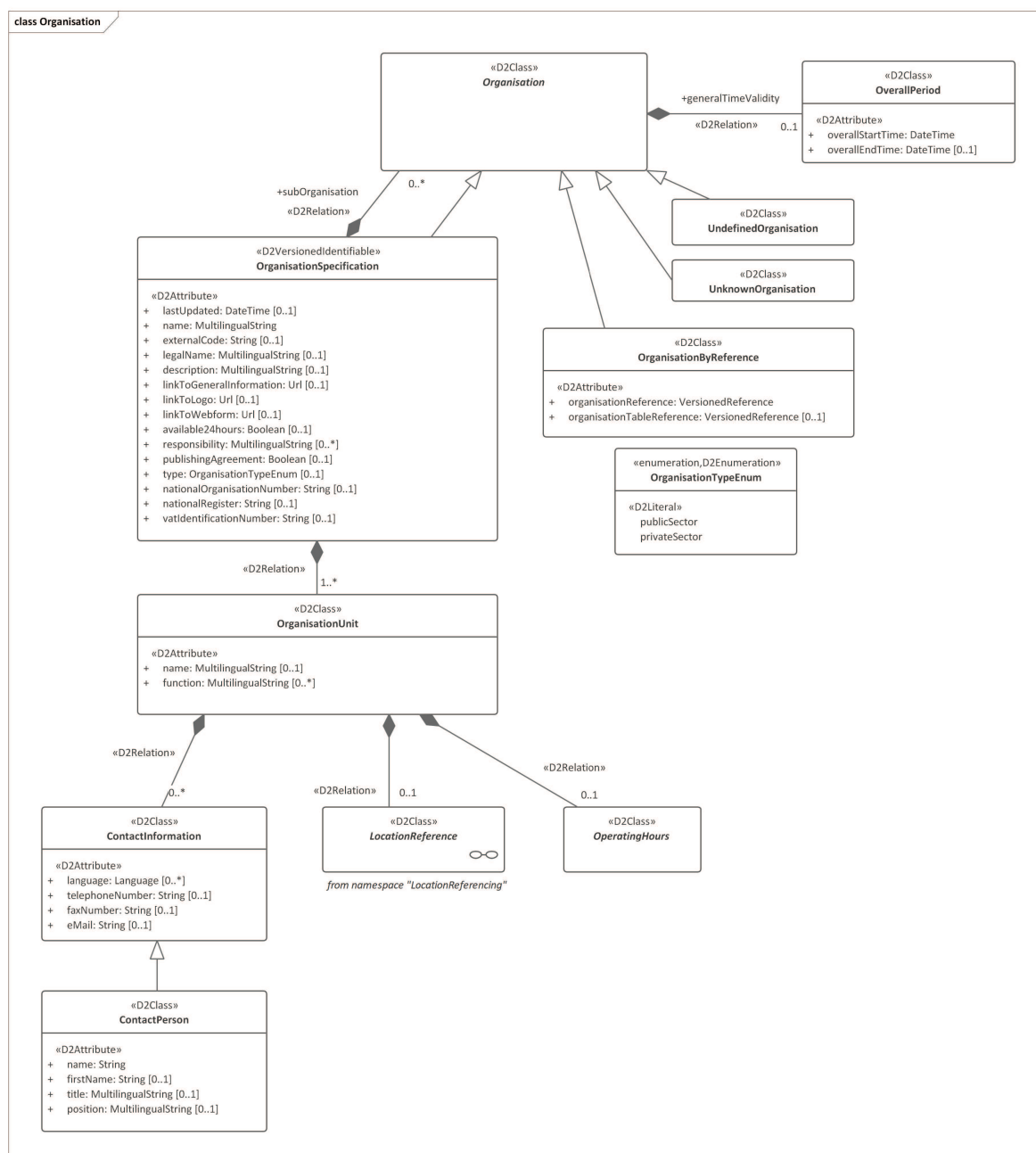


Figure 3 — The “Organisation” class model

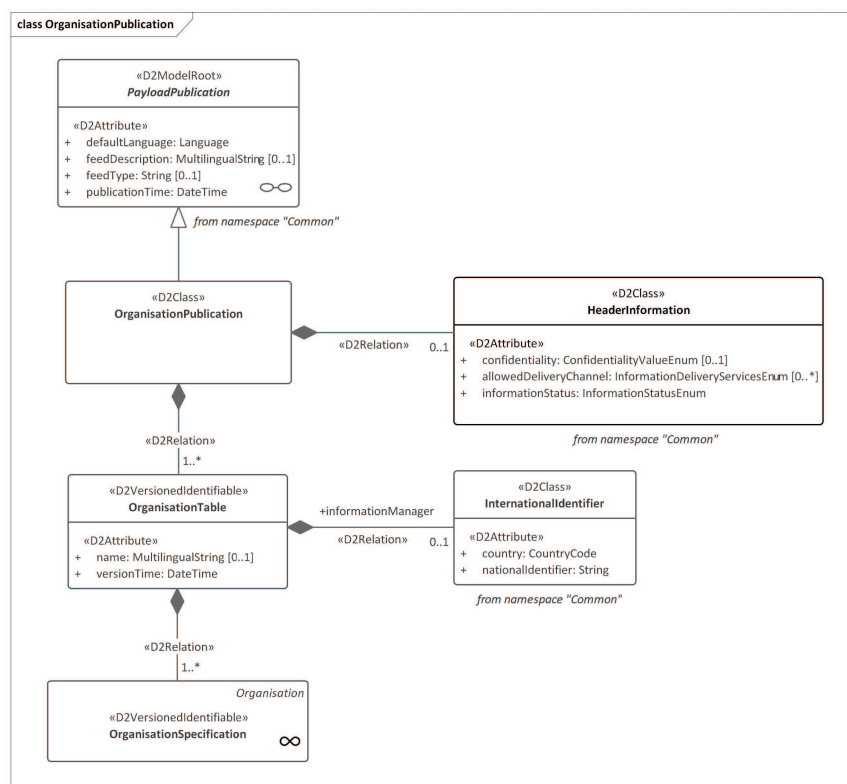


Figure 4 — The “OrganisationPublication” package class model

7.4.2 Semantics

7.4.2.1 «D2Class» Organisation

An instance of the abstract "Organisation" class shall be connected to some organisational role described by the calling association end, for example, 'operator' or 'serviceProvider'.

It shall be specialised by:

- the class "UnknownOrganisation" to specify that the organisation fulfilling this role is unknown;
- the class "UndefinedOrganisation" to specify that organisation fulfilling this role is not (yet) defined;
- the class "OrganisationByReference" to reference previously published organisation information;
- or by the class "OrganisationSpecification" to specify the corresponding organisation information.

7.4.2.2 «D2VersionedIdentifiable» OrganisationSpecification

An instance of this class may specify basic information about an organisation, like its name, a description or its type. At least one organisation unit must be specified (even if the organisation structure is not splitted).

It may be referenced by using the class "OrganisationByReference".

7.4.2.3 «D2Class» OrganisationUnit

An instance of this class may specify the name and function of an organisation unit, which can be physically or logically divided. A location (including address), operating hours and contact information may be supplied.

7.4.2.4 «D2Class» ContactInformation and «D2Class» ContactPerson

An instance of the "ContactInformation" class shall describe detailed information to contact the organisation unit, like telephone, E-Mail, etc. It may be specialised to specify a specific contact person.

7.4.2.5 «D2Class» OrganisationPublication

By using this class, it is possible to specify information on multiple organisations in the form of a payload publication to reference it later. The information shall be published by using one or more tables (class "OrganisationTable").

7.5 «D2Package» RatesPublication

7.5.1 Overview

The "RatesPublication" package shall support provision of information about Rates. The information may be specified directly or by reference (see Figure 5 and Figure 6).

By using the «D2Class» "RatesPublication", it shall be possible to define tables of rates information in advance and reference them later (see Figure 7).

NOTE Parts of the Rates-Publication sub-model have been derived/imported from a proposed version of prISO 5206-1, also known as "APDS-model". For this procedure, version v5 (05-2021) of that model was the reference. For the DATEX import, some adaptations had to be made on this model – see informative Annex D for details.

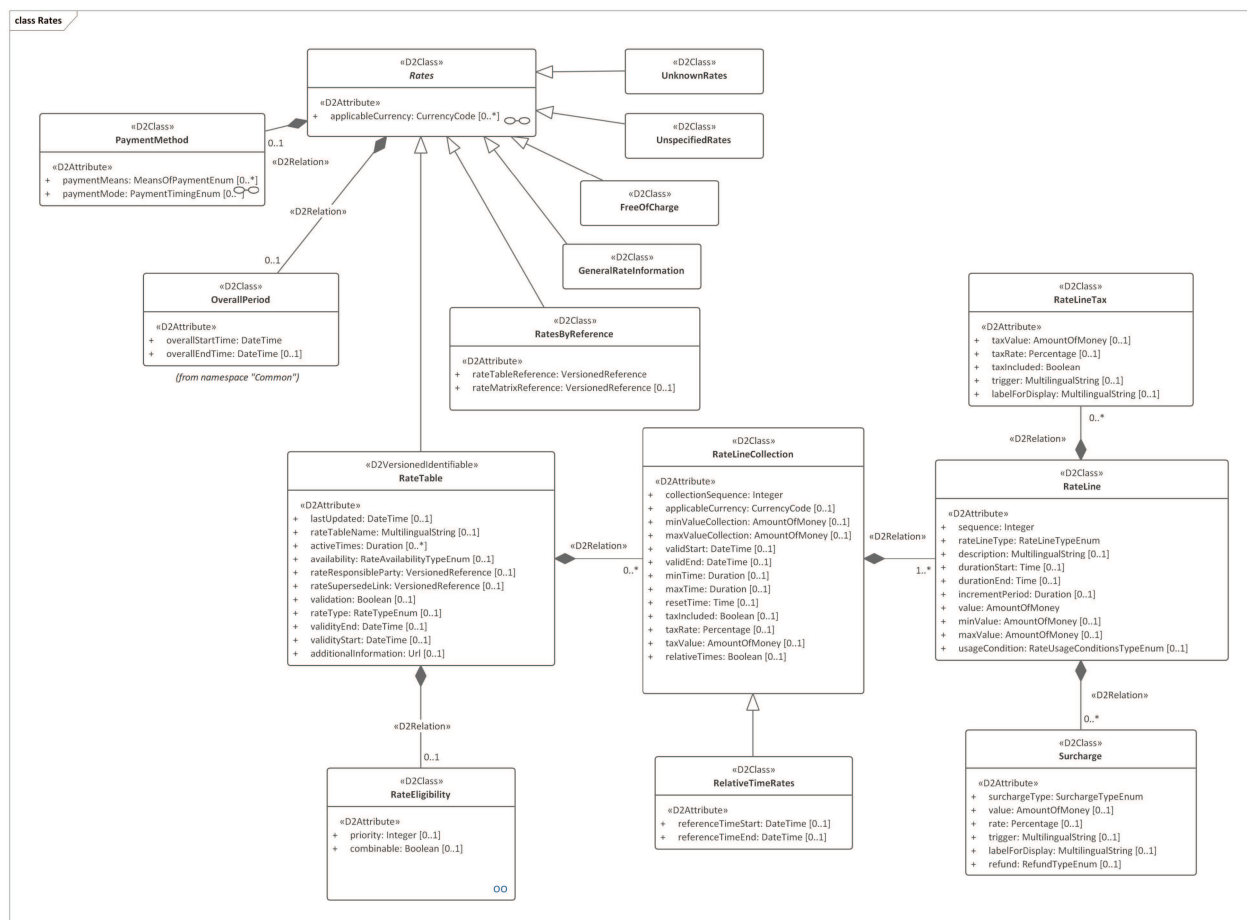
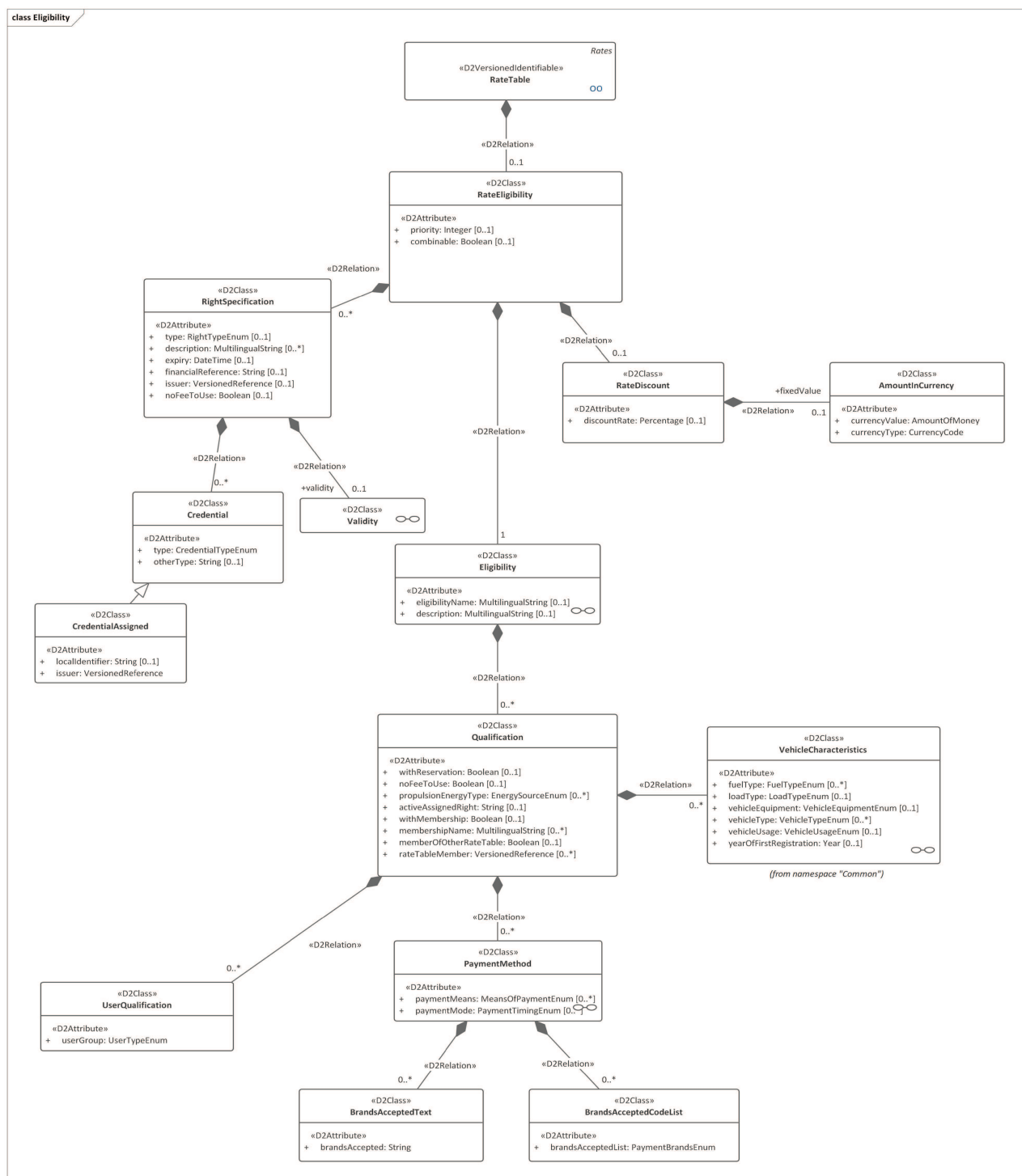


Figure 5 — The “Rates” package class model



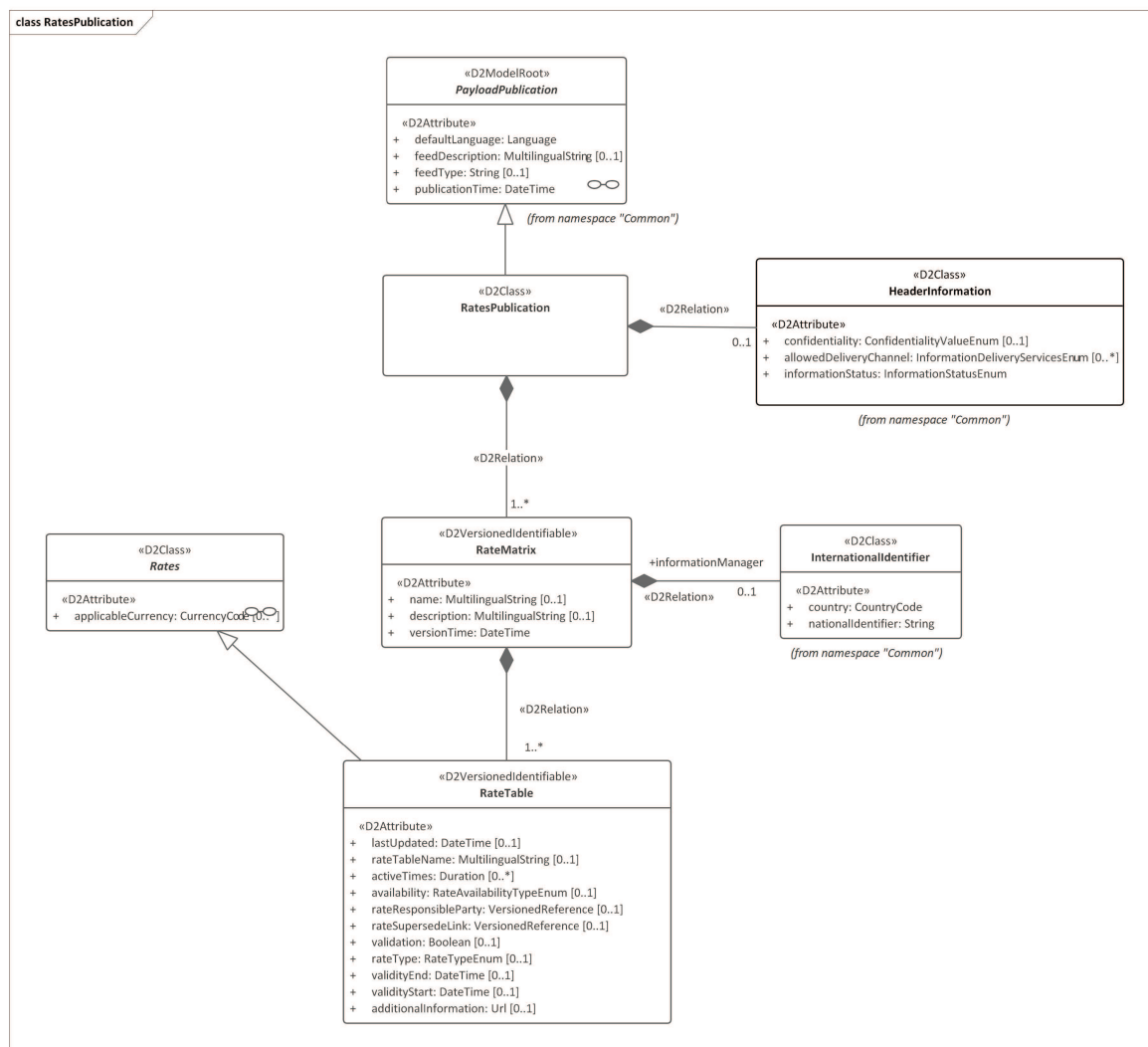


Figure 7 — The “RatesPublication” class model

7.5.2 Semantics

7.5.2.1 General semantics

The “RatesPublication” package provides a model for tariffs/fees, for example, for a parking or energy infrastructure site, including reservations and season tickets. Different rate tables can be defined and linked with periods and eligibility and quality criteria such as specific users or types of vehicles.

7.5.2.2 «D2Class» Rates

An instance of the abstract "Rates" class shall be specialised by:

- the class "UnknownRates" to specify that the rates are not known;
- the class "UnspecifiedRates" to specify that rates are not (yet) defined;
- the class "FreeOfCharge" to specify the absence of specific rates (no fees to pay);
- the class "GeneralRateInformation" to specify payment methods without defining a specific rate table;
- the class "RatesByReference" to reference previously published rates information;
- or by the class "RateTable" to specify the corresponding organisation information.

7.5.2.3 «D2VersionedIdentifiable» RateTable and Eligibility structure

NOTE This description is basically based on prISO 5206-1, pre-version v5 (05-2021).

A RateTable represents a set of charges that are applied to a single set of criteria and a single RightSpecification for parking or other operations (e.g. delivery permits, rideshare access, etc) at the Place. Examples of a RateTable are a weekday charge rate scales in a public multi-storey car park. Other related RateTables might be evening rates and weekend rates. The validity start and end define the period of validity of a RateTable. If the validity end is not set, the RateTable is considered to be valid until it is replaced. The rateSupersedeLink attribute may be used to indicate a reference to a previous RateTable that is being temporarily superseded.

A RateMatrix is defined as an aggregation of instances of RateTable. There are no specific constraints to the construction of a RateMatrix – it is simply an aggregation of instances of RateTable the data supplier wishes to provide together. It cannot be assumed that the RateTable in a RateMatrix relate to only one Place or that they provide any particular semantic meaning as an aggregation of RateTable.

To support the transmission of a RateTable that may contain multiple charging elements, a RateTable contains one to many RateLineCollection(s). An example could be a RateTable that contains a flat rate fee for e.g. reservation, plus a tiered time-based rate structure for charging over the time of the session. Each RateLineCollection represents one of those charging elements. A RateLineCollection is constructed of one-to-many RateLine.

The RateLine concept is flexible and supports a range of different characterisations, which include:

- Flat rate – where the RateLine is active the applied fee charge is a flat rate, unrelated to the duration or timing of the parking or other type of session; An example is a flat rate reservation fee for a session. Flat rate RateLine are defined by use of defining a value, but no use of the durationStart, durationEnd or incrementingPeriod attributes.
- Flat rate tier – where the applied fee charged is charged in full if the parking or other type of session indicates that that specific RateLine is active.

Example: in the second hour of a session the fee is 1€ – for any part of that hour.

For a flat rate within a tier the RateLines are defined the time boundary of the tier by use of the durationStart and durationEnd attributes and the value attribute to define the charge amount. If used, the incrementingPeriod attribute, in this case, shall be the same as the period between the durationStart and durationEnd (i.e. there is one increment). Charging is assumed to occur at the start of each increment.

- **IncrementingRate** – where the applied fee charged is related to the duration of this specific tier that has been activated by the parking or other type of Session. This charge type supports a **RateTable** that applies for short incrementing periods or time-based small increments of charge.

Example: in the second hour of a Session, charging is done at a rate of 0,05 € every 3 minutes.

For an incrementing rate within a tier, the **RateLine** defines the time boundary of the tier by use of the **durationStart** and **durationEnd** attributes. The **incrementingPeriod** and the value attribute indicate the charge amount of each increment (e.g. 0,05 € each 3 minutes). Charging is assumed to occur at the start of each increment.

Under most circumstances the start and end of charging periods are fixed and relative to local time (e.g. between 08:00 and 17:00 weekdays). In some instances, the charging period and related tiers may be relevant to a specific event. This is indicated by the use of the **relativeTimes** set to **TRUE** in the **RateLineCollection** and the use of the **RelativeTimeRates** class. All times are defined relative to the **referenceTimeStart**.

The applicable currency is defined in the **RateLineCollection**.

Individual **RateLine** support indication of whether tax is applicable within the defined **RateTable** or applied in addition to the defined Rate. The level of tax, if included, can be specified as either a monetary amount or a percentage rate. Taxes may also be applied to a **RateLineCollection** in a similar manner. It is common practice for taxes to be applied at the **RateLine** level – for example, the application of Value Added Tax (VAT) in Europe which is added to a basic parking fee and declared in the cost of the parking to the end user.

A **RateLineCollection** indicates whether the child **RateLine** are a chargeable tariff or represent a surcharge, which may be partially or fully refundable.

Each **RateTable** is applicable to a singular set of criteria and a single **RightSpecification**. The specification of the qualifying criteria is specified using **Eligibility**, see Figure 6.

Eligibility is specified as a collection of individual **Qualifications**. A **Qualification** is specified as a test with any of the attributes in the **Qualification** class set. In addition, **Qualifications** can be specified for other qualifications like for vehicle characteristics as defined in EN 16157-7.

Eligibility may be related or defined by membership. Typically, the **Qualification** in this case is defined by the **withMembership** attribute set to **TRUE** and the **membershipName** attribute set to the names of the relevant memberships (e.g. J-Park frequent users club, shoppers, cinema attendees, event ticket holders, military, industry specific vehicle, etc).

Additionally, **Eligibility** may be defined by the use of another **RateTable** (**memberofOtherRateTable** set to **FALSE**), or if the parker is a member of another specific **RateTable** (**memberofOtherRateTable** set to **TRUE**), and the **rateTableMember** set to identify the earlier linked **RateTable**.

7.6 «D2Package» SupplementalFacility

7.6.1 Overview

The “**SupplementalFacility**” package (see Figure 8) may support providing detailed information about available supplemental service facilities or equipment.

By using the class “**SupplementalFacilityStatus**” it shall be possible to define dynamic status information on the specified equipment or service facilities (see Figure 2).

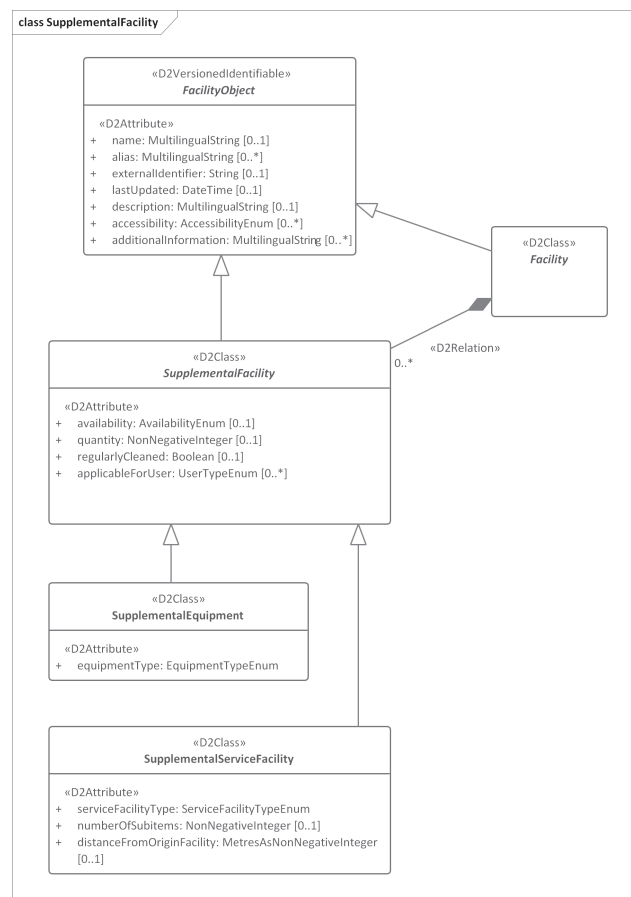


Figure 8 — The “SupplementalFacility” package class model

7.6.2 Semantics

7.6.2.1 General semantics

The package “SupplementalFacility” shall describe exactly one type of available supplemental equipment or one type of service facility.

Available equipment is some infrastructure element that provides a service or capability to users; Examples are toilets, elevators, internet access or waste bins. Example of service facilities are restaurants, petrol stations or a truck wash.

The class “SupplementalFacility” shall be abstract and shall be specialised by one instance out of “SupplementalEquipment” or “SupplementalServiceFacility”.

In the dynamic part of the model, a versioned reference to each element (inherited from FacilityObject, see 7.2.2.1) may be used to give explicit information about the availability of the specific element.

7.6.2.2 «D2Class» SupplementalFacility

Each instance of the “SupplementalFacility” class shall describe exactly one type of available supplemental equipment or one type of service facility (here within further called ‘element’).

The element may be enhanced with additional information (sometimes by inheritance of FacilityObject), for example:

- its number or its availability;
- a description and a comment;
- the name or brand of the service provided;
- accessibility information (e.g. persons with disabilities or wheelchair accessible);
- restriction to particular users;
- operating hours (class “OperatingHours”, see 7.7);
- a fee (class “Rates”, see 7.5);
- its location (class “LocationReference”, defined in EN 16157-2);
- or applicable vehicles, defined by their characteristics (class “VehicleCharacteristics”, defined in EN 16157-7).

The number of the element – with respect to the restrictions mentioned above - may be defined for each element by the attribute “quantity”.

EXAMPLE 5 toilets, 1 restaurant, 2 toilets for persons with disabilities, 2 toilets for men; note that for each example one instance of the class “SupplementalFacility” is necessary.

Operating hours for the element may be specified (i.e. a regular time schedule, at which the element should be available or open). Examples would be the operating hours of toilets or restaurants. Please note that different operating hours (e.g. for more than one restaurant) require multiple instances of the “SupplementalFacility” class.

The current availability of the element may be specified in a dynamic model by using the class “SupplementalFacilityStatus”.

NOTE For supplemental service facilities, it is possible to define the amount of subitems within the specialisation class. Thus, for example, it is possible to define that there are 5 restaurants with 300 restaurant places in total or 1 medical facility with 2 surgeries. See Table 1 for details.

For a reference-link between instances of “SupplementalFacility” and “SupplementalFacilityStatus” the versioned identifiable mechanism and the attribute “reference” of class FacilityObjectStatus shall be used.

7.6.2.3 «D2Class» SupplementalEquipment

Each instance of the “SupplementalEquipment” class shall define exactly one type of equipment (e.g. toilets, elevators, wireless internet etc.).

7.6.2.4 «D2Class» SupplementalServiceFacility

Each instance of the “SupplementalServiceFacility” class shall define exactly one type of service facility (e.g. restaurants, shops etc.) available on or accessible from some origin facility to which it is clearly related (typically a larger facility, e.g. a parking site). For the latter case, the distance between the origin facility and this supplemental service facility may be specified with the attribute “distanceFromOriginFacility”.

The number of subitems for this service facility may be specified (example: total number of restaurant places). Table 1 shall specify the usage of the attributes “quantity” and “numberOfSubitems” for each literal of “ServiceFacilityTypeEnum”. If there is a hyphen character in the table, use of the “numberOfSubitems” attribute is not permitted in this case.

Table 1 — Semantics of the number of additional service facility subitems

"serviceFacilityType"	"quantity"	"numberOfSubitems"
hotel	number of hotels	total number of hotel rooms
motel	number of motels	total number of motel rooms
overnightAccommodation	number of overnight accommodations	total number of overnight accommodation spaces
shop	number of shops	-
kiosk	number of kiosks	-
foodShopping	number of food shopping facilities	-
cafe	number of cafes	total number of cafe places
restaurant	number of restaurants	total number of restaurant places
restaurantSelfService	number of self-service restaurants	total number of self-service restaurant places
motorwayRestaurant	number of motorway restaurants	total number of motorway restaurant places
motorwayRestaurantSmall	number of small motorway restaurants	total number of small motorway restaurant places
sparePartsShopping	number of spare parts shopping facilities	-
petrolStation	number of petrol stations	total number of fuel dispensers
vehicleMaintenance	number of vehicle maintenance facilities	total number of vehicle maintenance places
tyreRepair	number of tyre repair facilities	total number of tyre repair places
truckRepair	number of truck repair facilities	total number of truck repair places
truckWash	number of truck wash facilities	total number of truck washing lines
carWash	number of car wash facilities	total number of car washing lines
pharmacy	number of pharmacies	-
medicalFacility	number of medical facilities	total number of surgeries
police	number of police stations	total number of police station counters
touristInformation	number of tourist information	total number of tourist information counters
bikeSharing	number of bike sharing facilities	total number of available bikes (roughly)
docstop	number of doc stop facilities	total number of surgeries
laundry	number of laundries	total number of washing machines
leisureActivities	number of leisure activity facilities	-
unknown	-	-
other	depends on "description" (free text)	

Note: The number of sub items always implies that they can be used simultaneously.
Thus for most elements this means a sufficient number of employees (tourist information, police, vehicle maintenance, ...)

7.6.2.5 «D2Class» SupplementalFacilityStatus

An instance of the “SupplementalFacilityStatus” class (see Figure 2) may override the quantity values for supplemental equipment and/or service facilities of the static part of the model. It may include current availability information.

EXAMPLE The number of toilets can be temporarily reduced to 5; The number of vacant restaurant seats can be set to 100.

For a reference-link between instances of "SupplementalFacility" and "SupplementalFacilityStatus" the versioned identifiable mechanism and the attribute "reference" of class FacilityObjectStatus shall be used.

7.7 «D2Package» OperatingHoursPublication

7.7.1 Overview

The “OperatingHoursPublication” package uses and extends the “Validity” package defined in EN 16157-7 to provide a generic structure for operating hours. The information may be specified directly or by reference (see Figure 9).

By using the «D2Class» "OperatingHoursPublication", it shall be possible to define tables of operating hours information in advance and reference them later (see Figure 10).

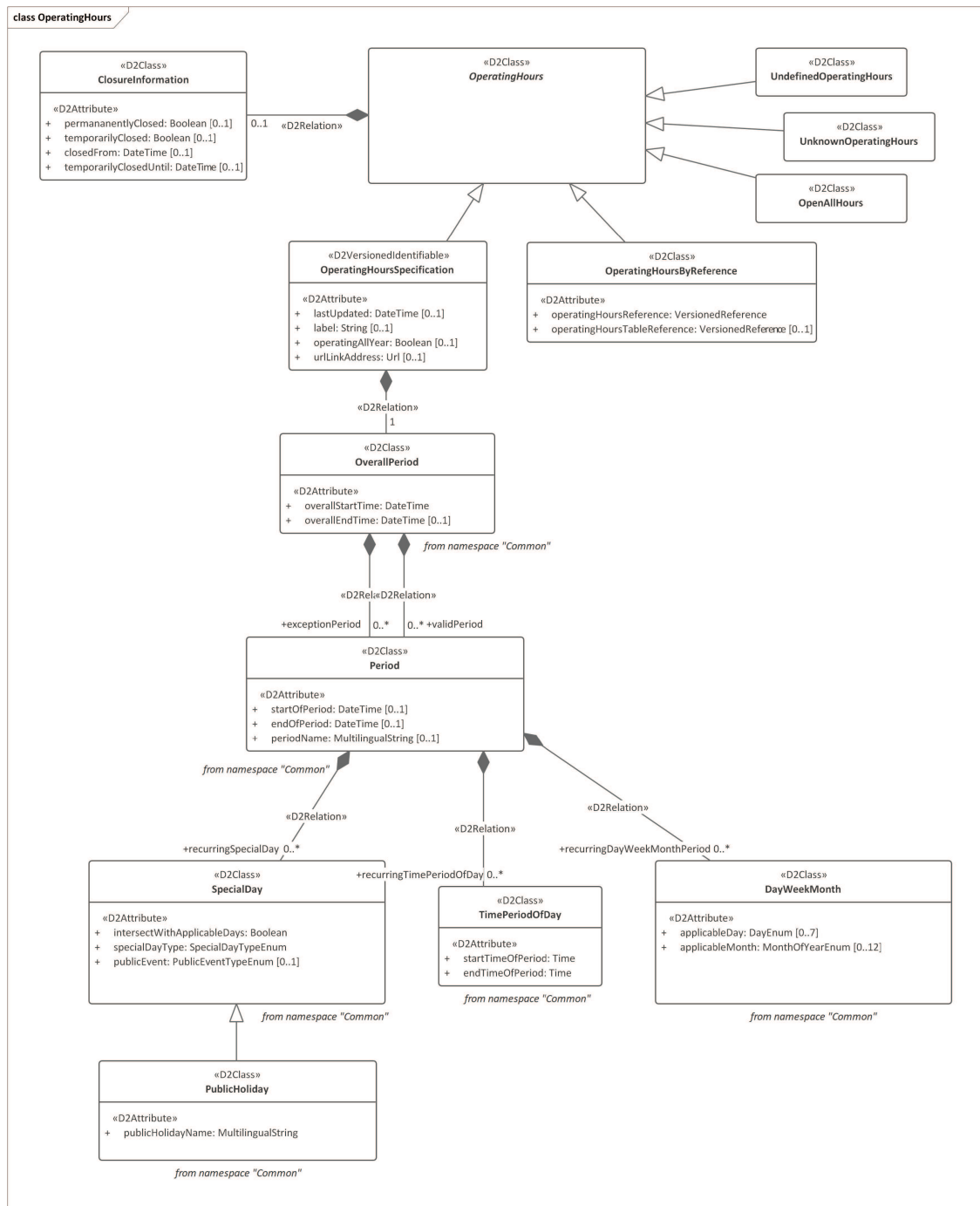


Figure 9 — The “OperatingHours” class model

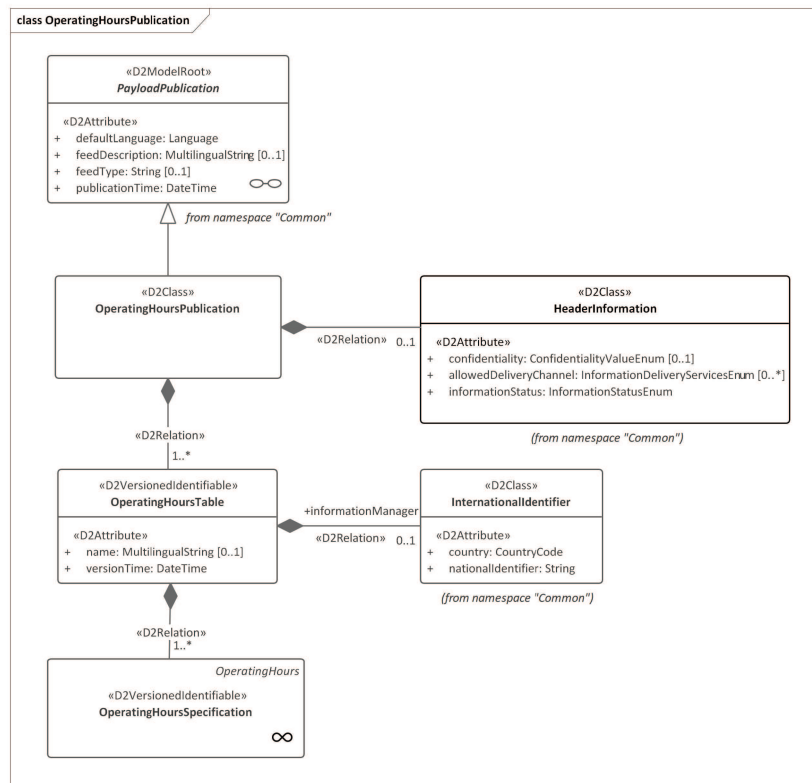


Figure 10 — The “OperatingHoursPublication” package class model

7.7.2 Semantics

7.7.2.1 General semantics

The “OperatingHoursPublication” package shall support provision of information to describe a time schedule for availability or usability ('operating hours') of a building, service facility etc. in terms of the “Validity” class defined in EN 16157-7.

7.7.2.2 «D2Class» OperatingHours

An instance of the abstract "OperatingHours" class shall be specialised by:

- the class "UnknownOperatingHours" to specify that the operating hours are unknown;
- the class "UndefinedOperatingHours" to specify that operating hours are not (yet) defined;
- the class "OpenAllHours" to specify that the facility is 24/7 open or available;
- the class "OperatingHoursByReference" to reference previously published operating hours information;
- or by the class "OperatingHoursSpecification" to specify the corresponding operating hours.

7.7.2.3 «D2VersionedIdentifiable» OperatingHoursSpecification

An instance of this class may specify basic information about operating hours, like a label, a URL and the information if the facility is open all the year. The concrete validity specification of the operating hours shall be supplied by using the class "OverallPeriod" and the underlying model structure specified in EN 16157-7.

It may be referenced by using the class "OperatingHoursByReference".

7.7.2.4 «D2Class» OperatingHoursPublication

By using this class, it is possible to specify information on multiple sets of operating hours in the form of a payload publication to reference it later. The information shall be published by using one or more tables (class "OperatingHoursTable").

7.7.2.5 «D2Class» ClosureInformation

By using the class "ClosureInformation" (see Figure 1), it is possible to specify information on specific types of closures of some facility, like e.g. a temporary closure or the date until it remains closed.

7.8 Data types

The following data types shall be part of the facilities model (see Figure 11):

- AmountOfMoney, derived from Decimal specified in EN 16157-7;
- SquareMetres, derived from NonNegativeInteger specified in EN 16157-7;
- TimeZone, derived from String specified in EN 16157-7;
- CurrencyCode, derived from String specified in EN 16157-7;
- IndexReference, derived from Integer specified in EN 16157-7;
- Duration, following the schema type "duration".

A value for data type TimeZone shall follow the pattern type "[+][0-9][0-9]:[0-9][0-9]Z" according to ISO 8601.

A value for data type CurrencyCode shall follow the pattern type "[A-Z][A-Z][A-Z]" according to ISO 4217.

The IndexReference datatype shall support a pattern where values of an integer index attribute may be quoted in another attribute of type IndexReference, typically in another class. This introduces a new alternative to the <<Identifiable>> and Reference pattern already established in earlier parts. The latter provides a globally unique identity suitable for use across publications, whereas the new pattern focuses on referencing within multiple ordered elements of known type.

A value for data type Duration shall follow the form [PnnYnnMnnDTnnHnnMnnS] according to ISO 8601.

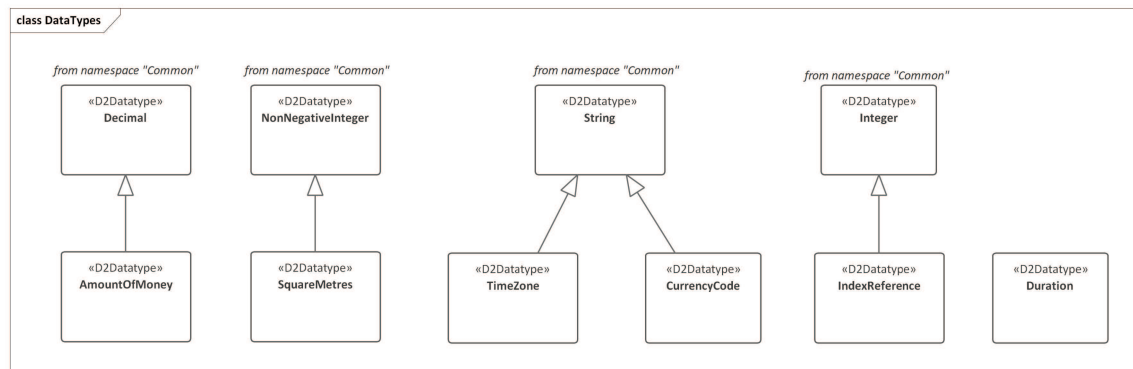


Figure 11 — Data types

7.9 Duration value

The class "DurationValue" shall be a specialisation of class DataValue defined in EN 16157-7 and specify a duration in seconds (see Figure 12).

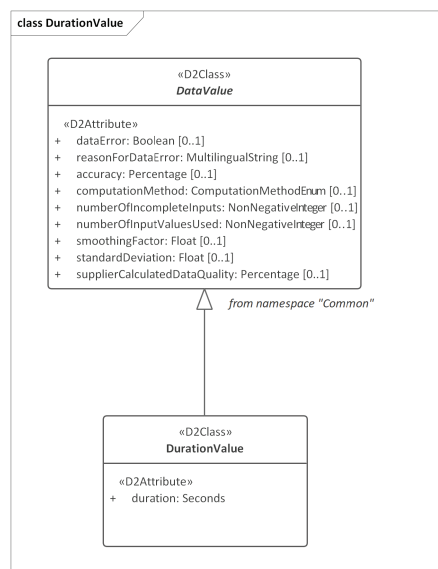


Figure 12 — Duration value

8 LocationExtension and EmissionsExtension in «D2Namespace» Extension

8.1 FacilityLocation (Address)

The «D2Class» FacilityLocation shall form a «D2LevelBExtension» of the «D2Class» LocationReference (from «D2Namespace» LocationReference specified in EN 16157-2) in the «D2Namespace » FacilityLocation which shall be located in the «D2Namespace» Extension (see Figure 13). With this extension, the corresponding time zone as well as an address for a facility may be specified. The address may be composed by an ordered set of address lines, each of a specific type defined in AddressLineTypeEnum. This address concept for a delivery or street address is based on the proposed model in prISO 5206-1 and a profile of ISO 19160-4.

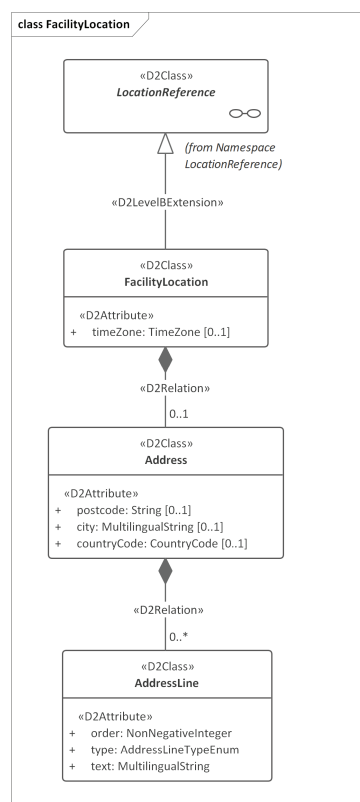


Figure 13 — Facility location

8.2 EmissionsExtension

The «D2Class» EmissionsExtension shall form a «D2LevelBExtension» of the «D2Class» Emissions (from «D2Namespace» Common specified in EN 16157-7) in the «D2Namespace» CommonExtension located in the «D2Namespace» Extension (see Figure 14).

With this extension, a comparison operator will be added to the Emissions class to be able to address specific ranges of applicable emissions. The comparison applies to the Roman- or Arabic numbered portion of the specified value (e.g. euro6 > euro5b), but not crosswise (e.g. euro6 cannot be compared to euroV).

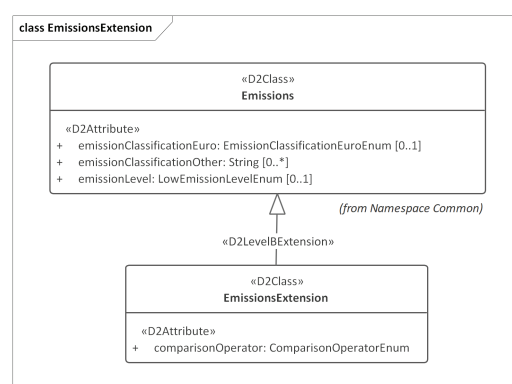


Figure 14 — Emissions extension

Annex A (normative)

Data Dictionary for «D2Namespace» Facilities

A.1 Overview

This data dictionary identifies the definitions and characteristics of the different classes, attributes, association ends, data types and enumerations appearing in the namespace. The data dictionary is specified in three parts, one for packages, one for <<datatypes>> and one for <<enumerations>>, each ordered alphabetically.

The generic data types which are used throughout all publications are defined in EN 16157-1.

The first part of the data dictionary for each publication is partitioned into subclauses which relate to each of the UML model packages and each subclause defines the contained classes, their attributes and any association ends defined for associations between the classes within that package.

The Data Dictionary tables use the following columns:

Column **Class name**: it provides the symbolic name (Upper Camel Case) given to the corresponding class.

Column **Association end**: it provides the symbolic name (Lower Camel Case) given to the corresponding association end.

Column **Attribute name**: it provides the symbolic name (Lower Camel Case) given to the corresponding attribute of a class.

Column **Enumerated value name**: It provides the symbolic name (Lower Camel Case) given to the corresponding enumerated value.

Column **Designation**: it provides the corresponding name in natural language of the corresponding class, attribute, association end or enumeration value.

Column **Definition**: it provides a comprehensive definition detailing the class, attribute or association end.

Column **Stereotype**: it provides a statement of the stereotype that is assigned to the class, if any.

Column **Abstract**: it provides a statement as to whether the class is abstract (non realisable) or concrete (realisable).

Column **Multiplicity**: it provides a statement of the allowed multiplicity for the attribute or association end.

Column **Target**: it provides the name of the class which is connected to the association end.

Column **Type**: it provides the name of the class used to define the data type relating to the attribute of the class.

A.2 Data Dictionary for "Facilities"

A.2.1 "DataValue" package

A.2.1.1 Location of "DataValue" package

The location of "DataValue" package is:

— D2Payload/PayloadPublication/Facilities/DataValue

A.2.1.2 Classes of the "DataValue" package

Table A.1 — Classes of the "DataValue" package

Class name	Designation	Definition	Stereotype	Abstract
DurationValue	Duration value	A measured or calculated value of a period of time.	D2Class	no

A.2.1.3 Specializations of the "DataValue" package

Table A.2 — Specializations of the "DataValue" package

Class name	Parent Class Name
DurationValue	Common.DataValue

A.2.1.4 Associations of the "DataValue" package

There are no defined associations in the "DataValue" package.

A.2.1.5 Attributes of the "DataValue" package

Table A.3 — Attributes of the "DataValue" package

Class name	Attribute name	Designation	Definition	Multiplicity	Type
DurationValue	duration	Duration	A period of time expressed in seconds.	1..1	Common.Seconds

A.2.2 "Dimension" package

A.2.2.1 Location of "Dimension" package

The location of "Dimension" package is:

— D2Payload/PayloadPublication/Facilities/Dimension

A.2.2.2 Classes of the "Dimension" package

Table A.4 — Classes of the "Dimension" package

Class name	Designation	Definition	Stereotype	Abstract
Dimension	Dimension	A component that provides dimension information. Especially for multi-storey buildings, the usable area might be larger than the product from its length and width.	D2Class	no

A.2.2.3 Specializations of the "Dimension" package

There are no defined specializations in the "Dimension" package.

A.2.2.4 Associations of the "Dimension" package

There are no defined associations in the "Dimension" package.

A.2.2.5 Attributes of the "Dimension" package

Table A.5 — Attributes of the "Dimension" package

Class name	Attribute name	Designation	Definition	Multiplicity	Type
Dimension	height	Height	Height	0..1	Common.MetresAsFloat
	length	Length	Length	0..1	Common.MetresAsFloat
	usableArea	Usable area	The area measured in square metres, that is available for some specific purpose.	0..1	Facilities.SquareMetres
	width	Width	Width	0..1	Common.MetresAsFloat

A.2.3 "Eligibility" package

A.2.3.1 Location of "Eligibility" package

The location of "Eligibility" package is:

— D2Payload/PayloadPublication/Facilities/RatesPublication/Eligibility

A.2.3.2 Classes of the "Eligibility" package

Table A.6 — Classes of the "Eligibility" package

Class name	Designation	Definition	Stereotype	Abstract
Eligibility	Eligibility	Class support concepts for defining eligibility criteria.	D2Class	no
Qualification	Qualification	A singular set of criteria used to test eligibility for use of a rate table.	D2Class	no
UserQualification	User qualification	Class supporting the definition of user group characteristics.	D2Class	no

A.2.3.3 Specializations of the "Eligibility" package

There are no defined specializations in the "Eligibility" package.

A.2.3.4 Associations of the "Eligibility" package

Table A.7 — Associations of the "Eligibility" package

Class name	Association end	Designation	Definition	Multiplicity	Target
Eligibility	qualification	Qualification	Qualification for the associated Eligibility.	0..*	Facilities.Qualification
Qualification	paymentMethod	Payment method	Payment method for the associated Qualification.	0..*	Facilities.PaymentMethod
	userQualification	User qualification	User qualification for the associated Qualification.	0..*	Facilities.UserQualification
	vehicleCharacteristics	Vehicle characteristics	Vehicle characteristics for the associated Qualification	0..*	Common.VehicleCharacteristics

A.2.3.5 Attributes of the "Eligibility" package

Table A.8 — Attributes of the "Eligibility" package

Class name	Attribute name	Designation	Definition	Multiplicity	Type
Eligibility	description	Description	Free-text description for the eligibility definition.	0..1	Common.MultilingualString
	eligibilityName	Eligibility name	Free-text name for the eligibility definition.	0..1	Common.MultilingualString
Qualification	activeAssignedRight	Active assigned right	Indication of an assigned right.	0..1	Common.String
	memberOfOtherRateTable	Member of other rate table	Indicates if this qualification can be used in combination with the use of another rate table. [TRUE]= member of (i.e., used) another rate table.	0..1	Common.Boolean
	membershipName	Membership name	Free-text description of the membership.	0..*	Common.MultilingualString
	noFeeToUse	No fee to use	Specific facility is free or not. [TRUE] (e.g. free to park).	0..1	Common.Boolean
	propulsionEnergyType	Propulsion energy type	Indicates eligible fuel types for applicable vehicles.	0..*	Facilities.EnergySourceEnum
	rateTableMember	Rate table member	Reference to another rate table membership.	0..*	Common.VersionedReference (fac:RateTable)
	withMembership	With membership	Indicates that a membership is required. [TRUE] membership required.	0..1	Common.Boolean
	withReservation	With reservation	Indicates whether a reservation is required. [TRUE] reservation required.	0..1	Common.Boolean
UserQualification	userGroup	User group	Indicates the user-defined user group qualification.	1..1	Facilities.UserTypeEnum

A.2.4 "Facility" package

A.2.4.1 Location of "Facility" package

The location of "Facility" package is:

— D2Payload/PayloadPublication/Facilities/Facility

A.2.4.2 Classes of the "Facility" package

Table A.9 — Classes of the "Facility" package

Class name	Designation	Definition	Stereotype	Abstract
AssociatedFacility	Associated facility	Infrastructure this site is associated with, i.e. they are located on the same property and may share entrance and exit.	D2Class	no
Facility	Facility	Provides information about a facility, which may represent any kind of site, building, or structure, and may be a composite facility that includes supplemental facilities.	D2Class	yes
FacilityObject	Facility object	Provides information about a facility object, which may represent any kind of site, building, or structure, including those which supplement a main facility.	D2VersionedIdentifiable	yes
FacilityObjectStatus	Facility object status	Dynamic status information for a facility object.	D2Class	no
FacilityStatus	Facility status	Dynamic status information for a facility.	D2Class	no
Image	Image	An image, with encoded data and identification of format.	D2Class	no

A.2.4.3 Specializations of the "Facility" package

Table A.10— Specializations of the "Facility" package

Class name	Parent Class Name
Facility	Facilities.FacilityObject
FacilityStatus	Facilities.FacilityObjectStatus

A.2.4.4 Associations of the "Facility" package

Table A.11 — Associations of the "Facility" package

Class name	Association end	Designation	Definition	Multiplicity	Target
Facility	supplementalFacility	Supplemental facility	Supplemental facility for the associated Facility.	0..*	Facilities.SupplementalFacility
FacilityObject	operatingHours	Operating hours	Operating hours for the associated FacilityObject.	0..1	Facilities.OperatingHours
	rates	Rates	Rates for the associated FacilityObject.	0..1	Facilities.Rates
	dimension	Dimension	Dimension for the associated FacilityObject.	0..1	Facilities.Dimension
	associatedFacility	Associated facility	Associated facility for the associated FacilityObject.	0..*	Facilities.AssociatedFacility
	locationReference	Location reference	Location reference for the associated FacilityObject.	0..1	LocationReferencing.LocationReference
	applicableForVehicles	Applicable for vehicles	A set of vehicles, for which this facility is appropriate, specified by its characteristics.	0..*	Common.VehicleCharacteristics
	informationWebsite	Information website	URL of some internet site with additional information.	0..*	Common.UrlLink
	operator	Operator	The operator of this facility.	0..1	Facilities.Organisation
	owner	Owner	The owner of this facility.	0..1	Facilities.Organisation
	photo	Photo	A binary photo of the facility or its surrounding.	0..*	Facilities.Image

Class name	Association end	Designation	Definition	Multiplicity	Target
	photoUrl	Photo URL	Specifies a URL at which a photo of the facility or its surrounding can be found.	0..*	Common.UrlLink
FacilityObjectStatus	fault	Fault	Fault for the associated FacilityObjectStatus.	0..1	Common.Fault
	newOperatingHours	New operating hours	Overrides the operating hours information specified in the static part either with a new reference or with a new defined version. An existing version should not be changed.	0..1	Facilities.OperatingHours
	newRates	New rates	Overrides the rates information specified in the static part either with a new reference or with a new defined version. An existing version should not be changed.	0..1	Facilities.Rates
FacilityStatus	supplementalFacilityStatus	Supplemental facility status	Supplemental facility status for the associated FacilityStatus.	0..*	Facilities.SupplementalFacilityStatus

A.2.4.5 Attributes of the "Facility" package

Table A.12 — Attributes of the "Facility" package

Class name	Attribute name	Designation	Definition	Multiplicity	Type
AssociatedFacility	description	Description	Any additional description of the associated facility.	0..1	Common.MultilingualString
	facilityReference	Facility reference	A reference to the associated facility.	0..1	Common.VersionedReference (fac:FacilityObject)
	type	Type	Specifies the type of facility or infrastructure this facility is associated with, i.e. they are located on the same property and may share entrance and exit.	1..1	Facilities.FacilityTypeEnum
FacilityObject	accessibility	Accessibility	Information on accessibility and facilities for persons with disabilities.	0..*	Facilities.AccessibilityEnum
	additionalInformation	Additional information	Some additional information.	0..*	Common.MultilingualString
	alias	Alias	An alternative name for this facility.	0..*	Common.MultilingualString
	description	Description	A description for this facility.	0..1	Common.MultilingualString
	externalIdentifier	External identifier	An external identifier for this facility.	0..1	Common.String
	lastUpdated	Last updated	Information on the time when the information has been updated the last time.	0..1	Common.DateTime
	name	Name	The name of this facility.	0..1	Common.MultilingualString

Class name	Attribute name	Designation	Definition	Multiplicity	Type
FacilityObjectStatus	lastUpdated	Last updated	Information on the time when the information has been updated the last time.	0..1	Common.DateTime
	openingStatus	Opening status	The opening status of this facility (open or not).	0..1	Facilities.OpeningStatusEnum
	reference	Reference	Reference to the corresponding static facility object.	1..1	Common.VersionedReference (fac:FacilityObject)
	regularOperatingHoursInForce	Regular operating hours in force	If true, regular operating hours are in force (can be open or closed).	0..1	Common.Boolean
	statusDescription	Status description	A description for the status of this facility.	0..1	Common.MultilingualString
Image	imageData	Image data	Encoded image data.	1..1	Common.Base64Binary
	imageFormat	Image format	Identifies the image format of the associated image data.	1..1	Facilities.ImageFormatEnum

A.2.5 "OperatingHoursPublication" package

A.2.5.1 Location of "OperatingHoursPublication" package

The location of "OperatingHoursPublication" package is:

— D2Payload/PayloadPublication/Facilities/OperatingHoursPublication

A.2.5.2 Classes of the "OperatingHoursPublication" package

Table A.13 — Classes of the "OperatingHoursPublication" package

Class name	Designation	Definition	Stereotype	Abstract
ClosureInformation	Closure information	Information about temporary or permanent closure.	D2Class	no
OpenAllHours	Open all hours	Open or available all the time (24/7).	D2Class	no
OperatingHours	Operating hours	Operating hours, either by reference or by specification.	D2Class	yes
OperatingHoursByReference	Operating hours by reference	Operating hours information that is addressed via a reference.	D2Class	no
OperatingHoursPublication	Operating hours publication	A publication defining one or more tables that have entries of operating hours specifications.	D2Class	no
OperatingHoursSpecification	Operating hours specification	A specification of operating hours (e.g. for a parking site, a service facility, an access or the availability for equipment).	D2VersionedIdentifiable	no
OperatingHoursTable	Operating hours table	A table comprising a number of operating hours specifications.	D2VersionedIdentifiable	no
UndefinedOperatingHours	Undefined operating hours	There are no operating hours specified.	D2Class	no
UnknownOperatingHours	Unknown operating hours	The operating hours are not known.	D2Class	no

A.2.5.3 Specializations of the "OperatingHoursPublication" package

Table A.14 — Specializations of the "OperatingHoursPublication" package

Class name	Parent Class Name
OpenAllHours	Facilities.OperatingHours
OperatingHoursByReference	Facilities.OperatingHours
OperatingHoursPublication	Common.PayloadPublication
OperatingHoursSpecification	Facilities.OperatingHours
UndefinedOperatingHours	Facilities.OperatingHours
UnknownOperatingHours	Facilities.OperatingHours

A.2.5.4 Associations of the "OperatingHoursPublication" package

Table A.15 — Associations of the "OperatingHoursPublication" package

Class name	Association end	Designation	Definition	Multiplicity	Target
OperatingHours	closureInformation	Closure information	Closure information for the associated OperatingHours.	0..1	Facilities.ClosureInformation
OperatingHoursPublication	operatingHoursTable	Operating hours table	Operating hours table for the associated OperatingHoursPublication.	1..*	Facilities.OperatingHoursTable
	headerInformation	Header information	Header information for the associated OperatingHoursPublication.	0..1	Common.HeaderInformation
OperatingHoursSpecification	overallPeriod	Overall period	Overall period for the associated OperatingHoursSpecification.	1..1	Common.OverallPeriod
OperatingHoursTable	operatingHoursSpecification	Operating hours specification	Operating hours specification for the associated OperatingHoursTable.	1..*	Facilities.OperatingHoursSpecification
	informationManager	Information manager	Organisation that manages the information content (is responsible for updates of this information) typically the organisation that first made the DATEX II publication of this content.	0..1	Common.InternationalIdentifier

A.2.5.5 Attributes of the "OperatingHoursPublication" package

Table A.16 — Attributes of the "OperatingHoursPublication" package

Class name	Attribute name	Designation	Definition	Multiplicity	Type
ClosureInformation	closedFrom	Closed from	Permanently or temporarily closed from the given date on. May lie in the future - in this case the scene is not closed now.	0..1	Common.DateTime
	permananentlyClosed	Permananently closed	Permanently closed, i.e. it is not intended to open again.	0..1	Common.Boolean
	temporarilyClosed	Temporarily closed	Temporarily closed for an unspecified period.	0..1	Common.Boolean
	temporarilyClosedUntil	Temporarily closed until	Temporarily closed until the given date (i.e. closure still includes this date).	0..1	Common.DateTime
OperatingHoursByReference	operatingHoursReference	Operating hours reference	The reference to an operating hours specification.	1..1	Common.VersionedReference (fac:OperatingHoursSpecification)
	operatingHoursTableReference	Operating hours table reference	Operation hours table in question defined by a reference.	0..1	Common.VersionedReference (fac:OperatingHoursTable)
OperatingHoursSpecification	label	Label	A label, name or identifier for this operating hours specification.	0..1	Common.String
	lastUpdated	Last updated	The date/time at which this information was last updated.	0..1	Common.DateTime
	operatingAllYear	Operating all year	The facility or organisation is not closed on a seasonal base.	0..1	Common.Boolean