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Intelligente Verkehrssysteme – Datex-II-Datenaustauschspezifikationen für Verkehrsmanagement und Verkehrsinformationen – Teil 6: Publikation von Parkinformationen; Englische Fassung CEN/TS 16157-6:2022

Intelligent transport systems –
DATEX II data exchange specifications for traffic management and information –
Part 6: Parking publications;
English version CEN/TS 16157-6:2022

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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DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE

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Nationales Vorwort

Dieses Dokument (CEN/TS 16157-6:2022) wurde vom Technischen Komitee CEN/TC 278 „Intelligente Verkehrssysteme“ ausgearbeitet, dessen Sekretariat von NEN (Niederlande) gehalten wird.

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Dieses Dokument enthält unter Berücksichtigung des DIN-Präsidialbeschlusses 1/2004 nur die Englische Fassung von CEN/TS 16157-6:2022.

Für die in diesem Dokument zitierten Dokumente wird im Folgenden auf die entsprechenden deutschen Dokumente hingewiesen:

CEN/TS 16157-10:2022	siehe	DIN CEN/TS 16157-10:2022-05
CEN/TS 16157-12:2022	siehe	DIN CEN/TS 16157-12:2022-10

Dieser Teil der Normenreihe behandelt die Publikation von Parkinformationen. In dieser technischen Spezifikation werden Informationsstrukturen und -definitionen festgelegt, welche zum Austausch von Informationen über städtische Parkplätze sowie Lkw-Parkplätze verwendet werden können.

Aktuelle Informationen zu diesem Dokument können über die Internetseiten von DIN (www.din.de) durch eine Suche nach der Dokumentennummer aufgerufen werden.

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Änderungen

Gegenüber DIN CEN/TS 16157-6 (DIN SPEC 70139-6):2016-02 wurden folgende Änderungen vorgenommen:

a) Umfangreiche Überarbeitung des Datenmodells, um die DIN EN 16157-1:2018 zu unterstützen;

b) Integration der ehemals veröffentlichten „Geprüften Level-B-Erweiterung“ in das Kernmodell;

c) Verwendung der Kernmodellelemente aus ISO 5206-1, auch bekannt als Alliance for Parking Data Standards (APDS) Modell, als Grundlage für das neue Modell;

d) Korrektur von redaktionellen Fehlern.

Frühere Ausgaben

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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 in 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:

— IEC Electropedia: verfügbar unter http://www.electropedia.org/

— ISO Online Browsing Platform: verfügbar unter http://www.iso.org/obp

3.1
Campus
große Einrichtung (wie z. B. ein Universitätscampus oder ein Flughafen) oder eine große geographische Zone (wie z. B. eine Großstadt oder eine Stadt), welche verschiedene Orte beinhalten kann, die als zusammenhängend bezeichnet werden können

3.2
dynamischer Teil [des Modells für die Publikation von Parkinformationen]
en dynamic part [of the parking publications model]
Modell für die Publikation von Statusinformationen zu Parkplätzen basierend auf der Klasse ParkingStatusPublication

3.3
EU-Verordnung zum Parken von Lastwagen
en EU truck parking regulation
Kurzform der „DELEGIERTEN VERORDNUNG (EU) Nr. 885/2013 DER KOMMISSION vom 15. Mai 2013 zur Ergänzung der IVS-Richtlinie 2010/40/EU des Europäischen Parlaments und des Rates in Bezug auf die Bereitstellung von Informationsdiensten für sichere Parkplätze für Lastkraftwagen und gewerbliche Fahrzeuge“ [1]

3.4
allgemeines hierarchisches Element
en hierachy element general
universelle Komponente einer Ortshierarchie, die ein Element in der baumartigen Hierarchie formt

3.5
identifiedArea
identifizierbare, diskrete begrenzte geographische Zone, die gemeinsame Charakteristiken aufweist und zum Parken und mobilitätsrelevante Tätigkeiten oder andere Zwecke verwendet wird

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3.6
Modell für die Publikation von Parkinformationen
en parking publications model
Gesamtheit aus den statischen und dynamischen Teilen des Modells für die Publikation von Parkinformationen

3.7
Ort
en place
Ort oder Bereich, der zum Parken, Be- und Entladen, Stehen sowie für einige andere Mobilitäts- oder Transportaktivitäten verwendet wird

3.8
Ortshierarchie
en place hierachy
Methode zum Aufbau einer Hierarchie von Ortseinträgen in Straßen-, Straßenrand- und Zonenumgebungen

Anmerkung 1 zum Begriff: Zonenumgebungen wie in diesem Dokument festgelegt.

3.9
Bereich
en space
einzelner Bereich zum Parken oder für andere mobilitätsbezogene Zwecke, der in der Regel für ein Fahrzeug ausgelegt ist und durch eine aufgemalte oder andere Straßenmarkierung gekennzeichnet sein kann, aber nicht muss

3.10
statischer Teil [des Modells für die Publikation von Parkinformationen]
en static part [of the parking publications model]
Modell für die Publikation von statischen Parkinformationen, basierend auf der Klasse ParkingTablePublication

3.11
Teilbereich Element
en subplace element
Unterteilung eines Bereiches, um diesen zum Nutzen des Betreibers zu segmentieren und verschiedene Nutzungen für park- und mobilitätsbezogene Tätigkeiten oder andere Zwecke zu identifizieren

3.12
Lastkraftwagen Parkstand
en truck parking site
Parkstand am städtischen oder überörtlichen Straßennetz, der für Lastkraftwagen vorgesehen ist

Anmerkung 1 zum Begriff: Andere Fahrzeuge können ebenfalls zugelassen sein.

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Nationaler Anhang NB
(informativ)

Literaturhinweise

DIN CEN/TS 16157-10:2022-05, *Intelligente Verkehrssysteme — DATEX-II-Datenaustauschspezifikation für Verkehrsmanagement und Verkehrsinformationen — Teil 10: Energieinfrastruktur Publikation*

DIN CEN/TS 16157-12:2022-10, *Intelligente Verkehrssysteme — DATEX-II-Datenaustauschspezifikation für Verkehrsmanagement und Verkehrsinformationen — Teil 12: Publikationen im Zusammenhang mit Einrichtungen*

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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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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.

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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 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.

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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).

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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

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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.

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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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7.2 The Parking Table Publication model

7.2.1 General structure of the model

Figure 1 shows the general structure of the static part of the parking model (only some structural relevant classes and no attributes are shown).

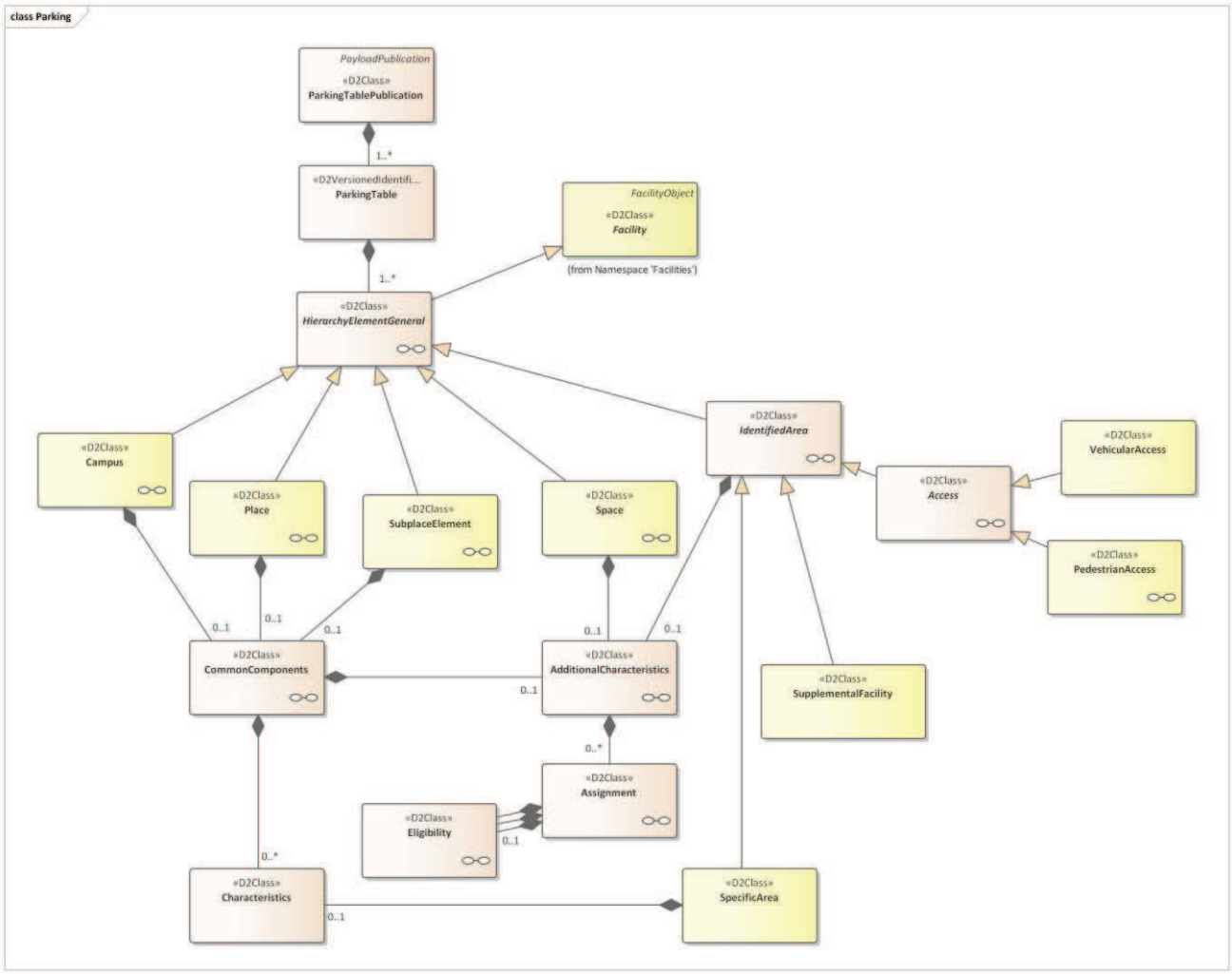

Figure 1 — General structure of the parking model

The specification in this document defines a method to build a hierarchy of place records, in on-street, off-street, and zone environments. Each instance of a place record corresponds to an instance of a class within the place hierarchy. This enables a parking or other type of operation to breakdown a place into discrete parking enclosures or defined areas to better communicate operating hours, space counts, operating restrictions, location, rights and associated pricing and occupancy information in a consistent manner.

The hierarchy allows a data distributing party to decide the appropriate level of detail to specify.

The hierarchy supports the ability of lower-level place hierarchy class instances (child records) to inherit specific instance data from a higher-level place hierarchy class instance (a parent record). The place hierarchy enables lower-level place hierarchy class instances to document variations in specific attributes from their parent, higher-level place hierarchy class instance.

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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 `PedestrianAcces` (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 in 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 exists 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.

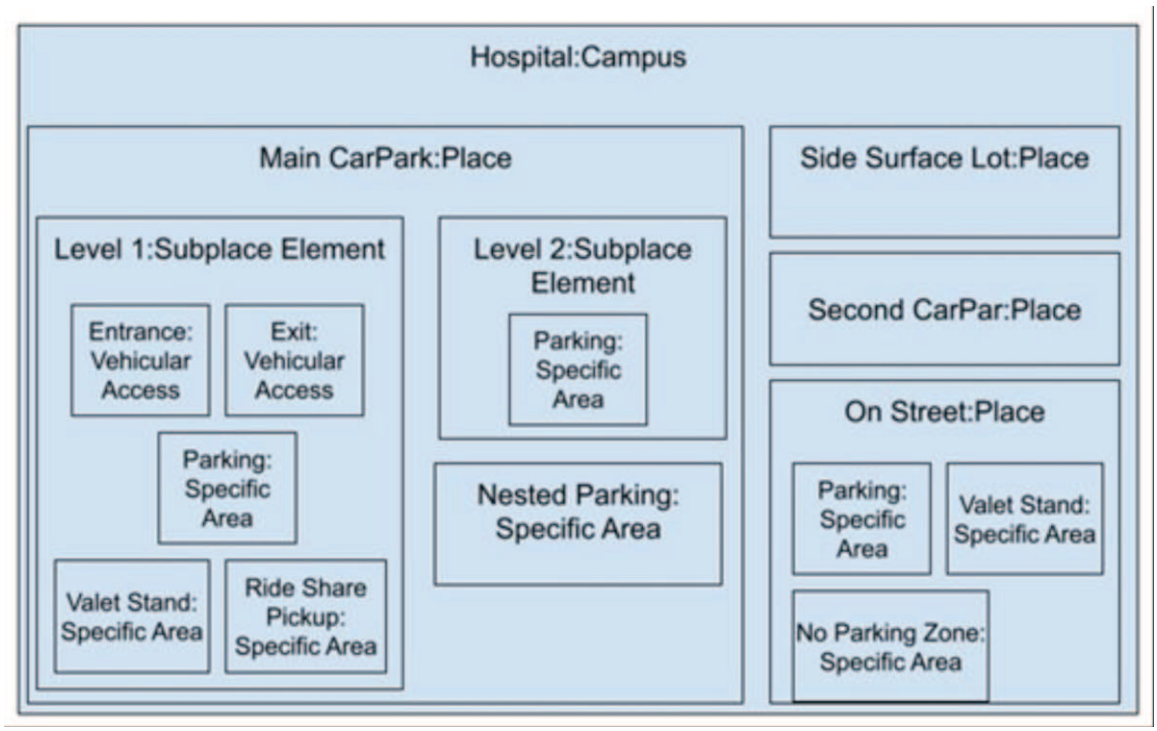

Figure 2 – Place Hierarchy Example – User oriented

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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.

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- `SubplaceElement` – a sub-division of a place for the convenience of the operator that is used for parking related or other purposes. Examples of SubplaceElement include a floor or level, specific street or row of a car parking facility.
- `IdentifiedArea` – an identifiable discrete bounded geographic zone that shares common characteristics and is used for parking related or other purposes. IdentifiedAreas are segmented into four specializations: `VehicularAccess` class, `PedestrianAccess`, `EquipmentServiceFacilityArea` class and `SpecificArea` class.
- `Space` – a single space for parking, usually designed for one vehicle, which may, but not necessarily, be denoted by painted or other road surface marker.

These specialisations of place hierarchy (`HierarchyElementGeneral`) class (i.e. `Campus`, `Place`, `SubplaceElement`, `IdentifiedArea` and `Space`) support both the notion of different scales within the hierarchy, but also support different forms of attribution, which are described later in this document.

The place hierarchy shall be defined “top-down” with the highest layer being numbered 0 (zero) and each subsequent layer being numbered by incremental increasing integers.

The place hierarchy can best be considered as a tree-like structure which starts from one common root element which will either be an instance of `Place` or, if used, `Campus`. Navigating down through the layers of the hierarchy, irrespective of which branch is taken, each subsequently layer sub-divides the previous. Each branch of hierarchy "tree" shall terminate in either an instance of `IdentifiedArea` or `Space`. Each branch of the hierarchy shall contain one instance of `Place`, and no more than one instance of `IdentifiedArea`. Note: A single instance of `Place` may support multiple branches, thus an instance of `Place` can have multiple instances of `IdentifiedArea` associated to it. If an instance of `Campus` is present, it shall only occur once in each branch of the hierarchy. See Figure 3, which provides an illustrative example of elements of a place hierarchy combine.

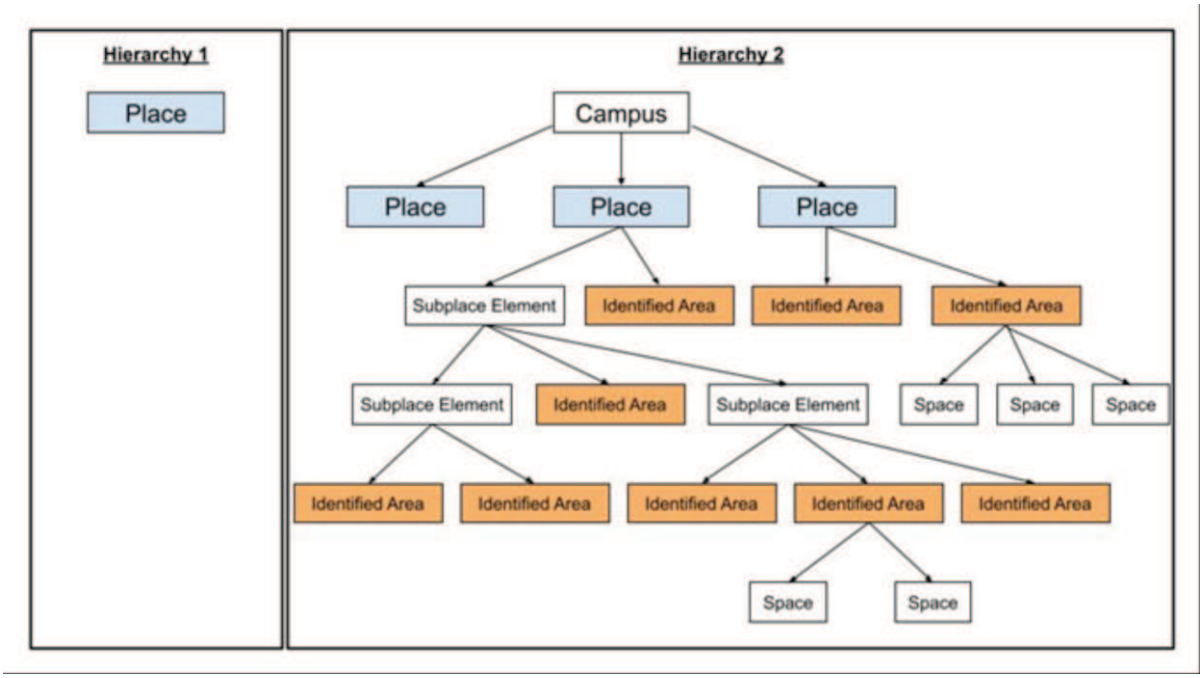

Figure 3 – Examples of Place Hierarchy

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When describing the homogeneous characteristic for an entire place, the tree structure may terminate with the instance of `Place`, (see Hierarchy 1 in Figure 3) with no further child hierarchy elements (including `IdentifiedArea`).

If the place is sub-divided, each "branch" of the hierarchy tree shall terminate in one instance of `IdentifiedArea`, and the `IdentifiedArea` class shall appear only once in each branch of the hierarchy tree. Only instances of the `Space` class may exist at the levels of a hierarchy below the occurrence of `IdentifiedArea` in each branch of the hierarchy tree. Every branch of the hierarchy tree may use instances of the data concepts `Campus`, `Place`, `SubplaceElement`, `IdentifiedArea` and `Space` in the order stated. Instances of `SubplaceElement` may be repeated in any branch of the hierarchy, so long as it conforms to the order in the stated sequence.

7.2.2 «D2Package» ParkingTablePublication

7.2.2.1 Overview

The "ParkingTablePublication" package (see Figure 4) shall comprise a sub-model for defining one or more publishable `ParkingTable`.

Each `ParkingTable` instance shall contain one or more instances of `HierarchicalElement-General`, the top-level element (which will be further specialised) to specify different elements describing parking related information.

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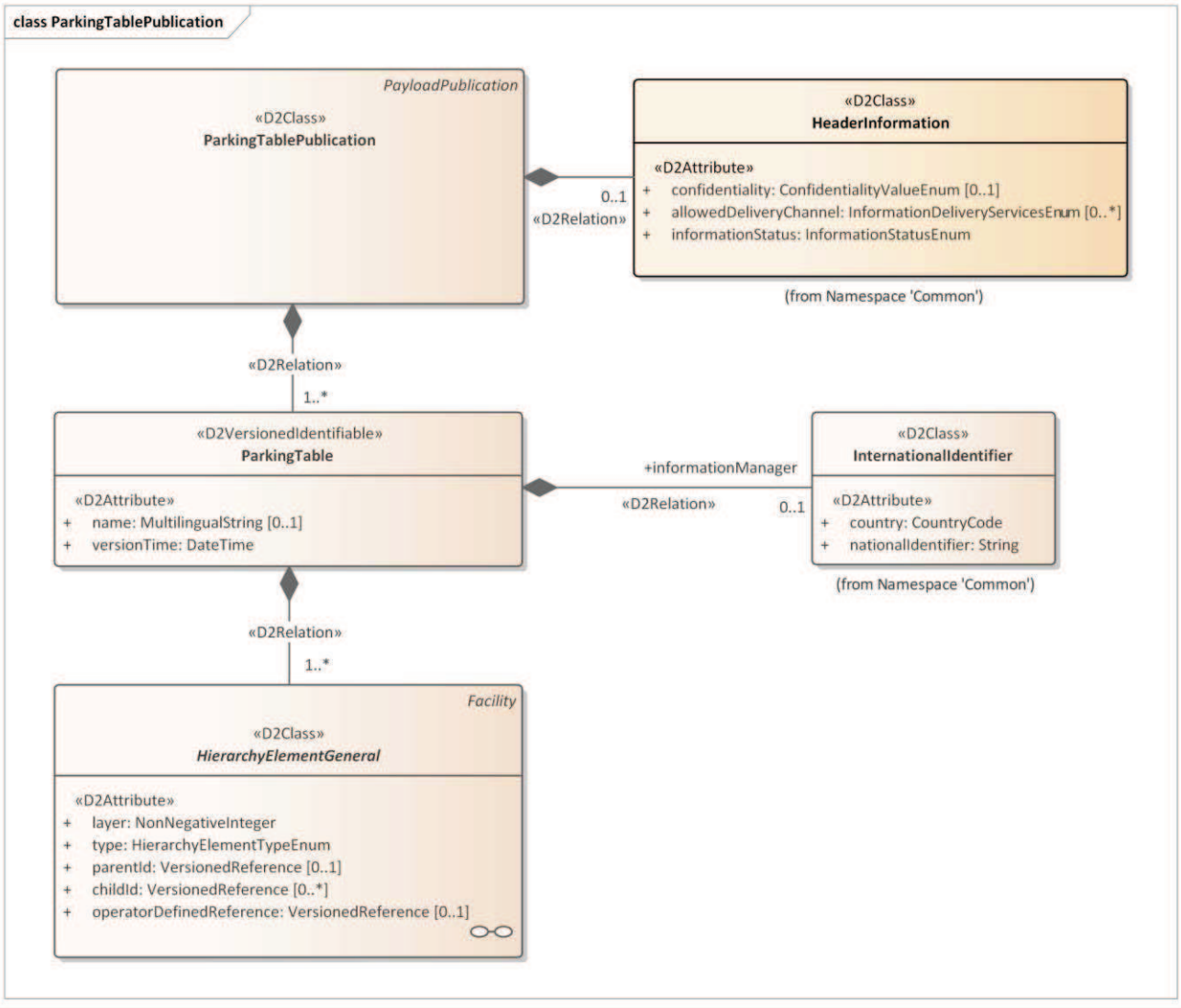

Figure 4 — The "ParkingTablePublication" package class model

7.2.2.2 Semantics

7.2.2.2.1 «D2Class» ParkingTablePublication

The `ParkingTablePublication` class is a specific realisable case of a `PayloadPublication` (defined in EN 16157-7). The `ParkingTablePublication` class is the base class for containing the published `ParkingTable`.

Each instance of a `ParkingTablePublication` may have associated metadata contained in an instance of the `HeaderInformation` class, which allows the supplier of the `ParkingTable-Publication` to specify how the recipient should treat the information contained in it. This class is defined in EN 16157-7.

7.2.2.2.2 «D2VersionedIdentifiable» ParkingTable

The `ParkingTable` class shall be of stereotype "D2VersionedIdentifiable" to be referenced in the Parking Status Publication model (see 7.3), which defines dynamic type of information.

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Each `ParkingTable` instance shall contain one or more instances of `HierarchicalElement-General`, the top-level element (which will be further specialised) to specify different elements describing parking related information.

7.2.3 «D2Package» PlaceHierarchy

7.2.3.1 Overview

The "PlaceHierarchy" package (see Figure 5) shall provide the `HierarchyElementGeneral` class and its specialisations that form the basic model structure as described in 7.2.1.

The `HierarchyElementGeneral` class shall be a specialisation of `Facility` specified in CEN/TS 16157-12.

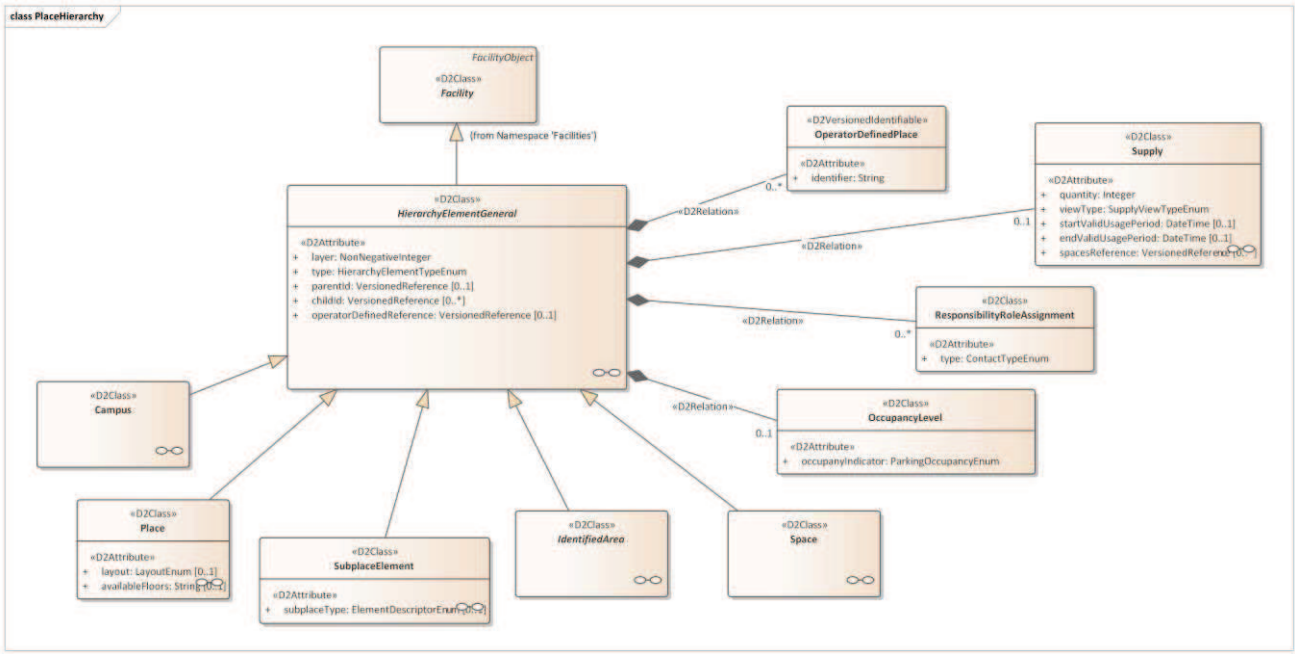

Figure 5 — The “PlaceHierarchy” package class model

7.2.3.2 Semantics

For a description of the semantics of the `PlaceHierarchy` package see 7.2.1.

For a description of the `Supply` class see 7.3.3.

7.2.4 «D2Package» Place

7.2.4.1 Overview

The "Place" package (see Figure 6) shall provide the `Place` class and associated features for a place.

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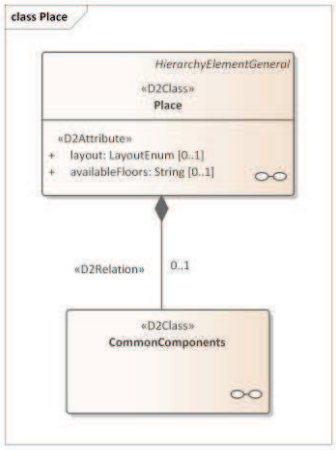

Figure 6 — The "Place" package class model

7.2.4.2 Semantics

A `Place` is a place or location used for parking, loading, unloading, standing, or some other mobility or transport related activity.

Basically, a Place may have some layout information or information on its available floors (denoted by a list from lowest to highest, separated by spaces, and following an individual customized scheme, for example: G 1st 2nd). All other relevant information may be specified using the `CommonComponents` class (see 7.2.8.2) or by inheritance from a `Facility` (specified in CEN/TS 16157-12). The latter may comprise one or more locations (for example an indicative point spatial location or an area location that represent the notional bounding polygon or zone for the place, as foreseen in APDS/ISO TS 5206-1), address (included in location information), operating hours or rates (see E.3), as well as many more other properties.

7.2.5 «D2Package» SubplaceElement

7.2.5.1 Overview

The "SubplaceElement" package (see Figure 7) shall provide the `SubplaceElement` class and associated features for this hierarchy element.

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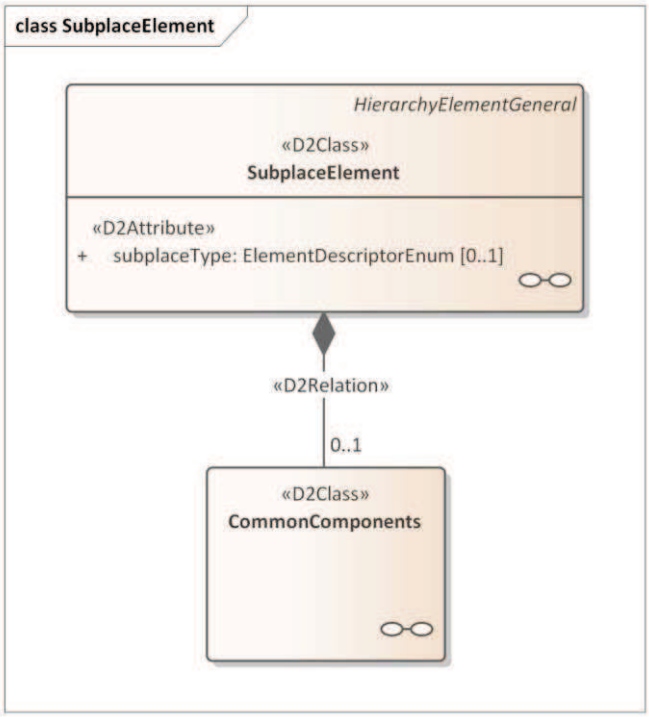

Figure 7 — The "SubplaceElement" package class model

7.2.5.2 Semantics

A `SubplaceElement` is a 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. Examples of `SubplaceElement` include a floor or level, specific street or row of a car parking facility.

Basically, a SubplaceElement may have a type. All other relevant information may be specified using the CommonComponents class (see 7.2.9) or by inheritance from a Facility (specified in CEN/TS 16157-12). The latter may comprise one or more locations (for example a notional element location or an element area location, as foreseen in APDS/ISO TS 5206-1), address (included in location information), operating hours or rates (see E.3), as well as many more other properties.

7.2.6 «D2Package» IdentifiedArea

7.2.6.1 Overview

The "IdentifiedArea package" (see Figure 8) shall provide the abstract `IdentifiedArea` class, its specialisations and features.

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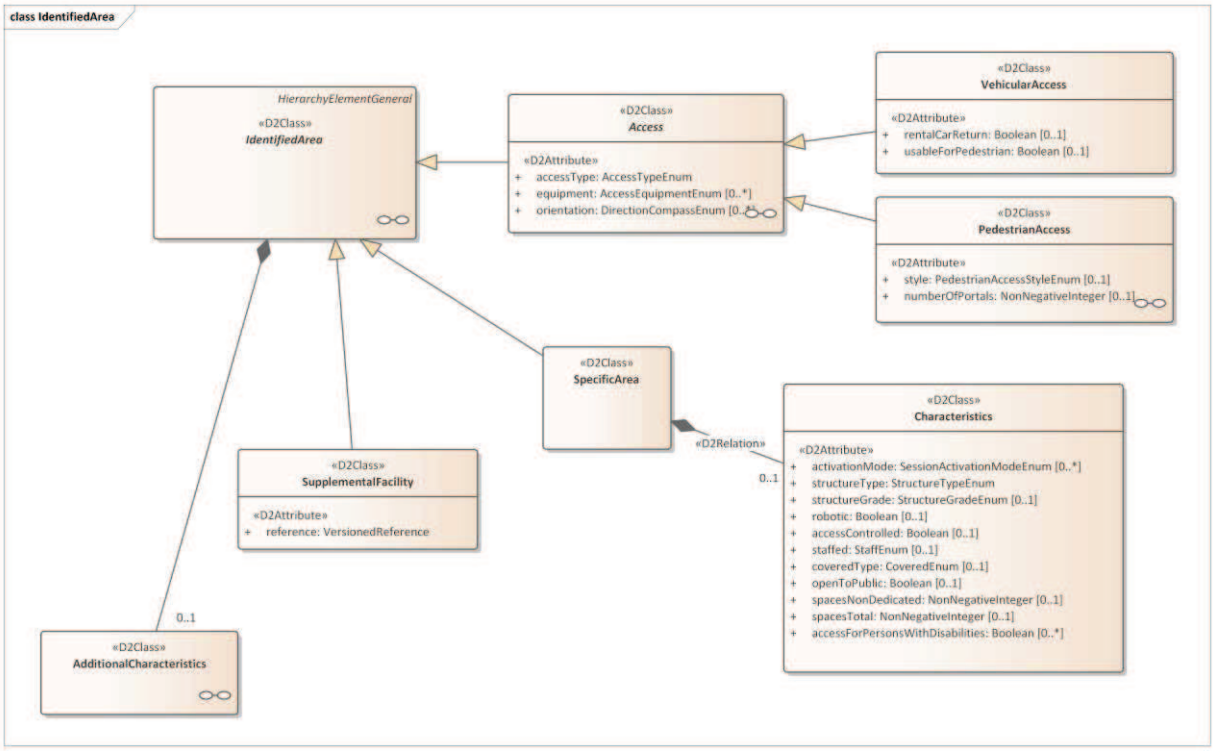

Figure 8 — The "IdentifiedArea" package class model

7.2.6.2 Semantics

An `IdentifiedArea` is an identifiable discrete bounded geographic zone that shares common characteristics and is used for parking related or other purposes. IdentifiedAreas are segmented into four specializations: `VehicularAccess` class, `PedestrianAccess` class (both via class `Access`), `EquipmentServiceFacilityArea` class and `SpecificArea` class.
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`, such as for example the `Facility` (specified in CEN/TS 16157-12). This allows for customization of operations at lower levels while relying on default data.

The `AdditionalCharacteristics` class allows the specification of a couple of additional information, see the next Clause 7.2.7 for details.

7.2.7 «D2Package» Space

7.2.7.1 Overview

The "Space" package (see Figure 9) shall provide the `Space` class and its features.

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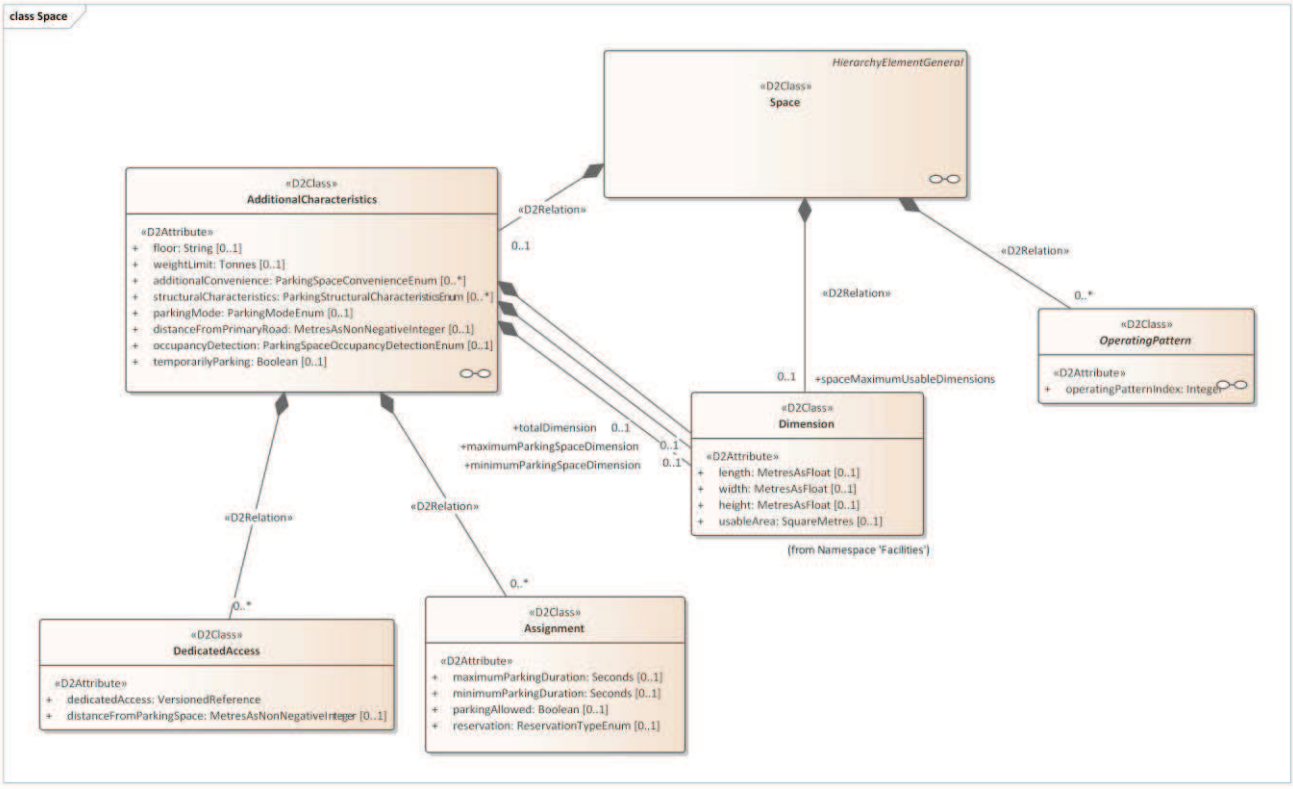

Figure 9 — The “Space” package class model

7.2.7.2 Semantics

A `Space` is a 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.

A space may be characterised by its maximum dimensions or operator patterns (7.2.10). With the `AdditionalCharacteristics` class – also available for a IdentifiedArea and also connected to the `CommonComponents` – it is possible to specify different types of dimensions for spaces, assignments (see 7.2.11), references to dedicated accesses (as specified in 7.2.12) and basic parking space information like the floor, a weight limit and more.

NOTE: A Space inherits properties from a "Facility" (specified in CEN/TS 16157-12), thus features like an external identifier, dimensions (in addition to its maximum dimensions), its accessibility and much more are available.

7.2.8 «D2Package» OrganisationRole

7.2.8.1 Overview

The "OrganisationRole" package (see Figure 10) shall provide elements to define operator defined places and responsibility role assignments.

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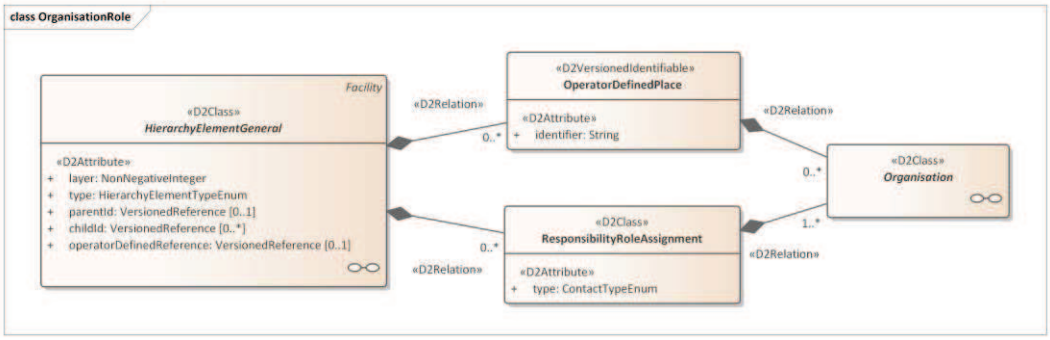

Figure 10 — The "OrganisationRole" package class model

7.2.8.2 Semantics

With the `OperatorDefinedPlace` class, it is possible, to define sets of alternative names for any element of the hierarchical place structure in correspondence to specific operators, denoted by their organisation and contact information.

With the `ResponsibilityRoleAssignment` class, it is possible to define organisation- and contact details for the following roles:

operator, owner, emergency contact, security service, customer service, property manager, reservation service, responsible authority or service partner.

The `Organisation` class is defined in CEN/TS 16157-12.

7.2.9 «D2Package» CommonComponents

7.2.9.1 Overview

The "CommonComponents" package (see Figure 12) shall provide elements that are common for `Campus`, `Place` and `SubplaceElement` as depicted in Figure 11.

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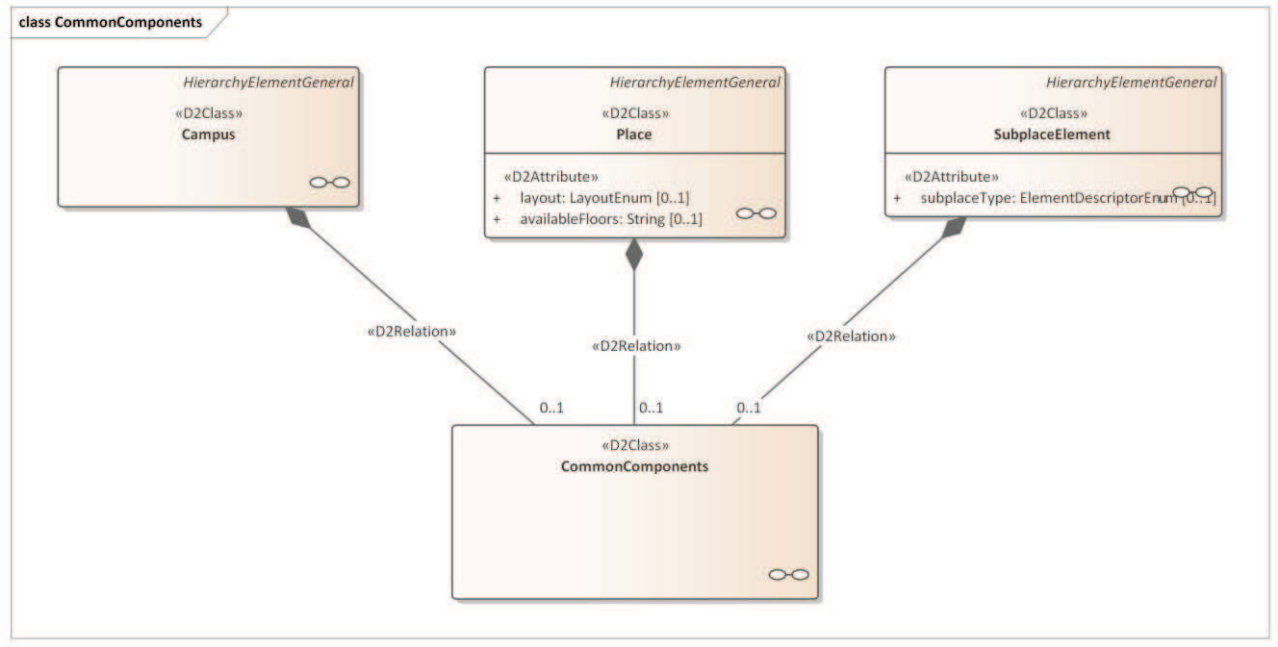

Figure 11 — Integration of the "CommonComponents" class

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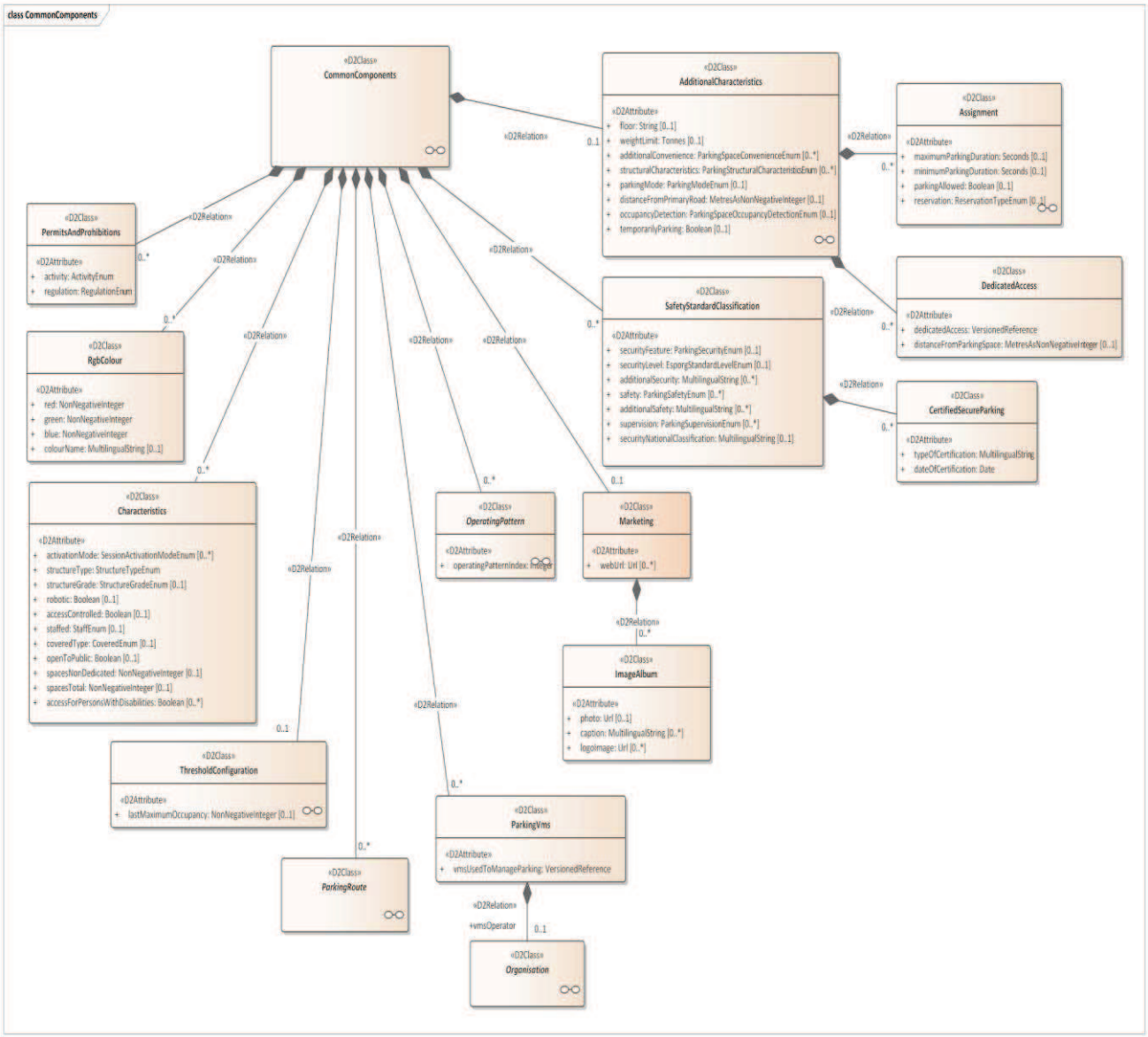

Figure 12 — The "CommonComponents" package class model

7.2.9.2 Semantics

`CommonComponents` represent a collection of common attribution that may be applied at several points in the `Place` hierarchy.

`CommonComponents` support a wide range of optional attribution which includes marketing content references, operating restrictions, colour association (where parking facility elements are colour coded), characteristics (such as operating mode, type of the parking structure, access control, etc.) and additional characteristics as well as safety standard classification.

An instance of the `SafetyStandardClassification` class may give information about security measures on the campus or parking place (e.g. fences, security service, etc.), about safety (e.g. relating pedestrian, dangerous goods) about the policy of supervision as well as about the standard level according to the technical specifications of the European secure parking organisation [3].

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An instance of the `CertifiedSecureParking` class may give information about a specific certification for the parking site.

Each instance of the `PermitsAndProhibitions` class may define a pair of activity and regulation to specify permits and prohibitions valid for the parking. Examples include 'open fire prohibited' or 'smoking only outside buildings'.

For a description of `OperatingPattern` see Clause 7.2.10.

For a description of `ParkingRoute` see Clause 7.2.13.

For a description of `ThresholdConfiguration` see Clause 7.2.14.

7.2.10 «D2Package» OperatingPattern

7.2.10.1 Overview

The "OperatingPattern" package (see Figure 13) shall provide elements to describe operating restrictions as well as specific usage scenarios of a campus, (sub)place, space or identified area.

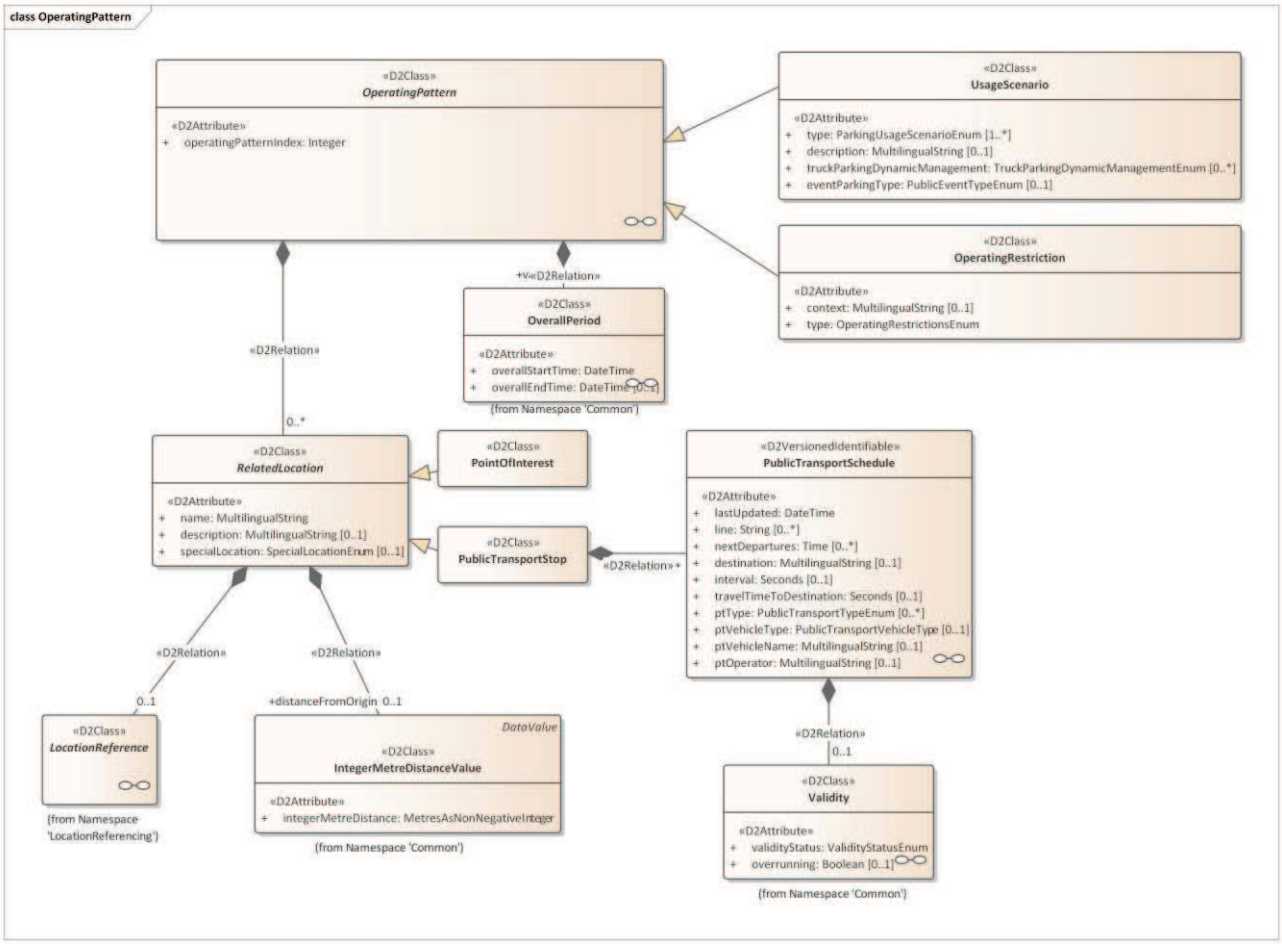

Figure 13 — The "OperatingPattern" package class model

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7.2.10.2 Semantics

The `OperatingRestriction` class may specify operating restrictions such as carpool only, bus only, no parking or similar.

The `UsageScenario` class may specify specific usage scenarios, such as for example truck parking, event parking, drop off, car sharing, points of interest or park and ride.

When using the “truckParking” scenario, the attribute “truckParkingDynamicManagement” may specify compact parking or queue parking, which are special types of truck parking management.

When using the “eventParking” scenario, the attribute “eventParkingType” may specify the corresponding event using the `PublicEventTypeEnum` specified in EN 16157-7.

A validity for the operating pattern can be specified by using the `OverallPeriod` structure defined in EN 1657-7. If no availability is specified, the operating pattern is valid all the time.

Instances of the class `OperatingPattern` shall be indexed with the "operatingPatternIndex" attribute in order to reference the corresponding objects in the dynamic part of the Parking Publications model in class `OperatingPatternStatus`. Each value for “operatingPatternIndex” shall be unique over all instances of `OperatingPatternStatus`.

Using the `RelatedLocation` class, it is possible to specify details on a point of interest or a public transport stop directly connected to the parking place. This may include its location and distance from the parking place. For a public transport stop, basic schedule information can be specified using the class `Public-TransportSchedule`.

7.2.11 «D2Package» Assignment

7.2.11.1 Overview

The “Assignment” package (see Figure 14) may be used to specify restrictions and assignments for a campus, (sub)place, space or identified area.

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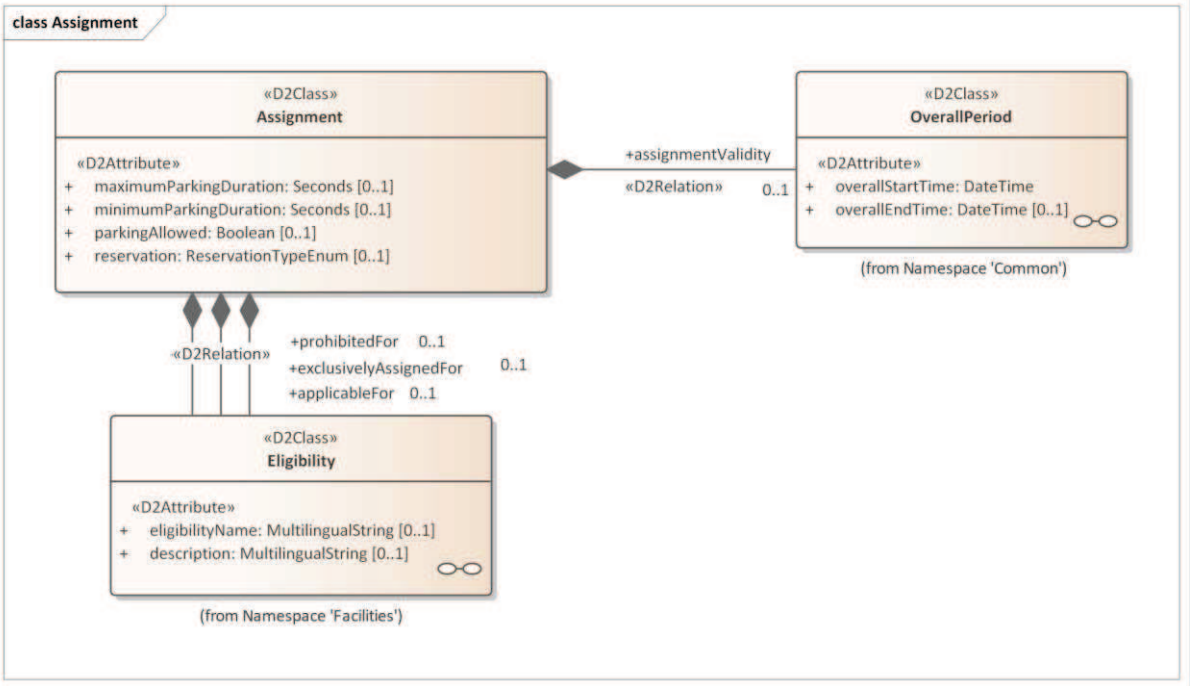

Figure 14 — The "Assignment" package class model

7.2.11.2 Semantics

Instances of the `Assignment` class may specify eligibility criteria (e.g. certain users, vehicle characteristics,) that are either prohibited, applicable for, or exclusively assigned for the corresponding campus, (sub)place or space or identified area. Minimum or maximum parking duration and reservation

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information can be given. The validity for these sets may be specified by a period model. If no validity is specified, the given assignment is valid all the time.

7.2.12 «D2Package» Access

7.2.12.1 Overview

The “Access” package shall support information about entrances, exits or both belonging to places or spaces for vehicles (see Figure 15) as well as for pedestrian (see Figure 16).

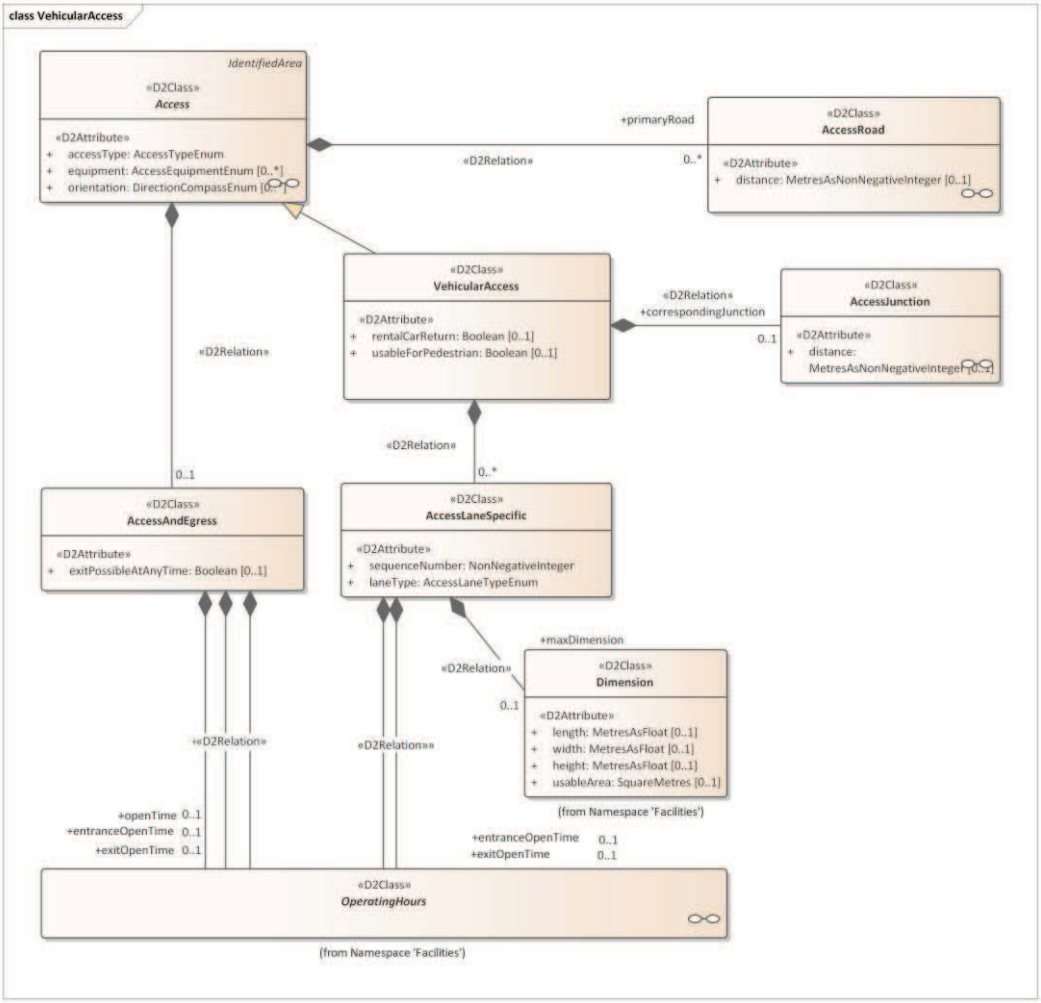

Figure 15 — The “VehicularAccess” class model

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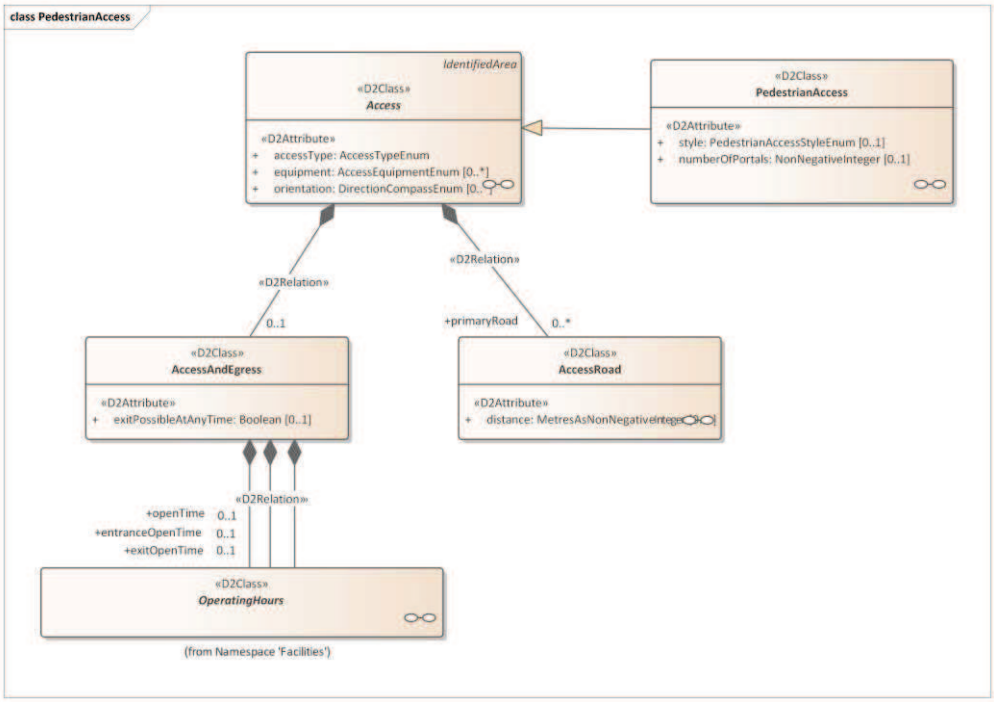

Figure 16 — The "PedestrianAccess" class model

7.2.12.2 Semantics

A `VehicularAccess` shall be an access for vehicles of type entry, exit, both of them or reversible. Equipment and its orientation may be specified. It may be used as a rental car return access.

A `VehicularAccess` is a specialisation of `Access`, which is a specialisation of IdentifiedArea, thus inheriting `AdditionalCharacteristics` and the Assignment structure, which allows to specify different vehicle types as applicable or prohibited, or the distinction on specific user groups (for example long- or short-term parkers). Accessibility on this access (barrier free, wheelchair accessible etc.) may be specified by using the corresponding attribute which is inherited from the `Facility` object.

Although a `PedestrianAccess` is available as a separate object to specify an access for pedestrian, it may also be possible to limit the information on a `VehicularAccess` and specify its Boolean attribute "usableForPedestrian", if appropriate.

Each of the `AccessLaneTypeEnum` literals may support the definition of characteristics for each lane within the instance of `VehicularAccess`. Preferred practice gives a sequence number to each lane left to right when entering the facility.

`VehicularAccess` also supports the description of a corresponding junction and primary roads, from which the parking place or space can be accessed, together with a distance information. See Clause 7.2.15 "JunctionAndRoad" for more details.

A `VehicularAccess` is also a specialisation of Facility, thus inheriting `OperatingHours` information for the access as such. However, with the classes `AccessLaneSpecific` and `AccessAndEgress`, it is possible to define much more detailed operating hour information, if needed, such as entrance and exit open times, or area entrance and exit open times.

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7.2.13 «D2Package» ParkingRoute

7.2.13.1 Overview

The "ParkingRoute" package (see Figure 17) shall support information about routes belonging to parking places or spaces.

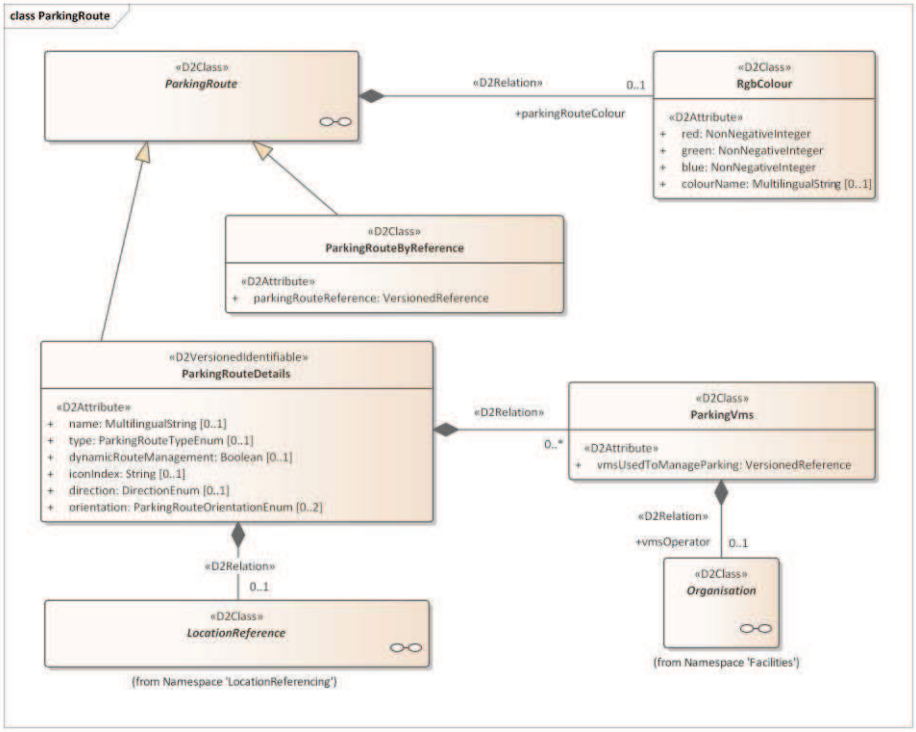

Figure 17 — The "ParkingRoute" package class model

7.2.13.2 Semantics

The "ParkingRoute" package shall provide information on routes dedicated for parking vehicles. It shall be possible to identify and to reuse the route information by using the `ParkingRouteByReference` class.

The `ParkingRoute` class shall be abstract and shall be specialised either by using the `ParkingRouteByReference` class to reference a previously defined parking route or by using the `ParkingRouteDetails` class to specify a new parking route.

An instance of the `ParkingRoute` class shall identify a route on which motorists are guided to this parking (for instance with help of VMS, see below). A name, a type, an index for an icon, a location (`LocationReference` class; the usage of an "Itinerary" location is suggested for this purpose) as well as the direction and orientation may be specified for this route. The Boolean attribute "dynamicRouteManagement" shall indicate, whether the route is part of some dynamic Truck Parking route management.

A corresponding colour may be defined for a parking route using the aggregation "parkingRouteColour". Each instance of the `RgbColour` class shall define a colour by values of red, green and blue, each given by an integer value between 0 and 255. In addition, a common name for that colour may be specified.

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Each instance of the `ParkingVms` class shall define a versioned reference to an instance of the class `VmsController` (defined in EN 16157-4) that contains the metadata for a specific VMS unit that may be used to manage parking information (e.g. to indicate to drivers the current availability of spaces) or a parking route. A corresponding vms operator may also be defined by using the `Organisation` structure (specified in CEN/TS 16157-12).

NOTE The `ParkingVms` class references to `VmsController`, originated in the «D2Namespace» "Vms". It is not necessary that this namespace is part of the profile. However, for the specification of Vms messages itself, the "Vms" namespace is needed. See also Annex C.

7.2.14 «D2Package» ThresholdConfiguration

7.2.14.1 Overview

The “ThresholdConfiguration” package (see Figure 18) shall specify a sub-model to configure thresholds for the "parkingStatus" element, i.e. threshold values may be defined of when a parking place is considered to be full, for example.

For a more detailed explanation on threshold configuration see also Annex D.

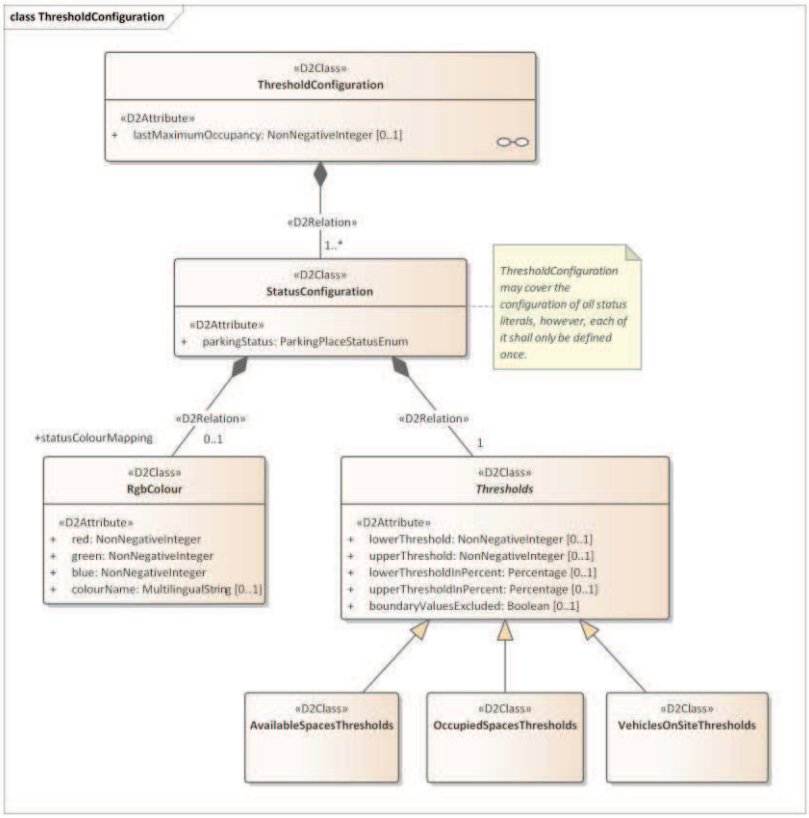

Figure 18 — The “ThresholdConfiguration” package class model

7.2.14.2 Semantics

With an instance of the "ThresholdConfiguration" package it shall be possible to define thresholds for the change of status information related to a campus or parking place, for example the number of available spaces from which the corresponding place or campus should be called as being full, empty or overcrowded ('status').

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Only one status should be active at a time, so that the most recently activated status means that an existing active status should be considered no longer active even if its threshold conditions are still met due to a hysteresis effect.

The `ThresholdConfiguration` class shall define one or more status configurations and may hold information on the last known maximum number of vehicles on the site.

For every literal of the `ParkingPlaceStatusEnum` it shall be possible to define a colour (class `RgbColour`, optional) and thresholds (class `Thresholds`). Every element of the enumeration shall only be defined once in implementations.

The abstract "Thresholds" class shall be specialised by the `AvailableSpacesThresholds` class, the `OccupiedSpacesThresholds` class or the `VehiclesOnSiteThresholds` class. Depending on this specialisation, the class specifies thresholds in terms of available spaces, thresholds in terms of occupied spaces or thresholds in terms of vehicles that are present on the site.

An upper as well as a lower threshold for the specified status literal may be specified. The threshold may be specified in terms of integer-numbers or in terms of percentages. It may be specified, if the threshold values itself should be excluded or not. The default interpretation, if the attribute "boundaryValuesExcluded" is not used, is 'false', i.e. the threshold values are included by default.

NOTE Thresholds may be defined overlapping. For example, for the status 'spacesAvailable' the AvailableSpacesThresholds may be set to 5 (lower) and 120 (upper), whereas for the status 'full' it may be set to 0 (lower) and (10) upper. Between 5 and 10 available spaces a hysteresis is defined in this case, which means the current status depends on the status development in the past. If the available spaces have been increasing, the status should change already at 5 to from 'full' to 'spacesAvailable', but when the number of available spaces have been decreasing, the status should already change at 10 from 'spacesAvailable' to 'full'.

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7.2.15 «D2Package» JunctionAndRoad

7.2.15.1 Overview

The “JunctionAndRoad” package shall support provision of additional information to describe a point (class “Point” defined in EN 16157-2) in terms of a junction (see Figure 19) and also comprise a data structure for access road and access junction information (see Figure 20).

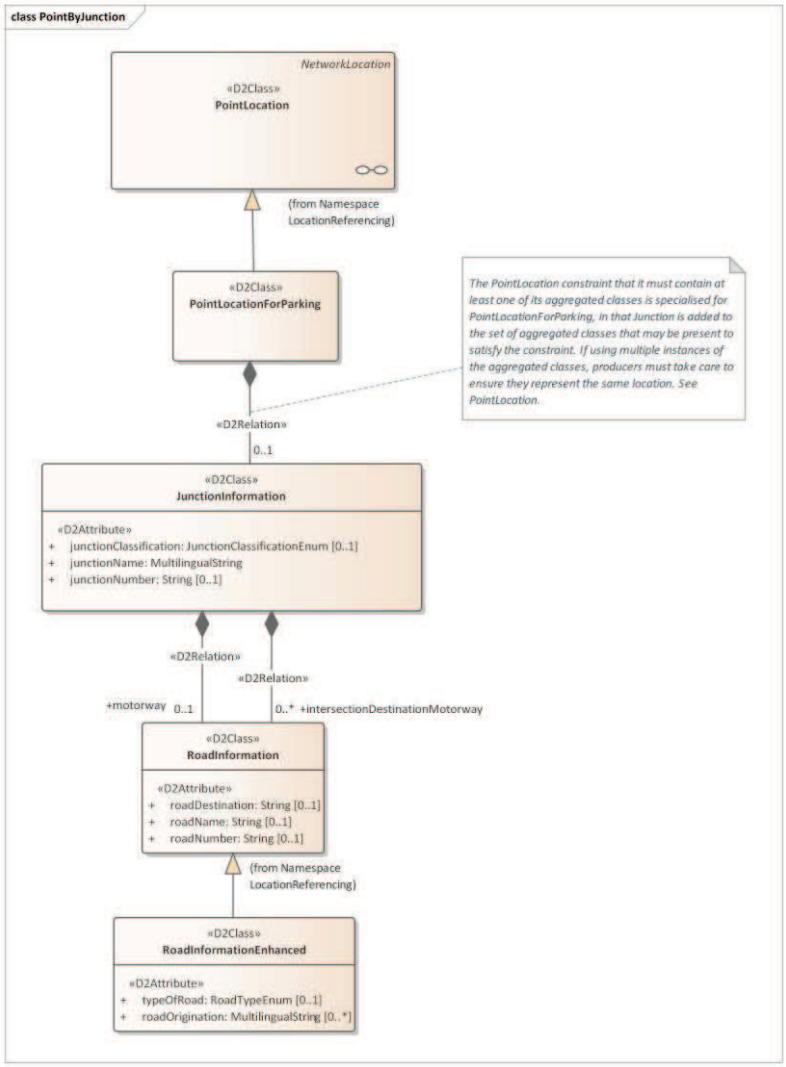

Figure 19 — The “PointLocationForParking” and "JunctionInformation" class model

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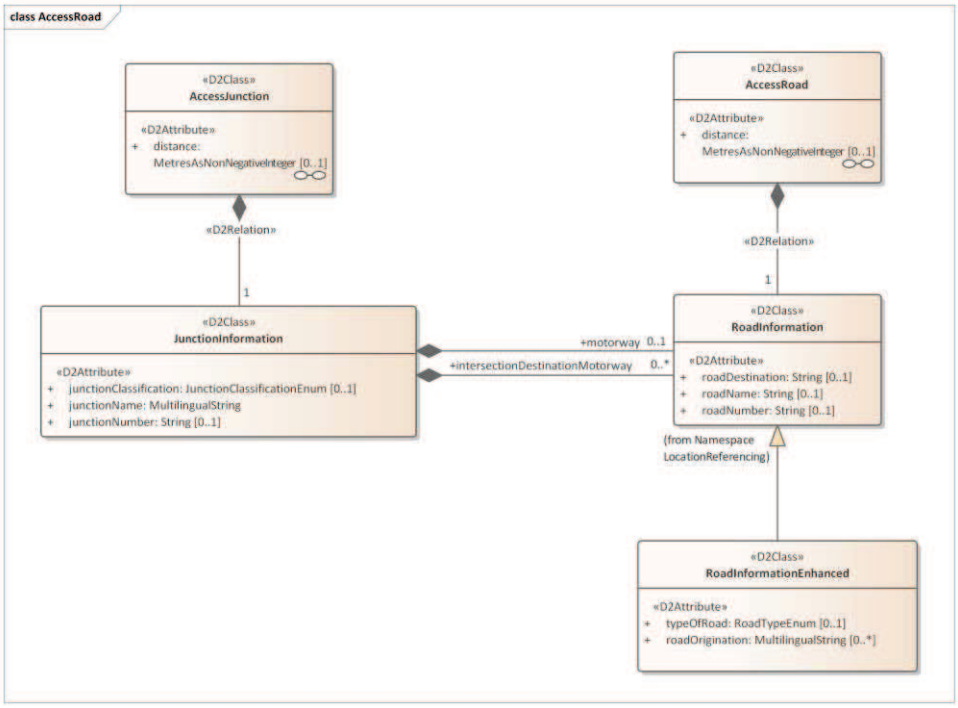

Figure 20 — The “AccessRoad” and "AccessJunction" class model

7.2.15.2 Semantics

An instance of the `JunctionInformation` class may provide information about a (motorway-) junction: classification (i.e. its type), name and number. The motorway in question may be specified using the `RoadInformation` class specified in EN 16157-2. This class may be specialised by `RoadInformationEnhanced` to have additional information like type of a road and the origination of a road.

If the junction type corresponds to any type of interchange, a destination motorway(s) may be specified in addition.

Using the `AccessRoad` and `AccessJunction` classes (aggregated to `VehicularAccess` or `PedestrianAccess`) it is possible to define the corresponding junctions and roads in combination with its distance to the access.

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7.3 The Parking Status Publication model

7.3.1 Overview

The Parking Status Publication model shall support the specification of dynamic information related to parking information, such as the status and occupancy of parking places and spaces as well as of associated infrastructure elements. Vehicle rates and detector measurements may also be included (see 7.3.5).

Beside the status and occupancy structure, the parking status model also comprises the supply and demand sub-model originating from APDS/ISO TS5206-1 (see 7.3.3). With this part of the model, it is possible, to specify occupancy supply and demand for a specified place or several spaces. Supply shows space inventory allocated for use (i.e. for parking, delivery, etc.), Demand shows the usage of space inventory. The two concepts are not identical but have some overlapping. In future, it is intended to further merge those two concepts.

The Parking Status Publication model comprises a number of packages, with the “ParkingStatus-Publication” package providing the entry point to the dynamic part of the Parking Publications model, which utilise some classes from the “Common” namespace defined in EN 16157-7. All instances of the Parking Status Publication model shall be linked to the specific, corresponding instances of the Parking Table Publication model by using the relevant versioned reference attributes.

The corresponding schema for the Parking Status Publication model can be found in normative Annex B of this document.

7.3.2 «D2Package» ParkingStatusPublication

7.3.2.1 Overview

The “ParkingStatusPublication” package (see Figure 21) shall form the entry point for the dynamic part of the Parking Publications model.

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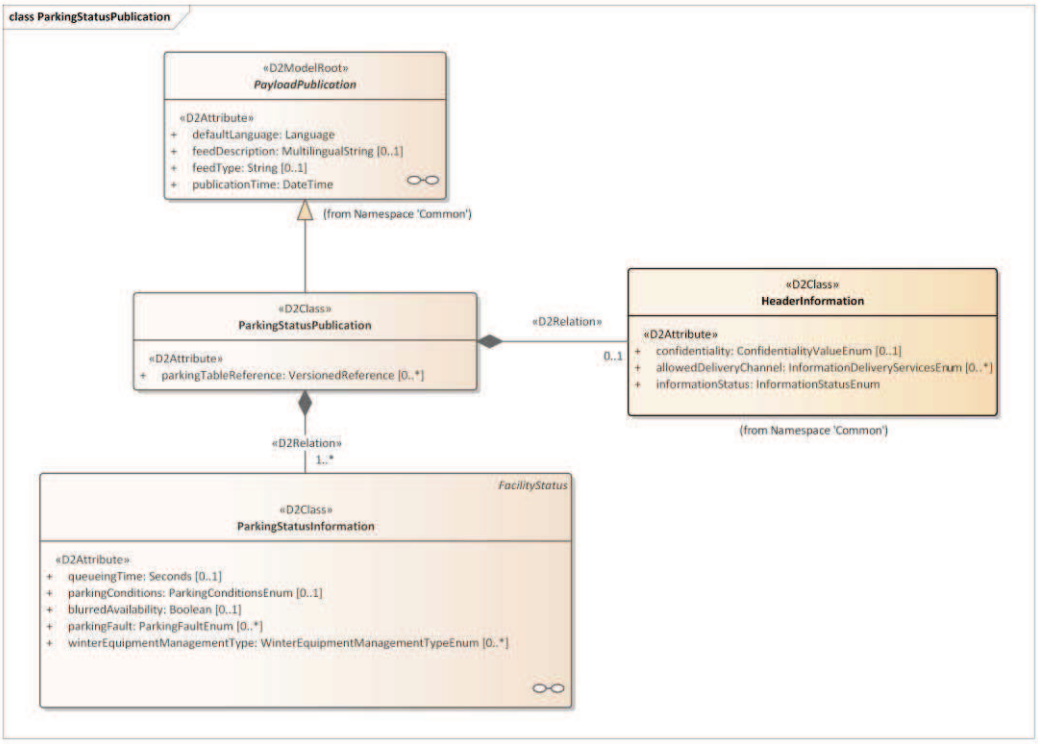

Figure 21 — The "ParkingStatusPublication" package class model

7.3.2.2 Semantics

7.3.2.2.1 «D2Class» ParkingStatusPublication

The `ParkingStatusPublication` class is a specific realisable case of a `PayloadPublication`.

Each `ParkingStatusPublication` may reference to zero, one or more `ParkingTable` from the static part of the model.

Each instance of a `ParkingStatusPublication` may have associated metadata contained in an instance of the `HeaderInformation` class, which allows the supplier of the `ParkingStatusPublication` to specify how the recipient should treat the information contained in it. This class is defined in EN 16157-7.

Each `ParkingStatusPublication` instance shall contain one or more instances of class `ParkingStatusInformation` (see 7.3.4.2.1).

7.3.3 «D2Package» SupplyAndDemand

7.3.3.1 Overview

The "SupplyAndDemand" package (see Figure 22 and Figure 23) shall define two structures to provide occupancy supply and demand for a specified place. `Supply` shows space inventory allocated for use (i.e. for parking, delivery, etc.), `Demand` shows the usage of space inventory.

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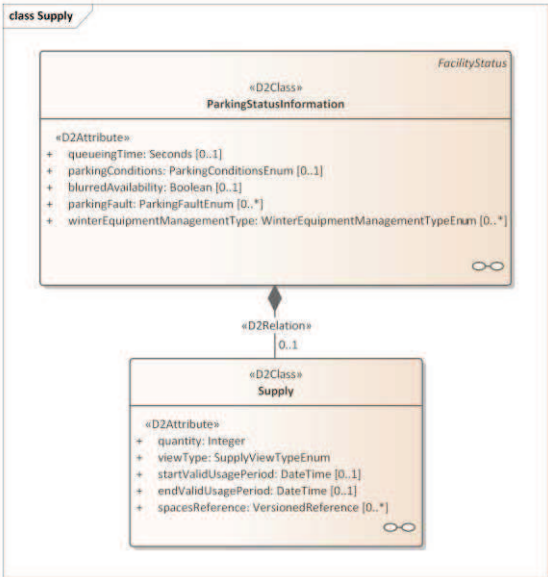

Figure 22 — The "Supply" class model

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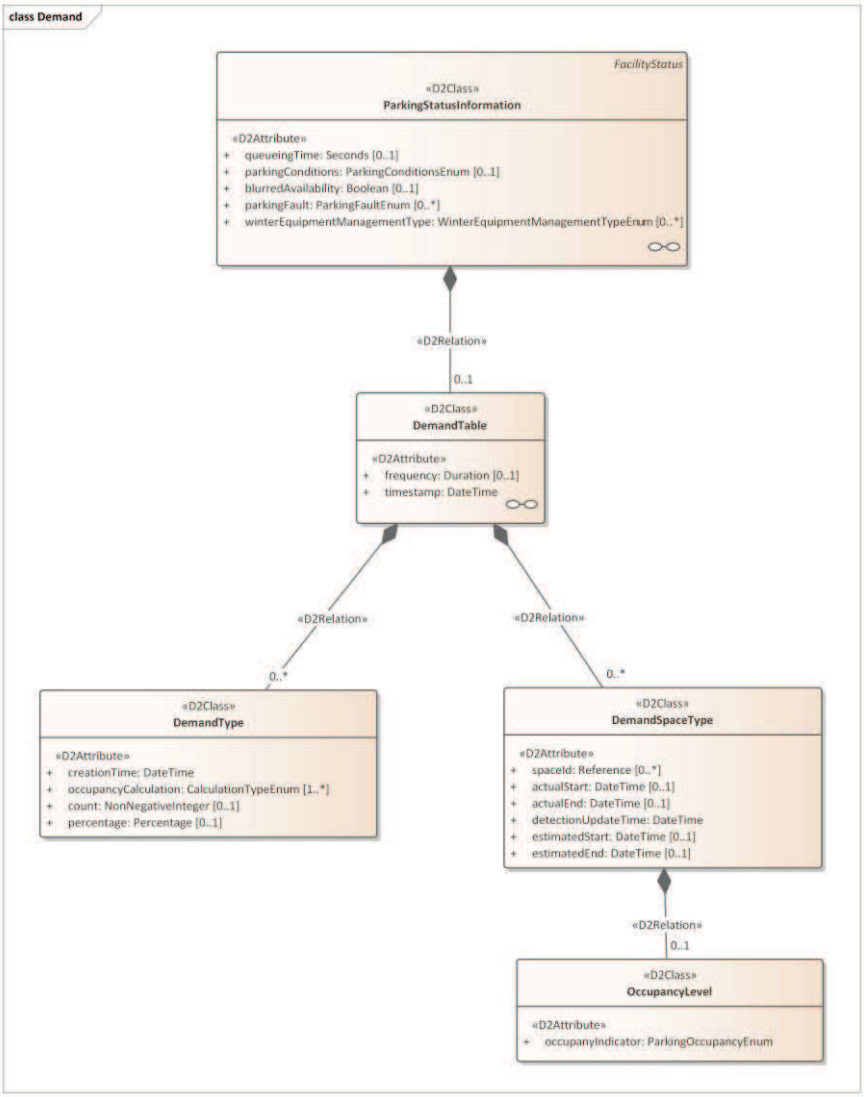

Figure 23 — The "Demand" class model

Note that the Supply model is as well available for the static part of the model, as it is aggregated as well to the `HierarchyElementGeneral`, see Figure 5.

7.3.3.2 Semantics

7.3.3.2.1 Supply

Through the `HierarchyElementGeneral` class, the `Supply` data class is linked to an identifiable element within the `Place` hierarchy. In addition, `Supply` is also available in the dynamic model for `ParkingStatusInformation`.

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The Supply class defines the supply quantity as an integer, relevant for a defined period. If the supplyValidityStart attribute is not set, the supplyQuantity is considered to be relevant from the present time until the supplyValidityEnd date/time. The supplyViewType attribute enables identification of different perspectives of specifying supply:

- spaceView - means that each space is physically marked and identifiable.
- vehicleView - means that vehicle capacity in an area is estimated based on calculating a capacity (e.g. curb length divided by a length of vehicle, or the holding capacity of a specific parking area). The Distributing Party decides on the appropriate means to calculate the vehicleView (e.g. length of vehicle to use).

The Supply class can be linked to one-to-many identified Spaces.

7.3.3.2.2 DemandTable

Through the CommonComponents class, the DemandTable data class is linked to an identifiable element within the Place hierarchy. In addition, DemandTable is also available in the dynamic model for ParkingStatusInformation, see 7.3.3.

The DemandType class indicates the timestamp of the associated demand characteristics, and the frequency that the demand characteristics are updated.

The DemandType class provides the numeric value or the percentage of this demand and its specific date/time stamp. Only one numeric value or percentage shall be provided. The DemandType class also supports identification of how the demand has been calculated through the occupancyCalculation attribute.

The DemandSpaceType class enables the demand to be defined relative to a specific identified Space. This can be used to indicate historical demand with the occupancyStartTime and occupancyEndTime being used to provide actual times of occupancy. Current demand uses either the occupancyStartTime or occupancyEstimatedStartTime to define the known or estimated start of a session respectively. Future demand can be defined by use of the occupancyEstimatedStartTime and occupancyEstimatedEndTime to define the estimated session.

7.3.4 «D2Package» ParkingStatus

7.3.4.1 Overview

The “ParkingStatus” package (see Figure 24 and Figure 25) shall support provision of status information (for example occupancy, availability etc.) for parking places and spaces as well as status information for a number of other specific elements from the static part of the Parking Publications model (e.g. routes, usage scenarios, accesses etc.).

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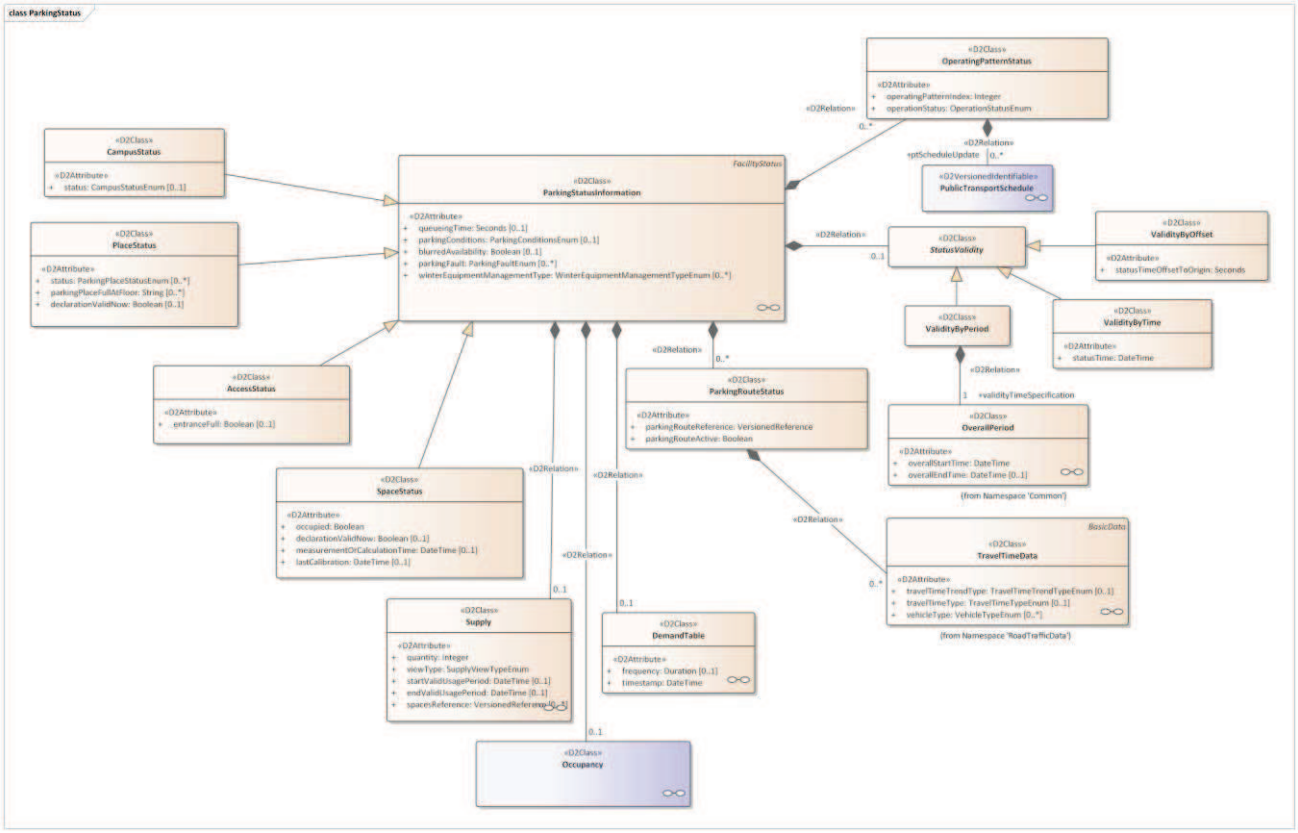

Figure 24 — The "ParkingStatusInformation" class model

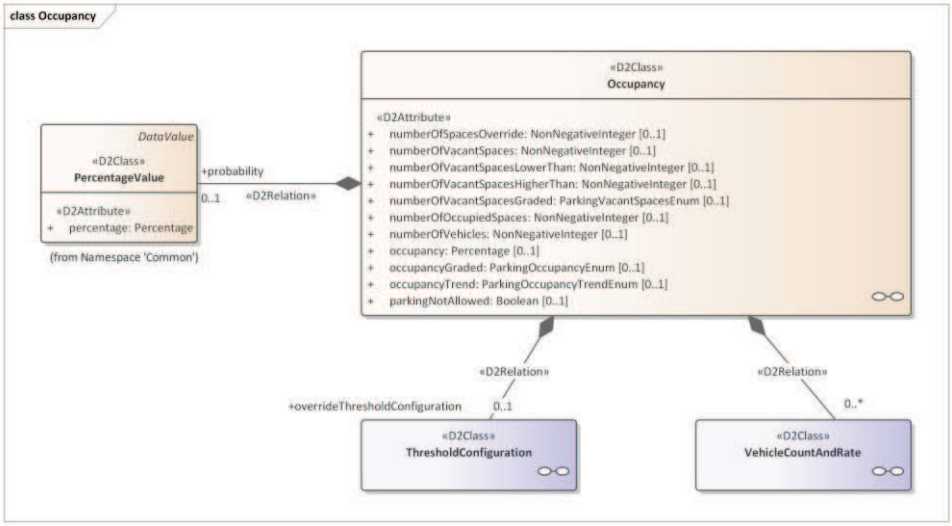

Figure 25 — The "Occupancy" class model

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7.3.4.2 Semantics

7.3.4.2.1 «D2Class» GeneralParkingStatusInformation and attached classes

The class `ParkingStatusInformation` is a specialisation of `FacilityStatus` specified in CEN/TS 16157-12. Thus, a number of status features are available by inheritance, such as a new reference to the static model, a description, operating hours, new rates, opening status or fault information.

The `ParkingStatusInformation` may be specialised by one of the classes `CampusStatus`, `PlaceStatus`, `AccessStatus` or `SpaceStatus`, depending which type was used in the static part of the model.

`CampusStatus` and `PlaceStatus` offer specific enumerations, an `AccessStatus` can be defined as being at entrance full. A space can be occupied or not, together with the information of the last calibration of the detection system. For a place as well as for a space it can be specified, whether the declaration is valid now, which is helpful, if different settings are valid over time (for example, a place might be suitable for trucks over night, but not during the day).

The elements `UsageScenarioStatus` and `ParkingRouteStatus` are aggregated to the `ParkingStatusInformation` class, to specify whether scenarios or routes are active or not. Up-to-date travel time information for the specific route may be added by using the class "TravelTimeData" specified in EN 16157-5 (note that this requires the usage of the «D2Namespace» "RoadTrafficData" – see Annex C). Updated versions of the corresponding `PublicTransportSchedules` may be added to the usage scenario status.

An instance of the `ThresholdConfiguration` class (aggregated to the `Occupancy` class) may be used to override values of this class from the static part of the Parking Publications model.

With the abstract class StatusValidity, the dynamic parking information provided may be specified as historical data (“statusTime” in the past) or for forecasted data (“statusTime” in the future). If this class is used, one of the specialisations ValidityByTime (i.e. a fixed point of time), ValidityByOffset (i.e. a relative point of time) or ValidityByPeriod (i.e. all points of time within a given period scheme, for example every first Monday in month within summer) must be chosen (for the latter, OverallPeriod shall be used, which is defined in EN 16157-7).

If StatusValidity is not used, the “lastUpdated” timestamp (class ParkingStatusInformation inherited from FacilityObjectStatus) shall represent the time for the parking status information.

If validity values are populated in both a `Supply` object (see 7.3.3) and in the `StatusValidity` of its owning ParkingStatusInformation then for the scope of Supply status only, the Supply-specific values take precedence.

7.3.4.2.2 «D2Class» Occupancy

An instance of the `Occupancy` class may be associated to the `ParkingStatusInformation` class and thus specify occupancy information for the specified element.

An instance of the `Occupancy` class may override the total number of spaces and may inform about free spaces and occupancy in different forms of expression. This covers numeric values like the number of free or occupied spaces (also: is lower or higher than) or the number of vehicles on the parking site as well as graded values (occupancy, occupancy trend, overcrowding). It is also possible to address the "probability", which is the likelihood of finding a space within the given place, subplace or campus.

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Each instance of the `Occupancy` class may have an instance of the `VehicleCountAndRate` class associated (see 7.3.5).

7.3.5 «D2Package» VehicleCountAndRate

7.3.5.1 Overview

The "VehicleCountAndRate" package (see Figure 26 and Figure 27) shall support provision of information about vehicle rates or occupancy changes within a given interval for the campus or parking place.

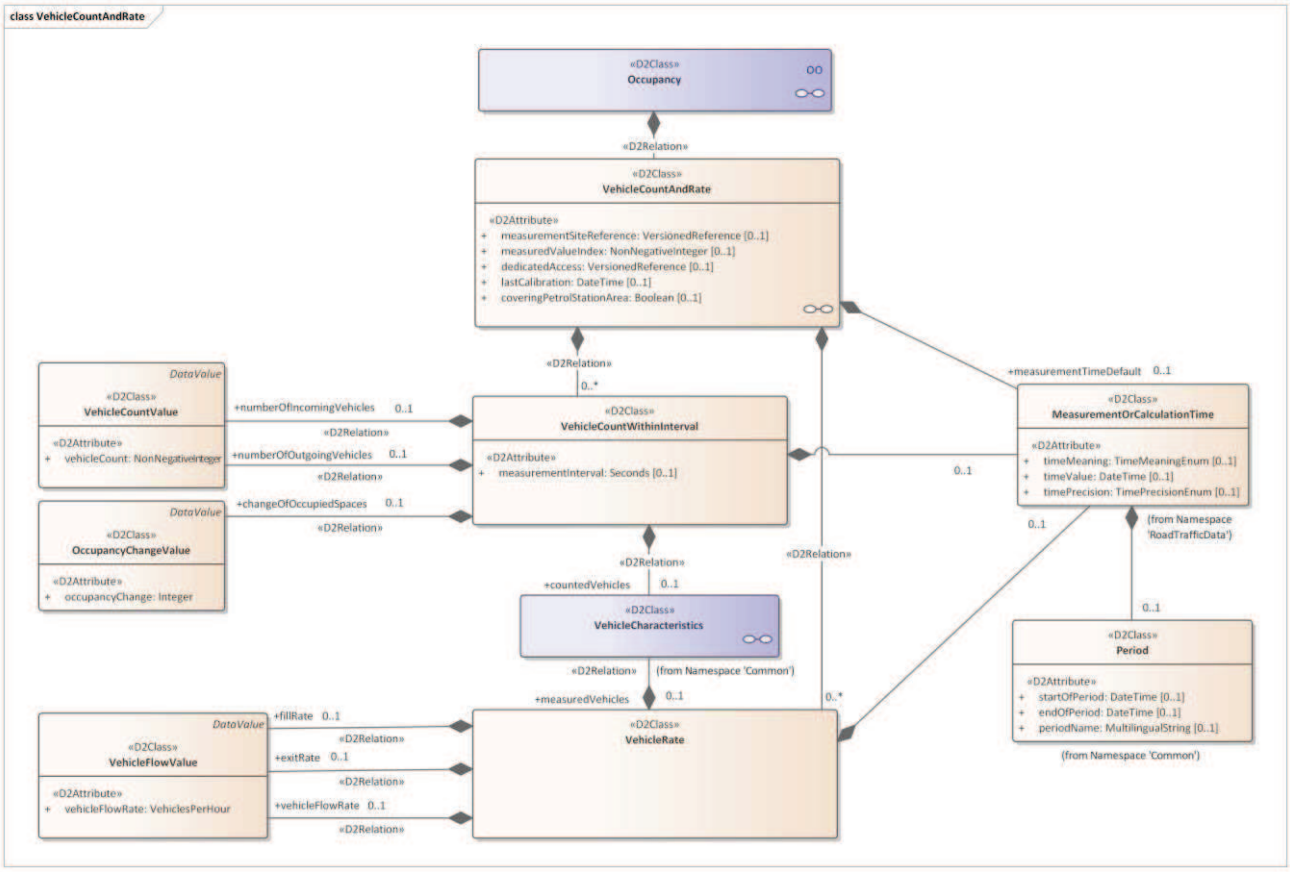

Figure 26 — The "VehicleCountAndRate" package class model

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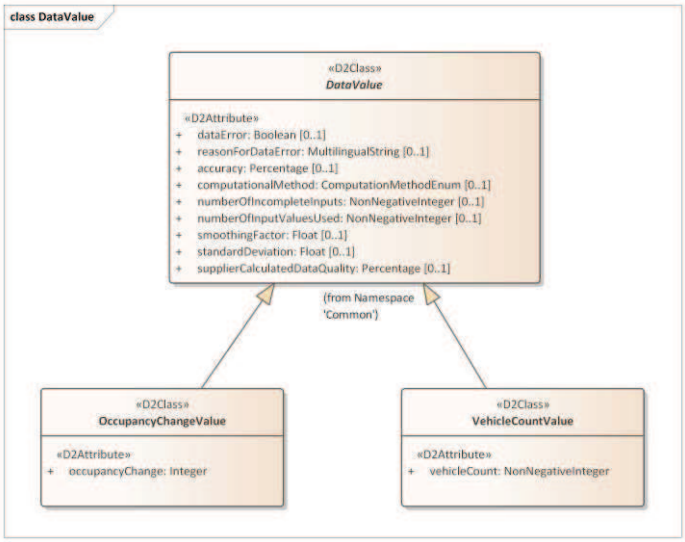

Figure 27 — New DataValue elements

7.3.5.2 Semantics

The “VehicleCountAndRate” package with the `VehicleCountAndRate` class may provide information

— about occupancy changes within a given interval using the class `VehicleCountWithinInterval`

— and/or about vehicle fill-, exit- or general flow rates using the class `VehicleRate`.

Occupancy changes within a given interval may be specified using the class `VehicleCountWithin-Interval`. An instance of this class may specify an interval in seconds with respect to the time value given in class `MeasurementOrCalculationTime` and specify the incoming or outgoing vehicles or the change of occupancy within this interval. As a second option, the interval may be specified precisely in terms of a period by using the `Period` class (aggregated to `MeasurementOrCalculationTime` class, defined in EN 16157-5 in the «D2Namespace» "RoadTrafficData"). The measurement information may be limited to specific vehicle types by using an instance of the class `VehicleCharacteristics` defined in EN 16157-7.

Information about vehicle fill-, exit- or general flow rates using the class `VehicleRate` may be linked with measurement sites defined by the Measurement Site Table Publication model in EN 16157-5 (note that this requires the usage of the «D2Namespace» "RoadTrafficData" – see Annex C). It may also point to a specific access defined in the Parking Table model or may be marked as including petrol station traffic. The rate information may be limited to specific vehicle types by using an instance of the class `VehicleCharacteristics` defined in EN 16157-7.

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Annex A
(normative)

Data Dictionary for «D2Namespace» Parking

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.

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