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Public transport — Network and timetable exchange (NeTEx)

Part 5: Alternative modes exchange format

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The UK participation in its preparation was entrusted to Technical Committee EPL/278, Intelligent transport systems.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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Published by BSI Standards Limited 2022

ISBN 978 0 539 17963 7

ICS 35.240.60

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This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 August 2022.

Amendments/corrigenda issued since publication

Date	Text affected

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TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CEN/TS 16614-5

June 2022

ICS 35.240.60

English Version

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

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

This Technical Specification (CEN/TS) was approved by CEN on 27 April 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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European foreword

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

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

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

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

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

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

- Part 1 is the description of the public transport network topology exchange format. It also contains use cases shared with part 2, and modelling rules and the description of a framework shared by all parts.
- Part 2 is the description of the scheduled timetables exchange format.
- Part 3 is the description of the fare information exchange format.
- Part 4 is the description of the passenger information European profile.
- Part 5 (this document) is the description of the alternative modes exchange format.

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

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

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

- Transmodel terms and NeTEx conceptual model elements are in capital letters (JOURNEY PATTERN for example).
- NeTEx physical model names are in bold italic font and use CamelCase style with no spaces (**JourneyPattern,** for example).
- NeTEx physical model attribute types are in italic font and use CamelCase style with no spaces (*TypeOfEntity,* for example).

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

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

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0 Introduction

Public transport services rely increasingly on information systems to ensure reliable, efficient operation and widely accessible, accurate passenger information. These systems are used for a range of specific purposes: setting schedules and timetables; managing vehicle fleets; publicising fares, issuing tickets and receipts; providing real-time information on service running, and so on.

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

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

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

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

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

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

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1 Scope

1.1 General

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

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

1.2 Alternative Modes Scope

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

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

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

- to be able to integrate legs made on alternative modes with conventional mode legs in seamless trip plans;
- to describe the coverage areas of alternative mode mobility services so that trip planning engines and others can make passengers aware of the possibility of using them, and provide appropriate links to invoke the dynamic services;
- to be able to find the locations of access points for alternative mode services, such as parking points, pooling stations, etc. including their relation to access points for conventional modes;
- to be able to indicate the costs of the mobility services for specific trip legs. Where operators offer a bundle of modes services (for example free cycle use with metro use) to be able to include the “fare product” for alternative mode legs in the sales offer;
- to be able to indicate how to book, purchase and pay for mobility services, and how to access them.

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

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1.3 Transport modes

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

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

1.4 Products and prices

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

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

Exchange protocols

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CEN/TS 16614-1, *Public transport — Network and timetable exchange (NeTEx) — Part 1: Public transport network topology exchange format*

CEN/TS 16614-2, *Public transport — Network and timetable exchange (NeTEx) — Part 2: Public transport timetable exchange format*

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

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

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

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

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3 Terms and definitions

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

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

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

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

3.1

access mode

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

3.2

alternative mode

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

3.3

car pooling

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

3.4

car rental

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

3.5

car sharing

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

3.6

conventional mode (of operation)

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

- drivers are employees;
- the fleet is owned by an authority, or owned or run by an operator
- the network topology is defined well in advance and is based on lines and journey patterns

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

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3.7

cycle rental

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

3.8

cycle sharing

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

3.9

flexible transport mode (of operation)

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

3.10

operational service

activities performed by actors in charge of operation of a service

3.11

mobility service

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

3.12

park and ride

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

3.13

park and ride facility

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

3.14

personal mode

private mode of operation excluding any publicly advertised use

3.15

public transport

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

3.16

scheduled mode

passenger transport operation following a fixed schedule and fixed routes

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3.17

taxi

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

3.18

taxi stand

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

3.19

traveller information provision

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

3.20

traveller service

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

3.21

walking mode

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

3.22

vehicle pooling

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

3.23

vehicle rental

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

3.24

vehicle sharing

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

3.25

vehicle with driver

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

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4 Symbols and abbreviations

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

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

5 Use Cases for Alternative Modes of Operation

5.1 General

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

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5.2 Network Description

Location Search

Table 1 — location search use cases

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

5.3 Integrated all Mode Trip Planning

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

Table 2 — integrated modes use cases

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

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

5.4 Trip Information

Table 3 — Trip information use cases

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

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6 Functional Description of the Alternative Modes

6.1 General

The Functional description of the alternative modes is the same as that of the Transmodel compatible definition, described in the PT1711 (CEN/TS 17413:2020) specification.

A normative CEN standardised functional specification is being developed as Transmodel.

For convenience, the functional description is included in this document as an informative annex – see Annex A.

The NeTEx specification includes functional enhancement over the original PT1711 function (now incorporated in a new Transmodel Part 10).

6.2 Geofencing and Areas of Permitted Use

Most vehicle systems, such as cycle share, vehicle rental, etc., operate only within a specific spatial area. This area may be indicated though maps or passenger information, or for vehicle with remote immobilisation systems, may even be enforced electronically by GPS detection.

Within the spatial extent there may be areas where only certain uses (or even no use at all) is permitted. The permitted areas may be described using mobility service constraint zones, each expressing a spatial extent and the permitted uses.

Mobility service constraint zones can also be used to limit use for other purposes, for example pollution control zones.

7 Generic Physical Model and XSD Mapping Rules

NeTEx uses a model driven design approach – a conceptual model, describe in UML, is systematically mapped into a more explicit implementation model, also in UML, which is then used to code an XML schema. The modularisation of packages in the schema follows the modularisation in the design MODELs. Transmodel relationships are implemented in the XML by containment or by reference as appropriate.

A method to map from a conceptual model to a physical XML model is described in NeTEx Part1. The same method I used for alternative modes to map from a Transmodel alternative model to an extended NeTEx XML schema. A number of revisions are made from the original PT1711 model to arrive at a stable Transmodel alternative model (Transmodel Part 10 (prEN 12896-10) will replace CEN/TS 17413:2020 drafted by PT1711) – see Annex E.

The additions to the NeTEx XML schema are backwards compatible – existing documents will still validate.

In the following chapter, for each submodel diagrams are provided for; (a) the conceptual modelling UML; (b) the corresponding physical model in UML, including identifiers, foreign keys and enumerations; (c) The corresponding XML schema elements, including XML groups, attributes and data types.

Some additional conventions are used to show Revisions and Extensions to the Transmodel 6.0 model as shown in the following diagram.

Entities

- Red triangle – Entity added to Transmodel 6.0 for alternative modes

Relationships

- Black – Existing Transmodel 6.0 Relationship

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- Red – Added for Alternative modes by PT1711
- Blue – Added /revised of Alternative modes for Transmodel NeTEx.

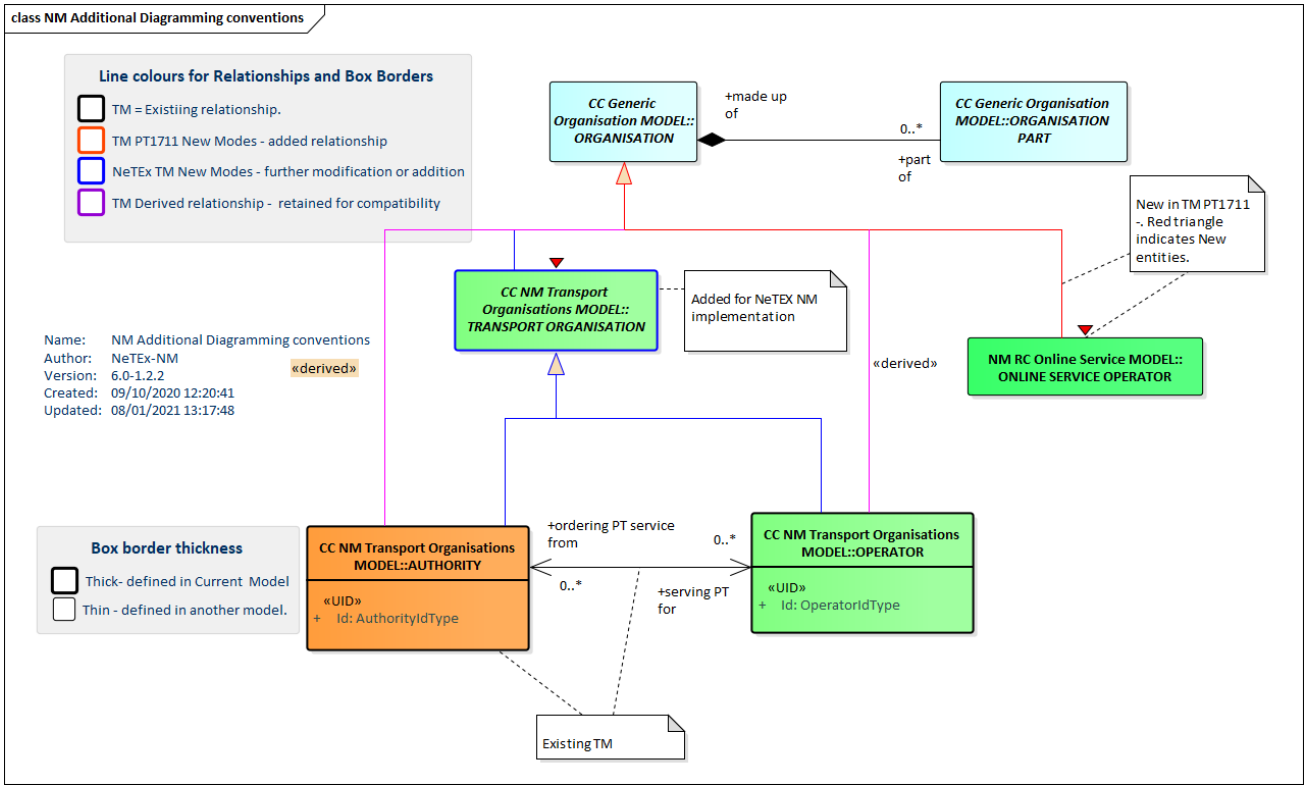


Figure 1 — Additional Conventions (UML)

8 Alternative modes – Data model

8.1 General

Following the Transmodel separation of concerns, the representation of the alternative modes is broken down into a number of separate submodels. The following section describes each functional submodel. In addition, some views are given to show how existing model elements may be used to represent alternative mode data without any additional changes being necessary.

The section is primarily concerned to document the XML schema, relating it to the physical model on which it is based. In order to relate the physical model to the corresponding Transmodel elements from which it is derived, each section is introduced by a UML diagram of the respective Transmodel Conceptual model.

8.2 Data Model

8.2.1 Overview

To support alternative modes, the existing v1.1 parts of NeTEx are extended (as NeTEx v1.2.2) in three distinct ways:

- A small number of new elements, attributes, and enumeration values are added to certain existing packages in the existing schema (covering the NeTEx Framework and Part1, Part2 and

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Part3). These extend the capabilities of the existing NeTEx components. Existing documents will still validate correctly against these parts.

- A small number of new packages are added as reusable components to the existing parts, as they are referenced by one or more of the modified core packages or may be of wider use for future NeTEx modules. These also extend the capabilities of the existing components, (for example, the various MODEs of OPERATION).
- A separate NeTEx Part5 module is added, containing a number of new packages that are specific to the alternative modes. This includes two new specific version frames; the MOBILITY SERVICE FRAME and the SINGLE JOURNEY FRAME, to hold the added elements. These allow the definition of carpooling, vehicle sharing, rental and other alternative mode services.

Packages that are specific to alternative modes are marked NM. The packages are ordered in general in order of dependency.

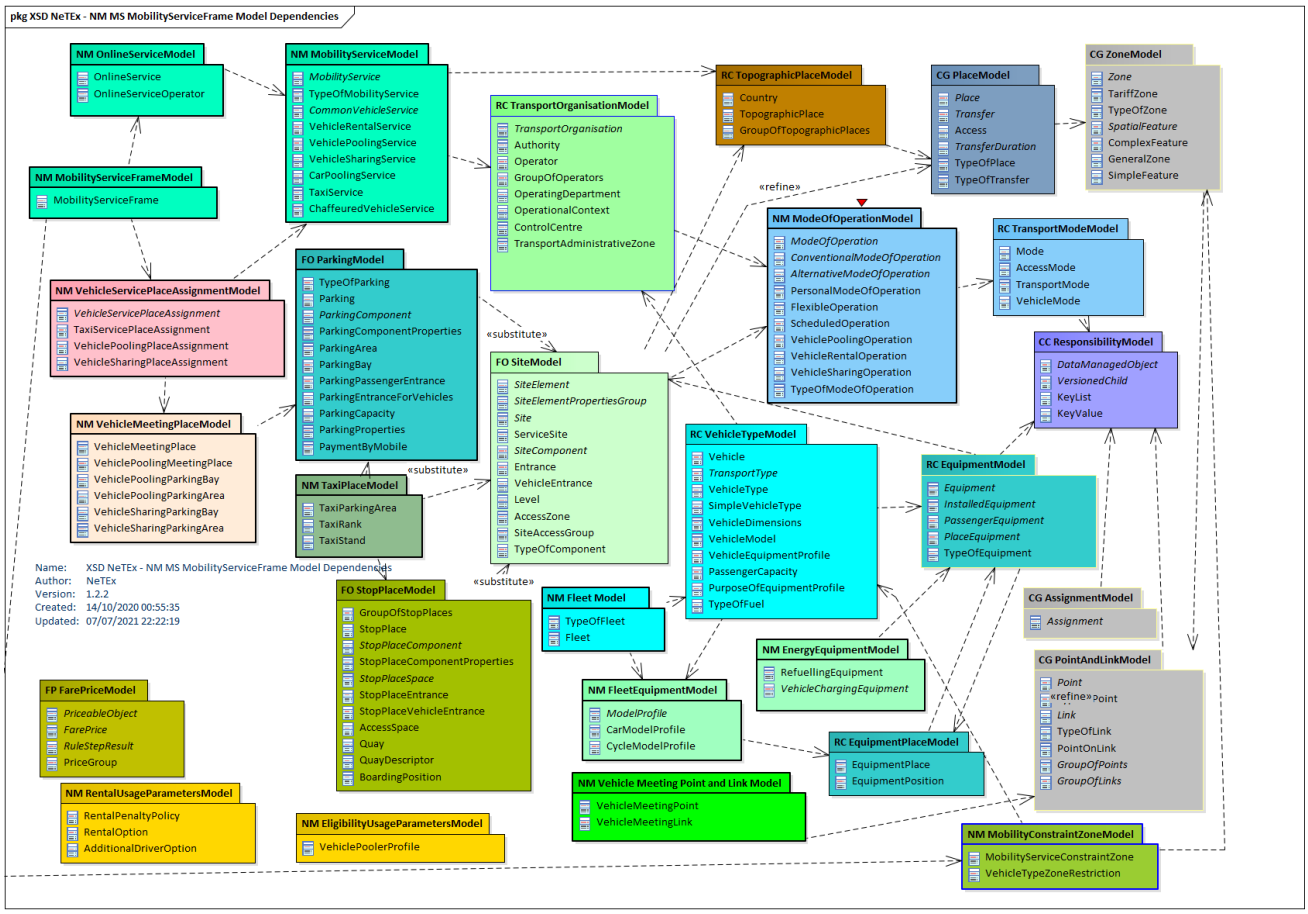


Figure 2 — NM Package Overview

The NeTEx Part5 specific packages are organized into five main groups:

- NM RC Explicit Frames – Provides frames to group alternative mode components.
- NM RC Reusable Components – Common components added to facilitate new modes.
- NM Topology – Provides several models for spatial information linked to alternative modes of operation.
- NM Journey Service - Describes alternative mode services such as vehicle pooling, sharing journeys, etc.

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- NM Fare Management – Describes Fare and pricing models for alternative modes.
- NM Travel Information: provides sub-models representing data requirements for the traveller information services.

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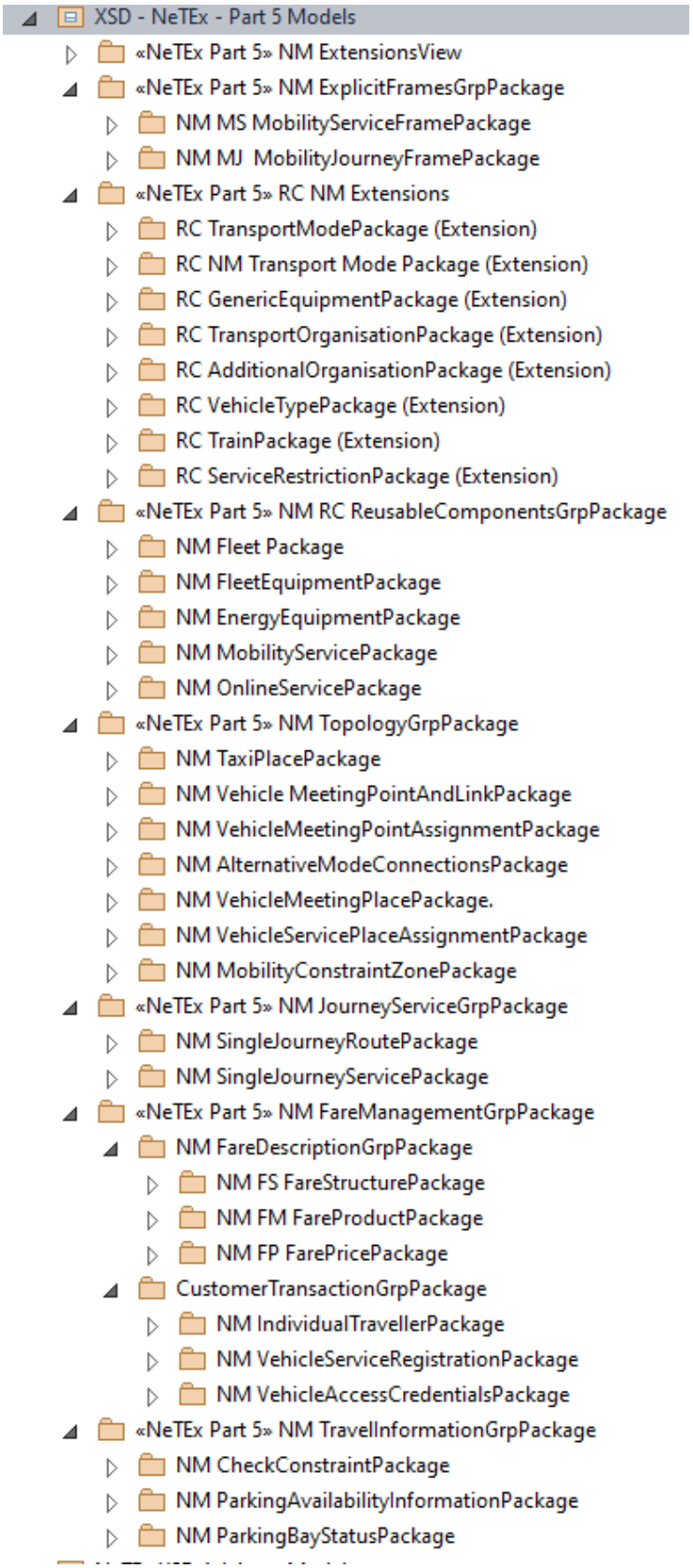


Figure 3 — NM Package Overview

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8.3 Reusable Components

8.3.1 General

This section describes new general-purpose components that are added to the core Transmodel/ NeTEx framework for use in both alternative-mode and conventional mode use cases.

For extensions to the existing Transmodel 6.0 / NeTEx v1.1 reusable components, see section 10. In particular VEHICLE TYPE and BOOKING ARRANGEMENTs are refined to support alternative mode requirements

8.3.2 Modes and Modes of Operation

8.3.2.1 MODE OF OPERATION – Conceptual MODEL

The diagram below is intended to clarify the distinction between the following two concepts:

- The concept of MODE, defined as any means of transport, or SUBMODE, defined as a variant of a MODE, linked to VEHICLE TYPE (see EN 12896-1);
- The concept of MODE OF OPERATION which represents the way the MODE or SUBMODE is operated. (Added for Alternative modes)

Three main specialisations of MODE OF OPERATION are identified:

- CONVENTIONAL MODE OF OPERATION: Legacy mode of operation providing a publicly advertised transport offer to a schedule or flexible operation plan.
- ALTERNATIVE MODE OF OPERATION: Any publicly advertised mode of operation different from the CONVENTIONAL MODE OF OPERATION, for example: VEHICLE SHARING, VEHICLE RENTAL and VEHICLE POOLING.
    - VEHICLE RENTAL: An ALTERNATIVE MODE OF OPERATION of a vehicle from a FLEET of vehicles (in general privately owned), available for use for a certain period of time and fee, with the constraint to bring it back at specified agencies.
    - VEHICLE SHARING: Short term vehicle rental where the vehicle can be taken from and parked at different places in the urban area, possibly without the constraint to bring back the vehicle to a specific location.
    - VEHICLE POOLING: An ALTERNATIVE MODE OF OPERATION of a privately-owned vehicle consisting in sharing the vehicle for a trip between the driver who is at the same time performing a trip and at least another traveller.

NOTE Chauffeured Car and Taxi are special types of VEHICLE POOLING (with a dedicated TYPE OF OPERATION).

- PERSONAL MODE OF OPERATION: Not advertised mode of operation of private persons using their own vehicle.

The following diagram shows that any SUBMODE may be assigned one or several MODEs OF OPERATION. For instance, a "local bus" may be operated as a CONVENTIONAL MODE, scheduled or flexible. A "mini-bus" may be operated using a CONVENTIONAL MODE OF OPERATION (scheduled or flexible), or as an ALTERNATIVE MODE, for instance, dedicated to VEHICLE SHARING.

TYPE OF MODE OF OPERATION characterises more precisely the possible ways of operation for a given a SUBMODE.

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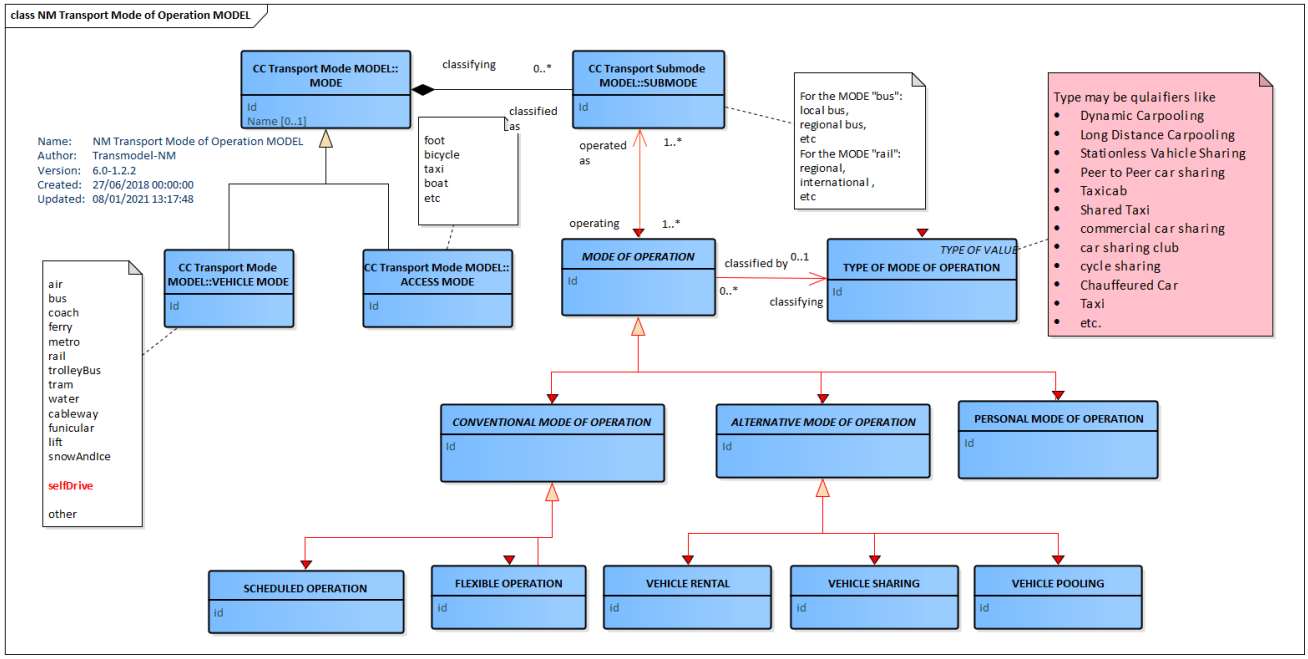


Figure 4 — NM Mode MODEL – Simplified view (UML)

This particular specification concerns the operation of transport services under the ALTERNATIVE MODES OF OPERATION, but such operation has many similarities to that under a CONVENTIONAL MODE, the models proposed in this specification therefore make extensive use of existing Transmodel entities and data structures.

8.3.2.2 ModeOfOperation – Physical Model

The following figure shows the attributes of the ModeOfOperation physical model.

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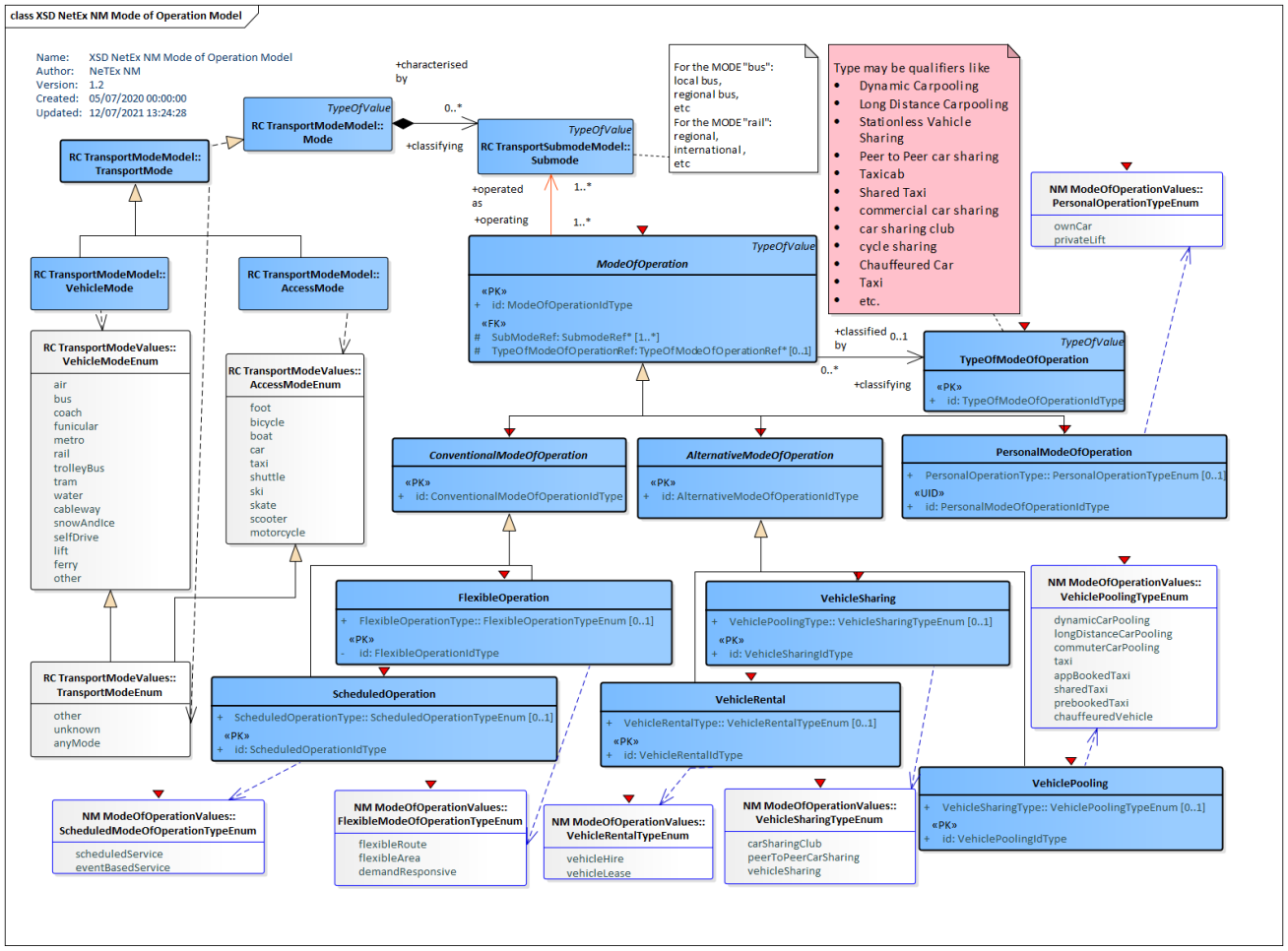


Figure 5 — ModeOfOperation – Physical Model (UML)

8.3.2.3 ModeOfOperation – Attributes and XSD

8.3.2.3.1 ModeOfOperation – Model Element

The use of any kind of vehicle to perform a trip using any mode of operation, this can be a CONVENTIONAL, ALTERNATIVE or a PERSONAL MODE OF OPERATION.

Table 4 — *ModeOfOperation* — Element

Classification	Name	Type	Cardinality	Description
::>	::>	*TypeOfValue*	::>	MODE OF OPERATION inherits from TYPE OF VALUE.
«PK»	***id***	*ModeOfOperationIdType*	1:1	Identifier of MODE OF OPERATION.
«FK»	***TypeOfModeOfOperationRef***	*TypeOfModeOfOperationRef*	0:1	Reference to a TYPE OF MODE OF OPERATION.
«FK»	***submodes***	*SubmodeRef*	1:*	Reference to a SUB MODE.

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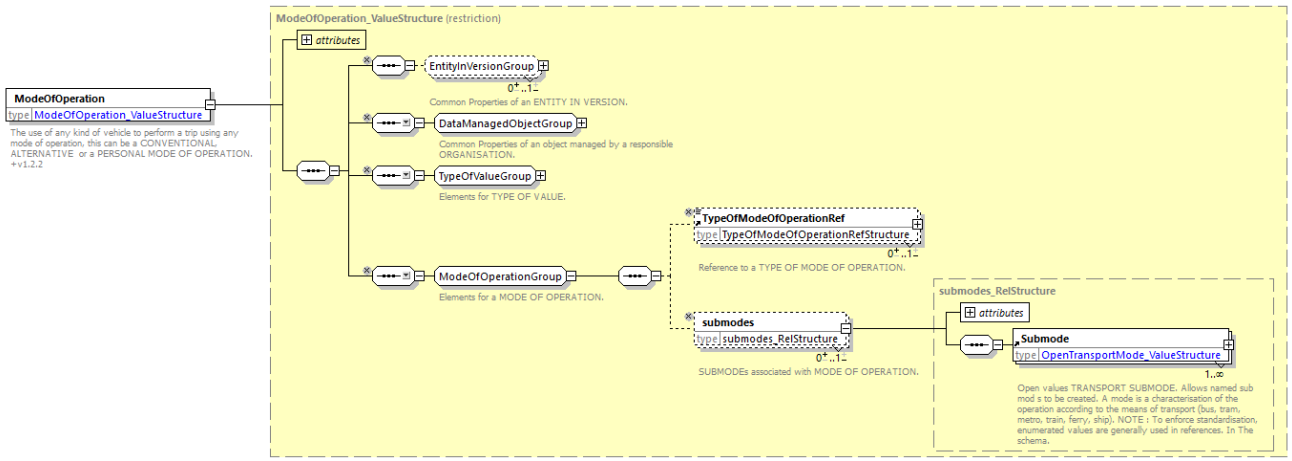


Figure 6 — ModeOfOperation – XSD

8.3.2.3.2 ConventionalModeOfOperation – Model Element

Legacy mode of operation which is provided as a scheduled and/or flexible publicly advertised transport offer.

Table 5 — ConventionalModeOfOperation — Element

Classifi-cation	Name	Type	Cardinality	Description
::>	::>	*ModeOfOperation*	::>	CONVENTIONAL MODE OF OPERATION inherits from MODE OF OPERATION.
«PK»	***id***	*ConventionalModeOfOperationIdType*	1:1	Identifier of CONVENTIONAL MODE OF OPERATION.

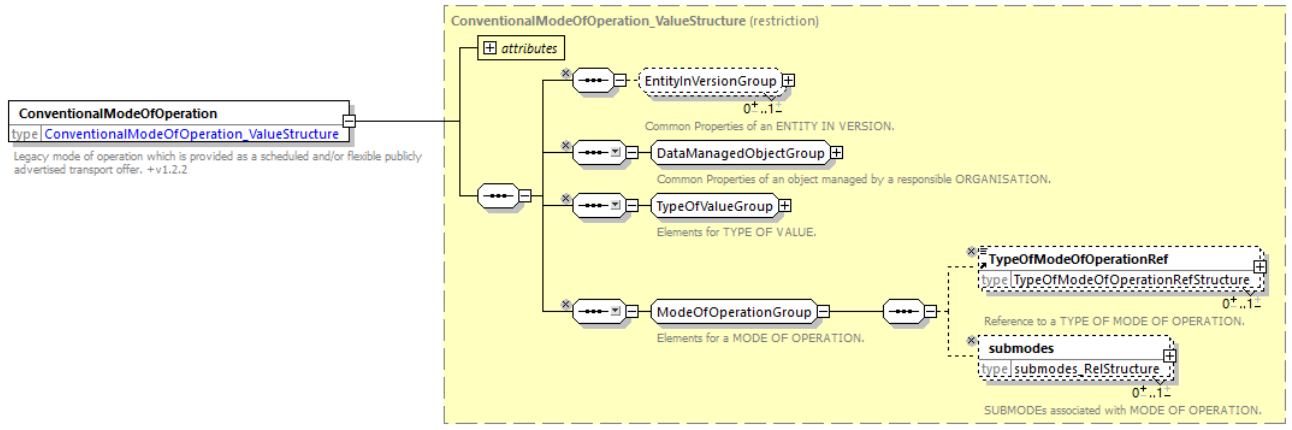


Figure 7 — ConventionalModeOfOperation – XSD

8.3.2.3.3 ScheduledOperation – Model Element

The operation of a transportation using any kind of vehicle with a predefined timetable.

Table 6 — ScheduledOperation — Element

Classifi-	Name	Type	Cardi n-	Description

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cation			ality	
::>	::>	*ConventionalModeOfOperation*	::>	SCHEDULED MODE OF OPERATION inherits from MODE OF OPERATION.
«PK»	***id***	*ScheduledOperationIdType*	1:1	Identifier of SCHEDULED MODE OF OPERATION.
«enum»	***ScheduledOperationType***	*ScheduledOperationTypeEnum*	0:1	Allowed values for type of VEHICLE POOLING MODE OF OPERATION. See below.

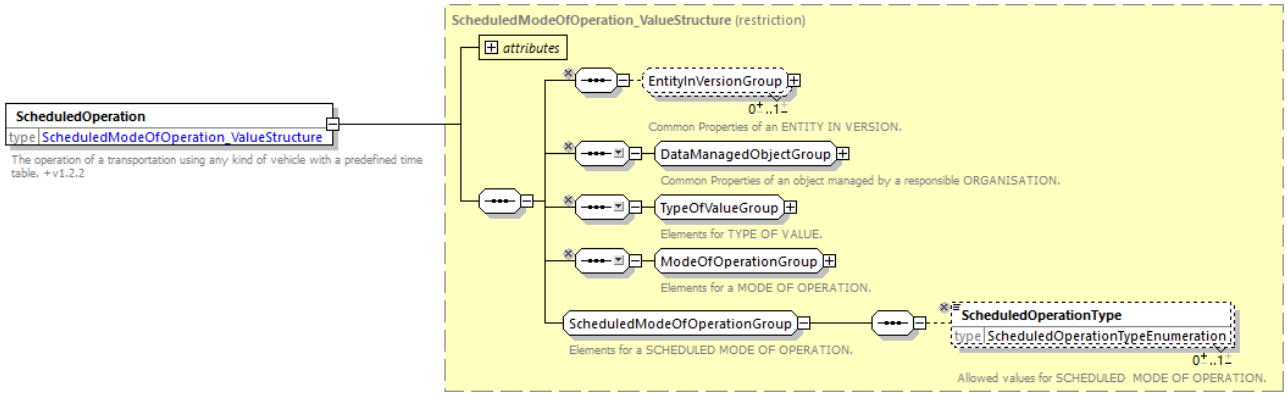


Figure 8 — ScheduledOperation – XSD

8.3.2.3.3.1 ScheduledOperationType – Allowed Values

The following table shows the allowed values for **ScheduledOperationType: (***ScheduledOperationTypeEnumeration***).**

Table 7 — ScheduledOperationType — Values

Value	Description
scheduledService	Service run to published schedule.
eventService	Service run for a scheduled event.

8.3.2.3.4 FlexibleOperation – Model Element

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

Table 8 — FlexibleOperation — Element

Classifi-cation	Name	Type	Cardin-ality	Description
::>	::>	*ConventionalModeOfOperation*	::>	FLEXIBLE MODE OF OPERATION inherits from MODE OF OPERATION.
«PK»	***id***	*FlexibleOperationIdType*	1:1	Identifier of FLEXIBLE MODE OF OPERATION.

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«enum»	***ModeOfOperation Type***	*FlexibleOperationEnum*	0:1	Allowed values for type of FLEXIBLE MODE OF OPERATION. See below.

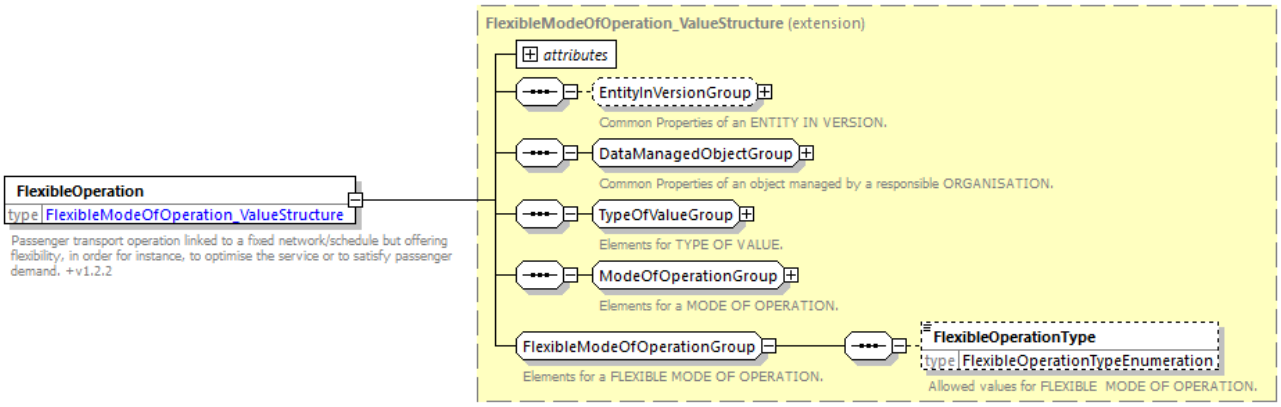


Figure 9 — FlexibleOperation – XSD

8.3.2.3.4.1 FlexibleOperationType – Allowed Values

The following table shows the allowed values for **FlexibleOperationType: (***FlexibleModeOfOperationTypeEnumeration***).**

Table 9 — FlexibleOperationType — Values

Value	Description
flexibleRoute	Service following flexible route.
flexibleArea	Service operating flexibly in an area.
demandResponsive	Service operating in response to demand.

8.3.2.3.5 AlternativeModeOfOperation – Model Element

Any publicly advertised mode of operation different from the CONVENTIONAL MODE OF OPERATION, for example: VEHICLE SHARING, VEHICLE RENTAL, VEHICLE POOLING.

Table 10 — AlternativeModeOfOperation — Element

Classifi-cation	Name	Type	Cardin-ality	Description
::>	::>	*ModeOfOperation*	::>	ALTERNATIVE MODE OF OPERATION inherits from MODE OF OPERATION.
«PK»	***id***	*AlternativeModeOfOperationIdType*	1:1	Identifier of ALTERNATIVE MODE OF OPERATION.

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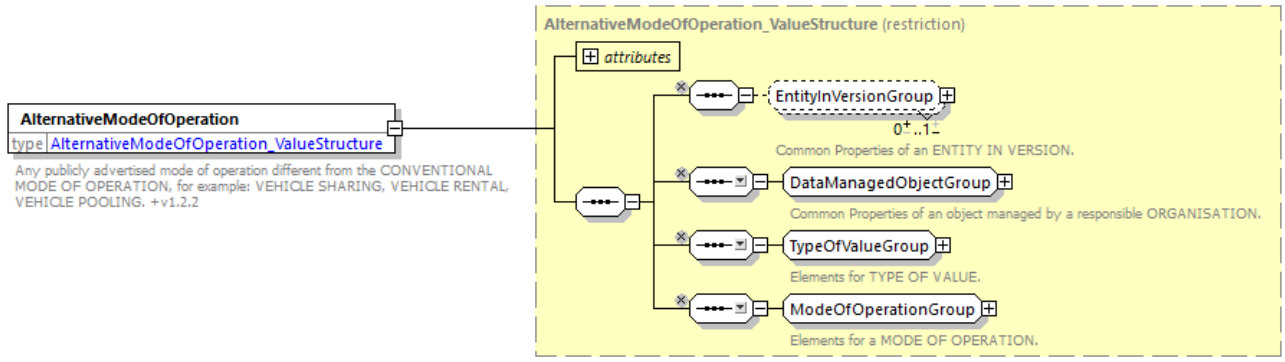


Figure 10 — AlternativeModeOfOperation – XSD

8.3.2.3.6 VehiclePooling – Model Element

An ALTERNATIVE MODE OF OPERATION of a privately-owned vehicle consisting in sharing the vehicle for a trip between the driver who is at the same time performing a trip and at least another traveller.

Note that Chauffeured Car and Taxi are special types of VEHICLE POOLING (with a dedicated TYPE OF OPERATION).

Table 11 — VehiclePooling — Element

Classifi-cation	Name	Type	Cardi nality	Description
::>	::>	*AlternativeModeOfOperation*	::>	VEHICLE POOLING inherits from ALTERNATIVE MODE OF OPERATION.
«PK»	***id***	*VehiclePoolingIdType*	1:1	Identifier of VEHICLE POOLING MODE OF OPERATION.
«enum»	***VehiclePoolingType***	*VehiclePoolingTypeEnum*	0:1	Allowed values for type of VEHICLE POOLING MODE OF OPERATION. See allowed values below.

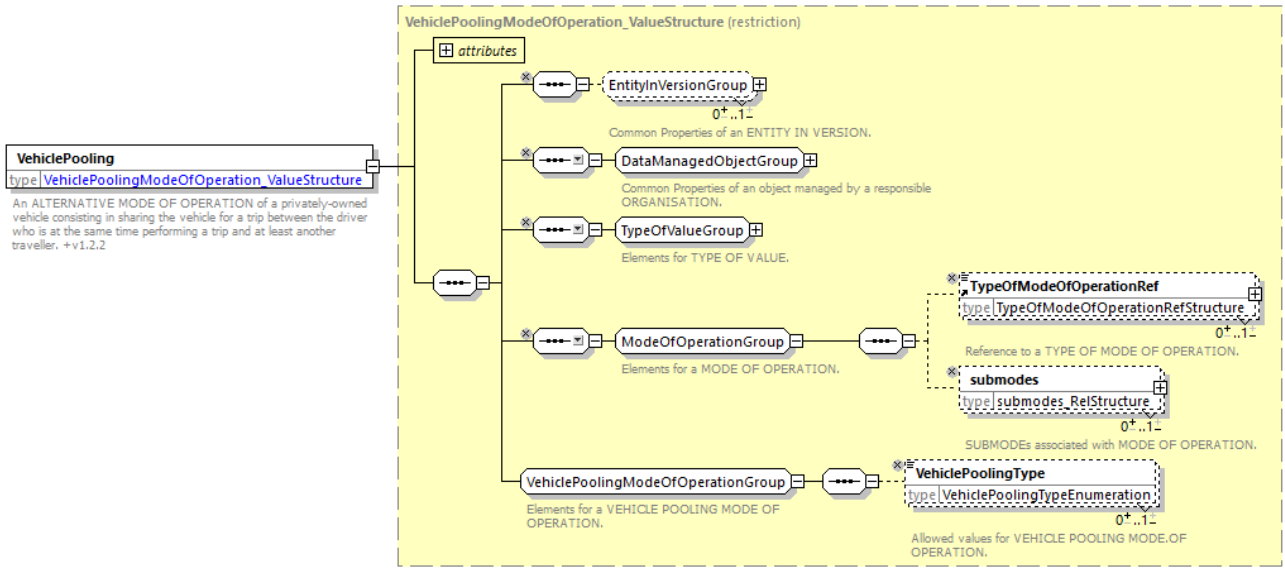


Figure 11 — VehiclePooling – XSD

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8.3.2.3.6.1 VehiclePoolingType – Allowed Values

The following table shows the allowed values for ***VehiclePoolingType***: *(VehiclePoolingTypeEnumeration*)**.**

NOTE See Transmodel Part 10 and Annex A (informative) Functional Description of Alternative Modes (from Transmodel) for a more detailed description of the following values.

Table 12 — VehiclePoolingType — Values

Value	Description
dynamicCarPooling	Dynamic car-pooling.
longDistanceCarPooling	Long distance car-pooling.
commuterDistanceCarPooling	Commuter distance Car Pooling.
taxi	Taxi (Walk-up/hailed).
appBookedTaxi	Mobile device Booked Taxi.
sharedTaxi	Shared taxi.
prebookedTaxi	Prebooked taxi.
chauffeuredCar	Chauffeured car.

8.3.2.3.7 VehicleRental – Model Element

An ALTERNATIVE MODE OF OPERATION of a vehicle, part of a FLEET (in general privately owned), available for use for a certain period of time and fee, with the constraint to bring it back at specified agencies.

Table 13 — VehicleRental — Element

Classifi-cation	Name	Type	Cardin-ality	Description
::>	::>	*AlternativeModeOfOperation*	::>	VEHICLE RENTAL inherits from ALTERNATIVE MODE OF OPERATION
«PK»	***id***	*VehicleRentalIdType*	1:1	Identifier of VEHICLE RENTAL MODE OF OPERATION.
«enum»	***VehicleRentalType***	*VehicleRentalTypeEnum*	0:1	Allowed values for type of VEHICLE RENTAL. See allowed values below.

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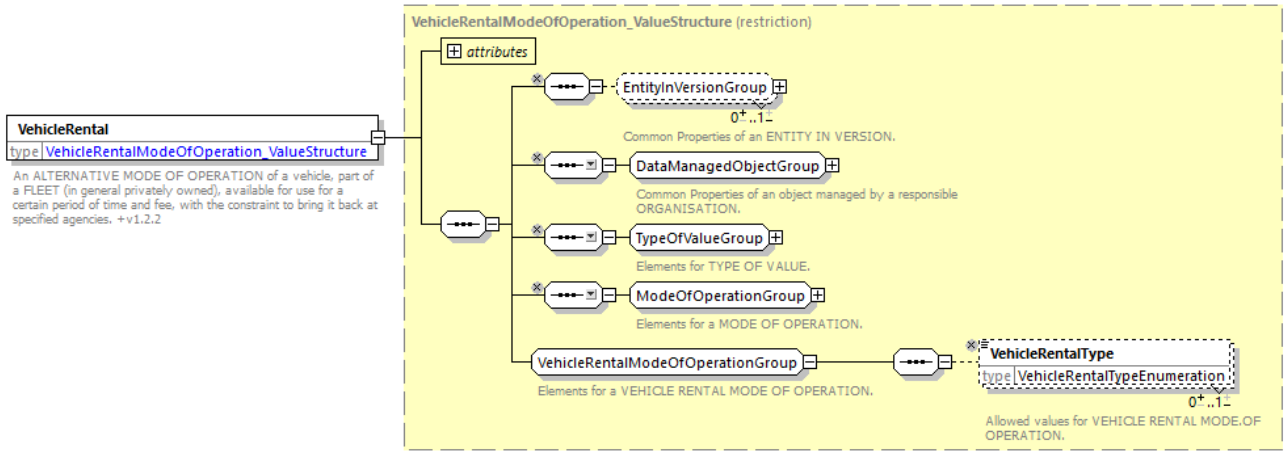


Figure 12 — VehicleRental – XSD

8.3.2.3.7.1 VehicleRentalType – Allowed Values

The following table shows the allowed values for **VehicleRentalType: (***VehicleRentalTypeEnumeration***).**

Table 14 — VehicleRentalType — Values

Value	Description
vehicleHire	Vehicle Hire (Short term).
vehicleLease	Vehicle Lease (Long term).

8.3.2.3.8 VehicleSharing – Model Element

Short term VEHICLE RENTAL where the vehicle can be taken from and parked at different places in the urban area, possibly without the constraint to bring back the vehicle to a specific location.

Table 15 — VehicleSharing — Element

Classifi-cation	Name	Type	Cardin-ality	Description
::>	::>	*AlternativeModeOfOperation*	::>	VEHICLE SHARING inherits from ALTERNATIVE MODE OF OPERATION.
«PK»	***id***	*VehicleSharingIdType*	1:1	Identifier of VEHICLE SHARING MODEL OF OPERATION.
«enum»	***VehicleSharingType***	*VehicleSharingTypeEnum*	0:1	Allowed values for type of VEHICLE SHARING. See allowed values below.

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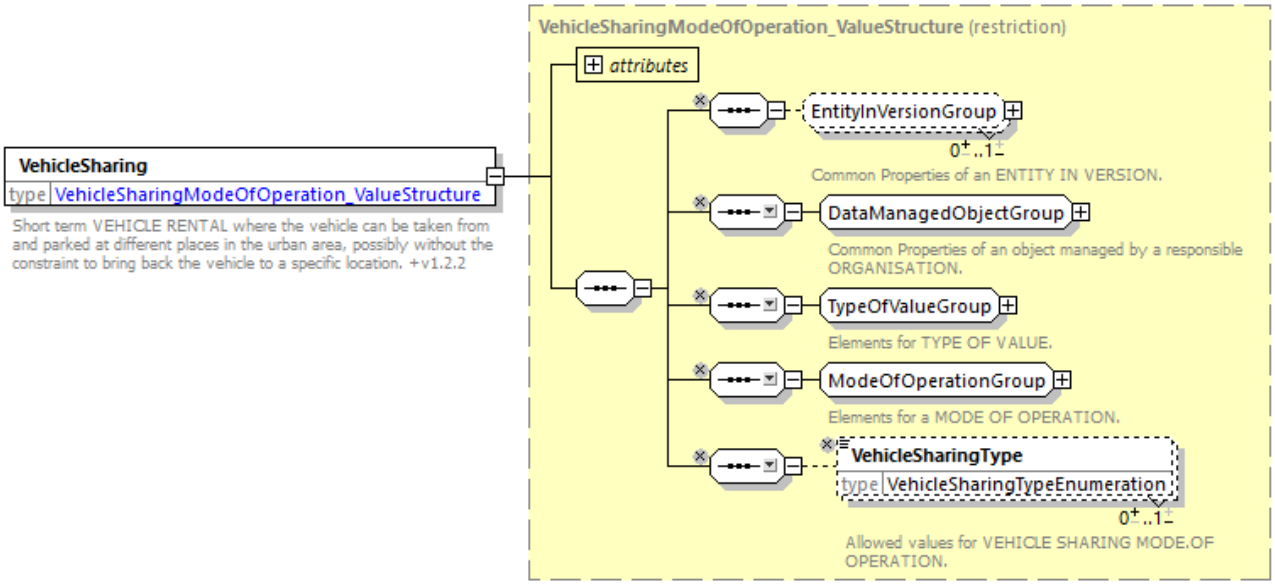


Figure 13 — VehicleSharing – XSD

8.3.2.3.8.1 VehicleSharingType – Allowed Values

The following table shows the allowed values for **VehicleSharingType: (***VehicleSharingTypeEnumeration***).**

Table 16 — VehicleSharingType — Values

Value	Description
carSharingClub	Car Sharing Club.
peerToPeerCarSharingClub	Peer-to-peer Car Sharing Club.
vehicleSharing	Vehicle Sharing.

8.3.2.3.9 PersonalModeOfOperation – Model Element

A non-advertised mode of operation of vehicles by persons using their own vehicle.

Table 17 — PersonalModeOfOperation — Element

Classification	Name	Type	Cardinality	Description
::>	::>	*ModeOfOperation*	::>	PERSONAL MODE OF OPERATION inherits from MODE OF OPERATION.
«PK»	***id***	*PersonalModeOfOperationIdType*	1:1	Identifier of PERSONAL MODE OF OPERATION.
«enum»	***PersonalOperationType***	*PersonalOperationTypeEnum*	0:1	Allowed values for type of PERSONAL MODE OF OPERATION. See allowed values below.

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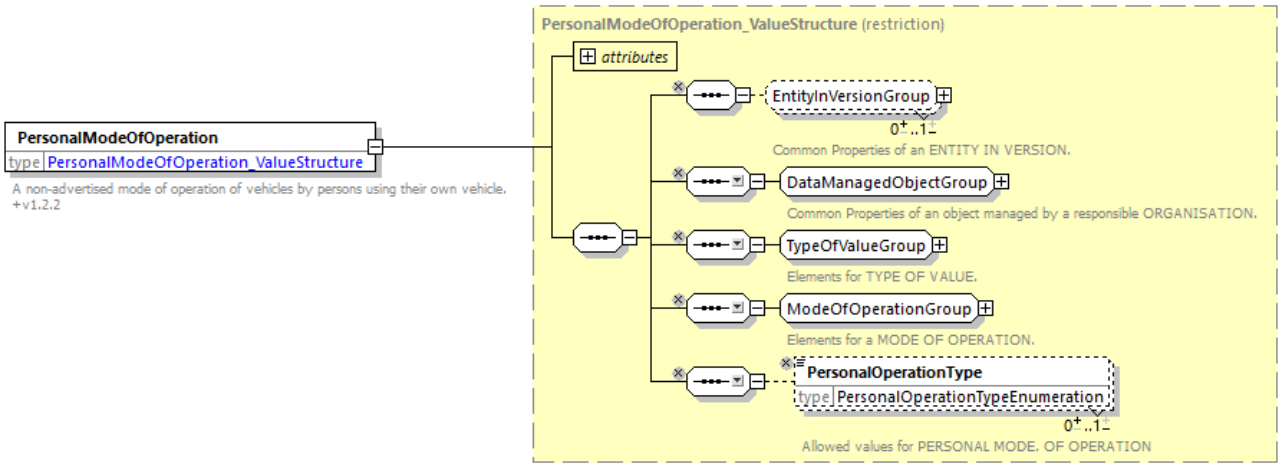


Figure 14 — PersonalModeOfOperation – XSD

8.3.2.3.9.1 PersonalOperationType – Allowed Values

The following table shows the allowed values for **PersonalOperationType: (***PersonalOperationTypeEnumeration***).**

Table 18 — PersonalOperationType — Values

Value	Description
ownCar	Travel in own car.
private	Lift in private car.

8.3.2.3.10 TypeOfModeOfOperation – Model Element

A classification for a MODE OF OPERATION.

Table 19 — TypeOfModeOfOperation — Element

Classifi-cation	Name	Type	Cardin-ality	Description
::>	::>	*TypeOfValue*	::>	TYPE OF MODE OF OPERATION inherits from TYPE OF VALUE.
«PK»	***id***	*TypeOfModeOfOperationIdType*	1:1	Identifier of TYPE OF MODE OF OPERATION.

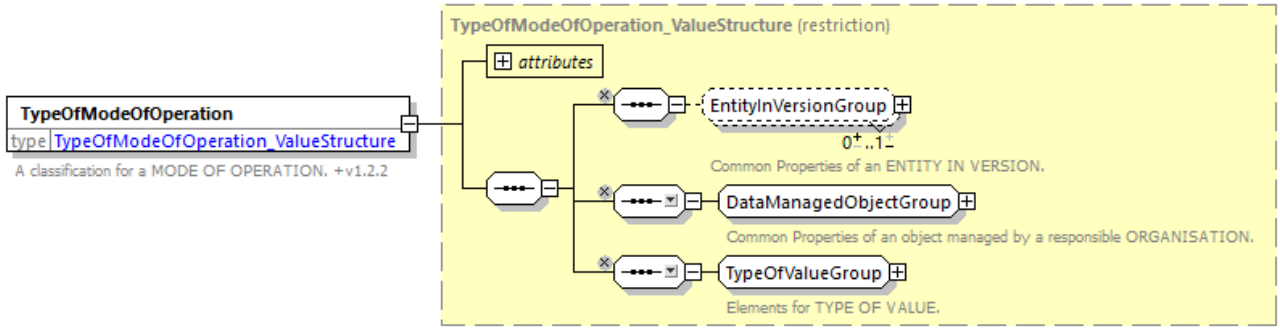


Figure 15 — TypeOfModeOfOperation – XSD

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8.3.2.4 Modes of Operation – XML Examples

8.3.2.4.1 Modes of Operation: XML Example of Cycle share

The following code fragment shows a VEHICLE SHARING OPERATION for a cycle share scheme:

```
<VehicleSharing version="any" id="cycle_share">
        <Name>Cycle Hire</Name>
        <Description>Cycles available from fixed stations charge per hour</Description>
        <submodes>
                <Submode version="any" id="cycle_share">
                        <TransportMode>selfDrive</TransportMode>
                        <SelfDriveSubmode>hireCycle</SelfDriveSubmode>
                </Submode>
        </submodes>
        <VehicleSharingType>vehicleSharing</VehicleSharingType>
</VehicleSharing>
```

8.3.2.4.2 Modes of Operation: XML Example of Chauffeured service share

The following code fragment shows a VEHICLE POOLING OPERATION for a Chauffeured car service:

```
<VehiclePooling version="any" id="chauffeured_car">
        <Name>Chauffeured car</Name>
        <Description>Prebooked car for a period or specific journey</Description>
        <submodes>
                <Submode version="any" id="chauffeured_car">
                        <TransportMode>taxi</TransportMode>
                        <TaxiSubmode>charterTaxi</TaxiSubmode>
                </Submode>
        </submodes>
        <VehiclePoolingType>chaffeuredVehicle</VehiclePoolingType>
</VehiclePooling>
```

8.3.2.4.3 Modes of Operation: XML Example of Ride share

The following code fragment shows a VEHICLE POOLING OPERATION for a ride share scheme:

```
 <VehiclePooling version="any" id="ride_share">
        <Name>Commuter car pool</Name>
        <Description>Available/ wanted Rides in commuters own cars matched</Description>
        <submodes>
                <Submode version="any" id="ride_share">
                        <TransportMode>selfDrive</TransportMode>
                        <SelfDriveSubmode>ownCar</SelfDriveSubmode>
                </Submode>
        </submodes>
        <VehiclePoolingType>commuterCarPooling</VehiclePoolingType>
</VehiclePooling>
```

8.3.3 Fleets

8.3.3.1 FLEET – Conceptual MODEL

The NM Fleet MODEL describes the vehicle FLEET, defined as a set of vehicles of any type. The concept of a FLEET is general, i.e., not dependent on MODE OF OPERATION, but is in particular of use in describing the services offered by some of the ALTERNATIVE MODES OF OPERATION.

A FLEET is owned by a TRANSPORT ORGANISATION, a legally incorporated body associated with any aspect of the transport system. A TRANSPORT ORGANISATION may own many FLEETs.

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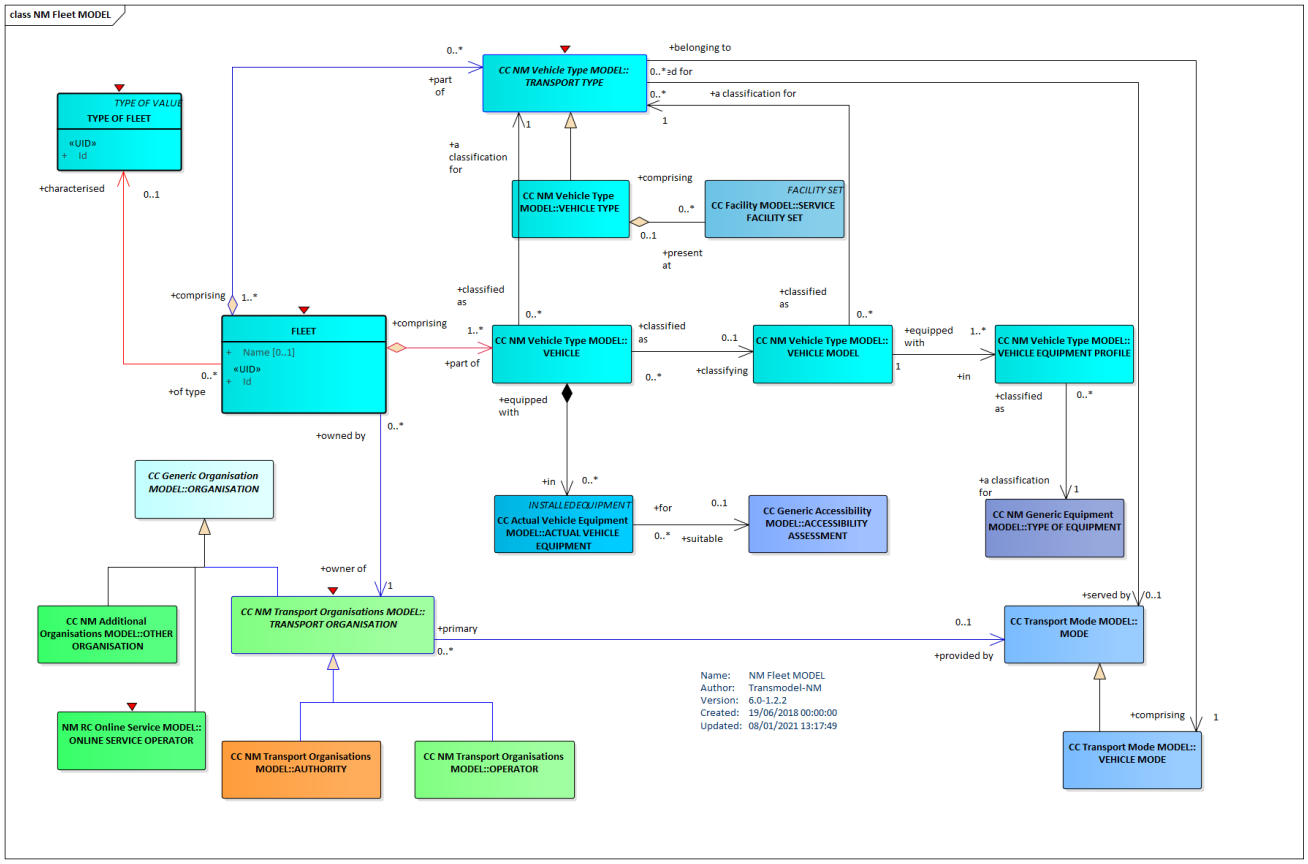


Figure 16 — Fleet – Conceptual MODEL (UML)

8.3.3.2 Fleet – Physical Model

The following figure shows physical attributes of the FLEET model.

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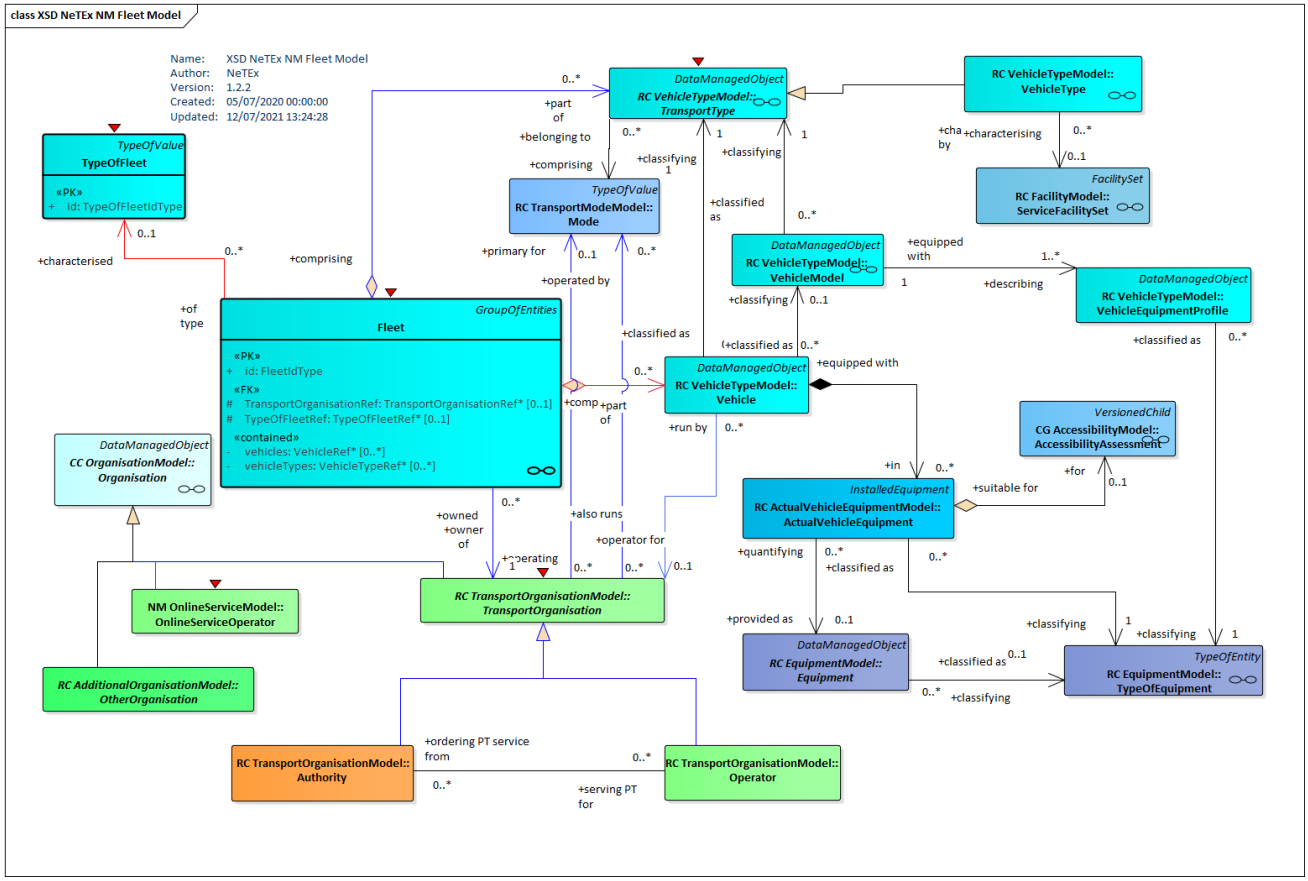


Figure 17 — Fleet – Physical Model (UML) – Detail

8.3.3.3 Fleet – Attributes and XSD

8.3.3.3.1 Fleet – Model Element

A set of vehicles of any type.

Table 20 — Fleet — Element

Classifi-cation	Name	Type	Cardin-ality	Description
::>	::>	*GroupOfEntities*	::>	FLEET inherits from GROUP OF ENTITIes.
«PK»	***id***	*FleetIdType*	1:1	Identifier of FLEET.
«cntd»	***members***	*Vehicle*	0:*	VEHICLES in FLEET. See VEHICLE.
«FK»	***TransportOrganisationRef***	*TransportOrganisationRef*	0:1	Reference to a TRANSPORT ORGANISATION owning the FLEET.
«FK»	***TypeOfFleetRef***	*TypeOfFleetRef*	0:1	Reference to a TYPE OF FLEET.
«cntd»	***transportTypes***	*TransportTypeRef*	0:*	TRANSPORT TYPEs and VEHICLE TYPEs in FLEET.

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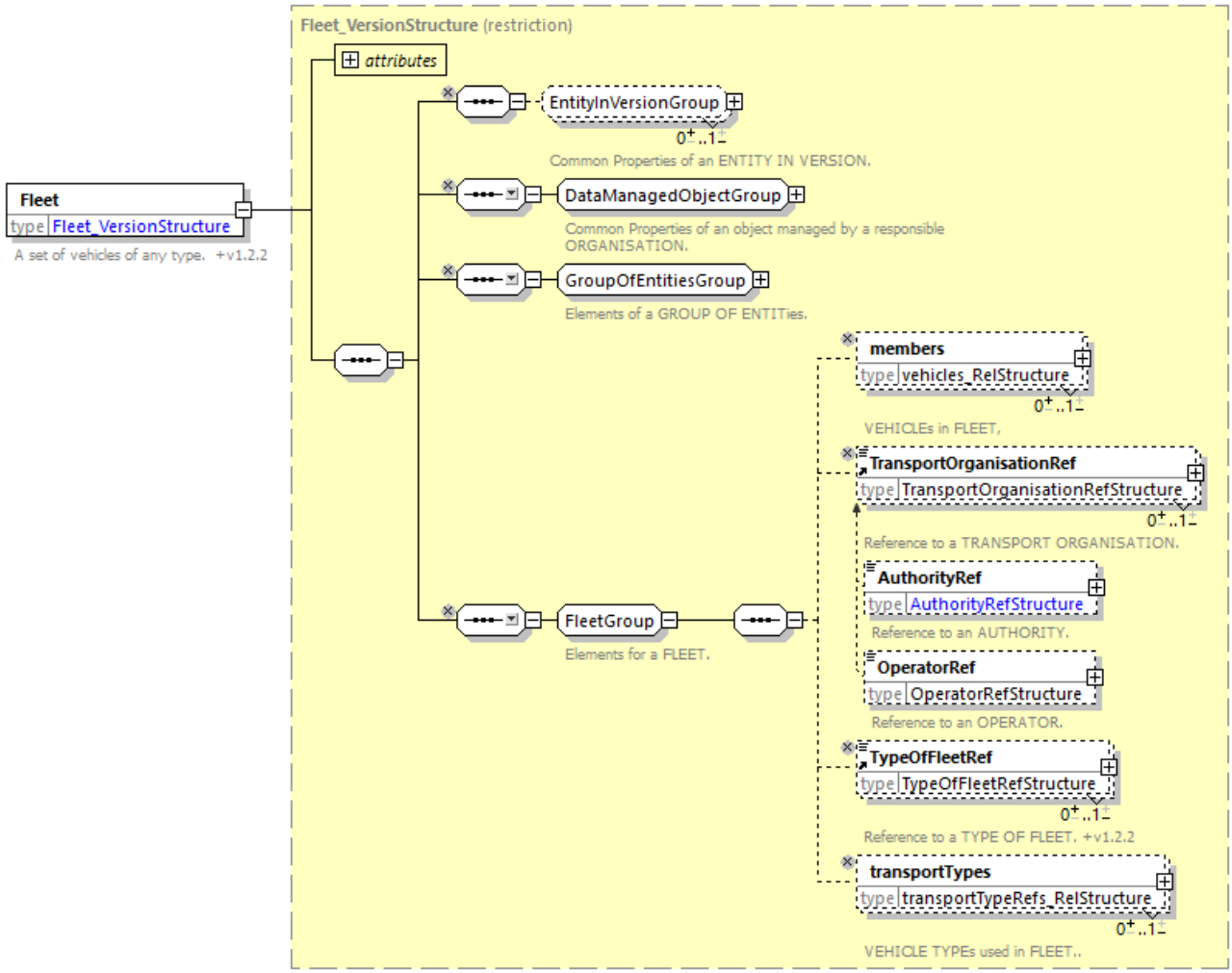


Figure 18 — *Fleet* – XSD

8.3.3.3.2 TypeOfFleet – Model Element

A classification for a fleet of VEHICLEs.

Table 21 — TypeOfFleet — Element

Classifi-cation	Name	Type	Cardin-ality	DESCRIPTION
::>	::>	*TypeOfValue*	::>	TYPE OF FLEET inherits from TYPE OF VALUE.
«PK»	***id***	*TypeOfFleetIdType*	1:1	Identifier of TYPE OF FLEET.

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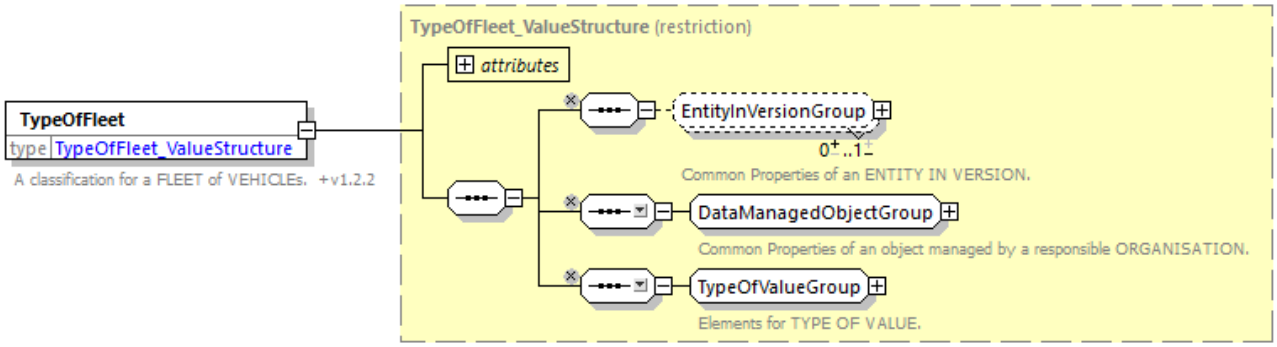


Figure 19 — TypeOfFleet – XSD

8.3.3.4 Fleet – XML Examples

8.3.3.4.1 Fleet: XML Example of Cycle share

The following code fragment shows a FLEET for a cycle share scheme:

```
<Fleet version="any" id="MetrobikeFleet">
        <Name>The metrobike fleet</Name>
        <members>
                <Vehicle version="any" id="P01">
                        <OperatorRef version="any" ref="noc:MBIKE"/>
                        <SimpleVehicleTypeRef version="any" ref="pedal_cycle"/>
                        <VehicleModelRef version="any" ref="pennyFarthing"/>
                        <actualVehicleEquipments>
                                <VehicleReleaseEquipment version="any" id="P01@release">
                                        <OutOfService>false</OutOfService>
                                        <RemoteControl>true</RemoteControl>
                                        <LocalControl>true</LocalControl>
                                        <LockingMechanism>dock</LockingMechanism>
                                </VehicleReleaseEquipment>
                        </actualVehicleEquipments>
                </Vehicle>
                <Vehicle version="any" id="P02">
                        <OperatorRef version="any" ref="noc:MBIKE"/>
                        <SimpleVehicleTypeRef version="any" ref="pedal_cycle"/>
                        <VehicleModelRef version="any" ref="pennyFarthing"/>
                        <actualVehicleEquipments>
                                <VehicleReleaseEquipment version="any" id="P02@release">
                                        <OutOfService>false</OutOfService>
                                        <RemoteControl>false</RemoteControl>
                                        <LocalControl>true</LocalControl>
                                        <LockingMechanism>dock</LockingMechanism>
                                </VehicleReleaseEquipment>
                        </actualVehicleEquipments>
                </Vehicle>
Etc., etc.
        </members>
</Fleet>
```

8.3.4 Fleet Equipment

8.3.4.1 FLEET EQUIPMENT – Conceptual MODEL

The Fleet Equipment MODEL describes the equipment of any vehicle which is part of a fleet. The VEHICLE MODEL PROFILE describes the EQUIPMENT installed on board VEHICLEs of a specific VEHICLE MODEL. which includes general purpose attributes useful for any type of vehicles such as

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gears, lockers etc.. Some of the attributes are specifically added to further support cycle sharing and rental systems.

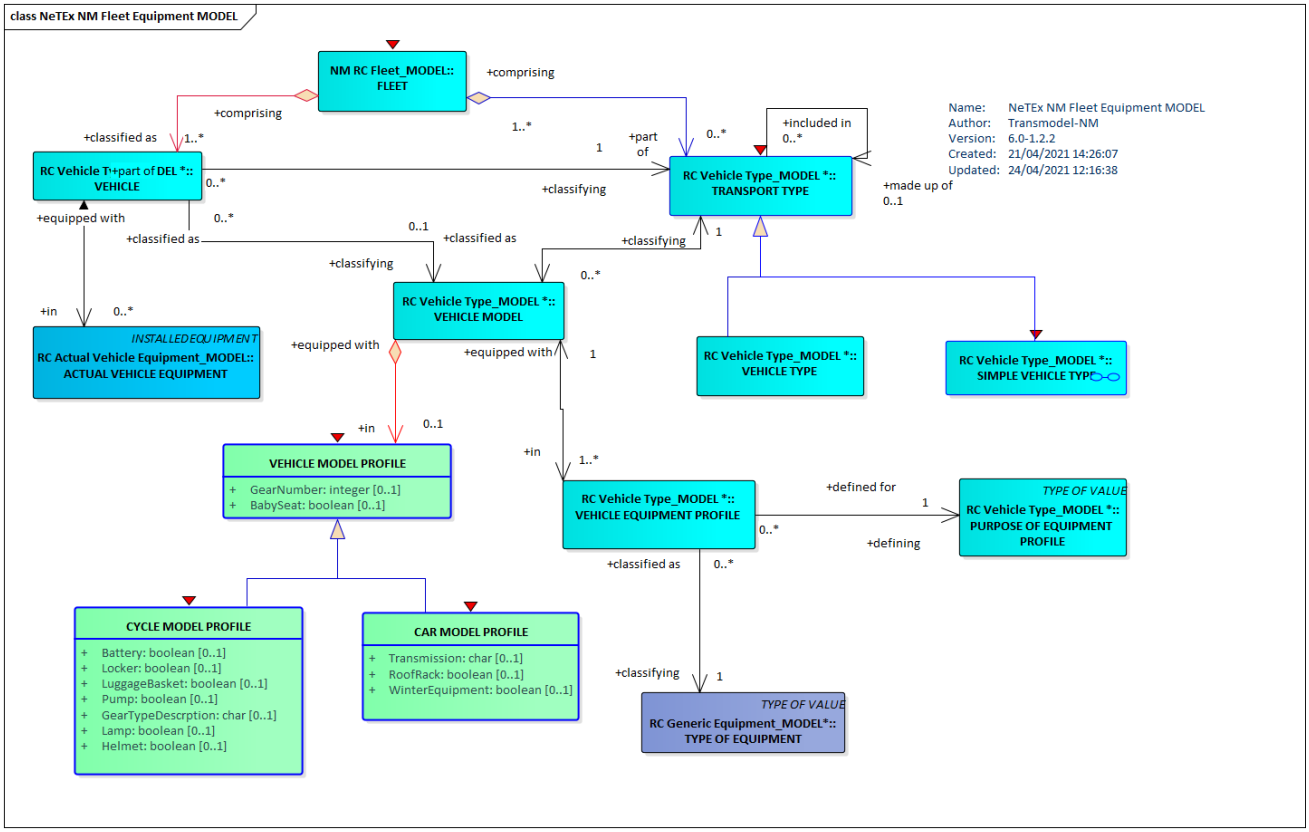


Figure 20 — NM Fleet Equipment – Conceptual MODEL (UML)

8.3.4.2 Fleet Equipment – Physical Model

The following figure shows physical attributes of the FLEET EQUIPMENT model.

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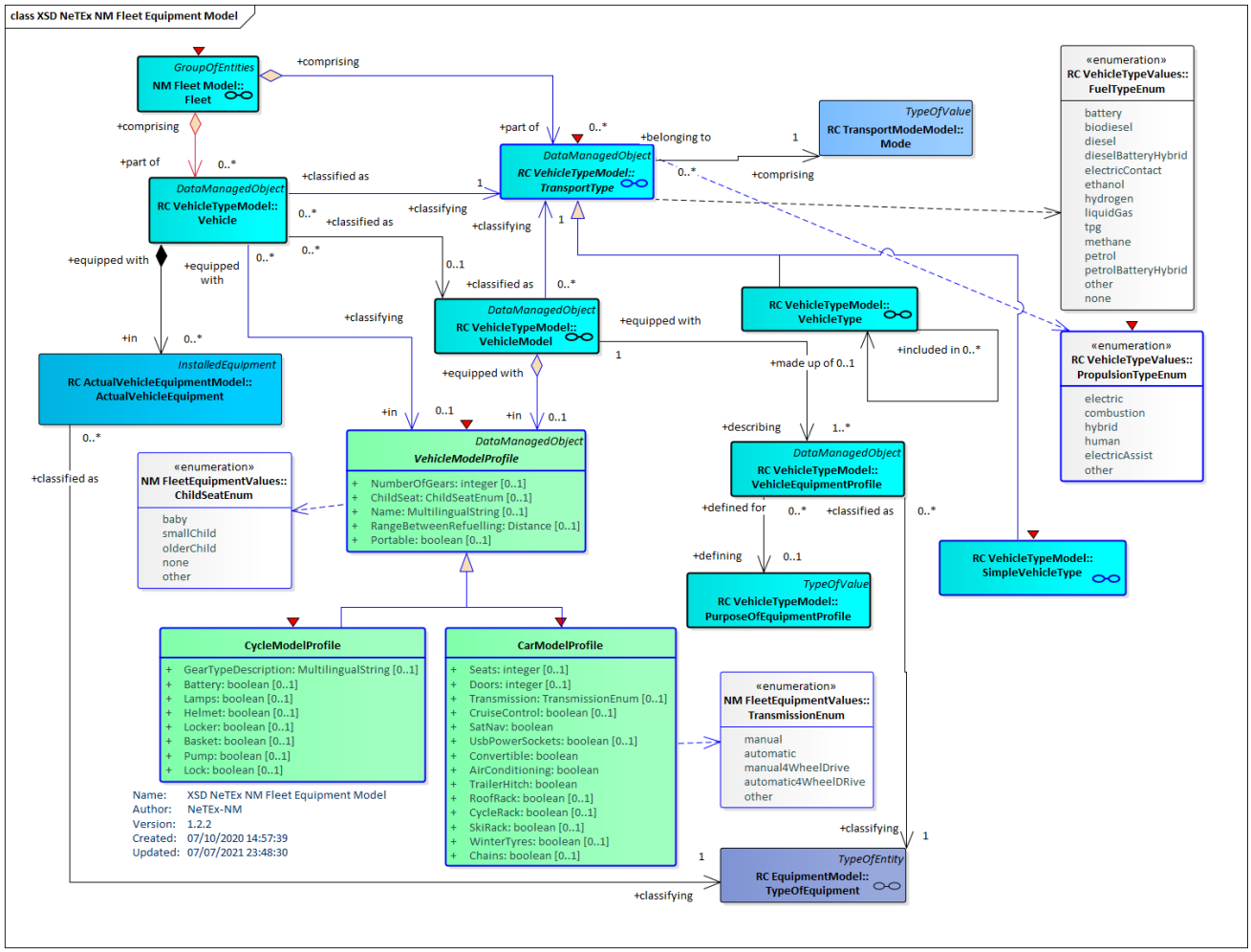


Figure 21 — NM Fleet Equipment – Physical Model (UML) – Detail

8.3.4.3 Fleet Equipment – Attributes and XSD

8.3.4.3.1 VehicleModelProfile – Model Element

A set of characteristics of equipment installed on-board and characterising a VEHICLE MODEL.

Table 22 — VehicleModelProfile — Element

Classification	Name	Type	Cardinality	Description
::>	::>	*DataManagedObject*	::>	VEHICLE MODEL PROFILE inherits from DATA MANAGED OBJECT.
	Name	*MultilingualString*	0:1	Name of VEHICLE MODEL PROFILE.
	NumberOfGears	*xsd:nonNegativeInteger*	0:1	Number of gears present on the VEHICLE.
«enum»	***ChildSeat***	*ChildSeatEnumeration*	0:1	Whether a child seat is present on board.
	RangeBetweenRefuelling	*DistanceType*	0:1	Maximum range between refuelling for vehicles of the MODEL PROFILE.
	IsPortable	*xsd:boolean*	0:1	Whether vehicle can be carried easily, e.g., scooter, skateboard, collapsible bicycle.

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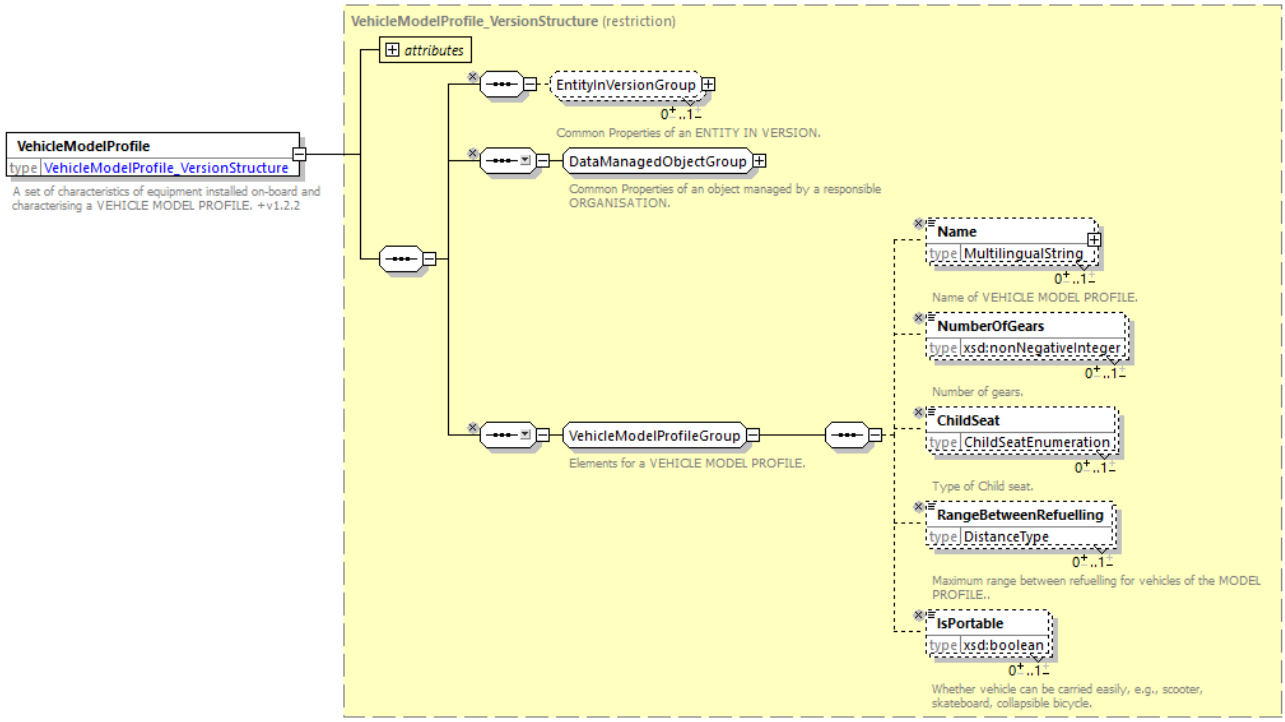


Figure 22 — VehicleModelProfile – XSD

8.3.4.3.1.1 ChildSeat – Allowed Values

The following table shows the allowed values for ***ChildSeat (****ChildSeatEnumeration****).***

Table 23 — ChildSeat — Values

Value	Description
Baby	Seat suitable for small baby.
smallChild	Seat suitable for small child 9-18 kg.
olderChild	Seat suitable for older child 15-36 kg.
None	No child.
other	Other type of seat.

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8.3.4.3.2 CarModelProfile – Model Element

A set of characteristics of equipment installed on-board and characterising a VEHICLE MODEL for a car.

Table 24 — CarModelProfile — Element

Classifi-cation	Name	Type	Cardi n-ality	Description
::>	::>	*ModelEquipmentProfile*	::>	CAR EQUIPMENT PROFILE inherits from VEHICLE MODEL PROFILE.
	Seats	*xsd:nonNegativeInteger*	0:1	Number of seats including driver.
	Doors	*xsd:nonNegativeInteger*	0:1	Number of doors.
«enum»	***Transmission***	*TransmissionEnum*	0:1	Transmission type (manual, automatic, etc).. See below.
	CruiseControl	*xsd:boolean*	0:1	Description of the gear type.
	SatNav	*xsd:boolean*	1:1	Whether the vehicle has satnav.
	AirConditioning	*xsd:boolean*	1:1	Whether the vehicle has air conditioning.
	Convertible	*xsd:boolean*	1:1	Whether vehicle is a convertible.
	UsbPowerSockets	*xsd:boolean*	0:1	Whether the vehicle is equipped with USB power sockets.
	WinterTyres	*xsd:boolean*	0:1	Whether the vehicle is equipped with winter equipment.
	Chains	*xsd:boolean*	0:1	Whether the vehicle is equipped with chains.
	TrailerHitch	*xsd:boolean*	1:1	Whether the vehicle has a trailer hitch.
	RoofRack	*xsd:boolean*	0:1	Whether a roof rack is available on the car.
	CycleRack	*xsd:boolean*	0:1	Whether a cycle rack is available on the car.
	SkiRack	*xsd:boolean*	0:1	Whether a ski rack is available on the car.

8.3.4.3.2.1 Transmission – Allowed Values

The following table shows the allowed values for ***Transmission (****TransmissionEnumeration****).***

Table 25 — Transmission — Values

Value	Description
manual	Manual transmission.
automatic	Automatic transmission.
manual4WheelDrive	Manual 4-wheel drive transmission.
automatic4WheelDrive	Automatic 4-wheel drive
	transmission.
other	Other.

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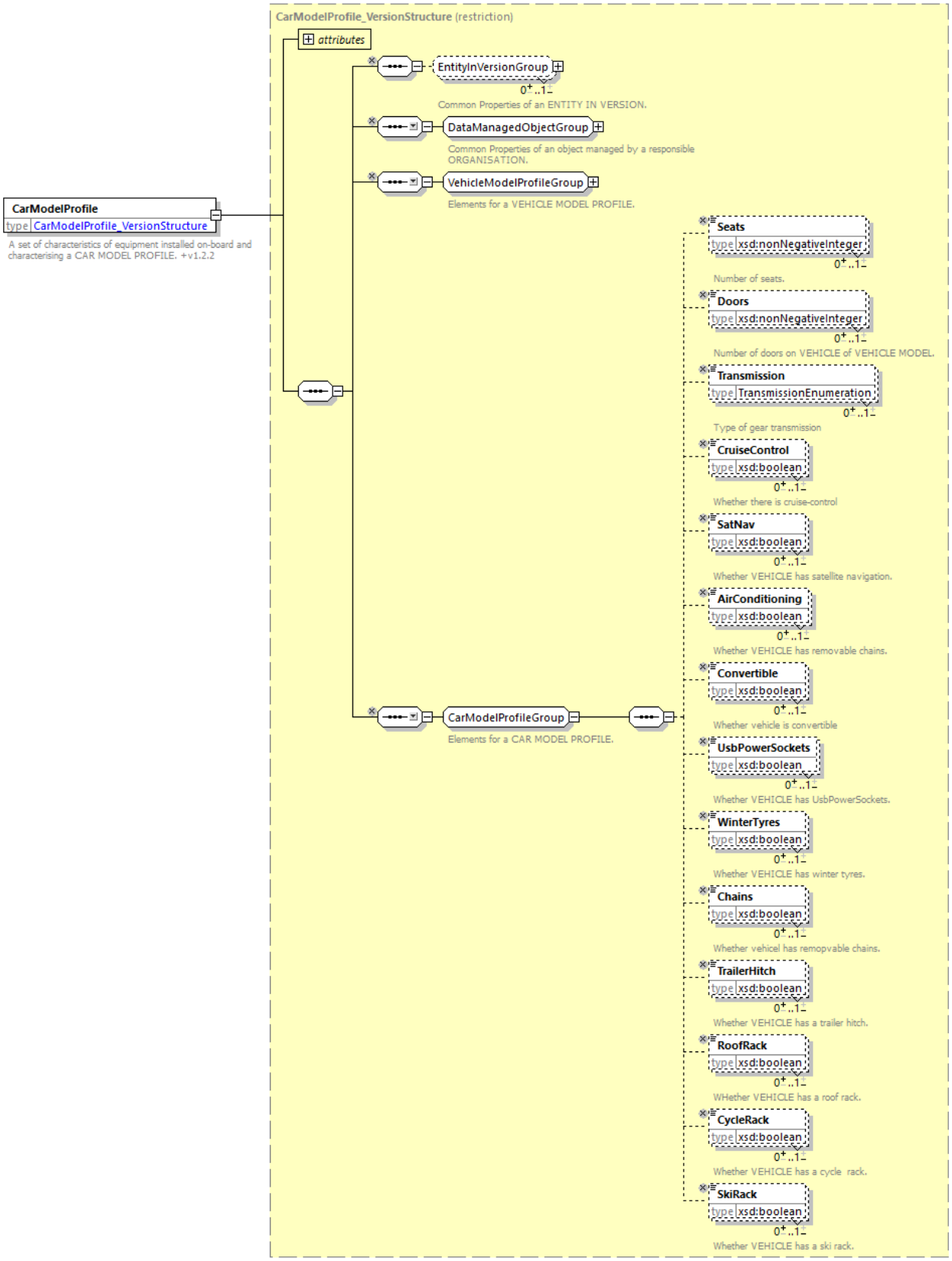


Figure 23 — CarModelProfile – XSD

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8.3.4.4 CycleModelProfile – Model Element

A set of characteristics of equipment installed on-board and characterising a VEHICLE MODEL for a cycle.

Table 26 — CycleModelProfile — Element

Classification	Name	Type	Cardinality	Description
::>	::>	*ModelEquipmentProfile*	::>	CYCLE EQUIPMENT PROFILE inherits from VEHICLE MODEL PROFILE.
	GearTypeDescription	*MultilingualString*	0:1	Description of the gear type.
	Battery	*xsd:boolean*	0:1	Whether battery is present.
	Lamps	*xsd:boolean*	0:1	Whether the vehicle is equipped with lights for night usage.
	Helmet	*xsd:boolean*	0:1	Whether a helmet is available on the cycle.
	Pump	*xsd:boolean*	0:1	Whether the cycle is equipped with a pump.
	Locker	*xsd:boolean*	0:1	Whether locker equipment is available on the vehicle.
	Basket	*xsd:boolean*	0:1	Whether a luggage basket is present on the cycle.
	Lock	*xsd:boolean*	0:1	Whether the cycle is equipped with a lock.

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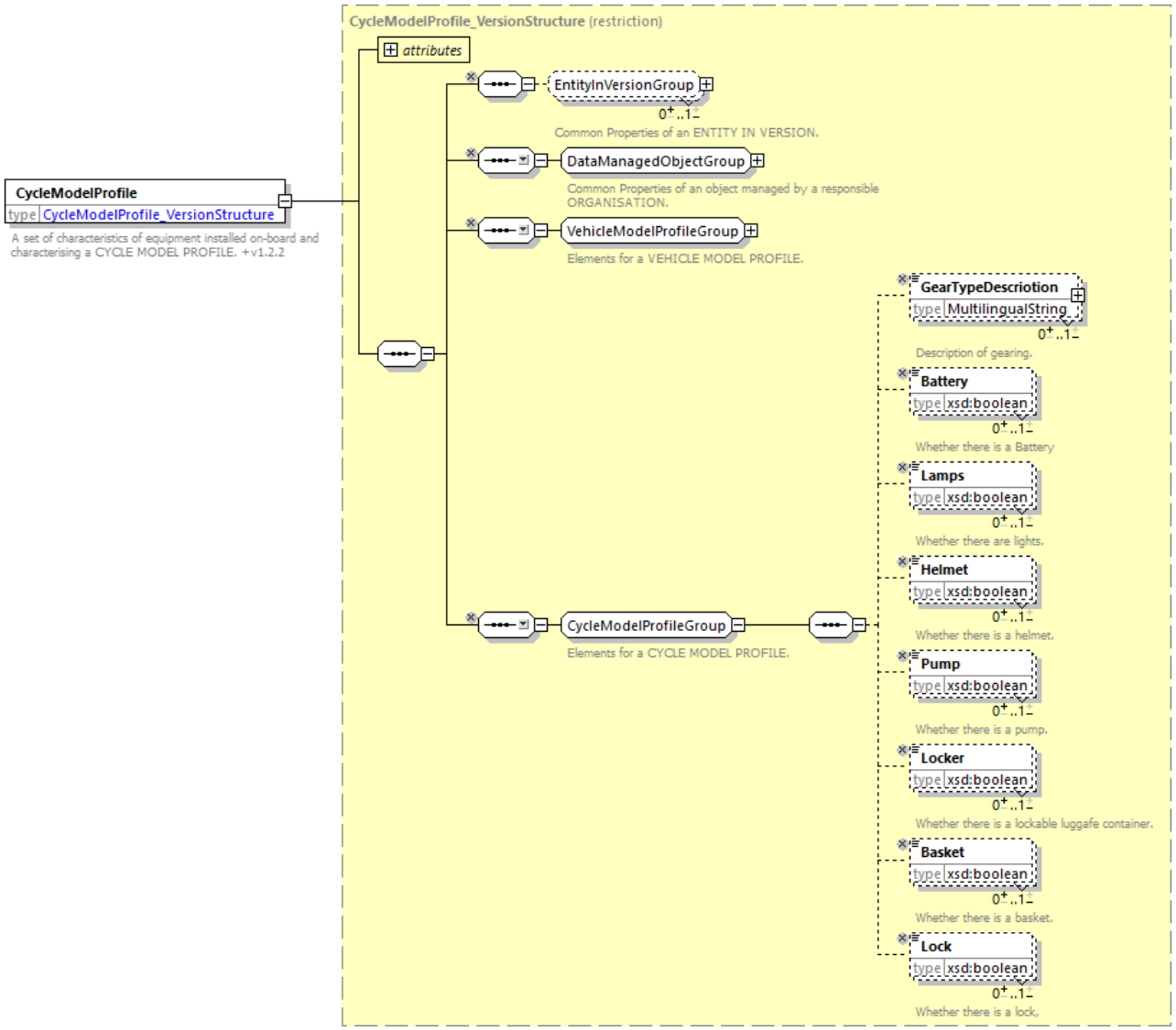


Figure 24 — CycleModelProfile – XSD

8.3.5 Mobility Services

8.3.5.1 MOBILITY SERVICE – Conceptual MODEL

The Mobility Service MODEL represents a transport service offer linked to an ALTERNATIVE MODE OF OPERATION.

A MOBILITY SERVICE is a transport service that may be available both at specific named SITEs (a SITE is a well-known geographic place of any type which may be specified as the origin or destination of a trip), and also more widely over a specified coverage area.

A MOBILITY SERVICE parallels, over a wider area, a Transmodel LOCAL SERVICE, a named service relating to the use of a SITE or transport services at a particular location, for example porterage, assistance for disabled users, booking offices etc.

An AVAILABILITY CONDITION can be used to indicate the temporal availability of a MOBILITY SERVICE (e.g., hours or days of week when a service is available for use).

A MOBILITY SERVICE itself is abstract. A COMMON VEHICLE SERVICE is specialisation of a MOBILITY SERVICE involving VEHICLEs. Three specialisations of a COMMON VEHICLE SERVICE are considered:

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- VEHICLE RENTAL SERVICE: A transport service offer related to VEHICLE RENTAL.
- VEHICLE SHARING SERVICE: A transport service offer related to VEHICLE SHARING.
- VEHICLE POOLING SERVICE: A transport service that connects (driver and passenger(s)) for carrying out trips. This may be further specialised into TAXI SERVICE, CHAUFFEURED VEHICLE SERVICE and GENERAL POOLING SERVICE

For VEHICLE RENTAL SERVICEs and/or VEHICLE SHARING SERVICEs, it is the FLEET which determines the transport service offer, characterised as to its area of operation by a TOPOGRAPHIC PLACE and as to its time of operation by an AVAILABILITY CONDITION. If there are further constraints on where the service may be used, these can be indicated by a separate additional model - see MOBILITY SERVICE CONSTRAINT ZONE.

The VEHICLE POOLING SERVICE is also considered as a MOBILITY SERVICE but is based on a service offer determined by a set of SINGLE JOURNEYs rather than on a FLEET of vehicles.

The SERVICE is to be understood as service offer. For vehicle sharing/rental this offer is represented by the availability of a FLEET. For Vehicle pooling the service offer is represented by a set of SINGLE JOURNEYs.

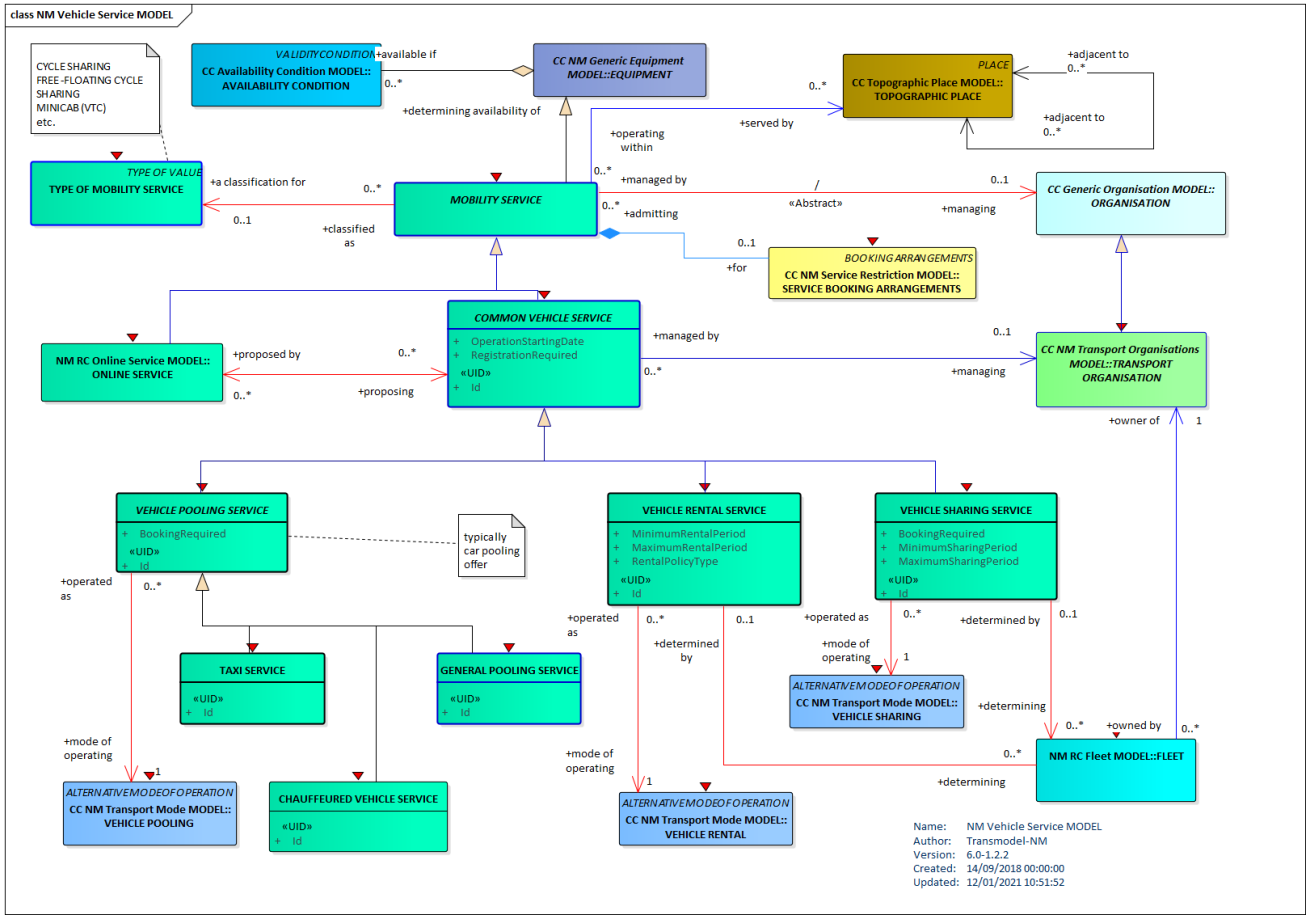


Figure 25 — NM Mobility Service MODEL (UML)

8.3.5.2 Mobility Service – Physical Model

The following figure shows physical attributes of the MOBILITY SERVICE model.

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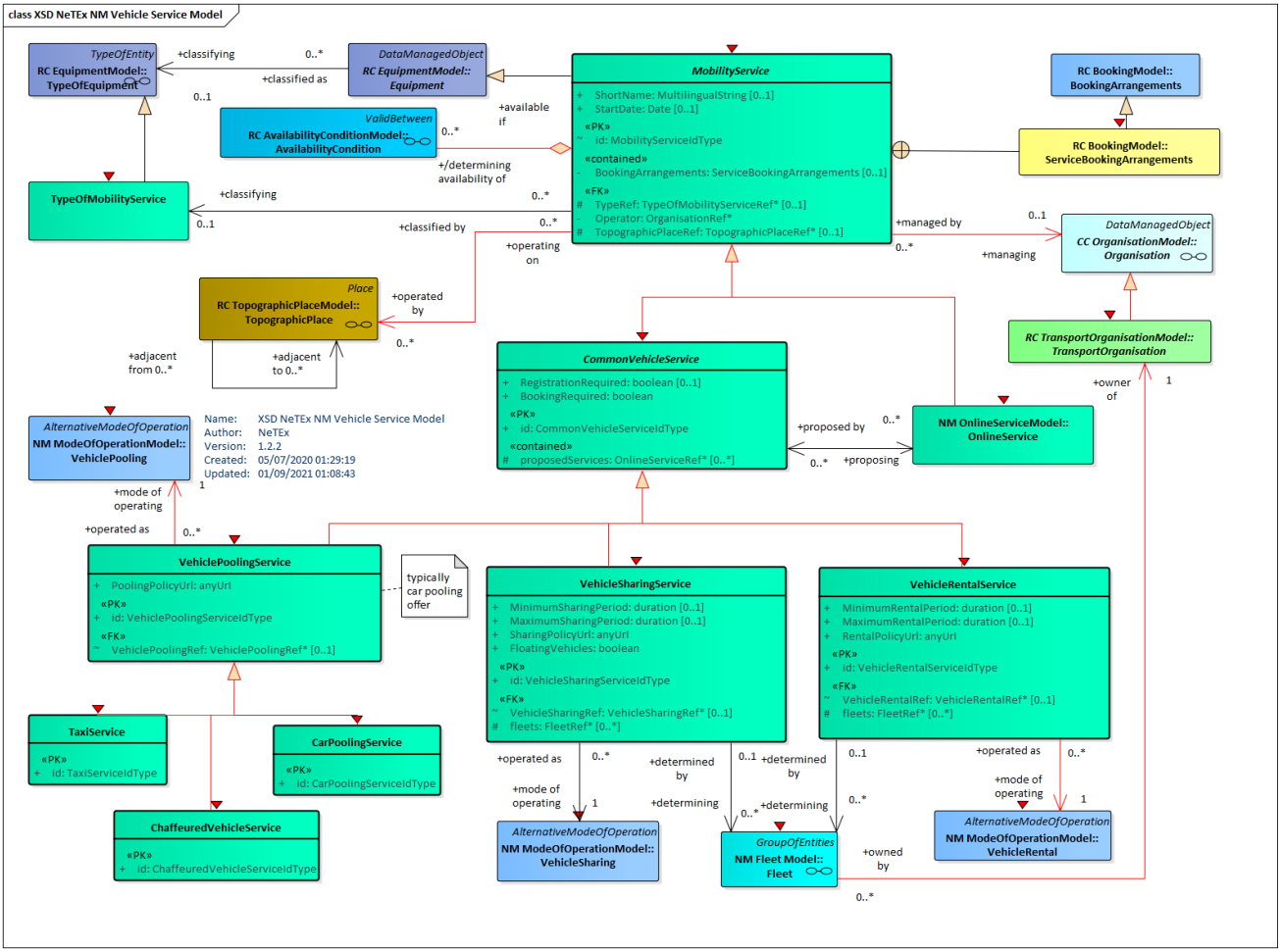


Figure 26 — Mobility Service – Physical Model (UML)

8.3.5.3 Mobility Service – Attributes and XSD

8.3.5.3.1 MobilityService_– Model Element

A named service available over a widespread area, for example car-pooling, rental, etc. The service may be accessible at designated SITEs or ADDRESSABLE PLACEs.

Table 27 — MobilityService — Element

Classifi-cation	Name	Type	Cardin-ality	Description
::>	::>	*Equipment*	::>	MOBILITY SERVICE inherits from EQUIPMENT.
«PK»	***id***	*MobilityServiceIdType*	1:1	Identifier of MOBILITY SERVICE.
	ShortName	*MultilingualString*	0:1	Short name of service.
	StartDate	*xsd:date*	0:1	The date on which this service started its operation.
«FK»	***OrganisationRef***	*OrganisationRef*	0:1	Reference to an ORGANISATION...

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«FK»	***TopographicPlaceRef***	*TopographicPlaceRef*	0:1	Reference to a TOPOGRAPHIC PLACE associated with SERVICE.
«FK»	***TypeOfMobilityServiceRef***	*TypeOfMobilityServiceRef*	0:1	Reference to Type of MOBILITY SERVICE.
«cntd»	***BookingArrangements***	*ServiceBookingArrangements*	0:1	Booking arrangements for users of the service.

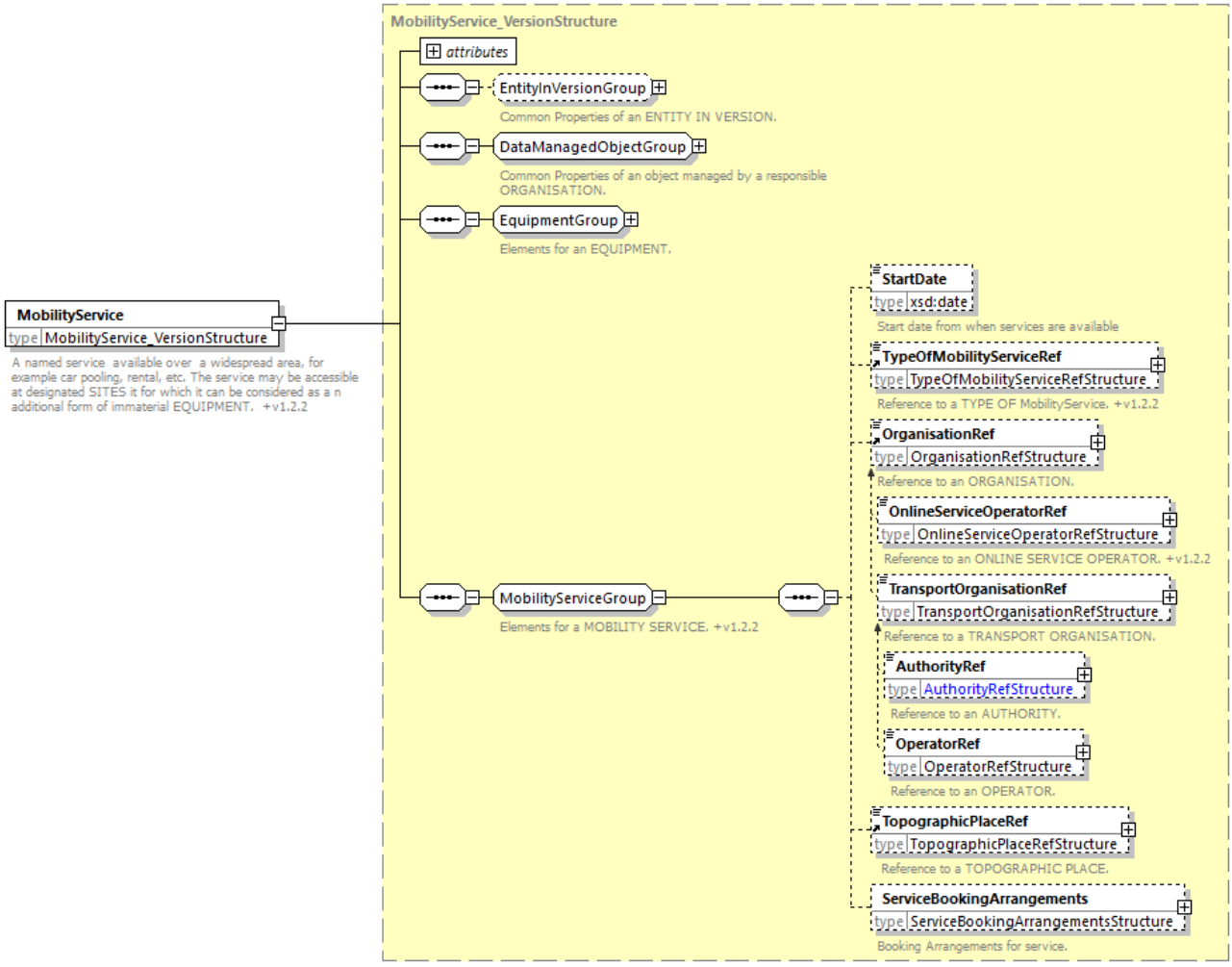


Figure 27 — MobilityService – XSD

8.3.5.3.2 CommonVehicleService_– Model Element

A transport service that uses vehicles for carrying out trips. The coverage area of the service can be indicated by a TOPOGRAPHIC PLACE.

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Table 28 — CommonVehicleService — Element

Classification	Name	Type	Cardinality	Description
::>	::>	*MobilityService*	::>	COMMON VEHICLE SERVICE inherits from MOBILITY SERVICE
«PK»	***id***	*CommonVehicleServiceIdType*	1:1	Identifier of COMMON VEHICLE SERVICE.
	BookingRequired	*xsd:boolean*	1:1	Whether booking is required for the service.
	RegistrationRequired	*xsd:boolean*	0:1	Whether registration is required for the service.
«cntd»	***proposedByServices***	*OnlineServiceRef*	0:*	ONLINE SERVICEs which promote the service.

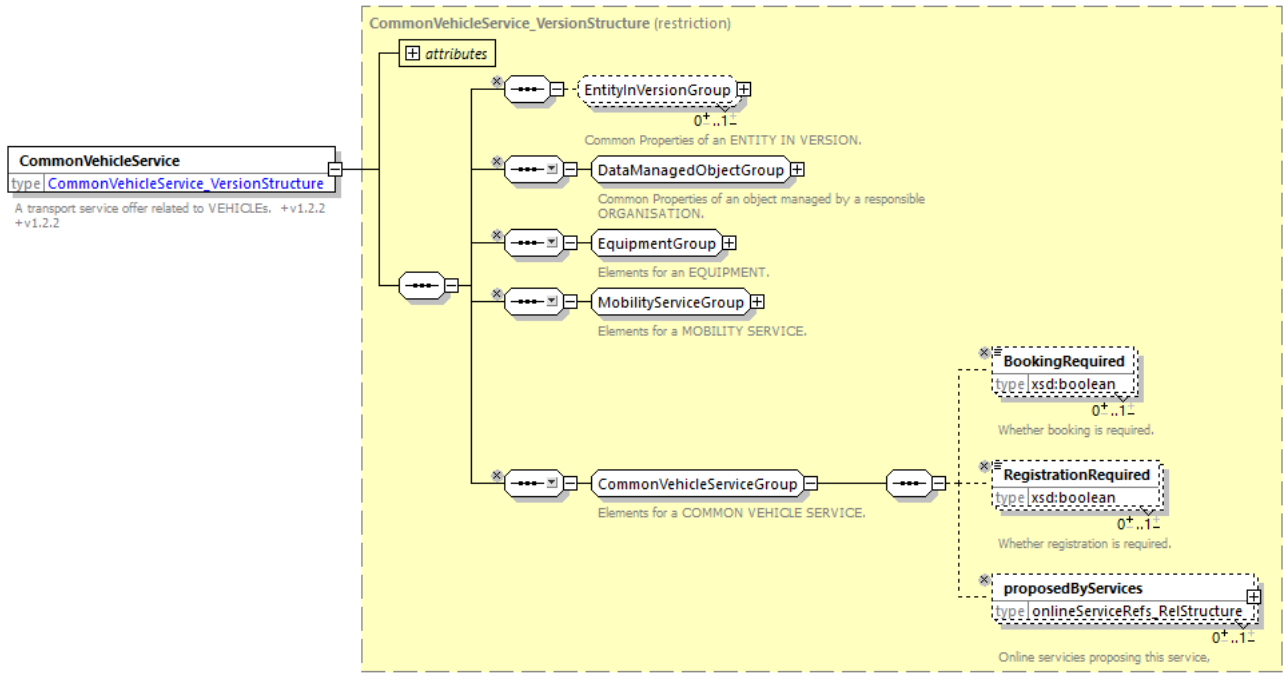


Figure 28 — CommonVehicleService – XSD

8.3.5.3.3 TypeOfMobilityService_– Model Element

A classification of a MOBILITY SERVICEs.

Table 29 — TypeOfMobilityService — Element

Classification	Name	z	Cardinality	Description
::>	::>	*TypeOfEquipment*	::>	TYPE OF MOBILITY SERVICE inherits from TYPE OF EQUIPMENT.
«PK»	***id***	*TypeOfMobilityServiceIdType*	1:1	Identifier of TYPE OF MOBILITY SERVICE.

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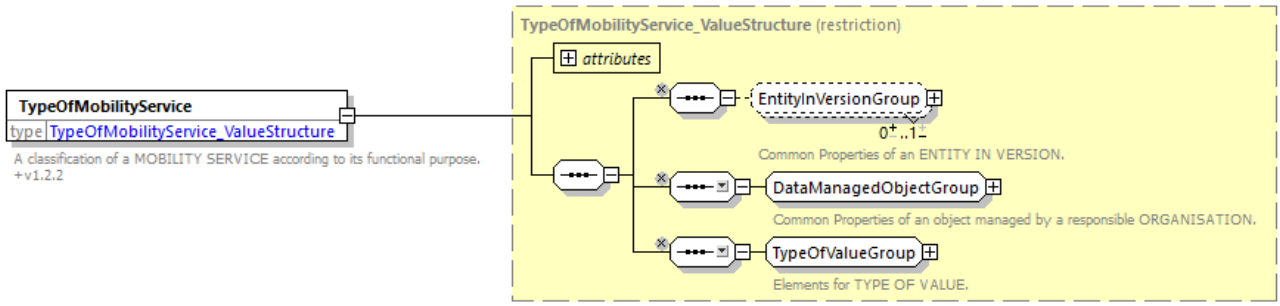


Figure 29 — TypeOfMobilityService – XSD

8.3.5.3.4 VehicleSharingService – Model Element

A transport service offer related to VEHICLE SHARING.

Table 30 –VehicleSharingService — Element

Classifi-cation	Name	Type	Cardinality	Description
::>	::>	*CommonVehicleService*	::>	VEHICLE SHARING SERVICE inherits from COMMON VEHICLE SERVICE.
«PK»	***id***	*VehicleSharingServiceIdType*	1:1	Identifier of VEHICLE SHARING SERVICE.
«FK»	***VehicleSharingRef***	*VehicleSharingRef*	0:1	Reference to identifier of a VEHICLE SHARING mode of operation..
	SharingPolicyUrl	*xsd:anyURI*	1:1	URL for rental policy.
	MinimumSharingPeriod	*xsd:duration*	0:1	Minimum time period for VEHICLE SHARING.
	MaximumSharingPeriod	*xsd:duration*	0:1	Maximum time period for VEHICLE SHARING.
	FloatingVehicles	*xsd:boolean*	0:1	Whether vehicle sharing is free-floating
«FK»	***fleets***	*FleetRef*	0:*	Reference to FLEETs used by service...

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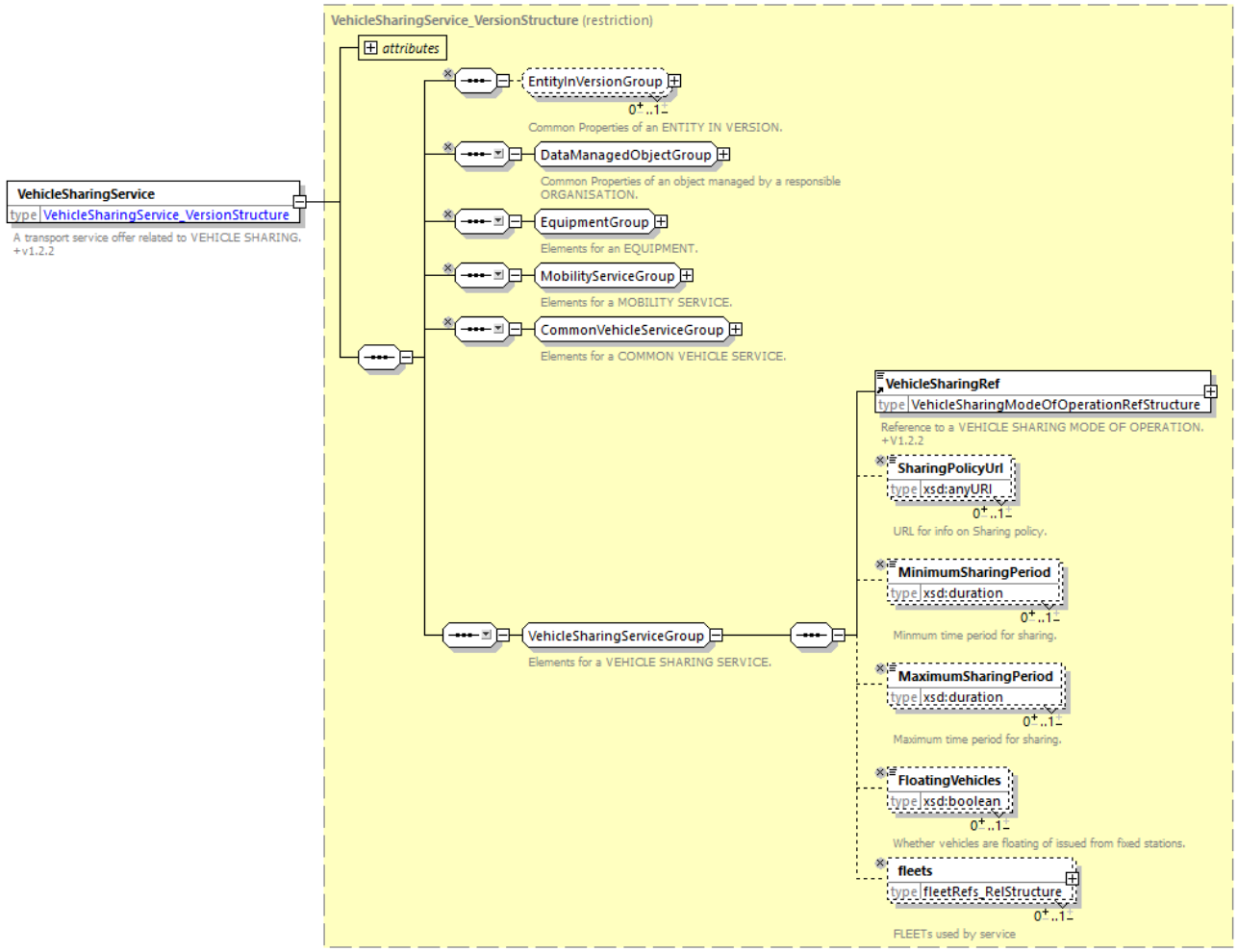


Figure 30 — VehicleSharingService – XSD

8.3.5.3.5 VehicleRentalService – Model Element

A transport service offer related to VEHICLE RENTAL.

Table 31 — VehicleRentalService — Element

Classifi-cation	Name	Type	Cardin-ality	Description
::>	::>	*CommonVehicleService*	::>	VEHICLE RENTAL SERVICE inherits from COMMON VEHICLE SERVICE.
«PK»	***id***	*VehicleRentalServiceIdType*	1:1	Identifier of VEHICLE RENTAL SERVICE.
«FK»	***VehicleRentalRef***	*VehicleRentalRef*	0:1	Reference to a VEHICLE RENTAL MODE OF OPERATION.
	MinimumRentalPeriod	*xsd:duration*	0:1	Minimum time period for rental.
	MaximumRentalPeriod	*xsd:duration*	0:1	Maximum time period for rental;
	RentalPolicyUrl	*xsd:anyURI*	1:1	URL for rental policy.
«FK»	***fleets***	*FleetRef*	0:*	Reference to FLEETs used by service..

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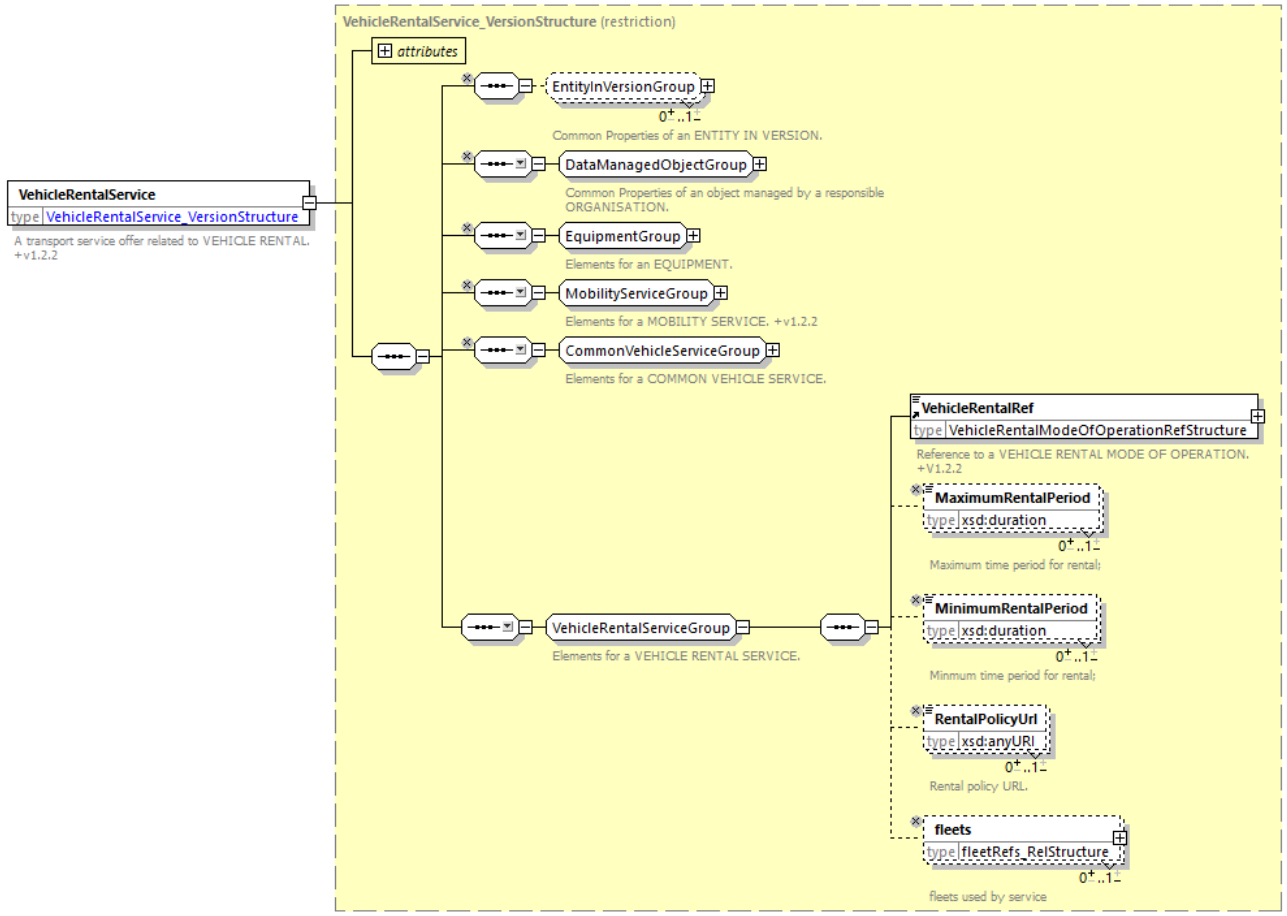


Figure 31 — VehicleRentalService – XSD

8.3.5.3.6 VehiclePoolingService – Model Element

A transport service that connects users (driver and passenger(s)) for carrying out trips. ***VehiclePoolingService*** itself is abstract – it is specialised by ***CarPoolingService***, ***TaxiService*** and ***ChauffeuredVehicleService.***

Table 32 — VehiclePoolingService — Element

Classifi-cation	Name	Type	Cardinality	Description
::>	::>	*CommonVehicleService*	::>	VEHICLE POOLING SERVICE inherits from COMMON VEHICLE SERVICE.
«PK»	***id***	*VehiclePoolingServiceIdType*	1:1	Identifier of VEHICLE POOLING SERVICE..
«FK»	***VehiclePoolingRef***	*VehiclePoolingRef*	0:1	Reference to a VEHICLE POOLING mode of operation..
	PoolingPolicyUrl	*xsd:anyURI*	1:1	URL for rental policy.

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