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Public Transport — Reference Data Model — Part 2 : Public Transport Network

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Contents

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Foreword

This document (prEN 12896-2:2015) "Transmodel V6 - part 2", has been prepared by Technical Committee CEN/TC 278, the secretariat of which is held by NEN.

This document is a working document.

The series composed of the following documents:

Public Transport Reference Data Model - Part 1: Common Concepts

Public Transport Reference Data Model - Part 2: Public Transport Network

Public Transport Reference Data Model - Part 3: Timing Information and Vehicle Scheduling

Public Transport Reference Data Model - Part 4: Operations Monitoring and Control

Public Transport Reference Data Model - Part 5: Fare Management

Public Transport Reference Data Model - Part 6: Passenger Information

Public Transport Reference Data Model - Part 7: Driver Management

Public Transport Reference Data Model - Part 8: Management Information and Statistics

Together these create version 6 of the European Standard EN 12896, known as "Transmodel" and thus replace Transmodel V5.1.

The split into several documents intends to ease the task of users interested in particular functional domains. Modularisation of Transmodel, undertaken within the NeTEx project, has contributed significantly to this new edition of Transmodel.

In addition to the eight Parts of this European Standard an informative Technical Report (Public Transport – Reference Data Model – Informative Documentation) is also being prepared to provide additional information to help those implementing projects involving the use of Transmodel. It is intended that this Technical Report will be extended and republished as all the eight parts are completed.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by month 20xx, and conflicting national standards shall be withdrawn at the latest by month 20xx.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

Part 1 of this standard presents the following items:

- Rationale for the Transmodel Standard
- Use of the Transmodel Standard
- Applicability of the Transmodel Standard
- Conformance Statement
- Transmodel Origins
- Reference to the Previous Version and Other Documents

The data structures represented in Part 1 are generic patterns that are referenced by different other parts. This particular document (Part 2) represents a new edition of EN12896-2006 of the Chapter Description of the Network. Moreover, it incorporates the major part of the IFOPT standard model of Stop Places and related concepts as updated and harmonised within the NeTEx project.

1 Scope

1.1 General Scope of the Standard

The main objective of the present standard is to present the Public Transport Reference Data Model based on:

- the Public Transport Reference Data Model published 2006 as EN12896 and known as Transmodel V5.1,
- the model for the Identification of Fixed Objects for Public transport, published 2009 as EN 28701and known as IFOPT,

incorporating the requirements of

- EN15531-1 to 3 and TS15531-4 and 5: Service interface for real-time information relating to public transport operations (SIRI),
- TS16614-1 and 2: Network and Timetable Exchange (NeTEx),

in particular the specific needs for long distance train operation.

Particular attention is drawn to the data model structure and methodology:

- the data model is described in a modular form in order to facilitate understanding and use of the model,
- the data model is entirely described in UML.

In particular, a Reference Data Model kernel is described, referring to the data domain:

- Network Description: routes, lines, journey patterns, timing patterns, service patterns, scheduled stop points and stop places.

This part corresponds to the network description as in Transmodel V5.1 extended by the relevant parts of IFOPT.

Furthermore, the following functional domains are considered:

- Timing Information and Vehicle Scheduling (runtimes, vehicle journeys, day type-related vehicle schedules)
- Passenger Information (planned and real-time)
- Operations Monitoring and Control: operating day-related data, vehicle follow-up , control actions
- Fare Management (fare structure and access rights definition, sales, validation, control)
- Management Information and Statistics (including data dedicated to service performance indicators).
- Driver Management:
    - Driver Scheduling (day-type related driver schedules),
    - Rostering (ordering of driver duties into sequences according to some chosen methods),
    - Driving Personnel Disposition (assignment of logical drivers to physical drivers and recording of driver performance).

The data modules dedicated to cover most functions of the above domains will be specified. Several concepts are shared by the different functional domains. This data domain is called “Common Concepts”.

1.2 Functional Domain Description

The different functional domains taken into account in the present standard and of which the data have been represented as the reference data model are described in “Public Transport Reference Data Model - Part 1: Common Concepts”.

They are

- Public Transport Network and Stop Description
- Timing Information and Vehicle scheduling
- Passenger information
- Fare management
- Operations monitoring and control
- Management information
- Personnel Management: Driver Scheduling, Rostering, Personnel Disposition

The aspects of multi-modal operation and multiple operators’ environment are also taken into account.

1.3 Particular Scope of this Document

The present European Standard entitled “Reference Data Model for Public Transport – Part 2 : Public Transport Network” incorporates data structures which form the network topology description of Transmodel V5.1 and the major part of the fixed objects model of IFOPT. It is composed of three data packages:

- Network Description,
- Fixed Objects,
- Tactical Planning Components.

The data structures represented in this part form network topology descriptions. They typically reference to structures as described in the Public Transport Reference Data Model - Part 1: Common Concepts", such as version frames or generic grouping mechanisms.

This document itself is composed of the following parts:

- Main document (normative) representing the data model for the concepts shared by the different domains covered by Transmodel,
- Appendix A (normative), containing the data dictionary, i.e. the list of all the concepts and attribute tables present in the main document together with the definitions,
- Appendix B (informative), indicating the data model evolutions.

2 Normative references

[1] EN 12896:2006: Public Transport Reference Data Model (Transmodel V5.1)

[2] EN 12701:2009: Identification of Fixed Objects for Public Transport (IFOPT)

[3] TS16614-1; Network and Timetable Exchange — Part 1: Network Topology (NeTEx)

[4] TS16614-2, Network and Timetable Exchange — Part 2: Timing Information (NeTEx)

[5] EN 15531-1 to -3 and TS 15531-4 and -5— Service interface for real-time information relating to public transport operations (SIRI)

[6] ISO/IEC 19501-1:2002, Unified Modelling Language (UML) – Part 1: Specification

[7] EN12896-1:2015: Public Transport - Reference Data Model - Part 1: Common Concepts (Transmodel V6)

[8] EN12896-3:2015: Public Transport - Reference Data Model - Part 3: Timing Information and Vehicle Scheduling (Transmodel V6)

3 Terms and definitions

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

3.1 attribute

property of an entity

3.2 conceptual data model

description of a real world domain in terms of entities, relationships and attributes, in an implementation independent manner. It should provide a structure on which the rest of the development of an application system can be based

3.3 conceptual level

in the context of data modelling, the conceptual data model

3.4 database

collection of data; often used in the sense of the physical implementation of a data model

3.5 data domain

data structure (in this European Standard, a part of the Reference Data Model for Public Transport) made up of data related to each other, through the fact that there is a functional area or group of functions using this data set as a whole

3.6 data model

description of a real world domain in terms of data and relationships

3.7 entity

object (data) that has its own existence (as opposed to an attribute)

3.8 fare management

all activities related to the collection of money from passengers

3.9 function

activity. In this European Standard, a sub-activity of a functional area

3.10 functional area

arbitrarily defined set of activities, used, in this European Standard, to define the objectives and limits of the data model

3.11 GDF

standard defining the contents and format of Geographical Data Files, used for the description, classification and encoding of road networks and road environment features

3.12 GDF database

database containing geographical information on the road network in a particular application area, possibly including information on the location of public transport points, links and services (routes)

3.13 interoperability

ability of (sub)systems to interact with other (sub)systems according to a set of predefined rules (interface)

3.14 logical data model

data design, that takes into account the type of database to be used, but does not consider means of utilization of space or access

3.15 logical denormalised model

relational data model that is not fully normalized, i.e. does not completely follow the normalization rules and thus may be redundant

3.16 logical level

in the context of data modelling, the logical data model

3.17 management information

all activities allowing the company management to collect the information necessary to meet problem-solving needs. Data of operational systems are filtered and aggregated for this purpose, and made available to the user interactively, or in the form of pre-defined reports and summaries. Such functions are in principle related to all functional areas of a company, with particular reference to the management of statistical results

3.18 object-oriented data model

data structure expressed according to principles that allow for a direct implementation as an object-oriented database, where information is represented in form of objects, i.e. respecting the principle of encapsulation meaning in particular that each data is accessed or modified through operations (methods) belonging to it

3.19 operations monitoring and control

all activities related to the transportation process, i.e. real-time functions related to the driving and transportation of passengers according to given instructions, including the monitoring of the driving process and its control in case of deviations, as well as all activities that support the driving process (traffic light priority, track switching, bay selection, advance/delay advice etc.). Such functions are often assisted by computer-aided tools, known as Automated Vehicle Monitoring (AVM)

3.20 passenger information

all activities related to informing the users either about the planned or about the actual transportation services

3.21 personnel disposition

all activities related to the mid term and short-term management of drivers

3.22 real-time control

see Operations monitoring and control

3.23 relational data model

type of logical data model giving the information as series of tables (relations) and attributes. It must have the following characteristics: 1. all attribute values are atomic, 2. all "tuples" (rows/occurrences) are distinct, 3. no part of the primary key may be null, 4. foreign key values must correspond to an existing primary key in another relation or be null

3.24 scheduling

see Tactical Planning

3.25 tactical planning

all activities related to the tactical planning of transportation, split into vehicle scheduling, driver scheduling, rostering

4 Symbols and Abbreviations

DRT	Demand Responsive Transport.
FTS	Flexible Transport Service.
GIS	Geographic Information System
IFOPT	Identification of Fixed Objects in Public Transport.
ISO	International Standards Organisation.
IT	Information Technology
NeTEx	Network and Timetable Exchange.
PT	Public Transport.
PTO	Public Transport Operator.
SIRI	Service Interface for Real-time Information.
UML	Unified Modelling Language.
URI	Uniform Resource Identifier.
URL	Universal Resource Locator.
VDV	Verband Deutscher Verkehrsunternehmen (D).
WGS	World Geodetic Standard.

5 The Network Topology Domain

5.1 Introduction

The reference data model includes entity definitions for different types of points and links as the building elements of the topological network. Stop points, timing points and route points, for instance, reflect the different roles one point may have in the network definition: whether it is used for the definition of (topological or geographical) routes, as a point served by vehicles when operating on a line, or as a location against which timing information like departure, passing, or wait times are stored in order to construct the timetables.

The line network is the fundamental infrastructure for the service offer, to be provided in the form of vehicle journeys which passengers may use for their trips. The main entities describing the line network in the reference data model are the line, the route and the journey pattern, which refer to the concepts of an identified service offer to the public, the possible variants of itineraries vehicles would follow when serving the line, and the (possibly different) successions of stop points served by the vehicles when operating on the route.

The model delivers also a detailed geographical representation of stopping locations and related concepts, such as equipment, access and navigation paths taken from the IFOPT standard and harmonised with Transmodel within the NeTEx project., including the description of:

— The stops and stations at which transport is accessed together with accessibility characteristics,

— The points of interest from/to which passengers are travelling,

— The detailed navigation paths between the various locations and associated constraints,

— The equipment and services relevant for public transport actors,

— The parking locations relative to both stops and points of interest.

5.2 Model and document structure

The Network Topology models split into three main sub-models.

1. Network Description Model (ND)
2. Fixed Object Model (FO)
3. Tactical Planning Components Model (TP)

Network Description Model: describes infrastructure elements (different types of points and links) and paths (routes and lines) dedicated to (regular and flexible) public transport operation; this description may be considered as a macroscopic view of the network topological aspects of the network. The model splits into:

- Network Infrastructure Model
- Line Network Model
- Route Model
- Flexible Network Model
- Activation Model
- Vehicle & Crew Point Model

Fixed Object Model: describes geographical aspects of fixed elements such as stopping locations, or points of interest. It represents, in particular, a detailed view of the stopping places, and associated elements, such as services or equipment, but also concepts enabling the representation of the navigation through or access to the stops. The model splits into:

- Site Model
- Stop Place Model
- Flexible Stop Place Model
- Point Of Interest Model
- Equipment Description Model
- Path & Navigation Path Model
- Check Constraint Model
- Parking Model
- Vehicle Stopping Model

Tactical Planning Components Model: describes basic concepts related to the description of the work patterns of public transport vehicles, such as journey patterns and service patterns, useful for planning transport and some related aspects. This part describes the space-related aspects of the vehicle services, whereas the time-related aspects (vehicle journeys, run times, etc) are described in Part 3 – Timing Information and Vehicle Scheduling. The model splits into:

- Journey Pattern Model
- Timing Pattern Model
- Service Connection Model
- Service Pattern Model
- Common Section Model
- Routing Constraint Model
- Time Demand Type Model
- Stop Assignment Model
- Train Stop Assignment Model
- Path Assignment Model
- Notice Assignment Model
- Passenger Information Display Assignment Model

Explicit Frames Model: specific sets of “explicit“ VERSION FRAMES that specify sets of data elements appropriate for a particular use case or set of related use cases.

The present document is structured according to the model structure as shown above with some exceptions due to the necessity to introduce some concepts earlier in the document in order to ease the understanding.

5.3 Network Description Model

5.3.1 Model overview

The Network Description model describes the basic physical network for transport and is itself divided into a number of separate sub-models covering different aspects of the network:

- Network Infrastructure Model:
  - Infrastructure Network
  - Network Restriction
- Main Tactical Planning Points and Links Model (from the Journey Pattern Model)
- Activation Model
- Vehicle & Crew Point Model

- Line and Route Model
- Line Network Model
  - Line Network
  - Line Schematic Map
- Flexible Network Model
  - Flexible Link, Point and Zone
  - Flexible Route
  - Flexible Line

For ease of understanding, the sub-models are presented one at a time, each describing only a small set of related concepts.

The sub-models depend on a number of general framework models (for example, Generic Point and Link Model, Notice Model, etc.) described in the part “Public Transport Data Model – Part 1 : Common Concepts”.

5.3.2 Infrastructure Network

The Infrastructure Network model describes the physical network on which the transport services run; a closely related Network Restriction model describes the physical restrictions on its use. This part does not concern the service aspects, i.e. vehicle work patterns described separately (e.g. by TIMING PATTERNs, JOURNEY PATTERNs, SERVICE PATTERNs).

5.3.2.1 Infrastructure Network– Conceptual Model

Figure 1 describes the main components of the physical path network (rail, roads, etc.).

This modelling of the infrastructure is, however, very basic and simple and is used here to represent specific operational constraints (restrictions) for public transport operation resulting from the characteristics of the INFRASTRUCTURE POINTs and LINKs and of VEHICLE TYPEs.The spatial detailed organisation of the infrastructure itself is described by other models (GDF, Inspire, etc.) and the data is usually provided by GIS data sets.

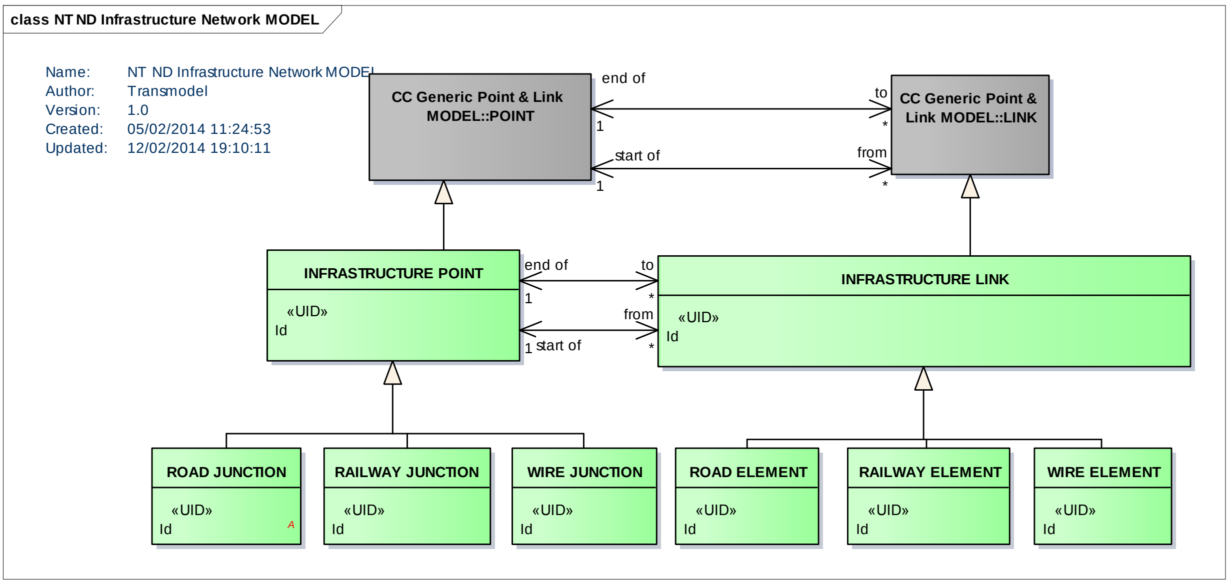


Figure 1 – Infrastructure Network – Conceptual Model

5.3.2.1.1 Infrastructure Points and Links

The PT network is described in Transmodel by POINTs and LINKs. This means that separate descriptions of a network either as a set of points or a set of links, or both, are possible and may be kept separately (cf. Generic POINT & LINK – Conceptual Model from the "Public Transport Data Model – Part 1 : Common Concepts".

The approach of representing the network in terms of generic POINTs and/or LINKs and their specialisations (here: INFRASTRUCTURE POINT, INFRASTRUCTURE LINK) is used extensively in Transmodel to describe distinct functional layers as separate graphs.

5.3.2.1.2 Infrastructure Network and functional aspects of the network

In Transmodel terms, the Infrastructure Network builds a LAYER (cf. Layer – Conceptual Model from the "Public Transport Reference Data Model - Part 1: Common Concepts"). A LAYER is a user-defined GROUP OF ENTITies, specified for a particular functional purpose, associating data referring to a particular LOCATING SYSTEM.

Examples of LAYERS (described through concepts introduced later in this document) are: timing pattern layer (defined through TIMING POINTs and TIMING LINKs), and service pattern layer (defined through SCHEDULED STOP POINTs and SERVICE LINKs). Transmodel defines a correspondence mechanism between LAYERS, called PROJECTION (cf. section Generic Projection from part "Public Transport Reference Data Model Part 1: Common Concepts"). It should be noted that the uniqueness of a LOCATING SYSTEM within a LAYER is an important parameter, in particular for the coherence of distances.

Each separate LAYER reflects different concerns and is deliberately kept independent of other LAYERs. Thus for example the modelling of the objects necessary to describe the work patterns of vehicles (JOURNEY PATTERNs) is represented separately in the LAYERs describing the operational planning and not in the infrastructure layer.

The different functional LAYERs may be projected (using the Transmodel projection mechanism) onto the the infrastructure layer to represent how they are related to the physical paths represented by sequences of INFRASTRUCTURE LINKs.

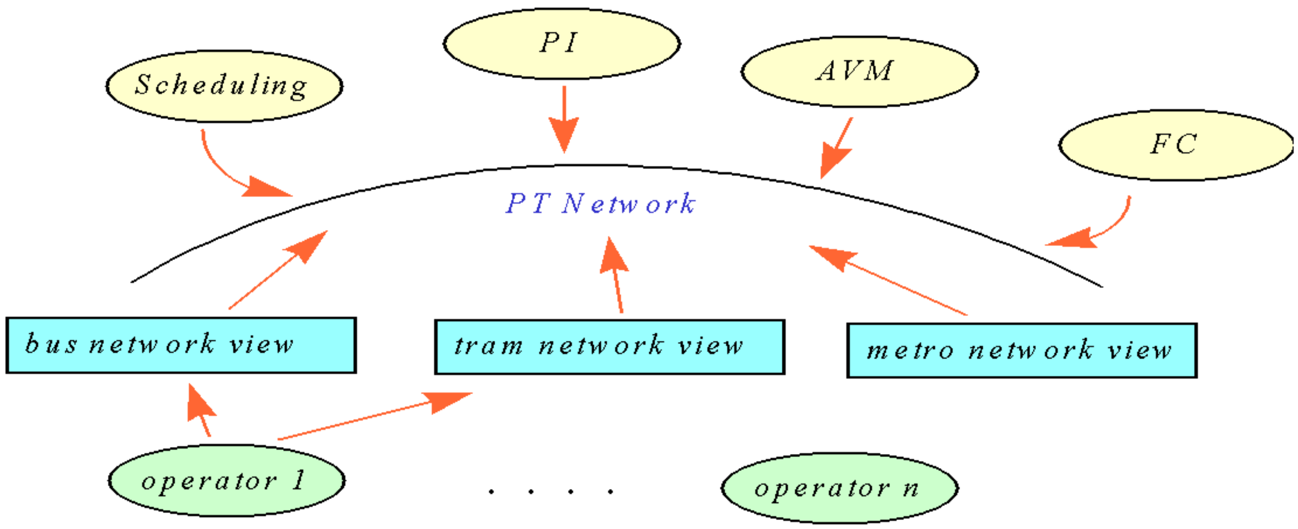


Figure 2 – Examples of Layers – Different Layers According to the Transport Mode

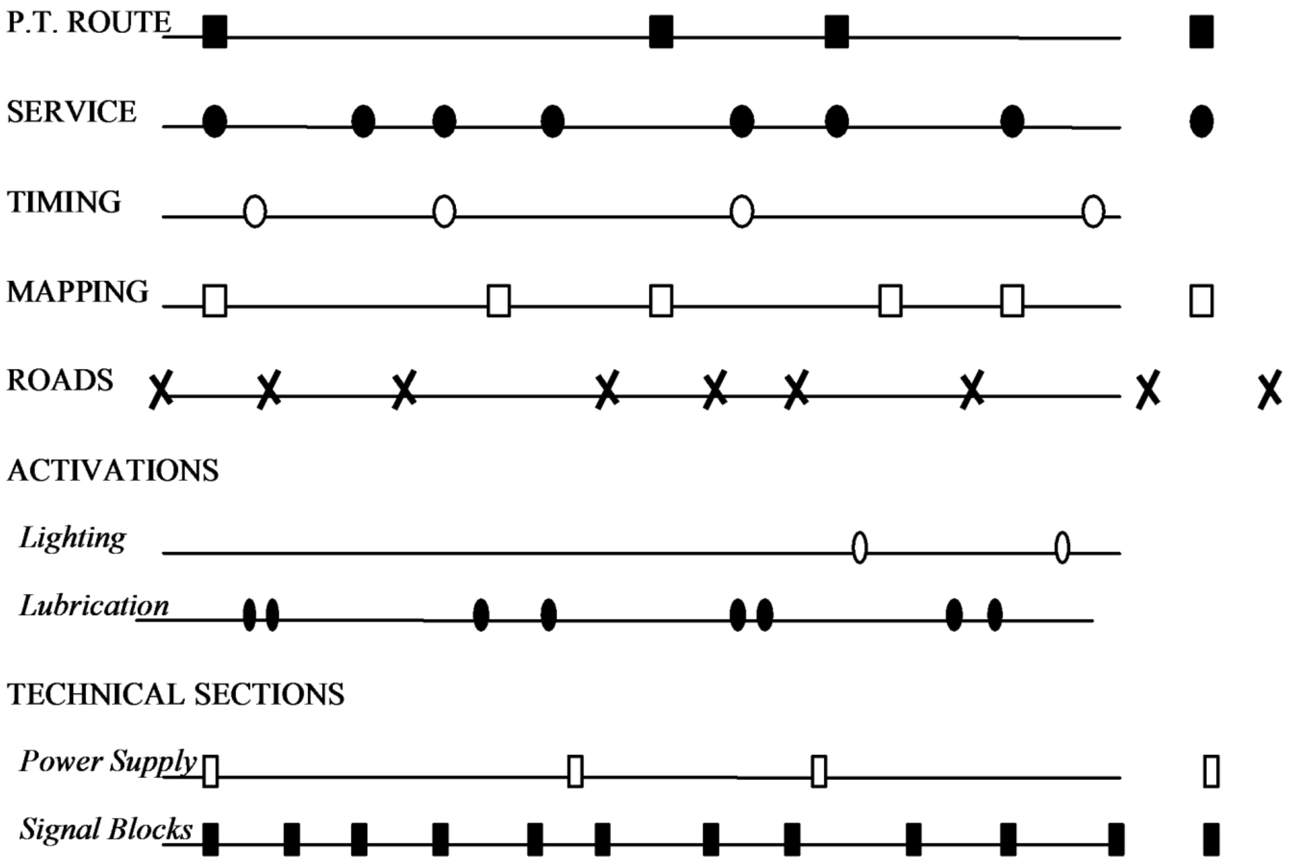


Figure 3 – Examples of Layers – Different Layers According to an Operational Need

Any POINT necessary to describe the infrastructure network is defined as an INFRASTRUCTURE POINT, which is a generic entity including several specialisations (e.g. ROAD JUNCTION, RAILWAY JUNCTION). Similarly, the necessary LINKs between the POINTs are defined as INFRASTRUCTURE LINKs (e.g. ROAD ELEMENT, RAILWAY ELEMENT).

Any INFRASTRUCTURE LINK must be bordered by a start and an end INFRASTRUCTURE POINT. This orientation does not necessarily refer to the direction of the traffic flow, but has to be interpreted as an arbitrary orientation (it may be "used" in one way or the other by the objects, like ROUTEs, JOURNEY PATTERNs, etc. referring to it through the PROJECTION mechanism).

5.3.2.1.3 Road Network: ROAD JUNCTION & ROAD ELEMENT

The physical road network represents all the carriageways available for buses, into which the bus line network can be embedded.

The corresponding road INFRASTRUCTURE POINTs are defined as ROAD JUNCTIONs, while the corresponding INFRASTRUCTURE LINKs are defined as ROAD ELEMENTs.

5.3.2.1.4 Rail Network: RAIL JUNCTION & RAIL ELEMENT

The rail network model represents the track network along which VEHICLEs (usually TRAINs) can physically proceed, without taking into account of other operational aspects such as security, regulations or operational conventions followed by the company staff or other authorities. Railway elements are modelled in this data model for reference purposes and not for control functions.

The corresponding rail INFRASTRUCTURE POINTs are defined as RAILWAY JUNCTIONs, while the corresponding INFRASTRUCTURE LINKs are defined as RAILWAY ELEMENTs.

RAILWAY ELEMENTs will always have to be interpreted as non-overlapping parts of the rail network. This means that one railway section between two switches ("points" in English vernacular) or crossings cannot be described alternatively, and in parallel, by two or more different subdivisions into chains of railway elements. Different sequences of railway elements between two switches will principally mean multiple connections, physically separated from each other.

The location where contiguous RAILWAY ELEMENTs are connected is represented by a RAILWAY JUNCTION. The two RAILWAY JUNCTIONs bounding a RAILWAY ELEMENT are specified by two relationships between these entities. The names of the relationship ends suggest a direction, which has to be interpreted as an arbitrary orientation, similar to the orientation of ROAD ELEMENTs described in the previous section.

5.3.2.1.5 Wire Network: WIRE JUNCTION & WIRE ELEMENT

The wire network for power supply of trolley buses (or trams) is modelled according to the same principles as applied for the rail network. WIRE ELEMENTs will be defined as the links between WIRE JUNCTIONs, which may be at places where three or more WIRE ELEMENTs are joined, at locations where only two adjacent WIRE ELEMENTs are connected or possibly at intermediate locations.

5.3.2.2 Network Infrastructure – Example

In Figure 4, the Street Network is an example of an Infrastructure Network, that may be represented (in a GIS for instance) by ROAD JUNCTIONs and ROAD LINKs.

Other layers are represented by coloured graphs: green (timing pattern layer), blue (route layer), red (service pattern layer)

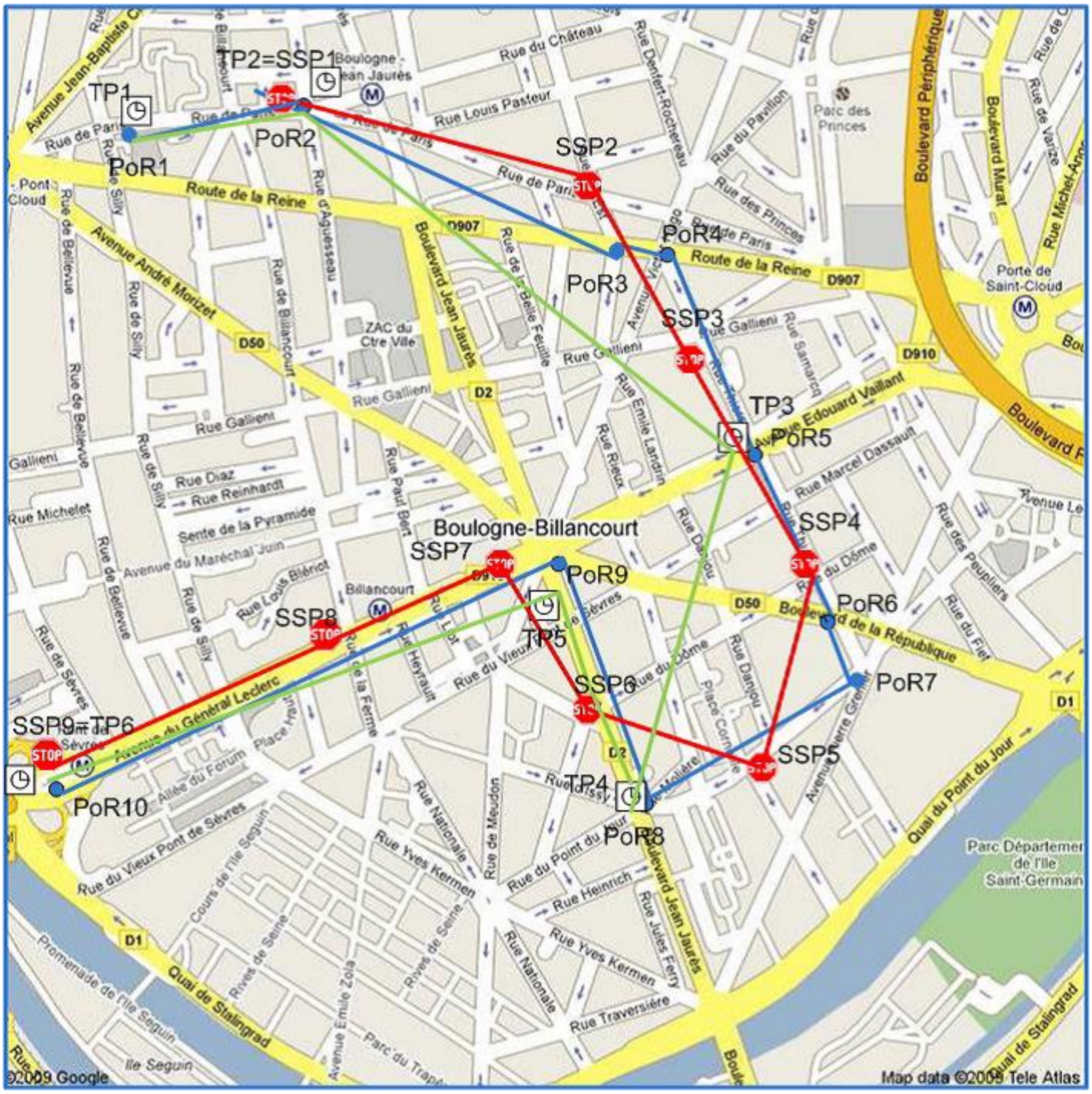


Figure 4 – Network Infrastructure Example

5.3.3 Network Restriction

Constraints resulting from the physical characteristics of the network are represented in Transmodel by a range of restrictions. The Network Restriction model represents a number of the most relevant constraints (e.g. the OVERTAKING POSSIBILITY). Transmodel explains the approach as follows: The fact that trains cannot overtake each other or meet each other on the same track is obvious for railway systems, but similar restrictions apply for trolley buses and even conventional buses, under specific circumstances (depending on the number and width of lanes on the street). This type of restriction may be relevant for the scheduling process, because vehicle journeys must be scheduled in a way to avoid such conflicting events.

5.3.3.1 NETWORK RESTRICTION – Conceptual Model

The fact that trains cannot overtake each other or meet each other on the same track is obvious for railway systems, but similar restrictions apply for trolley buses and even conventional diesel buses, under specific circumstances (depending on the number and width of lanes on the street). This type of restriction may be relevant for the scheduling process, because vehicle journeys must be scheduled in a way to avoid such conflicting events.

The Network Restriction model is not aimed at describing the management of track or of train movements, for which the concepts to consider are far more complex. It fits with a use case often found in light train operation, which consists of an initial verification of the train movements planned in a schedule, in order to check whether there are situations in which the track constraints makes the schedule impossible to run. This function is usually operated with feedback to the scheduling process.

The model comprises a set of different types of Network Restriction elements (VEHICLE TYPE AT POINT, OVERTAKING POSSIBILITY, IMPOSSIBLE MANOEUVRE and MEETING RESTRICTION) that apply to specific VEHICLE TYPEs (cf . "Public Transport Reference Data Model - Part 1: Common Concepts")

Restrictions are explicit: if no NETWORK DESCRIPTION is described, it can be assumed that no limitations apply.

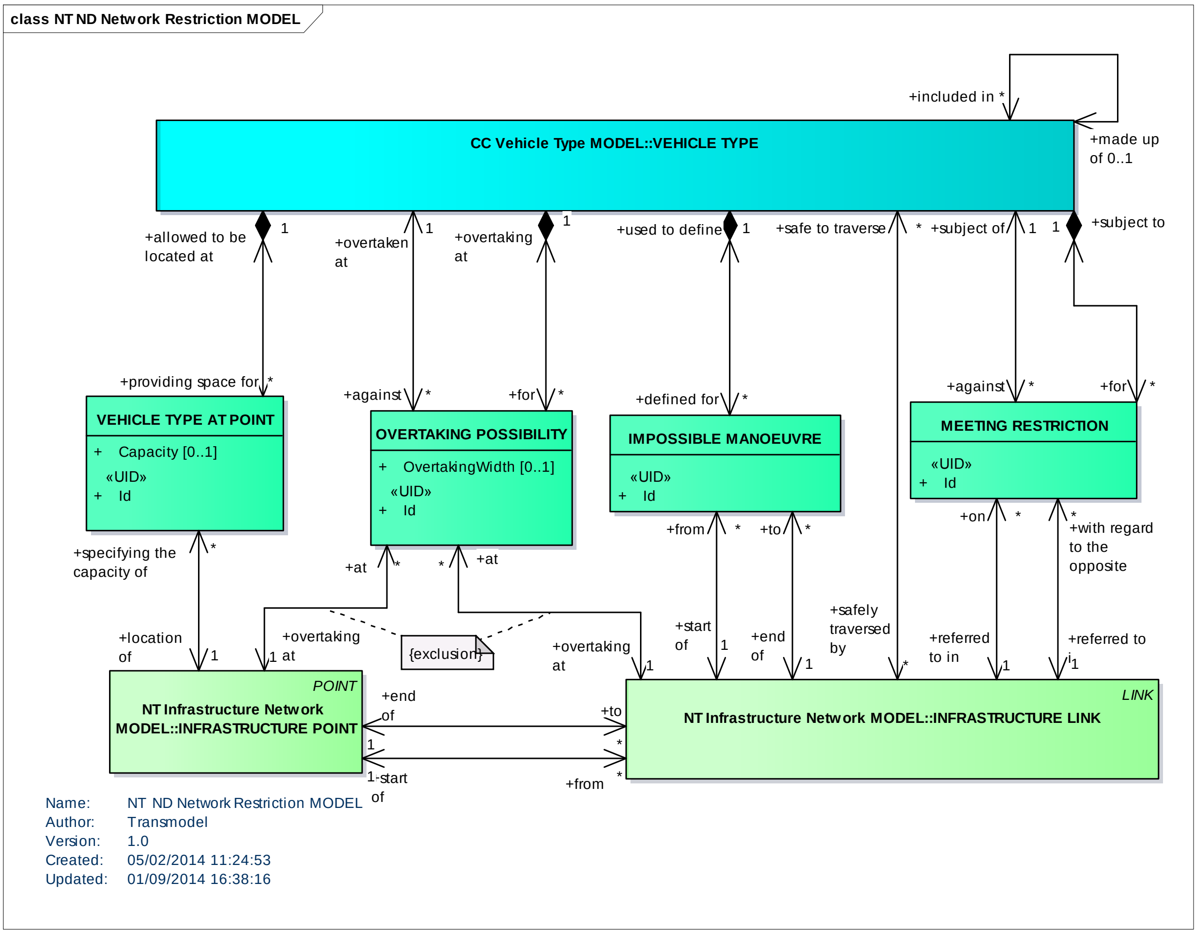


Figure 5 – Network Restriction – Conceptual Model

5.3.3.1.1 Vehicle Types at Points

A VEHICLE TYPE characterises the common properties of a defined class of public transport vehicles (cf.“Public Transport Reference Data Model - Part 1: Common Concepts”)). Vehicles of a certain VEHICLE TYPE may not be allowed, or physically not able, to stop for any length of time at particular INFRASTRUCTURE POINTs in the network. The entity VEHICLE TYPE AT POINT may be used to express how many vehicles of each type there is space for at the specified POINT. This usually will be a SCHEDULED STOP POINT. If the number is 0, then vehicles of that VEHICLE TYPE cannot stop at this INFRASTRUCTURE POINT at all. This restriction sometimes may be relevant for checking the timing of overtaking journeys during the scheduling process.

5.3.3.1.2 Availability of Links

Vehicles of a certain VEHICLE TYPE may not be able, allowed or safe to cross particular ROUTE LINKs (cf. 5.3.7 Routes and Lines) in the network. For example, a double-decker bus may not be able to pass under a low bridge. The reference data model expresses this as a positive relationship: a VEHICLE TYPE is safe to traverse a particular ROUTE LINK.

There may be LINKs which are not available at all on certain DAY TYPEs (cf.“Public Transport Reference Data Model Part 1: Common Concepts”). While these limitations generally depend only on the choice of the public transport company to offer or not to offer particular services, there may be physical restrictions that prevent particular LINKs to be used on a specific DAY TYPE. For instance, a street may be blocked because of a special event (e.g. market day) which occurs regularly on each day of that DAY TYPE. A relationship between the LINK and the DAY TYPE entity may be used to express this kind of limited availability on parts of the public transport network.

5.3.3.1.3 Overtaking Possibility

In rail or wire systems, overtaking is only possible if an appropriate overtaking track is available. In bus systems, the situation of two buses regularly planned to overtake each other while operating on the same ROUTE LINK can be practically neglected. Consequently, the places where it is possible to overtake can be described by particular POINTs, as far as the planning domain is concerned. Most often SCHEDULED STOP POINTs will be used for this purpose in operational practice.

The entity OVERTAKING POSSIBILITY is therefore related to, and identified by, the INFRASTRUCTURE POINT which allows a vehicle stopping at this POINT to be overtaken by another vehicle passing by. The OVERTAKING POSSIBILITY specifies that this INFRASTRUCTURE POINT provides means (for instance a bus bay, or an overtaking rail) for one vehicle overtaking the other. This possibility may depend on the characteristics of the VEHICLE TYPEs in question, so the VEHICLE TYPEs of both the overtaking and the overtaken vehicle are associated with the OVERTAKING POSSIBILITY, by means of identifying relationships.

5.3.3.1.4 Meeting Restrictions

The entity MEETING RESTRICTION expresses that vehicles of two specified VEHICLE TYPEs are not allowed to meet on a particular pair of INFRASTRUCTURE LINKs (e.g. opposite tracks). In practice, this will probably occur mainly in tram systems, where several generations of tram vehicles are operating on the same rail network, with different vehicle widths leading to conflicting clearance profiles along certain parts of the track network. In metro or light rail systems, such a situation may occur if the network comprises single-track sections.

5.3.3.1.5 Impossible Manoeuvre

A particular characteristic of railway networks (in contrast to road networks) is the fact that the railway geometry does not always allow vehicle movement between two adjacent railway elements, for instance in the case of switches or crossings. Railway elements may not be suitable to be passed through in any arbitrary sequence and some successions may physically be impossible. This kind of restrictions is expressed by the entity IMPOSSIBLE MANOEUVRE, specifying from which INFRASTRUCTURE LINK to which other (adjacent) element a rail vehicle cannot proceed because of physical restrictions. Additional information can be attached, for example the VEHICLE TYPEs for which an IMPOSSIBLEMANOEUVRE would apply (for instance, bidirectional rail vehicles may be able to perform a certain manoeuvre whereas one-directional vehicles are not capable of it).

5.3.3.2 Network Restriction – Example

Figure 6 provides an example of a meeting restriction: two vehicles run their journeys on opposite tracks, but due to the narrowing of the track, they are not able to meet on the two opposite red links.

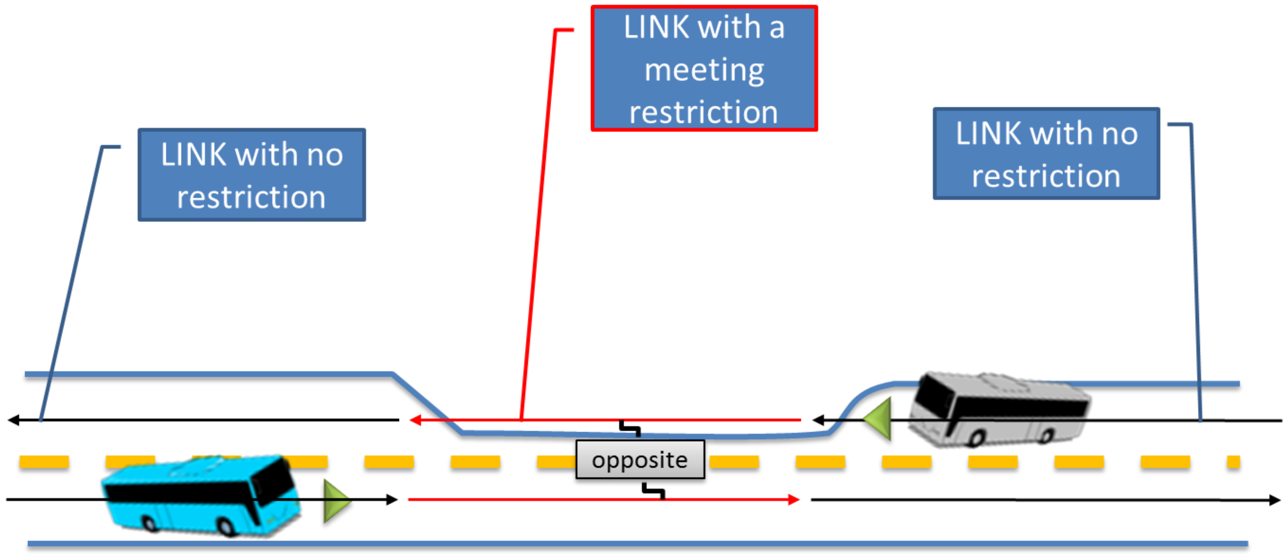


Figure 6 – Network Infrastructure Example (source NeTEx – Part 1)

5.3.4 Main Tactical Planning Points and Links

The Generic Point and Link Model (cf. "Public Transport Reference Data Model - Part 1: Common Concepts") presents the generic objects composing a network (points, links and zones). Specific roles are assigned to these simple objects according to the functional purpose. Figure 7 presents the network points and links, dedicated in particular to the tactical planning of operations.

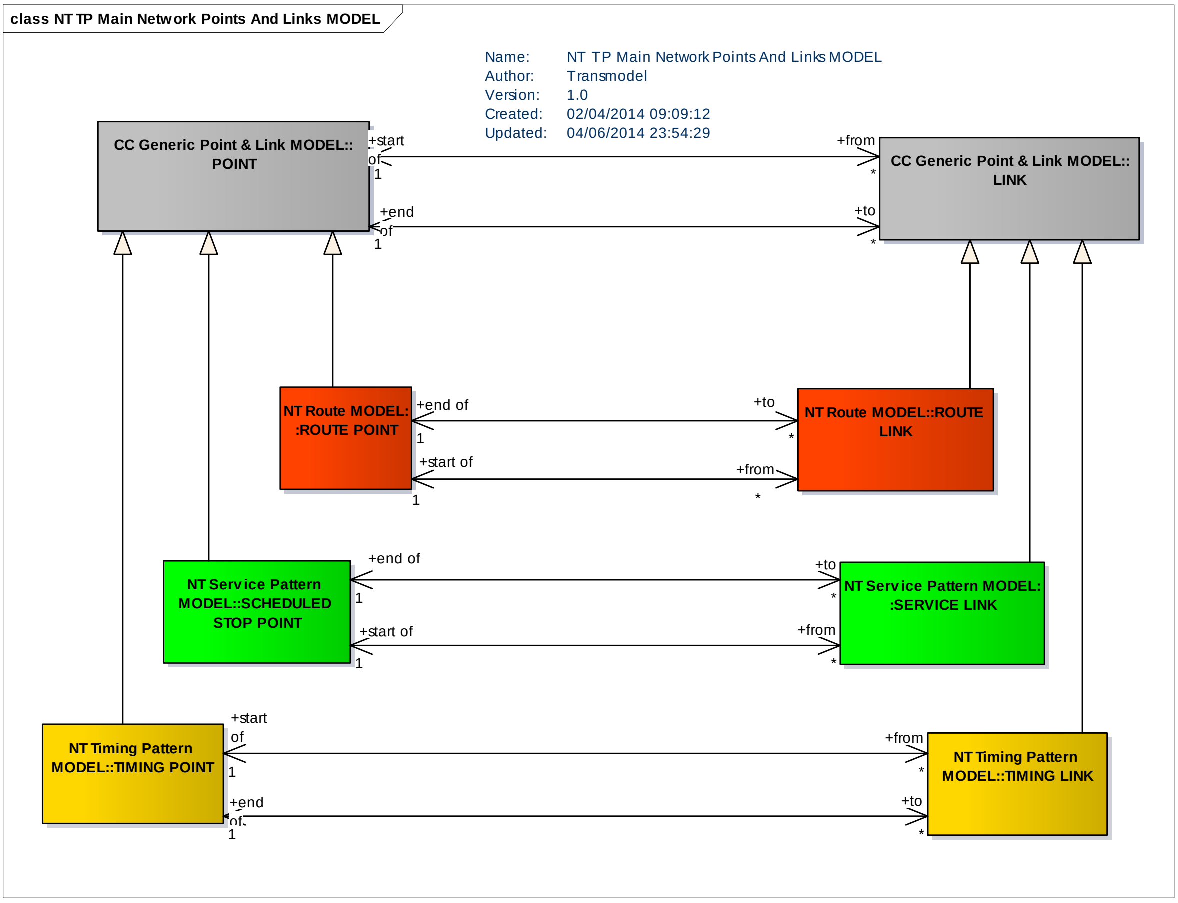


Figure 7 - Main Network Points and Links – Conceptual Model

A SCHEDULED STOP POINT is the location of a bus stop where passengers can board or alight from vehicles. This may be restricted to boarding only or alighting only. A SCHEDULED STOP POINT is a conventional representation of such a stopping place, as used to build the schedules or to provide broad traveller information. More detailed stopping positions may be necessary for dynamic platform management and the corresponding traveller information (see section 5.5.9 & 5.5.10).

Any pair of SCHEDULED STOP POINTs may be related by a SERVICE LINK, which expresses the possibility for a service to run from one of these SCHEDULED STOP POINTs to the other.

A TIMING POINT is a location for which timing information necessary to build schedules may be recorded. A classical way of using TIMING POINTs is to relate them by a LINK. Such a TIMING LINK, relating a start TIMING POINT to an end TIMING POINT, may be used to store standard run times against it.

In some cases, it is necessary to store standard waiting times at some selected TIMING POINTs. A flag attribute 'waiting point' allows such points to be specified.

Some operators may want to define run times between any pair of SCHEDULED STOP POINTs related by a SERVICE LINK. In such a case, probably all SCHEDULED STOP POINTs of the network will also be classified as TIMING POINTs. Other companies will define run times only for a selection of SCHEDULED STOP POINTs. The times related to the rest of the stops would then be derived by process (e.g. interpolation). In addition, some POINTs that are not SCHEDULED STOP POINTs are classified as TIMING POINTs. It is often the case for garage entry or exit points (cf. section below).

The path to be followed by services is described thanks to ROUTE POINTs, related by ROUTE LINKs. A ROUTE POINT may be an end point of a route ("terminus") or a point chosen to express that a route is passing "via" this ROUTE POINT. If there are several possible paths between two ROUTE POINTs, the most common practice is to create such “via” ROUTE POINTs, in order to distinguish the various paths (cf. section referring to the Route Model).

5.3.5 Activation

The ACTIVATION Model relates the points in the network at which monitoring equipment may interact with vehicles - possibly with on-board equipment. Such equipment may be relevant for real-time control. Uses of ACTIVATED EQUIPMENT can include:

- Detectors for vehicle locating systems.
- Traffic Light priority systems.
- Sign cleardown: the use of vehicle to infrastructure wireless communication to trigger sign content update based on proximity (providing a faster and more reliable link than a hub based signal).

5.3.5.1 ACTIVATION – Conceptual Model

Figure 8 describes the relationship between ACTIVATION POINTs, ACTIVATION LINKs, TRAFFIC CONTROL POINTs and the ACTIVATED EQUIPMENT using ACTIVATION ASSIGNMENTs.

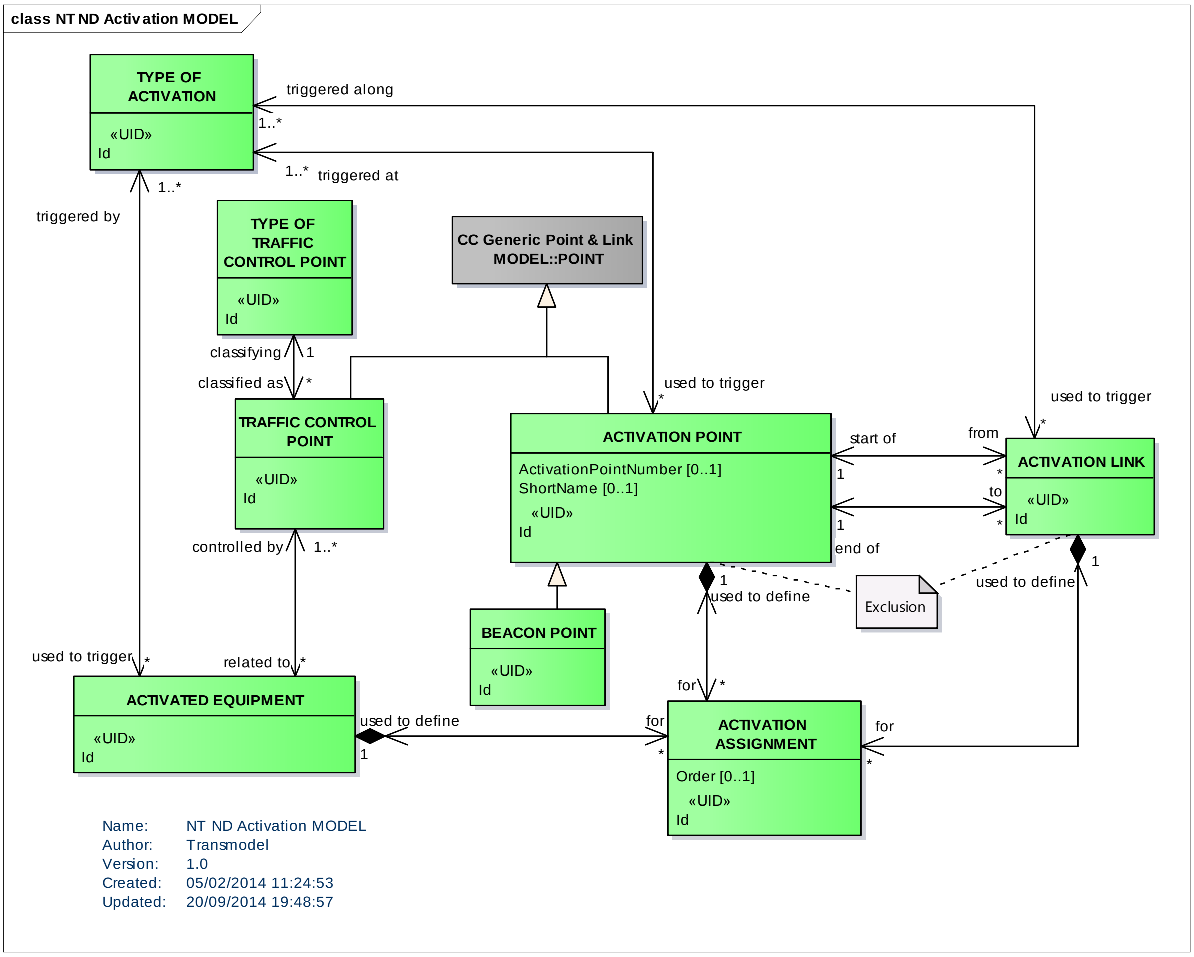


Figure 8 – Activation – Conceptual Model

An ACTIVATION POINT represents a POINT in the network that is used to activate some device when a vehicle passes it. Similarly, an ACTIVATION LINK represents a LINK used for such a function. The event of passing by may be recognised by a particular piece of equipment (e.g. beacon), or may be calculated (e.g. by an AVM system). The appropriate control process, or other action, hence will be triggered.

A particular subtype of ACTIVATION POINT is the BEACON POINT. Infrared or electronic beacons are installed at particular locations along the tracks or at stops, for instance. They send out a specific ‘code’ (permanently or after having been activated by a vehicle passing by) to be used by a vehicle location system to identify the actual location of vehicles.

Any device to be activated will be identified as ACTIVATED EQUIPMENT. ACTIVATION ASSIGNMENT is used to specify which ACTIVATED EQUIPMENT is alerted when a vehicle passes either by an ACTIVATION POINT or an ACTIVATION LINK. The actions triggered by ACTIVATED EQUIPMENT are classified according to a TYPE OF ACTIVATION (traffic light priority or barrier opening request, interior lighting of vehicles in tunnels, etc.). In some systems the activation process consists of several messages. The first message triggers the activation once a vehicle passes a first point, whereas the activation will be cancelled as soon as the vehicle passes the second point. In addition, some systems need to refer to a certain approaching section for a pre-announcement (e.g. in traffic light priorities). Such processes are differentiated by distinct TYPEs OF ACTIVATION.

An important case of activation is the process of priority requests sent to TRAFFIC CONTROL POINTs. This entity represents a POINT in the network where a traffic light (or another device used to influence the traffic flow) is located. The traffic lights installed at a TRAFFIC CONTROL POINT will be controlled by one or more traffic light controllers, specified as ACTIVATED EQUIPMENT. Such a controller may control more than one traffic light, all of which may be at the same road junction, or may be distributed over several consecutive road junctions. TRAFFIC CONTROL POINTs are classified according to a TYPE OF TRAFFIC CONTROL POINT.

5.3.6 Vehicle & Crew Point

The Vehicle & Crew Point model describes the location of the garages and crew changeover points that are referenced by vehicle and duty schedules.

5.3.6.1 VEHICLE & CREW POINT – Conceptual Model

Figure 9 shows the Conceptual Model for VEHICLE & CREW POINTs. There are three types of POINT: RELIEF POINT, PARKING POINT and GARAGE POINT at which VEHICLEs may be located. These may be associated with organisation entities for staff – CREW BASE – and for vehicle scheduling – GARAGE.

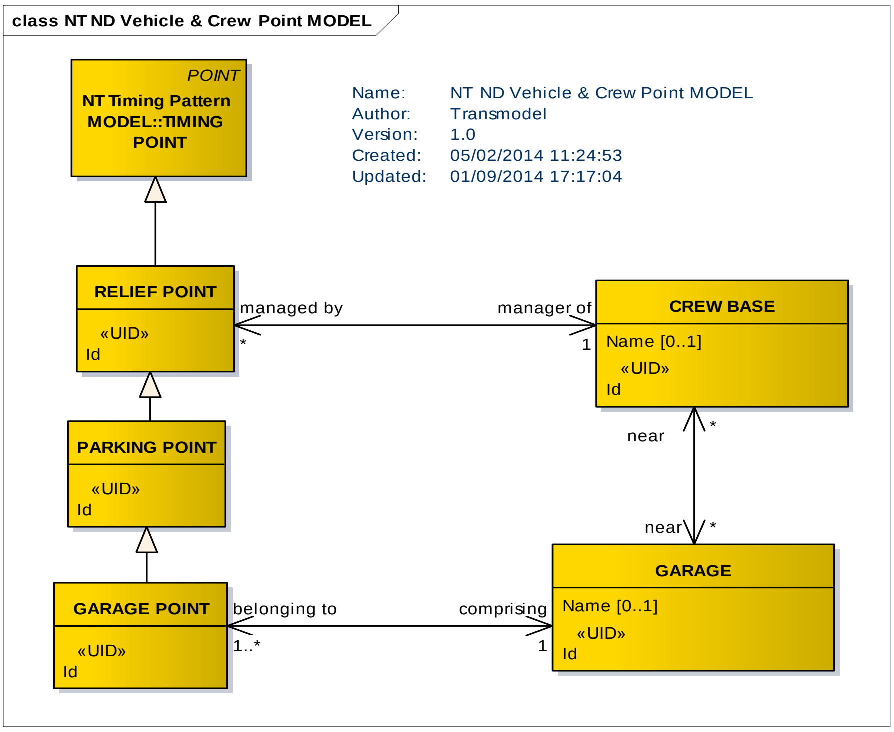


Figure 9 –Vehicle & Crew Point – Conceptual Model

The GARAGEs where public transport vehicles are usually parked are considered to be part of the basic network definition. They are the source and destination places where vehicles start and end their operation, and thus are part of the basic infrastructure.

Within a GARAGE, it is often necessary to distinguish several GARAGE POINTs. Such points are not aimed at describing any precise parking place for vehicles, but to specify conventional places where timing information, necessary for planning, may be different. Therefore, different GARAGE POINTs may represent different parking areas, or different entry or exit points.

PARKING POINT represents any POINT where a public transport vehicle may be parked for a while. It includes GARAGE POINTs located within a GARAGE, as a subtype. Other PARKING POINTs located at other places may be defined. For instance, in bus operation, PARKING POINTs often exist in central places of the network; buses may be parked there at off-peak hours, or as tactical reserves.

Operating employees of a PT operator, in particular the drivers, are managed at a CREW BASE, where they report, sign on or off, stock up with tickets, etc. A CREW BASE and a GARAGE may be near each other (or even in the same “depot”).

The driver planning process defines in advance the points where the drivers will start or stop driving vehicles. Such POINTs are qualified as RELIEF POINTs. They are managed by a CREW BASE. RELIEF POINT has an extended meaning, as it includes any point where a driver may pick up an unattended vehicle or park it. Therefore, PARKING POINT (including GARAGE POINT) is a specialisation of RELIEF POINT.

As the start or the end of a driving spell are at fixed times, RELIEF POINT is a subtype of TIMING POINT. PARKING POINT and GARAGE POINT are hence specialisations of TIMING POINT as well.

5.3.7 Lines and Routes

5.3.7.1 ROUTE – Conceptual Model

The ROUTE entity represents a conventional way of describing a path through the network, to be used by regular PT services. A ROUTE is a linear feature composed of points and links specifically defined for that purpose. This sequence of points and links must be built in a way that identifies a path without any ambiguity.

The ROUTE entity represents an abstract concept that has in itself no real operational meaning. Its purpose is to describe a path *independently* of both the *infrastructure pattern* (e.g. ROAD ELEMENTs or RAILWAY ELEMENTs) and the *operational pattern* (e.g. sequence of SCHEDULED STOP POINTs presented in a further section). ROUTE is classically used as an interfacing object between operational planning and infrastructure description. The independence of the ROUTE definition serves to separate the concerns of the different layers allowing a modular consideration of network topology data.

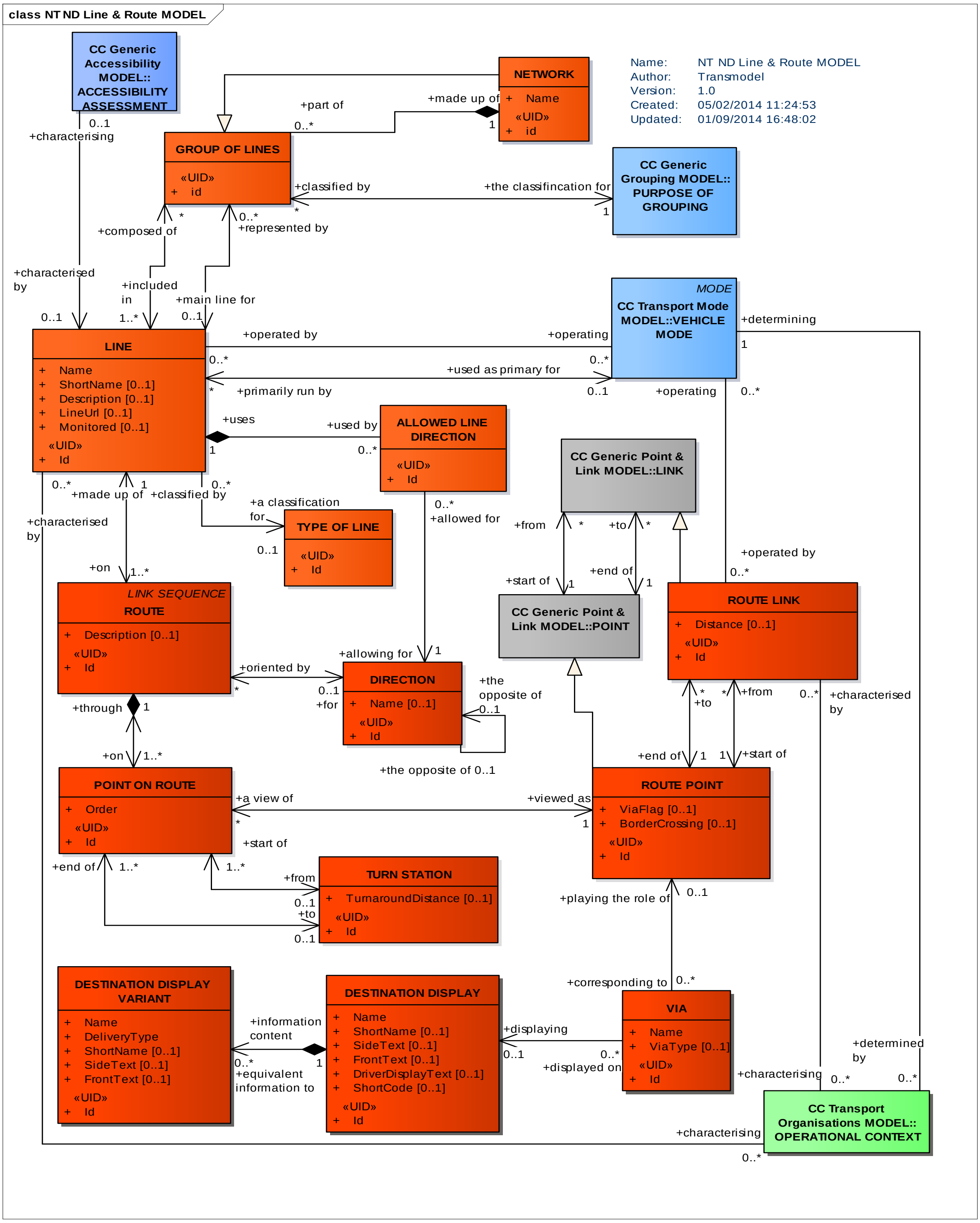


Figure 10 – Line & Route – Conceptual Model

A ROUTE is made up of ROUTE LINKs, which are LINKs defined between two ROUTE POINTs. A ROUTE LINK is restricted to be identifiable by its end ROUTE POINTs, which means that there cannot normally be any alternative ROUTE LINK between the same pair of ROUTE POINTs. This restriction corresponds to most practices, but if necessary can be qualified by the use of an OPERATIONAL CONTEXT (See TRANSPORT ORGANISATION Model), which allows separate links for separate designated purposes.

A ROUTE is thus a LINK SEQUENCE, defined by an ordered sequence of (two or more) POINTs ON ROUTE. A ROUTE may pass through the same ROUTE POINT more than once, as in the case of a loop. The POINT

ON ROUTE entity is accordingly used to describe the ordered list of ROUTE POINTs defining the path of a ROUTE, with an attribute 'order' as identifier.

It should be noted that a ROUTE – as a single path through a network in one direction – corresponds to only one of the possible senses of 'route' in colloquial English. In particular the wider sense of a set of paths including branches and conditional variants given a common name for marketing to the public, is represented by the concept of a LINE,

The LINE & ROUTE model above gives an overview on all the relevant concepts in this context. They will be explained in the following sections.

5.3.7.2 Route Topologies

A number of different geometries for routes are typically found in transport networks, all of which may be described using POINT and LINK representations.

- **Linear**: A simple linear path from an origin stop to a destination stop. It may be exactly symmetric i.e. be traversed to matching stop pairs in the outbound and inbound direction. Or asymmetric – with differences in the stop sequences in each direction.

- **Circular** : A path that returns to the origin stop as the destination. It then may continue round repeatedly. There may be symmetric or asymmetric services in the clockwise or anticlockwise direction. The destinations shown for such routes may vary along the way.

- **Lollipop**: A path that goes round a loop one way at the outbound destination end and then returns past the same stops on the inbound path.

- **Cloverleaf**: A path that returns repeatedly to the same stop.

- **Branching**: Alternate paths that go one or other alternative way at either end of the journey.

- **Eye**: Alternate paths that go one or other alternative way round an intermediate section of the route.

There must be a valid ROUTE LINK between each pair of consecutive POINTs ON ROUTE.

The general orientation of a ROUTE (a ROUTE is of course oriented) may be described by an expression like "outwards", "backwards" etc., often referring approximately to the city centre. This classification may lead to the definition of arbitrarily chosen DIRECTIONs, which may be used for passenger information, but may also be relevant for scheduling or fare management. Two DIRECTIONs may be defined as being opposite to each other.

5.3.7.3 Route – Example

Figure 11 shows a ROUTE described through a sequence of POINTs ON ROUTE. It should clarify in particular, the difference between the Infrastructure Network (streets) and the schematic representation of the physical path for vehicles: the ROUTE.

Figure 11 – Route Point & Point On Route – Example (NeTEx- Part 1)

Figure 12 shows an example of ROUTE POINTs used by two ROUTEs, with ROUTE 1 (the green one) passing the same ROUTE POINT several times. Each time the ROUTE passes through a ROUTE POINT, it "creates" a new POINT ON ROUTE.

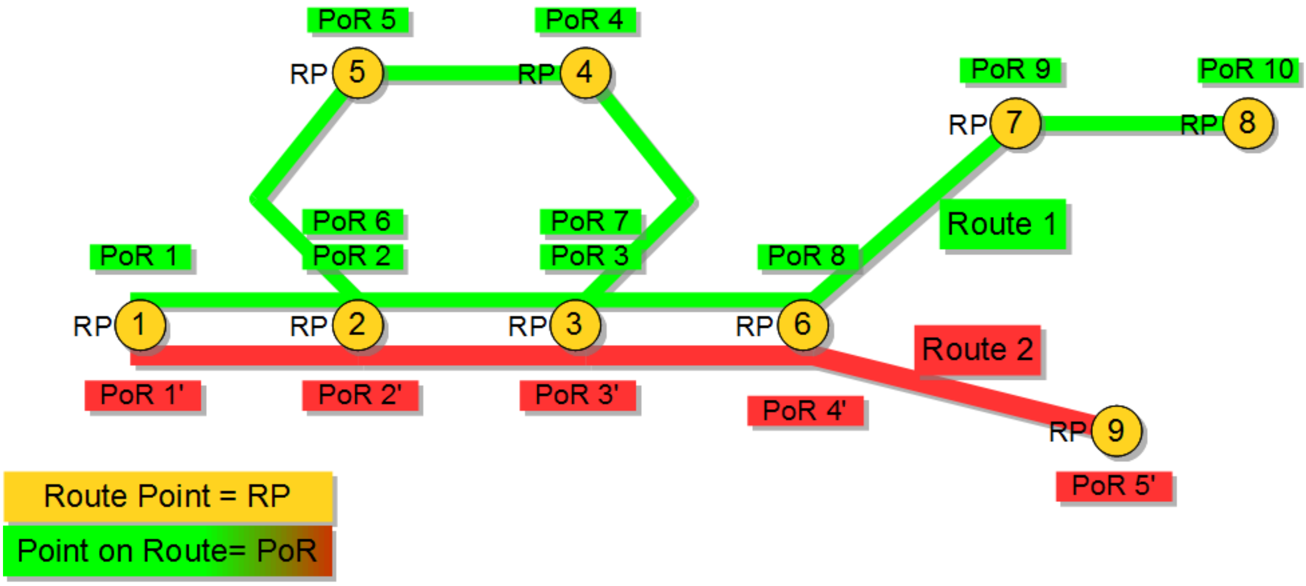


Figure 12 – Route Point & Point On Route – Example (NeTEx – Part 1)

5.3.7.4 LINE – Conceptual Model

Figure 13 incorporates the Line Model. Transmodel defines a LINE as a grouping of ROUTEs that is generally known to the public by a similar name or number. These ROUTEs are usually very similar to each other from the topological point of view, being variants of a core route with some deviations only on certain parts. Often the vehicle journeys on these ROUTEs are scheduled jointly with tight synchronisation, in order to provide a regular service on this specific LINE. They are often grouped together for presentation of the timetable to the public.

Two ROUTEs using the same infrastructure path (or parallel tracks), but with opposite DIRECTIONs, will generally belong to the same LINE.

LINEs may be grouped into GROUPs OF LINES for particular purposes, such as fare harmonisation, day type assignment, or to group some kind of service categories (night buses, etc.). Grouping can also be used to define several kinds of PT networks and sub-networks: what is usually called 'public transport network' is in fact only a specific GROUP OF LINES and a LINE may belong to several of them. For example in Ile de France, a LINE may belong to the STIF network (the all Ile-de-France Network), but also to the Nocitlien network (night buses) and the PHEBUS network (Versailles' town bus network).

Each GROUP OF LINES must be defined for only one purpose, which is expressed by a PURPOSE OF GROUPING. A LINE may be in different groups for different purposes, and may also belong to more than one GROUP OF LINES for one single purpose. It is the responsibility of users to assure consistent groupings, suitable for the specific purpose in question (cf. “Public Transport Reference Data Model - Part 1: Common Concepts”).

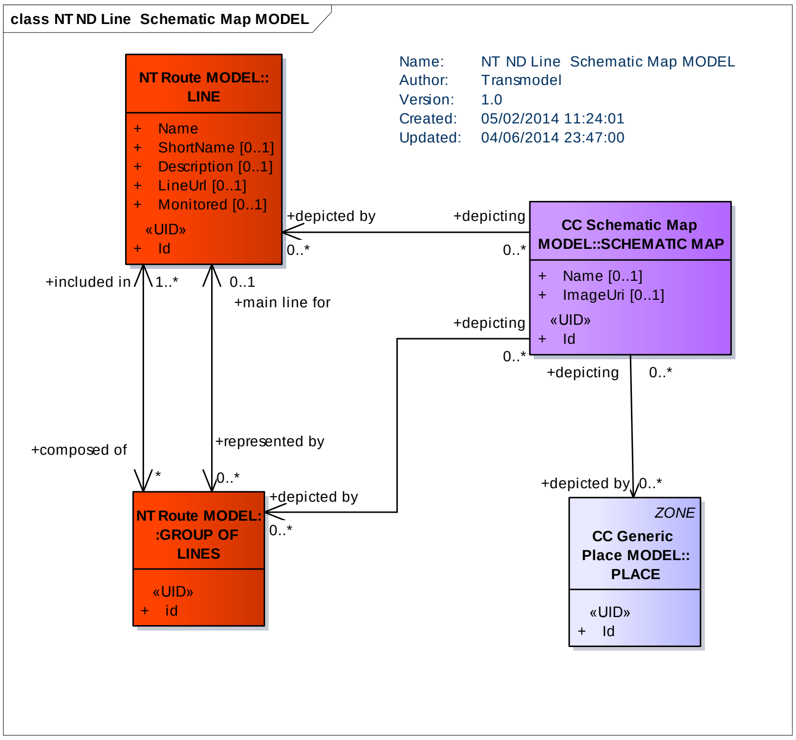


Figure 13 – Line Schematic Map – Conceptual Model

Figure 13 expresses the fact that a SCHEMATIC MAP may be representing schematically the layout of the topographic structure of a LINE or a GROUP OF LINES.

5.3.8 Line Network

The Line Network model provides a means of describing the overall topology of a route - or rather all the ROUTEs of a LINE - including branches and alternatives etc. This is in contrast to ROUTEs, SERVICE PATTERNs, JOURNEY PATTERNs, etc., which show a single path though the network for a single journey.

The grouping of patterns into a LINE NETWORK has uses for visualisations (for example a schematic map of a network) and for relating situations to affected parts of the network.

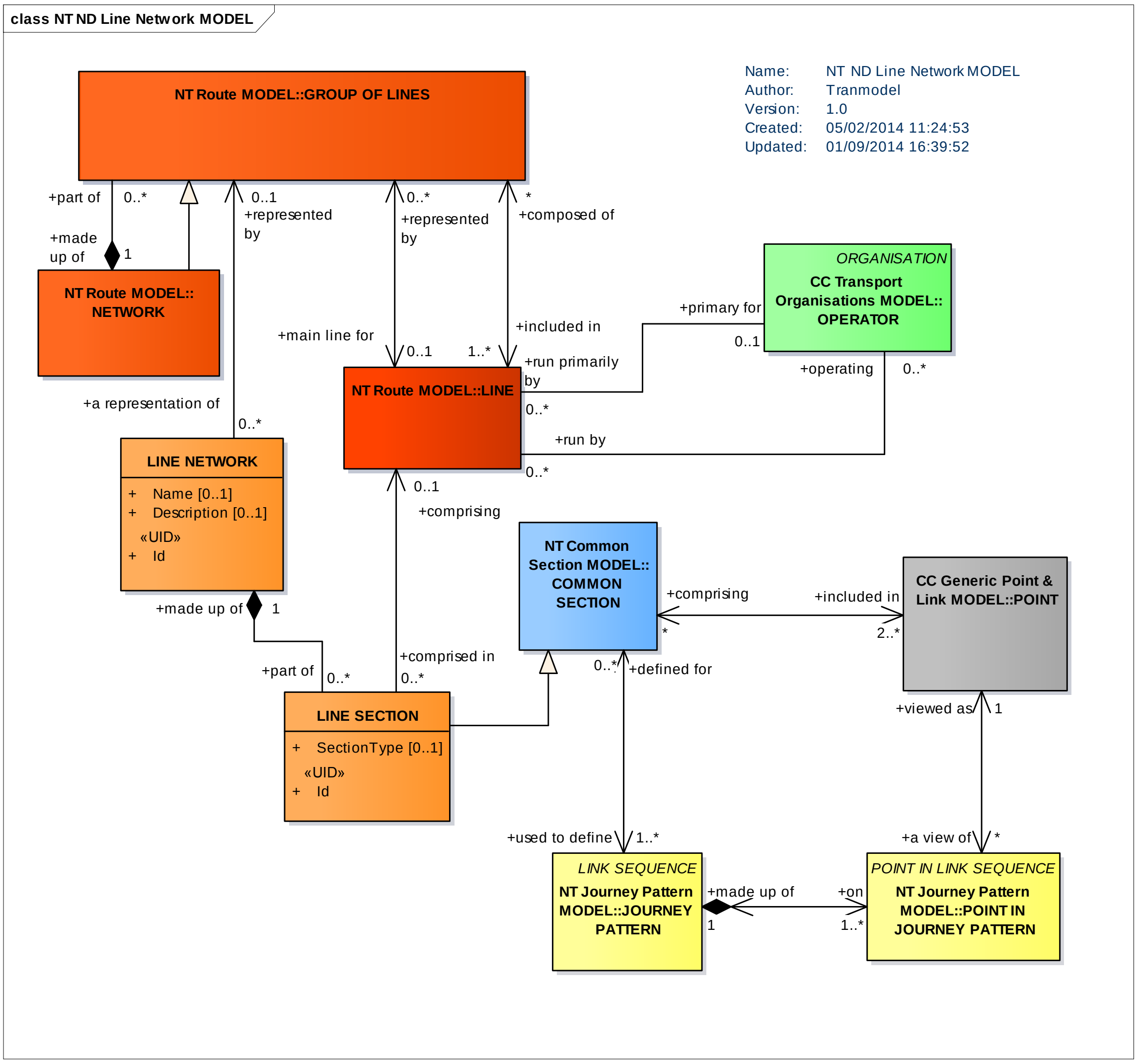


Figure 14 – Line Network – Conceptual Model

5.3.8.1 LINE NETWORK – Conceptual Model

A LINE NETWORK represents the network topology as a named set of LINE SECTIONs. Each LINK SECTION is a sequence of SCHEDULED STOP POINTs and/or SERVICE LINKs.

5.3.8.2 Line Network – Example

Figure 15 shows an example of a LINE NETWORK for the Northern Line of the London Underground. It includes a number of branches and covers both direction of the line.

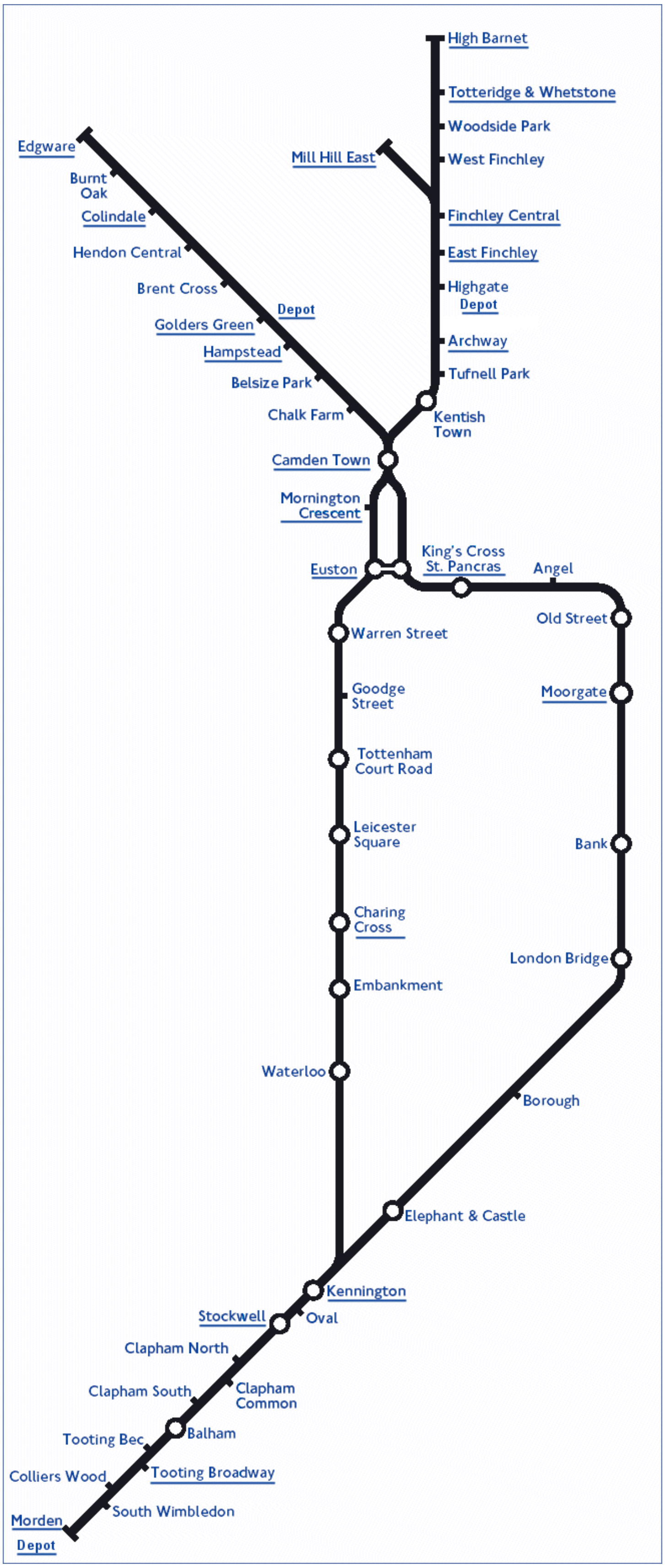


Figure 15– Example of a Schematic Representation of a LINE (Line Network LUL Northern Line -source NeTEx – Part 1)

5.3.9 Flexible Network

Transmodel is designed to support FTS (Flexible Transport Service) and DRT (Demand Responsive Transport). DRT and FTS often cover similar services; FTS being more generic since flexibility may not be directly linked to the demand, but may be related to some operating needs or cost optimisations. The term ‘FTS’ will be used in the following text to cover both concepts.

5.3.9.1 Flexible Network Introduction

Transmodel does not have a separate FTS specific model, but has extra properties that can be used to describe FTS systems.

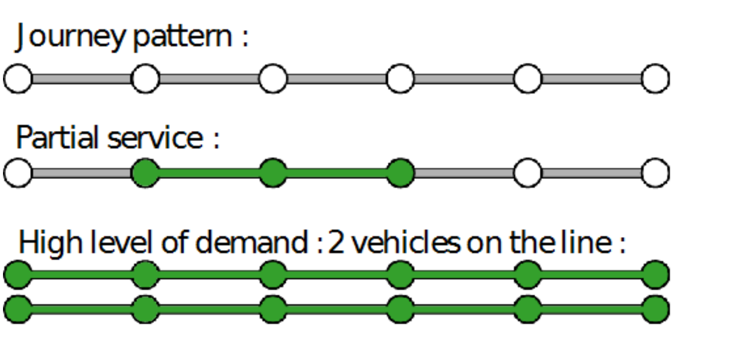
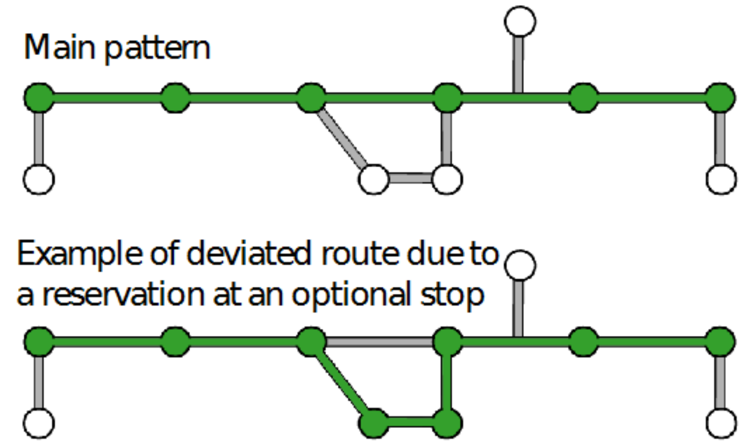
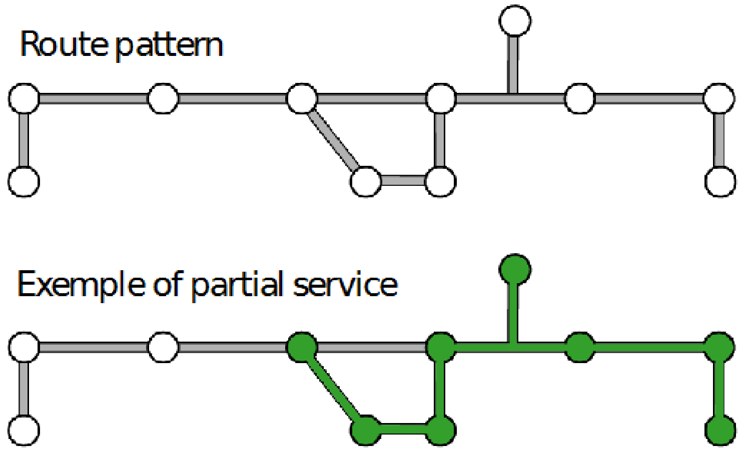
For Network Topology, the main FTS aspect considered is the FTS line structure.

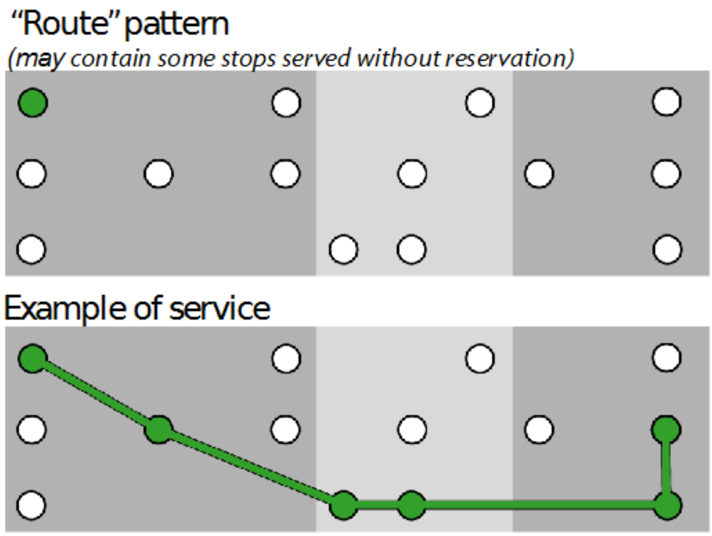
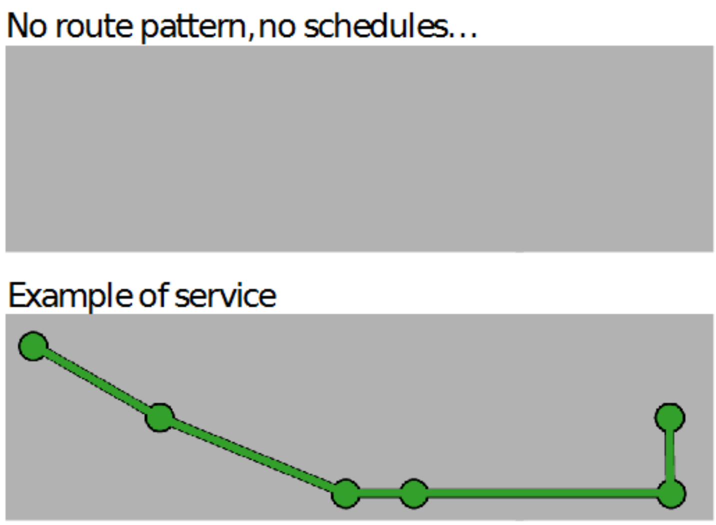
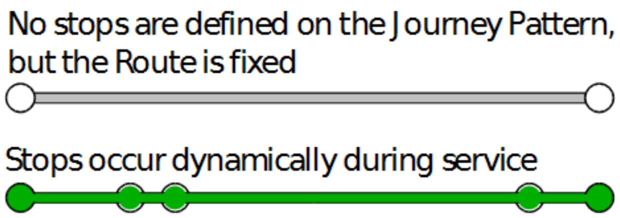
Different types of FTS are considered in the present document. The FTS type considered are defined on JOURNEY PATTERN level (or POINT IN JOURNEY PATTERN, in the case when only a part of the JOURNEY PATTERN is flexible) or on ROUTE level. This allows for:

- Virtual line service
- Flexible service with main route
- Corridor service (Flexible service without main route)
- Fixed stop area-wide flexible service
- Free area-wide flexible service
- Mixed types of flexible service (not at POINT level)

Table 1 summarises the FTS LINE topologies taken into account in Transmodel.

Table 1 – FTS typology (source NeTEx)

Name	Description	Figure
Virtual Line	This case is very similar to fixed line operation: journey patterns are defined as usual, but stops are served only if there is a passenger booking for it. Several vehicles may be allocated to the same journey when high level of demand occurs. Virtual line can be operated with fixed or dynamic passing times.	
Flexible line with main route	A minimal list and order of stops are defined determining a “main and minimal” journey pattern. Possible additional stops are defined but will be served only in case of passenger reservation. A range of journey patterns is determined through a stop list and order defined dynamically according to the passenger reservations and "around" the “main and minimal” journey pattern..	
Flexible line without main route	The possible stops of the journey pattern are known, and the possible stop sequences are also defined and the real stop list and order are defined dynamically according to the passenger reservations without any reference to a main pattern.	

Flexible zone with fixed stops	The service is defined by one or several zones (in sequence). Each zone is defined by a set of possible stops. Stops served, and stop order are defined for each vehicle journey according to the reservations. Passing times (entry and exit time) are usually defined for each zone. They may also be defined for each stop.	
Flexible zone without fixed stops	The service is defined by one or several zones (in sequence). A stop can occur anywhere in each Zone. Stops served, and stop order will be defined four each vehicle journey according to the reservations. Passing times may be defined for each zone (entry and exit time), or for each stop.	
Hail & Ride	The route is defined, but the Journey Pattern only has a start and an end. Boarding or alighting is obtained by signalling the driver that one wishes to board/alight, and can occur anywhere along the Route. It also sometimes happens that boarding may occur at fixed stops, and only alighting can occur on demand anywhere along the Route.	
Combination of any of the previous FTS structure	A lot of FTS services are defined as a sequence of the previously described FTS types.	

5.3.9.2 FLEXIBLE NETWORK – Conceptual Model

Figure 16 shows that there is no major difference between FTS and fixed route points, links and zones. The main difference resides in the way the model and the typology are used.

- FTS often needs to refer to a ZONE of operation instead of specific SCHEDULED STOP POINTs. As shown by the diagram, a POINT may represent the functional centroid of a ZONE (i.e. not necessarily the geometric centre of the ZONE). Therefore Transmodel uses the convention that if the POINT (a SCHEDULED STOP POINT, a TIMING POINT or a ROUTE POINT) is the centroid of a ZONE, this means that this POINT (SCHEDULED STOP, TIMING or ROUTE POINT) is *representing* a ZONE, to be used for FTS as a flexible ZONE. In order to specify the nature of the flexibility, the additional FLEXIBLE POINT PROPERTIES element is available.

- The ZONE itself may contain a set of POINTs through the 'including' relation (it is then possible to define all the SCHEDULED STOP POINTs of a flexible zone with fixed stops, for example). A ZONE may include other ZONEs. According to the typology of FTS chosen, a constraint is formulated requiring that a ZONE may contain POINTs or ZONEs, but not both.

- The FLEXIBLE LINK PROPERTIES are available for LINKs, making it possible to describe hail & ride LINKs or a LINE structure combining different kind of FTS. The LINK with FLEXIBLE LINK PROPERTIES can have some generic VALIDITY CONDITIONs in order to be able to describe situations likes LINKs being hail & ride only between 9 pm and 7 am.

Note that in order to make coverage by flexible services visible to journey planners, FLEXIBLE STOP PLACEs, FLEXIBLE AREAs and HAIL AND RIDE AREAs can be defined. See section on FLEXIBLE STOP PLACE model.

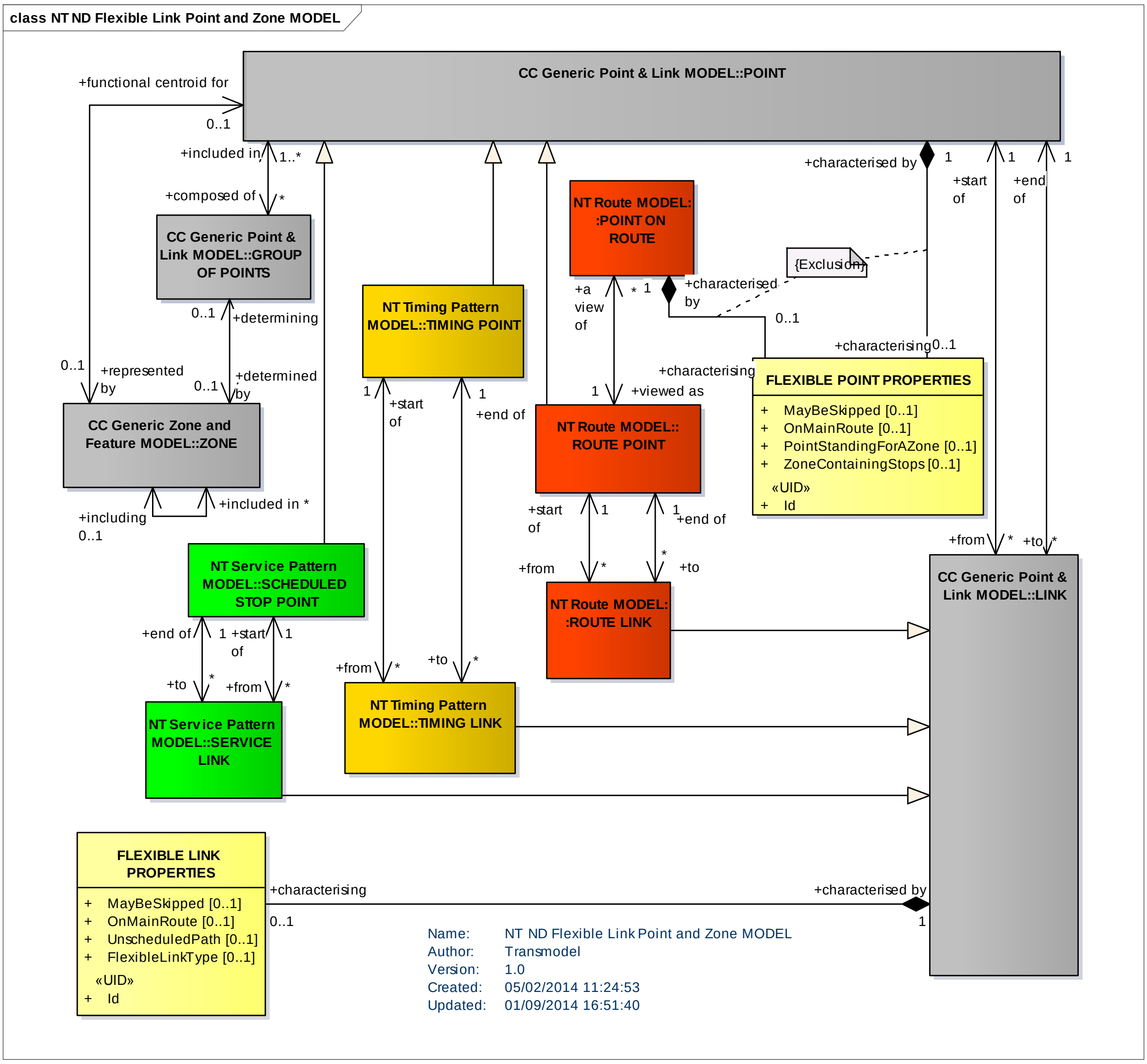


Figure 16 – Flexible Link, Point and Zone – Conceptual Model

5.3.9.2.1 Flexible Routes

A FLEXIBLE ROUTE is a specialisation of ROUTE allowing flexible behaviour, the type of flexibility being described by its attribute.

As shown above, ROUTE POINTs and ROUTE LINKs may have flexible properties (FLEXIBLE POINT and LINK PROPERTIES have already been described with the previous schema). This modelling also applies to POINTs ON ROUTE in order to describe FLEXIBLE ROUTEs. .

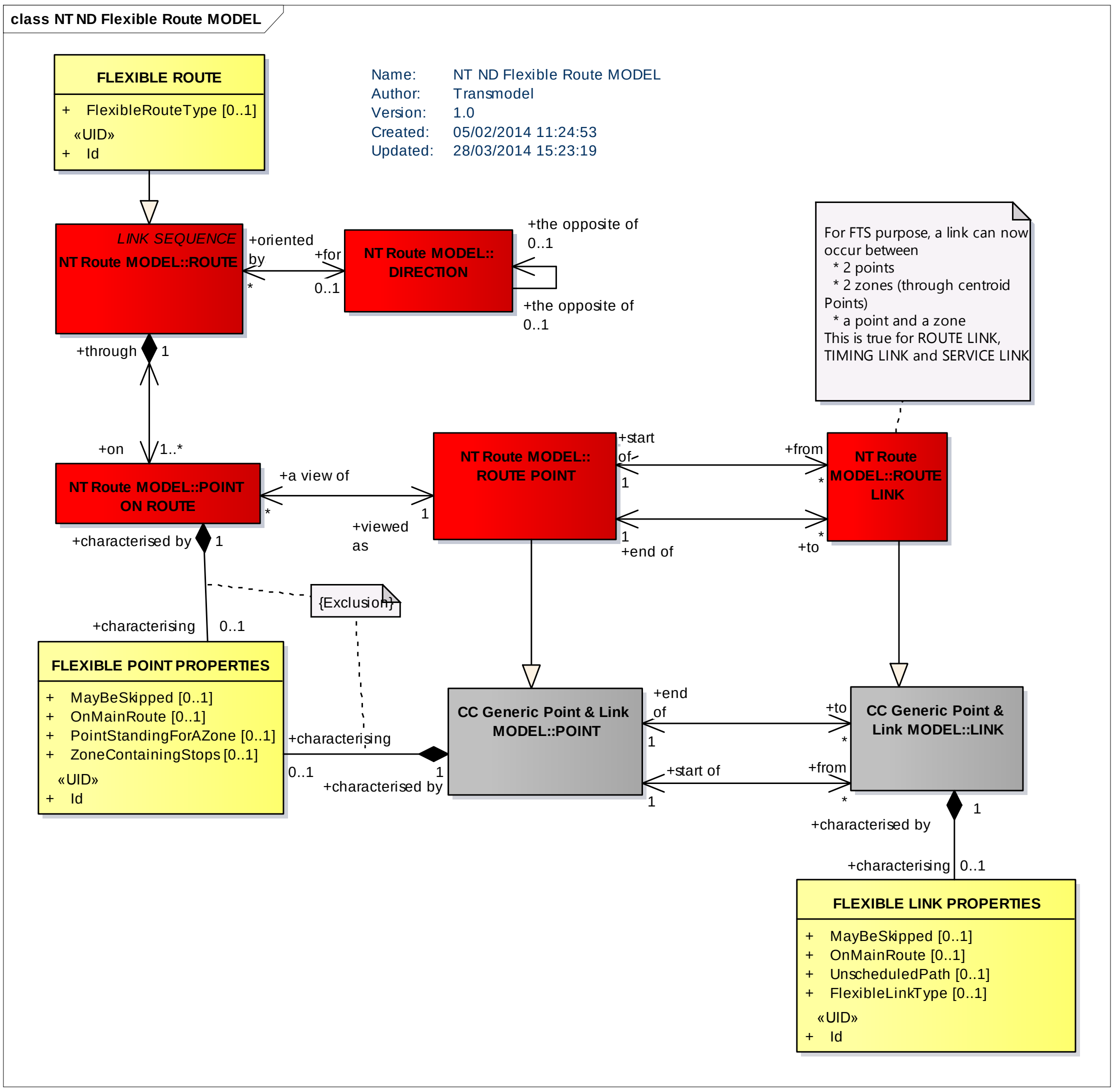


Figure 17 – Flexible Route – Conceptual Model

5.3.9.2.2 Flexible Lines

A FLEXIBLE LINE is a group of FLEXIBLE ROUTEs which is generally known to the public by a similar name or number and which have common booking arrangements

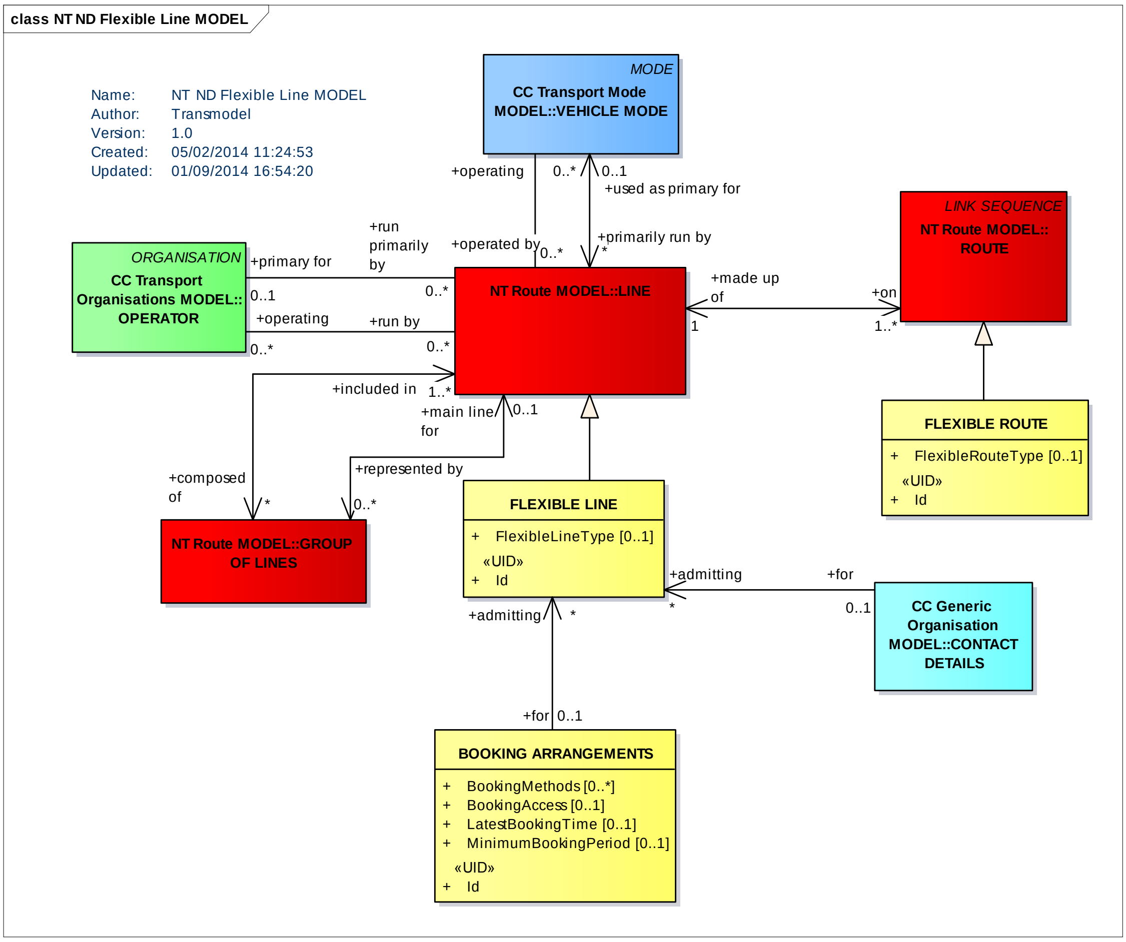


Figure 18 – Flexible Line – Conceptual Model

5.4 Fixed Object Model

5.4.1 Model Overview

The Fixed Objects Model describes fixed stops and out of vehicle passenger aspects of a network and is itself divided into a number of separate sub-models.

The sub-models depend on a number of general framework models (for example, Generic Point and Link model, Notice model, etc.) described in the part "Public Transport Reference Data Model – Part 1: Common Concepts". The following sub-models are described in the sections below:

- SITE Model: models a location that passengers travel from or to,
- STOP PLACE Model: models a station or stop,
- FLEXIBLE STOP PLACE Model: models an area covered by a Flexible Transport Service,
- POINT OF INTEREST Model: models a public site other than a station or stop to or from which a passenger may want to travel,
- EQUIPMENT Description Model: models on one hand the installed equipment, i.e. fixed equipment and passenger equipment (that may be also on-board), on the other hand local services, considered as immaterial equipment,
- NAVIGATION PATH Model: models the paths through a SITE,
- CHECK CONSTRAINT Model: models processes that may slow a passenger down when using a SITE,
- PARKING Model: models a parking facility associated with a SITE.
- VEHICLE STOPPING Model: models where vehicles stop within a SITE.

5.4.2 Site

The SITE Model provides a general description of the common properties of a physically situated location, such as a station or point of interest, including its entrances, levels, equipment, paths, accessibility properties. etc. The SITE Model is refined by specific sub-models such as STOP PLACE, POINT OF INTEREST, PARKING, etc. to define specialisations of PLACE.

5.4.2.1 SITE – Conceptual Model

5.4.2.1.1 SITE – Basic Conceptual Model

Figure 19 shows the basic elements making up a SITE.

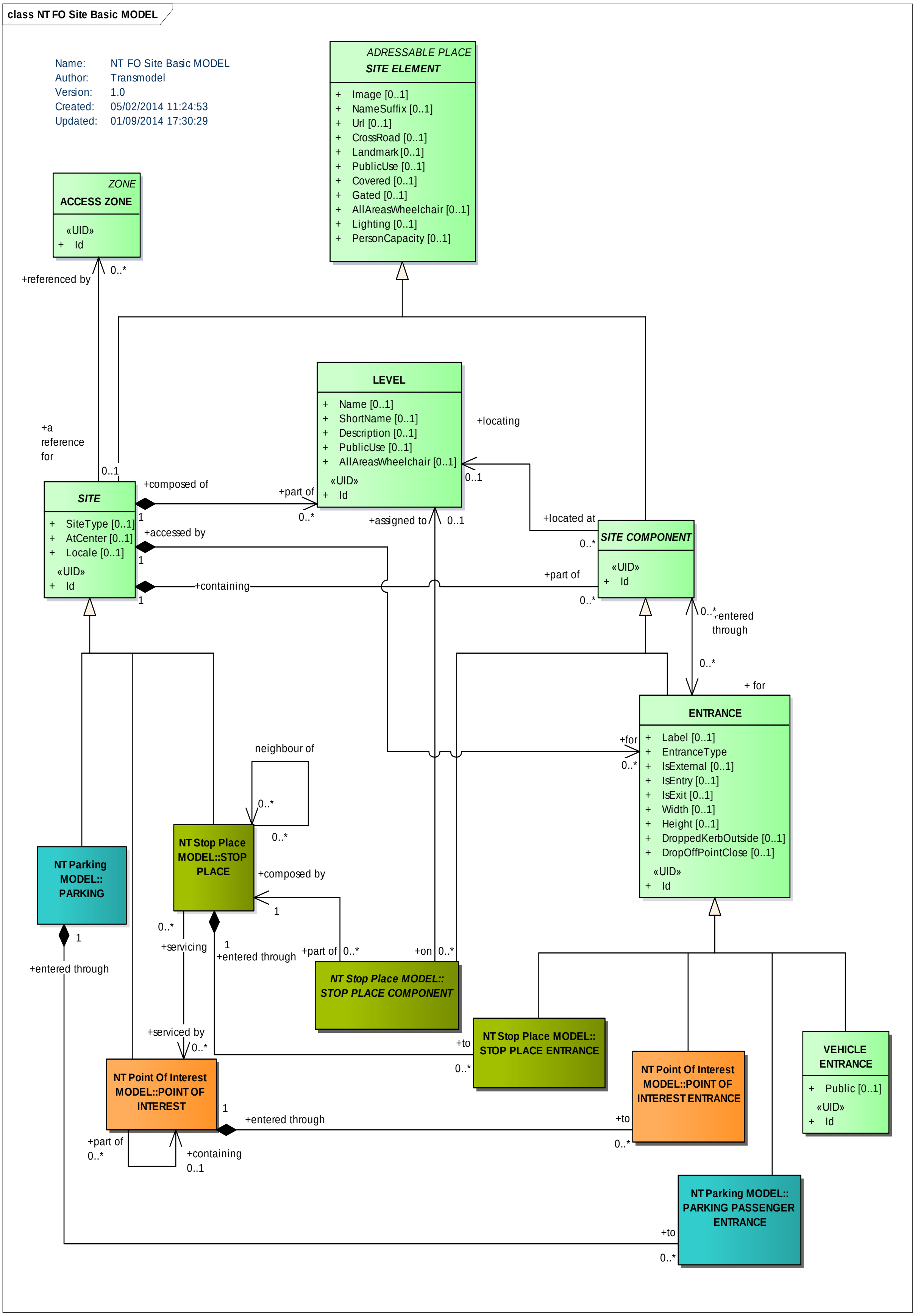


Figure 19 – Site – Basic Conceptual Model

A SITE COMPONENT is an element of a SITE describing part of its structure, such as a platform, concourse, ticket hall, entrance hall, forecourt, room, retail area, etc., etc.

A LEVEL is an identified storey (ground, first, basement, mezzanine, etc.) within an interchange building or SITE on which SITE COMPONENTs reside.

An ENTRANCE: A physical entrance or exit to/from a SITE.

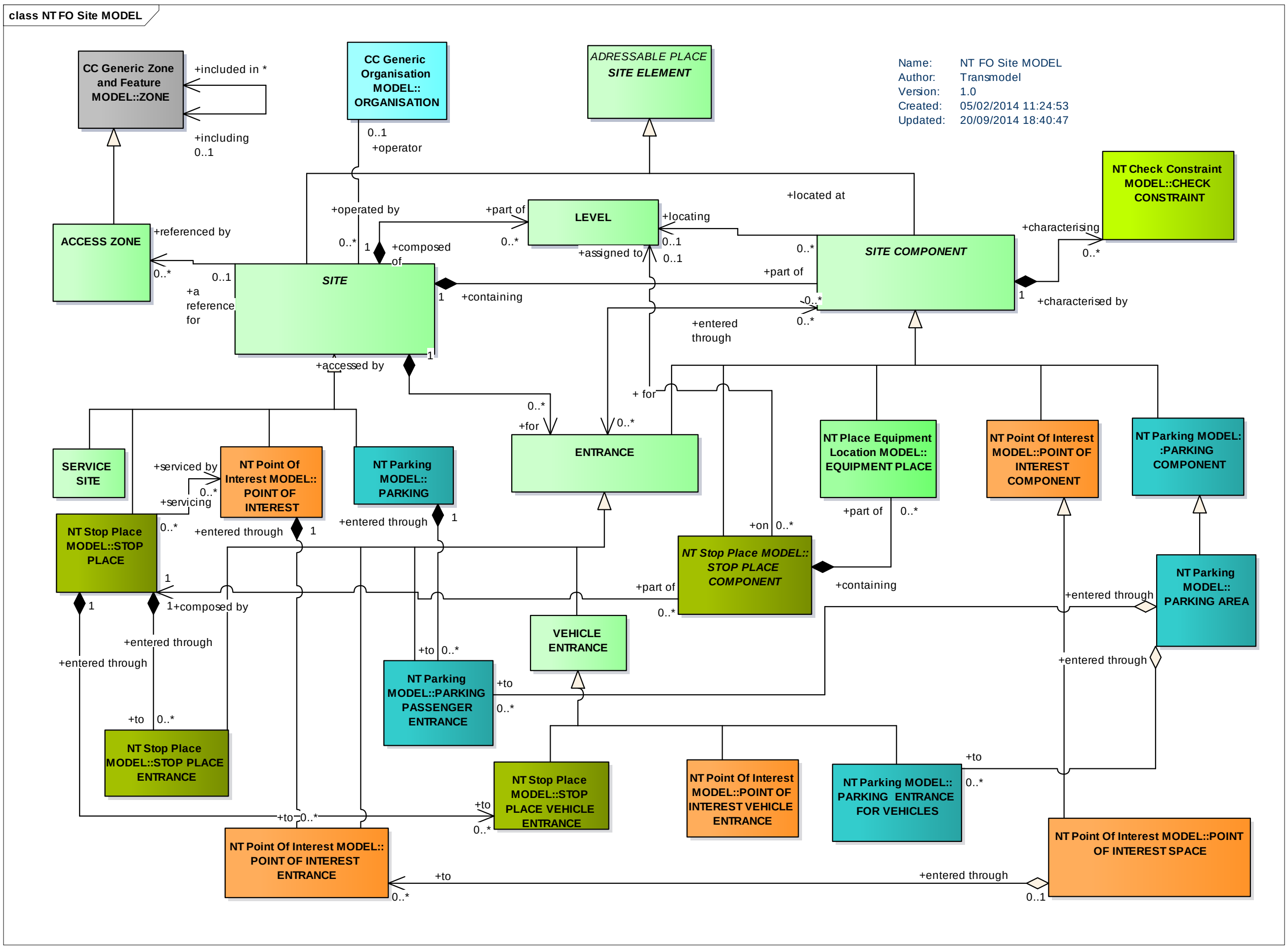


Figure 20 – Site – Conceptual Model

5.4.2.1.2 SITE ELEMENT- Conceptual Model

The SITE Model allows a number of additional characteristics to be specified that are relevant to passenger use of the SITE.

- The accessibility of the SITE and its components can be described using ACCESSIBILITY ASSESSMENTs. Accessibility is described further in the next section.
- The availability of parts of the SITE may be specified using a VALIDITY CONDITION.
- The nature and likely time impact of processes taking place at points on the site, such as Check in, ticket purchase, security checks etc., can be specified with a CHECK CONSTRAINT and a CHECK CONSTRAINT DELAY.
- The ROAD and POSTAL ADDRESS of components can be specified.

— The EQUIPMENT found on the site such as barriers, gates, stairs, lifts, seats, lavatories etc., etc. can be specified.

— The NAVIGATION PATHs to go between the different points of the site can be specified. These are made up of PATH LINKs and PATH JUNCTIONs (cf. separate model).

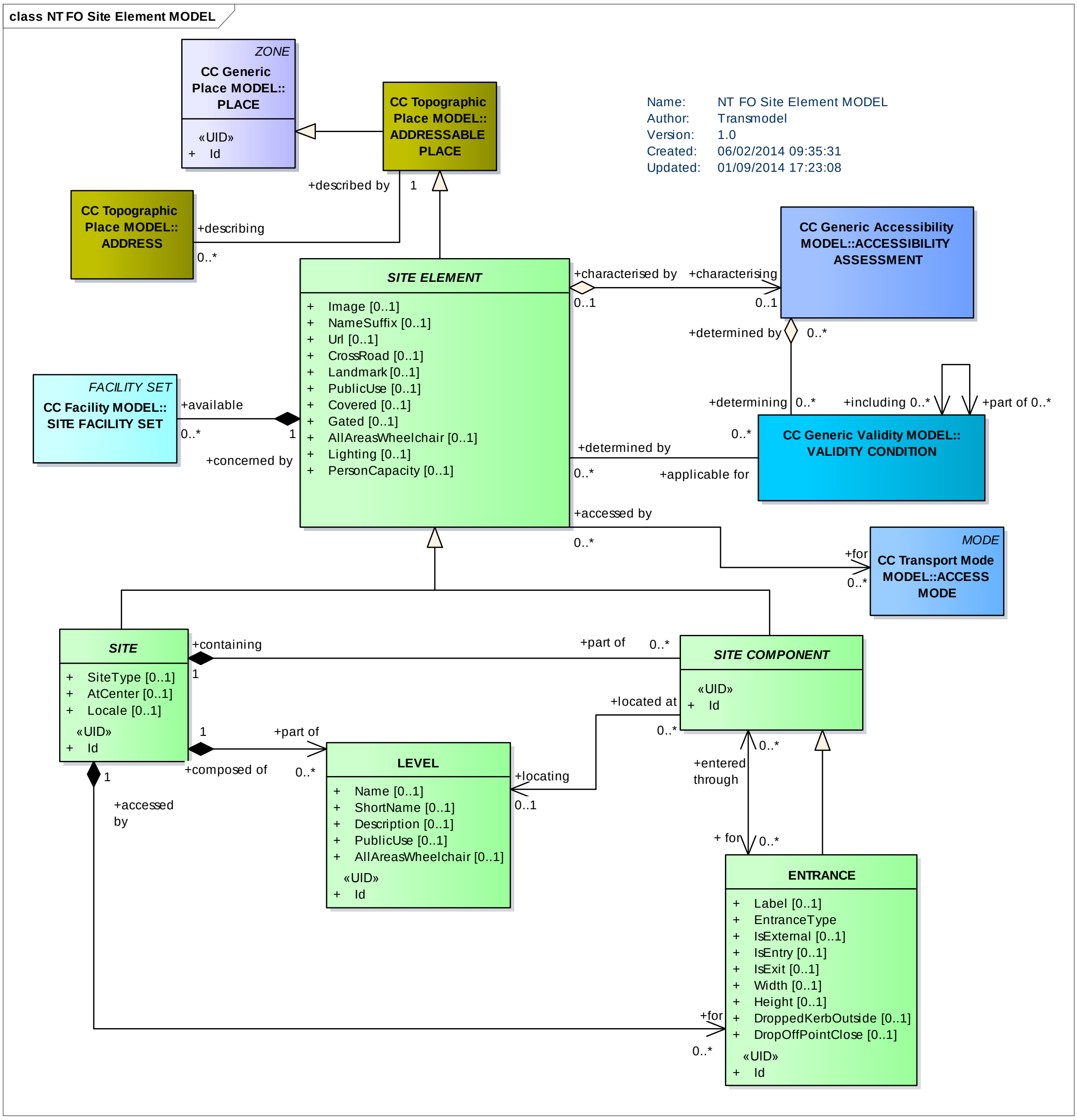


Figure 21 – Site Element –Conceptual Model

An overview of the hierarchy of the ZONEs is given in the diagram below.

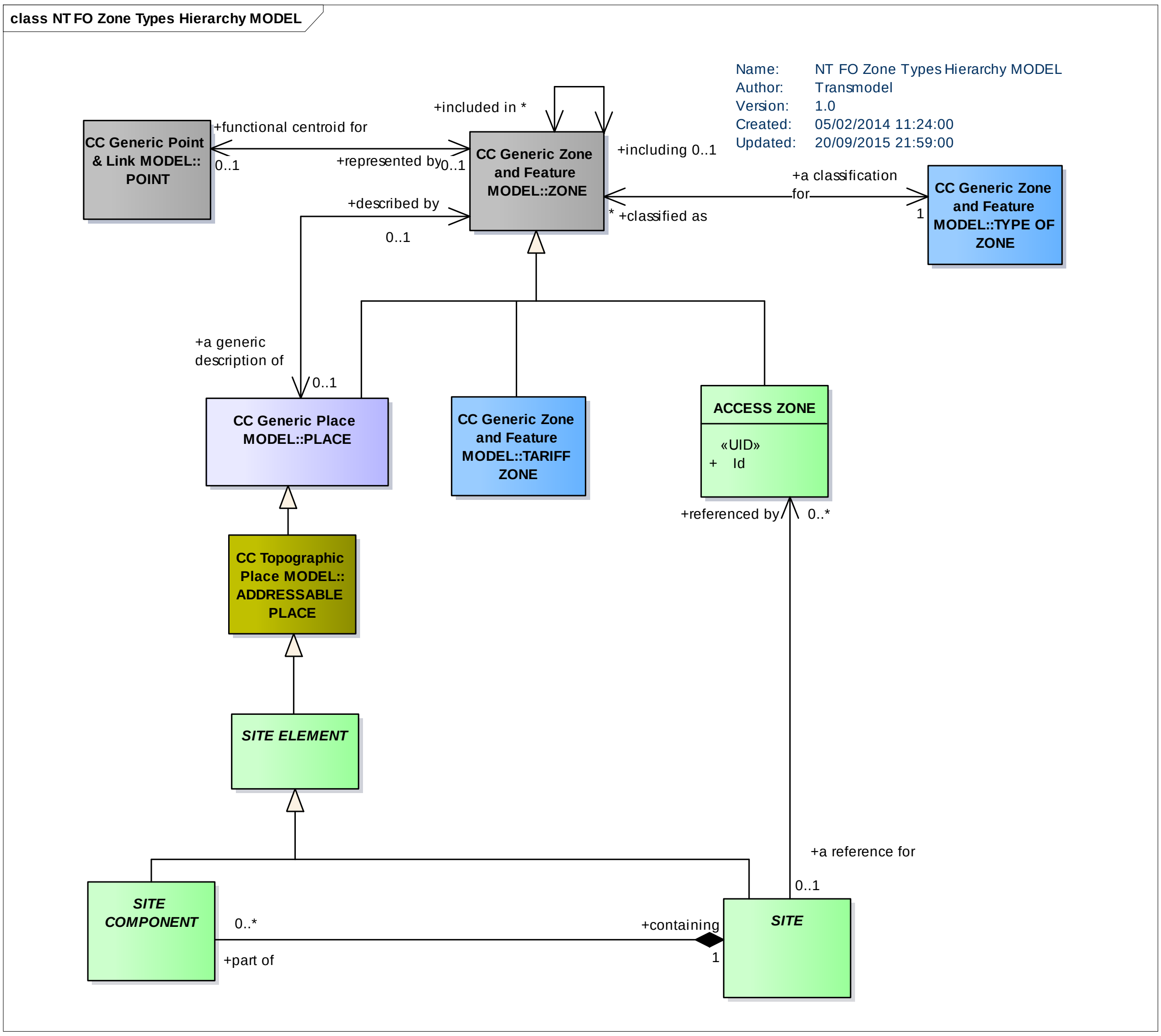


Figure 22 – Zone Types Hierarchy –Conceptual Model

5.4.2.1.3 SITE Accessibility – Conceptual Model

The accessibility of the SITE and its components can be specified using ACCESSIBILITY ASSESSMENTs. (cf. Reusable Components Model – "Public Transport Reference Data Model – Part 1: Common Concepts"). A number of different types of EQUIPMENT may also be relevant for disabled users.

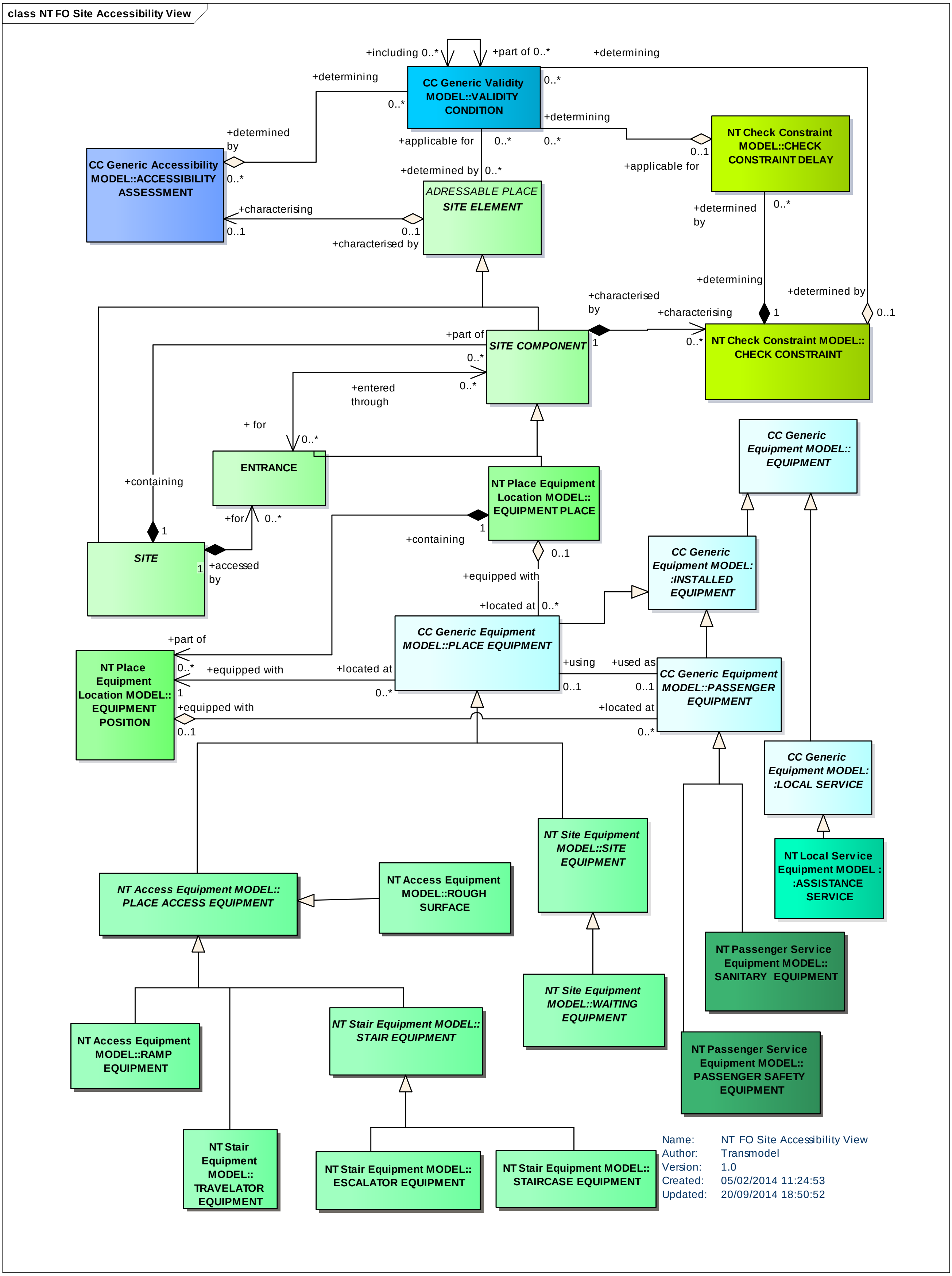


Figure 23 – Site Accessibility View – Conceptual Model

5.4.3 Stop Place

5.4.3.1 STOP PLACE – Conceptual Model

The STOP PLACE model describes different aspects of a physical point of access to transport, such as a stop or station. For a complex interchange, such as a station, this includes all the component areas of the station; the entrances, concourses, platforms; the levels they are on, the paths through the station and the various types of equipment found in the station, such as ticket machines and lifts, barriers, signs and seating. It also allows detailed accessibility attributes to be recorded at both the element and the station level.

A STOP PLACE represents a *physical* stop or station; that is an interchange, a stop point, a pair of stop points or a cluster of stop points on a LINE. A STOP PLACE is a type of SITE. Note that a STOP PLACE is a distinct concept from the representation of the stop in a timetable – the SCHEDULED STOP POINT. The two can be connected using a STOP ASSIGNMENT (cf.5.5.9).

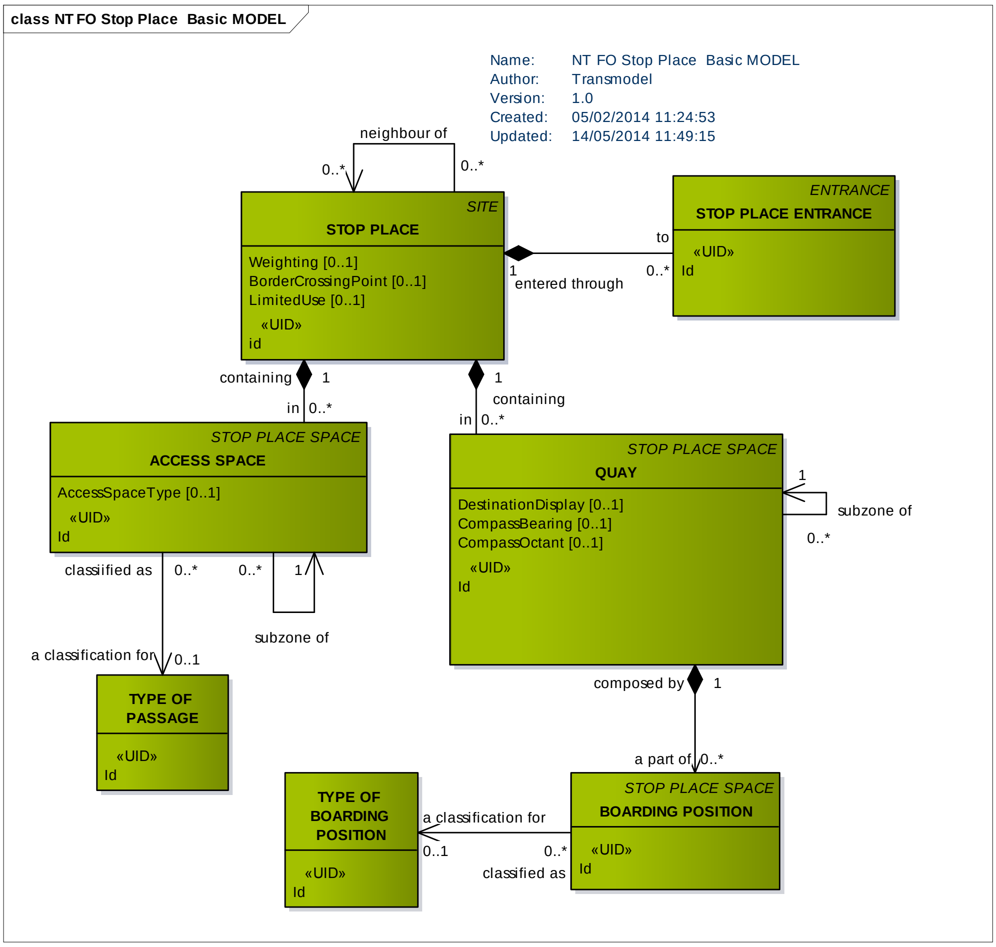


Figure 24 – Stop Place – Basic Conceptual Model

The various spaces of which a STOP PLACE is comprised are described as different types of SITE COMPONENT specific to a STOP PLACE, such as platforms (QUAYs), and concourses (ACCESS SPACEs), etc. The physical point of access to transport is always a QUAY. ENTRANCEs describe the internal and external entrances to the STOP PLACE.

— QUAYs and ACCESS SPACES can be connected to each other using PATH LINKs.

- SITE and SITE COMPONENT inherit common properties from SITE ELEMENT, including ACCESSIBILITY characteristics, and the ability to specify ALTERNATIVE NAMEs, ACCESSIBILITY, PATH LINKs, CHECK CONSTRAINTs and EQUIPMENT, all of which are discussed separately. It is also possible to specify whether the component is indoors or outdoors, or with a gated area.

Furthermore:

- Specific labelled points on a QUAY can be identified as BOARDING POSITIONs, for example the positions to board Eurostar coaches, or the doorways points to an enclosed metro line like the TfL Jubilee Line.

- STOP PLACEs can be organised into a hierarchy so that clusters of transport interchanges, such as a paired rail and tube station, can be described.

- QUAYs can be nested; this allows one to represent composite platforms with two or more sides or named sections. One can thus journey plan to any level of detail. See later below for examples. Similarly ACCESS SPACEs can be nested – within another ACCESS SPACE.

- ENTRANCEs describe points at which a passenger can access a stop place, normally on foot – an Access mode can be used to identify other permitted modes of entry such as cycle or car. ENTRANCEs can be external (for example the main entrance) or internal (for example from an entrance concourse to a platform).

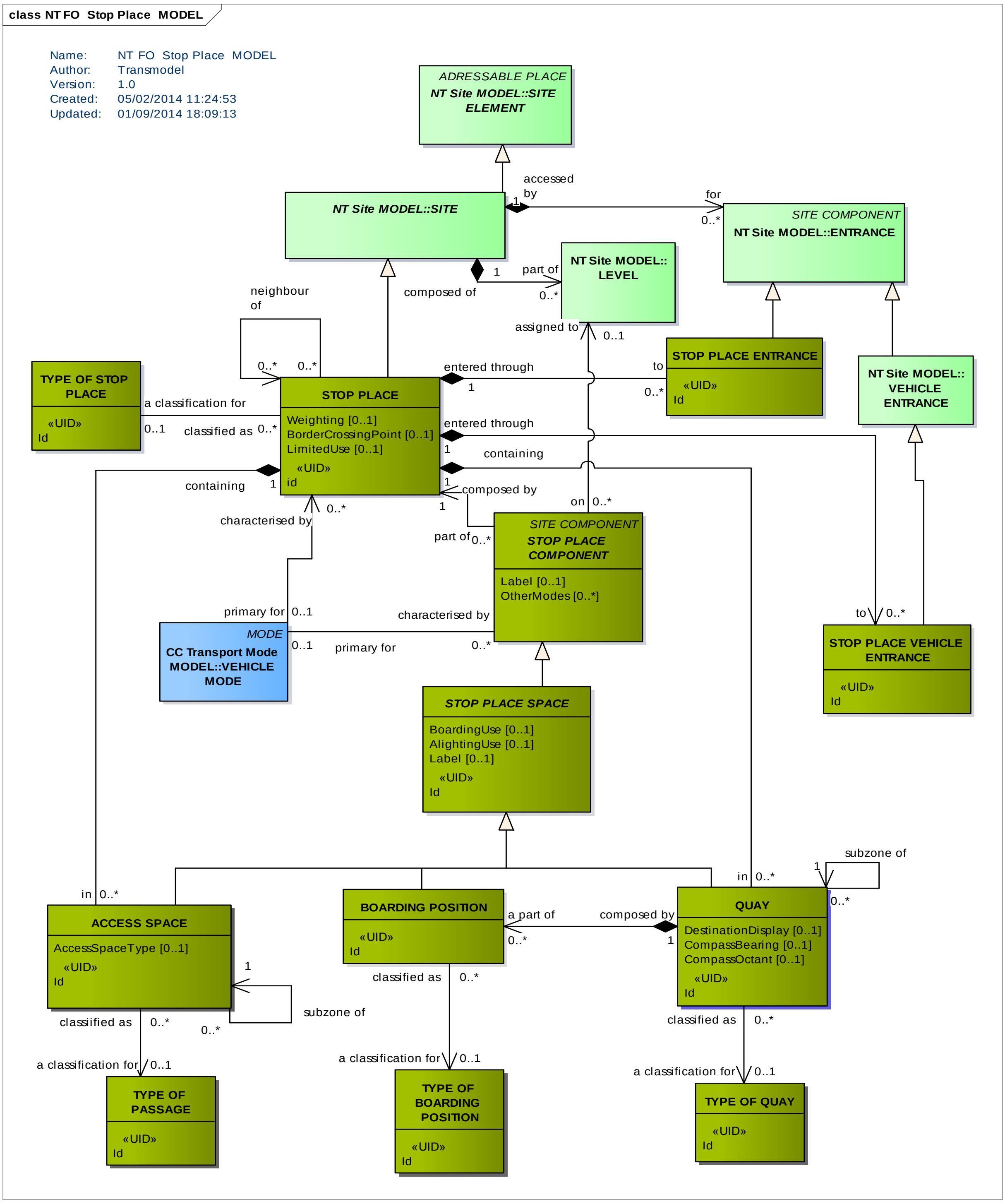


Figure 25 – Stop Place –Conceptual Model

5.4.3.2 Stop Place – Examples

Table 2 shows how the different elements would be used to represent different types of stop.

Table 2– Common stop element combinations (source NeTEx)

	Stop	*Transmodel*	Comment
On street	Single bus stop	1 STOP PLACE + 1 QUAY	EQUIPMENT for stop furniture
	Pair of bus stops on a route bus stop	1 STOP PLACE + 2 QUAYs	
	On street bus cluster	1 STOP PLACE + n QUAYs	
	Hail & Ride Zone	1 STOP PLACE + 1 FLEXIBLE QUAY	
	FlexibleZone	1 STOP PLACE + 1 FLEXIBLE QUAY	Zone projection for flexible area
Off-street	Single mode rail station	1 STOP PLACE + n QUAYs + x ACCESS SPACES + y ENTRANCEs.	Use PATH LINKs + NAVIGATION PATHs for connectivity.
	Single mode metro station	1 STOP PLACE + n QUAYs + x ACCESS SPACES + y ENTRANCEs.	
	Bus or Coach station	1 STOP PLACE + n QUAYs + x ACCESS SPACES + y ENTRANCEs.	
	Airport	1 STOP PLACE + n QUAYs + x ACCESS SPACES + y ENTRANCEs.	
Multi modal interchange	Discrete places for each mode	As for single mode, Use PARENT STOP PLACE reference to link to main STOP AREA.	
	Shared use of platforms by different modes	1 STOP PLACE + n QUAYs + x ACCESS SPACES + y ENTRANCEs. Distinct SCHEDULED STOP POINTs for each mode, with STOP ASSIGNMENTs	See example

5.4.3.2.1 Examples of simple on-street Stop Places

This section illustrates some of the commonly used combinations.

Figure 26 shows an on-street bus stop as a simple STOP PLACE with a single QUAY for a single direction, as might commonly be found at a terminus of a service.

Figure 26 – Example of a single bus stop on street (source NeTEx-Part1)

Figure 27 shows an on-street bus stop pair named '*St George's Road'* as a simple STOP PLACE with two QUAYs, one for each direction.

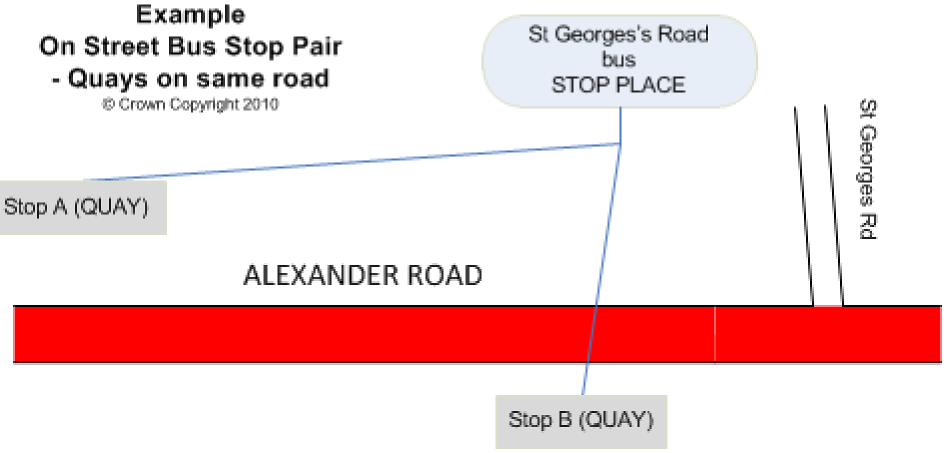


Figure 27 – Example pair of bus stops on street (source NeTEx-Part1)

Figure 28 shows an on-street bus cluster as a simple STOP PLACE with four QUAYs.

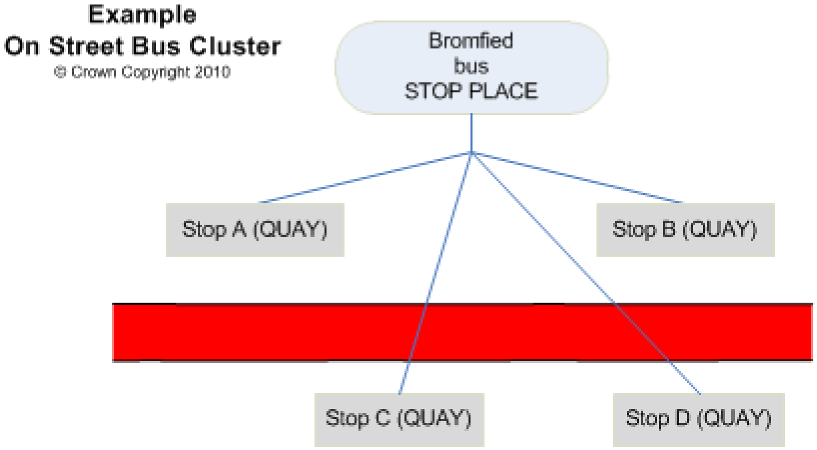


Figure 28 – Example bus cluster on street (source NeTEx-Part1)

5.4.3.2.2 Simple Examples of Stations

Figure 29 shows a simple rail station with two platforms connected by a barrow crossing represented by two QUAYs and various different types of ACCESS SPACE.

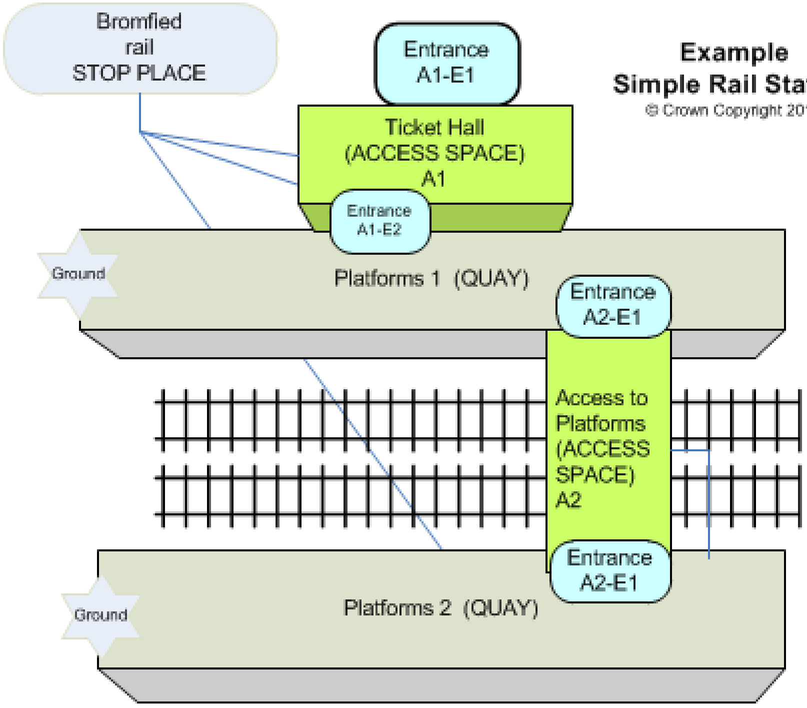


Figure 29 – Simple Rail Station Example – Barrow crossing((source NeTEx-Part1)

Figure 30 shows a simple rail station with two platforms connected by a bridge (or subway), represented by two QUAYs and various different types of ACCESS SPACE.

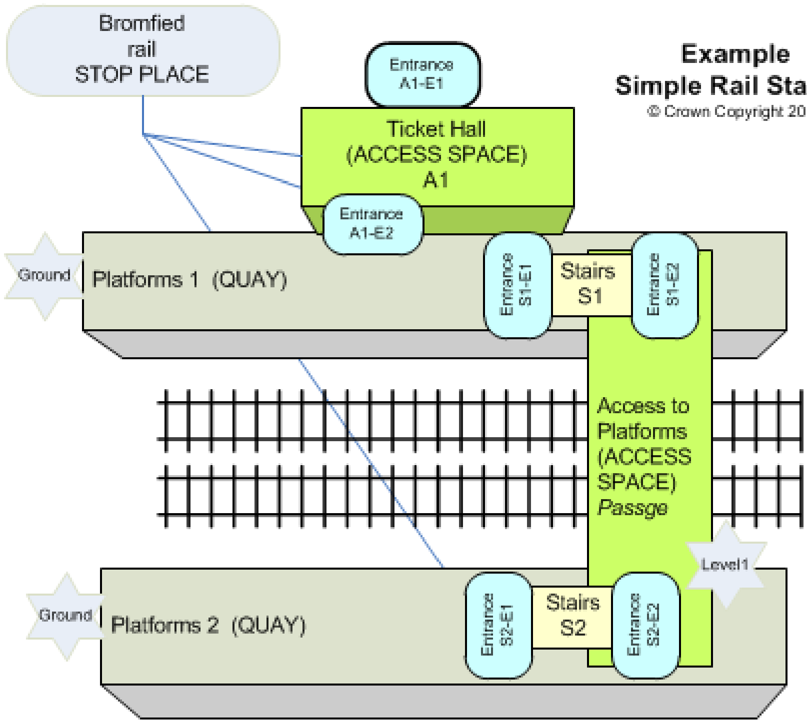


Figure 30 – Simple Rail Station Example – Crossing with stairs (source NeTEx-Part1)

Figure 31 shows a slightly more complicated example of rail station with four platforms connected by a bridge (or subway) and two ENTRANCEs on different LEVELs.

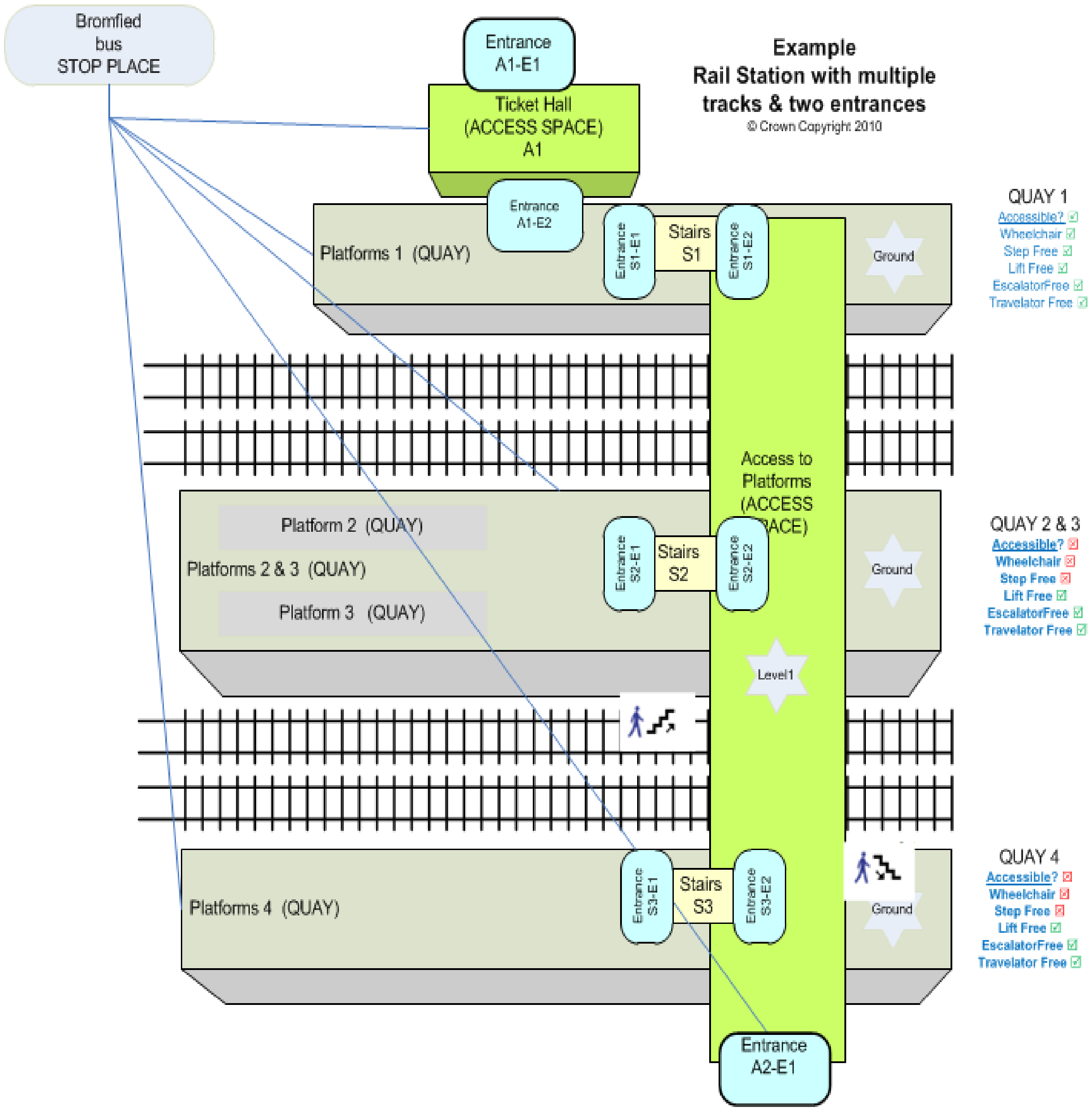


Figure 31 – Rail Station example with multiple platforms (source NeTEx-Part1)

5.4.3.2.3 Nesting Stop Places

Sometimes a complex SITE is made up of a number of different SITEs, for example a large rail STOP PLACE may contain a metro station as a child STOP PLACE and have associated STOP PLACEs for the stops of the bus routes that pass by it – see Figure 32.

— There should be a separate STOP PLACE for each transport mode (But see discussion below of shared multimodal use of platforms).

— A separate STOP PLACE should be created if an area of a station can be referenced as a separate station by a timetable or other passenger information usage. For example "*St Pancras Domestic"* and "*St Pancras International*".

— There should be a separate STOP PLACE for each pair of bus or tram stops (or isolated stop) on street.

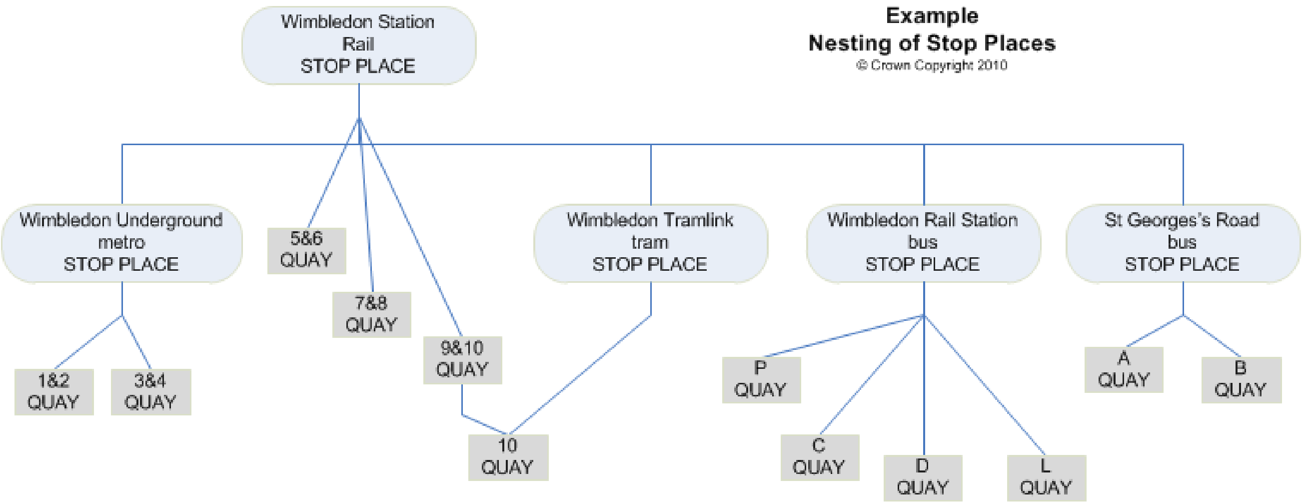


Figure 32 – Example Nesting of Stop Places (source NeTEx-Part1)

5.4.3.2.4 Nesting Quays / Platforms

Several arrangements of composite platforms are commonly found in stations, for example one sided, two sided, etc. Figure 33 illustrates common configurations.

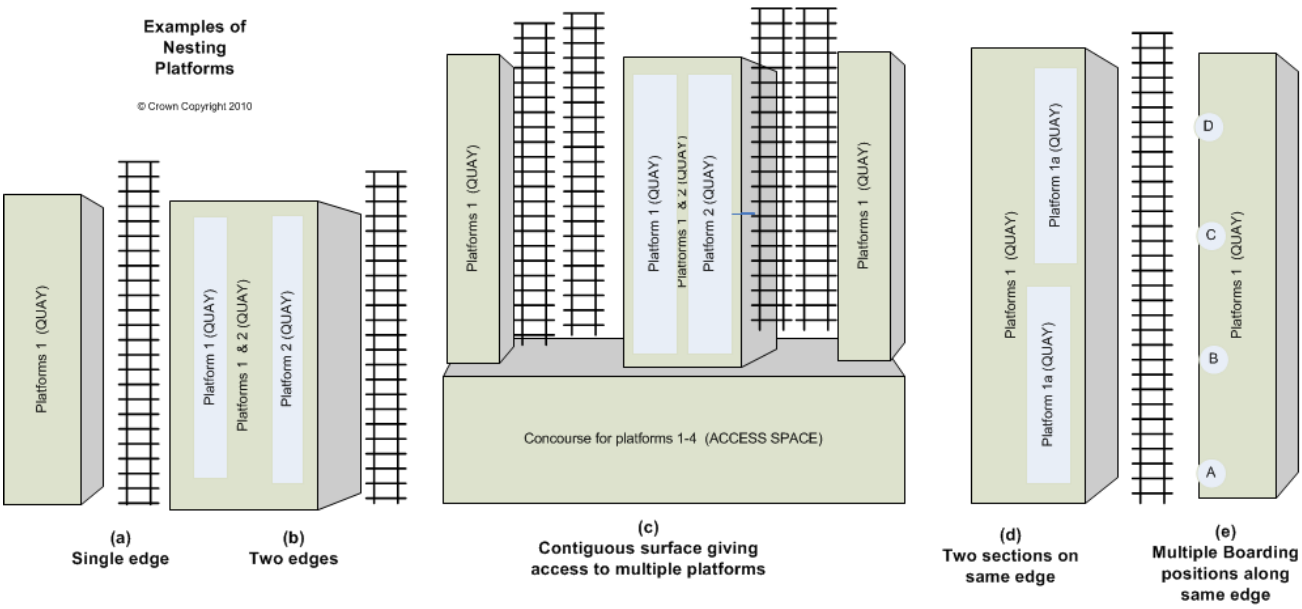


Figure 33 – Common QUAY configurations for station platforms (source NeTEx-Part1)

Figure 33 and Table 3 summarise the common configurations along with a recommended representation using *Transmodel* elements. Further more

- A nested QUAY is always physically contiguous with its parent and so has the same accessibility characteristics as it parents.
- Nested QUAYs should not be used to mark individual positions on a platform – BOARDING POSITIONs are used for this purpose.
- Nested QUAYs and ACCESS PLACES must always be on the same LEVEL as their parent.

Table 3 – Nested QUAY configurations. (source NeTEx-Part1)

Quay Arrangement	Description	Modelling in *Transmodel*
Single edged platform	A single physical platform with a track along a single side	A single QUAY
Double edged platform	A single physical platform with tracks along both sides. Examples; *Wimbledon 5 & 6*	A parent QUAY with two nested child QUAYs for each side.
Multiple section same edge	A physical platform divided into sections on the same side, for example to indicate train sections that will go to different destinations. Examples: *Cambridge*	A parent QUAY with separate nested child QUAYs for each section. There may be BOARDING POSITIONs to mark points on the platform for each specific carriage
Multiple sections both edges	A physical platform divided into sections on both sides.	A parent QUAY with nested child QUAYs for each side, and separate nested child QUAYs for each section
Contiguous surface giving access to multiple platforms	A collection of platforms joined by a contiguous end section: usually found at a terminus or a large station that is a terminus or where some of the tracks terminate. Examples: *Kings Cross, Cambridge, Wimbledon District Line platforms 1-4*	An ACCESS SPACE for the end section and separate QUAYs for each platform as above. **Not** a parent QUAY for the whole contiguous area containing nested QUAYs for each platform.

5.4.3.2.5 Multimodal use of the same platform

Usually there will be a separate STOP PLACE for each transport mode at an interchange, each with its own QUAYs, and with distinct ENTRANCEs. Sometimes however STOP PLACEs for different modes may be intermingled, with the same platform being shared; for example between rail, tram or metro, or between bus and coach, or bus and tram.

For example, in the Wimbledon example given earlier there are distinct *Wimbledon Rail Station* and *Wimbledon Tramlink* STOP PLACEs, even though they both share platform 10.

- Where platforms are shared between modes, a single definition of the platform i.e. QUAY can be made. The STOP PLACE for the major mode (e.g. *rail*) can contain the QUAY definition. Two alternative approaches are possible.

  (i) Create a separate STOP PLACE for the additional mode; the STOP PLACE mode can reference the QUAY definition.

  (ii) Simply specify multiple modes for the STOP PLACE and the QUAY (e.g. *rail, metro*).

- The rail STOP PLACE can state tram as another mode and vice versa.

- Typically there will be separate SCHEDULED STOP POINTs for the Tram and for the Rail timetables.

- In addition there can be separate PASSENGER STOP ASSIGNMENTs to assign different SCHEDULED STOP POINTs for each mode to the same QUAY.

5.4.3.2.6 Representing an Entrance between two adjacent spaces

Where there is an ENTRANCE between two adjacent spaces (e.g. ACCESS SPACEs or QUAYs), it is not necessary to create two separate ENTRANCE elements. Instead a single ENTRANCE can be created and shared between the two spaces.

- ENTRANCEs are normally specified as properties of the overall SITE i.e. STOP PLACE.

- ENTRANCEs may be referenced additionally by the ACCESS SPACES and QUAYs which use them.

5.4.4 Flexible Stop Place

5.4.4.1 FLEXIBLE STOP PLACE – Conceptual Model.

Hail and ride or zone-based Flexible services which serve a section of road or an area can be represented in *Transmodel* using FLEXIBLE STOP PLACEs and FLEXIBLE QUAYs. This allows the sections or zones to appear as named “stops” in their own right in a journey planner. It has to be noted that flexible services can also use regular STOP PLACEs and QUAYs.

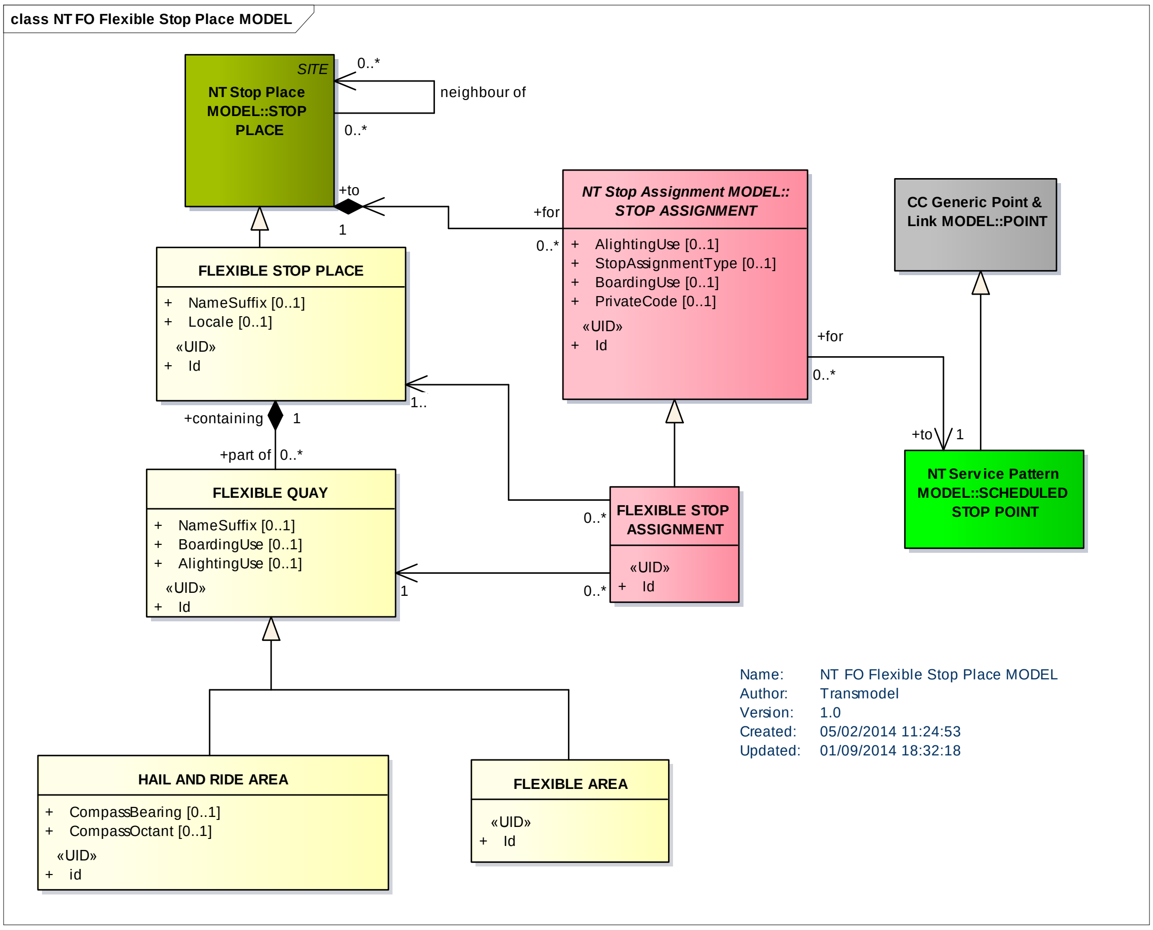


Figure 34 – Flexible Stop Place – Conceptual Model

5.4.4.2 Flexible Stop Place – Examples

The following sections show examples of flexible stops

5.4.4.2.1 Simple Examples Hail and Ride Stop

Figure 35 describes a Hail and Ride section along a bus line (in red). It has two separated start and end points, one for each direction. Between start and end point, the vehicle can be stopped on any point (on passenger demand) for boarding or alighting.

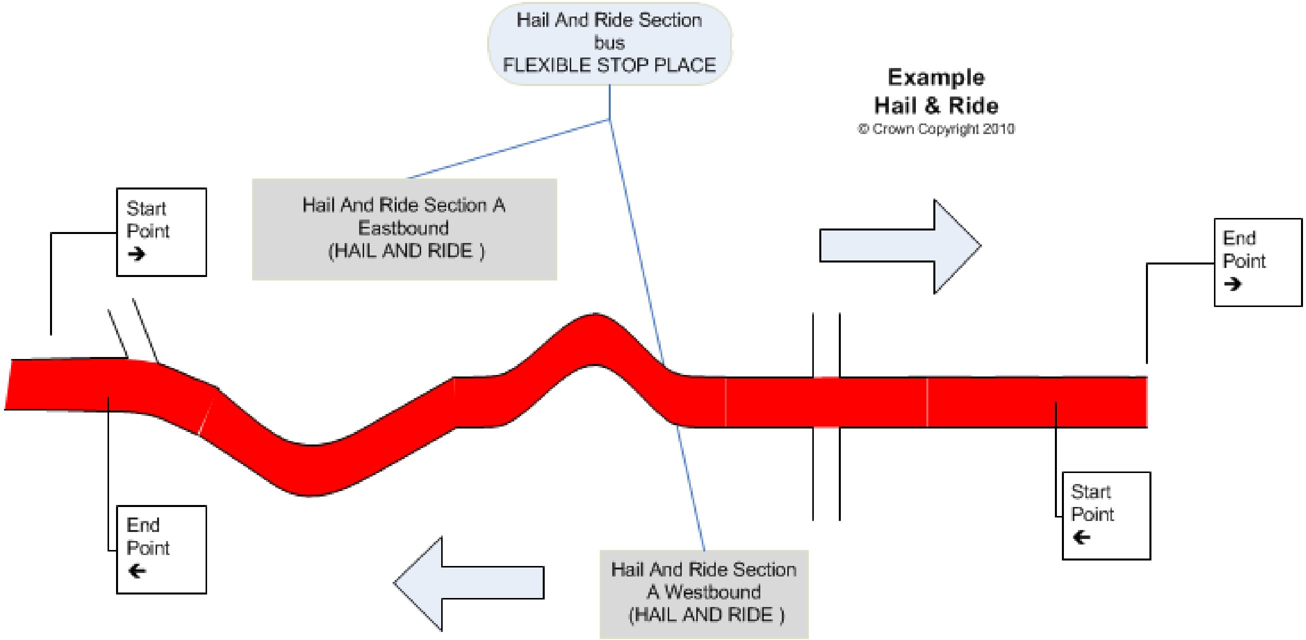


Figure 35 – Example of Hail and Ride Stop (source NeTEx-Part1)

5.4.4.2.2 Simple Examples of Flexible Stop

Figure 36 describes two flexible zones on some bus lines (main route in red). In this example, Hail and Ride is available for any part of the bus lines inside the defined flexible zones.

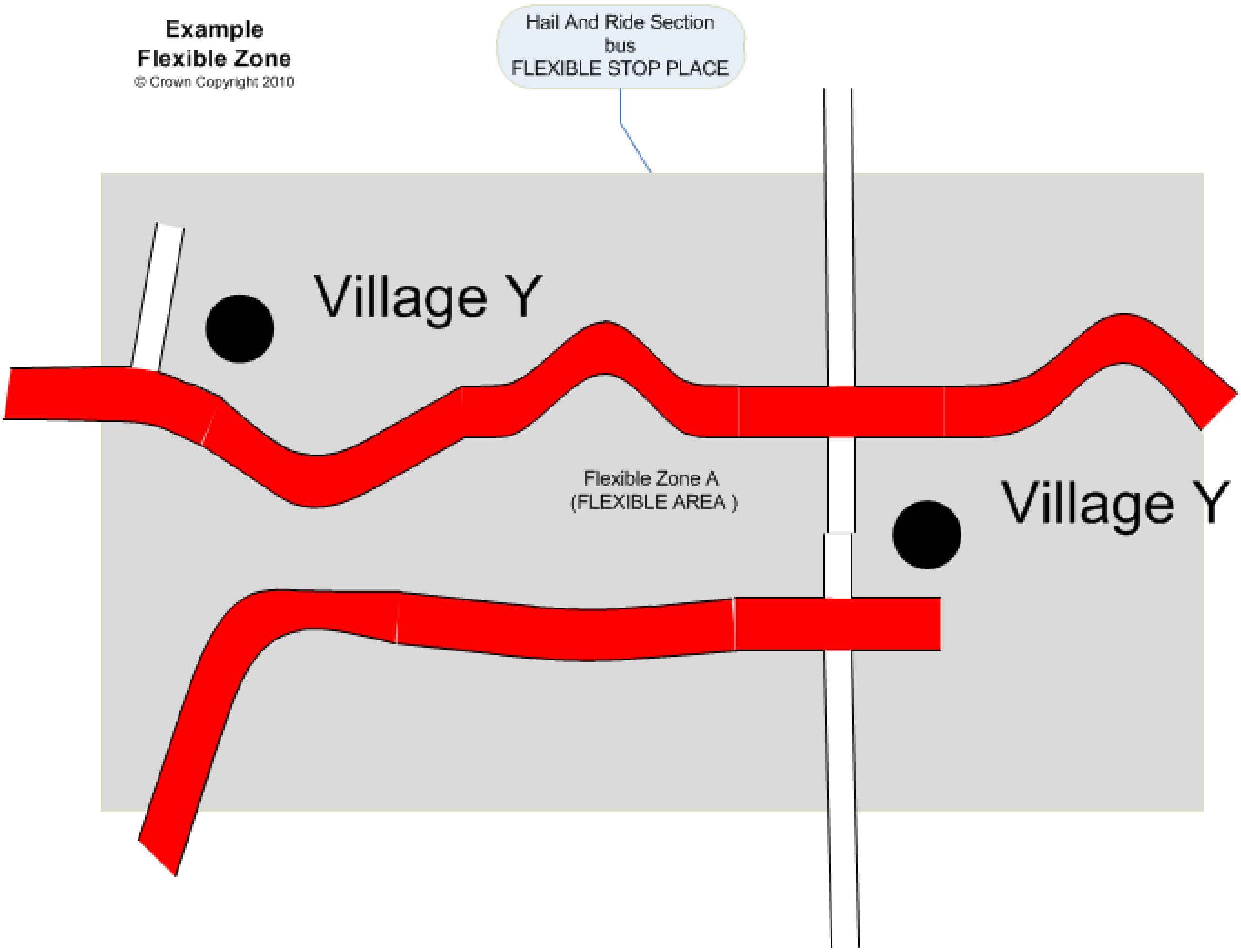


Figure 36 – Example of Flexible Zone (source NeTEx-Part1)

5.4.5 Associating Equipment with Site Components

EQUIPMENT can be located within a SITE with an EQUIPMENT PLACE using both relative (e.g. 6m along a link) or absolute (e.g. WGS coordinates). In many cases it is sufficient just to associate equipment with a SITE COMPONENT. In other cases it is useful to give a precise location.

Certain types of equipment are LOCAL SERVICEs that are not placed but rather associated with the STOP PLACE as a whole.

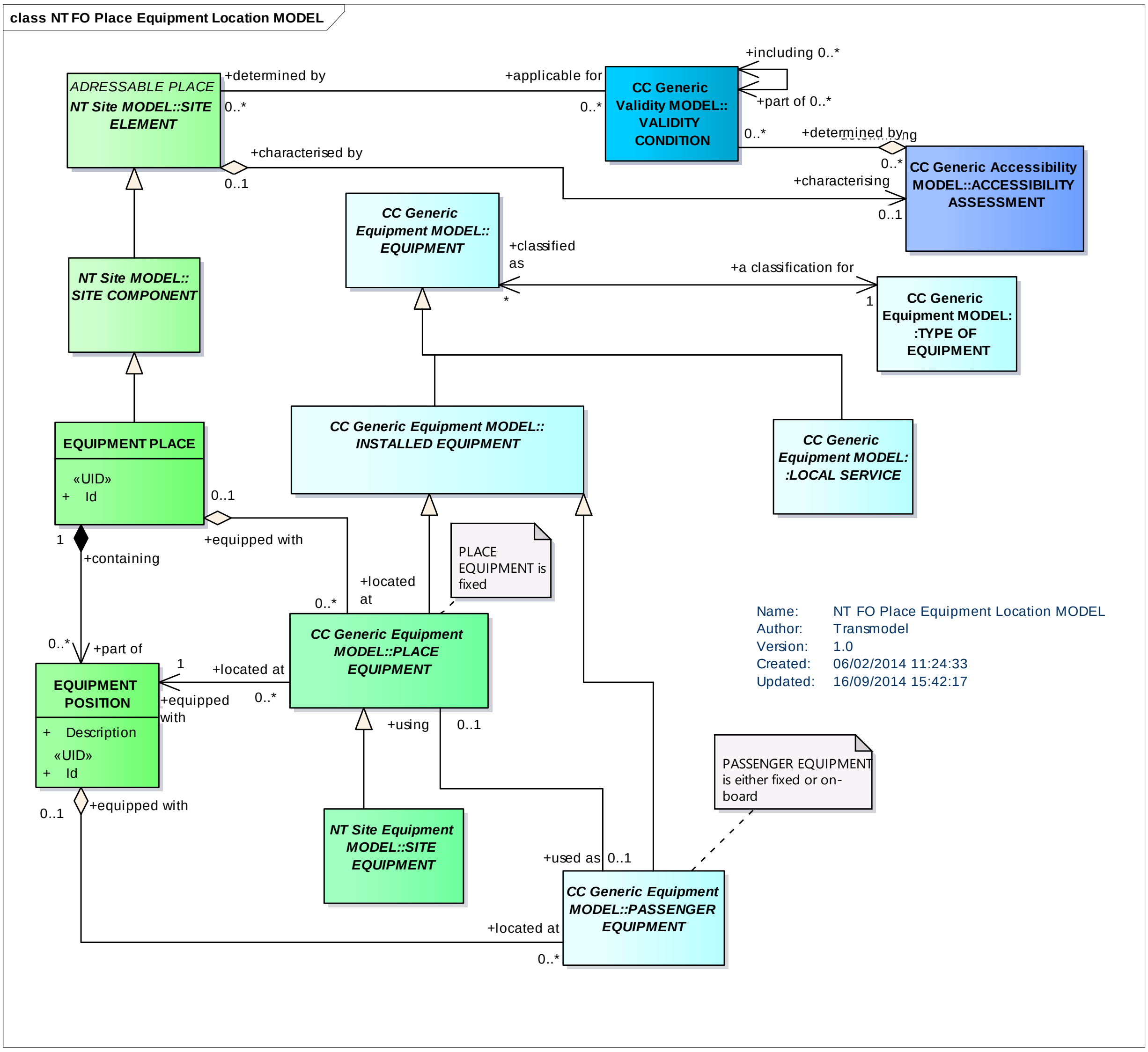


Figure 37 – Place Equipment Location – Conceptual Model

5.4.6 Equipment Description Overview

The topological components of a SITE (that is constituent parts of STOP PLACEs, POINTs of INTEREST etc.), such as QUAYs, ACCESS SPACEs, ENTRANCEs and PATH LINKs can be annotated with equipment, images and other attributes that describe the detailed properties of the interchange, for example, lifts, or stairs, ticket barriers, surfaces, and their accessibility properties. *Transmodel* provides a systematic set of standardised EQUIPMENT objects, describing different types of equipment including ticket machines, doors, gates, ramps, seats, phones and information displays with standardised attributes.

The Equipment Description Models describe the EQUIPMENT that can be associated with STOP PLACEs.

The sub-models depend on a number of general framework models, in particular the Generic Equipment Model described in “Public Transport Reference Data Model: Part 1 - Common Concepts**”.**

The different sub-models are:

- Waiting and Luggage Equipment Model: models site specific EQUIPMENT.
- Ticketing Equipment Model: Models EQUIPMENT for ticket validation,
- Passenger Service Equipment Model: EQUIPMENT Model for passenger services (e.g. sanitary equipment).
- Site Access Equipment Model: models EQUIPMENT for access to a SITE (e.g. ramps, entrance equipment, stairs, lifts, etc but also heading signs, etc)
- Local Service Equipment and Local Commercial Service Model: models services linked to transport and other (commercial) services.

5.4.7 Waiting and Luggage Equipment

5.4.7.1 Waiting and Luggage Equipment – Conceptual Model

Various types of WAITING EQUIPMENT can be specified including SEATING, WAITING ROOMs.

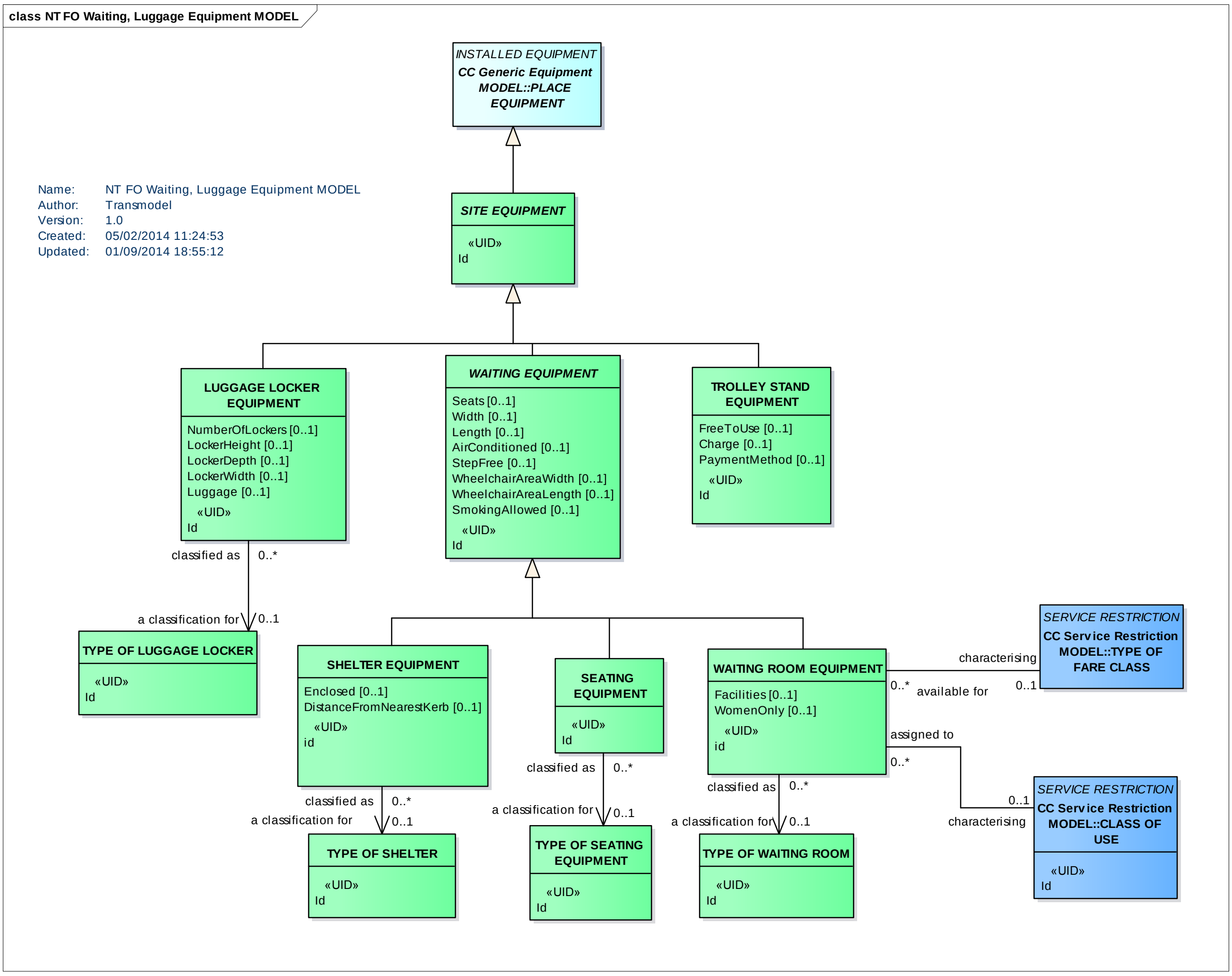


Figure 38 – Waiting & Luggage Equipment – Conceptual Model

5.4.8 Point Of Interest

5.4.8.1 POINT OF INTEREST – Conceptual Model

STOP PLACEs are a type of SITE that provides access to public transport. A POINT OF INTEREST is another type of SITE used to represent a well-known attraction such as a museum, stadium, park, venue, etc. Like a STOP PLACE a POINT OF INTEREST may comprise SITE COMPONENTs such as designated ENTRANCEs and SITE SPACEs. PATH LINKs and NAVIGATION PATHs may be used to connect to it and within it and ACCESSIBILITY properties may be assigned. Some types of EQUIPMENT are also relevant, for examples lifts, stairs.

In addition a POINT OF INTEREST may be described by one or more POINT OF INTEREST CLASSIFICATIONs. These can be organised into a POINT OF INTEREST CLASSIFICATION HIERARCHY which provides a way of exchanging categorisations of points of interest.

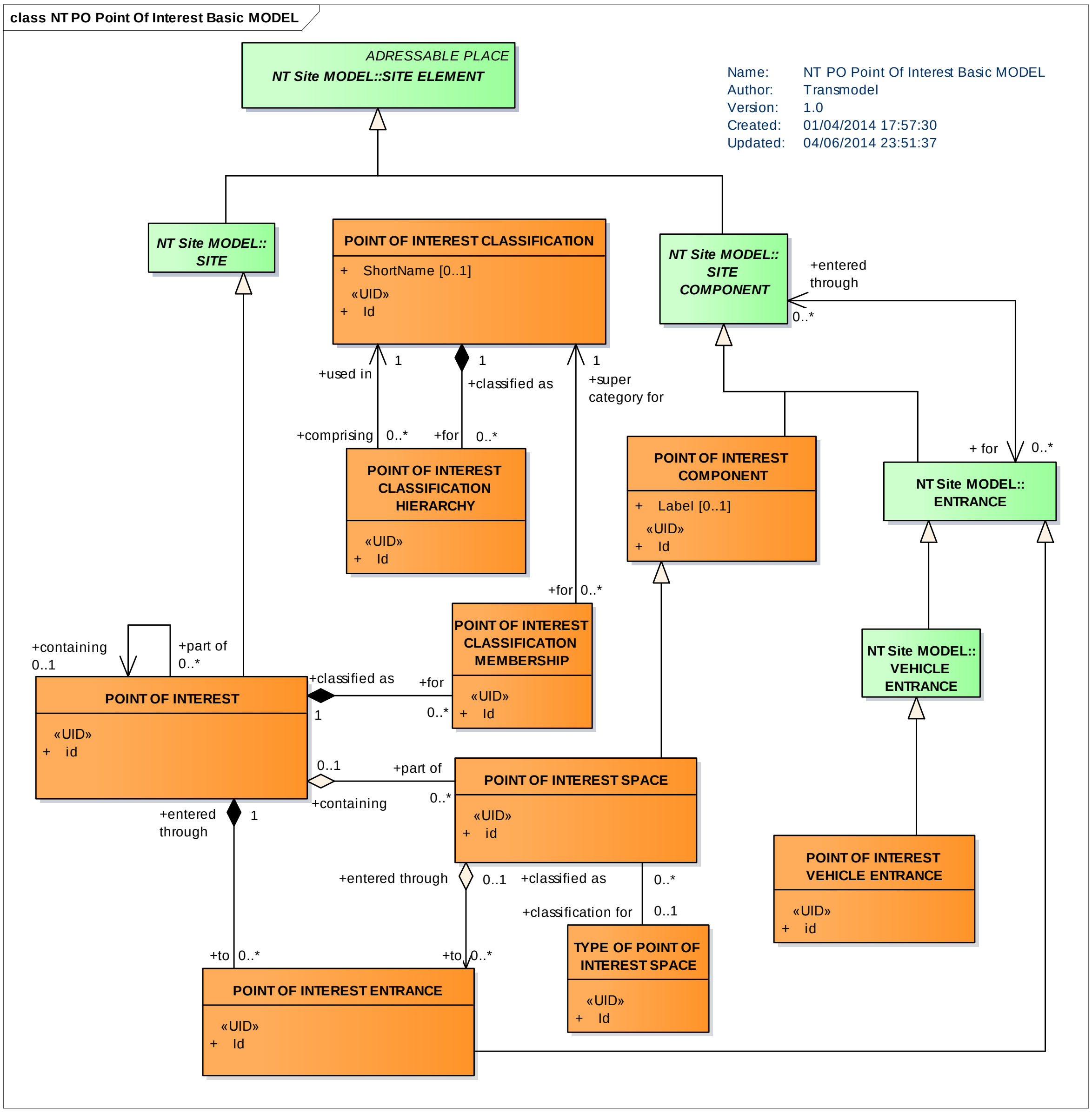


Figure 39 – Point of Interest – Basic Conceptual Model

As a specialisation of a SITE, a POINT OF INTEREST may be characterised by additional features, such as ACCESSIBILITY, VALIDITY CONDITIONS, etc as shown in Figure 40.

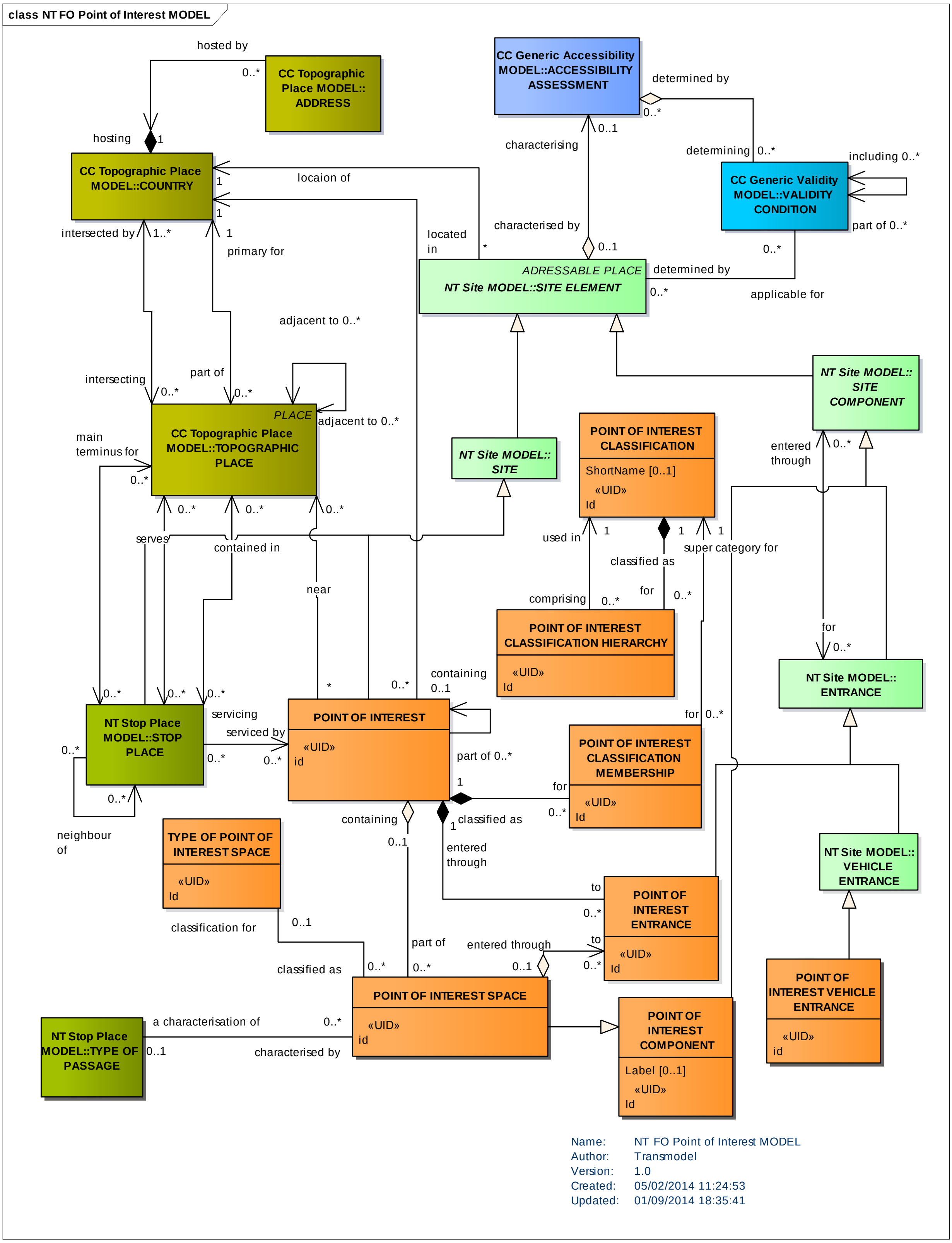


Figure 40 – Point of Interest–Conceptual Model

5.4.8.2 Point of Interest – Examples

5.4.8.2.1 Example of Point of Interest – Basic Stadium

Figure 41 shows the use of SITE COMPONENTs to describe the existence of a stadium with four separate ENTRANCEs.

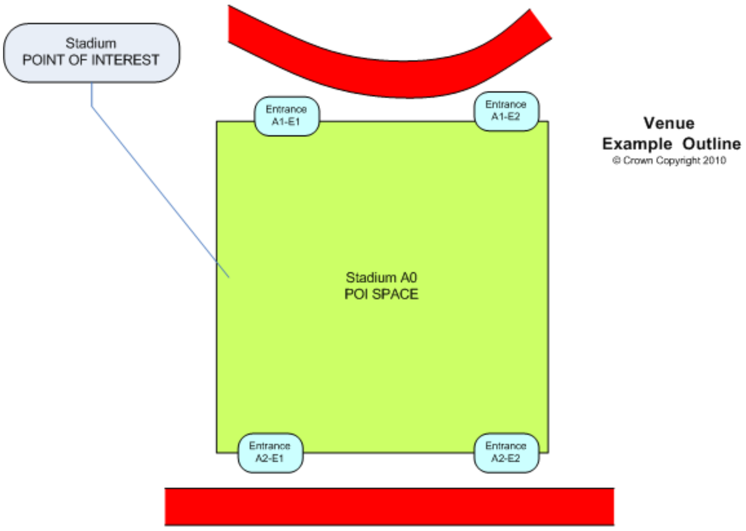


Figure 41 – Example Basic Point of Interest (source NeTEx-Part1)

5.4.8.2.2 Example of Point of Interest – Stadium with Stands

Figure 42 shows the use of SITE COMPONENTs to describe access details to the same stadium shown in slightly more detail with two separate ENTRANCEs and security check areas. PATH LINKs describe the connectivity within the site

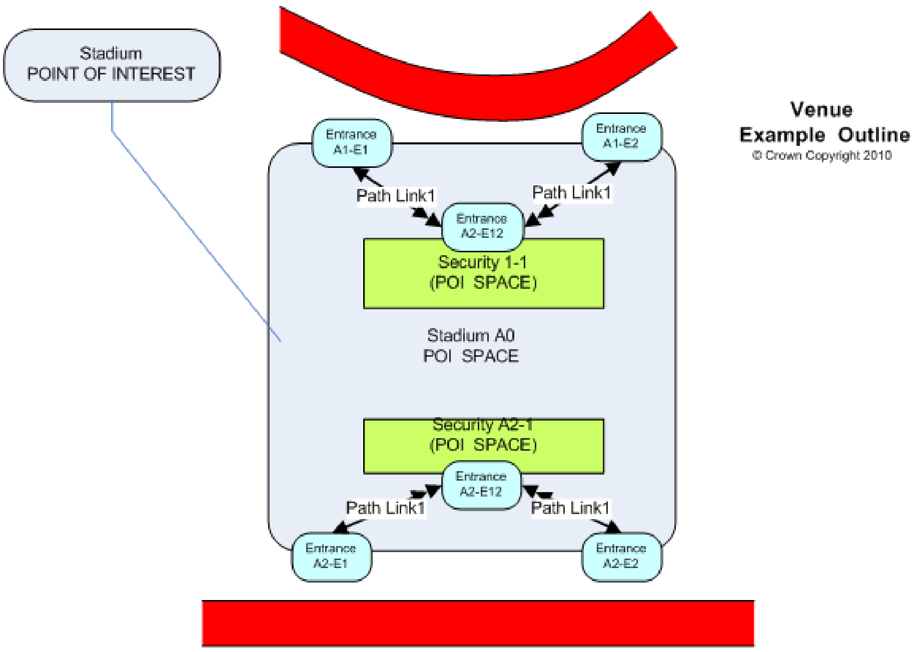


Figure 42 – Example Point of Interest – Stadium Outline (source NeTEx-Part1)

5.4.8.2.3 Example of Point of Interest – Stadium with detail

Figure 43 shows the use of SITE COMPONENTs to further describe the internal parts of the stadium sufficient to indicate the ENTRANCE to use to reach a given set of seats.

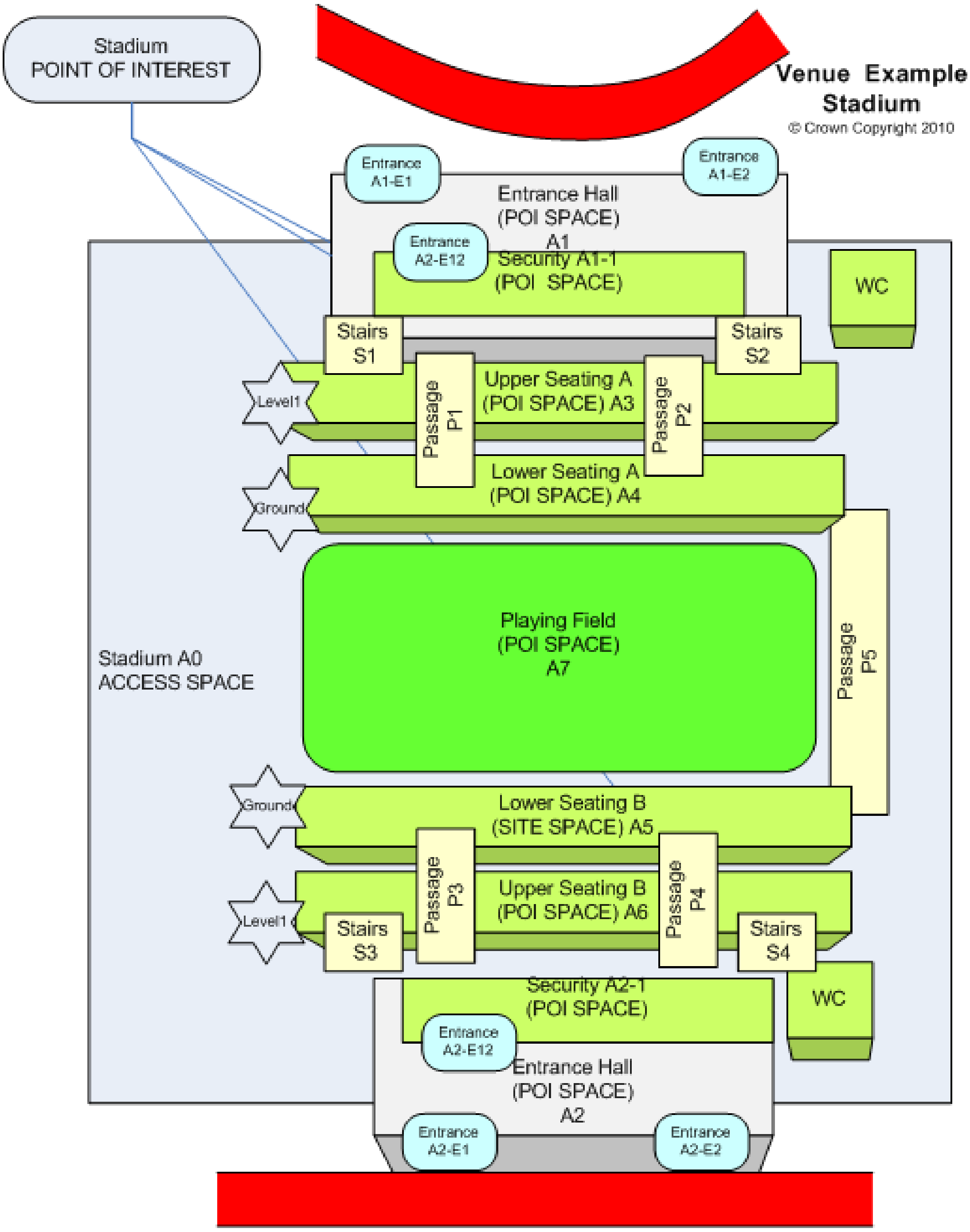


Figure 43 – Example Point of Interest – Stadium (source NeTEx-Part1)

5.4.8.2.4 Example of Point of Interest – Large Stadium

Figure 44 shows the use of SITE COMPONENTs to describe the seat number ranges within a large stadium so that the appropriate ENTRANCE can be selected.

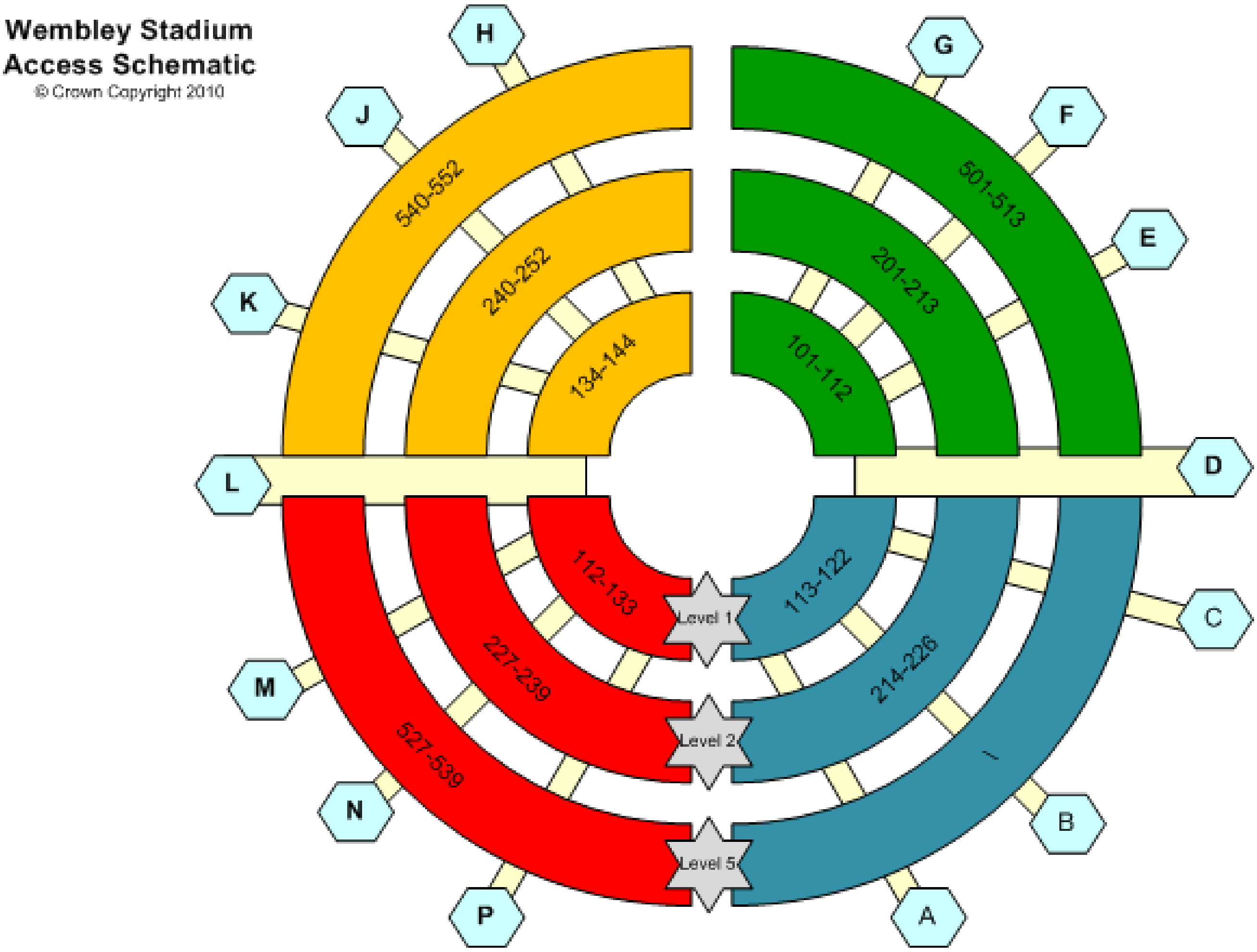


Figure 44 – Example Point of Interest – Stadium with Numbered sections (source NeTEx-Part1)

5.4.9 Passenger Service Equipment

5.4.9.1 Passenger Service Equipment – Conceptual Model

There are three types of Passenger Service Equipment: PASSENGER SAFETY EQUIPMENT, describing help points etc.; SANITARY EQUIPMENT describing toilets and washing amenities, and RUBBISH DISPOSAL, describing bins for different categories of waste.

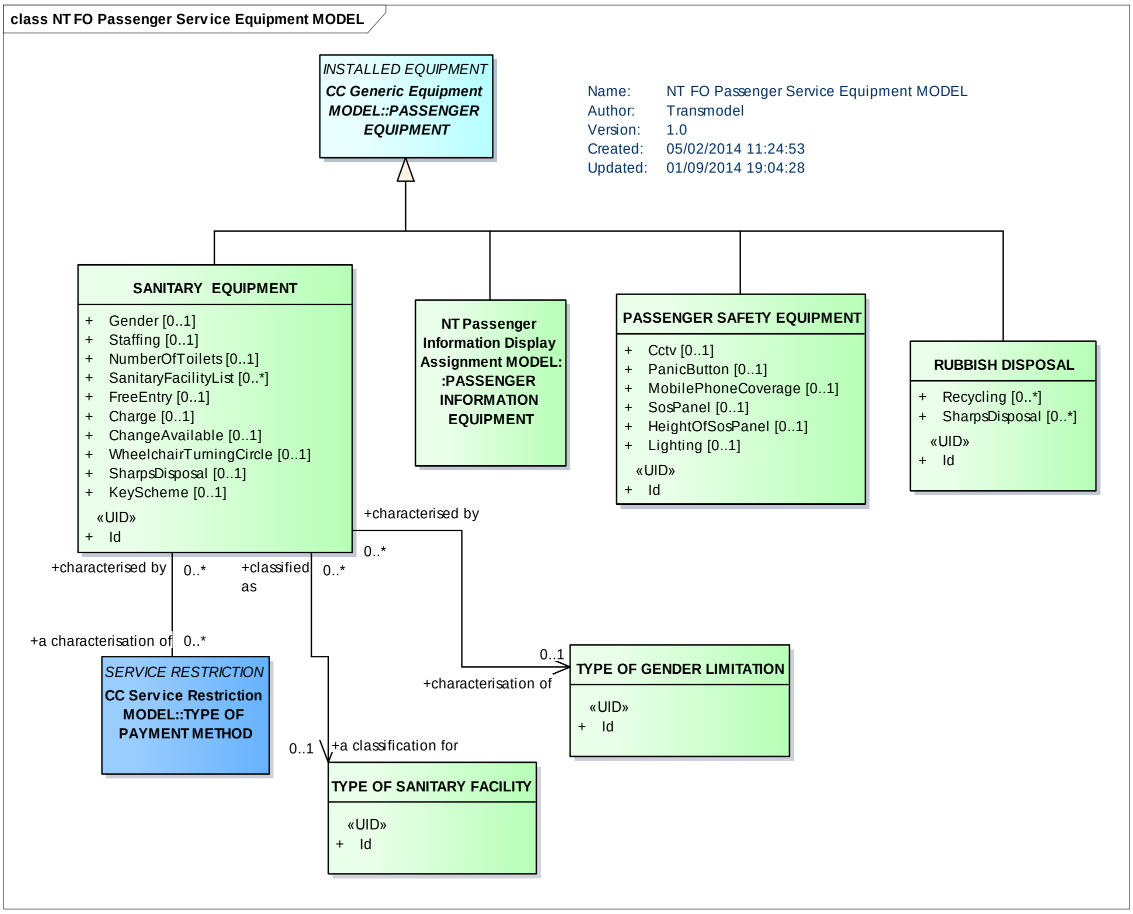


Figure 45 – Passenger Service Equipment – Conceptual Model

5.4.10 Ticketing Equipment

5.4.10.1 TICKETING EQUIPMENT – Conceptual Model

TICKETING EQUIPMENT describes elements relevant for ticketing. Figure 46 shows the Conceptual model for TICKETING EQUIPMENT.

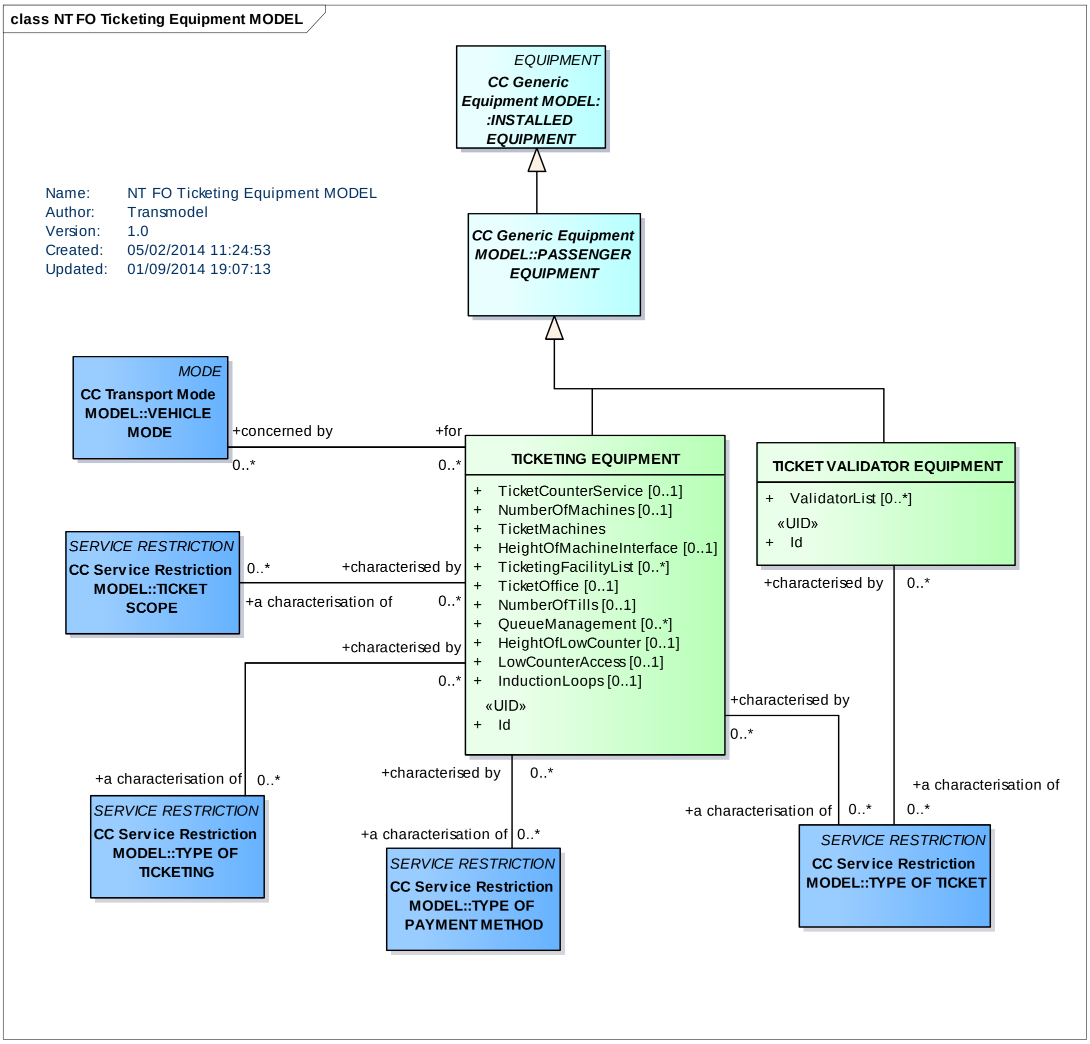


Figure 46 – Ticketing Equipment – Conceptual Model

5.4.11 Site Access Equipment

5.4.11.1 ACCESS EQUIPMENT – Conceptual Model

ACCESS EQUIPMENT describes equipment and properties relating to access to a SITE by a passenger, such as STAIRs, RAMPs, ESCALATORs, QUEUING EQUIPMENT, surfaces, lighting, etc., and also sign equipment.

Stations typically have carefully designed signage located at critical decision points within the interchange – for example '*District Line Northbound'*, *'London Trains platform 3 & 4', 'Exit to Centre Court Shopping Centre*', etc. *Transmodel* treats signs as a kind of EQUIPMENT whose contents and locations can be specified exactly. This makes it possible to create detailed journey plan instructions, augmented reality guides and other applications for the interchange that refer to what the user can see if they are positioned within it.

The overall model is presented in Figure 47.

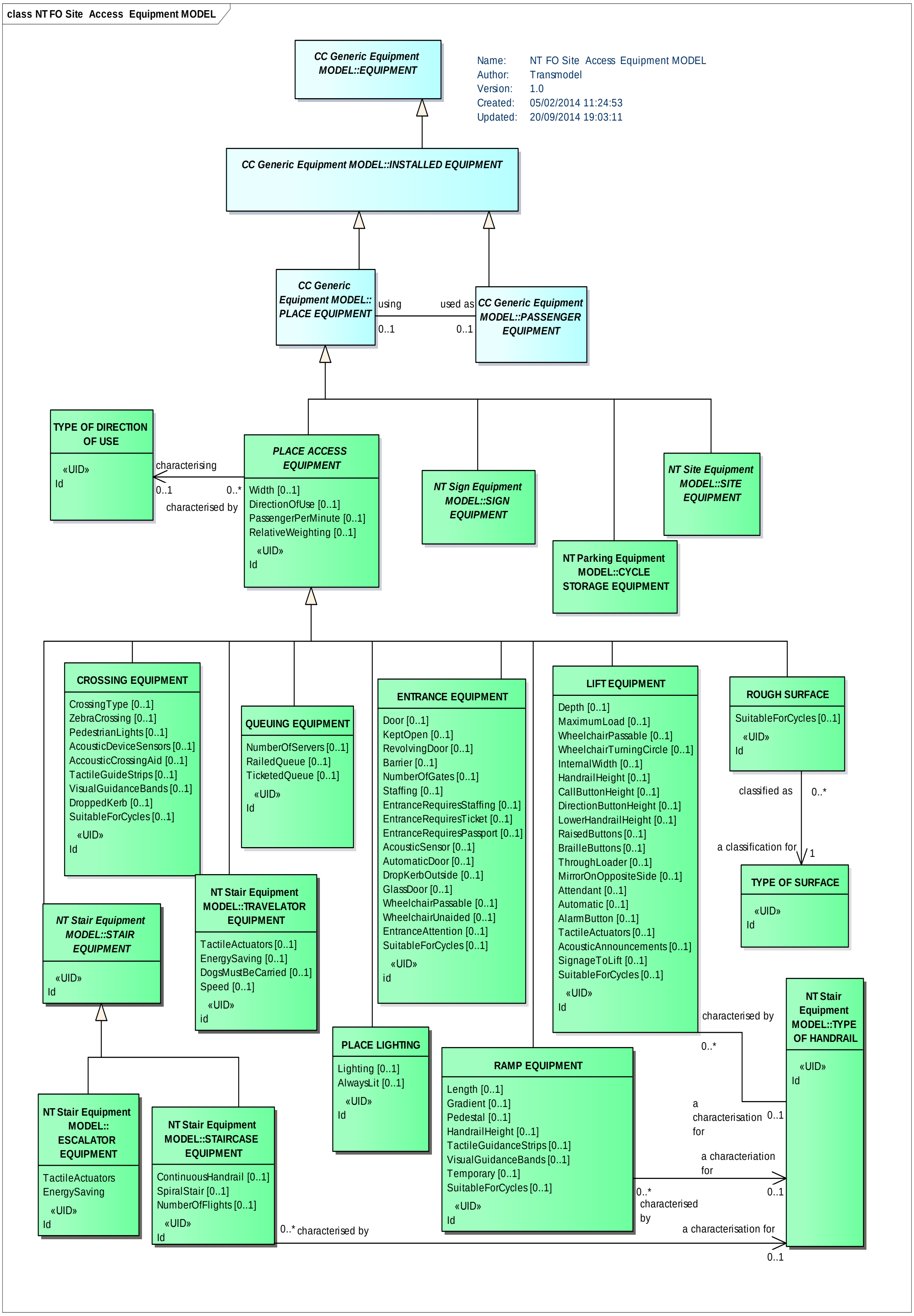


Figure 47 – Site Access Equipment – Conceptual Model

SIGN EQUIPMENT can define signs visible to passengers at places in a SITE, such as PLACE SIGNS, HEADING SIGNs, etc., which can be used to provide guidance.

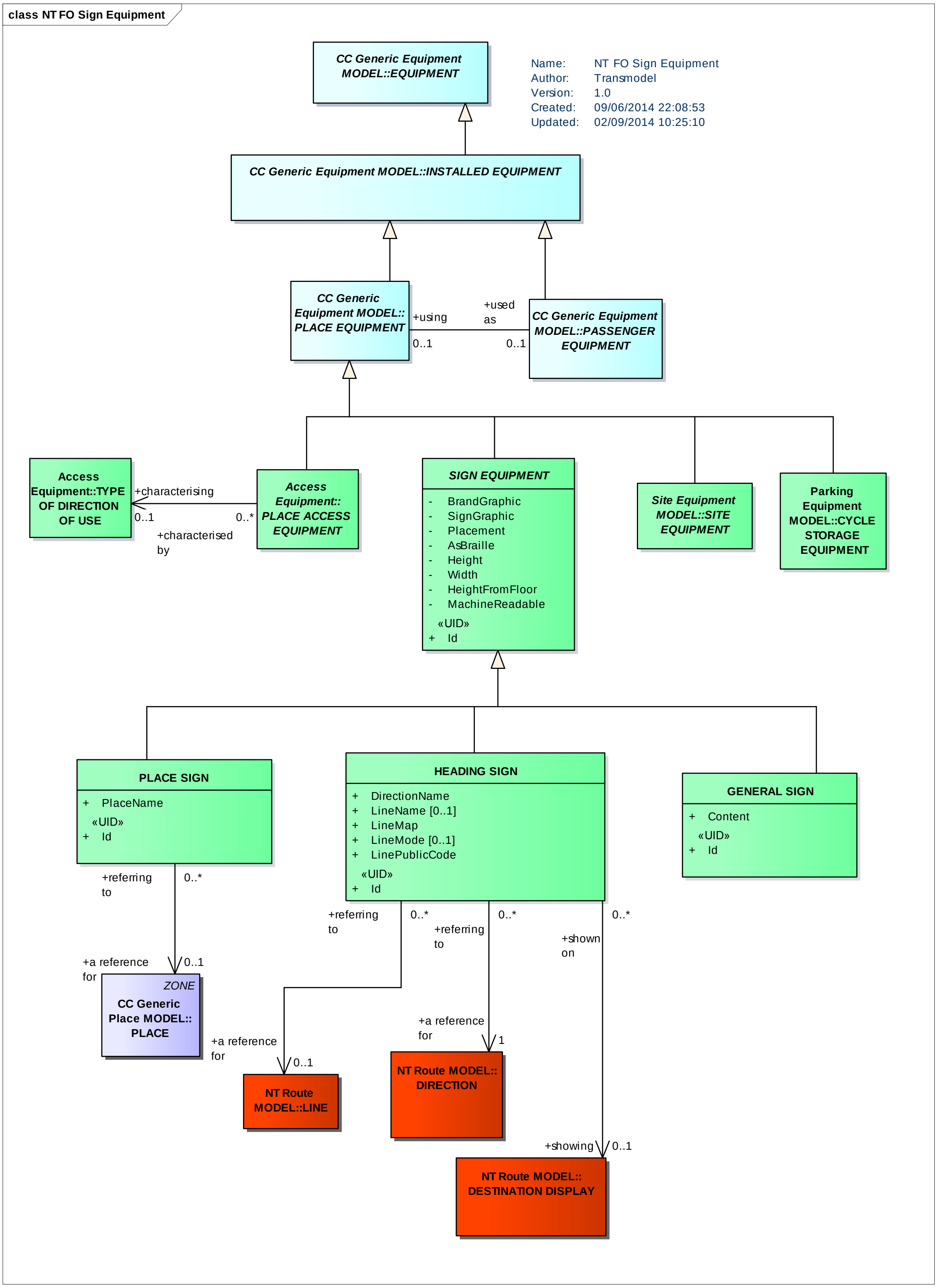


Figure 48 – Sign Equipment – Conceptual Model

5.4.12 Local Service

5.4.12.1 LOCAL SERVICE – Conceptual Model

Figure 49 shows detailed attributes of the LOCAL SERVICE model elements

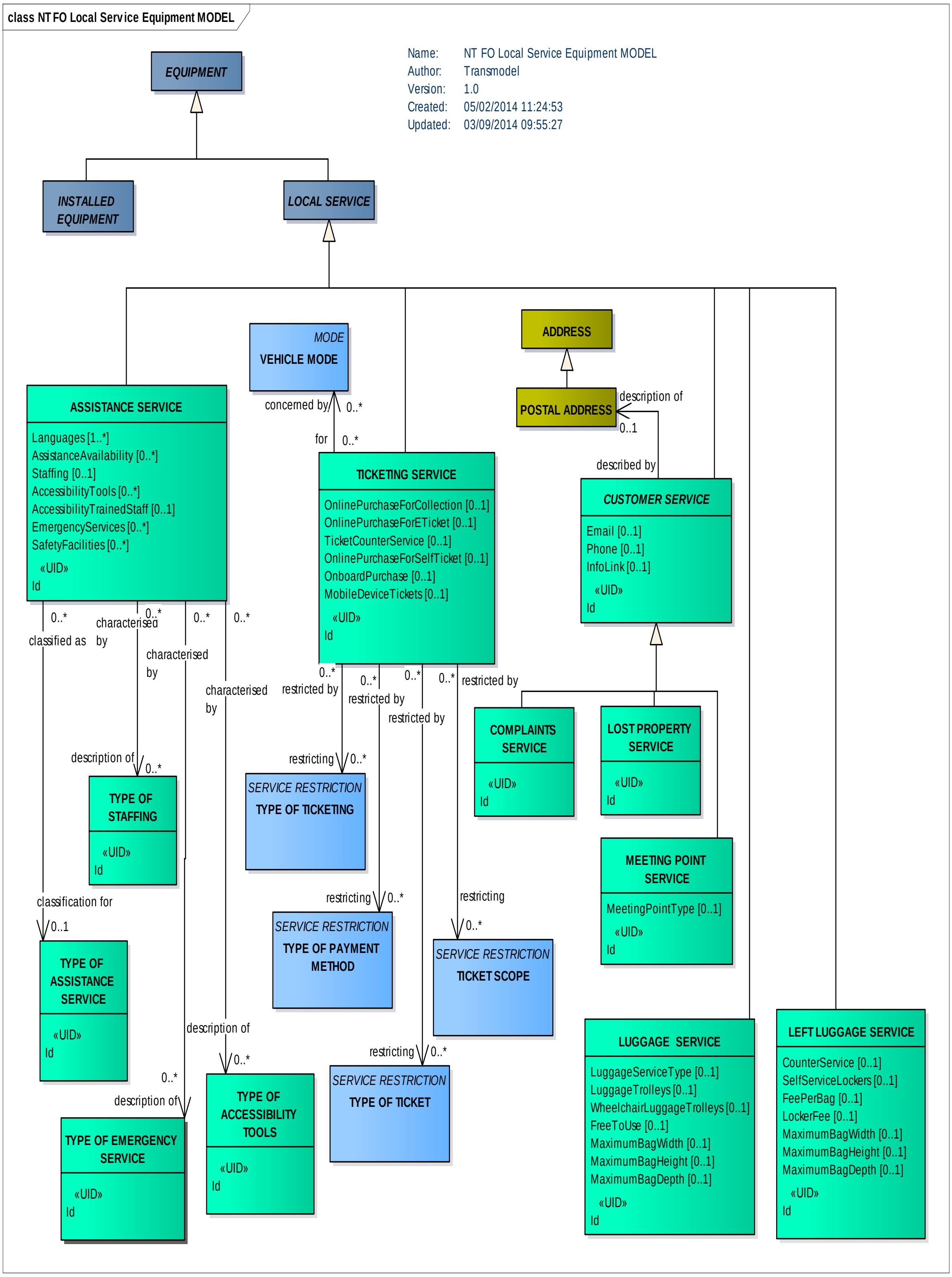


Figure 49 – Local Service – Conceptual Model

5.4.12.2 LOCAL (Commercial) SERVICE – Conceptual Model

Figure 50 shows the LOCAL SERVICE sub-model dedicated to commercial services.

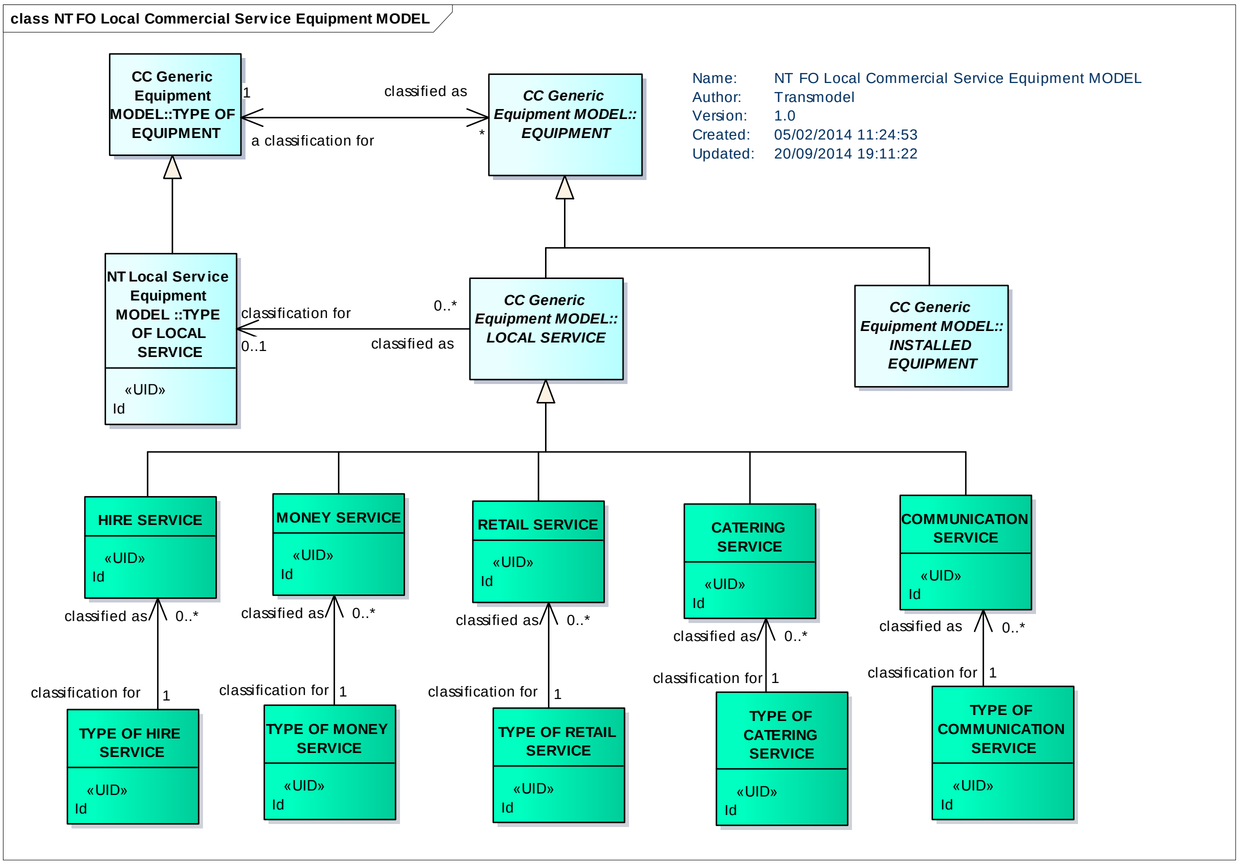


Figure 50 – Local Commercial Service – Conceptual Model

5.4.13 Parking Equipment

5.4.13.1 PARKING EQUIPMENT – Conceptual Model

Figure 51 shows detailed attributes of the PARKING EQUIPMENT model elements.

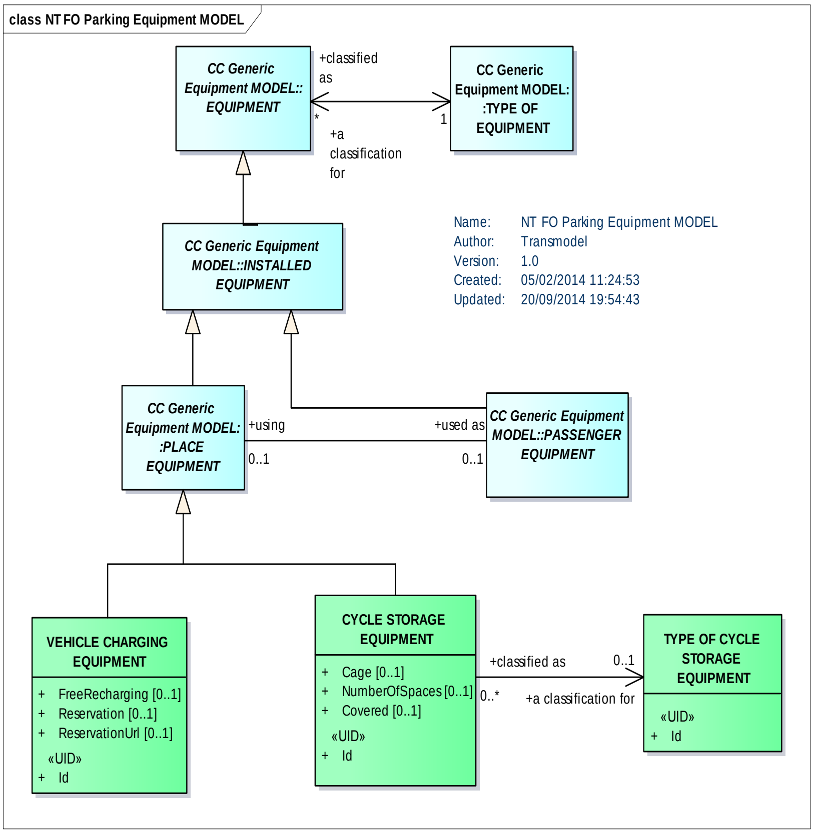


Figure 51 – Parking Equipment – Conceptual Model

5.4.14 Site Equipment – Examples

Some examples of using equipment data are shown in Figure 52.

- Lift
- The lift car dimensions are sufficient for a wheelchair user and their companion.
- The lift has audible announcements.
- There is an emergency alarm button in easy reach for all users.

- There are unisex accessible toilet facilities available.
- The main entrance doors of the toilet are not automatic.
- The entrance door to the toilet opens in.
- The toilets are kept locked.
- The toilets require a RADAR Key.
- There is an assistance alarm provided.
- There is a large cubicle available.
- There are no baby change facilities available.

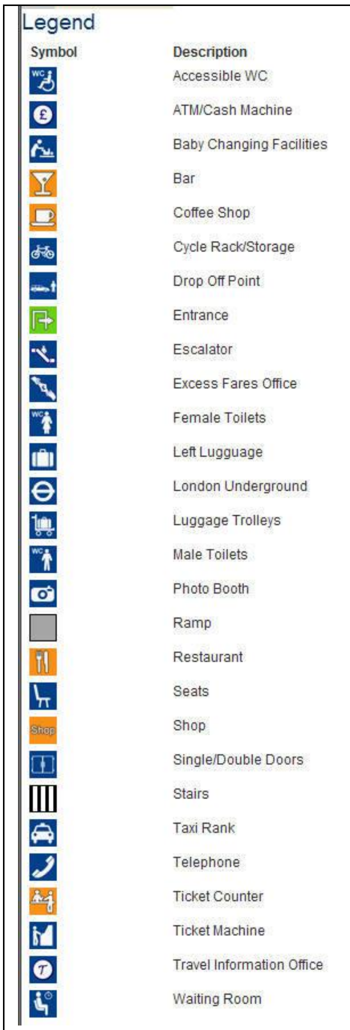
- Platforms 7 and 8 Stairs
- Number of Steps: 13,13
- The steps have handrails.

- Ticket Gates
- Accessible ticket gates are not automatic but staff will check tickets by hand.

Figure 52 – Equipment Example – "Hover windows" for Equipment (NRE Stations Made Easy –source NeTEx)

Each EQUIPMENT type typically will have an icon associated with it.

Table 4 – Equipment Example – NRE Station Made Easy: Legend (From Euston Station)



Facility	**Element**	**Attribute**
Accessible WC	***SANITARY EQUIPMENT***	wheelchairAccessible
Cash Machine	***CATERING SERVICE***	cashMachine
Baby Changing	***SANITARY EQUIPMENT***	babyChange
Bar	***CATERING SERVICE***	bar
Coffee Shop	***CATERING SERVICE***	coffeeShop
Cycle Rack	***CYCLE STORAGE EQUIPMENT***	racks
Drop Off Point	QUAY + ***SIGN EQUIPMENT***	setDown
Entrance	ENTRANCE + ***SIGN EQUIPMENT***	entrance
Escalator	***ESCALATOR EQUIPMENT***	
Excess Fares	***TICKETING EQUIPMENT***	excessFares
Female Toilets	***SANITARY EQUIPMENT***	femaleOnly
LeftLuggage	***LUGGAGE LOCKER EQUIPMENT***	
Metro	ENTRANCE +***SIGN EQUIPMENT***	
Luggage Trolleys	***TROLLEY STAND EQUIPMENT***	
Male Toilets	***SANITARY EQUIPMENT***	maleOnly
Photo Booth	***RETAIL SERVICE***	photoBooth
Ramp	***RAMP EQUIPMENT***	
Restaurant	***CATERING SERVICE***	restaurant
Seats	***WAITING ROOM EQUIPMENT***	seats
Shop	***RETAIL EQUIPMENT***	
Doors	***ENTRANCE EQUIPMENT***	

	Stairs	***STAIR EQUIPMENT***	
	Taxi	QUAY + S***IGN EQUIPMENT***	
	Telephone	***COMMUNICATION SERVICE***	phone
	Ticket Counter	***TICKETING EQUIPMENT***	counterService
	Ticket Machine	***TICKETING EQUIPMENT***	TicketMachines
	Info Office	***ASSISTANCE SERVICE***	information
	Waiting Room	***WAITING ROOM EQUIPMENT***	
	Lost Property	***LOST PROPERTY SERVICE***	
	Internet	***COMMUNICATION SERVICE***	internet
	Postbox	***COMMUNICATION SERVICE***	postbox

Table 5 shows the different types of EQUIPMENT. The Accessibility Attributes column lists specific properties of EQUIPMENT that are relevant for accessibility.

Table 5 – Summary of Equipment types relevant for Accessibility

Group	Subgroup	Equipment	Accessibility attributes
Place-Equipment	Access-Equipment	***ROUGH SURFACE***	SurfaceType.
		ENTRANCE EQUIPMENT	Dimensions, wheelchair passable, controls, acoustic sensor, automatic.
		STAIRCASE EQUIPMENT	Handrail, handrail height, step height, number of steps.
		LIFT EQUIPMENT	Dimensions, wheelchair passable, wheelchair turning circle.
		ESCALATOR EQUIPMENT	Width
		TRAVELATOR EQUIPMENT	Width.
		RAMP EQUIPMENT	Dimensions, gradient, handrail, bands, strips.
		QUEUING EQUIPMENT	
		CROSSING EQUIPMENT	Strips, sounds, sensors, acoustic aids dropped curb.
	SignEquipment	***STOP PLACE SIGN***	A sign giving the stop name.
		HEADING SIGN	
		GENERAL SIGN	

	Ticketing	***TICKETING EQUIPMENT***	Low counter access.
		TICKET VALIDATOR EQUIPMENT	
	StopPlace	***LUGGAGE LOCKER EQUIPMENT***	
		SHELTER EQUIPMENT	Number of seats, dimensions, StepFree, wheelchair area width, wheelchair area depth.
		TROLLEY STAND EQUIPMENT	
		WAITING ROOM EQUIPMENT	Number of seats, dimensions, step free, wheelchair area width, wheelchair area depth.
	Passenger-Equipment	***PASSENGER INFO EQUIPMENT***	Accessibility Info
		PASSENGER SAFETY EQUIPMENT	ccTV, Panic button, SOS Phones, Height of SOS Panel, Acoustic Announcements.
		SANITARY FACILITY	Gender, Type Of Sanitary Facility Wheelchair turning circle.
Local Service	Customer	***ASSISTANCE SERVICE***	Services to help customers board. etc.

5.4.15 Path Links and Navigation Paths

The possible paths for passengers between the points of an interchange are represented as PATH LINKs. PATH LINKs connect the points of an interchange creating a network of possible paths. Each PATH LINK connects with a SITE COMPONENT, such as a QUAY (i.e. platform or stop) or ACCESS SPACE (i.e. hall concourse or passage) or an intermediate PATH JUNCTION.

— Each end of a PATH LINK may specify an ENTRANCE to indicate the point of connection. There doesn’t have to be an ENTRANCE: for example, a ticket hall may have a well-defined entrance, but a platform or on-street stop may well not have an entrance, but rather be accessible over a whole edge.

— Each PATH LINK also describes any change in LEVEL, for example, between the concourse and lower ground platforms, as well as any EQUIPMENT (lift, steps etc.) associated with that path link and the time taken for the path link. PATH LINKs state in which direction they can be used, and can have accessibility attributes.

— Where a QUAY is nested, for example, ‘*Platform 3 & 4’* is made up of ‘*Platform 3’* and ‘*Platform 4*’. It is sufficient to have only PATH LINKs to the containing QUAY and to infer the connectivity to the contained children. Thus a smaller number of links and paths are needed to describe an interchange.

PATH LINKs are intended to describe a detailed topology for a station. For an outline topology NAVIGATION PATHs and/or CONNECTIONs should be used instead.

5.4.15.1 NAVIGATION PATH – Conceptual Model

Sequences of PATH LINKs can be assembled into named NAVIGATION PATHs to guide the user through a site. The model for NAVIGATION PATHs is thus two-level.

A NAVIGATION PATH normally contains a sequence of one or more simple point to point PATH LINKs that link nodes: nodes may be QUAYs or ACCESS SPACEs or PATH JUNCTIONs – intermediate branch points. PATH JUNCTIONs make it possible to use the same links in many different NAVIGATION PATHS

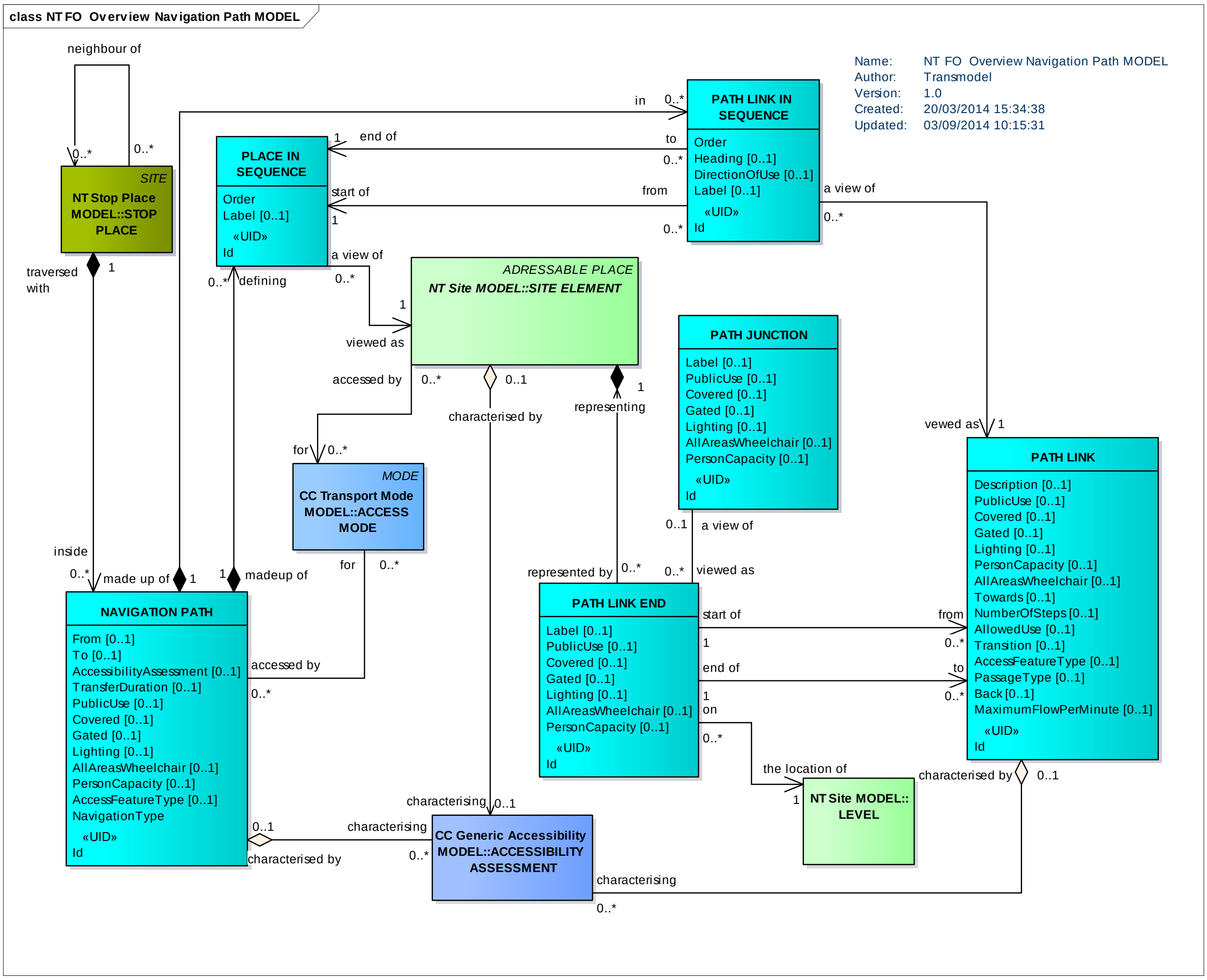


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Figure 53 - Overview Navigation Path – Conceptual Model

It is possible for a NAVIGATION PATH to be used just as a summary – i.e. without PATH LINKs, for example in order to record transfer times.

NAVIGATION PATHs and PATH LINKs are normally specified as properties of the overall SITE (for example STOP PLACE or POINT OF INTEREST, rather than a specific component such as a QUAY).

The NAVIGATION PATH can be given a meaningful name that identifies a route to the user – e.g. “*Entrance Hall to Platform 1’.* NAVIGATION PATHs can also be given accessibility attributes so that searches can be filtered according to the specific needs of the users, for example to avoid steps or escalators, and summary data such as the number of lifts, escalators and traversal time.

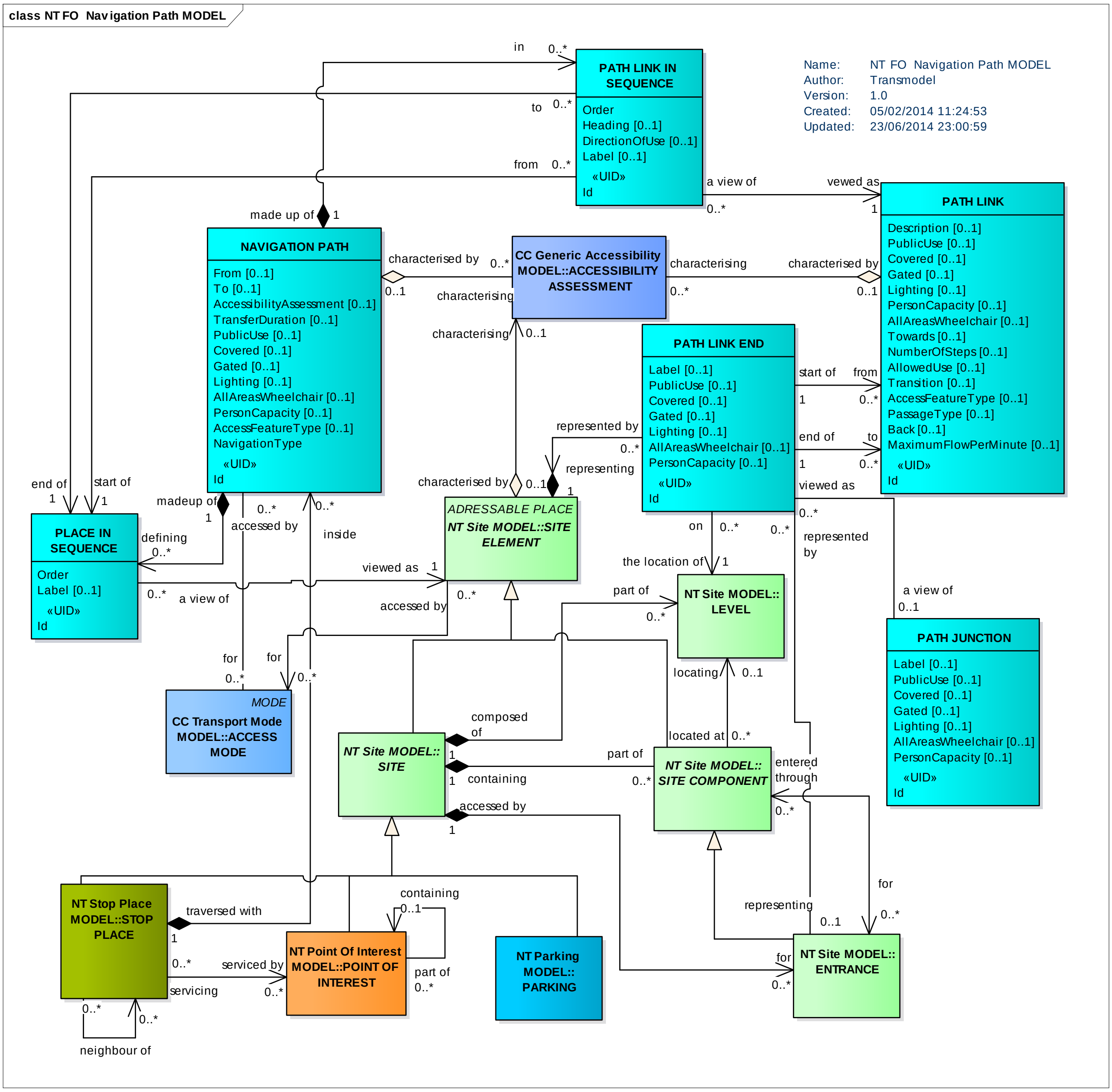

Figure 54 – Navigation Path – Conceptual Model

5.4.16 Path Links – Examples

5.4.16.1 Simple examples of Path Links

Each end of a PATH LINK can optionally indicate an ENTRANCE and a LEVEL.

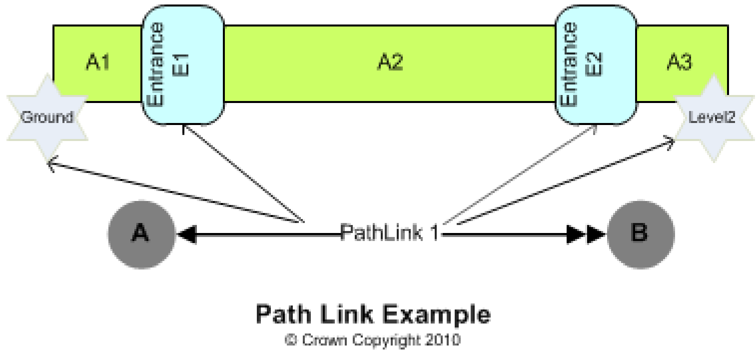

Figure 55 – Example of a single Path Link (source NeTEx - Part 1)

PATH LINKs can be connected in sequences either to STOP COMPONENTs or to the intermediate PATH JUNCTION points.

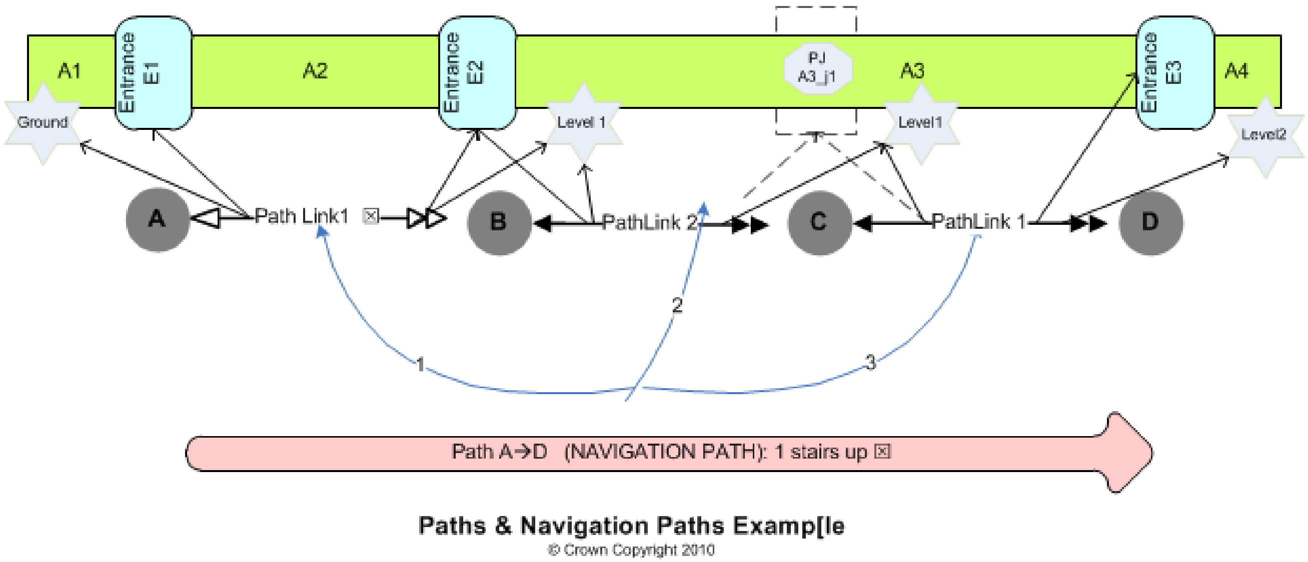

Figure 56 – Example of a sequence of Path Links (source NeTEx - Part 1)

5.4.16.2 Simple examples of Path Links in a Stop Place

Figure 57 shows an example of the use of path links to describe the topology of a simple station. There are two external entrances to a ticket hall and then a stairway to the platforms. There are two platforms, the furthest of which is reached using a barrow crossing over the tracks.

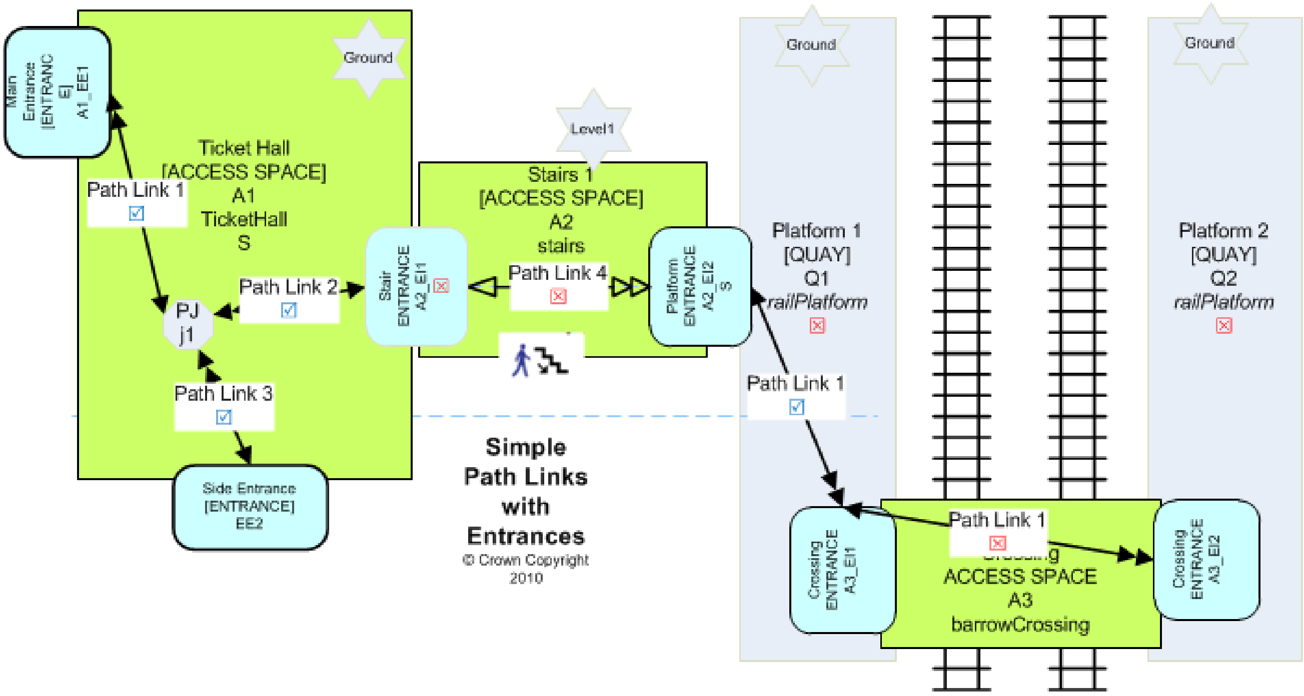

Figure 57 – Example of Path Links used to connect Access and platforms (source NeTEx - Part 1)

Sometimes a path link is used simply to indicate that two spaces are connected, without specifying an ENTRANCE, for example where there is a long open edge between them. Figure 58 shows a simple ferry stop with a long quay and an open sided shelter opening onto an access area.

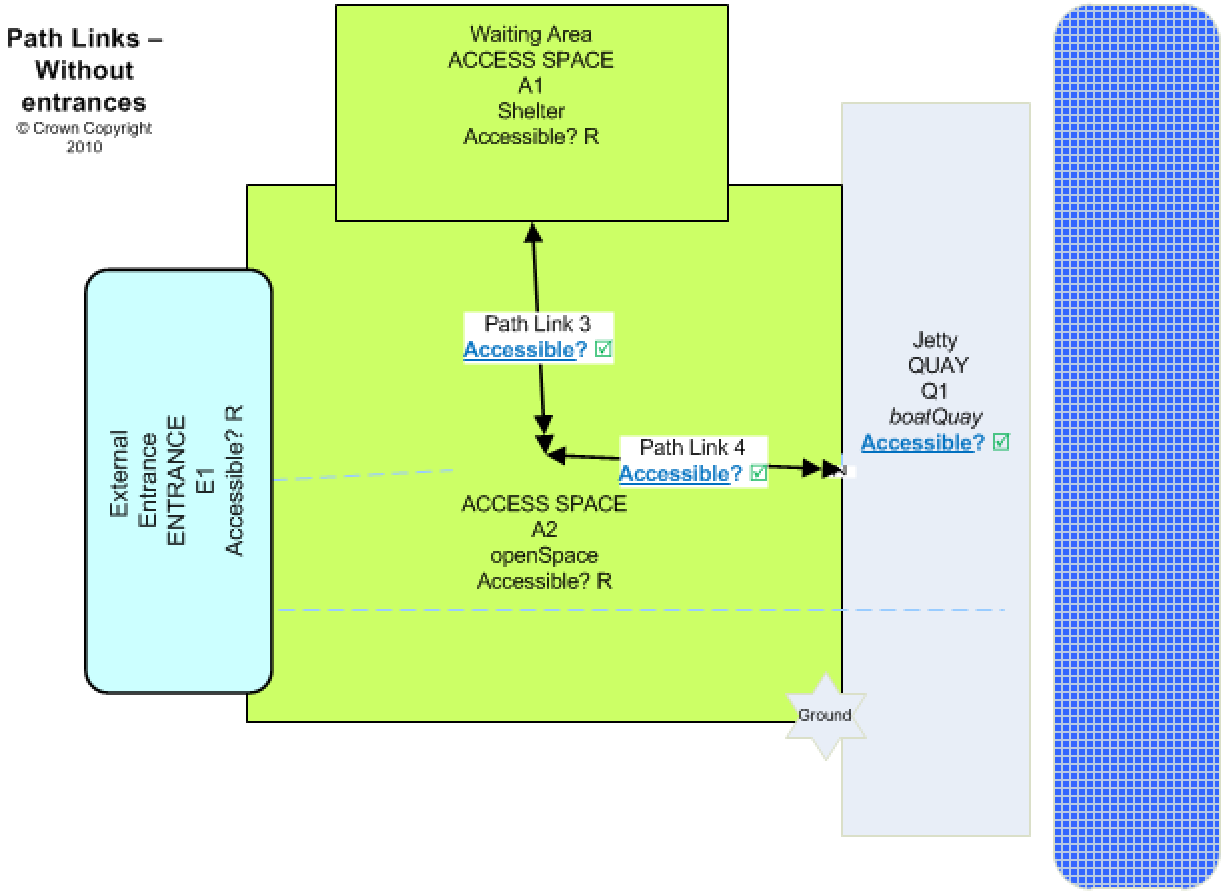

Figure 58 – Example of Path links between open areas (source NeTEx - Part 1)

5.4.17 Navigation Paths – Examples

5.4.17.1 Wimbledon Example showing Nodes and Path Links

Figure 59 taken from the Wimbledon example gives an example of a medium size interchange that illustrates many of the elements discussed above. It shows Wimbledon station as a set of nodes connected by path links to create a topological model of the interchange.

- Red triangles indicate elements that correspond to points referenced in the UK's NaPTAN database (stop points, platforms, access areas, etc).
- The path links (arrowed lines) connect the access spaces and quays: these can also indicate the use of specific entrances at either end, if relevant. The precise choice of path links will reflect the level of detail that one wishes to capture about the topology. Elements which fall within the gated area (light green), i.e. that require a ticket to access, can be distinguished from areas of unrestricted access.

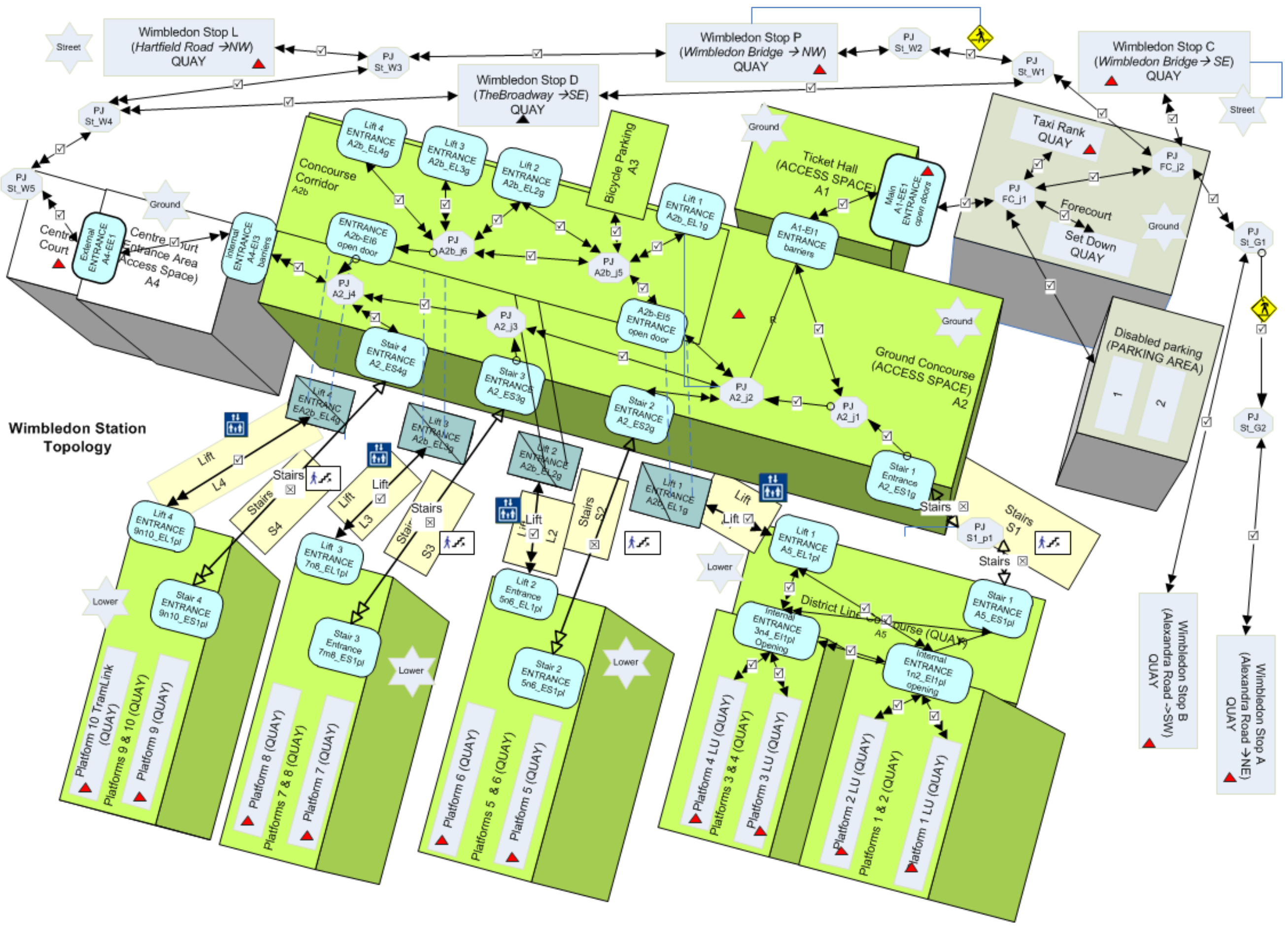

Figure 59 – Example – Wimbledon Nodes & Path Links (source NeTEx - Part 1)

5.4.17.2 Wimbledon Example showing Navigation Paths

PATH LINKs typically describe detailed connectivity between two components. To describe a route through a station a NAVIGATION PATH is used – a sequence of PATH LINKs that can be given a meaningful name to a user – for example "*Platform 1 to Platform 5".* NAVIGATION PATHs may be given an overall accessibility. Figure 60 shows a few of the possible paths for *Wimbledon*, corresponding to some of those shown in *Direct Enquiries*. As previously noted, the NAVIGATION PATHs may either be created manually, or be computed dynamically by an indoor routing engine.

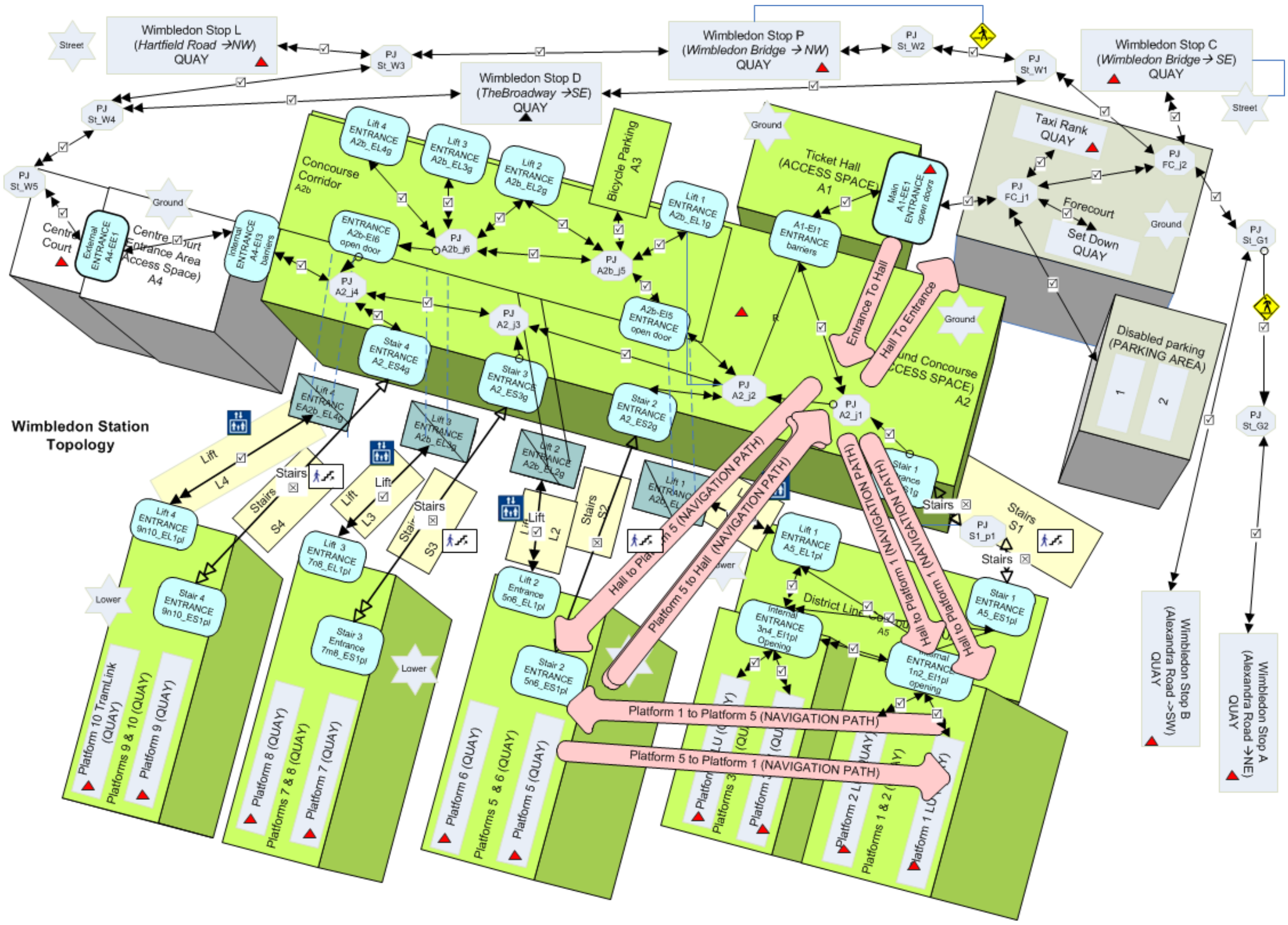

Figure 60 – Example – Some Navigation Paths for Wimbledon (source NeTEx - Part 1)

5.4.17.3 Wimbledon example Navigation Path

Figure 61 shows an example of a NAVIGATION PATH from a bus stop to a platform: it describes an accessible route that traverses a sequence of spaces by following PATH LINKs. It uses a lift.

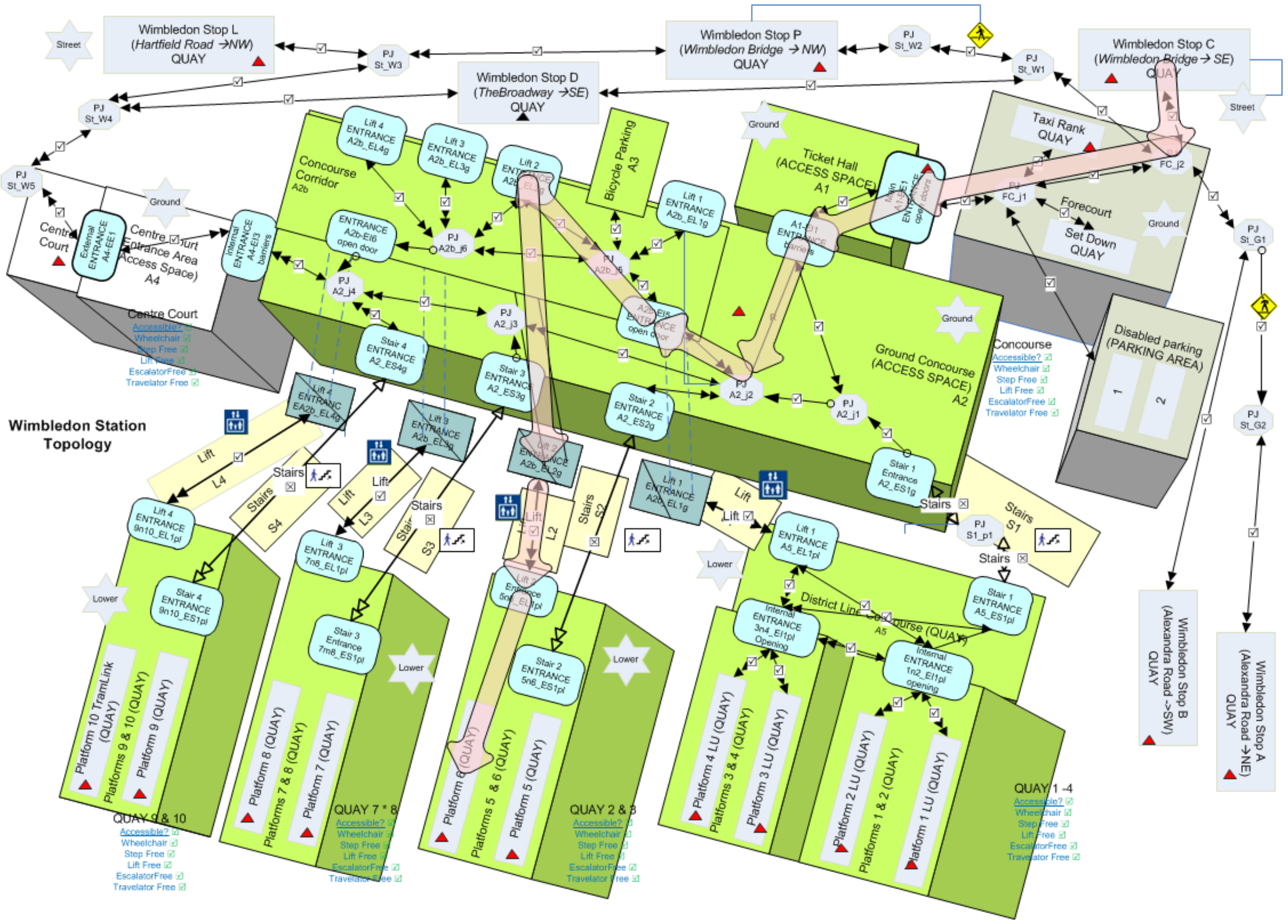

Figure 61 – Example – Wimbledon path from Stop Q to Platform 6 (source NeTEx - Part 1)

5.4.17.4 2012 Olympic example Navigation Path

Figure 62 of the main London 2012 Olympic Park shows a large complex site with a number of different points of interest (arenas, stadia etc) which people need to reach from the available public transport stops. Access is only through a number of designated entrances. At peak times there are potential delays from congestion, for example for the security checks.

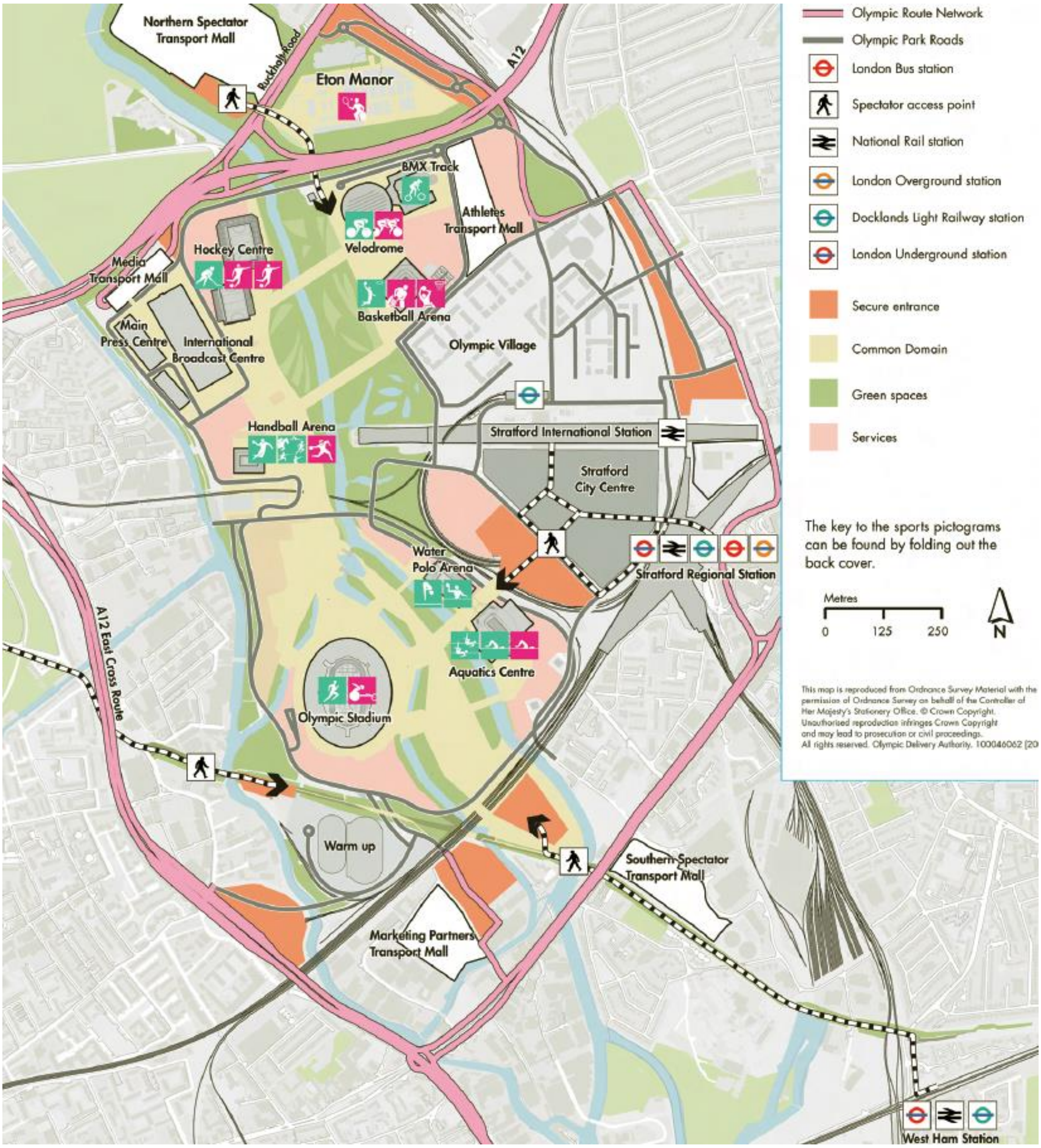

Figure 62 – Example – London2012 Olympics Main Site (source NeTEx - Part 1)

The site in the map of the London 2012 Olympic Park shown in Figure 62 is represented in Figure 63 as a network of POINTs OF INTEREST and STOP PLACES, connected by a PATH LINKs. To get between any two points the links can be navigated in sequence to create a NAVIGATION PATH. Processes that take place at particular points such as security checks or queues can be represented by CHECK CONSTRAINTs.

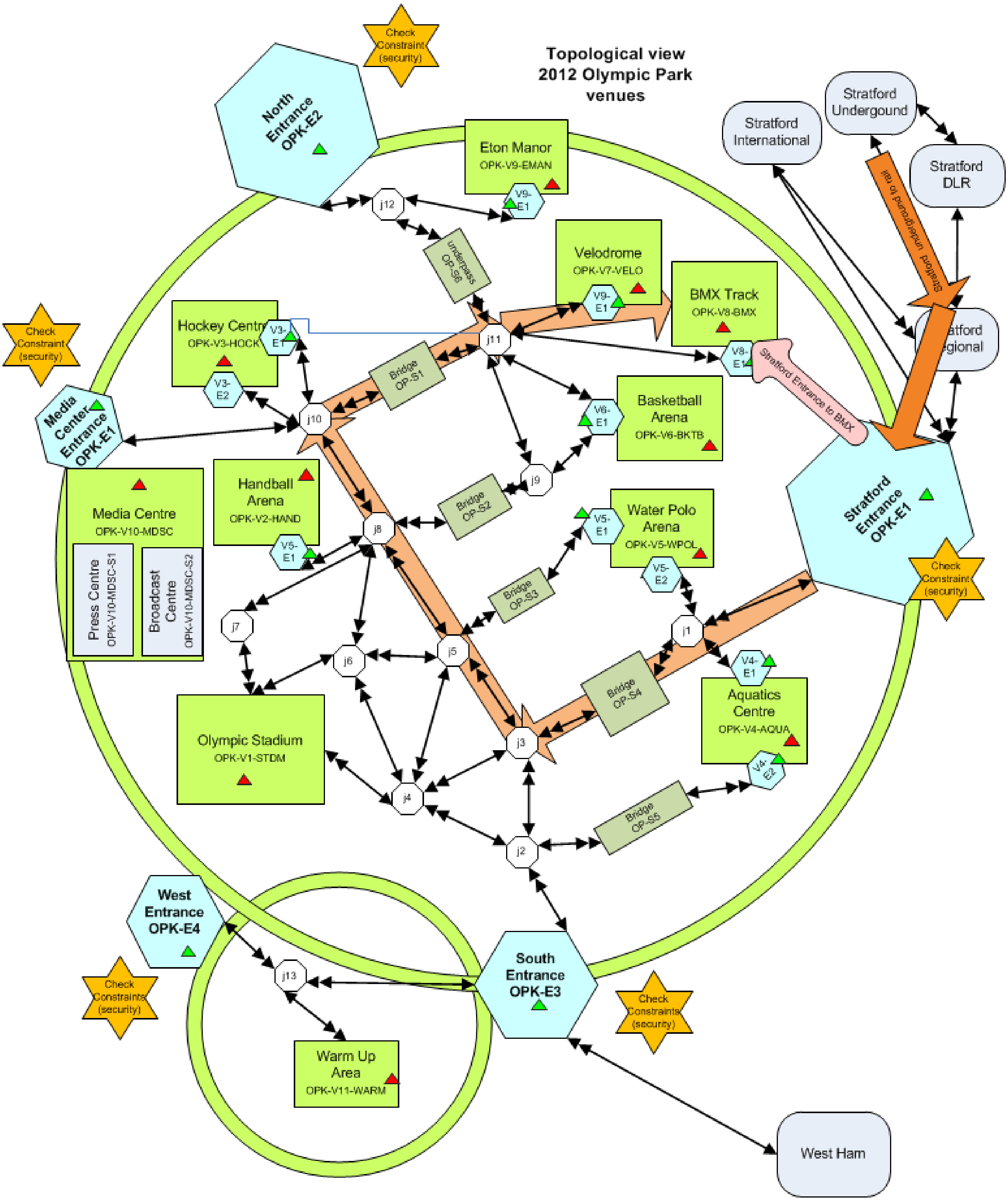

Figure 63 – Example – London 2012 Olympic Park Navigation Path (source NeTEx - Part 1)

5.4.17.5 Creating Navigation paths

In an implementation, NAVIGATION PATHs can either be predefined statically by hand or be computed dynamically from path links by a micro journey planner. Since the number of permutations of point to paths for different accessibility characteristics can be large even for a small station, a computational approach is preferable.

Where NAVIGATION PATHs are created manually it is possible to use NAVIGATION paths at a summary level only, that is not to have detailed PATH LINKs; this at least gives an indication of overall accessibility, albeit without step by step navigation. There may be more than one NAVIGATION PATH between the same two nodes, each corresponding to a different route.

5.4.17.6 Path Link & Navigation Path direction

A PATH LINK connects any two spaces or PATH JUNCTIONs within a SITE that can be traversed by a passenger, also optionally indicating an ENTRANCE if the end point is a QUAY or ACCESS SPACE.

- The same PATH LINK may be reused in many different NAVIGATION PATHs.
- A PATH LINK is **directional** in that it always has a 'from' end and a 'to' end – however it may be used in either direction, unless tagged to indicate it is one way – as say an escalator or one-way subway tunnel might be tagged to indicate that it can only be used in one direction.
- A NAVIGATION PATH references a sequence of PATH LINKs. For each path link, the NAVIGATION PATH indicates whether the use is forwards (i.e. from origin to destination) or backwards (i.e. from destination to origin).
- A NAVIGATION PATH has a single direction from origin to destination.

This is shown in Figure 64, where two different NAVIGATION PATHs (*A->D* and *D->A*) use the same three PATH LINKs (*Path Link 1:A->B, Path Link 2 B->C* and *Path Link 3: C->D*) in two different directions. The directionality of the path link is indicated by a double arrowhead on the forward end.

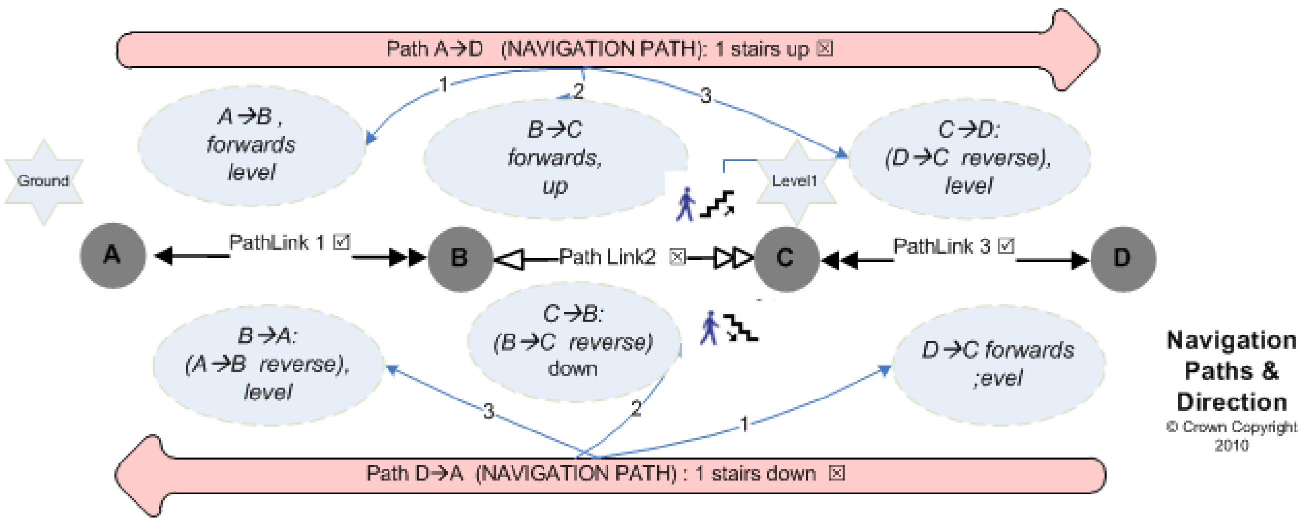

Figure 64 – Example – Direction of Path Links and Navigation Paths (source NeTEx - Part 1)

5.4.18 Check Constraint

5.4.18.1 CHECK CONSTRAINT – Conceptual Model

There may be points in the STOP PLACE or SITE that incur significant delays either always or at certain times of day – for example, to buy a ticket, pass through a ticket barrier or security check, or immigration control. *Transmodel* allows one or more CHECK CONSTRAINTs to be associated with STOP PLACE COMPONENTs, each specifying a process type and a delay. There may be different CHECK CONSTRAINT DELAYs for different times of day and/or days of the week.

One can also specify a VALIDITY CONDITION for when it applies (e.g. *ticket machine queue delays* 5-10 minutes*, 8:30-9:30 am*). These can be used to give more realistic journey times and to warn users of potential bottlenecks of which they might not be aware, (for example trying to buy a TfL ticket at a major station in rush hour).If more than one CHECK CONSTRAINT is valid at a given time, an order of precedence can be specified.

A CHECK CONSTRAINT associated with a PATH LINK by default applies in the directions specified for it (i.e. one way or two way). It may be further restricted to apply only in a given sense of the link.

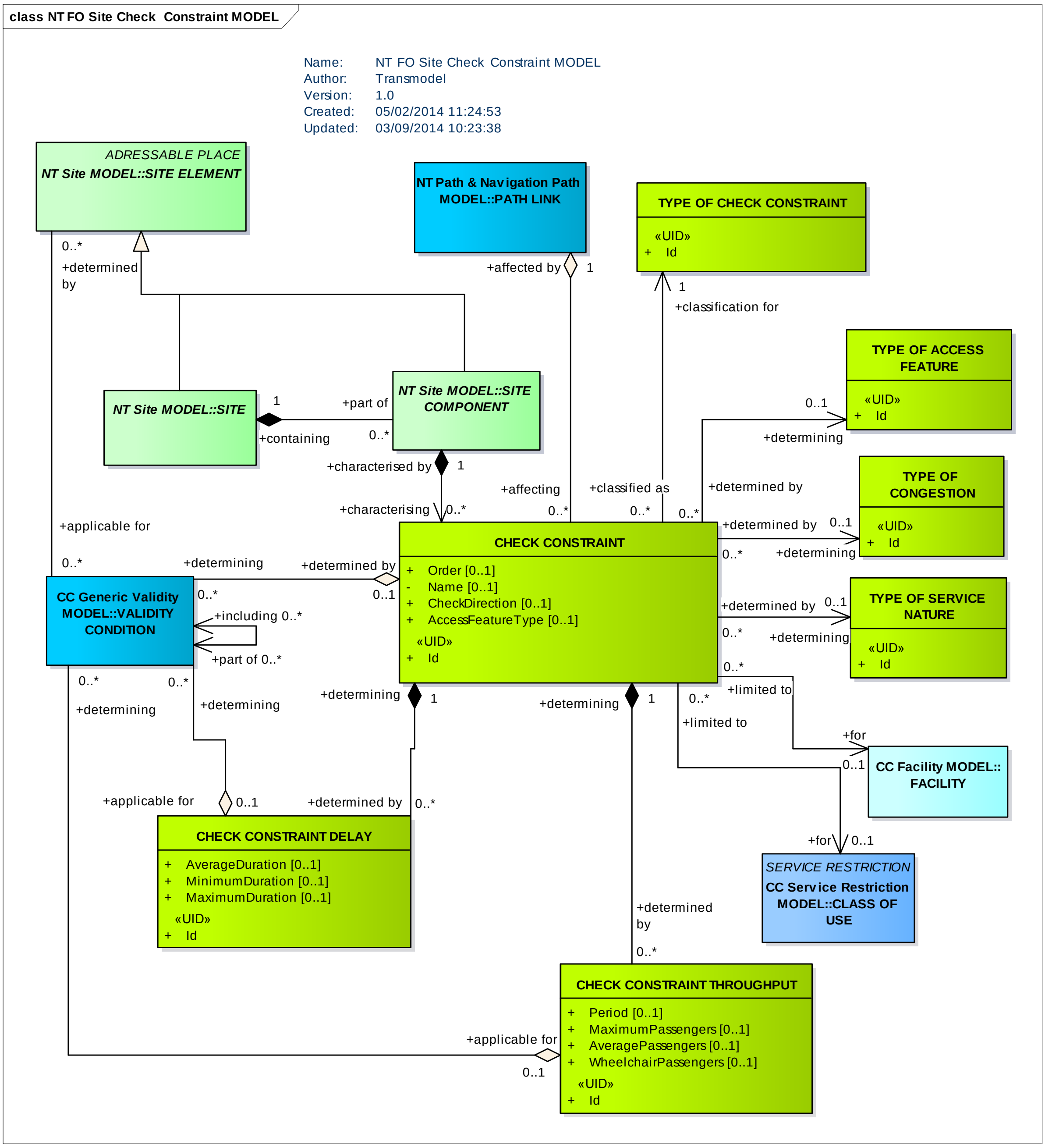

Figure 65 – Site Check Constraint – Conceptual Model

The CHECK CONSTRAINTs may also concern the STOP PLACEs as shown below.

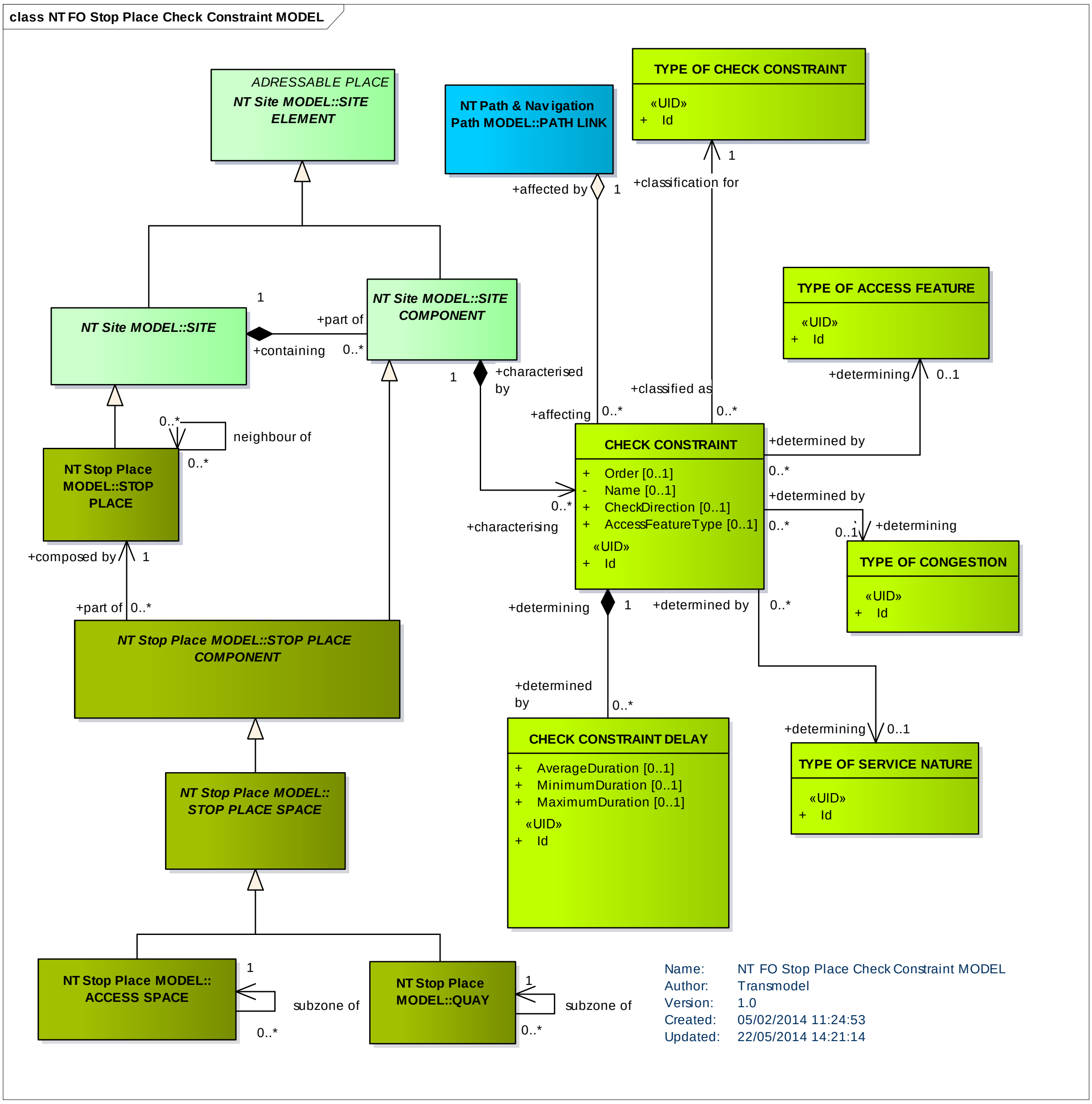

Figure 66 – Stop Place Check Constraint – Conceptual Model

5.4.19 Parking

5.4.19.1 PARKING – Conceptual Model

Transmodel includes a model to describe parking elements. A PARKING is a type of SITE that describes the availability of parking for different types of vehicles, and its relation to other SITEs such as stations.

A PARKING may be described in summary – for example, a car park of 50 places, or be further broken down into PARKING AREAs (each on a LEVEL), each containing individual PARKING BAYs of a designated size.

— A PARKING may have designated PARKING VEHICLE ENTRANCEs as well as PARKING PASSENGER ENTRANCEs.

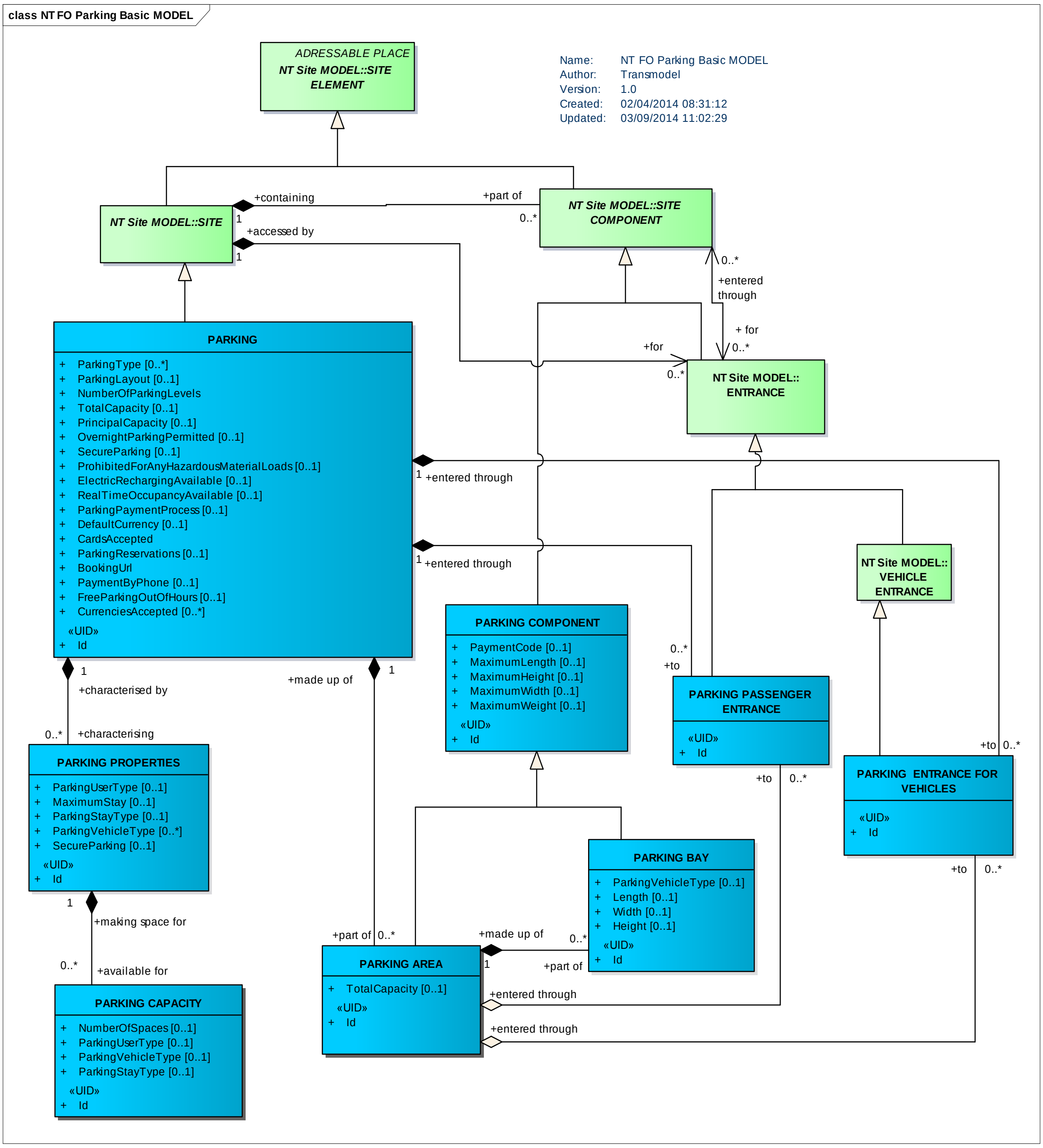

Figure 67 – Parking – Basic Conceptual Model

The overall Parking Model is presented in the Figure 68.

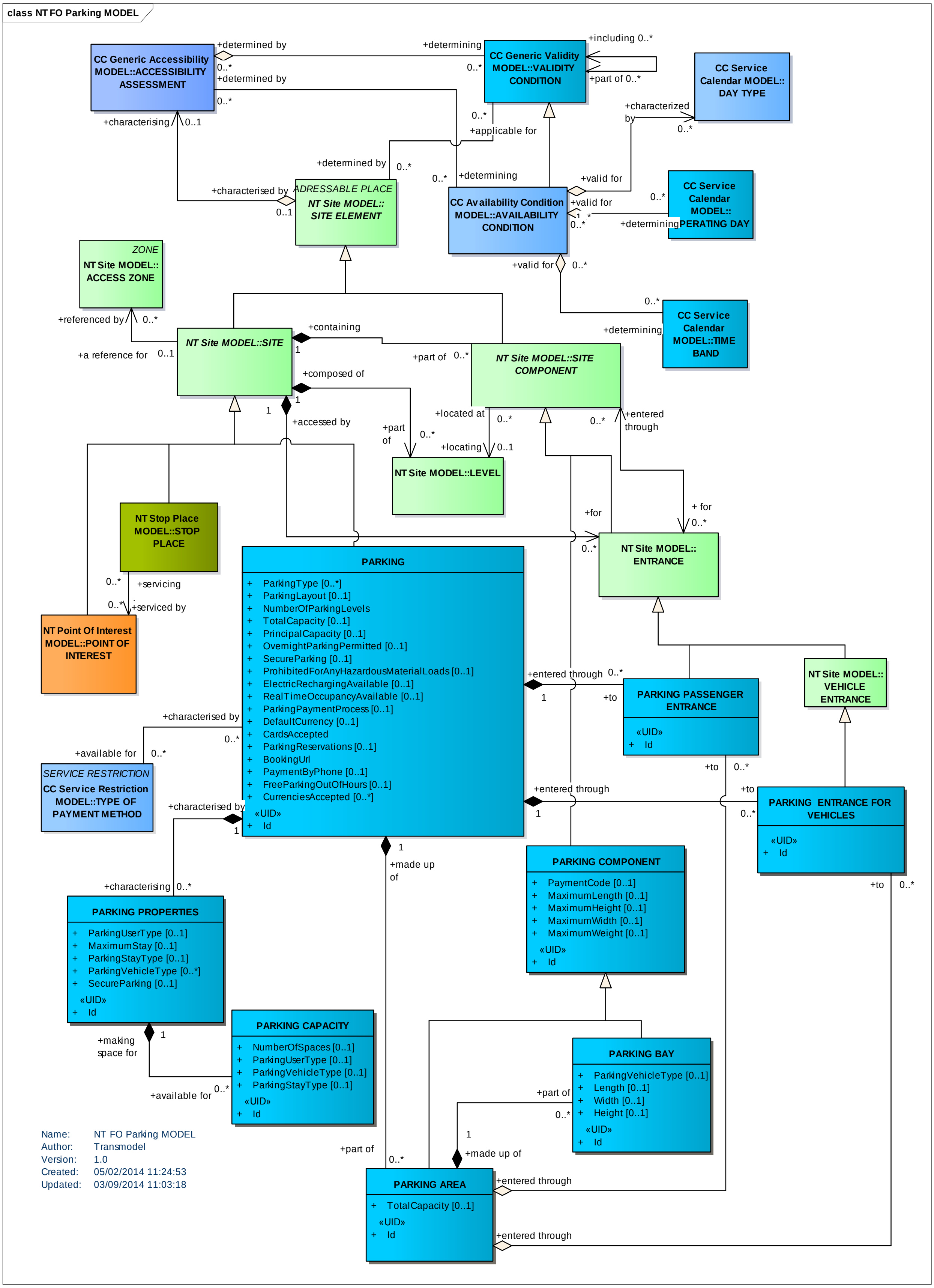

Figure 68 – Parking –Conceptual Model

5.4.20 Vehicle Stopping

5.4.20.1 VEHICLE STOPPING – Conceptual Model

The VEHICLE STOPPING Model describes the designated stopping positions for public transport VEHICLEs so that the VEHICLE doors are correctly aligned with the QUAYs and BOARDING POSITIONs. These are relevant for some real-time control systems.

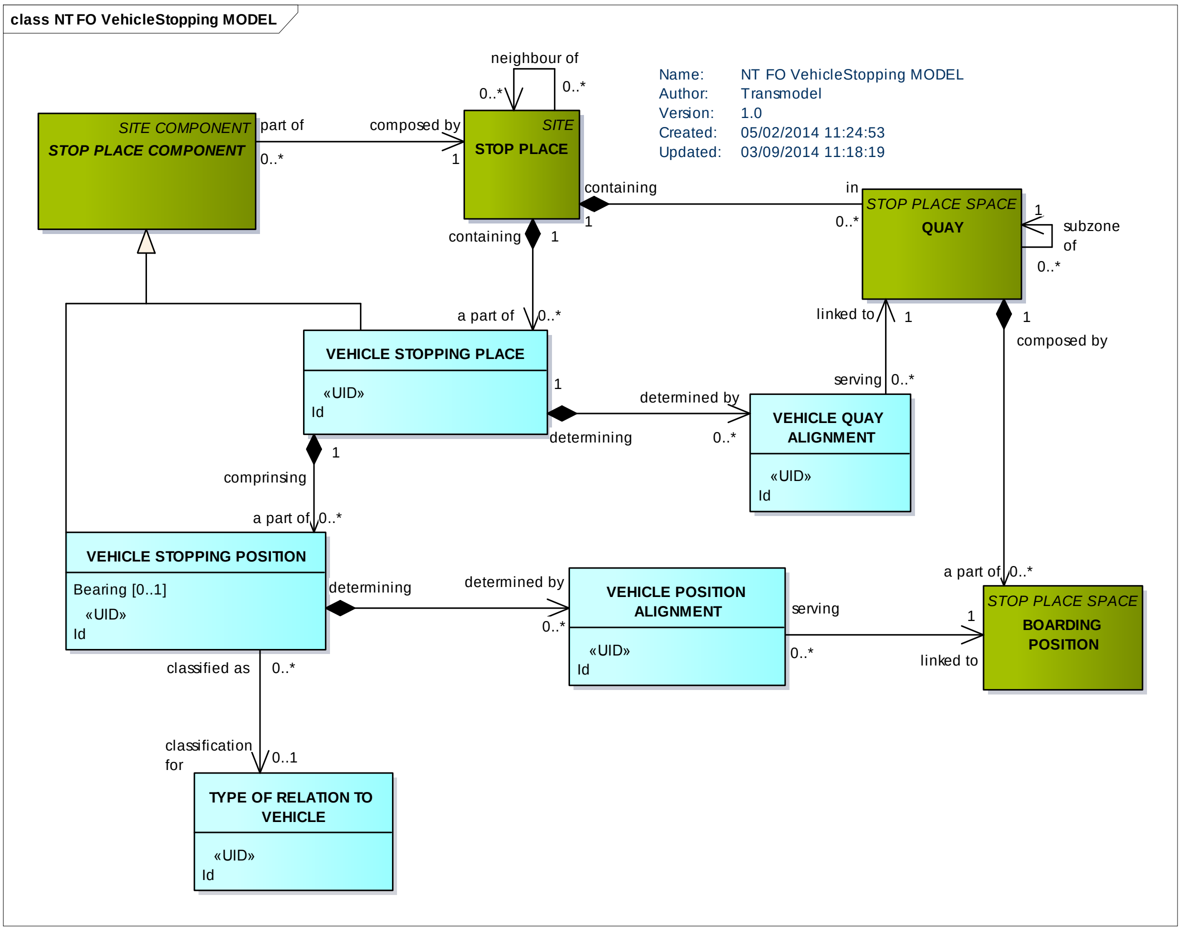

Figure 69 – Vehicle Stopping – Conceptual Model

5.4.21 Accessibility Coverage

All SITE ELEMENTs, such as ENTRANCEs, QUAYs, ACCESS SPACEs and STOP PLACEs should be given basic ACCESSIBILITY LIMITATION attributes for each of the five standard criterion (*Wheelchair, LiftFree, StepFree, EscalatorFree, TravelatorFree* as described in the section on accessibility).

Each of these takes one of three values '*true', 'false',* or *'unknown'.*

It is important to distinguish between absence of data and absence of accessibility, so if no data is available an element should nonetheless be tagged as '*unknown*'.

5.4.22 Accessibility Coverage of Site Elements

5.4.22.1 Site Accessibility Coverage

A STOP PLACE should be classified as one of the three values.

— A STOP PLACE is accessible (*true*) for a given criterion if **all** of its QUAYs can be reached from an external entrance by at least one NAVIGATION PATH that fulfils that criterion.

— A STOP PLACE is **not** an accessible (*false*) STOP PLACE for a given criterion if at least one of its QUAYs **cannot** be reached from an external entrance by at least one NAVIGATION PATH that fulfils that criterion.

— SITEs and other STOP PLACEs should be stated as accessible '*unknown'* unless explicitly known otherwise.

5.4.22.2 Quay and Access Space Accessibility Coverage

SITE COMPONENTs within a STOP PLACE should be classified as one of the following values:

— A QUAY or ACCESS SPACE (or other SITE COMPONENT) is accessible (true) for a given criterion if it can be reached from an external entrance by at least one NAVIGATION PATH that fulfils that criterion.

— A QUAY or ACCESS SPACE (or other SITE COMPONENT) is not accessible for a given criterion (false) if it cannot be reached from an external entrance by at least one NAVIGATION PATH that fulfils that criterion.

5.4.22.3 Defaulting Accessibility Values for Site Components

- On street QUAYs should be stated as accessible '*true'* unless known otherwise.
- Off street QUAYs (e.g. stations), should be stated as accessible '*unknown'* unless explicitly known otherwise.

Table 6 – Accessibility Attributes for level 1

		Rail / Metro			**On Street Bus**
		STOP PLACE	**QUAY**		**QUAY**
Wheelchair		*unknown*	*unknown*		*true*
LiftFree		*unknown*	*unknown*		*true*
StepFree		*unknown*	*unknown*		*true*
EscalatorFree		*unknown*	*unknown*		*true*
TravelatorFree		*true*	*true*		*true*

5.4.23 Accessibility Coverage of Paths

5.4.23.1 Path Link Accessibility Coverage

PATH LINKs should be classified as one of the three values:

— A PATH LINK is accessible (true) for a given criterion if it can be traversed according to that criterion.

— A PATH LINK is not accessible (false) for a given criterion if it cannot be traversed according to that criterion.

— A PATH LINK should be stated as accessible (true) unless known otherwise.

5.4.23.2 Navigation Path Accessibility Coverage

NAVIGATION PATHs should be classified as one of the two accessibility values:

— A NAVIGATION PATH is accessible (true) for a given criterion if it can be traversed along at least one branch according to that criterion.

— A NAVIGATION PATH is not accessible (false) for a given criterion if it cannot be traversed along any branch according to that criterion.

The accessibility of a NAVIGATION PATH can be derived from its PATH LINKs.

5.5 Tactical Planning Components Model

5.5.1 Model Overview

The Tactical Planning Components Model provides reusable information about transport planning, such as spatial description of journey patterns and service patterns. Reusable journey patterns and service patterns are independent of actual operating times in scheduled journeys.

In most transport networks the scheduled journeys follow the same patterns of movement and the Tactical Planning Components Model allows these to be described as reusable components in their own right. The elements defined in the Tactical Planning Components Model are subsequently used in the JOURNEY TIMES model to specify actual VEHICLE JOURNEYs at particular times ([8]").

The sub-models depend on a number of general framework models (described in the part "Public Transport Data Model: Part 1 **-** Common Concepts") and are the following:

- JOURNEY PATTERN Model: models the pattern of POINTs and LINKs of a Transport NETWORK that its services follow including both stops and other points of operational interest,
- COMMON SECTION Model: models part of a public transport network where the ROUTEs of several JOURNEY PATTERNs are going in parallel and where the synchronisation of SERVICE JOURNEYs may be planned,
- TIMING PATTERN Model: models points and links used for timing of journeys,
- SERVICE PATTERN Model: models the subset of the JOURNEY PATTERN that is relevant to passengers,
- SERVICE CONNECTION Model: models the possible connections allowed at points in the network,
- ROUTING CONSTRAINT Model: models restrictions on connections between journeys such as 'CannotBoardAndAlightInSameZone', 'MustAlightInZone', 'MustBoardInZone',
- TIME DEMAND TYPE Model: characterises the different temporal contexts in which services may run such as '*peak', 'off peak'*, etc.,
- PASSENGER STOP ASSIGNMENT Model, TRAIN STOP ASSIGNMENT Model, and NAVIGATION PATH ASSIGNMENT Model: model the relationship between stops in the timetable and the physical platforms of an actual station or other stop,
- NOTICE ASSIGNMENT Model: models the association of footnotes and passenger information content such as stop announcements and the network,
- PASSENGER INFORMATION DISPLAY ASSIGNMENT Model: models the relationship between passenger display equipment and the services to be shown on them.

5.5.2 Journey Pattern

The JOURNEY PATTERN model is concerned with the spatial description of services, i.e. spatial aspects of the work of the vehicles. The concerns of this model are different from those of describing the ROUTEs and LINEs. The latter are describing schematic paths of vehicles through the road network whereas JOURNEY PATTERNs describe how the work of vehicles is performed. These work patterns describes the sequence of points where vehicles stop and specific points attributed with timing information.

This means that a JOURNEY PATTERN consists of:

- An ordered sequence of SCHEDULED STOP POINTs to be served;

— An ordered sequence of TIMING POINTs at which timing information is scheduled. These TIMING POINTs may be SCHEDULED STOP POINTs or other POINTs.

5.5.2.1 JOURNEY PATTERN – Conceptual Model

The JOURNEY PATTERN is defined through a sequence of POINTs, which play specific roles in that JOURNEY PATTERN. The modelling specifies the roles that a POINT plays relatively to a particular JOURNEY PATTERN. For instance, a POINT in the network that is a SCHEDULED STOP POINT and also a TIMING POINT may be used by a JOURNEY PATTERN only as a SCHEDULED STOP POINT or only as a TIMING POINT (or both, as a TIMING POINT and a SCHEDULED STOP POINT). This POINT IN JOURNEY PATTERN expresses the fact that the role of a POINT defining a JOURNEY PATTERN is specific to that JOURNEY PATTERN.

The working pattern described by a JOURNEY PATTERN must be related to a ROUTE it covers. Several JOURNEY PATTERNs may use the same ROUTE (e.g. express service or service stopping at all stops).

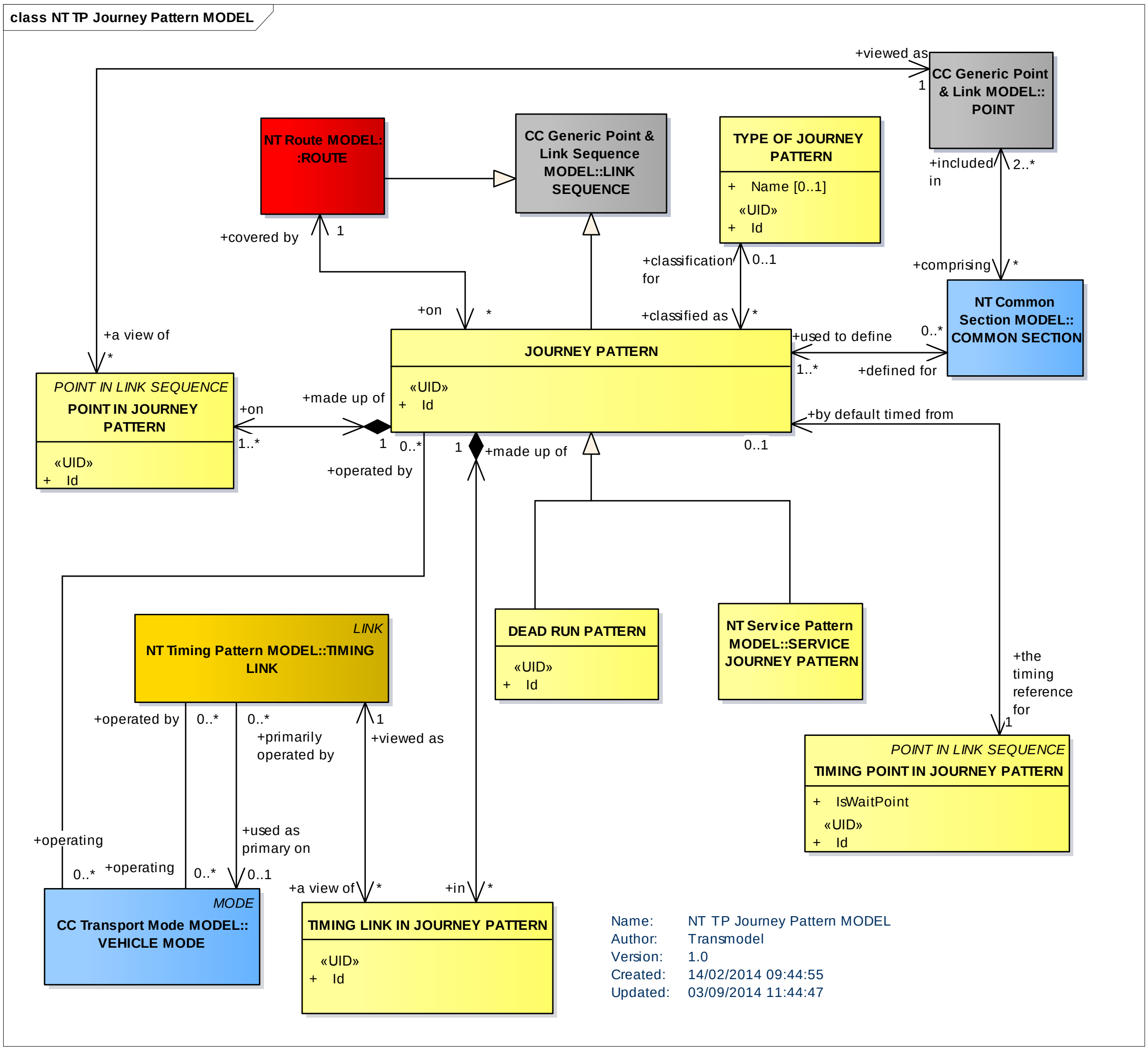

Figure 70 – Journey Pattern – Conceptual Model

Figures 70 and 71 are concrete instances of the abstract Generic Point and Link Model: its main classes are specialisations of POINT, LINK and LINK SEQUENCE. However, such an inheritance from the generic classes is not shown each time in order not to complicate the presentation.

Figure 71 presents an overview of the different patterns related to the JOURNEY PATTERN.

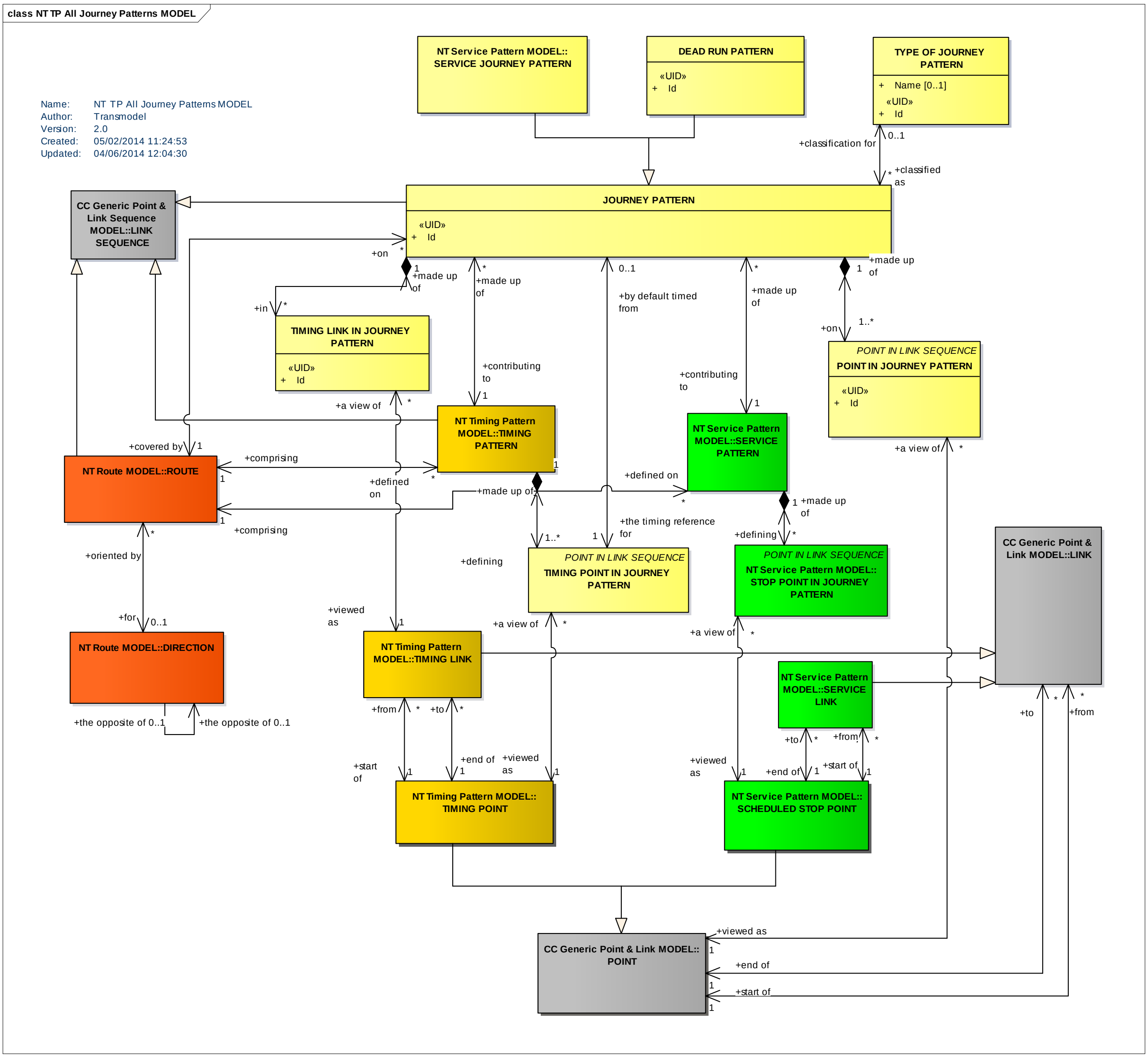

Figure 71 – Journey Pattern Overview – Conceptual Model

The topological features such as ROUTEs or JOURNEY PATTERNs, operated by certain VEHICLE MODEs may be also considered as being characterised by OPERATIONAL CONEXTs. Some users do not use the OPERATIONAL CONTEXT but directly the VEHICLE MODE.

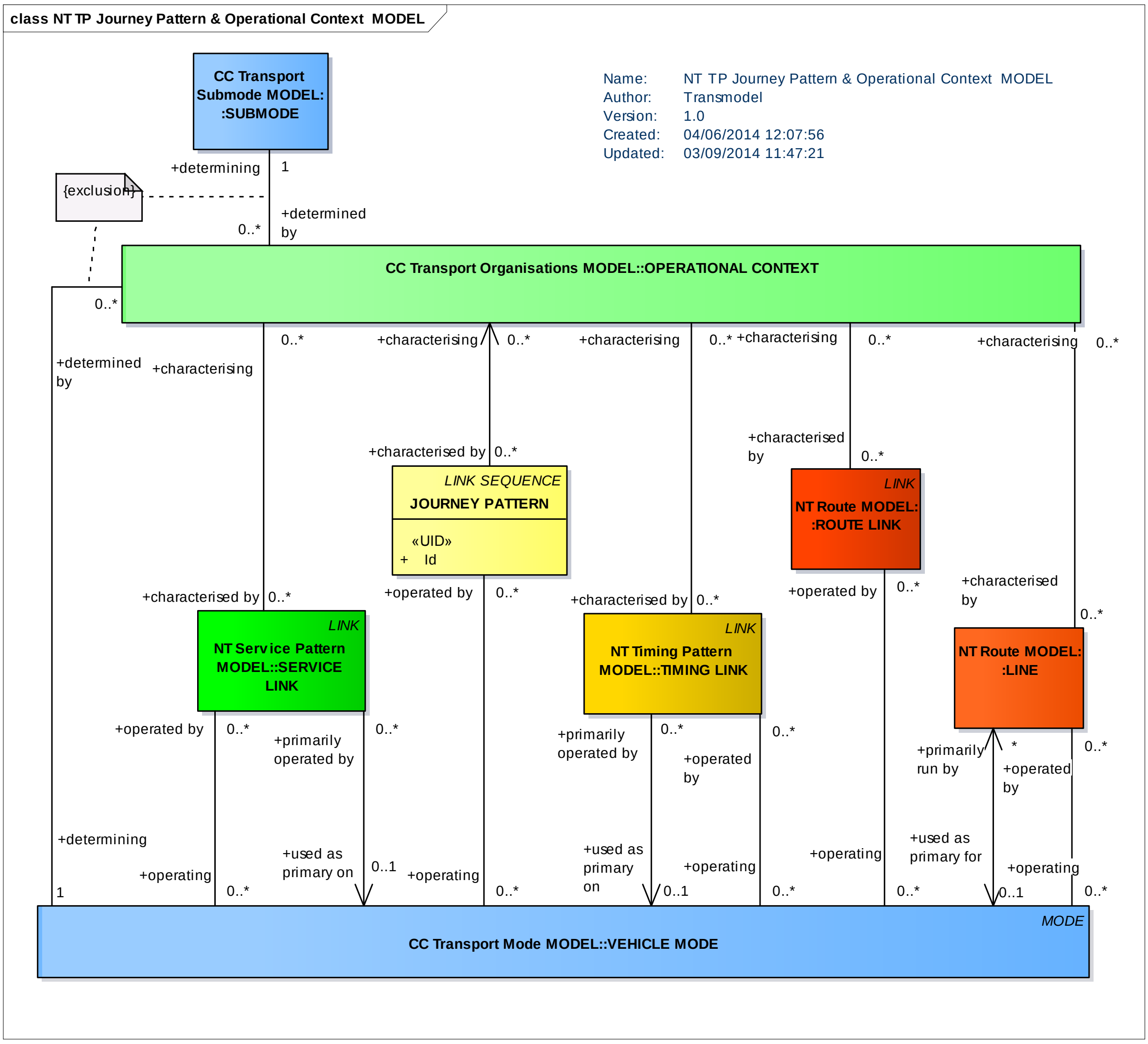

Figure 72 – Journey Pattern & Operational Context – Conceptual Model

DESTINATION DISPLAY is an advertised destination of a specific JOURNEY PATTERN, usually displayed on a headsign or at other on-board locations. There is usually a primary DESTINATION DISPLAY. This display may be adapted according to specific operational needs. The diagram below depicts this situation.

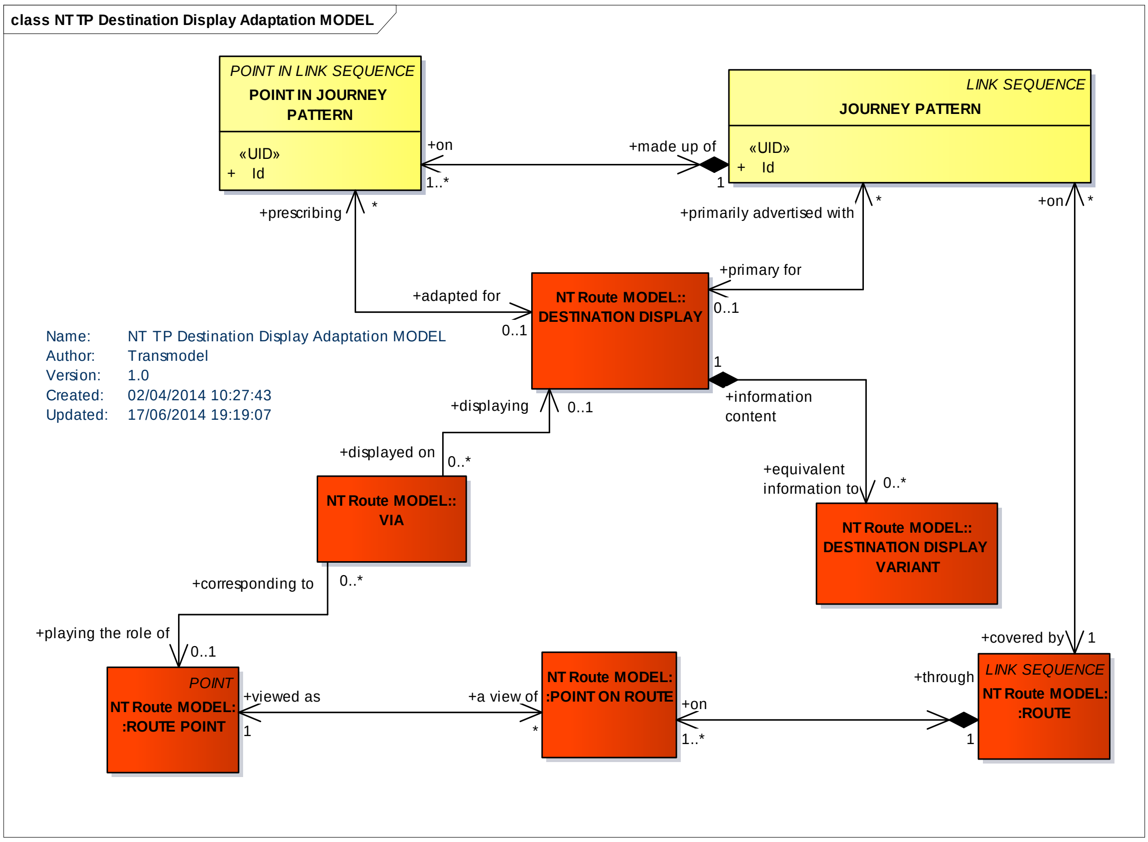

Figure 73 – Destination Display Adaptation – Conceptual Model

5.5.3 Common Section

5.5.3.1 COMMON SECTION – Conceptual Model

In many public transport networks, particularly in big cities, there will be parts of the network where ROUTEs (and JOURNEY PATTERNs) overlap. In other words, lines may be bundled on parts of the network where passengers have the choice of several lines to reach their destinations.

The fact that several JOURNEY PATTERNs are associated in such a bundled section is not necessarily depending on a common topology. The relevant parts of the network where a synchronized schedule will be offered may be chosen arbitrarily by the schedulers, and they need not cover the whole length of the common itinerary of the ROUTEs and JOURNEY PATTERNs in question. Some common itineraries may not be chosen for schedule synchronization at all. In addition, a synchronized schedule may be offered for parts of ROUTEs that are not identical, but parallel (e.g. a tramway line on a specific track, besides a road on which synchronized bus lines operate).

Therefore, an entity COMMON SECTION is introduced in order to define those network sections where bundled lines have to be considered jointly in the scheduling process. A COMMON SECTION is determined by a set of JOURNEY PATTERNs, together with a set of POINTs, each of which has to be a view of a POINT IN in one of those JOURNEY PATTERNs.

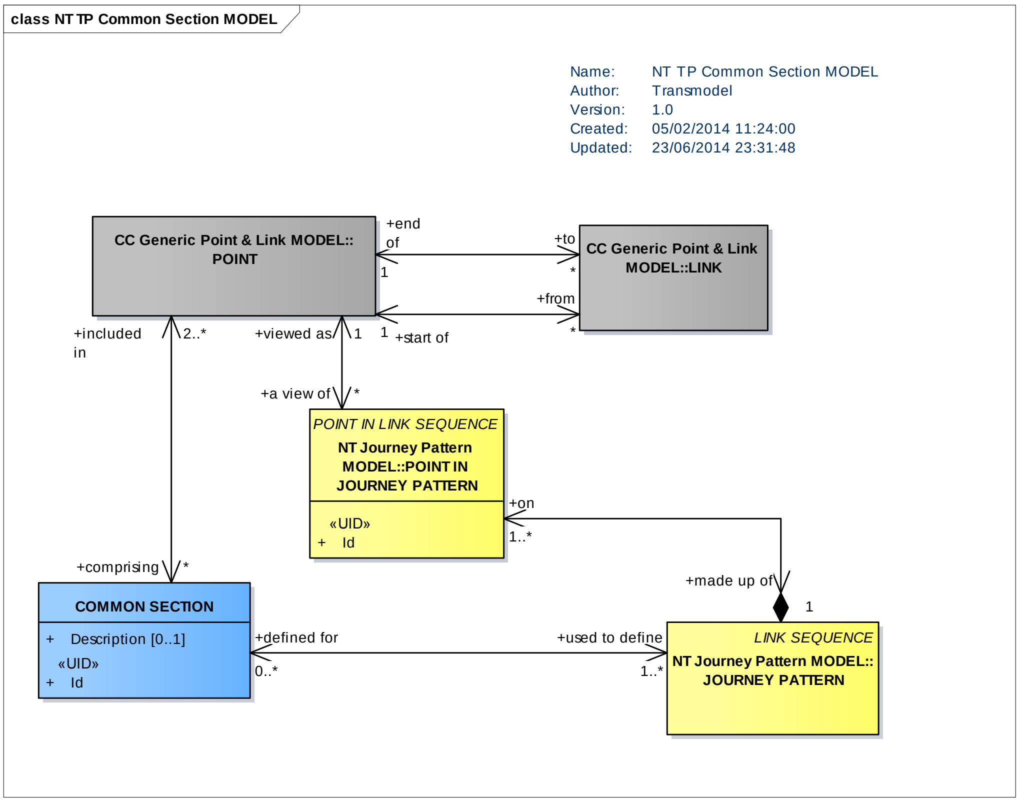

Figure 74 — Common Section – Conceptual Model

5.5.4 Timing Pattern

The TIMING PATTERN model describes the point and links in the transport network that should be used for timing journeys. It is made up of TIMING POINTs and TIMING LINKs. Many TIMING POINTs are also SCHEDULED STOP POINTs but others may be control points that are not stops. The TIMING PATTERN does not actually specify the actual time values – these are provided by the JOURNEY TIME and other models in the context of specific JOURNEY PATTERNs and VEHICLE JOURNEYs ([8]).

The same TIMING POINTs and TIMING LINKs may be used in many different TIMING PATTERNs.

5.5.4.1 TIMING PATTERN – Conceptual Model

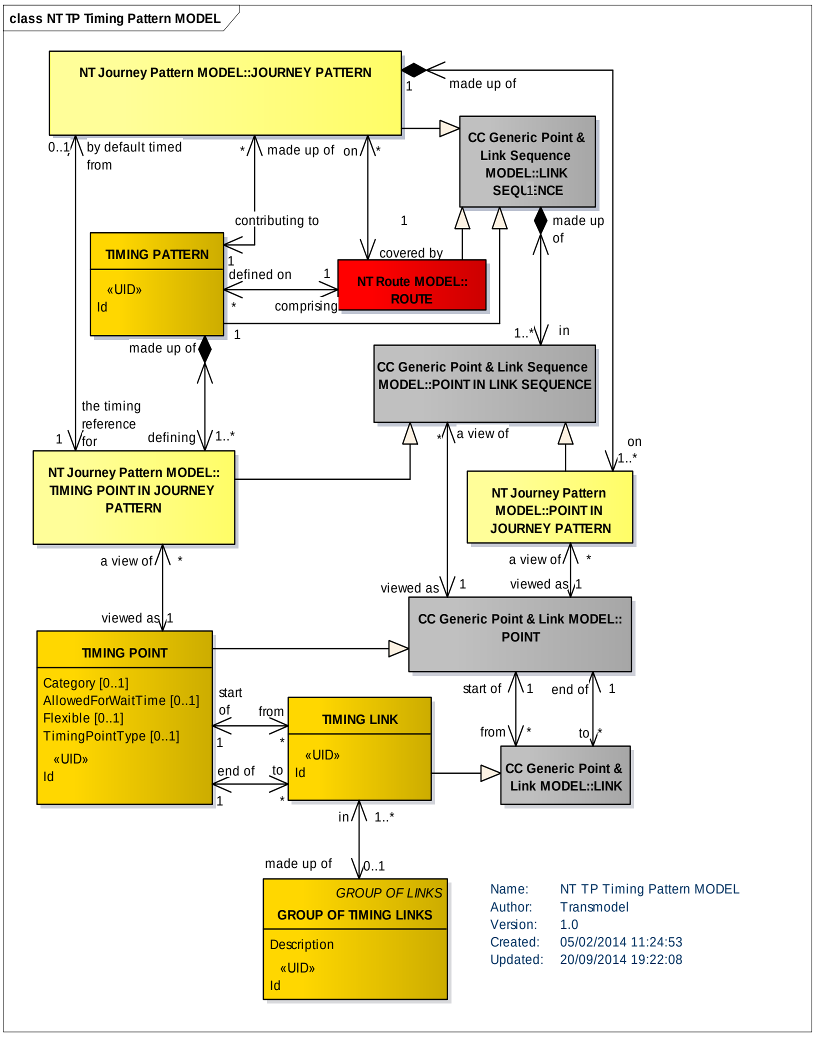

Figure 75 – Timing Pattern – Conceptual Model

5.5.4.2 Timing Pattern – Example

5.5.4.2.1 Timing Pattern in bus operation – Example

This example shows how TIMING PATTERNs can be used for bus operation. TIMING POINTs determine the TIMING PATTERN (green) independently from the SERVICE PATTERN (red) defined by the SCHEDULED STOP POINTs.

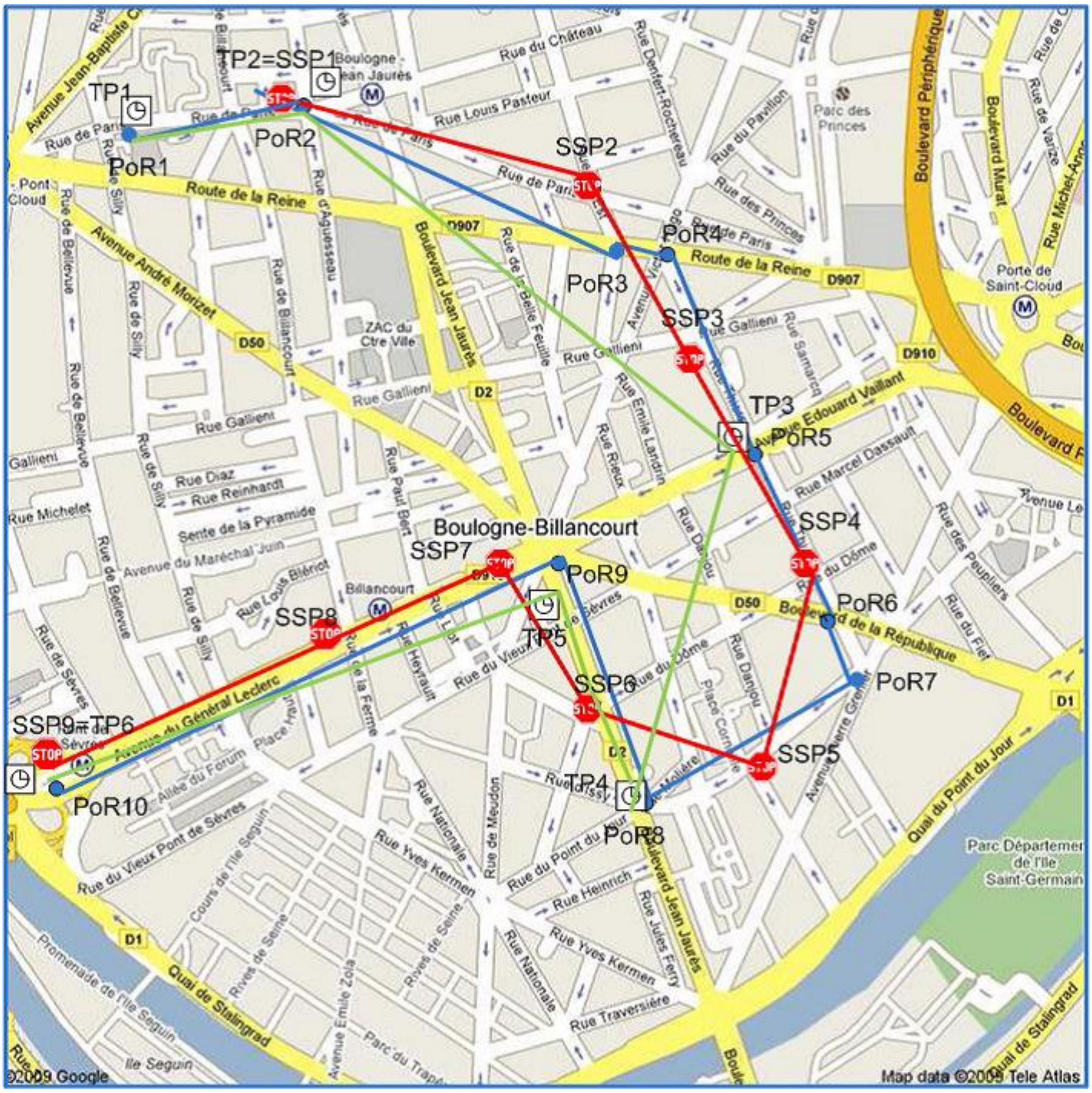

Figure 76 –Timing Link and Timing Points example (source NeTEx – Part 1)

5.5.4.2.2 Simple Rail Timing Pattern – Example

The following fictional example illustrates the use of timing patterns for a simple rail service. On the top are shown a number of different SERVICE PATTERNs followed by different trains on the outbound London to Paris Eurostar route. Below are shown a hypothetical set of TIMING LINKs and TIMING POINTs that can be reused to describe the different TIMING PATTERNs found. In reality there would probably be many more intermediate TIMING POINTs; this example includes just two extra TIMING POINTs (entry and exit from the tunnel) that are not SCHEDULED STOP POINTs.

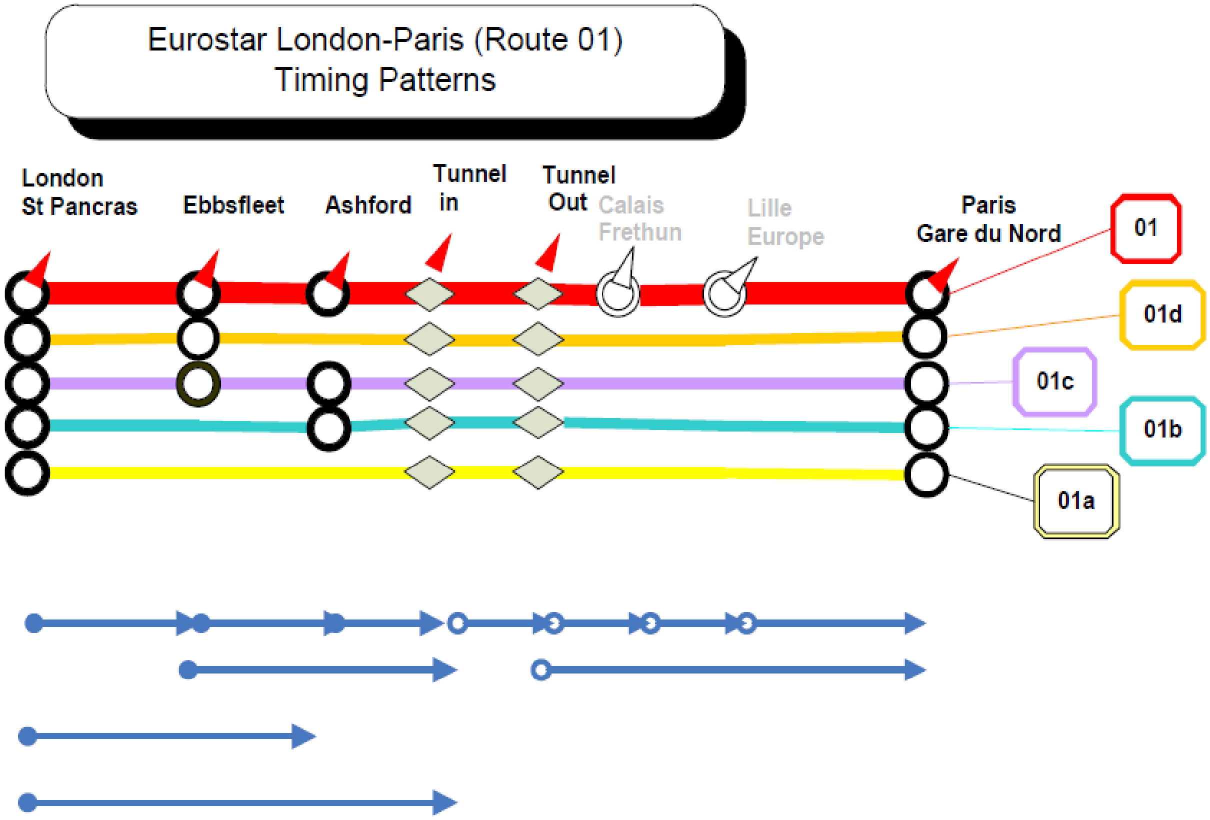

Figure 77 – Rail Timing Link and Timing Points example (source NeTEx – Part 1)

Figure 78 shows some hypothetical timing patterns composed from the timing points and links. The actual timings (run times on TIMING LINKs and wait times on TIMING POINTs) are distinct from the timing patterns. Some SCHEDULED STOP POINTs are used as TIMING POINTs even if the train does not stop at them. Different sets of timings may be associated with the same TIMING PATTERN for different SERVICE JOURNEYs.

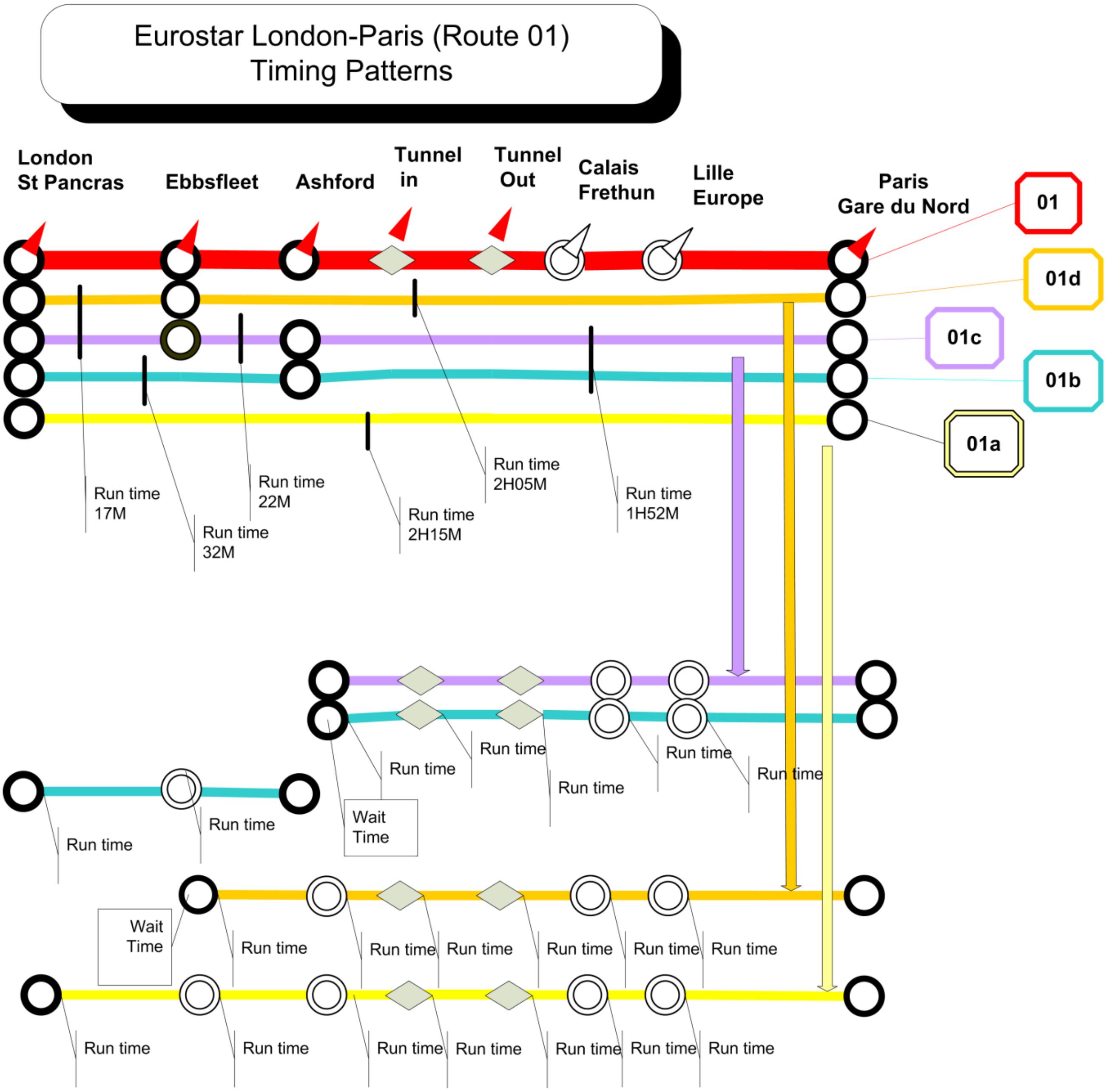

Figure 78 – Rail Timing Pattern Example (source NeTEx – Part 1)

5.5.5 Service Pattern

A Service Pattern is a view of a JOURNEY PATTERN, i.e. the vehicle service from the point of view of the passenger. Passengers are not interested in points dedicated to the scheduling process or vehicle follow up, but in SCHEDULED STOP POINTs, i.e. locations where they will be able to board or leave a vehicle.

Warning: it should be noted that in many cases (systems or companies) the sequence of such points is often called a line. However, the objective of Transmodel is the separation of concerns: LINEs are groupings of ROUTEs, i.e. schematic views of physical paths through the network, determined through ROUTE POINTs, whereas SERVICE PATTERNs are sequences of points of another type. Thus a Transmodel LINE is conceptually *different* from a grouping of SERVICE PATTERNs even if a link exists (a LINE is a group of ROUTEs and each ROUTE is linked to one or more SERVICE PATTERNs).

Of course, from the point of view of the precise physical path (along the road network) both types of points (ROUTE POINTs and SCHEDULED STOP POINTs) are on the INFRASTRUCTURE LINKs taken by the vehicle but the ROUTE and SERVICE PATTERN are not the same LINK SEQUENCEs as shown Figure 79

Figure 79 – Route and Service Pattern Example

Figure 79 shows the different LINK SEQUENCEs: a ROUTE is defined by a sequence of POINTs ON ROUTE, each of them also being a ROUTE POINT (blue) (a single ROUTE POINT can be used as several POINTs ON ROUTE in the case of a circular ROUTE for example) and a SERVICE PATTERN (which is defined by an ordered sequence of SCHEDULED STOP POINTs (red)).

5.5.5.1 SERVICE PATTERN – Conceptual Model

A SERVICE PATTERN is made up of an ordered sequence of STOP POINTs IN JOURNEY PATTERN, with a SERVICE LINK between each pair of consecutive SCHEDULED STOP POINTs. As the same SCHEDULED STOP POINT may occur more than once in the same SERVICE PATTERN, a STOP POINT IN JOURNEY PATTERN is identified by that SERVICE PATTERN together with an 'order' attribute. A relationship between STOP POINT IN JOURNEY PATTERN and SCHEDULED STOP POINT determines the SCHEDULED STOP POINT that is related to that order.

It has to be noted that a SERVICE PATTERN is a sequence of SCHEDULED STOP POINTs to be served by one or several JOURNEY PATTERNs.

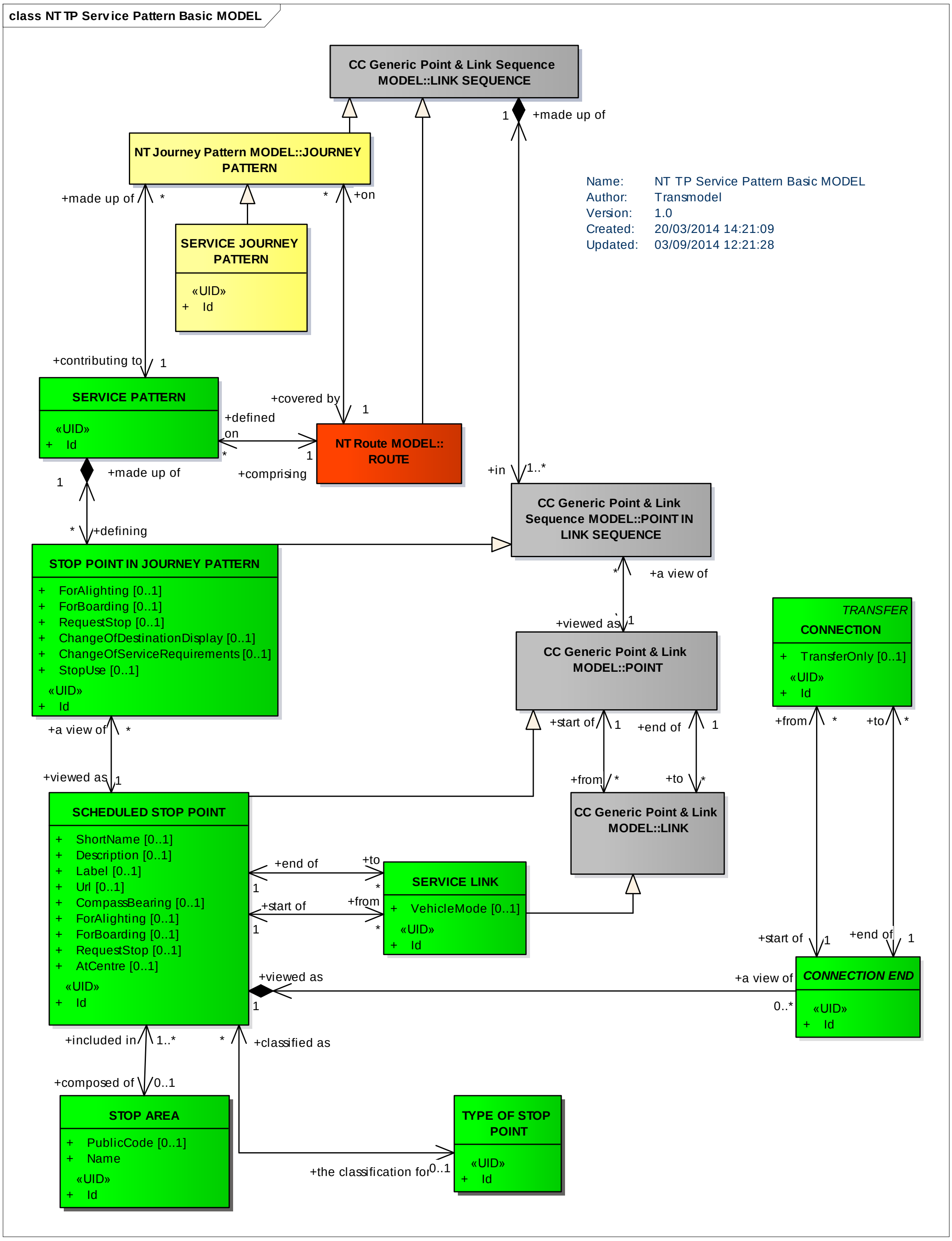

Figure 80 – Service Pattern – Basic Conceptual Model

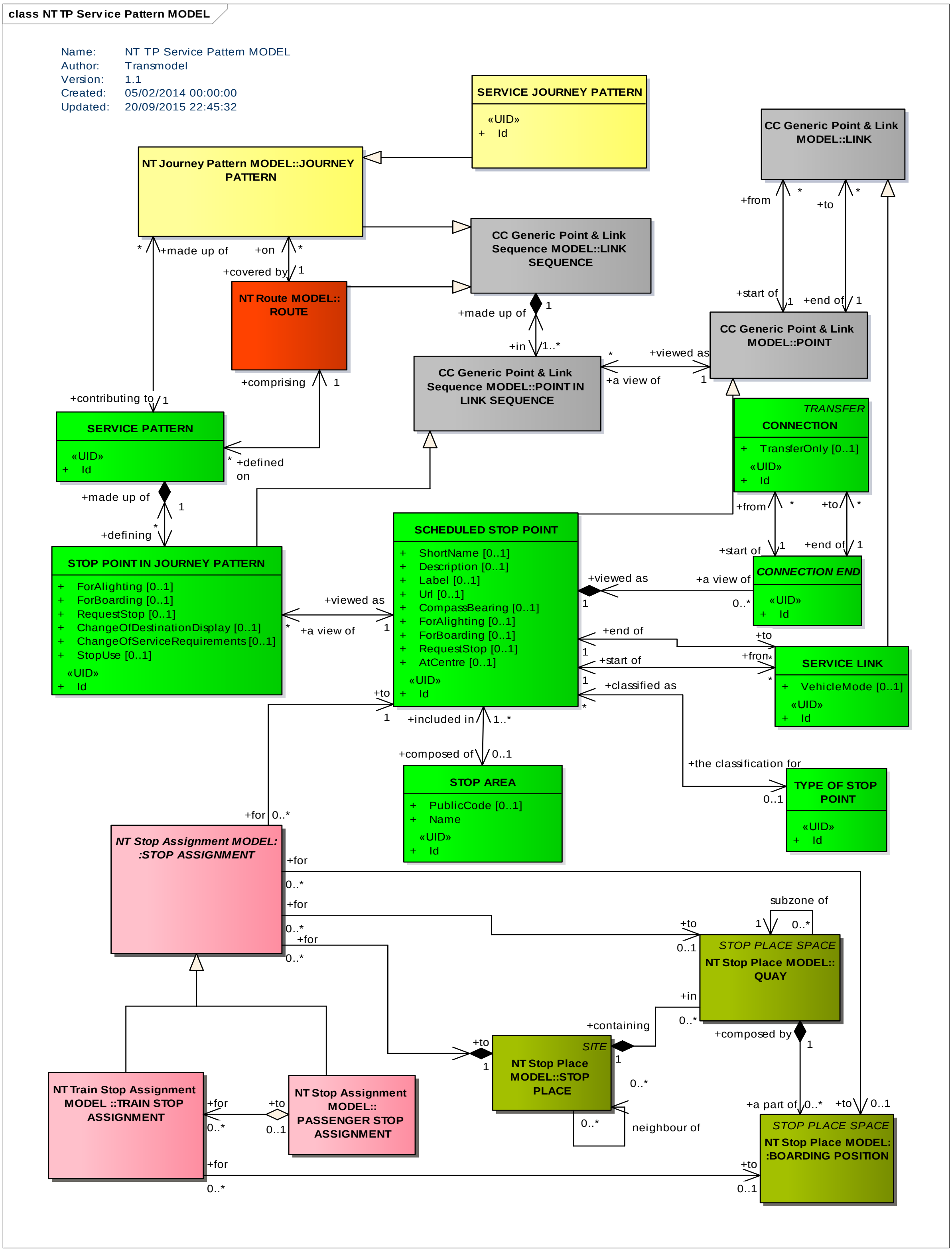

Figure 81 – Service Pattern – Conceptual Model

5.5.5.2 Service Pattern – Examples

Figure 82 introduces the Eurostar route network. There are two main destinations from London (Paris and Brussels) and three minor destinations. In Transmodel terms we can consider each of these to be a LINE.

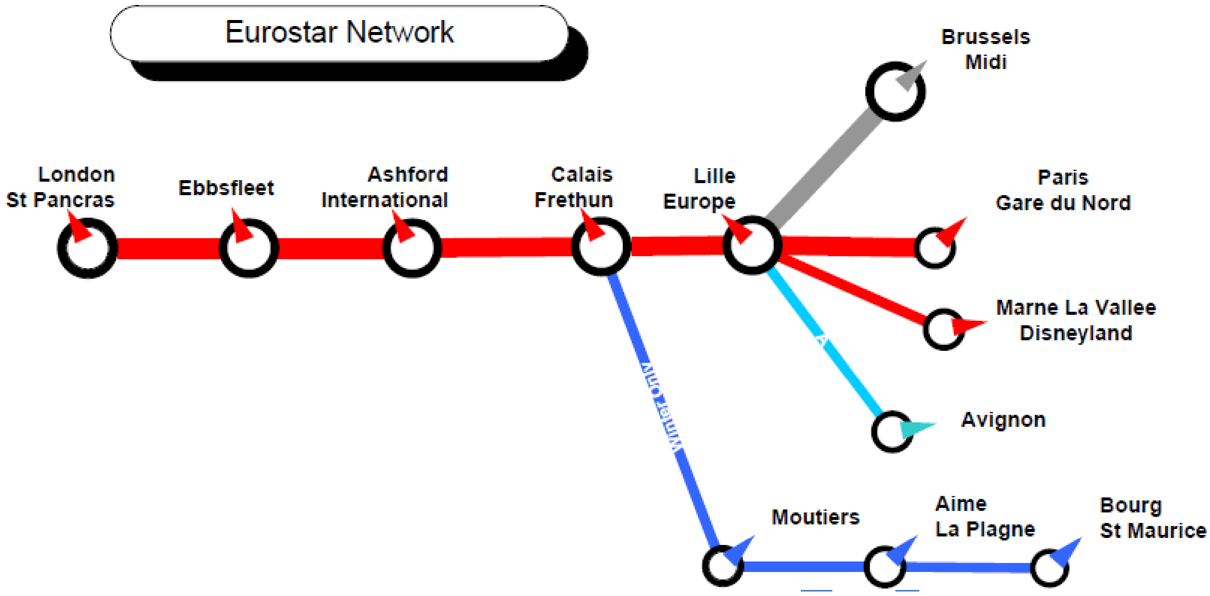

Figure 82 – Eurostar Lines – Example (source NeTEx – Part 1)

In fact services to specific destinations only stop at particular stops, i.e. have different SERVICE PATTERNs, as shown in the following figure.

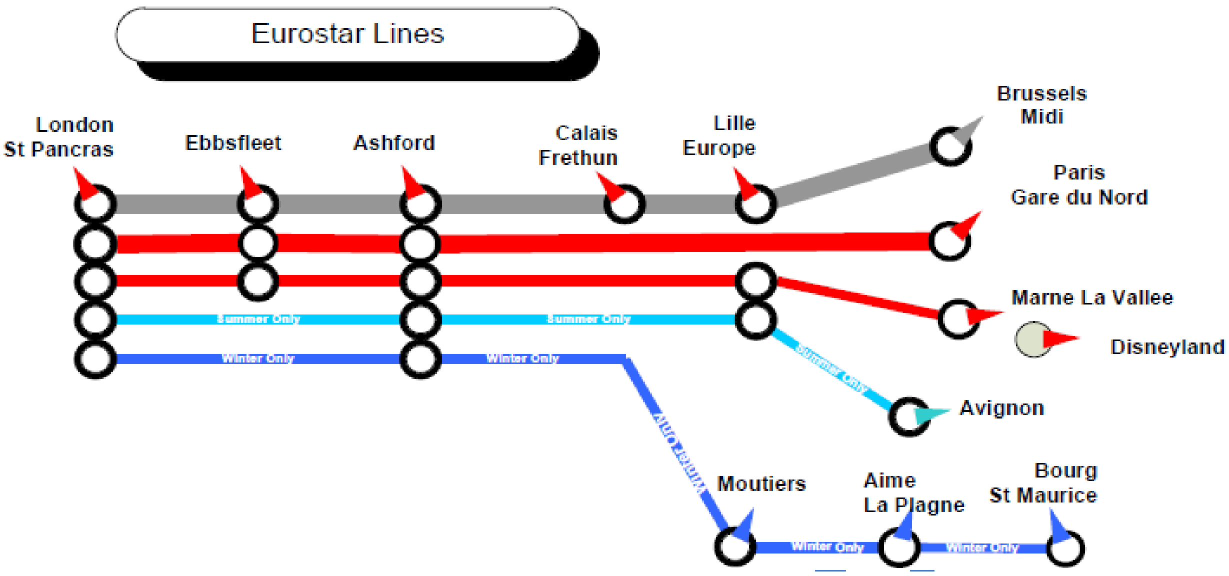

Figure 83 – Eurostar Stops – Example (source NeTEx – Part 1)

Furthermore, if we consider the journeys for the two main “Lines”, *London to Paris*, in one direction, as shown in the following timetable, we see that different services on the same line may also have different SERVICE PATTERNs, representing different subsets of stops visited.

London ▸ Paris/Brussels

Monday to Friday

Notes	LONDON	EBBSFLEET	ASHFORD	CALAIS	LILLE	BRUSSELS	PARIS	Train no
1	05:25	05:42	-	-	-	-	08:50	9078
	06:19	06:36	06:58	08:32	09:10	09:42		9108
2	06:12	06:29	06:53	-	-	-	09:54	9002
1	06:53	-	07:25	-	-	-	10:17	9004
	07:22	07:41	-	-	-	-	10:47	9006
	07:34	-	-	-	-	10:27		9112
	08:02	-	-	-	-	-	11:17	9008
	08:27	08:45	-	-	10:58	11:33		9120
1	08:55	09:12	-	-	-	-	12:17	9012
	09:22	-	09:55	-	-	-	12:47	9014
	10:25	10:42	-	-	-	-	13:47	9018
	10:57	11:15	-	13:02	13:35	14:12		9126
3	11:32	-	-	-	-	-	14:47	9022
	12:28	12:45	-	-	-	-	15:50	9024
	12:58	13:15	-	-	15:28	16:05		9132
	14:02	-	-	-	-	-	17:23	9030
	14:34	-	-	-	16:58	17:33		9138
	15:02	-	-	-	-	-	18:17	9034
	16:02	-	-	-	-	-	19:17	9038
	16:22	-	16:55	-	-	-	19:47	9040
	17:04	-	-	-	19:28	20:03		9148
	17:32	-	-	-	-	-	20:47	9044
	18:02	-	-	-	-	-	21:17	9046
3	18:31	-	-	-	-	-	21:47	9048
4	18:34	-	-	20:32	21:02	21:37		9154
3	18:34	-	-	20:33	-	21:33		9154
	19:02	-	-	-	-	-	22:17	9050
	19:34	-	-	-	21:58	22:33		9158
	20:02	-	-	-	-	-	23:17	9054

Figure 84 –Eurostar Example - London to Paris Trains (source NeTEx – Part 1)

If we analyse the journeys for just one of the “Lines”, London to Paris, we find five distinct SERVICE PATTERNs, most of which are shared between more than one journey.

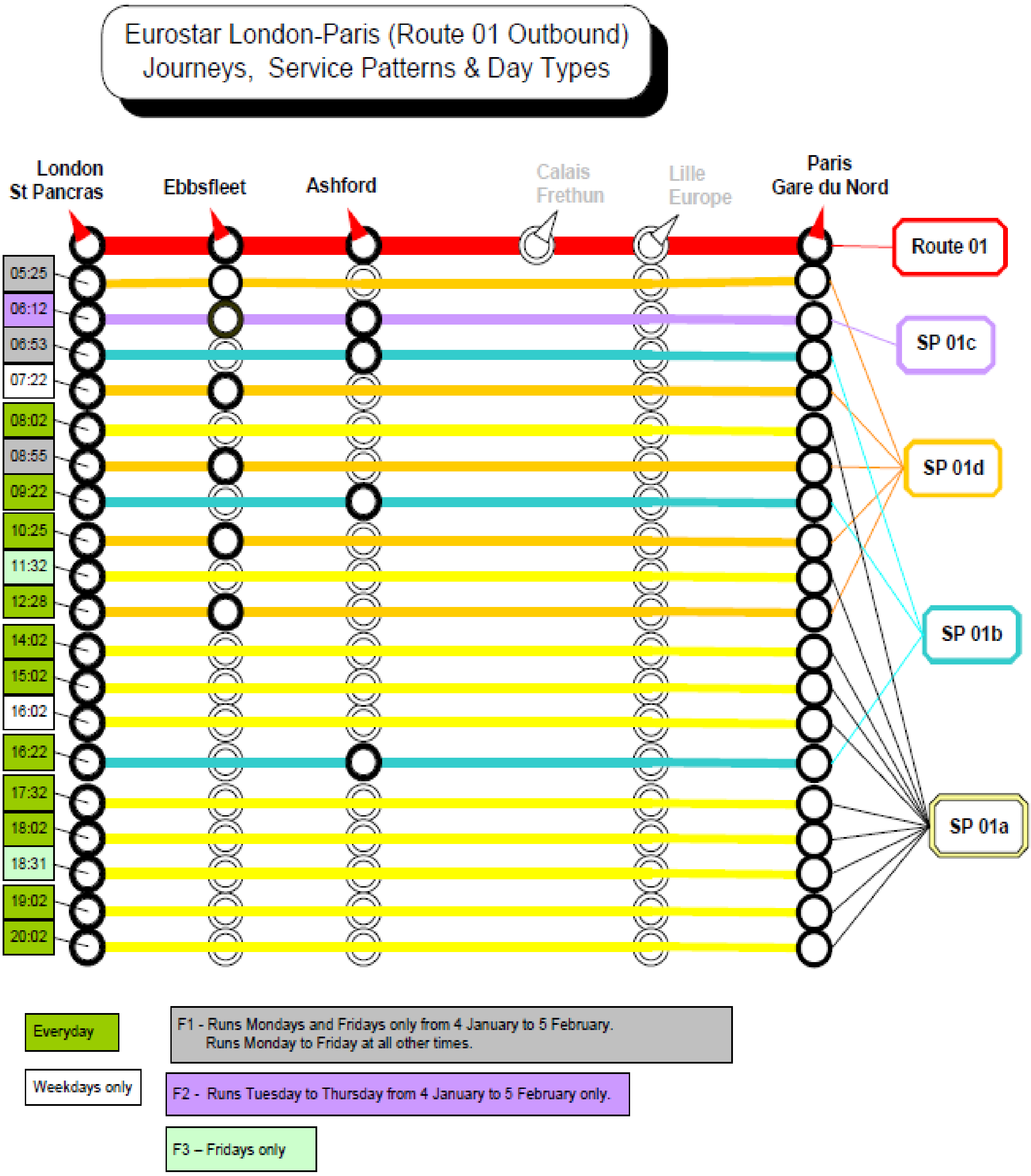

Figure 85– Eurostar Example - Outbound Journeys (source NeTEx – Part 1)

The London to Paris service may be described using the set of patterns shown in Figure 86.

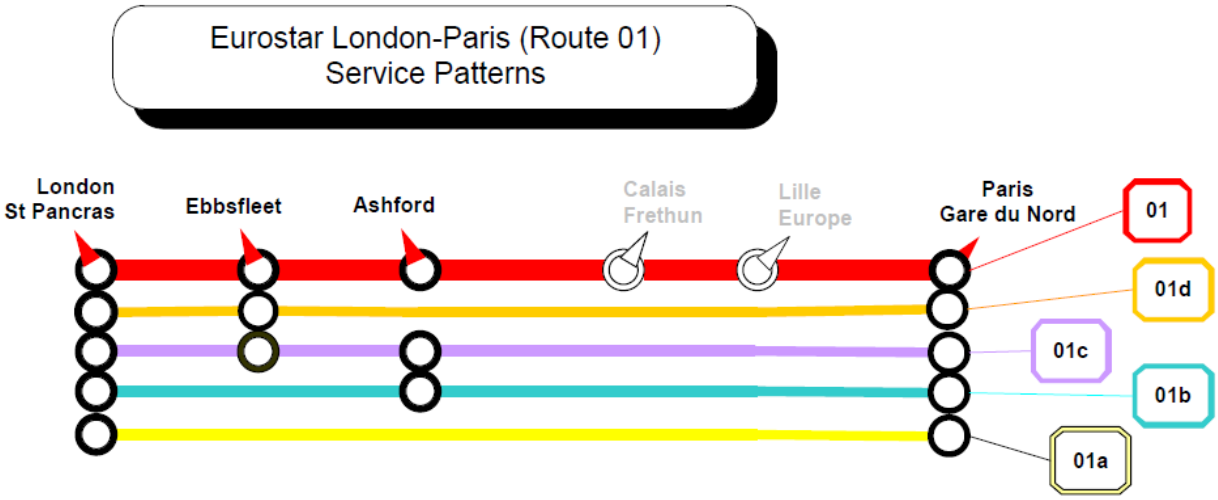

Figure 86– Eurostar Example – Summary Service Patterns

5.5.6 Service Connection

5.5.6.1 SERVICE CONNECTION – Conceptual Model

A CONNECTION (link) expresses the possibility for a passenger to interchange from one public transport vehicle to another, to continue the trip. It refers to the link between two specified SCHEDULED STOP POINTS (or STOP AREAs). This concept will be used each time an interchange is found to be possible, i.e. when the walking link is suitable for an interchange.

A CONNECTION may be characterised by the various times taken by different types of passenger to traverse the link between the two specified SCHEDULED STOP POINTs. The time information given for CONNECTIONs will be used by the scheduling software to synchronise SERVICE JOURNEYs for possible interchanges between different LINEs ([8]). It will also be used for passenger information, to inform on possible interchanges or to compute the whole duration of a trip.

This concept is generalised and a set of TRANSFER possibilities (and associated durations) dedicated for journey planning is additionally defined as follows:

1. DEFAULT CONNECTION – a default time for a transfer between modes on any SITE or given OPERATOR, to be used if there is no more specific value for a site.

2. ACCESS – the possibility of a transfer between any two points or places. This can be used to state the best STOP PLACE to use to reach a particular a POINT OF INTEREST or other distinct SITE.

   — An ACCESS allows a default time for making a transfer between two sites to be specified – this will be regardless of the time needed to reach a particular point within a large site. This can be used to state the average time needed to reach a POINT OF INTEREST or other distinct SITE.

3. CONNECTION – the possibility of making a connection between two SCHEDULED STOP POINTs or STOP AREAs. It allows a default time for a transfer between two SCHEDULED STOP POINTs or STOP AREAs. This allows logical connections in the timetable to be computed independently of a STOP PLACE model, for example, '*King's Cross to St Pancras International*'.

   — A CONNECTION can also be used to state an average contingency time to change at a given interchange regardless of the actual point to point transition – by making the 'from' and the 'to' SCHEDULED STOP POINTs the same. (Some journey planners support only this level of precision).

- A CONNECTION can also be used to state an average contingency time to change at a given interchange between any two modes regardless of the actual point to point transition – by using the ‘from’ and the ‘to’ SCHEDULED STOP POINTs for the respective modes.

4. SITE CONNECTION – The possibility of making a connection between two SITEs / SITE COMPONENTs and/or SCHEDULED STOP POINTs and STOP AREAs. Used to define points of connection between areas of a SITE for reaching public transport. It allows a default time for a transfer between a part of a SITE (which may also correspond to SCHEDULED STOP POINTs or STOP AREAs).

In addition a further precision is possible:

5. A NAVIGATION PATH may state a transfer time for using a specific path to make a transfer between two physical points within the context of a SITE. For example ‘*District Line Platform 1 to Tramlink Platform 10’* via lift, allowing a very detailed calculation of journey times for a specific accessibility constraint, if desired.

   - Each PATH LINK may have a TRANSFER DURATION specified on it.

   - A NAVIGATION PATH may have a total TRANSFER DURATION – this should be the sum of the individual links, if present.

   - There can be more than one NAVIGATION PATH between the same points with different times.

   - A NAVIGATION PATH may reference an ACCESS or CONNECTION for which it provides more detailed information. Several different NAVIGATION PATHs may be associated with the same CONNECTION, representing alternative paths.

CONNECTION times are typically created as part of tactical planning of routes and timetables. NAVIGATION PATH times are derived from a bottom up assessment of the Physical STOP PLACE. The following should be emphasized:

CONNECTION transfer times relate to the timetabled connection times (and can be used without reference to actual platforms). NAVIGATION PATH transfer times relate to the known times to traverse between the physical stops. Whilst these may be the same, they are not necessarily so.

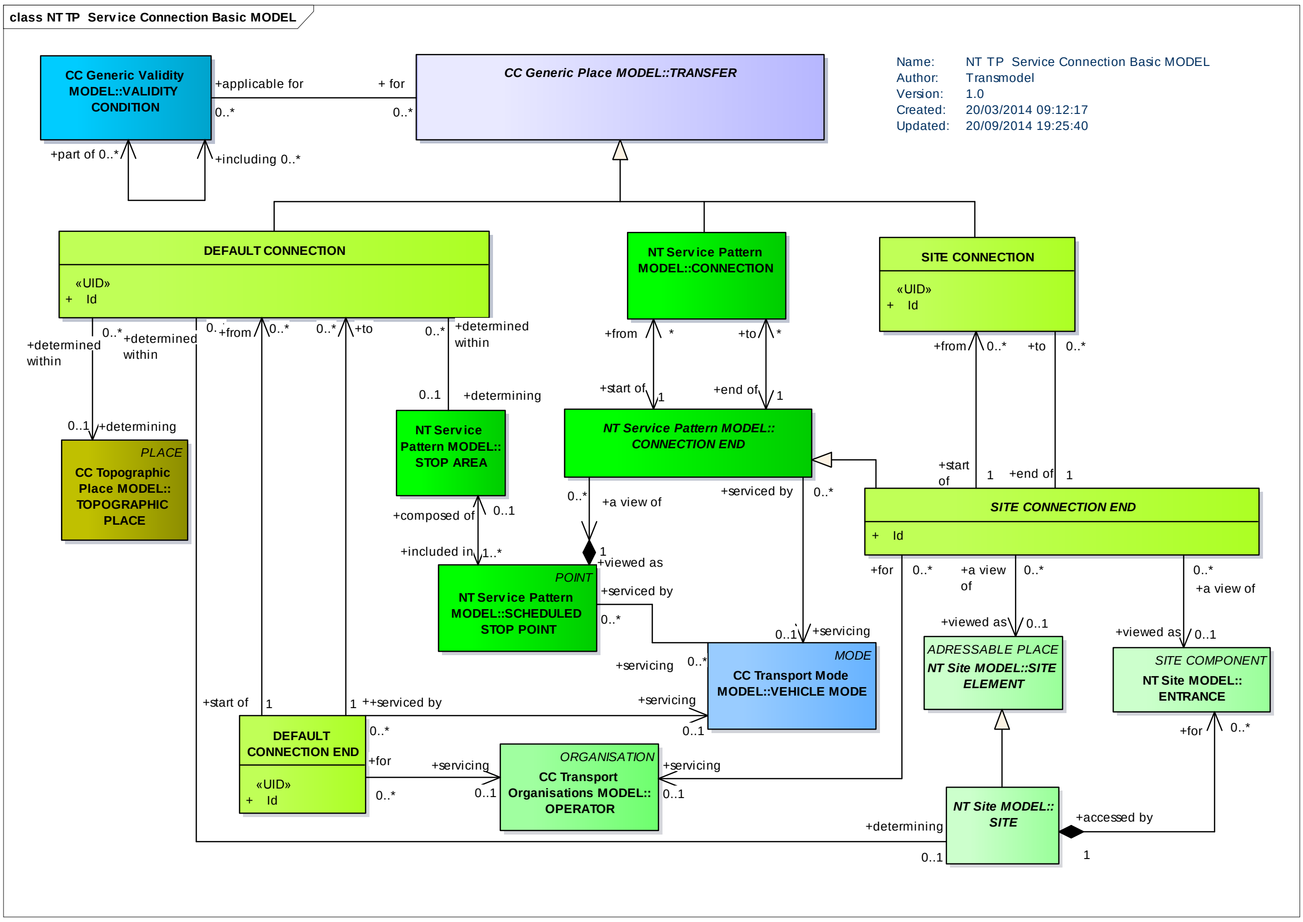

Figure 87 – Service Connection – Basic Conceptual Model

Times taken for TRANSFERs (transfer times) are characterised through four different transfer times which may be specified in a given TRANSFER.

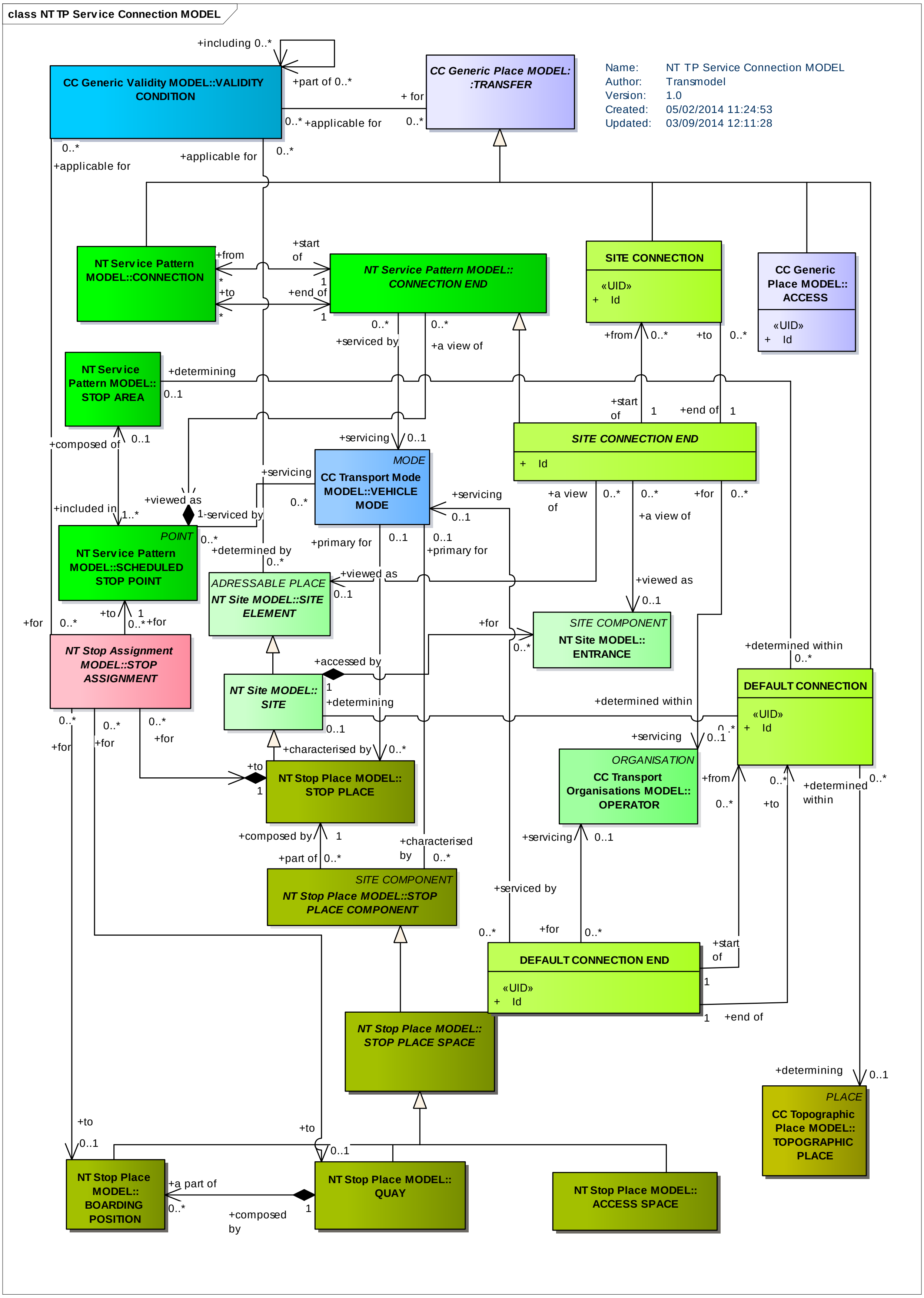

Figure 88 – Service Connection –Conceptual Model

5.5.7 Routing Constraints

5.5.7.1 ROUTING CONSTRAINTs – Conceptual Model

In order to manage competition between operators or bus lines, PT authorities sometimes define ROUTING CONSTRAINTs, preventing passengers boarding or alighting from a vehicle under certain circumstances.

Several types of constraints may be defined.

Zone based constraints are define by a ROUTING CONSTRAINT ZONE. The ZONE may be defined by its contained SCHEDULED STOP POINTS or by its boundary points. ZONEs are usually used to express constraints like "If you board in this ZONE, you can't alight in the same ZONE", or "only alighting is permitted in this ZONE". The constraint applies to all the POINTs IN JOURNEY PATTERN of specific LINEs included in the ZONE.

A SERVICE EXCLUSION constraint expresses the fact that the service on a specific JOURNEY PATTERN (usually a flexible JOURNEY PATTERN) cannot operate when another (regular) service operates. This may occur only on a subpart of the JOURNEY PATTERN, or only on one or some specific SCHEDULED STOP POINTS. This type of constraint is usually defined to prevent a demand responsive service competing with regular lines (meaning that the demand responsive service has to avoid certain areas at hours when the regular lines operate). The model relates the SERVICE EXCLUSION to JOURNEY PATTERN but the "constrained by" relation has to be understood as "*constrained by all the JOURNEYs running on that JOURNEY PATTERN from the time of the first service to the time of the last one*"

TRANSFER RESTRICTIONs are constraints that can be applied on a CONNECTION or INTERCHANGE between two SCHEDULED STOP POINTs, preventing or forbidding the passenger to make a transfer there. They are often used to favour certain connection over others possible on the same couple of lines (in order to use a more appropriate stop for connection, to manage security issues, to manage passenger flow on connections, etc.).

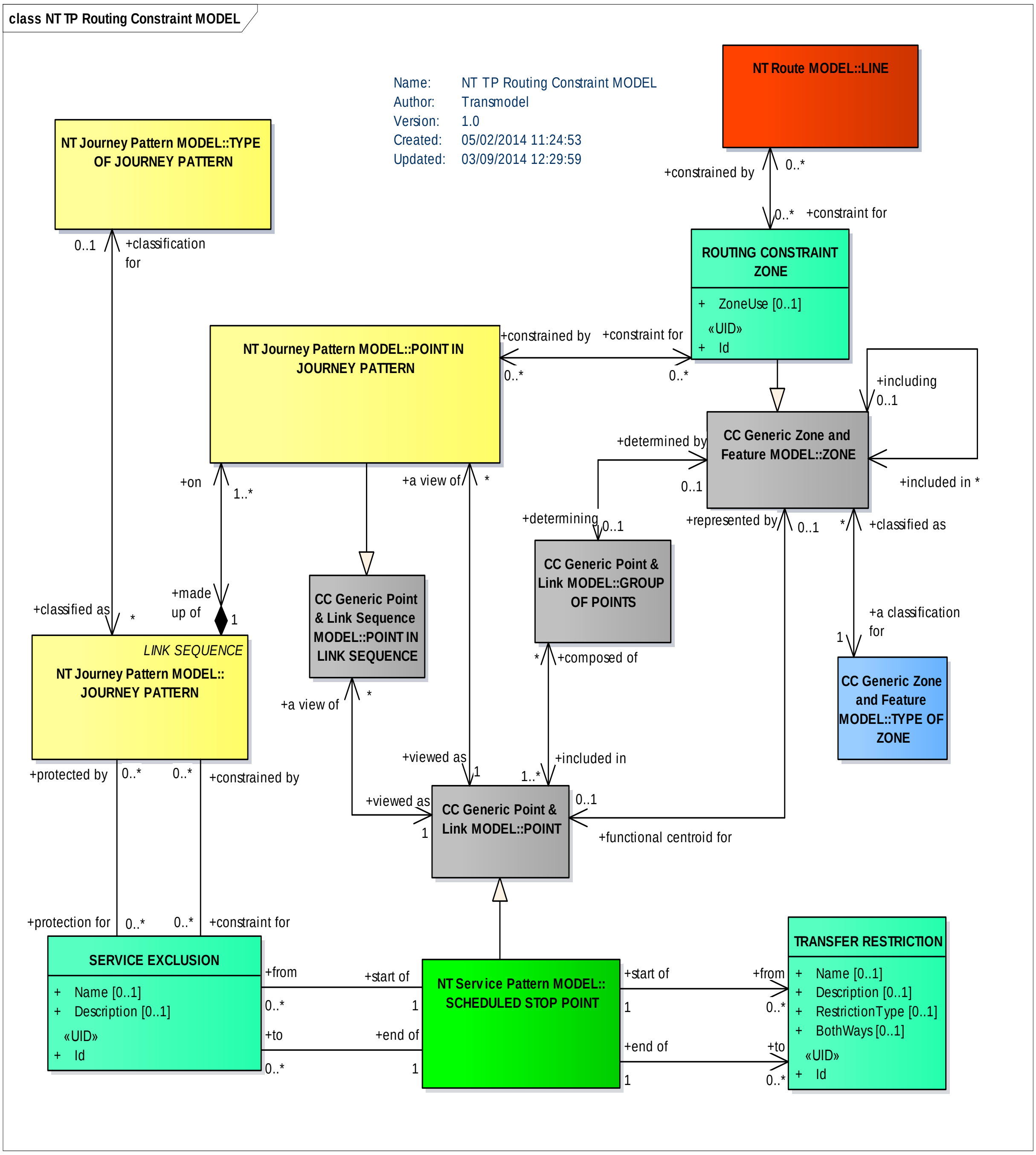

Figure 89 – Routing Constraint – Conceptual Model

5.5.7.2 Routing Constraints – Examples

Figure 90 provides a typical example of ROUTING CONSTRAINT. A regional bus (Magenta Line) joins several towns. Towns B and C have their own local bus network and don't want the Magenta Line to compete with these local bus lines. Therefore two ROUTING CONSTRAINT ZONEs are defined (one for town B and the other for town C). Inside these ZONEs, a passenger can't board and alight while staying inside the ZONE, so that the Magenta Line provides for only the journeys between these towns, but not the ones inside either town.

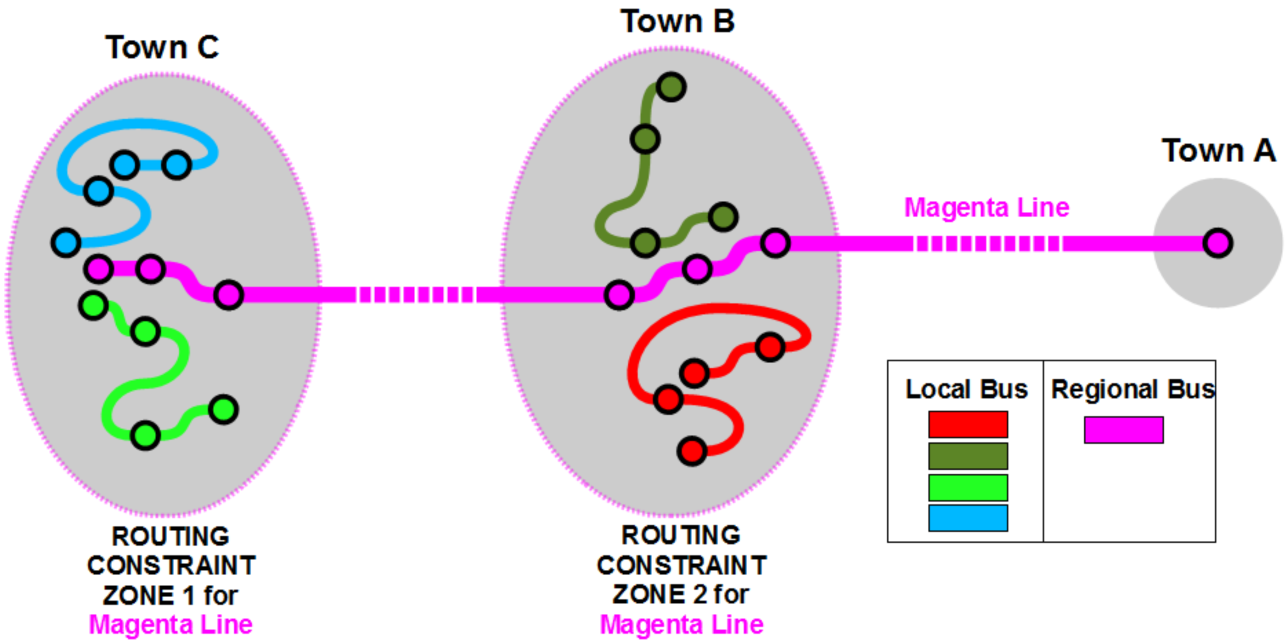

Figure 90 – Routing constraint example (source NeTEx – Part 1)

5.5.8 Time Demand Type

5.5.8.1 Introduction

The transport offer of a public transport company is provided to match different levels of demand at different times. The demand, as well as the traffic environment (such as traffic volume and flow speed) tends to vary during the course of the day, but with repeating characteristics each day. To handle these variations, public transport companies usually differentiate between dense traffic hours (such as morning and afternoon peak hours) and low traffic hours. Planning a detailed service is often based on predetermined service levels and parameters in these intervals.

5.5.8.2 TIME DEMAND TYPE – Conceptual Model

A TIME DEMAND TYPE represents the entity which encapsulates differentiation between time intervals with its own demand and traffic flow characteristics (such as peak hours and off-peak hours). All time-related values – especially run times and layover times – depend on which TIME DEMAND TYPE they are used for.

To represent the function, a TIME DEMAND TYPE ASSIGNMENT relates each GROUP OF TIMING LINKs to TIME DEMAND TYPEs.

A TIME DEMAND TYPE also refers to a TIME BAND (cf. “Public Transport Data Model: Part 1 - Common Concepts”) in which the aforementioned characteristics apply.

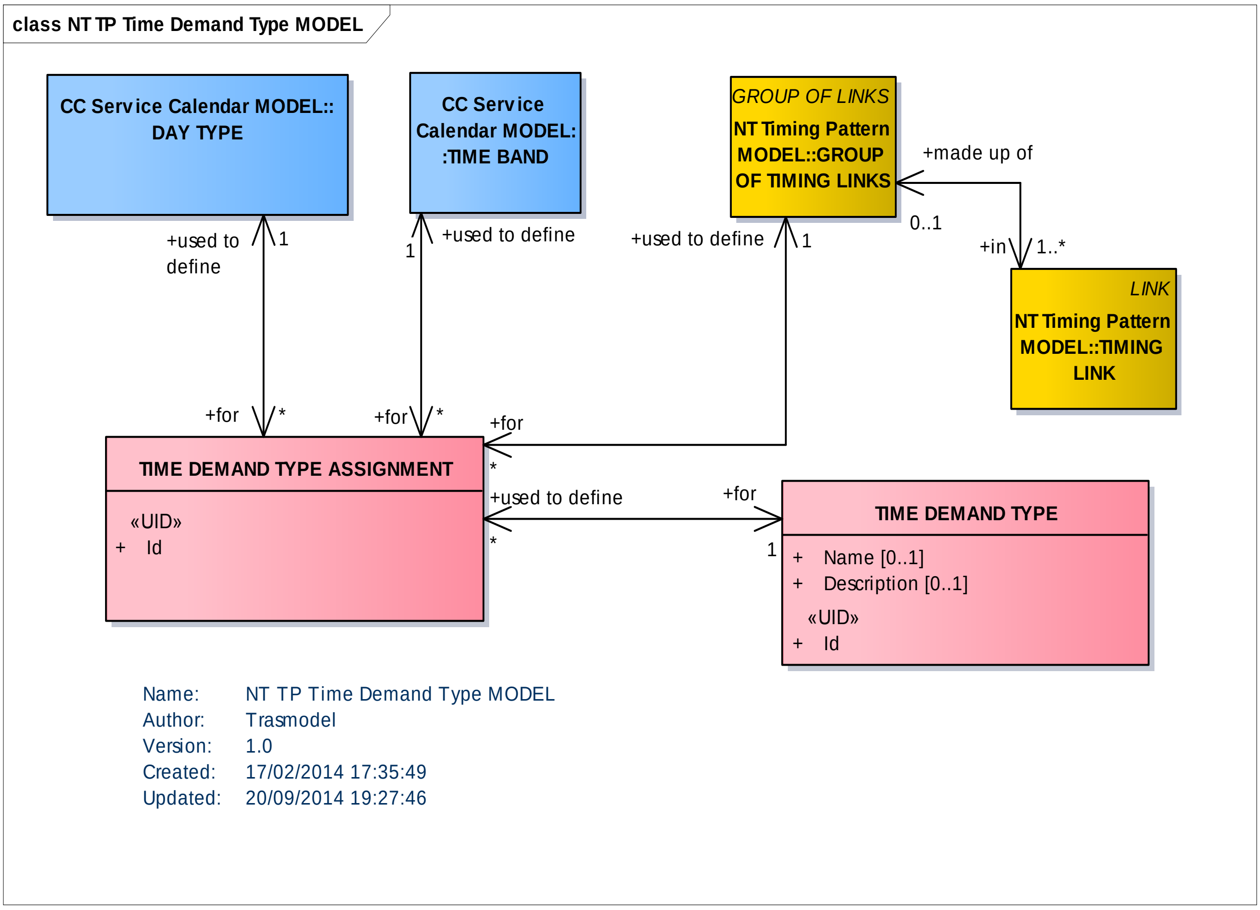

Figure 91 – Time Demand Type – Conceptual Model

5.5.9 Passenger Stop Assignment

5.5.9.1 Introduction

For the scheduling process, but also in the passenger information domain, approximate locations for boarding/alighting are determined in order either to plan timetables or to inform passenger about the availability of public transport at some specific places (e.g. points of interest, specific addresses, etc.). Frequently, these locations represent the centroid of a cluster of points, close to each other, where public transport vehicles stop and where the users have the opportunity to board/alight. These “points” in space are, geometrically speaking, areas. In the case of trains or metro, such locations may be quays with several boarding positions. However, for advertisement or planning purposes, only one single location is taken into account: the term “logical stop” is often used to describe this situation. Transmodel uses in this context the concept of (SCHEDULED) STOP POINT.

In reality, i.e. physically, such a SCHEDULED STOP POINT may correspond either to a whole STOP PLACE or to a QUAY, or to a BOARDING POSITION. Conversely a STOP PLACE, QUAY or BOARDING POSITION may be viewed in different functional contexts and be subject to several assignments to SCHEDULED STOP POINTs.

5.5.9.1.1 Further Discussion

Historically there has been some confusion in transport models between *a stop as identified in the timetable* (a logical construct, for example, that a timetabled service going in a particular direction stops at a station at a particular time regardless of platform); *a stop as a physical point* (i.e. an actual pole beside the road, or platform within a station), and the *stop as a point on a line regardless of a timetable or direction (*for example, a rail or metro station, or a pair of physical stops either side of a road on a bus route that are depicted as being a single “stop” on a route map).

Figures 92, 93 and 94 attempt to further convey this distinction by showing the same three stops (a) as points on a line in a typical schematic map of a line; (b) as the stopping points of some journeys of a timetable; and (c) as physical points at which the vehicles may visit.

Figure 92 – Stops as Places on a Line – Example (source NeTEx – Part 1)

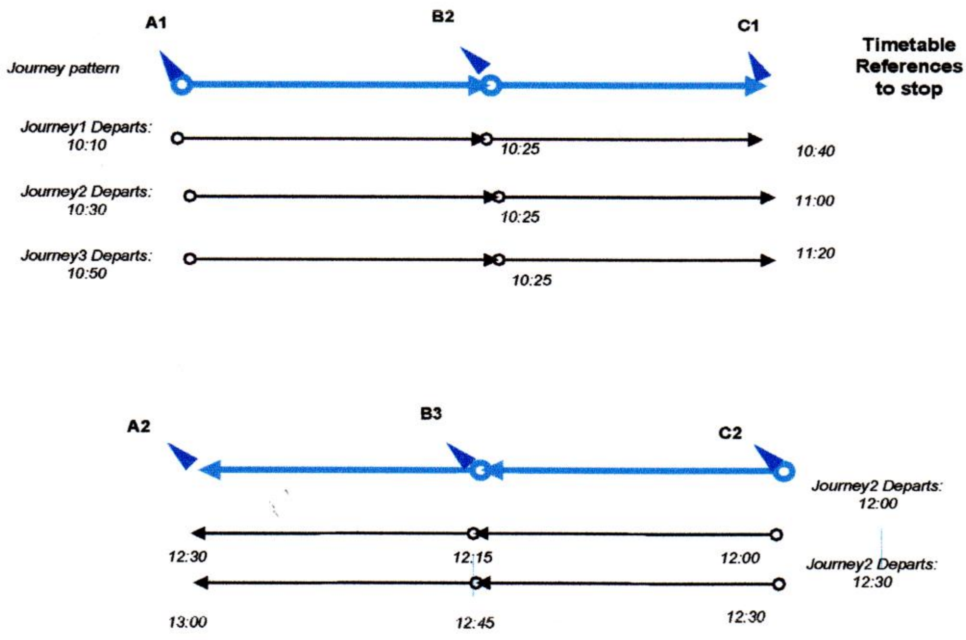

Figure 93 – Stops as Stopping Points in the Timetable – Example (source NeTEx – Part 1)

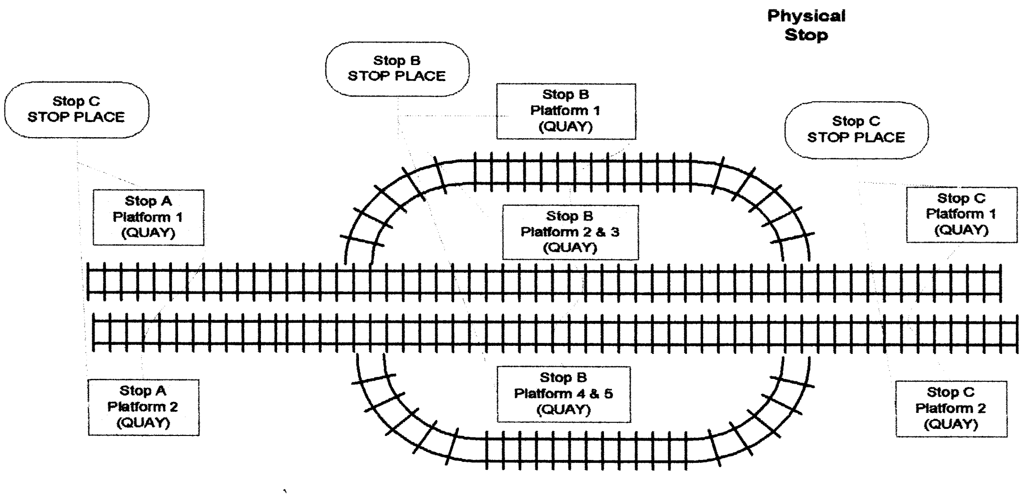

Figure 94 – Stops as Physical Places – Example (source NeTEx – Part 1)

Transmodel clarifies these various possible relationships. It represents the logical stop in the timetable as a distinct concept, the SCHEDULED STOP POINT, independent of its physical nature. It separately represents the physical point of access as a QUAY, i.e. platform or pole, ferry landing or airline gate. It adds a STOP PLACE as a named representation of a physical interchange that may group QUAYs – for example, a station, or a pair of bus stops on a street with the same name. Then to associate a timetable or real-time data for a particular service with a physical stop, Transmodel uses the concept of a STOP ASSIGNMENT, which associates a SCHEDULED STOP POINT with a STOP PLACE. An assignment can be just to the whole station (STOP PLACE), or to a specific platform (QUAY) within the station (thus allowing for detailed platform allocation and also platform changes).

In the trivial case where the SCHEDULED STOP POINT has the same identifier as the STOP PLACE or QUAY, the assignment can be implicit (i.e. because they have been given the same codes, the association between the SCHEDULED STOP POINT and the QUAY or STOP PLACE can be inferred). In other cases, where the code is different, an explicit assignment needs to be used.

Potentially there can be multiple assignments of the same STOP PLACE. A condition quite often found in the real world is that different operators or different modes use different codes for either the same SCHEDULED STOP POINT, or STOP PLACE and QUAY, or both: Transmodel allows this to be represented.

5.5.9.2 PASSENGER STOP ASSIGNMENT – Conceptual Model

SCHEDULED STOP POINTs are related to the physical stop through the concept of a PASSENGER STOP ASSIGNMENT, defined as the allocation of a SCHEDULED STOP POINT (i.e. a STOP POINT of a SERVICE PATTERN or JOURNEY PATTERN) to a specific STOP PLACE, a QUAY or a BOARDING POSITION. For the reasons explained above, there may be several such assignments for a STOP PLACE, a QUAY or a BOARDING POSITION.

This assignment may be subject to AVAILABILITY CONDITIONs.

In general a fixed assignment of a SCHEDULED STOP POINT to an exact STOP PLACE, QUAY or BOARDING POSITION will be planned but may sometimes change dynamically. Often such dynamic assignments represent a change of platform and are a consequence of a control action of an AVM system.

A DYNAMIC STOP POINT ASSIGNMENT is used to represent this situation. It may indicate also a scheduled set of STOP POINTs from which the real-time allocation may be made.

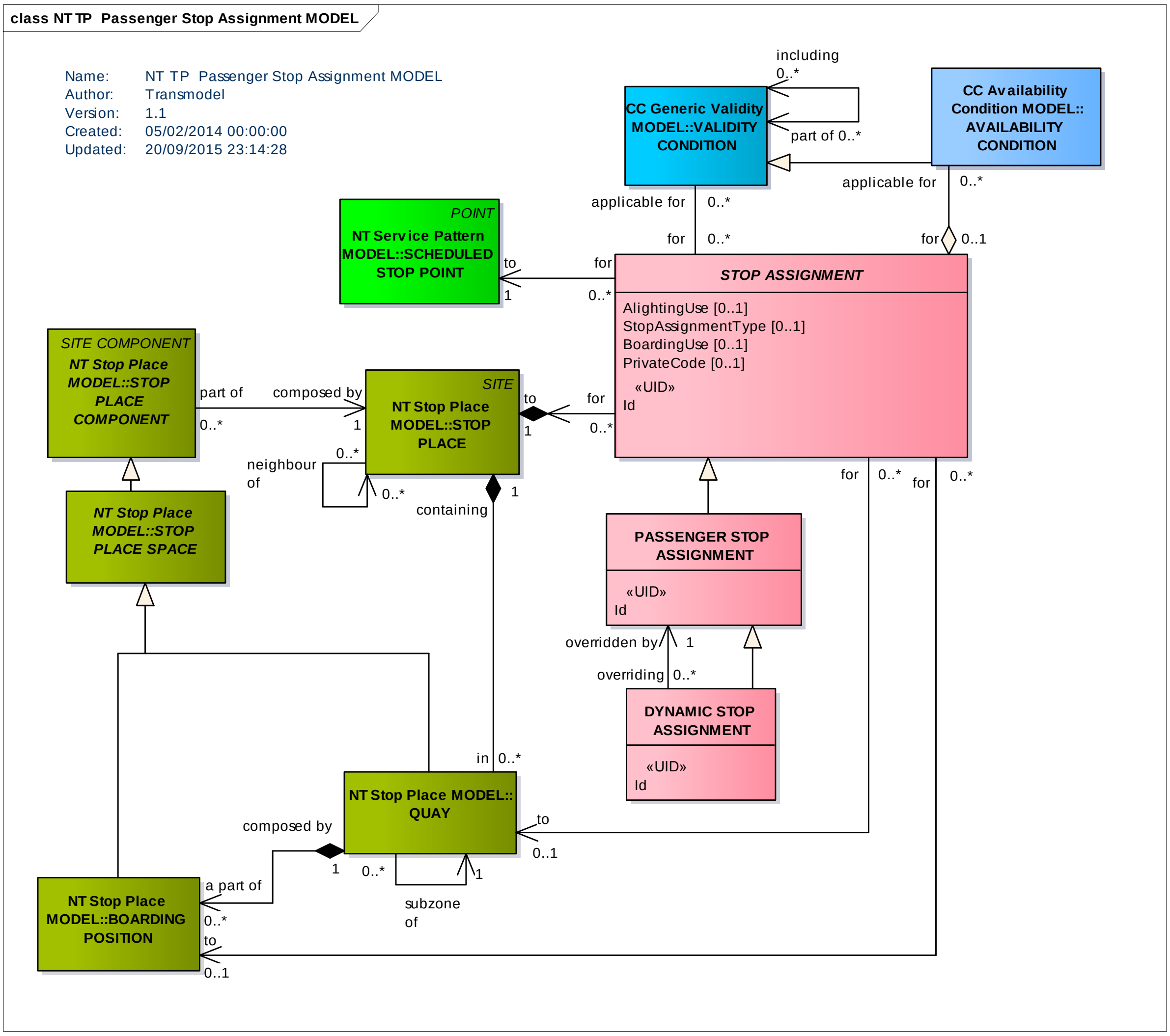

Figure 95 – Passenger Stop Assignment - Conceptual Model

5.5.9.2.1 Example of a Stop Assignment

Figure 96 shows some of the PASSENGER STOP ASSIGNMENTs for Wimbledon station, which has four different modes (Rail, Metro, Tram and Bus). The Tram Link and bus stop SCHEDULED STOP POINTs correspond to specific QUAYs. The Rail SCHEDULED STOP POINTs correspond to the STATION as a whole (but could potential be assigned in more detail to a specific platform, i.e. QUAY within the station. The Tram shares a specific rail platform. The metro SCHEDULED STOP POINT alternates between either platform.

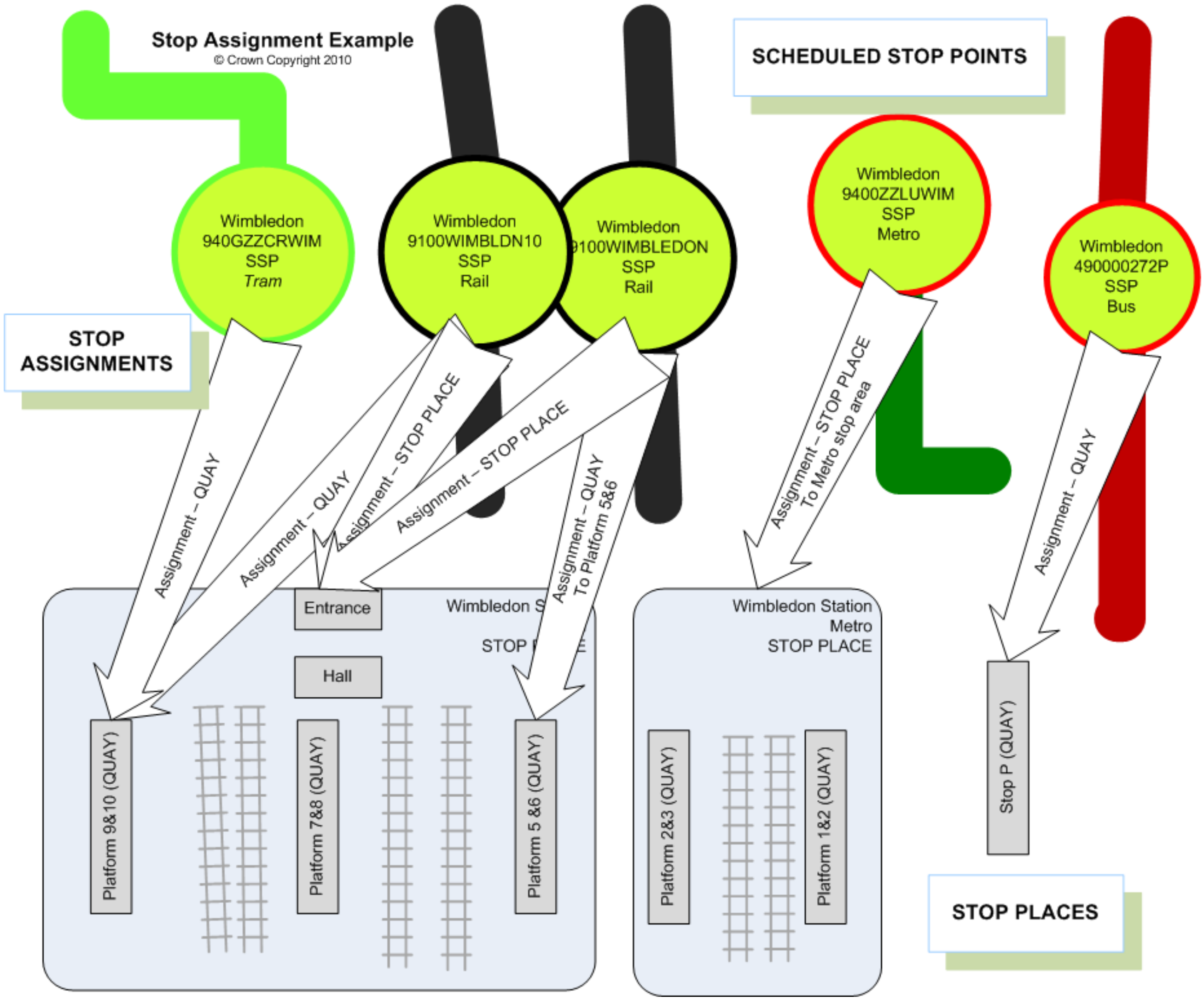

Figure 96 – Some Stop Assignments for the Wimbledon – Example (source NeTEx –Part 1)

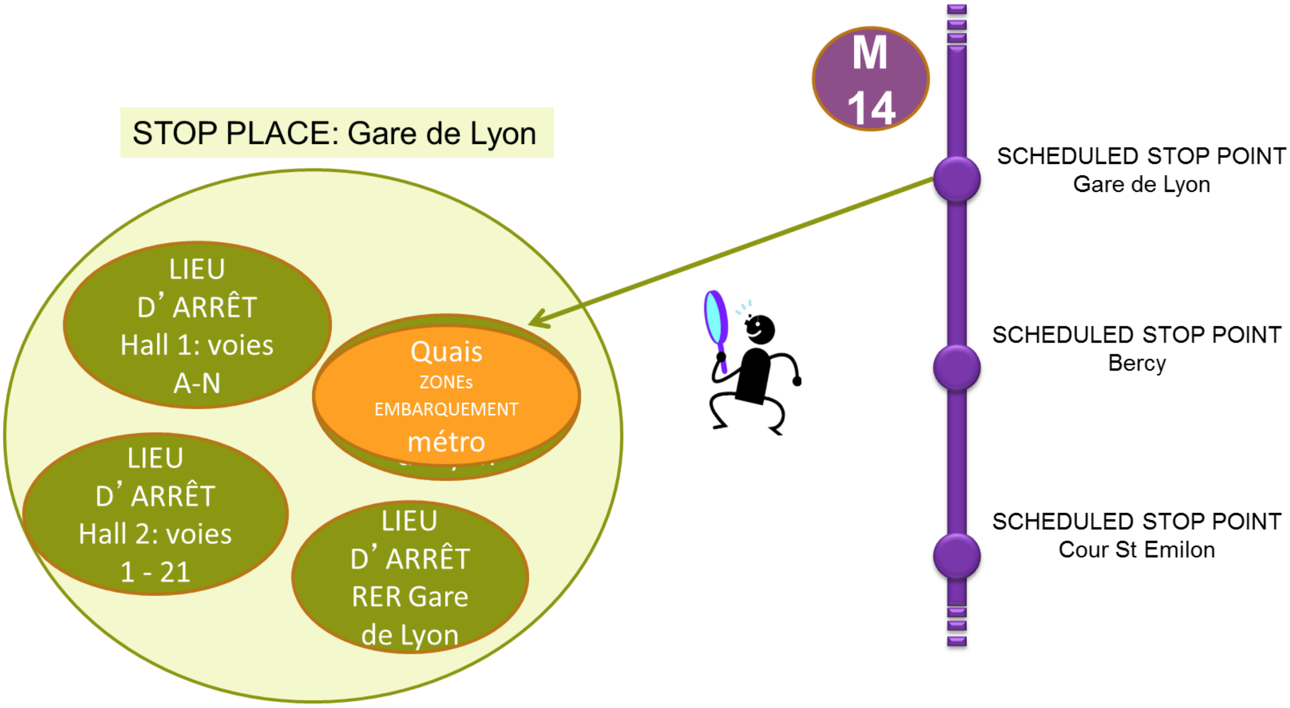

Figure 97 – Stop Assignment for the Stop Gare de Lyon in Paris

5.5.10 Train Stop Assignment

5.5.10.1 TRAIN STOP ASSIGNMENT – Conceptual Model

A TRAIN STOP ASSIGNMENT describes the alignment of the carriages of a train with the BOARDING POSITIONs of a QUAY so that, for example, exact guidance can be given to passengers as to where to stand on the platform to access a particular carriage or part of the train.

Each TRAIN COMPONENT of a TRAIN can be assigned to a SCHEDULED STOP POINT and a specific QUAY and BOARDING POSITION of a STOP PLACE.

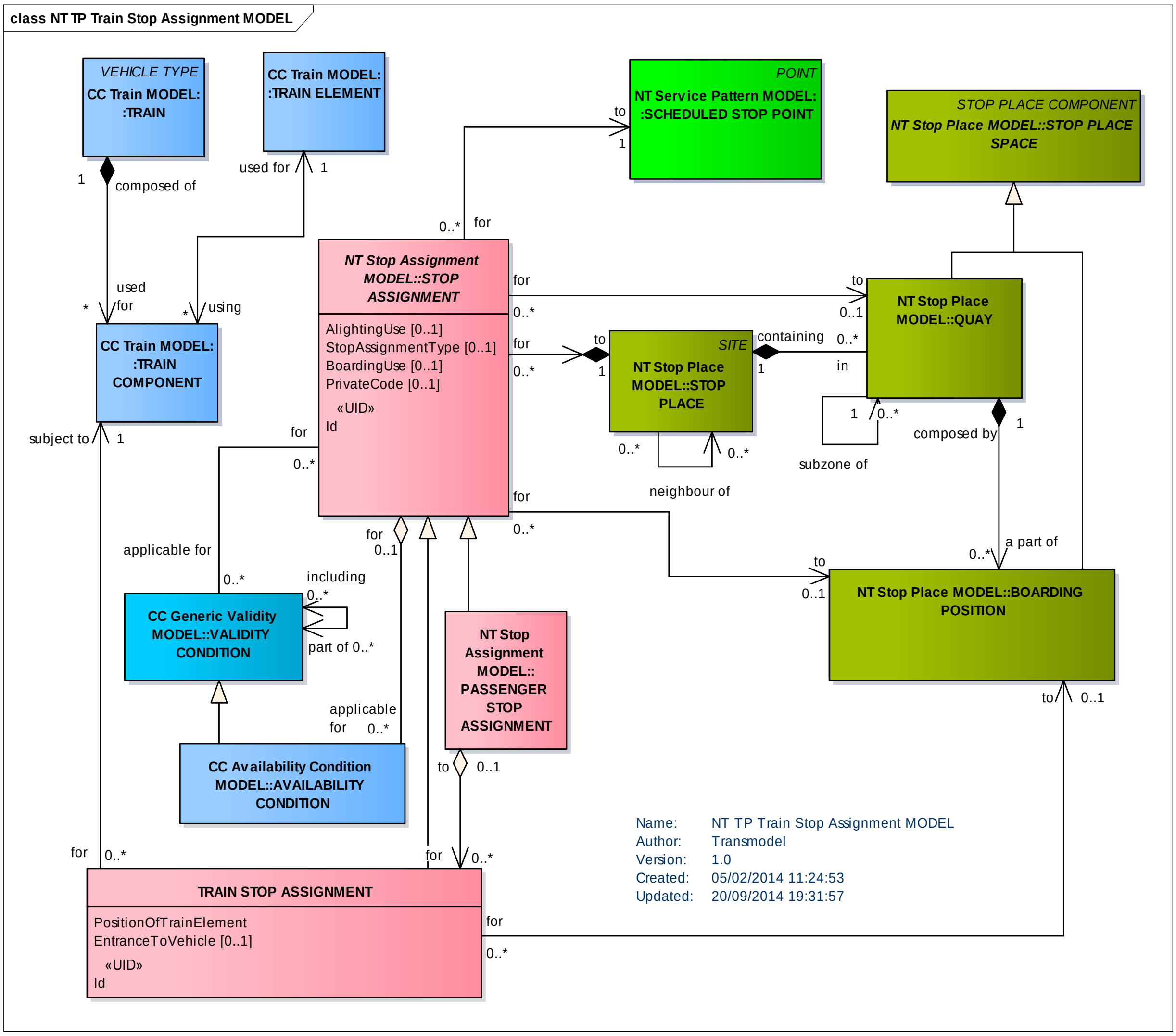

Figure 98 – Train Stop Assignment – Conceptual Model

5.5.10.2 Train Stop Assignment – Example

Figure 99 shows how a TRAIN STOP ASSIGNMENT can be used to relate specific TRAIN COMPONENTs to specific BOARDING POSITIONs.

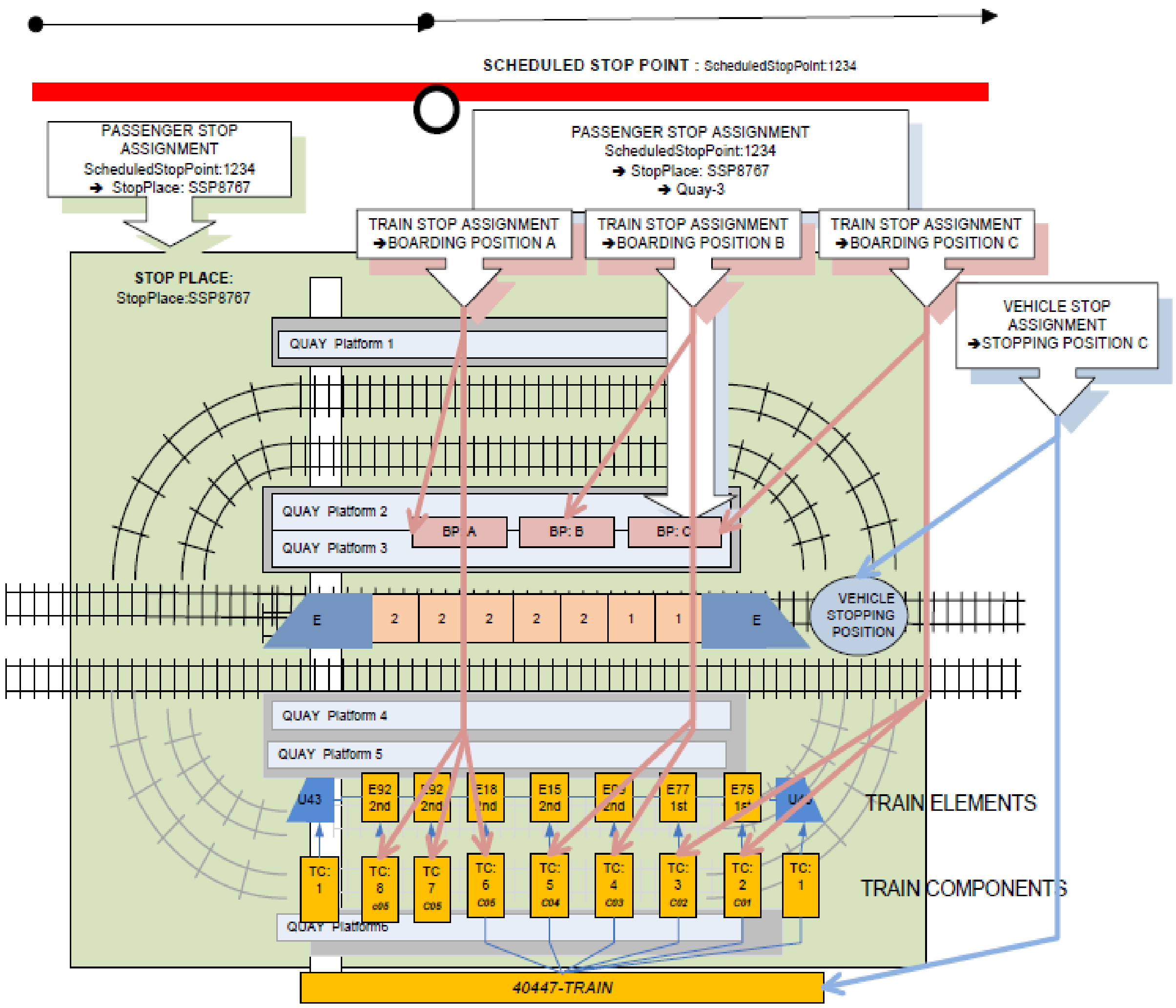

Figure 99 – Train Assignment – Example (source NeTEx – Part 1)

5.5.11 Path Assignment

A NAVIGATION PATH ASSIGNMENT associates a physical NAVIGATION PATH with a CONNECTION link as one of the recommended ways to make a transfer between the points of the connection.

5.5.11.1 PATH ASSIGNMENT – Conceptual Model

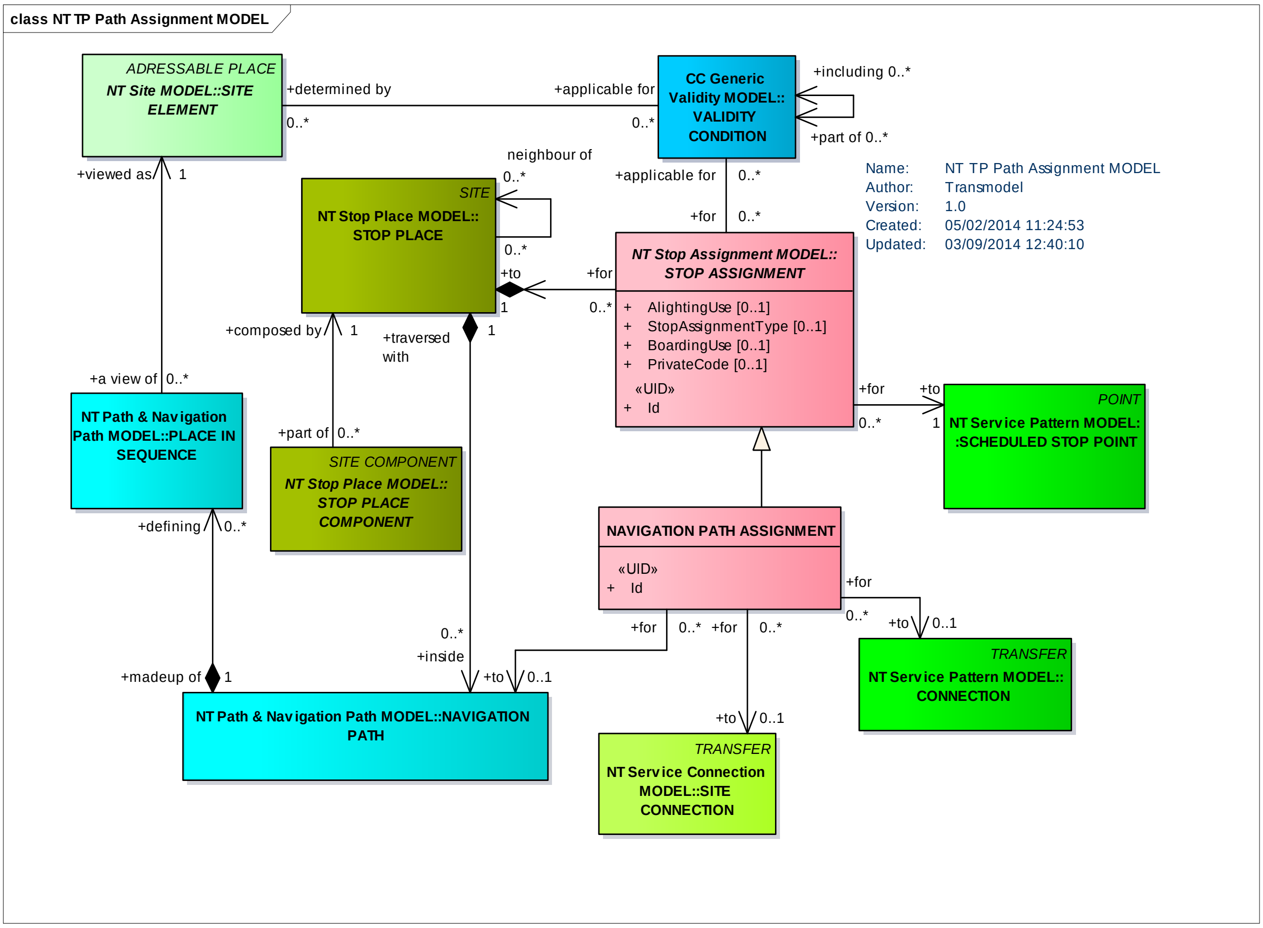

Figure 100 – Path Assignment – Conceptual Model

5.5.12 Notice Assignment

5.5.12.1 Notice Assignment – Conceptual Model

A NOTICE carries additional information for passengers that may help them planning their travel or during their travel. Footnotes are one type of NOTICE, a human-understandable text that may be made available in various delivery formats. Using a NOTICE ASSIGNMENT, NOTICEs can be assigned to stops of one service (POINT IN JOURNEY PATTERN), to stops in more services (COMMON SECTION) or to JOURNEY PATTERNs. Each NOTICE ASSIGNMENT can be restricted in its validity by specifying a VALIDITY CONDITION.

The following figure shows the use of NOTICEs.

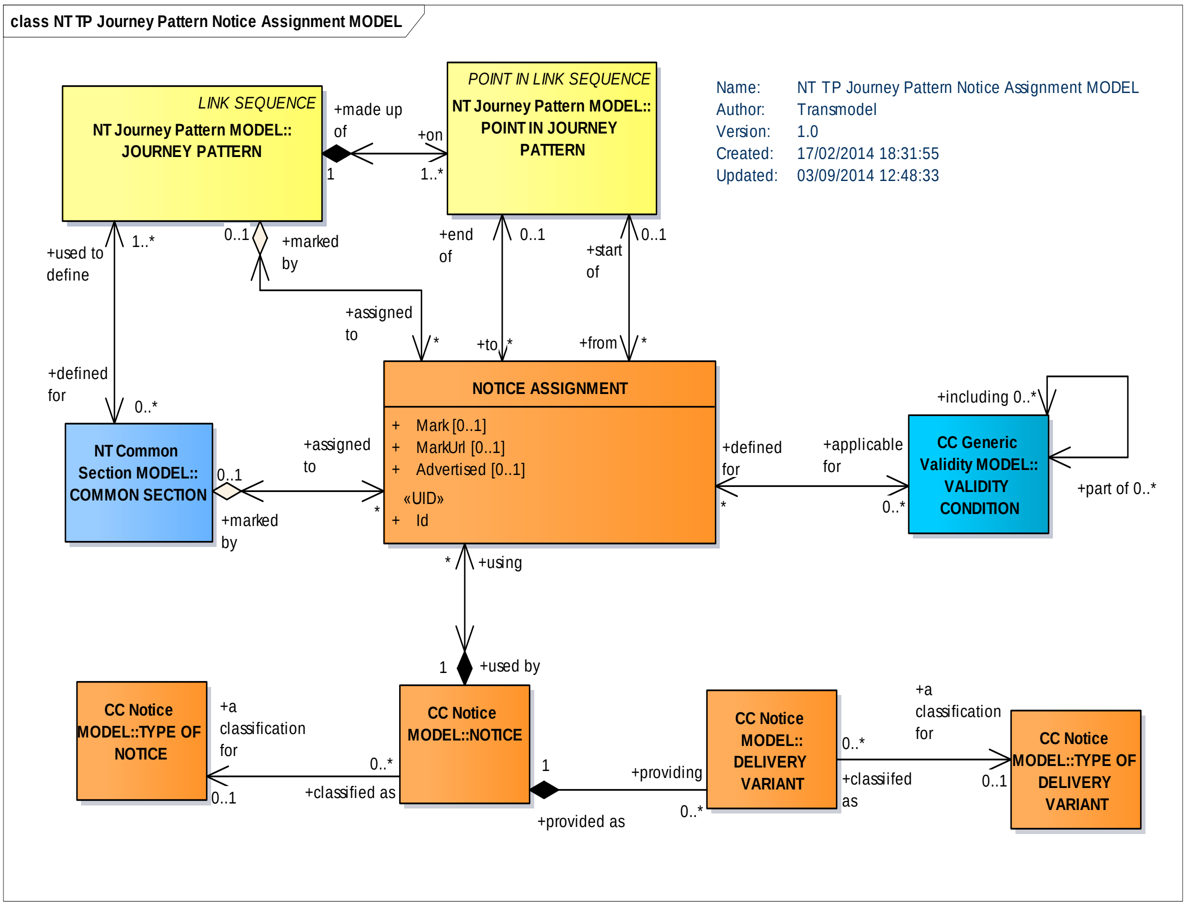

Figure 101 – Notice Assignment – Conceptual Model

5.5.13 Passenger Information Display Assignment

5.5.13.1 Passenger Information Display Assignment – Conceptual Model

Displays at stops or on board vehicles, on kiosk terminals or at information desks are examples for passenger information facilities. PASSENGER INFORMATION EQUIPMENT is therefore classified by the generic entity TYPE OF PASSENGER INFORMATION EQUIPMENT. The PASSENGER INFORMATION EQUIPMENT can be associated with a LOGICAL DISPLAY; using a DISPLAY ASSIGNMENT a LOGICAL DISPLAY can be assigned to SCHEDULED STOP POINTs and JOURNEY PATTERNs. A JOURNEY PATTERN itself can be associated with a DESTINATION DISPLAY entity that describes the passenger information displays on the vehicle.

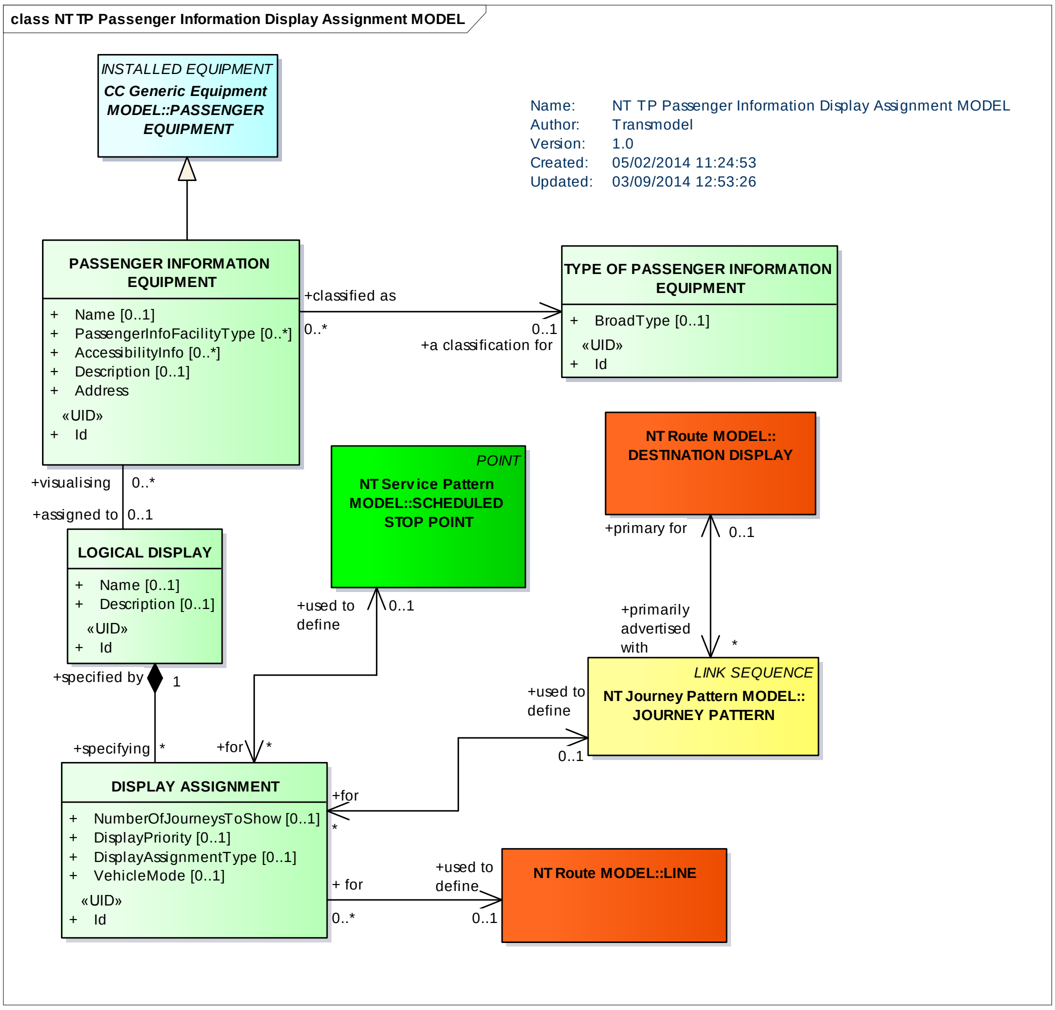

Figure 102 – Passenger Information Display Assignment – Conceptual Model

5.6 Explicit Frames

In order to facilitate the management of information, data in an information system may be associated in groups of data, which share the same validity conditions. Such a group of data is described by a VERSION FRAME In [7], the conceptual data model for generic VERSION FRAMEs has been presented: a VERSION FRAME contains a list of specific versions of an ENTITY, that is, instances of ENTITY IN VERSION referring to a same DATA SOURCE and belonging to the same TYPE OF FRAME. In [3] and [4] consider VERSION FRAMEs mainly for the purpose of data exchange. However, coherent sets of data may be defined explicitly in a data base and maintained to be used for a specific purpose (e.g. planning). Another common term for a frame may be “subsystem”.

The general frame mechanism presented in [7] is complemented by a more specific set of “explicit“ VERSION FRAMES that specify sets of data elements appropriate for a particular use case or set of related use cases. Three explicit VERSION FRAMEs have been defined as regards the network topology: the INFRASTRUCTURE FRAME, the SERVICE FRAME, the SITE FRAME.

Several user-defined explicit types of VERSION FRAMEs may exist. For instance, coherent subsets of the VERSION FRAMEs presented here may be useful (e.g. the set of data referring to a STOP PLACE, data referring to a certain LINE).

In order to avoid overloading the diagrams in this section, the labels of the relationships (part of/comprising) have been omitted intentionally.

5.6.1 Infrastructure Frame

The INFRASTRUCTURE FRAME is a type of VERSION FRAME made up of a set of infrastructure network data (and other data logically related to these) to which the same VALIDITY CONDITIONs have been assigned. The data composing the INFRASTRUCTURE FRAME are presented in the diagram below.

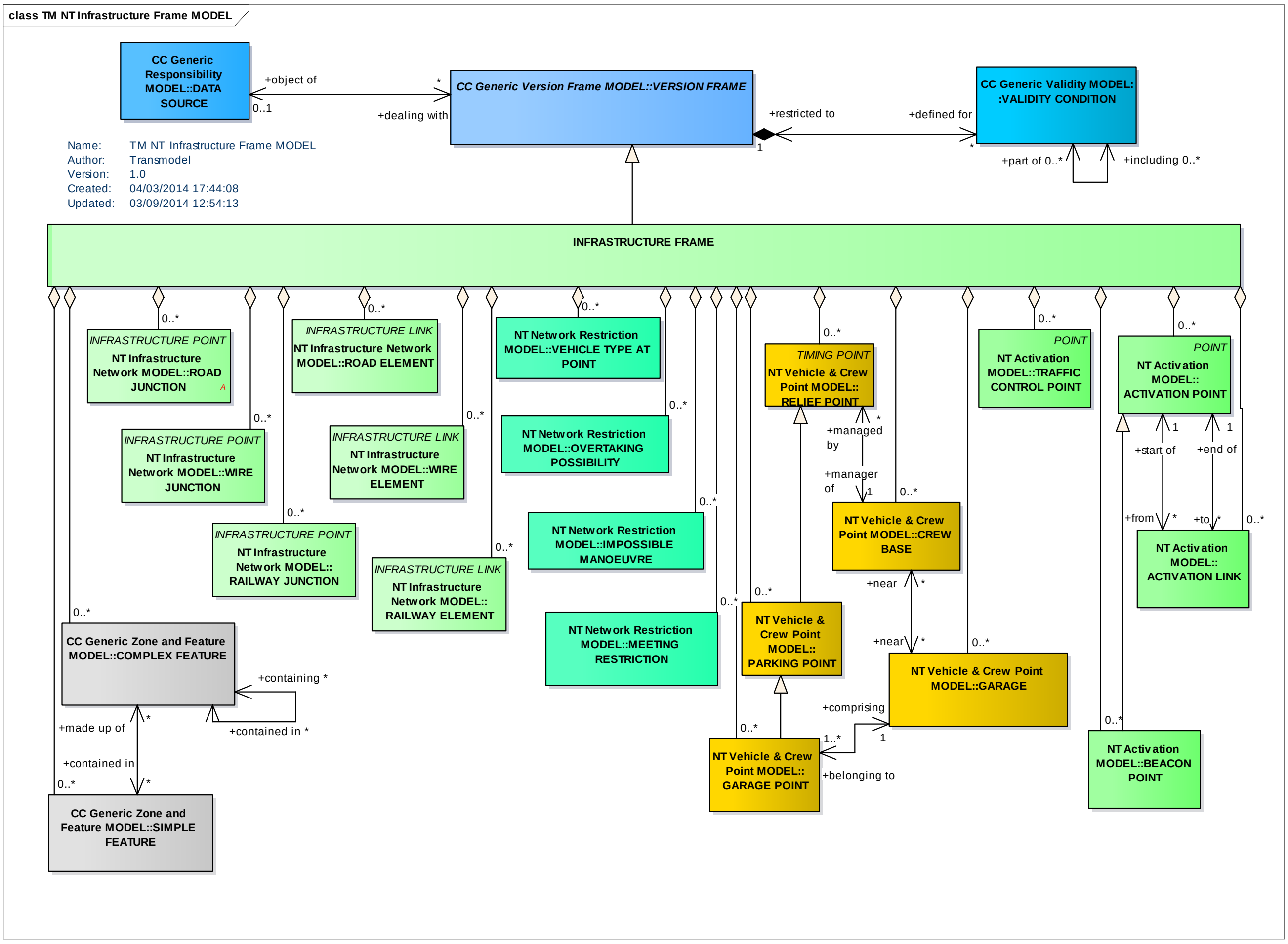

Figure 103 – Infrastructure Frame Overview

5.6.2 Service Frame

The SERVICE FRAME is a type of VERSION FRAME that holds elements describing various underlying aspects of the transport service.

The SERVICE FRAME comprises the following data elements:

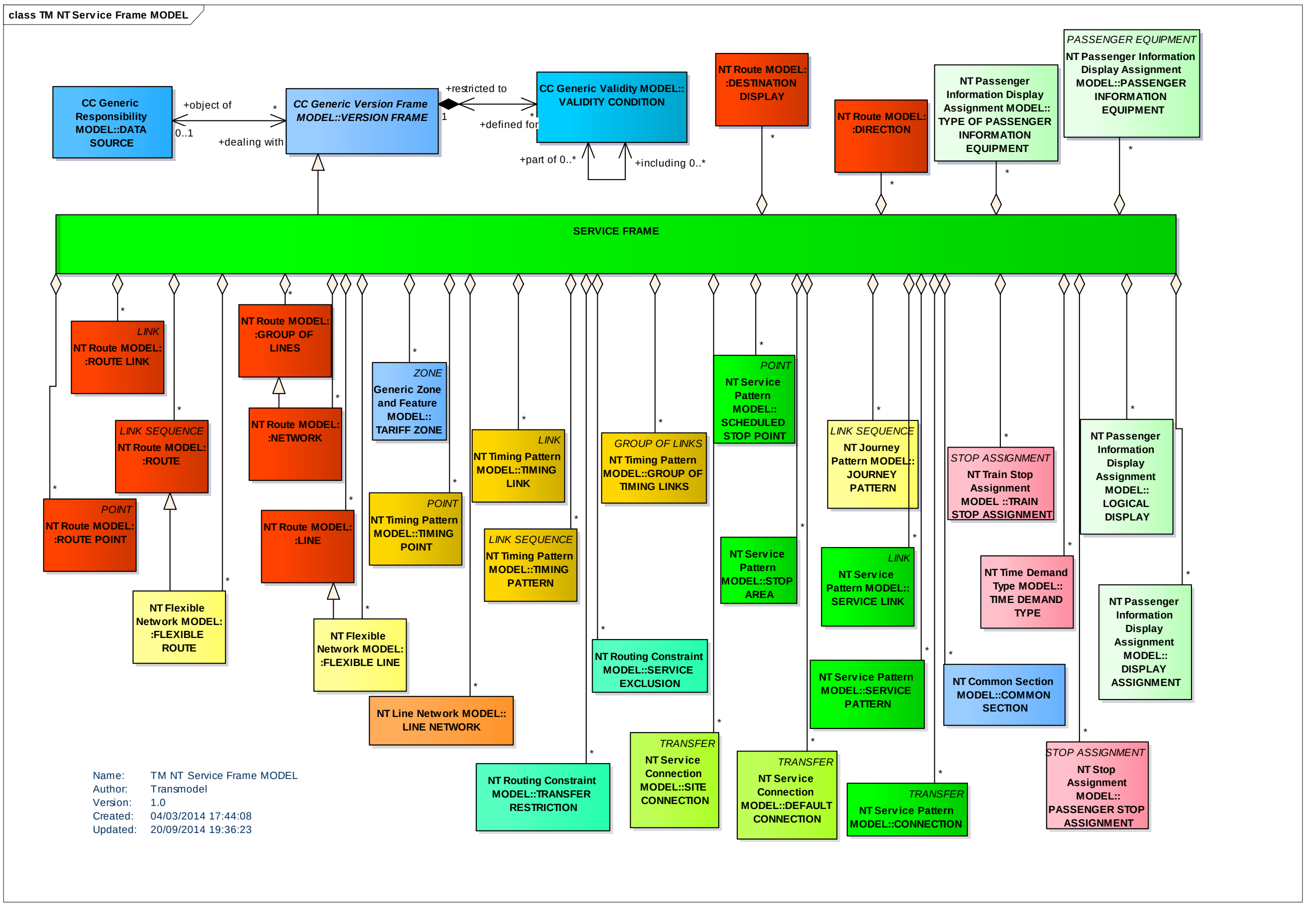

Figure 104 – Service Frame Overview

5.6.3 Site Frame

The SITE FRAME holds a coherent set of SITE elements. It is composed of the following elements:

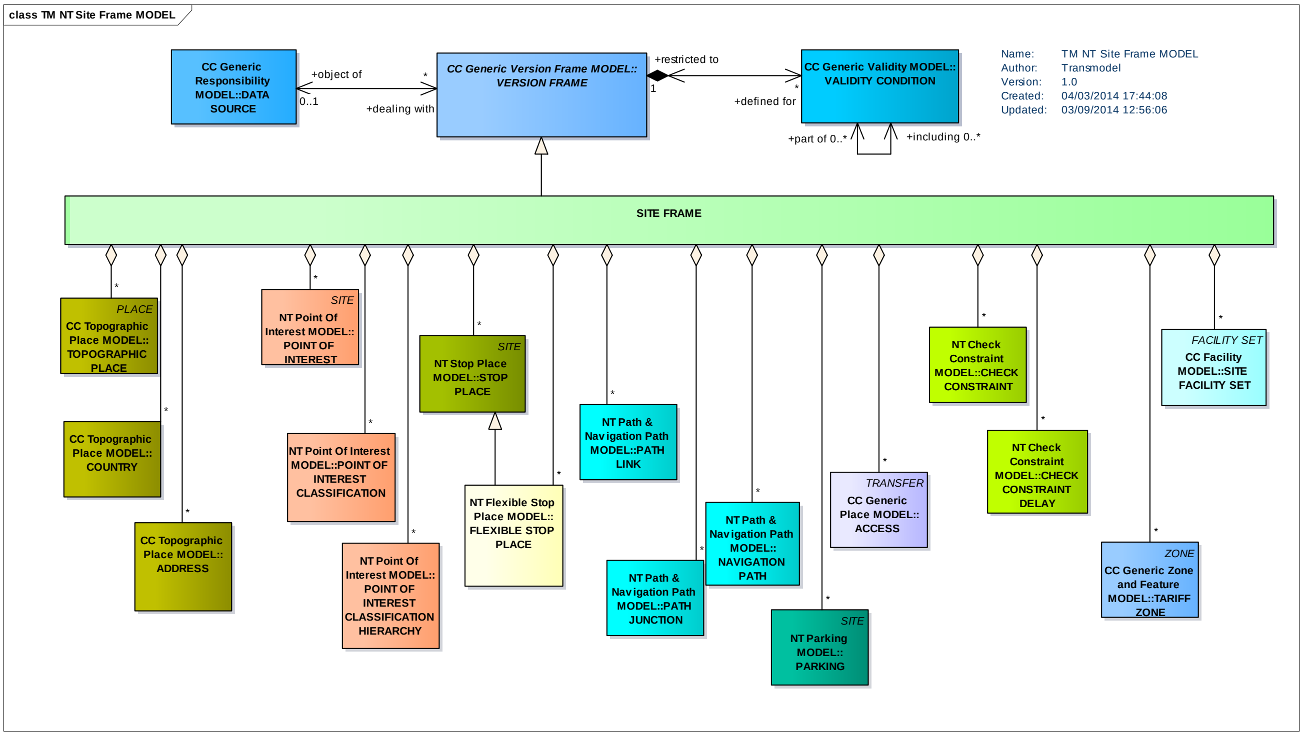

Figure 105 – Site Frame Overview

Appendix A – Data Dictionary

In addition to the definitions given in [7], the following definitions apply for this standard:

ACCESS SPACE (NT Stop Place MODEL)

A passenger area within a STOP PLACE such as a concourse or booking hall, immigration hall or security area that is accessible by passengers, but without a direct access to vehicles. Direct access to a VEHICLE is always from a QUAY and/or BOARDING POSITION. An ACCESS SPACE may be a Room, Hall, Concourse, Corridor, or bounded open space within a STOP PLACE.

Inherits from *(empty if no inheritance)*: ***STOP PLACE SPACE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	AccessSpaceType	*AccessSpaceTypeEnum*	0:1

ACCESS ZONE (NT Site MODEL)

A ZONE for which the duration to cover any ACCESS link to a particular SCHEDULED STOP POINT is the same.

Inherits from *(empty if no inheritance)*: ***ZONE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

ACTIVATED EQUIPMENT (NT Activation MODEL)

An equipment activated by the passage of a vehicle at an ACTIVATION POINT or on an ACTIVATION LINK .

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

ACTIVATION ASSIGNMENT (NT Activation MODEL)

An assignment of an ACTIVATION POINT/LINK to an ACTIVATED EQUIPMENT related on its turn to a TRAFFIC CONTROL POINT. The considered ACTIVATION POINT/LINK will be used to influence the control process for that TRAFFIC CONTROL POINT (e.g. to fix priorities as regards the processing of competing requests from different ACTIVATION POINTs/LINKs).

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Order	*positiveInteger*	0:1

ACTIVATION LINK (NT Activation MODEL)

A LINK where a control process is activated when a vehicle passes it.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

ACTIVATION POINT (NT Activation MODEL)

A POINT where a control process is activated when a vehicle passes it. Equipment may be needed for the activation.

Inherits from *(empty if no inheritance)*: ***POINT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	ActivationPointNumber	*normalizedString*	0:1
	ShortName	*MultilingualString*	0:1

ALLOWED LINE DIRECTION (NT Route MODEL)

An allowed DIRECTION that can be used on a given ROUTE. This can be used to validate the selection of allowed values.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

ASSISTANCE SERVICE (Local Service Equipment MODEL)

Specialisation of LOCAL SERVICE for ASSISTANCE providing information like language, accessibility trained staff, etc.

Inherits from *(empty if no inheritance)*: ***LOCAL SERVICE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***	*AssistanceService*	1:1
	Languages	*lang*	1:*
	AssistanceAvailability	*AssistanceAvailabilityEnum*	0:*
	Staffing	*StaffingEnum*	0:1
	AccessibilityTools	*AccessibilityToolEnum*	0:*
	AccessibilityTrainedStaff	*boolean*	0:1
	EmergencyServices	*EmergencyServicesEnum*	0:*
	SafetyFacilities	*SafetyFacilityEnum*	0:*

BEACON POINT (NT Activation MODEL)

A POINT where a beacon or similar device to support the automatic detection of vehicles passing by is located.

Inherits from *(empty if no inheritance)*: ***ACTIVATION POINT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

BOARDING POSITION (NT Stop Place MODEL)

A location within a QUAY from which passengers may directly board, or onto which passengers may directly alight from a VEHICLE.

Inherits from *(empty if no inheritance)*: ***STOP PLACE SPACE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

BOOKING ARRANGEMENTS (NT Flexible Network MODEL)

Booking arrangements for FLEXIBLE LINE.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
	BookingMethods	*BookingMethodEnum*	0:*
	BookingAccess	*BookingAccessEnum*	0:1
	LatestBookingTime	*MultilingualString*	0:1
	MinimumBookingPeriod	*duration*	0:1
«UID»	***Id***		1:1

CATERING SERVICE (NT Local Commercial Service MODEL)

Specialisation of LOCAL SERVICE dedicated to catering service.

Inherits from *(empty if no inheritance)*: ***LOCAL SERVICE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

CHECK CONSTRAINT (NT Check Constraint MODEL)

Characteristics of a process that takes place at a SITE COMPONENT, such as check-in, security screening, ticket control or immigration, that may potentially incur a time penalty that should be allowed for when journey planning.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Order	*integer*	0:1
	Name	*MultilingualString*	0:1
	CheckDirection	*CheckDirectionEnum*	0:1
	AccessFeatureType	*AccessFeatureEnum*	0:1

CHECK CONSTRAINT DELAY (NT Check Constraint MODEL)

Time penalty associated with a CHECK CONSTRAINT.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	AverageDuration	*duration*	0:1
	MinimumDuration	*duration*	0:1
	MaximumDuration	*duration*	0:1

CHECK CONSTRAINT THROUGHPUT (NT Check Constraint MODEL)

Throughput of a CHECK CONSTRAINT: the number of passengers who can pass through it in a specified interval.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Period	*duration*	0:1
	MaximumPassengers	*NumberOfPassengers*	0:1
	AveragePassengers	*NumberOfPassengers*	0:1
	WheelchairPassengers	*NumberOfPassengers*	0:1

COMMON SECTION (NT Common Section MODEL)

A part of a public transport network where the ROUTEs of several JOURNEY PATTERNs are going in parallel and where the synchronisation of SERVICE JOURNEYs may be planned and controlled with respect to commonly used LINKs and SCHEDULED STOP POINTs. COMMON SECTIONs are defined arbitrarily and need not cover the total lengths of topologically bundled sections.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Description		0:1

COMMUNICATION SERVICE (NT Local Commercial Service MODEL)

Specialisation of LOCAL SERVICE dedicated to communication services.

Inherits from *(empty if no inheritance)*: ***LOCAL SERVICE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

COMPLAINTS SERVICE (NT Local Service Equipment MODEL)

Specialisation of CUSTOMER SERVICE for COMPLAINTs

Inherits from *(empty if no inheritance)*: ***CUSTOMER SERVICE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***	*ComplaintsService*	1:1

CONNECTION (NT Service Pattern MODEL)

The physical (spatial) possibility for a passenger to change from one public transport vehicle to another to continue the trip, determined by two SCHEDULED STOP POINTs. Different times may be necessary to cover the link between these points, depending on the kind of passenger.

Inherits from *(empty if no inheritance)*: ***TRANSFER***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	TransferOnly	*boolean*	0:1

CONNECTION END (NT Service Pattern MODEL)

One end of a CONNECTION.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

CREW BASE (NT Vehicle & Crew Point MODEL)

A place where operating employees (e.g. drivers) report on and register their work.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Name	*normalizedString*	0:1

CROSSING EQUIPMENT (NT Access Equipment MODEL)

Specialisation of PLACE ACCESS EQUIPMENT for CROSSING EQUIPMENTs (zebra, pedestrian lights, acoustic device sensors, tactile guide strips, etc.).

Inherits from *(empty if no inheritance)*: ***PLACE ACCESS EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	CrossingType	*CrossingtTypeEnum*	0:1
	ZebraCrossing	*boolean*	0:1
	PedestrianLights	*boolean*	0:1
	AcousticDeviceSensors	*boolean*	0:1
	AccousticCrossingAid	*boolean*	0:1
	TactileGuideStrips	*boolean*	0:1
	VisualGuidanceBands	*boolean*	0:1
	DroppedKerb	*boolean*	0:1
	SuitableForCycles	*boolean*	0:1

CUSTOMER SERVICE (NT Local Service Equipment MODEL)

Generic specialisation of LOCAL SERVICE for CUSTOMER SERVICEs (lost properties, meeting point, complaints, etc.).

Inherits from *(empty if no inheritance)*: ***LOCAL SERVICE***			
Classifi-cation	**Name**	**Type**	**cardinality**
	Email	*EmailAddressType*	0:1
	Phone	*PhoneNumberType*	0:1
	InfoLink	*InfoLink*	0:1
«UID»	***Id***		1:1

CYCLE STORAGE EQUIPMENT (NT Parking Equipment MODEL)

A specialisation of PLACE EQUIPMENT describing cycle parking equipment.

Inherits from *(empty if no inheritance)*: ***PLACE EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Cage	*boolean*	0:1
	NumberOfSpaces	*integer*	0:1
	Covered	*boolean*	0:1

DEAD RUN PATTERN (NT Journey Pattern MODEL)

A JOURNEY PATTERN to be used for DEAD RUNs.

Inherits from *(empty if no inheritance)*: ***JOURNEY PATTERN***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

DEFAULT CONNECTION (NT Service Connection MODEL)

The physical (spatial) possibility for a passenger to change from one public transport vehicle to another to continue the trip.
It specifies default times to be used to change from one mode of transport to another at an area or national level as specified by a TOPOGRAPHIC PLACE, STOP AREA or SITE ELEMENT. It may be restricted to a specific MODE or OPERATOR or only apply in a particular direction of transfer, e.g. bus to rail may have a different time for rail to bus.

Inherits from *(empty if no inheritance)*: ***TRANSFER***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

DEFAULT CONNECTION END (NT Service Connection MODEL)

One end of a DEFAULT CONNECTION.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

DESTINATION DISPLAY (NT Route MODEL)

An advertised destination of a specific JOURNEY PATTERN, usually displayed on a headsign or at other on-board locations.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Name	*MultilingualString*	1:1
	ShortName	*MultilingualString*	0:1
	SideText	*MultilingualString*	0:1
	FrontText	*MultilingualString*	0:1
	DriverDisplayText	*MultilingualString*	0:1
	ShortCode	*normalizedString*	0:1

DESTINATION DISPLAY VARIANT (NT Route MODEL)

An advertised destination of a specific JOURNEY PATTERN, usually displayed on a headsign or at other on-board locations.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Name	*MultilingualString*	1:1
	DeliveryType	*DeliveryMediaEnum*	1:1
	ShortName	*MultilingualString*	0:1
	SideText	*MultilingualString*	0:1
	FrontText	*MultilingualString*	0:1

DIRECTION (NT Route MODEL)

A classification for the general orientation of ROUTEs.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Name		0:1

DISPLAY ASSIGNMENT (NT Passenger Information Display Assignment MODEL)

The assignment of one SCHEDULED STOP POINT and one JOURNEY PATTERN to a PASSENGER INFORMATION EQUIPMENT specifying that information on the SCHEDULED STOP POINT and the JOURNEY PATTERN will be provided (e.g. displayed, printed).

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	NumberOfJourneysToShow	*nonNegativeInteger*	0:1
	DisplayPriority	*nonNegativeInteger*	0:1
	DisplayAssignmentType	*DisplayAssignmentTypeEnum*	0:1
	VehicleMode	*VehicleModeEnum*	0:1

DYNAMIC STOP ASSIGNMENT (NT Stop Assignment MODEL)

The dynamic association of a SCHEDULED STOP POINT (i.e. a SCHEDULED STOP POINT of a SERVICE PATTERN or JOURNEY PATTERN) with the next available STOP PLACE, QUAY or BOARDING POSITION within a STOP PLACE.

Inherits from *(empty if no inheritance)*: ***PASSENGER STOP ASSIGNMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

ENTRANCE (NT Site MODEL)

A physical entrance or exit to/from a SITE. May be a door, barrier, gate or other recognizable point of access.

Inherits from *(empty if no inheritance)*: ***SITE COMPONENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Label	*normalizedString*	0:1
	EntranceType	*EntranceTypeEnum*	1:1
	IsExternal	*boolean*	0:1
	IsEntry	*boolean*	0:1
	IsExit	*boolean*	0:1
	Width	*LengthType*	0:1
	Height	*LengthType*	0:1
	DroppedKerbOutside	*boolean*	0:1
	DropOffPointClose	*boolean*	0:1

ENTRANCE EQUIPMENT (NT Access Equipment MODEL)

Specialisation of PLACE ACCESS EQUIPMENT for ENTRANCEs (door, barrier, revolving door, etc.).

Inherits from *(empty if no inheritance)*: ***PLACE ACCESS EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Door	*boolean*	0:1
	KeptOpen	*boolean*	0:1
	RevolvingDoor	*boolean*	0:1
	Barrier	*boolean*	0:1
	NumberOfGates	*integer*	0:1
	Staffing	*boolean*	0:1
	EntranceRequiresStaffing	*boolean*	0:1
	EntranceRequiresTicket	*boolean*	0:1
	EntranceRequiresPassport	*boolean*	0:1
	AcousticSensor	*boolean*	0:1
	AutomaticDoor	*boolean*	0:1
	DropKerbOutside	*boolean*	0:1
	GlassDoor	*boolean*	0:1
	WheelchairPassable	*boolean*	0:1
	WheelchairUnaided	*boolean*	0:1
	EntranceAttention	*EntranceAttentionEnum*	0:1
	SuitableForCycles	*boolean*	0:1

EQUIPMENT PLACE (NT Place Equipment Location MODEL)

A SITE COMPONENT containing EQUIPMENT

Inherits from *(empty if no inheritance)*: ***SITE COMPONENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***	*EquipmentPlaceId*	1:1

EQUIPMENT POSITION (NT Place Equipment Location MODEL)

The precise position within an EQUIPMENT PLACE where particular equipment is placed.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
	Description	*MultilingualString*	1:1
«UID»	***Id***		1:1

ESCALATOR EQUIPMENT (NT Stair Equipment MODEL)

Specialisation of STAIR EQUIPMENT for ESCALATORs.

Inherits from *(empty if no inheritance)*: ***STAIR EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	TactileActuators	*boolean*	1:1
	EnergySaving	*boolean*	1:1

FLEXIBLE AREA (NT Flexible Stop Place MODEL)

Specialisation of a FLEXIBLE QUAY (which is abstract) to identify what is the catchment area for a flexible service (so that a stop finder can find the nearest available types of transport). It is a named zone visited by a particular mode of transport. It is part of the SITE data set rather than the service data set, since it can be defined and exists independently of an actual service.

Inherits from *(empty if no inheritance)*: ***FLEXIBLE QUAY***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

FLEXIBLE LINE (NT Flexible Network MODEL)

Specialisation of LINE for flexible service. As all the service on a LINE may not all be flexible, flexibility itself is described at JOURNEY PATTERN level (meaning that a separate JOURNEY PATTERN is needed for each type of flexibility available for the line).

Types of flexible services are :
- Virtual line service
- Flexible service with main route
- Corridor service
- Fixed stop area-wide flexible service
- Free area-wide flexible service
- Mixed types of flexible service
- Mixed type of flexible and regular services

Inherits from *(empty if no inheritance)*: ***LINE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	FlexibleLineType	*FlexibleLineTypeEnum*	0:1

FLEXIBLE LINK PROPERTIES (NT Flexible Network MODEL)

Set of properties describing the flexible characteristics of a LINK. A composition is used with LINK in order to avoid multiple inheritance and a type explosion of link subtypes

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	MayBeSkipped	*boolean*	0:1
	OnMainRoute	*boolean*	0:1
	UnscheduledPath	*boolean*	0:1
	FlexibleLinkType	*FlexibleLinkTypeEnum*	0:1

FLEXIBLE POINT PROPERTIES (NT Flexible Network MODEL)

Set of characteristics describing the possible flexibility of POINTs. A composition is used with POINT in order to avoid multiple inheritance.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	MayBeSkipped	*boolean*	0:1
	OnMainRoute	*boolean*	0:1
	PointStandingForAZone	*boolean*	0:1
	ZoneContainingStops	*boolean*	0:1

FLEXIBLE QUAY (NT Flexible Stop Place MODEL)

A physical ZONE such as a section of a road where a flexible service is available on demand. The existence of the zone makes the services visible to journey planners looking for available services for an area.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	NameSuffix	*MultilingualString*	0:1
	BoardingUse	*boolean*	0:1
	AlightingUse	*boolean*	0:1

FLEXIBLE ROUTE (NT Flexible Network MODEL)

Specialisation of ROUTE for flexible service. May include both point and zonal areas and ordered and unordered sections.

Inherits from *(empty if no inheritance)*: ***ROUTE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	FlexibleRouteType	*FlexibleRouteTypeEnum*	0:1

FLEXIBLE STOP ASSIGNMENT (NT Flexible Stop Place MODEL)

The allocation of a SCHEDULED STOP POINT (i.e. a STOP POINT of a SERVICE PATTERN or JOURNEY PATTERN) to a specific FLEXIBLE STOP PLACE, and also possibly a FLEXIBLE AREA or HAIL AND RIDE AREA. May be subject to a VALIDITY CONDITION.

Inherits from *(empty if no inheritance)*: ***STOP ASSIGNMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

FLEXIBLE STOP PLACE (NT Flexible Stop Place MODEL)

A specialisation of the STOP PLACE describing a stop of a FLEXIBLE SERVICE. It may be composed of FLEXIBLE AREAs or HAIL AND RIDE AREAs identifying the catchment areas for flexible services (when they use areas or flexible quays). Some FLEXIBLE SERVICE also use regular STOP PLACEs for their stops. When assigned to a SCHEDULED STOP POINT the corresponding SCHEDULED STOP POINT is supposed to be a ZONE (the centroid point of the ZONE being the SCHEDULED STOP POINT).

Inherits from *(empty if no inheritance)*: ***STOP PLACE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	NameSuffix	*MultilingualString*	0:1
	Locale	*Locale*	0:1

GARAGE (NT Vehicle & Crew Point MODEL)

A facility used for parking and maintaining vehicles. PARKING POINTs in a GARAGE are called GARAGE POINTs.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Name		0:1

GARAGE POINT (NT Vehicle & Crew Point MODEL)

A subtype of PARKING POINT located in a GARAGE.

Inherits from *(empty if no inheritance)*: ***PARKING POINT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

GENERAL SIGN (NT Sign Equipment MODEL)

Specialisation of SIGN EQUIPMENT which are not HEADING SIGNs nor PLACE SIGNs.

Inherits from *(empty if no inheritance)*: ***SIGN EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Content	*MultilingualString*	1:1

GROUP OF LINES (NT Route MODEL)

A grouping of lines which will be commonly referenced for a specific purpose.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***id***		1:1

GROUP OF TIMING LINKS (NT Timing Pattern MODEL)

A set of TIMING LINKs grouped together according to the similarity of TIME BANDs which are relevant to them. There may be a GROUP OF TIMING LINKS which covers all TIMING LINKs, for use when different GROUPs OF TIMING LINKS are not needed.

Inherits from *(empty if no inheritance)*: ***GROUP OF LINKS***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Description		1:1

HAIL AND RIDE AREA (NT Flexible Stop Place MODEL)

Specialisation of a FLEXIBLE QUAY to identify what is the catchment zone for a hail and ride service (so that a stop finder can find the nearest available types of transport). It is a named zone visited by a particular mode of transport and may be designated by a start point and end point on the road

It is part of the Site data set rather than the service data set, since it can be defined and exists indepently of an actual service.

Inherits from *(empty if no inheritance)*: ***FLEXIBLE QUAY***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	CompassBearing	*CompassBearingType*	0:1
	CompassOctant	*CompassOctantEnum*	0:1

HEADING SIGN (NT Sign Equipment MODEL)

Specialisation of SIGN EQUIPMENT for headings providing information like direction name, line name, etc.

Inherits from *(empty if no inheritance)*: ***SIGN EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	DirectionName	*MultilingualString*	1:1
	LineName	*MultilingualString*	0:1
	LineMap	*anyURI*	1:1
	LineMode	*VehicleModeEnum*	0:1
	LinePublicCode	*normalizedString*	1:1

HIRE SERVICE (NT Local Commercial Service MODEL)

Specialisation of LOCAL SERVICE dedicated to hire services (e.g. cycle hire, car hire).

Inherits from *(empty if no inheritance)*: ***LOCAL SERVICE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

IMPOSSIBLE MANOEUVRE (NT Network Restriction MODEL)

A specification of impossible move for a certain type of vehicle. It specifies from which INFRASTRUCTURE LINK to which other (adjacent) INFRASTRUCTURE LINK a certain VEHICLE TYPE cannot proceed, due to physical restrictions.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

INFRASTRUCTURE FRAME (NT Infrastructure Frame MODEL)

A set of infrastructure network data (and other data logically related to these) to which the same VALIDITY CONDITIONs have been assigned.

Inherits from *(empty if no inheritance)*: ***VERSION FRAME***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

INFRASTRUCTURE LINK (NT Infrastructure Network MODEL)

A super-type including all LINKs of the physical network (e.g. RAILWAY ELEMENT).

Inherits from *(empty if no inheritance)*: ***LINK***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

INFRASTRUCTURE POINT (NT Infrastructure Network MODEL)

A super-type including all POINTs of the physical network (e.g. RAILWAY JUNCTION).

Inherits from *(empty if no inheritance)*: ***POINT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

JOURNEY PATTERN (NT Journey Pattern MODEL)

An ordered list of SCHEDULED STOP POINTs and TIMING POINTs on a single ROUTE, describing the pattern of working for public transport vehicles.A JOURNEY PATTERN may pass through the same POINT more than once. The first point of a JOURNEY PATTERN is the origin. The last point is the destination.

Inherits from *(empty if no inheritance)*: ***LINK SEQUENCE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

LEFT LUGGAGE SERVICE (NT Local Service Equipment MODEL)

Specialisation of CUSTOMER SERVICE for left luggage (provides left luggage information like self service locker, locker free, etc.).

Inherits from *(empty if no inheritance)*: ***LOCAL SERVICE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	CounterService	*boolean*	0:1
	SelfServiceLockers	*boolean*	0:1
	FeePerBag	*boolean*	0:1
	LockerFee	*boolean*	0:1
	MaximumBagWidth	*LengthType*	0:1
	MaximumBagHeight	*LengthType*	0:1
	MaximumBagDepth	*LengthType*	0:1

LEVEL (NT Site MODEL)

An identified storey (ground, first, basement, mezzanine, etc) within an interchange building or SITE on which SITE COMPONENTs reside. A PATH LINK may connect components on different levels.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Name	*MultilingualString*	0:1
	ShortName	*MultilingualString*	0:1
	Description	*MultilingualString*	0:1
	PublicUse	*boolean*	0:1
	AllAreasWheelchair	*boolean*	0:1

LIFT EQUIPMENT (NT Access Equipment MODEL)

Specialisation of PLACE ACCESS EQUIPMENT for LIFTs (provides lift characteristics like depth, maximum load, etc.).

Inherits from *(empty if no inheritance)*: ***PLACE ACCESS EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Depth	*LengthType*	0:1
	MaximumLoad	*WeightType*	0:1
	WheelchairPassable	*boolean*	0:1
	WheelchairTurningCircle	*LengthType*	0:1
	InternalWidth	*LengthType*	0:1
	HandrailHeight	*LengthType*	0:1
	CallButtonHeight	*LengthType*	0:1
	DirectionButtonHeight	*LengthType*	0:1
	LowerHandrailHeight	*LengthType*	0:1
	RaisedButtons	*boolean*	0:1
	BrailleButtons	*boolean*	0:1
	ThroughLoader	*boolean*	0:1
	MirrorOnOppositeSide	*boolean*	0:1
	Attendant	*boolean*	0:1
	Automatic	*boolean*	0:1
	AlarmButton	*boolean*	0:1
	TactileActuators	*boolean*	0:1
	AcousticAnnouncements	*boolean*	0:1
	SignageToLift	*boolean*	0:1
	SuitableForCycles	*boolean*	0:1

LINE (NT Route MODEL)

A group of ROUTEs which is generally known to the public by a similar name or number.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Name	*MultilingualString*	1:1
	ShortName	*MultilingualString*	0:1
	Description	*MultilingualString*	0:1
	LineUrl	*any*	0:1
	Monitored	*boolean*	0:1

LINE NETWORK (NT Line Network MODEL)

The topological structure of a NETWORK as a graph of LINE SECTIONs. This allows the branches and loops of a LINE to be described as a whole.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Name	*MultilingualString*	0:1
	Description	*MultilingualString*	0:1

LINE SECTION (NT Line Network MODEL)

A part of a NETWORK comprising an edge between two nodes. Not directional.

Inherits from *(empty if no inheritance)*: ***COMMON SECTION***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	SectionType	*SectionTypeEnum*	0:1

LOGICAL DISPLAY (NT Passenger Information Display Assignment MODEL)

A set of data that can be assembled for assignment to a physical PASSENGER INFORMATION EQUIPMENT or to a logical channel such as web or media. It is independent of any physical embodiment.
A LOGICAL DISPLAY may have a set of DISPLAY ASSIGNMENTS each of which associates a JOURNEY PATTERN whose journeys are to be shown at the LOGICAL DISPLAY. It may also be associated with a SCHEDULED STOP POINT. A LOGICAL DISPLAY corresponds to a SIRI STOP MONITORING point.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Name	*MultilingualString*	0:1
	Description	*MultilingualString*	0:1

LOST PROPERTY SERVICE (NT Local Service Equipment MODEL)

Specialisation of CUSTOMER SERVICE for lost properties.

Inherits from *(empty if no inheritance)*: ***CUSTOMER SERVICE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

LUGGAGE SERVICE (NT Local Service Equipment MODEL)

Specialisation of CUSTOMER SERVICE for luggage services (provides luggage service facilites and characteristics like luggage trolley, free to use, etc.).

Inherits from *(empty if no inheritance)*: ***LOCAL SERVICE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	LuggageServiceType	*LuggageServiceFacilityEnum*	0:1
	LuggageTrolleys	*boolean*	0:1
	WheelchairLuggageTrolleys	*boolean*	0:1
	FreeToUse	*boolean*	0:1
	MaximumBagWidth	*LengthType*	0:1
	MaximumBagHeight	*LengthType*	0:1
	MaximumBagDepth	*LengthType*	0:1

LUGGAGE LOCKER EQUIPMENT (NT Site Equipment MODEL)

Specialisation of STOP PLACE EQUIPMENT for luggage lockers.

Inherits from *(empty if no inheritance)*: ***SITE EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	NumberOfLockers	*integer*	0:1
	LockerHeight	*LengthType*	0:1
	LockerDepth	*LengthType*	0:1
	LockerWidth	*LengthType*	0:1
	Luggage	*LuggageLockerEnum*	0:1

MEETING POINT SERVICE (NT Local Service Equipment MODEL)

Specialisation of CUSTOMER SERVICE for meeting points (provides characteristics like description, label, etc.).

Inherits from *(empty if no inheritance)*: ***CUSTOMER SERVICE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	MeetingPointType	*MeetingPointEnum*	0:1

MEETING RESTRICTION (NT Network Restriction MODEL)

A pair of INFRASTRUCTURE LINKs where vehicles of specified VEHICLE TYPEs are not allowed to meet.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

MONEY SERVICE (NT Local Commercial Service MODEL)

Specialisation of LOCAL SERVICE dedicated to money services.

Inherits from *(empty if no inheritance)*: ***LOCAL SERVICE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

NAVIGATION PATH (NT Path & Navigation Path MODEL)

A designated path between two places. May include an ordered sequence of PATH LINKs.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	From	*PathLinkEnd*	0:1
	To	*PathLinkEnd*	0:1
	AccessibilityAssessment	*AccessibilityAssessment*	0:1
	TransferDuration	*TransferDuration*	0:1
	PublicUse	*boolean*	0:1
	Covered	*CoveredEnum*	0:1
	Gated	*GatedEnum*	0:1
	Lighting	*LightingEnum*	0:1
	AllAreasWheelchair	*boolean*	0:1
	PersonCapacity	*NumberOfPeople*	0:1
	AccessFeatureType	*AccessFeatureEnum*	0:1
	NavigationType	*NavigationTypeEnum*	1:1

NAVIGATION PATH ASSIGNMENT (NT Path Assignment MODEL)

The allocation of a NAVIGATION PATH to a specific STOP POINT ASSIGNMENT, for example to indicate the path to be taken to make a CONNECTION

Inherits from *(empty if no inheritance)*: ***STOP ASSIGNMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

NETWORK (NT Route MODEL)

A named grouping of LINEs under which a transport network is known.

Inherits from *(empty if no inheritance)*: ***GROUP OF LINES***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Name	*MultilingualString*	1:1

NOTICE ASSIGNMENT (NT Notice Assignment MODEL)

The assignment of a NOTICE showing an exception in a JOURNEY PATTERN, a COMMON SECTION, or a VEHICLE JOURNEY, possibly specifying at which POINT IN JOURNEY PATTERN the validity of the NOTICE starts and ends respectively.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Mark	*any*	0:1
	MarkUrl	*anyURI*	0:1
	Advertised	*boolean*	0:1

OVERTAKING POSSIBILITY (NT Network Restriction MODEL)

NETWORK RESTRICTION specifying a POINT or a LINK where vehicles of specified VEHICLE TYPEs are or are not allowed to overtake each other.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	OvertakingWidth	*LengthType*	0:1

PARKING (NT Parking MODEL)

Designated locations for leaving vehicles such as cars, motorcycles and bicycles.

Inherits from *(empty if no inheritance)*: ***SITE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	ParkingType	*ParkingTypeEnum*	0:*
	ParkingLayout	*ParkingLayoutEnum*	0:1
	NumberOfParkingLevels	*integer*	1:1
	TotalCapacity	*NumberOfSpaces*	0:1
	PrincipalCapacity	*NumberOfSpaces*	0:1
	OvernightParkingPermitted	*boolean*	0:1
	SecureParking	*boolean*	0:1
	ProhibitedForAnyHazardousMaterialLoads	*boolean*	0:1
	ElectricRechargingAvailable	*boolean*	0:1
	RealTimeOccupancyAvailable	*boolean*	0:1
	ParkingPaymentProcess	*PaymentProcessEnum*	0:1
	DefaultCurrency	*CurrencyType*	0:1
	CardsAccepted	*normalizedString*	1:1
	ParkingReservations	*ParkingReservationEnum*	0:1
	BookingUrl	*anyUrl*	1:1
	PaymentByPhone	*PaymentByPhone*	0:1
	FreeParkingOutOfHours	*boolean*	0:1
	CurrenciesAccepted	*Currency*	0:*

PARKING AREA (NT Parking MODEL)

A marked zone within a PARKING containing PARKING BAYs.

Inherits from *(empty if no inheritance)*: ***PARKING COMPONENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	TotalCapacity	*NumberOfSpaces*	0:1

PARKING BAY (NT Parking MODEL)

A place to park an individual vehicle.

Inherits from *(empty if no inheritance)*: ***PARKING COMPONENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	ParkingVehicleType	*ParkingVehicleEnum*	0:1
	Length	*LengthType*	0:1
	Width	*LengthType*	0:1
	Height	*LengthType*	0:1

PARKING CAPACITY (NT Parking MODEL)

PARKING properties providing information about its CAPACITY.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	NumberOfSpaces	*integer*	0:1
	ParkingUserType	*ParkingUserEnum*	0:1
	ParkingVehicleType	*ParkingVehicleEnum*	0:1
	ParkingStayType	*ParkingStayEnum*	0:1

PARKING COMPONENT (NT Parking MODEL)

Generic COMPONENT of a PARKING (e.g. PARKING AREA or PARKING BAY)

Inherits from *(empty if no inheritance)*: ***SITE COMPONENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	PaymentCode	*normalizedString*	0:1
	MaximumLength	*LengthType*	0:1
	MaximumHeight	*LengthType*	0:1
	MaximumWidth	*LengthType*	0:1
	MaximumWeight	*WeightType*	0:1

PARKING ENTRANCE FOR VEHICLES (NT Parking MODEL)

An entrance for vehicles to the PARKING from the road.

Inherits from *(empty if no inheritance)*: ***VEHICLE ENTRANCE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

PARKING PASSENGER ENTRANCE (NT Parking MODEL)

An entrance to the PARKING for passengers on foot or other out-of-vehicle mode, such as wheelchair.

Inherits from *(empty if no inheritance)*: ***ENTRANCE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***	*PassengerEntranceId*	1:1

PARKING POINT (NT Vehicle & Crew Point MODEL)

A TIMING POINT where vehicles may stay unattended for a long time. A vehicle's return to park at a PARKING POINT marks the end of a BLOCK.

Inherits from *(empty if no inheritance)*: ***RELIEF POINT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

PARKING PROPERTIES (NT Parking MODEL)

PARKING specific properties other than its capacity.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	ParkingUserType	*ParkingUserEnum*	0:1
	MaximumStay	*duration*	0:1
	ParkingStayType	*ParkingStayEnum*	0:1
	ParkingVehicleType	*ParkingVehicleEnum*	0:*
	SecureParking	*boolean*	0:1

PASSENGER INFORMATION EQUIPMENT (NT Passenger Information Display Assignment MODEL)

A public transport information piece of equipment, as for instance terminals (on street, at information desks, telematic, ...) or printed material (leaflets displayed at stops, booklets, ...).

Inherits from *(empty if no inheritance)*: ***PASSENGER EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Name	*MultilingualString*	0:1
	PassengerInfoFacilityType	*PassengerInformationEquipmentEnum*	0:*
	AccessibilityInfo	*AccessibilityInfoFacilityEnum*	0:*
	Description	*MultilingualString*	0:1
	Address	*anyURI*	1:1

PASSENGER SAFETY EQUIPMENT (NT Passenger Service Equipment MODEL)

Specialisation of PASSENGER EQUIPMENT for passenger safety.

Inherits from *(empty if no inheritance)*: ***PASSENGER EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Cctv	*boolean*	0:1
	PanicButton	*boolean*	0:1
	MobilePhoneCoverage	*boolean*	0:1
	SosPanel	*boolean*	0:1
	HeightOfSosPanel	*LengthType*	0:1
	Lighting	*LightingEnum*	0:1

PASSENGER STOP ASSIGNMENT (NT Stop Assignment MODEL)

The allocation of a SCHEDULED STOP POINT (i.e. a SCHEDULED STOP POINT of a SERVICE PATTERN or JOURNEY PATTERN) to a specific STOP PLACE for a SERVICE JOURNEY, and also possibly a QUAY and BOARDING POSITION.

Inherits from *(empty if no inheritance)*: ***STOP ASSIGNMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

PATH JUNCTION (NT Path & Navigation Path MODEL)

A designated point, inside or outside of a STOP PLACE or POINT OF INTEREST, at which two or more PATH LINKs may connect or branch.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Label	*MultilingualString*	0:1
	PublicUse	*PublicUseEnum*	0:1
	Covered	*CoveredEnum*	0:1
	Gated	*GatedEnum*	0:1
	Lighting	*LightingEnum*	0:1
	AllAreasWheelchair	*boolean*	0:1
	PersonCapacity	*NumberOfPeople*	0:1

PATH LINK (NT Path & Navigation Path MODEL)

A link within a PLACE of or between two PLACEs (that is STOP PLACEs, ACCESS SPACEs or QUAYs,BOARDING POSITIONs,, POINTs OF INTEREST etc or PATH JUNCTIONs) that represents a step in a possible route for pedestrians, cyclists or other out-of-vehicle passengers within or between a PLACE.
NOTE: It is possible but not mandatory that a PATH LINK projects onto a more detailed set of infrastructure or mapping links that plot the spatial course, allowing it to be represented on maps and to tracking systems.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Description	*MultilingualString*	0:1
	PublicUse	*boolean*	0:1
	Covered	*CoveredEnum*	0:1
	Gated	*GatedEnum*	0:1
	Lighting	*LightingEnum*	0:1
	PersonCapacity	*NumberOfPeople*	0:1
	AllAreasWheelchair	*boolean*	0:1
	Towards	*MultilingualString*	0:1
	NumberOfSteps	*integer*	0:1
	AllowedUse	*DirectionOfUseEnum*	0:1
	Transition	*TransitionEnum*	0:1
	AccessFeatureType	*AccessFeatureEnum*	0:1
	PassageType	*PassageTypeEnum*	0:1
	Back	*MultilingualString*	0:1
	MaximumFlowPerMinute	*PassengersPerMinute*	0:1

PATH LINK END (NT Path & Navigation Path MODEL)

Beginning or end SITE for a PATH LINK. May be linked to a specific LEVEL of the SITE.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Label	*MultilingualString*	0:1
	PublicUse	*PublicUseEnum*	0:1
	Covered	*CoveredEnum*	0:1
	Gated	*GatedEnum*	0:1
	Lighting	*LightingEnum*	0:1
	AllAreasWheelchair	*boolean*	0:1
	PersonCapacity	*NumberOfPeople*	0:1

PATH LINK IN SEQUENCE (NT Path & Navigation Path MODEL)

A step of a NAVIGATION PATH indicating traversal of a particular PATH LINK as part of a recommended route.
The same PATH LINK may occur in different sequences in different NAVIGATION PATHs.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Order	*integer*	1:1
	Heading	*HeadingEnum*	0:1
	DirectionOfUse	*DirectionOfUseEnum*	0:1
	Label	*MultilingualString*	0:1

PLACE ACCESS EQUIPMENT (NT Access Equipment MODEL)

Specialisation of PLACE EQUIPMENT dedicated to access (e.g. lifts, entrances, stairs, ramps, etc.).

Inherits from *(empty if no inheritance)*: ***PLACE EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Width	*meters*	0:1
	DirectionOfUse	*DirectionOfUseEnum*	0:1
	PassengerPerMinute	*PassengersPerMinuteType*	0:1
	RelativeWeighting	*integer*	0:1

PLACE IN SEQUENCE (NT Path & Navigation Path MODEL)

Point traversed by a NAVIGATION PATH in sequence, connected by a PATH LINK to the next point. May be a Place, PATH JUNCTION or POINT.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Order	*integer*	1:1
	Label	*MultilingualString*	0:1

PLACE LIGHTING (NT Access Equipment MODEL)

Specialisation of PLACE EQUIPMENT for LIGHTING EQUIPMENT (e.g. lamp post).

Inherits from *(empty if no inheritance)*: ***PLACE ACCESS EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Lighting	*LightingEnum*	0:1
	AlwaysLit	*boolean*	0:1

PLACE SIGN (NT Sign Equipment MODEL)

Sign with the name of a PLACE on it.

Inherits from *(empty if no inheritance)*: ***SIGN EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	PlaceName	*MultilingualString*	1:1

POINT IN JOURNEY PATTERN (NT Journey Pattern MODEL)

A SCHEDULED STOP POINT or TIMING POINT in a JOURNEY PATTERN with its order in that JOURNEY PATTERN.

Inherits from *(empty if no inheritance)*: ***POINT IN LINK SEQUENCE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

POINT OF INTEREST (NT Point Of Interest MODEL)

A type of PLACE to or through which passengers may wish to navigate as part of their journey and which is modelled in detail by journey planners.

Inherits from *(empty if no inheritance)*: ***SITE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

POINT OF INTEREST CLASSIFICATION (NT Point Of Interest MODEL)

A classification of a POINT OF INTEREST that may be used in a CLASSIFICATION HIERARCHY to categorise the point by nature of interest using a systematic taxonomy, for example Museum, Football, Stadium.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	ShortName	*MultilingualString*	0:1

POINT OF INTEREST CLASSIFICATION HIERARCHY (NT Point Of Interest MODEL)

A logical hierarchy for organizing POINT OF INTEREST CLASSIFICATIONs. A POINT OF INTEREST CLASSIFICATION can belong to more than one hierarchy.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

POINT OF INTEREST CLASSIFICATION MEMBERSHIP (NT Point Of Interest MODEL)

The POINT OF INTEREST CLASSIFICATION and POINT OF INTEREST CLASSIFICATION MEMBERSHIP are used to encode a hierarchy of classifications to index and find different types of POINT OF INTEREST. For example, *Educational Building -> School -> Primary School*, or *Cultural Attraction -> Museum -> Art Museum*.

POINT OF INTEREST CLASSIFICATION MEMBERSHIP does not have to be disjoint, i.e. the same category may appear in more than one classification.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

POINT OF INTEREST COMPONENT (NT Point Of Interest MODEL)

Specialisation of SITE COMPONENT for COMPONENT of POINT OF INTEREST. Usually used for POINT OF INTEREST SPACEs.

Inherits from *(empty if no inheritance)*: ***SITE COMPONENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Label	*normalizedString*	0:1

POINT OF INTEREST ENTRANCE (NT Point Of Interest MODEL)

Specialisation of ENTRANCE to enter/exit a POINT OF INTEREST.

Inherits from *(empty if no inheritance)*: ***ENTRANCE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***	*PoiEntranceId*	1:1

POINT OF INTEREST SPACE (NT Point Of Interest MODEL)

Specialisation of POINT OF INTEREST COMPONENT for SPACEs. A physical area within the POINT OF INTEREST, such as a concourse.

Inherits from *(empty if no inheritance)*: ***POINT OF INTEREST COMPONENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

POINT OF INTEREST VEHICLE ENTRANCE (NT Point Of Interest MODEL)

A physical entrance or exit to/from a POINT OF INTEREST for vehicles .

Inherits from *(empty if no inheritance)*: ***VEHICLE ENTRANCE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***	*PoiVehicleEntranceId*	1:1

POINT ON ROUTE (NT Route MODEL)

A ROUTE POINT used to define a ROUTE with its order on that ROUTE.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Order	*int*	1:1

QUAY (NT Stop Place MODEL)

A place such as platform, stance, or quayside where passengers have access to PT vehicles, Taxi, cars or other means of transportation. A QUAY may serve one or more VEHICLE STOPPING PLACEs and be associated with one or more SCHEDULED STOP POINTS. A QUAY may contain other sub QUAYs. A child QUAY must be physically contained within its parent QUAY.

Inherits from *(empty if no inheritance)*: ***STOP PLACE SPACE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	DestinationDisplay	*MultilingualString*	0:1
	CompassBearing	*CompassBearingType*	0:1
	CompassOctant	*CompassOctantEnum*	0:1

QUEUING EQUIPMENT (NT Access Equipment MODEL)

Specialisation of PLACE ACCESS EQUIPMENT dedicated to queuing.

Inherits from *(empty if no inheritance)*: ***PLACE ACCESS EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	NumberOfServers	*integer*	0:1
	RailedQueue	*boolean*	0:1
	TicketedQueue	*boolean*	0:1

RAILWAY ELEMENT (NT Infrastructure Network MODEL)

A type of INFRASTRUCTURE LINK used to describe a railway network.

Inherits from *(empty if no inheritance)*: ***INFRASTRUCTURE LINK***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

RAILWAY JUNCTION (NT Infrastructure Network MODEL)

A type of INFRASTRUCTURE POINT used to describe a railway network.

Inherits from *(empty if no inheritance)*: ***INFRASTRUCTURE POINT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

RAMP EQUIPMENT (NT Access Equipment MODEL)

Specialisation of PLACE ACCESS EQUIPMENT for ramps (provides ramp characteristics like length, gradient, etc.).

Inherits from *(empty if no inheritance)*: ***PLACE ACCESS EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Length	*LengthType*	0:1
	Gradient	*decimal*	0:1
	Pedestal	*boolean*	0:1
	HandrailHeight	*LengthType*	0:1
	TactileGuidanceStrips	*boolean*	0:1
	VisualGuidanceBands	*boolean*	0:1
	Temporary	*boolean*	0:1
	SuitableForCycles	*boolean*	0:1

RELIEF POINT (NT Vehicle & Crew Point MODEL)

A TIMING POINT where a relief is possible, i.e. a driver may take on or hand over a vehicle. The vehicle may sometimes be left unattended.

Inherits from *(empty if no inheritance)*: ***TIMING POINT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

RETAIL SERVICE (NT Local Commercial Service MODEL)

Specialisation of LOCAL SERVICE dedicated to retail services.

Inherits from *(empty if no inheritance)*: ***LOCAL SERVICE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

ROAD ELEMENT (NT Infrastructure Network MODEL)

A type of INFRASTRUCTURE LINK used to describe a road network.

Inherits from *(empty if no inheritance)*: ***INFRASTRUCTURE LINK***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

ROAD JUNCTION (NT Infrastructure Network MODEL)

A type of INFRASTRUCTURE POINT used to describe a road network.

Inherits from *(empty if no inheritance)*: ***INFRASTRUCTURE POINT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

ROUGH SURFACE (NTAccess Equipment MODEL)

Specialisation of PLACE EQUIPMENT for rough surfaces, giving properties of surface texture, mainly for impaired person information.

Inherits from *(empty if no inheritance)*: ***PLACE ACCESS EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	SuitableForCycles	*boolean*	0:1

ROUTE (NT Route MODEL)

An ordered list of located POINTs defining one single path through the road (or rail) network. A ROUTE may pass through the same POINT more than once.

Inherits from *(empty if no inheritance)*: ***LINK SEQUENCE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Description	*MultilingualString*	0:1

ROUTE LINK (NT Route MODEL)

An oriented link between two ROUTE POINTs allowing the definition of a unique path through the network.

Inherits from *(empty if no inheritance)*: ***LINK***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Distance	*DistanceType*	0:1

ROUTE POINT (NT Route MODEL)

A POINT used to define the shape of a ROUTE through the network.

Inherits from *(empty if no inheritance)*: ***POINT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	ViaFlag	*boolean*	0:1
	BorderCrossing	*boolean*	0:1

ROUTING CONSTRAINT ZONE (NT Routing Constraint MODEL)

A ZONE defining a ROUTING CONSTRAINT. The ZONE may be defined by its contained SCHEDULED STOP POINTS or by its boundary points.
Examples of routing constraints are : "If you board in this ZONE, you can't alight in the same ZONE".

Inherits from *(empty if no inheritance)*: ***ZONE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	ZoneUse	*ZoneUseTypeEnum*	0:1

RUBBISH DISPOSAL (NT Passenger Service Equipment MODEL)

Specialization of EQUIPMENT for Rubbish disposal, describing rubbish types, etc.

Inherits from *(empty if no inheritance)*: ***PASSENGER EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Recycling	*boolean*	0:*
	SharpsDisposal	*boolean*	0:*

SANITARY EQUIPMENT (NT Passenger Service Equipment MODEL)

Specialisation of PASSENGER EQUIPMENT for sanitary facilities.

Inherits from *(empty if no inheritance)*: ***PASSENGER EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Gender	*GenderLimitationEnum*	0:1
	Staffing	*StaffingEnum*	0:1
	NumberOfToilets	*Integer*	0:1
	SanitaryFacilityList	*SanitaryFacilityEnum*	0:*
	FreeEntry	*boolean*	0:1
	Charge	*Amount*	0:1
	ChangeAvailable	*boolean*	0:1
	WheelchairTurningCircle	*LengthType*	0:1
	SharpsDisposal	*boolean*	0:1
	KeyScheme	*normalizedString*	0:1

SCHEDULED STOP POINT (NT Service Pattern MODEL)

A POINT where passengers can board or alight from vehicles.

Inherits from *(empty if no inheritance)*: ***POINT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	ShortName	*MultilingualString*	0:1
	Description	*MultilingualString*	0:1
	Label	*MultilingualString*	0:1
	Url	*abyURI*	0:1
	CompassBearing	*degrees*	0:1
	ForAlighting	*boolean*	0:1
	ForBoarding	*boolean*	0:1
	RequestStop	*boolean*	0:1
	AtCentre	*boolean*	0:1

SEATING EQUIPMENT (NT Site Equipment MODEL)

Specialisation of PLACE EQUIPMENT describing the properties of seating

Inherits from *(empty if no inheritance)*: ***WAITING EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

SERVICE EXCLUSION (NT Routing Constraint MODEL)

A constraint expressing the fact that the service, on a specific JOURNEY PATTERN (usually a flexible transport service JOURNEY PATTERN) cannot operate when another (regular) service operates. This may occur only on a subpart of the JOURNEY PATTERN, or only on one or some specific SCHEDULED STOP POINTS.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Name	*MultilingualString*	0:1
	Description	*MultilingualString*	0:1

SERVICE FRAME (NT Service Frame MODEL)

A set of network service data (and other data logically related to these) to which the same VALIDITY CONDITIONs has been assigned.

Inherits from *(empty if no inheritance)*: ***VERSION FRAME***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

SERVICE JOURNEY PATTERN (NT Service Pattern MODEL)

The JOURNEY PATTERN for a (passenger carrying) SERVICE JOURNEY.

Inherits from *(empty if no inheritance)*: ***JOURNEY PATTERN***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

SERVICE LINK (NT Service Pattern MODEL)

A LINK between an ordered pair of SCHEDULED STOP POINTs.

Inherits from *(empty if no inheritance)*: ***LINK***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	VehicleMode	*TransportModeEnum*	0:1

SERVICE PATTERN (NT Service Pattern MODEL)

The subset of a JOURNEY PATTERN made up only of STOP POINTs IN JOURNEY PATTERN.

Inherits from *(empty if no inheritance)*:			
Classification	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

SERVICE SITE (NT Site MODEL)

A sub-type of SITE which is of specific interest for the operator (e.g. where a joint service or a joint fee is proposed)., other than a STOP PLACE.

Inherits from *(empty if no inheritance)*: ***SITE***			
Classification	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

SHELTER EQUIPMENT (NT Site Equipment MODEL)

Specialisation of WAITING EQUIPMENT for a shelter.

Inherits from *(empty if no inheritance)*: ***WAITING EQUIPMENT***			
Classification	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Enclosed	*boolean*	0:1
	DistanceFromNearestKerb	*LengthType*	0:1

SIGN EQUIPMENT (NT Sign Equipment MODEL)

Specialisation of PLACE EQUIPMENT for signs (heading signs, etc.).

Inherits from *(empty if no inheritance)*: ***PLACE EQUIPMENT***			
Classification	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	BrandGraphic	*anyUrl*	1:1
	SignGraphic	*anyUrl*	1:1
	Placement	*string*	1:1
	AsBraille	*boolean*	1:1
	Height	*LengthType*	1:1
	Width	*LengthType*	1:1
	HeightFromFloor	*LengthType*	1:1
	MachineReadable	*boolean*	1:1

SITE (NT Site MODEL)

A well known PLACE to which passengers may refer to indicate the origin or a destination of a trip.

Inherits from *(empty if no inheritance)*: ***SITE ELEMENT***			
Classification	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	SiteType	*SiteTypeEnum*	0:1
	AtCenter	*boolean*	0:1
	Locale	*Locale*	0:1

SITE COMPONENT (NT Site MODEL)

An element of a SITE describing a part of its structure. SITE COMPONENTs share common properties for data management, accessibility and other features.

Inherits from *(empty if no inheritance)*: ***SITE ELEMENT***			
Classification	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

SITE CONNECTION (NT Service Connection MODEL)

The physical (spatial) possibility for a passenger to change from one public transport vehicle to another to continue the trip, determined by physical locations, such as SITEs and/or its components and/or ENTRANCEs, in particular STOP PLACEs and/or its components. Different times may be necessary to cover the resulting distance, depending on the kind of passenger.

Inherits from *(empty if no inheritance)*: ***TRANSFER***			
Classification	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

***SITE CONNECTION END* (NT Service Connection MODEL)**

One end of a SITE CONNECTION.

Inherits from *(empty if no inheritance)*: ***CONNECTION END***			
Classification	**Name**	**Type**	**cardinality**

***SITE ELEMENT* (NT Site MODEL)**

A type of ADDRESSABLE PLACE specifying common properties of a SITE or a SITE COMPONENT to describe it, including accessibility.

Inherits from *(empty if no inheritance)*: ***ADDRESSABLE PLACE***			
Classification	**Name**	**Type**	**cardinality**
	Image	*anyUri*	0:1
	NameSuffix	*MultilingualString*	0:1
	Url	*anyUri*	0:1
	CrossRoad	*MultilingualString*	0:1
	Landmark	*MultilingualString*	0:1
	PublicUse	*PublicUseEnum*	0:1
	Covered	*CoveredEnum*	0:1
	Gated	*GatedEnum*	0:1
	AllAreasWheelchair	*boolean*	0:1
	Lighting	*LightingEnum*	0:1
	PersonCapacity	*NumberOfPeople*	0:1

SITE EQUIPMENT (NT Site Equipment MODEL)

Specialisation of PLACE EQUIPMENT for SITEs (e.g. LUGGAGE LOCKER, WAITING EQUIPMENT, TROLLEY STAND, etc.)

Inherits from *(empty if no inheritance)*: ***PLACE EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

SITE FRAME (NT Site Frame MODEL)

A set of SITE data to which the same VALIDITY CONDITIONs have been assigned.

Inherits from *(empty if no inheritance)*: ***VERSION FRAME***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

STAIR EQUIPMENT (NT Stair Equipment MODEL)

Specialisation of PLACE ACCESS EQUIPMENT for stairs (stair, escalator, staircase, etc.).

Inherits from *(empty if no inheritance)*: ***PLACE ACCESS EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

STAIRCASE EQUIPMENT (NT Stair Equipment MODEL)

Specialisation of STAIR EQUIPMENT for stair cases.

Inherits from *(empty if no inheritance)*: ***STAIR EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	ContinuousHandrail	*boolean*	0:1
	SpiralStair	*boolean*	0:1
	NumberOfFlights	*integer*	0:1

STOP AREA (NT Service Pattern MODEL)

A group of SCHEDULED STOP POINTs close to each other.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	PublicCode	*normalizedString*	0:1
	Name	*normalizedString*	1:1

STOP ASSIGNMENT (NT Stop Assignment MODEL)

The allocation of a SCHEDULED STOP POINT (i.e. a SCHEDULED STOP POINT of a SERVICE PATTERN or JOURNEY PATTERN) to a specific STOP PLACE, for either a SERVICE JOURNEY or VEHICLE SERVICE.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	AlightingUse	*boolean*	0:1
	StopAssignmentType	*Enum*	0:1
	BoardingUse	*boolean*	0:1
	PrivateCode	*normalizedString*	0:1

STOP PLACE (NT Stop Place MODEL)

A place comprising one or more locations where vehicles may stop and where passengers may board or leave vehicles or prepare their trip. A STOP PLACE will usually have one or more wellknown names.

Inherits from *(empty if no inheritance)*: ***SITE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***id***		1:1
	Weighting	*integer*	0:1
	BorderCrossingPoint	*boolean*	0:1
	LimitedUse	*LimitedUseEnum*	0:1

STOP PLACE COMPONENT (NT Stop Place MODEL)

An element of a STOP PLACE describing part of its structure. STOP PLACE COMPONENTs share common properties for data management, accessibility and other features.

Inherits from *(empty if no inheritance)*: ***SITE COMPONENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
	Label	*normalizedString*	0:1
	OtherModes	*AccessModeEnum*	0:*

STOP PLACE ENTRANCE (NT Stop Place MODEL)

A physical entrance or exit to/from a STOP PLACE for a Passenger. May be a door, barrier, gate or other recognizable point of access.

Inherits from *(empty if no inheritance)*: ***ENTRANCE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

STOP PLACE SPACE (NT Stop Place MODEL)

A physical area within a STOP PLACE, for example, a QUAY, BOARDING POSITION, ACCESS SPACE or EQUIPMENT PLACE.

Inherits from *(empty if no inheritance)*: ***STOP PLACE COMPONENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	BoardingUse	*boolean*	0:1
	AlightingUse	*boolean*	0:1
	Label	*normalizedString*	0:1

STOP PLACE VEHICLE ENTRANCE (NT Stop Place MODEL)

A physical entrance or exit to/from a STOP PLACE for a vehicle.

Inherits from *(empty if no inheritance)*: ***VEHICLE ENTRANCE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

STOP POINT IN JOURNEY PATTERN (NT Service Pattern MODEL)

A POINT in a JOURNEY PATTERN which is a SCHEDULED STOP POINT.

Inherits from *(empty if no inheritance)*: ***POINT IN LINK SEQUENCE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	ForAlighting	*boolean*	0:1
	ForBoarding	*boolean*	0:1
	RequestStop	*boolean*	0:1
	ChangeOfDestinationDisplay	*boolean*	0:1
	ChangeOfServiceRequirements	*boolean*	0:1
	StopUse	*StopUseEnum*	0:1

TICKET VALIDATOR EQUIPMENT (NT Ticketing Equipment MODEL)

Specialisation of PASSENGER EQUIPMENT (PLACE EQUIPMENT) describing ticket validators.

Inherits from *(empty if no inheritance)*: ***PASSENGER EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	ValidatorList	*TicketValidatorEnum*	0:*

TICKETING EQUIPMENT (NT Ticketing Equipment MODEL)

Specialization of PASSENGER EQUIPMENT for ticketing.

Inherits from *(empty if no inheritance)*: ***PASSENGER EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	TicketCounterService	*boolean*	0:1
	NumberOfMachines	*integer*	0:1
	TicketMachines	*boolean*	1:1
	HeightOfMachineInterface	*LengthType*	0:1
	TicketingFacilityList	*TicketingFaciltyEnum*	0:*
	TicketOffice	*boolean*	0:1
	NumberOfTills	*integer*	0:1
	QueueManagement	*QueueManagementEnum*	0:*
	HeightOfLowCounter	*LengthType*	0:1
	LowCounterAccess	*boolean*	0:1
	InductionLoops	*boolean*	0:1

TICKETING SERVICE (NT Local Service Equipment MODEL)

Specialization of LOCAL SERVICE for ticketing, providing ticket counter and online purchase information, also associated with payment method and TYPE OF TICKET.

Inherits from *(empty if no inheritance)*: ***LOCAL SERVICE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	OnlinePurchaseForCollection	*boolean*	0:1
	OnlinePurchaseForETicket	*boolean*	0:1
	TicketCounterService	*boolean*	0:1
	OnlinePurchaseForSelfTicket	*boolean*	0:1
	OnboardPurchase	*boolean*	0:1
	MobileDeviceTickets	*boolean*	0:1

TIME DEMAND TYPE (NT Time Demand Type MODEL)

An indicator of traffic conditions or other factors which may affect vehicle run or wait times. It may be entered directly by the scheduler or defined by the use of TIME BANDs.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Name	*MultilingualString*	0:1
	Description	*MultilingualString*	0:1

TIME DEMAND TYPE ASSIGNMENT (NT Time Demand Type MODEL)

The assignment of a TIME DEMAND TYPE to a TIME BAND depending on the DAY TYPE and GROUP OF TIMING LINKS.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TIMING LINK (NT Timing Pattern MODEL)

An ordered pair of TIMING POINTs for which run times may be recorded.

Inherits from *(empty if no inheritance)*: ***LINK***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TIMING LINK IN JOURNEY PATTERN (NT Journey Pattern MODEL)

The position of a TIMING LINK in a JOURNEY PATTERN. This entity is needed if a TIMING LINK is repeated in the same JOURNEY PATTERN, and separate information is to be stored about each iteration of the TIMING LINK.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TIMING PATTERN (NT Timing Pattern MODEL)

The subset of a JOURNEY PATTERN made up only of TIMING POINTs IN JOURNEY PATTERN.

Inherits from *(empty if no inheritance)*: ***LINK SEQUENCE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TIMING POINT (NT Timing Pattern MODEL)

A POINT against which the timing information necessary to build schedules may be recorded.

Inherits from *(empty if no inheritance)*: ***POINT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Category	*string*	0:1
	AllowedForWaitTime	*duration*	0:1
	Flexible	*boolean*	0:1
	TimingPointType	*TimingStatusEnum*	0:1

TIMING POINT IN JOURNEY PATTERN (NT Journey Pattern MODEL)

A POINT in a JOURNEY PATTERN which is a TIMING POINT.

Inherits from *(empty if no inheritance)*: ***POINT IN LINK SEQUENCE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***	*TimingPointInJourneyPatternId*	1:1
	IsWaitPoint	*boolean*	1:1

TRAFFIC CONTROL POINT (NT Activation MODEL)

A POINT where the traffic flow can be influenced. Examples are: traffic lights (lanterns), barriers.

Inherits from *(empty if no inheritance)*: ***POINT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TRAIN STOP ASSIGNMENT (NT Train Stop Assignment MODEL)

The association of a TRAIN COMPONENT at a SCHEDULED STOP POINT with a specific STOP PLACE and also possibly a QUAY and BOARDING POSITION.

Inherits from *(empty if no inheritance)*: ***STOP ASSIGNMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	PositionOfTrainElement	*positiveInteger*	1:1
	EntranceToVehicle	*MultilingualString*	0:1

TRANSFER RESTRICTION (NT Routing Constraint MODEL)

A constraint that can be applied on a CONNECTION or INTERCHANGE between two SCHEDULED STOP POINTs, preventing or forbidding the passenger to use it.

Inherits from *(empty if no inheritance)*:			
Classification	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Name	*MultilingualString*	0:1
	Description	*MultilingualString*	0:1
	RestrictionType	*TransferRestrictionTypeEnum*	0:1
	BothWays	*boolean*	0:1

TRAVELATOR EQUIPMENT (NT Stair Equipment) MODEL)

Specialisation of PLACE ACCESS EQUIPMENT for travelators (provides travelator properties like speed, etc).

Inherits from *(empty if no inheritance)*: ***PLACE ACCESS EQUIPMENT***			
Classification	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	TactileActuators	*boolean*	0:1
	EnergySaving	*boolean*	0:1
	DogsMustBeCarried	*boolean*	0:1
	Speed	*SpeedType*	0:1

TROLLEY STAND EQUIPMENT (NT Site Equipment MODEL)

Specialisation of STOP PLACE EQUIPMENT for trolley stands.

Inherits from *(empty if no inheritance)*: ***SITE EQUIPMENT***			
Classification	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	FreeToUse	*boolean*	0:1
	Charge	*Amount*	0:1
	PaymentMethod	*PaymentMethodEnum*	0:1

TURN STATION (NT Route MODEL)

A place (often a terminus) where a vehicle can reverse its direction (from a ROUTE to another of opposite DIRECTION).

Inherits from *(empty if no inheritance)*:			
Classification	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	TurnaroundDistance	*Distance*	0:1

TYPE OF ACCESS FEATURE (NT Check Constraint MODEL)

A Classification of ACCESS FEATURE for CHECK CONSTRAINT (e.g. barrier, narrow entrance, confined space, queue management, etc.)

Inherits from *(empty if no inheritance)*:			
Classification	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF ACCESSIBILITY TOOLS (Local Service Equipment MODEL)

A classification of ACCESSIBILITY TOOLS used by or available from ASSISTANCE SERVICE (e.g.wheelchair, walking stick, audio navigator, visual navigator, etc.)

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF ACTIVATION (NT Activation MODEL)

A classification of real-time processes that are activated when vehicles passes an ACTIVATION POINT or an ACTIVATION LINK.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF ASSISTANCE SERVICE (NT Local Service Equipment MODEL)

A classification of ASSISTANCE SERVICE (e.g. boarding assistance, onboard assistance, porterage, foreign language, sign language translation, etc.).

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF BOARDING POSITION (NT Stop Place MODEL)

A classification for BOARDING POSITIONs.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF CATERING SERVICE (NT Local Commercial Service MODEL)

A classification of CATERING SERVICE (e.g. beverage vending machine, buffet, food vending machine, restaurant, snacks, trolley service, no beverages available, no food available).

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF CHECK CONSTRAINT (NT Check Constraint MODEL)

A classification of CHECK CONSTRAINT (e.g. ticket collection, ticket purchase, baggage check-in, incoming customs, outgoing customs, tax refunds, etc.)

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF COMMUNICATION SERVICE (NT Local Commercial Service MODEL)

A classification of COMMUNICATION SERVICE (e.g. free wifi, public wifi, phone, mobile coverage, internet, video entertainment ,audio entertainment, post box, post office, business services).

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF CONGESTION (NT Check Constraint MODEL)

A typology of congestions resulting from CHECK CONSTRAINT (e.g. no waiting, queue, crowding, full).

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF CYCLE STORAGE EQUIPMENT (NT Parking Equipment MODEL)

A classification of CYCLE STORAGE EQUIPMENT (e.g. racks, bars, railings, etc.)

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF DIRECTION OF USE (NT Access Equipment MODEL)

Direction in which EQUIPMENT. can be used. (e.g. up, down, level, one way, both way, etc.).

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF EMERGENCY SERVICE (NT Local Service Equipment MODEL)

A typology of emergency services (e.g police, first aid, sos point, cctv).

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF GENDER LIMITATION (NT Passenger Service Equipment MODEL)

A classification for GENDER LIMITATIONSs (mainly for SANITARY EQUIPMENT, e.g. male only, female only, both).

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF HANDRAIL (NT Stair Equipment MODEL)

A classification of HANDRAIL (one side, both sides).

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF HIRE SERVICE (NT Local Commercial Service MODEL)

A classification of HIRE SERVICEs (e.g. car hire, motor cycle hire, cycle hire, recreational device hire).

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF JOURNEY PATTERN (NT Journey Pattern MODEL)

A classification of JOURNEY PATTERNs used to distinguish other categories of JOURNEY PATTERN than SERVICE JOURNEY PATTERN and DEAD RUN PATTERN.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Name		0:1

TYPE OF LINE (NT Route MODEL)

A classification for LINEs.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF LOCAL SERVICE (NT Local Service Equipment MODEL)

A generic (abstract) classification of LOCAL SERVICEs.

Inherits from *(empty if no inheritance)*: ***TYPE OF EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF LUGGAGE LOCKER (NT Site Equipment MODEL)

A classification for LUGGAGE LOCKER EQUIPMENT (e.g. left luggage, lockers, bike carriage, porterage, free trolleys, paid trolleys)

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF MONEY SERVICE (NT Local Commercial Service MODEL)

A classification of MONEY SERVICE (e.g. cash machine, bank, insurance, bureau de change)

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF PASSAGE (NT Stop Place MODEL)

A classification for spaces to express how the space can be used as a passage (e.g. pathway, corridor, overpass, underpass, tunnel, etc.).

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF PASSENGER INFORMATION EQUIPMENT (NT Passenger Information Display Assignment MODEL)

A classification for PASSENGER INFORMATION EQUIPMENT (e.g. next stop indicator, stop announcements, passenger information facility).

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	BroadType	*normalizedString*	0:1

TYPE OF POINT OF INTEREST SPACE (NT Point Of Interest MODEL)

A classification for POINT OF INTEREST SPACEs.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF QUAY (NT Stop Place MODEL)

A classification for QUAYs.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF RELATION TO VEHICLE (NT Vehicle Stopping MODEL)

A classification of the way a VEHICLE STOPPING POSITION is used (e.g. front left, front right, back left, back right, driver left, driver right).

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF RETAIL SERVICE (NT Local Commercial Service MODEL)

A classification of RETAIL SERVICE (e.g. food, newspaper tobacco, health hygiene beauty, fashion accessories, bank finance insurance, tourism, photo booth)

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF SANITARY FACILITY (NT Passenger Service Equipment MODEL)

A classification for SANITARY EQUIPMENT (e.g. toilet, wheelchair access toilet, shower, baby change, wheelchair baby change)

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF SEATING EQUIPMENT (NT Site Equipment MODEL)

A classification for SEATING EQUIPMENT.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF SERVICE NATURE (NT Check Constraint MODEL)

A classification for service available for a CHECK CONSTRAINT (e.g. self-service machine, counter service).

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF SHELTER (NT Site Equipment MODEL)

A classification for SHELTERs

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF STAFFING (NT Local Service Equipment MODEL)

A classification for the availability of the STAFF associated with an ASSISTANCE SERVICE (e.g. full time, part time)

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF STOP PLACE (NT Stop Place MODEL)

A classification for STOP PLACEs (e.g. complex, simple, multimodal, etc).

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF STOP POINT (NT Service Pattern MODEL)

A classification of SCHEDULED STOP POINTs, used for instance to characterize the equipment to be installed at stops (post, shelter, seats, etc.).

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF SURFACE (NT Access Equipment MODEL)

A classification for ROUGH SURFACE types.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF TRAFFIC CONTROL POINT (NT Activation MODEL)

A classification of TRAFFIC CONTROL POINTs.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

TYPE OF WAITING ROOM (NT Site Equipment MODEL)

A classification for WAITING ROOM EQUIPMENT.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

VEHICLE CHARGING EQUIPMENT (NT Parking Equipment MODEL)

Specialisation of PLACE EQUIPMENT for vehicle charging.

Inherits from *(empty if no inheritance)*: ***PLACE EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	FreeRecharging	*boolean*	0:1
	Reservation	*boolean*	0:1
	ReservationUrl	*anyURI*	0:1

VEHICLE ENTRANCE (NT Site MODEL)

A physical entrance or exit to/from a STOP PLACE for a VEHICLE. May be a door, barrier, gate or other recognizable point of access.

Inherits from *(empty if no inheritance)*: ***ENTRANCE***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Public	*boolean*	0:1

VEHICLE POSITION ALIGNMENT (NT Vehicle Stopping MODEL)

The alignment of a particular BOARDING POSITION with the entrance of a VEHICLE as the result of positioning the VEHICLE at a particular VEHICLE STOPPING PLACE.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

VEHICLE QUAY ALIGNMENT (NT Vehicle Stopping MODEL)

The alignment of a particular QUAY with a vehicle as the result of positioning a VEHICLE at a particular VEHICLE STOPPING PLACE.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

VEHICLE STOPPING PLACE (NT Vehicle Stopping MODEL)

A place on the vehicle track where vehicles stop in order for passengers to board or alight from a vehicle.
A vehicle track is located on the respective INFRASTUCTURE LINK for the MODE (RAILWAY ELEMENT of rail network, ROAD ELEMENT of road network, etc). A VEHICLE STOPPING PLACE may be served by one or more QUAYs.

Inherits from *(empty if no inheritance)*: ***STOP PLACE COMPONENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

VEHICLE STOPPING POSITION (NT Vehicle Stopping MODEL)

The stopping position of a vehicle or one of its components as a location. May be specified as a ZONE corresponding to the bounding polygon of the vehicle, or one or more POINTs corresponding to parts of the vehicle such as a door.
If given as a single point, indicates the position for the door relative to an indicated side of the vehicle.

Inherits from *(empty if no inheritance)*: ***STOP PLACE COMPONENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Bearing	*degrees*	0:1

VEHICLE TYPE AT POINT (NT Network Restriction MODEL)

The number of vehicles of a specified VEHICLE TYPE which may wait at a specified POINT at any one time. If the capacity is 0, then that type of vehicle may not stop there.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Capacity	*NumberOfVehicles*	0:1

VIA (NT Route MODEL)

A secondary heading relevant for a certain part of the JOURNEY PATTERN advertising an onward intermediate destination to supplement the advertised (final) destination of DESTINATION DISPLAY.

Inherits from *(empty if no inheritance)*:			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Name	*MultiLingualString*	1:1
	ViaType	*ViaTypeEnum*	0:1

WAITING EQUIPMENT (NT Site Equipment MODEL)

Specialisation of STOP PLACE EQUIPMENT for WAITING EQUIPMENTs (shelter, waiting room, etc.).

Inherits from *(empty if no inheritance)*: ***SITE EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Seats	*integer*	0:1
	Width	*LengthType*	0:1
	Length	*LengthType*	0:1
	AirConditioned	*boolean*	0:1
	StepFree	*boolean*	0:1
	WheelchairAreaWidth	*LengthType*	0:1
	WheelchairAreaLength	*LengthType*	0:1
	SmokingAllowed	*boolean*	0:1

WAITING ROOM EQUIPMENT (NT Site Equipment MODEL)

Specialisation of WAITING EQUIPMENT for waiting rooms, classified by TYPE OF WAITING ROOM.

Inherits from *(empty if no inheritance)*: ***WAITING EQUIPMENT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1
	Facilities	*SanitaryEquipment*	0:1
	WomenOnly	*boolean*	0:1

WIRE ELEMENT (NT Infrastructure Network MODEL)

A type of INFRASTRUCTURE LINK used to describe a wire network.

Inherits from *(empty if no inheritance)*: ***INFRASTRUCTURE LINK***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

WIRE JUNCTION (NT Infrastructure Network MODEL)

A type of INFRASTRUCTURE POINT used to describe a wire network.

Inherits from *(empty if no inheritance)*: ***INFRASTRUCTURE POINT***			
Classifi-cation	**Name**	**Type**	**cardinality**
«UID»	***Id***		1:1

Additional definitions from [8]:

VEHICLE SERVICE A workplan for a vehicle for a whole day, planned for a specific DAY TYPE.

SERVICE JOURNEY A passenger carrying VEHICLE JOURNEY for one specified DAY TYPE. The pattern of working is in principle defined by a SERVICE JOURNEY PATTERN.

VEHICLE JOURNEY The planned movement of a public transport vehicle on a DAY TYPE from the start point to the end point of a JOURNEY PATTERN on a specified ROUTE.

INTERCHANGE The scheduled possibility for transfer of passengers at the same or different SCHEDULED STOP POINTs.

Appendix B : Status of the Textual Descriptions & Model Evolution

In order to allow the reader familiar with Transmodel V5.1 (marked TM) to appraise the changes each numbered (level 3) section indicates the source of the text:

TM: text incorporating either simple reformulations or taken over from TM;

TM and NeTEx: text based on TM with additions by NeTEx;

IFOPT and NeTEx: text based on IFOPT with additions by NeTEx;

NeTEx: text incorporating significant enhancements or a totally new text compared to Transmodel V5.1. Some of them take over explanations referring to IFOPT.

Table 7 : Sources of text in the Network Topology Domain

Section	Topic	Source
5.1	**Introduction**	
5.2	**Model and Document Structure**	
5.3	**Network Description Model**	
5.3.1	Model Overview	NeTEx
5.3.2	Infrastructure Network	TM
5.3.3	Network Restriction	TM
5.3.4	Main Tactical Planning Points and Links	TM
5.3.5	Activation	TM
5.3.6	Vehicle & Crew Point	TM
5.3.7	Lines and Routes	TM and NeTEx
5.3.8	Line Network	NeTEx
5.3.9	Flexible Network	NeTEx
5.4	**Fixed Object Model**	
5.4.1	Model Overview	NeTEx
5.4.2	Site	NeTEx
5.4.3	Stop Place	IFOPT and NeTEx
5.4.4	Flexible Stop Place	NeTEx
5.4.5	Associating Equipment with Site Components	NeTEx
5.4.6	Equipment Description Overview	IFOPT and NeTEx
5.4.7	Waiting and Luggage Equipment	IFOPT and NeTEx
5.4.8	Point Of Interest	IFOPT and NeTEx
5.4.9	Passenger Service Equipment	IFOPT and NeTEx
5.4.10	Ticketing Equipment	IFOPT and NeTEx
5.4.11	Site Access Equipment	IFOPT and NeTEx
5.4.12	Local Service	IFOPT and NeTEx

5.4.13	Parking Equipment	IFOPT and NeTEx
5.4.14	Site Equipment – Examples	IFOPT and NeTEx
5.4.15	Path Links and Navigation Paths	IFOPT and NeTEx
5.4.16	Path Links – Examples	IFOPT and NeTEx
5.4.17	Navigation Paths – Examples	IFOPT and NeTEx
5.4.18	Check Constraint	IFOPT and NeTEx
5.4.19	Parking	IFOPT and NeTEx
5.4.20	Vehicle Stopping	IFOPT and NeTEx
5.4.21	Accessibility Coverage	IFOPT and NeTEx
5.4.22	Accessibility Coverage of Site Elements	NeTEx
5.4.23	Accessibility Coverage of Paths	NeTEx
5.5	**Tactical Planning Components Model**	
5.5.1	Model Overview	NeTEx
5.5.2	Journey Pattern	TM
5.5.3	Common Section	TM
5.5.4	Timing Pattern	TM
5.5.5	Service Pattern	TM and NeTEx
5.5.6	Service Connection	TM and NeTEx
5.5.7	Routing Constraints	NeTEx
5.5.8	Time Demand Type	TM and NeTEx
5.5.9	Passenger Stop Assignment	IFOPT and NeTEx
5.5.10	Train Stop Assignment	IFOPT and NeTEx
5.5.11	Path Assignment	IFOPT and NeTEx
5.5.12	Notice Assignment	NeTEx
5.5.13	Passenger Information Display Assignment	NeTEx
5.6	**Explicit Frames**	
5.6.1	Infrastructure Frame	NeTEx
5.6.2	Service Frame	NeTEx
5.6.3	Site Frame	NeTEx

Table 8 : Status of diagrams & figures compared to NeTEx

Part 2 figure	Main Package	Part 2 diagram/figure title	status compared to NeTEx
1	**Network Description**	Infrastructure Network Model	copied
2		*Different Layers According to the Transport Mode*	*from TM*
3		*Different Layers According to an Operational Need*	*from TM*
4		*Network Infrastructure Example*	*copied*
5		Network Restriction Model	copied
6		*Network Infrastructure example*	*copied*
7		Main Network Points And Links Model	added
8		Activation Model	modified
9		Vehicle & Crew Point Model	copied
10		Line & Route Model	copied
11		*Route Point & Point On Route Example*	*copied*
12		*Route Point & Point On Route Example*	*copied*
13		Line Schematic Map Model	modified
14		Line Network Model	copied
15		*Example of a Schematic Representation of a LINE*	*copied*
16		Flexible Link Point and Zone Model	corrected
17		Flexible Route Model	copied
18		Flexible Line Model	copied
19	**Fixed Objects**	Site Basic Model	copied
20		Site Model	copied simplified
21		Site Element Model	Added &modified
22		Zone Types Hierarchy	modified
23		Site Accessibility View	corrected
24		Stop Place Basic Model	copied
25		Stop Place Model	copied
26		*Example of a single bus stop on street*	*copied*
27		*Example pair of bus stops on street*	*copied*
28		*Example bus cluster on street*	*copied*
29		*Simple Rail Station Example – Barrow crossing*	*copied*
30		*Simple Rail Station Example – Crossing with stairs*	*copied*
31		*Rail Station example with multiple platforms*	*copied*
32		*Example Nesting of Stop Places*	*copied*
33		*Common QUAY configurations for station platforms*	*copied*
34		Flexible Stop Place Model	copied
35		*Example of Hail and Ride Stop*	*copied*
36		*Example of Flexible Zone*	*copied*

37		Place Equipment Location Model	modified
38		Waiting, Luggage Equipment Model	copied
39		Point Of Interest Basic Model	corrected
40		Point of Interest Model	corrected
41		*Example Basic Point of Interest*	*copied*
42		*Example Point of Interest – Stadium Outline*	*copied*
43		*Example Point of Interest – Stadium*	*copied*
44		*Example Point of Interest – Stadium with Numbered sections*	*copied*
45		Passenger Service Equipment Model	copied
46		Ticketing Equipment Model	copied
47		Site Access Equipment Model	corrected & simplified
48		Sign Equipment Model	corrected & simplified
49		Local Service Equipment Model	copied
50		Local Commercial Service Equipment Model	corrected
51		Parking Equipment Model	copied
52		Equipment Example Hover windows for Equipment	copied
53		Overview Navigation Path Model	corrected
54		Navigation Path Model	corrected
55		Example of a single Path Link	copied
56		*Example of a sequence of Path Links*	*copied*
57		*Example of Path Links used to connect Access and platforms*	*copied*
58		*Example of Path links between open areas*	*copied*
59		*Example – Wimbledon Nodes & Path Links*	*copied*
60		*Example – Some Navigation Paths for Wimbledon*	*copied*
61		*Example – Wimbledon path from Stop Q to Platform 6*	*copied*
62		*Example – London2012 Olympics Main Site*	*copied*
63		*Example – London 2012 Olympic Park Navigation Path*	*copied*
64		*Example – Direction of Path Links and Navigation Paths*	*copied*
65		Site Check Constraint Model	copied
66		Stop Place Check Constraint Model	copied
67		Parking Basic Model	added
68		Parking Model	copied
69		Vehicle Stopping Model	copied
70	**Tactical Planning Components**	Journey Pattern Model	copied
71		All Journey Patterns Model	copied
72		Journey Pattern & Operational Context Model	added
73		Destination Display Adaptation Model	added
74		Common Section Model	modified
75		Timing Pattern Model	copied
76		*Timing Link and Timing Points example*	*copied*
77		*Rail Timing Link and Timing Points example*	*copied*

78		*Rail Timing Pattern Example*	*copied*
79		*Route and Service Pattern Example*	*copied*
80		Service Pattern Basic Model	added
81		Service Pattern Model	copied
82		*Eurostar Lines – Example*	*copied*
83		*Eurostar Stops – Example*	*copied*
84		*Eurostar Example - London to Paris Trains*	*copied*
85		*Eurostar Example - Outbound Journeys*	*copied*
86		*Eurostar Example – Summary Service Patterns*	*copied*
87		Service Connection Basic Model	added
88		Service Connection Model	copied
89		Routing Constraint Model	copied
90		*Routing constraint example*	*copied*
91		Time Demand Type Model	copied simplified
92		*Stops as Places on a Line – Example*	*copied*
93		*Stops as Stopping Points in the Timetable – Example*	*copied*
94		*Stops as Physical Places – Example*	*copied*
95		*Passenger Stop Assignment Model*	*corrected*
96		*Some Stop Assignments for the Wimbledon – Example*	*copied*
97		*Stop Assignment for the Stop Gare de Lyon in Paris*	*copied*
98		Train Stop Assignment Model	copied
99		*Train Assignment – Example*	*copied*
100		Path Assignment Model	copied
101		Journey Pattern Notice Assignment Model	added simplified
102		Passenger Information Display Assignment Model	copied
103	**Explicit Frames**	Infrastructure Frame Model	copied
104		Service Frame Model	copied
105		Site Frame Model	copied

Copied: means "copied from NeTEx" with no change except layout, and adaptation of the stereotype PK --> UID.

Corrected: means "corrected from NeTEx" where the correction refers to the type of association (composition <--> aggregation), cardinality, scope of ID (private-->public), label naming.

Modified: means "modified from NeTEx" if it includes any change other than the above ones.

Added means "added compared to NeTEx" with possible substantial changes.

New: means "not considered within NeTEx" (but considered in Transmodel).