Department for Transport

1A10001

NaPTAN - National Public Transport Access Node database

http://www.dft.gov.uk/naptan

NeTEx Stop & Venue Data
UK Naptan 3.0 PROFILE

NaPTAN3.0 using CEN NeTEx / IFOPT format.

DRAFT FOR REVIEW

NaPTAN v.3.0a

Version History

Version	Contents	Date		Audience
3.0a-02	Rough Draft	06.08.2010	NJSK	internal
3.0a-06	Revised Draft with added examples	19.08.2010	NJSK	internal
3.0a-07	Revised with corrections and clarifications	10.09.2010	NJSK	internal
3.0a-08	Revised with corrections and clarifications	30.10.2010	NJSK	Review
3.0a-09	Revised with corrections and clarifications	19.10.2010	NJSK	Review
3.0a-10	Revised with POI and Lift values	19.11.2010	NJSK	Review
3.0a-11	Revised with Venue	09.01.2011	NJSK	Review

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1 INTRODUCTION

1.1 This Document

This document describes the exchange of UK *NaPTAN* data in an alternative and extended '*NaPTAN 3.0*' format based on the CEN *NeTEx / IFOPT /Transmodel* standard – a 'UK Profile' for *NeTEx*. The extended format allows the addition to the *NaPTAN* data set of many further information elements, including transfer times, accessibility properties, navigation paths through an interchange, and details of equipment available in the interchange. The format can be used to exchange existing *NaPTAN* data but has syntactic differences from the existing *NaPTAN* and so does not have strict compatibility with existing *NaPTAN* documents.

Significant work has already been done by organisations such as National Rail Enquiries and Transport for London to collect accessibility data sets – and by their suppliers, notably Direct Enquiries and MDV, to create tools to handle the additional data. This work has in effect developed several pre-standards that help to characterise the required data set and exchange formats and furthermore has populated them with a considerable body of data. The NaPTAN 3.0 profile seeks to systemise this work to enable a wider exchange of such data, a higher degree of integration with other data, and the further augmentation of UK data with new capabilities. This should both obtain greater value from the existing assets and enable further applications.

NaPTAN 3.0 is intended to allow a gradual evolution of NaPTAN. Existing basic data management of stop data may continue as at present without change. At the same time an enabling framework is put in place that allows a useful data from other sources to be harnessed for the benefit of the passenger.

This document is a detailed technical paper intended for a technical audience. For a high level overview of the business context, see the accompanying papers [Napt-Strat-1]

1.2 Status of this Document

This document has been drafted by the Transport Direct (TD) unit of the UK Department for Transport, in the context of the London 2012 Olympics.

The 2012 Olympic Games is keen to make effective use of public transport, and in particular to allow for access by disabled travellers. However, existing UK standards – including the current version of the access node specification, NaPTAN – do not include the accessibility parameters that will be required.

Accordingly we have undertaken some significant project work to adapt and adopt elements of the emerging European NeTEx standard. The intention is that the specifications resulting from this project work will, having been stress-tested in the live Olympics environment, be a valuable legacy for the UK public transport sector as a whole. This document represents one of these outputs.

In order to emphasise continuity, we have codenamed this specification "NaPTAN 3.0a". It is still very much in development and may go through significant change as business requirements, UK policy, European standards, or technology opportunities change. While the hope is for this to evolve towards an eventual publication of a full-fledged revision of NaPTAN, which would be "NaPTAN v3.0" (and for this to be fully NeTEx / IFOPT compliant), **there is no commitment to, or timeline for, this step**.

[THIS DOCUMENT IS A DISCUSSION DRAFT AND HAS A NUMBER OF LOOSE ENDS AND OMISSIONS. COMMENTS ARE INVITED IN PARTICULAR ON.

- SCOPE DESIRABLE FOR UK USE.
- POSSIBLE SIMPLIFICATIONS.
- BUSINESS RULES NEEDED TO INTERPRET DATA.

- BUSINESS PROCESSES NEEDED TO SUPPORT THE ADDITIONAL DATA.
- ASPECTS NEEDING FURTHER EXPLANATION OR CLARIFICATION.
- MISSING ATTRIBUTES.]

1.3 Document Structure

This document is intended for developers and other technically aware readers and includes technical terminology and notations. It is organised into the following main sections:

Part I

(i) Introduction and standards context.
- Provides a high level overview of the relationship of current and extended NaPTAN data

(ii) Overview of NaPTAN 3.0 approach.
- Provides a high level overview of the relationship of current and extended NaPTAN data

Part II

(iii) Short overview of the NeTEx / IFOPT model
- An overview of the NETEX / IFOPT model.

(iv) Mapping to NaPTAN
- An overview of the Mapping of *NaPTAN* 2x to *NaPTAN* 3x.
- Further details of specific aspects.

(v) Further Guidance on adding NaPTAN 3.0 data elements

Appendices

(a) Summary recap of the NPTG & NaPTAN models.

1.4 Context

The National Public Transport Access Nodes (*NaPTAN)* database is a UK nationwide system for uniquely identifying all the points of access to public transport in the UK. *NaPTAN* seeks to provide a comprehensive data set of all of the stopping places used by public transport services. *NaPTAN* data can be exchanged as XML documents using a publically available schema provided by the DfT.

NaPTAN (together with the National Public Transport Gazetteer, NPTG) enables computerised public transport information systems to provide stop finding and referencing capabilities using consistent, meaningful names for places and stops. The points of the *NaPTAN* system provide a coherent national framework of reference for integrating all kinds of public transport data including journey planning and real-time information. Other UK standards such as *TransXChange* are built upon this standard.

To date the scope of the *NaPTAN* model has been to describe basic point based information about the names and locations of all on street stops, and station entrances. It has not included accessibility information, or information about paths into and out of stations or other sites. Path data requires a considerably richer and more complex model (of which the current *NaPTAN* point model can nonetheless be regarded as a simpler subset) – but is important for a full description of accessibility. The UK has a strategic requirement to develop a richer stop model that includes an accessibility model and navigation data. This could also include explicit data about transfer times at an interchange by the different paths – a data set also not currently supported by the current *NaPTAN* model. This data set would underpin an enhanced *JourneyWeb* protocol capable of providing full accessibility information as well as other personal navigation applications. An accessibility model is relevant not just for transport interchanges, but also for other large venues with a complex layout including museums, parks and stadia.

Transmodel is a European CEN standard that provides an abstract reference model of the data of interest to organisations providing transport related information systems. It has provided a conceptual rationale for *TransXChange* and other UK PT standards and is of great use in mapping concepts between different data models and for harmonising data systems. At the time *NaPTAN* was developed (c2000), *Transmodel* did not have a concrete XML schema for actual data exchange, nor did it have a detailed model of Stations, Airports and other physical interchanges that covering their pathways, accessibility, equipment, etc. Since then, *Transmodel* has been further evolved by the addition of a detailed conceptual model of physical interchanges: *IFOPT* (Identification of Fixed Objects) which draws on extensively on *NaPTAN* as well as the experience of other European nations. Furthermore the *IFOPT* model is being implemented as an XML schema as part of a larger CEN XML schema, *NeTEx* (Network Exchange) that also includes multimodal timetables and many other data entities. *NeTEx* is being developed in three stages; *Part-1* Network including Transport Interchanges; *Part-2* Timetables and tactical planning; and *Part-3* Simple fares and advanced real-time data.

The *NeTEx* / *IFOPT* model allows the detailed paths through a complex interchange to be described, including accessibility. The same model can also be used for other types of sites, such as sports venues and points of interest allowing a proper “last mile” treatment of journeys for journey planning. It uses a general purpose representation that can be used for many different kinds of passenger information application.

It is proposed to use the *NeTEx* / *IFOPT* XML model as a concrete format for this.

1.5 Motivation

The NaPTAN 3.0 enhancements should enable new application capabilities, including:

- Accessibility aware distributed Journey planning, with the ability to plan journeys to take into account accessibility of stations
- Full information on accessibility routes for a wide variety of user needs at an interchange or other site.
- Full information on passenger facilities and accessibility routes at an interchange or other site.
- Improved journey planning results through interchanges with more precise interchange times, including different for different day types and times of day.
- Improved processing of impact of real-time delays for journey planning and journey repair.
- Step by step navigation through complex interchanges including signage
- Step by step navigation to and through points of interest.
- Personal navigation applications.
- Improved integration of interchange & transport data with Map data sets.
- Description of other types of site such as points of interest.

1.6 Relationship between Transmodel, IFOPT and NeTEx

1.6.1 Conceptual, Physical and Implementation models

To understand the relation ship between the different CEN and UK standards such as Transmodel *IFOPT*, *NeTEx* and *NaPTAN* and *TransXChange*, it is useful to understand the nature of different types of software model relevant for designing and implementing computer systems.

- A **conceptual** model describes the entities and relationships of an application domain independently of any specific implementation technology. It establishes a uniform terminology and is concerned to understand the constraints between elements, but may be unconcerned about technical or implementation details such as the exact scope of identifiers, or the implementations of attributes. It can be used to understand and relate different implementations using many different technologies and physical models. It will strive to be as general as possible and to not preclude different approaches to organising the processes used to manage the data.

- A **physical** model maps a conceptual model into a more detailed design model that assumes a specific implementation technology, and in a way that is subject to the particular limitations of that technology. For example, different object programming technologies (XML, Java, C#, CLOS, Smalltalk, Scala, etc) support inheritance in different ways, whilst relational data base technologies do not support inheritance or strict encapsulation at all. In addition a physical model will add specific details about attributes, typing, identifier scope, etc. It will strive to indicate how the mechanisms of an implementation language will be used to create a representation that that is efficient to use and to maintain. In general a physical model will have more limited semantics than a conceptual model because of the constraints of the chosen implementation language and of the need to simplify the use of a rich conceptual model for any practical implementation. It must also make specific choices on common aspects of object behaviour like name spaces, versioning and data rights. A physical model is still however not usually an executable or completely finalised representation, but rather a translation tool that shows how to go from a high level, technology-independent conceptual model to a concrete implementation in a specific language. To do this in a single step would be too difficult, ambiguous or obscure to follow.

- An **implementation** model represents a physical model in the actual language constructs and types of an implementation language, such as a DDL for a database, Java or C# Classes for an application, or an XML schema for an exchange format. It describes software artefacts that may be processed or are even directly executable by a computer running software programs and other tools. It must make a specific interpretation of business rules and transforms that operate upon the data.

Figure 1-1 illustrates the transformation from a single conceptual model to separate physical and implementation models.

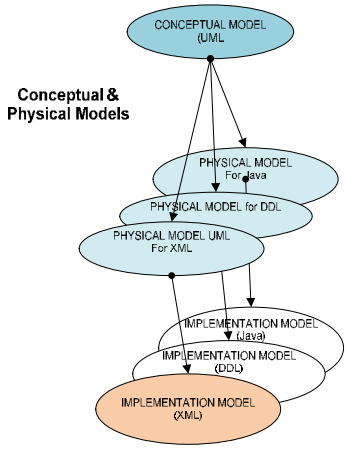


Figure 1-1 – Conceptual and physical models

Transmodel is purely a conceptual model, and *IFOPT* is also primarily a conceptual model, albeit with more attributes than in *Transmodel* and with a detailed physical model. In contrast, the current *NaPTAN* 2.x is documented as a UML physical model and has a corresponding implementation as an exchange format specified as an XML schema (and another as CSV files). *NeTEx* will provide all three model types: a revised *Transmodel* / *IFOPT* conceptual model; a distinct *NeTEx* physical model; and a *NeTEx* XML schema.

	Transmodel 5.1	***IFOPT***	***NeTEx***	***NaPTAN***
Conceptual	Y	(Y)	Y	
Physical		Y	Y	Y
XML Schema			Y	Y

Table 1-1 –Abstraction Levels of CEN & UK Transport Standards

1.6.2 Protocols versus payload

The implementation models discussed above describe the data content to be exchanged, but do not prescribe the ways that it may be transmitted between systems. The same content model can be exchanged electronically using a variety of different transport protocols, for example as a file by FTP, as an email attachment by SMTP, over HTTP as an attachment, or a as stream over a TCPIP socket. (Databases may alternatively use direct replication). An XML model is designed for serialisation of data into files for transmission.
Where parts of a model need to be exchanged, considerations apply to the selection and currency of data and different sequences of messages may be used to meet different requirements. For example "Give me the areas you know about", then "Give me the stops in area Z2", then ""Give me the routes that connect to stop 21". The nature of these messages will depend on the content model.
The NeTEx specification includes two standard protocols (but this does not preclude the use of the content model in other protocols)

- Simple bulk **publication** – A file containing all the data elements for a specified area or areas, with a header indicating the data or production and other metadata. This is very similar to current NaPTAN use. **Filter** objects describe what has been included.
- Exchange over http as a **SIRI service**: The same content model can be embedded as a SIRI data service. Filter objects similarly specify the scope of a request.

1.6.3 Considerations for developing software exchange standards

1.6.3.1Modelling complex domains

Software models involve choosing the aspects of real world that are relevant for representing a problem so that useful computation can be done over it. Usually many given modelling solutions can be found for a given domain; at one extreme are solutions with a small number of simple objects and relationships with very complex processing rules for how these are related and must be assembled. At the other extreme are more complex models with a larger number of explicit objects for each type of entity found and each relationship between them, but a simpler and more unambiguous processing of those elements. Software standards try to minimize ambiguity and the chances of misinterpretation by different implementors. It is generally harder to describe a complex process than a structure, so the first approach - a more explicit style is generally preferable.

1.6.3.2Terminology for complex domains

For a complex domain like travel information, terminology presents a particular problem – in colloquial use, many of the terms for real-world entities corresponding to different aspects of the model have many different or overlapping meanings – for example 'stop', 'journey', 'route'. A technically rigorous model must use terms more precisely, either by using terms in a deliberately restricted sense (as with *Transmodel* terms like VEHICLE JOURNEY), or by introducing artificial terms as with *Transmodel* STOP POINT , or NaPTAN ***ServicedOrganisation,*** in effect introducing new generalisations covering a number of different colloquial usages. This can make specifications harder to learn for the reader unfamiliar with the domain model, but makes discussion much more efficient and rigorous for those who are familiar.

1.6.3.3Open Implementation and technology use

Data standards are primarily concerned with models of data exchange between systems so that multiple parties can integrate data from different sources - see. As long as tools and products can accept data in a common format, suppliers should be free to implement their actual data bases and choose the internal representations used in their tools in different ways to suit their product objectives and favoured technologies. See Figure 1-1 above.

It is important that standards are designed to allow an economic implementation using standard mainstream software tools and technologies a high degree of automation. ***An XML schema provides the key software artefact for doing this***, as shown in Figure 1-2, which illustrates the derivation of an XML exchange implementation from the conceptual model. Thus;

(i) The conceptual model in UML is used to specify a Physical model in UML (*XML-1* in Figure 1-2*).*

(ii) The Physical UML Model is used to specify an XML model (*XML-2* in Figure 1-2*)* which can be used to automatically validate documents exchanging data conforming to the model using widely available tools (*XML-3* in Figure 1-2*).*

(iii) The XML schema can also be used to automatically derive software language bindings (for example, in Java JAXB or equivalent) for the adaptor programs (*XML-4 a & b* in Figure 1-2) which input or output XML from a database in an implementation.

(iv) Implementations will support an XML import/export tool which will translate data from an implementation database into the XML format for exchange with another system. (*ImPex a & b* in Figure 1-2*).*

(v) Each data model will be capable of representing the entities of the conceptual model as mapped to relational database design in UML or other notation (*DB-1* in Figure 1-2). And then translated into an actual Data Definition Language such as SQL (*DB-2* in Figure 1-2) However, the database schema will typically be a proprietary design whose details do not need to be exposed.

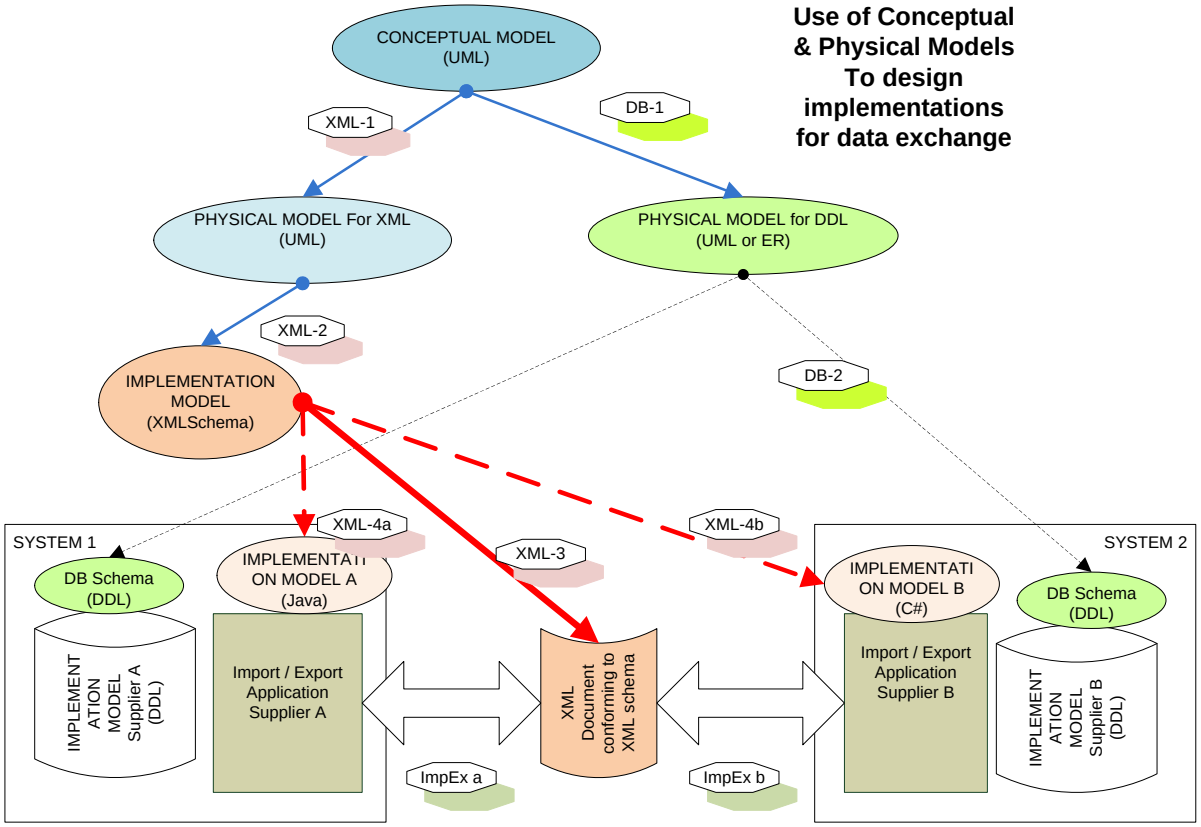


Figure 1-2 – Use of Standards in Implementations

1.6.4 Modularisation of Transmodel and scope of NaPTAN 3.0

The *Transmodel* conceptual model contains a rich level of functionality covering many different area of application, including operations, and control as well as passenger information - Figure 1-3 shows *Transmodel* as a large ellipse containing a number of functional areas, extended by an interchange model (*IFOPT*), shown as an additional circle. ***Transmodel*** v5.1 is only loosely modularised.

The current scope of *NeTEx* does not cover all of *Transmodel,* but focuses on some basic functional areas of infrastructure and tactical planning and passenger information, as scoped by *NeTEx Part-1* to *Part-3* respectively.

Figure 1-3 also shows the scope of the *NeTEx* XML schema (*Part-1* in Green, *Part-2* in Blue and *Part-3* in yellow) – in effect a subset of the Original Transmodel Schema, also extended by *IFOPT* to cover sites and accessibility.

The *NaPTAN* 3.0 profile constitutes a further subset of the *NeTEx Part-1* model. Since there is a cost involved in capturing and maintaining any type of data *NaPTAN* focuses on a more limited subset corresponding for the most part with data that has already been captured for at least some parts of the UK. The profile identifies a useful subset of *NeTEx* / *IFOPT* data that adds specific capability to meet the UK's requirements and that builds on the UK's existing investment in *NaPTAN*.

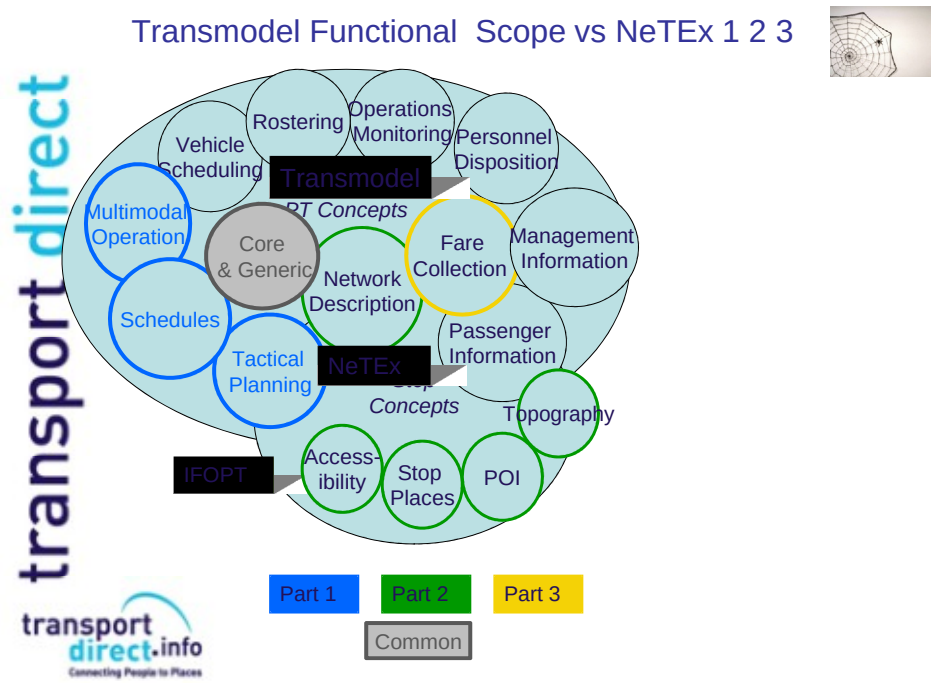


Figure 1-3 – *NeTEx* scope

1.6.5 Transforming Models

NeTEx uses a systematic process to map the conceptual model into a XML schema in three steps:

(i) The *Transmodel* conceptual model is modularised into core framework of **generic** element **packages** and a number of **functional packages** that share any necessary common **generic packages**, but that are not promiscuously interdependent. This modularisation further refines the original loose functional partition of *Transmodel* into a more rigorous organisation that upholds a linear dependency graph, so that components required for a given purpose can be used independently of other parts of Transmodel. The modularised "*NeTEx* conceptual model" is also updated to integrate Transmodel & *IFOPT* concepts. The model is documented in UML in an electronic form that can be exchanged and versioned.

(ii) For each package of the conceptual model, a corresponding set of physical model packages, also documented in UML, is developed. This "*NeTEx* physical model" adds in detailed property attributes for the conceptual model entities based on the requirements of current European national standards such as *VDV452* (de / ch / at), *Trident* / *Chouette* (fr) , *NOPTIS* (se / dk / no) and *NaPTAN* /*TransXChange* (uk).

- The *NeTEx* physical model is targeted towards XML, and assumes XML as a programming model, for example it assumes a single inheritance model and XML types & enumerations.
- In particular, the *NeTEx* physical model is concerned with an efficient serialisation of complex objects for data exchange in XML (this may be contrasted with, say, a physical model optimized for database storage or for in-memory computing). As such, it is concerned to identify elements and groupings of elements that are actually

exchanged in practice (such as a network description, a station, or a whole timetable) and to optimise their representation for reuse in many different use cases. The aim is to simplify the conceptual model and have a smaller number of "first class elements" that represent the semantically significant entities. Other secondary entities are then only exchanged in the context of these items. For example, use of a stop in a timetable is only exchanged as part of a timetable, not as an independent element (though it is in fact an entity in its own right – a STOP IN SEQUENCE).

- Specifically the physical model: (a) names elements and all types and assigns them each to a package (typically a refinement of the conceptual model packages); (b) identifies identifiers and their scopes so that distributed data sets can be created and integrated; (c) indicates how relationships are to be serialized; (d) indicates a composition of objects from reusable elements using inheritance hierarchies and/or composition of the target implementation technology. For serialisation to XML, decisions about the implementation of relationships (as reference or containment) are an especially important consideration.

(iii) The *NeTEx* Physical UML model is used to create an XML schema. For each Physical model entity and attribute corresponding XML elements are created, modularised within a similar package structure to that of the physical model, but further broken down. Where possible, semantic constraints are enforced in the XML, so that the built in capability of standard XML validators and parser to be harnessed, for example though XML language mechanism such as types and enumerations. However in order to have a single set of XML elements that can be used in a wide set of applications, cardinality constraints are generally more relaxed in the XML schema than in the conceptual model; for example a name attribute might be mandatory in the conceptual model, but optional in the schema.

NeTEx uses a small number of design patterns to transform the conceptual model to the physical model and the physical model to XML. An understanding of these patterns makes an understanding of *NeTEx* simpler to grasp. See the *NeTEx* documentation for further details.

1.7 Related documents

This paper accompanies two high level papers

- [NaptStrat-2010] *NAPTAN & NPTG SCHEMA GUIDE* October 2010

The UK Profile makes reference to the following underlying technical standards and related papers.

- [NAPT-2010] UK *NaPTAN Schema Guide* v2.4 (July 2010, Revised Dec 2010).
- [TM-2001] CEN Transmodel.
  - CEN TC278, *Reference Data Model for Public Transport*, ENV12896 revised, June 2005.
- [IFOPT-2008] CEN *IFOPT* (note that this needs NeTEx Updates (2010).
  - Road traffic and transport telematics — Public transport — Identification of fixed objects in public transport CEN/TS 00278207 C 278 WG3 (2008)
- [NETEX-2010] *prCEN* TS-xxx-NeTEx.
  - CEN *NeTEx* Document
    - Part-1 Network Infrastructure.
    - Part-2 Timetables.
  - CEN *NeTEx* Data model (Draft) (Draft 2010)
  - CEN *NeTEx* XML.
    - Examples. (Sept 2010
    - CEN *NeTEx* XML Schema (Draft) (Revised Dec 2010).

The following standards which use *NaPTAN* data are also relevant:

- [JW-2010] UK *JourneyWeb Schema Guide* v2.4b (Draft Sept 2010).
- [TXC-2010] UK *TransXChange Schema Guide* v2.4 (Aug 2010).

The following paper describes Wimbledon NaPTAN example in details, and is accompanied by XML data, are also relevant:

- [WIM2010] -Wimbledon data example paper.
  - IA09301h *Accessible Journey Planning - Wimbledon Station*. Transport Direct (June 2010, Revised Dec 2010).
  - Wimbledon NaPTAN XML example (June 2010).
  - Wimbledon NeTEx XML example (June 2010, Revised Dec 2010).
- [OPK2010] –Olympic Park data example paper.
  - IA09901f *Accessible Journey Planning – Olympic Venues*. Transport Direct (Dec 2010).
  - 2012 Olympic Park NeTEx XML example (Dec 2010).

NaPTAN 3.0 has been informed by data examples. Web sites and proprietary specifications are also relevant:

- [NRE-Acc] National Rail Enquiries (http://nationalrail.co.uk) and data samples.
- [TfL-Acc] Transport for London (http://tfl.gov.uk/journeyplanner) and data samples.
- [DE-Acc] Direct Enquiries.com (http://directenquiries.com) and data samples.
- [TD-Air] F061 Air interchange Interface Transport Direct / Atos (23 Sept 2004).
- [MDV-DivaStop] DIVA4 Stop Management MDV2010.08.10.

1.8 Presentation Conventions

The presentation of technical terms in this document follows normal presentation conventions for UK standards:

- Transmodel / NeTEx / IFOPT conceptual model elements are shown in UPPER CASE.
- Concrete XML elements are shown in ***bold italic***. Compound words are camel cased, e.g. ***StopPoint.***
- Where helpful, a Namespace is used to distinguish, models, for example ***naptan***:***StopPoint***, ***Quay.***
- The terms *NeTEx* and *IFOPT* are used more or less interchangeable in this model, in particular to refer to the Transmodel XML schema.
- Standard UML notation is used for structure diagrams.

2 NAPTAN 3.0 APPROACH

NaPTAN 3.0 proposes to allow the augmentation of *NaPTAN* data with additional elements defined by the *NeTEx* / *IFOPT* model, following a *Transmodel* / *NeTEx* conceptual model. Two different approaches to developing an exchange format for such data might be considered:

(i) To add new elements to the existing NaPTAN schema.
(ii) To use existing NaPTAN data in another existing schema (E.g. CEN *NeTEx*) that already has the extra elements.

This document focuses on the second approach: rather than introduce further extensive ad hoc modifications to the existing v2.x *NaPTAN* XML schema, instead the new CEN *NeTEx* / *IFOPT* XML schema is used to exchange data, populated with both *NaPTAN* and any additional required data elements. The UK profile describes this use. This has both functional advantages in making all of the NeTEx function potential available in future, and some strategic advantages; for example, the *NaPTAN* 3.0 format is harmonised with other CEN models and so can both reuse CEN specifications and documentation and draw on a European wide market of suppliers and users supporting the *NeTEx* XML format.

The validity of this choice depends to some degree on the nature and complexity of the additional elements that are desired – which in turn depends on the scope of the UK profile. If it were decide that only a very limited level of accessibility data should be supported then a slight augmentation of NaPTAN 2.4 would be sufficient. However for any significant comparable also be supported.

2.1 Scope of this document

This profile document therefore provides guidance on a subset of the *NeTEx* / *IFOPT* schema to support accessibility and other additional capabilities using UK data -. In particular:

(i) Which additional *NeTEx* elements not found in current *NaPTAN* should be used to support added function such as paths and accessibility?
(ii) How to map *NaPTAN* elements into the *NeTEx/IFOPT* schema?

It excludes *NeTEx* elements which are currently out of scope, and other *NeTEx* elements that support different functional areas - apart from general purpose framework elements. Scope is still undecided for some elements.
This document is accompanied by two example XML files based on Wimbledon [WIM-2010]. These include; (i) data for Wimbledon in *NaPTAN* format; and (b) the same data in *NeTEx* format, with hypothetical data added for additional elements based on the NRE TfL and Transport Direct web sites.

2.2 Capability levels

In providing guidance on the use of additional *NeTEx* elements, it is important to recognise that (a) different types of data enable different capabilities and (b) that an incremental approach is needed that allows for the gradual improvement of data coverage over time

Table 2-1 distinguishes six different levels of capability for applications supporting advanced interchange information and accessibility information for passengers. Each successive level depends on the previous. However CapLvl5 and CapLvl6 do not depend on CapLvl4.

Level	Capability	Summary	Example capability enabled by capability
CapLvl0	**Stop Identification:** current NaPTAN capability	Identification of entrance, stations, platforms as points.	Integrated multimodal journey planning (computable). Examples: • Current *Transport Direct & TfL* point to point journey planners.
CapLvl1	**Connection**	Ability to state the	Journey plans that more accurately reflect connection

	aware Journey Planning	explicit average transfer times at a all interchanges and at a specific interchange Addition of Pints of interests and access as well as Stop places	times. Example: • (Data not currently exchanged for *Transport Direct* but implemented internally to various degrees by each journey planner using system parameters).
CapLvl2	**Point aware Accessibility Journey Planning**	Allows simple tagging of stop points with summary accessibility characteristics. enabling basic journey planning	Journey planning that uses accessible interchanges (computable). Examples: • TfL Journey planning with accessibility constraints. • TfL. • New *Journey Web* 2.4 accessibility attributes on input and results.
CapLvl3	**Navigation Path aware Accessibility Journey planning.**	Support for point to point path connections within interchange according to accessibility characteristics	Detailed journey planning advice on accessible use of an interchange. Constraints (computable) Examples: • *NRE Direct Enquiries* micro journey planner provides a local. • New *JourneyWeb* 2.4 leg path details query.
CapLvl4	**Delay aware Journey planning.**	Support for process delays	Detailed Journey planning able to include process delays at particular points at particular times.
CapLvl5	**Path link level In station navigation**	Support for detailed paths.	Detailed visualisation of journeys (narrative). • TfL access exit paths on web site.
CapLvl6	**Full In station passenger information**	Data support for visualisation tools such as schematic maps with hover points that connect to details.	Location and visualisation of facilities in a station including accessibility (narrative). • NRE Direct enquiries station browser with maps and hover points showing images and attributes.

Table 2-1 – Capability Levels and NaPTAN 3.0 data content

2.3 Use of data in Passenger Information applications

Within the above categorisation it is useful to distinguish between applications that provide merely "**narrative**" presentations of the data, whereby the user has to use a browser and visualisation tools to visit each step of a journey to assess each feature of relevance to them (as say when rehearsing a journey), and "**computable**" use, in which an application will use the data attributes to undertake a series of calculations on behalf of the user, for example, as inputs to a journey planning algorithm, (as for accessibility-aware journey plans), or other application (for example, to compute a user's progress along a path in real-time).

- For a "computable" use, a high degree of standardisation is needed; for example the values used to compute the accessible characteristics and transfer times need to be directly comparable (i.e. either quantitative values or restricted enumerations), even if provided by very different suppliers. Coverage needs to be as comprehensive as possible, so that it is possible to determine whether an entire journey between a number of different places is accessible, inaccessible or of unknown accessibility.
- For "narrative" use, a looser representation of the data is possible in principle, with attributes being treated as textual or image properties if necessary. Data will typically be used for a single place at a time so even an uneven coverage is still useful where available for a given place However to achieve consistent coverage with the same levels of information and to allow a uniform presentation with standard iconography, comparable properties are still desirable. It is therefore desirable to also use an explicit structured model for narrative attributes too – as based in particular on the *NeTEx* EQUIPMENT model.

2.4 Relationship between Elements & Capability Levels

Figure 2-1 outlines the relationship between capability levels and the model elements. Current *NaPTAN* capability is to represent certain key places of a stop or interchanges as a point – as indicated by the topmost horizontal box. There is data for on-street stops and for station entrances as indicated by the pink oval. However currently platform data is not fully populated in the NaPTAN database (as indicated in Figure 2-1by a dotted oval below the horizontal line dividing the topmost box).
The additional capability levels of the NaPTAN 3.0 profile add successive groups of elements that describe the interchange in more detail – these fall into three main groups, as indicated by the three diagonal boxes; (a) transfer times between modes/areas; (b) detailed paths; and (c) Check constraints & delays. All three make use of common definitions of accessibility elements (Blue vertical box on left) which defines standardised accessibility attributes such as *'wheelchair', 'lift free',* etc; and various equipment elements (Green vertical box on the right) which define the detailed properties of lifts, ticket machines, barriers and other objects found in a station.
The most basic use of accessibility data is for point aware journey planning. The *NaPTAN* 3.0 model could also be used to support other types of sites such as Points of Interest including Parks, venues etc.
A distinct Parking submodel introduces additional descriptive elements to describe parking areas that would also be related the transport points in the path model. Transport Direct holds data on many parking locations in the UK that could be exchanged using the NeTEx schema.

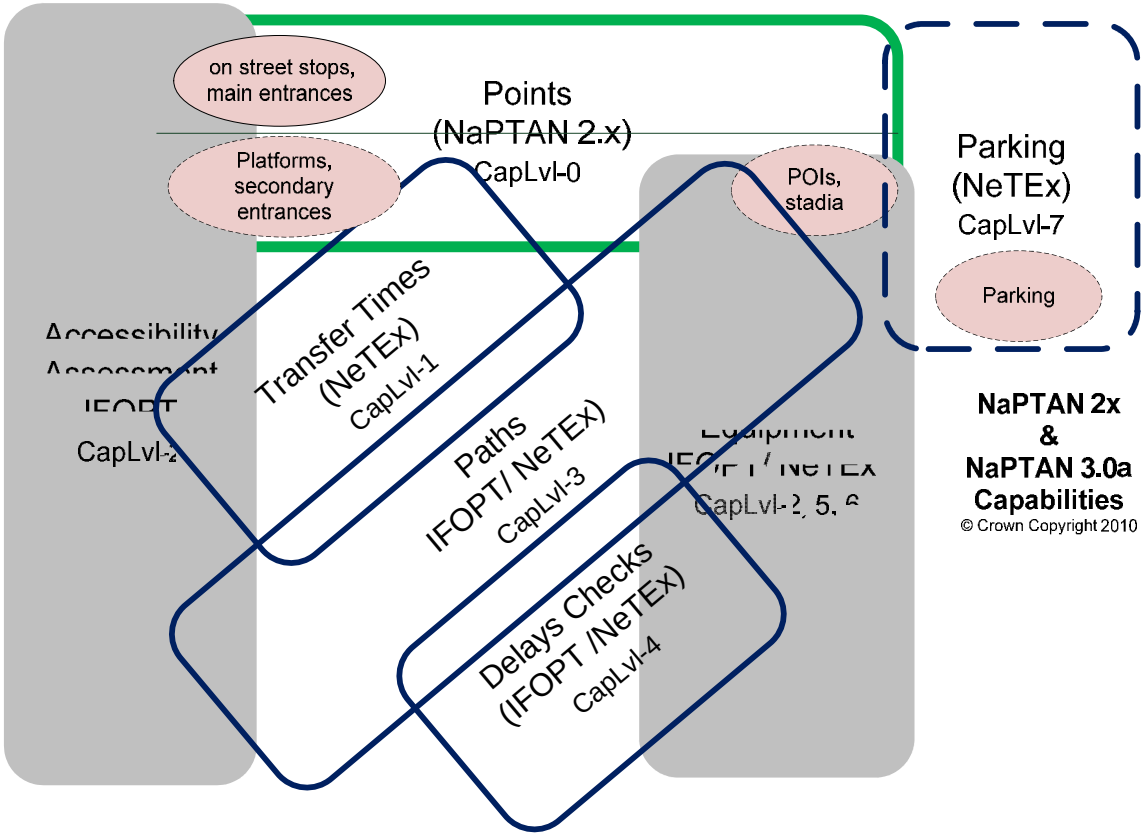


Figure 2-1 – Capability level interdependencies

2.5 NaPTAN 3.0 versus NaPTAN 2.0 – High level example

The following two diagrams give a simple way of visualising the added scope of NaPTAN 3.0 using the example of a specific station, Wimbledon from [WIM2010]. Figure 2-2 shows the data elements currently modelled by the NaPTAN 2.0 representation – there is a NaPTAN point for each platform or stop and for the overall station as a simple point. Figure 2-3 shows most of the additional elements modelled by NAPTAN 3.0, including entrances, paths, equipment and accessibility information.

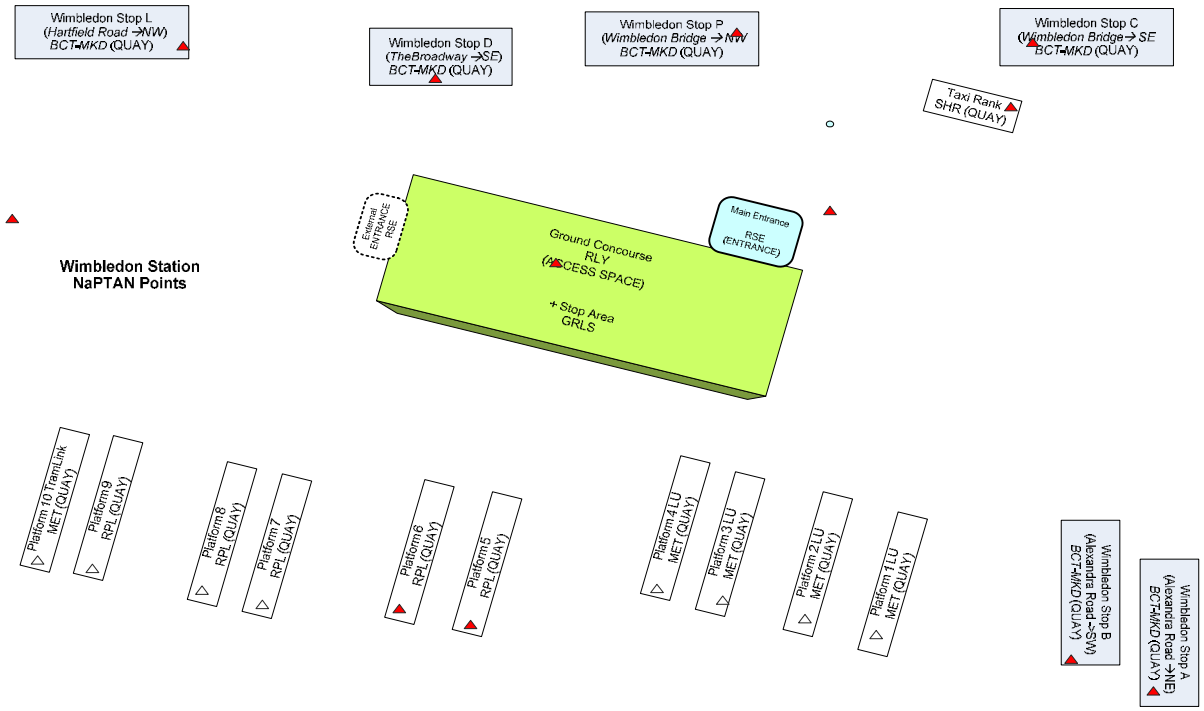


Figure 2-2 – NaPTAN 2.0 elements used to represent Wimbledon Station

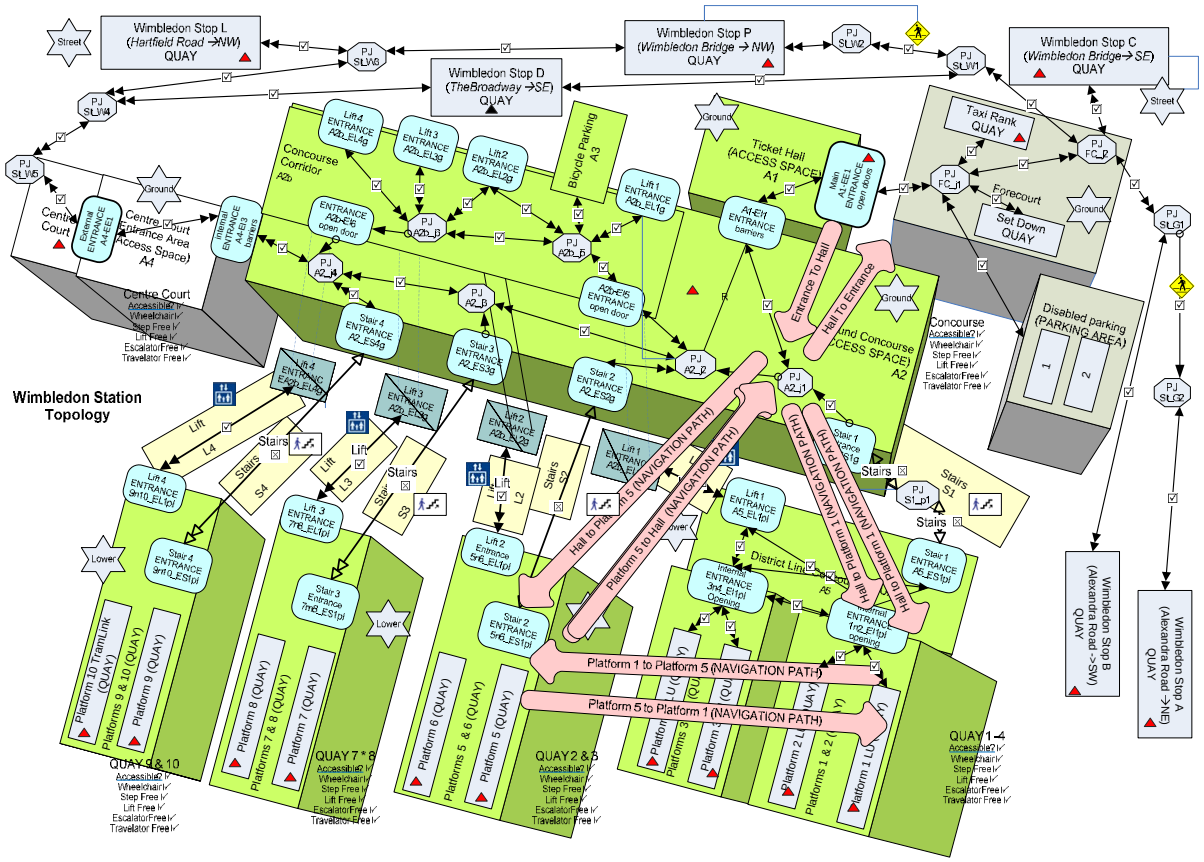


Figure 2-3 – NaPTAN 3.0 elements used to represent Wimbledon Station

2.6 Coexistence of NPTG and NaPTAN formats

Developing an enhanced data set that includes accessibility data for all of the UK will take some time and needs to be done incrementally. Figure 2-4 illustrates the use of *NaPTAN* 3.0 format as an alternative format that can and will coexist with *NaPTAN* 2.x, enabling a gradual upgrade of systems over time to support the additional *NaPTAN 3.0* features.

- On the top left, the diagram shows databases with the capability to hold and exchange current 2.x *NPTG* and *NaPTAN* content. They can import and export in *NaPTAN* 2.x XML and CSV. The basic *NaPTAN* data could also be output in *NaPTAN* 3.0 format (populating only a limited subset of elements such as interchanges, entrances and platforms.
- On the bottom left are shown databases holding current accessibility data in proprietary format, along with the structural nodes of the site: this data needs to be integrated into a standard format. This might be done by a separate adaptor tool to transform a proprietary format into NeTEx 3.0, or by direct output into the format. In both cases it needs to be possible to *relate* certain reference points in the accessibility data to *NaPTAN* data.
- In the middle is shown an extended *NaPTAN* database that includes supports for additional *NeTEx* elements such as paths, accessibility attributes, equipment, etc. This can obtain data from standard *NaPTAN* sources (using either *NaPTAN* 2.x or *NaPTAN* 3.0 formats), and also from other sources using the *NeTEx* XML format - which can also be .used to exchange data with other products.
- On the right would exist a wide range of downstream applications – journey planners, navigators, etc, that are able to use *NaPTAN* data.

Other data types could also be exchanged in the *NaPTAN* 3.0 / *NeTEx* format, for example points of interest such as stadia, parks, etc, or stop specific connection times.

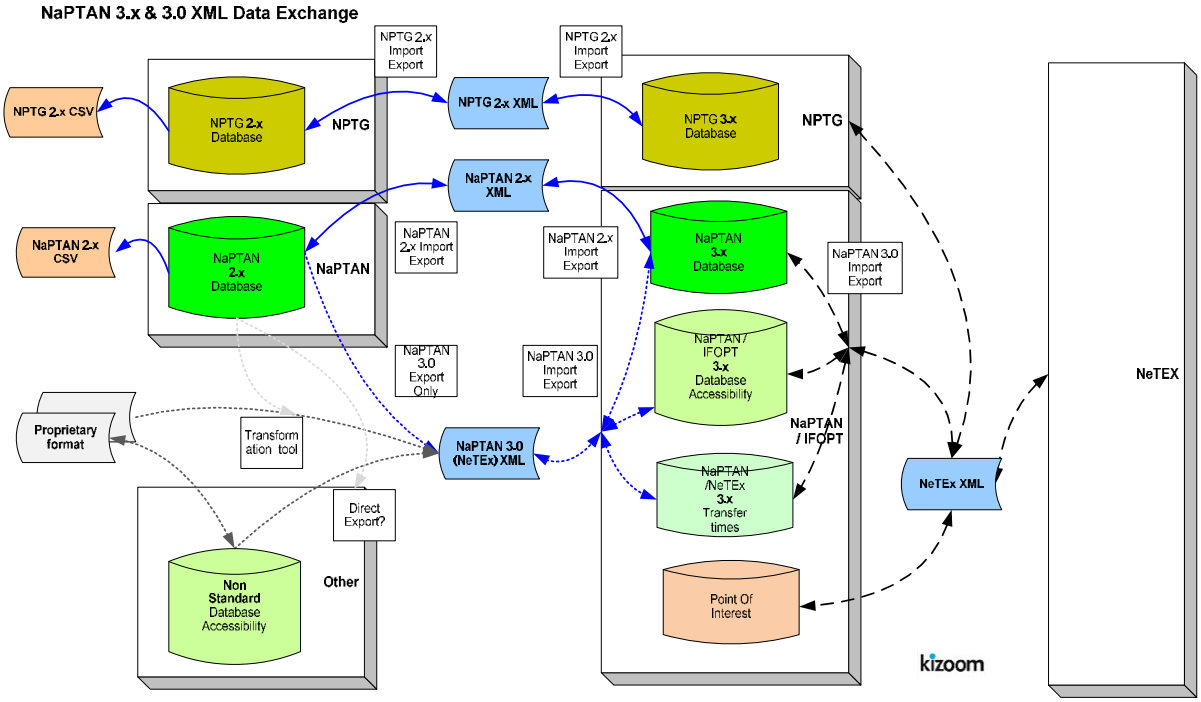


Figure 2-4 – Support of Exchange formats for 2.x and 3.x

2.7 NeTEx Status

The NeTEx schema and its subpackages are systematically versioned in line with XML practice, with separately available schemas for each release – the same approach used for UK standards. The NeTEx standard is being developed in three stages, and includes some generic core parts that are used by each of the three main parts. The latter have been mostly defined but may be subject to minor refinements as the final parts are refined and national examples added. Since the third part of

The UK will nominate a specific interim release of the NeTEx schema as the stable version to work with until the final CEN version is approved, which is likely to take some time.

2.8 NaPTAN System aspects

The focus of this document is to describe an alternative *IFOPT* **XML schema** for exchanging *NaPTAN* data, but it is important to recognize that *NaPTAN* as a system in the wider sense is not just a data exchange schema, but comprises an interlocking set of processes and software systems. Table 2-2 lists key aspects of the *NaPTAN* system that need considering: enhancing the scope of NaPTAN variously requires extensions to these as well.

	NaPTAN 2.x Aspect	***Comment***
#1	A standard **method for identifying** and **describing** access points to public transport.	NaPTAN 2.x already provides guidance on choosing and naming basic stop points. The mapping to *NeTEx* is described in this document. Some NaPTAN points, e.g. Rail Platforms which are not yet populated are covered additionally. NaPTAN 3.x will require guidance on use of the additional elements – this document is intended to establish an initial set of rules.
#2	An **XML Schema** for describing the *NaPTAN* data when it is exchanged as XML documents, based on a conceptual model	*NaPTAN* 3.0 can be regarded as variant XML schema for the same data, with many added elements.
#3	An alternative exchange format for exchanging stop data as **CSV** files	There will not be a *NaPTAN* 3.0 CSV format. Though it will be possible to export a subset of the ongoing *NaPTAN* 3.0 data set back to CSV
#4	A **process** for gathering information about changes to stop data and compiling it into the central database	The processes will need to be augmented to source and integrate additional data from additional sources, for example, for accessibility, rail platforms, transfer times and possibly parking.
#5	A **database** of all the access points in the UK, compiled to the standard that can be exported into the prescribed formats. The *NaPTAN* database is maintained centrally under contract to the Department for Transport	The current central *NaPTAN* repository is at 2.x. There are no current plans to extend this to include support for NaPTAN 3.x elements. However, even without support for NaPTAN 3.0 elements. It would be possible to support direct export to *NaPTAN* 3.0 format of 2.x elements from the repository.
#6	The implementation of **products** by a number of different suppliers, all capable of exchanging *NaPTAN* data. These typically contain a richer proprietary database that allows a mapping of the data	It is up to suppliers to implement a database that suits their products and that can import *NaPTAN* 3.0 data - as at present for *NaPTAN* 2.x data. The *NaPTAN* 3.0 conceptual models will assist this.

Table 2-2 – Aspects of the NaPTAN System

2.9 Processes for Capability Levels

Table 2-3 outlines the processes and tools needed to support the different capability levels.

Level	**Capability**	**Source**	**Tooling to capture data**	**Applications to use data**
CapLvl0	**Stop Identification:** current NaPTAN capability	Existing NaPTAN Processes.	• Existing NaPTAN toolset.	• Existing Applications.
CapLvl1	**Connection aware Journey Planning**	Existing Journey Planners & Timetable Systems (e.g. DIVA)	• Import export of Transfer times and connection links. • Tools to update	• Existing & enhanced journey planners.

			values	
	Including POIs	• POI data could also be added	• Data tools for POI data	• Point to point Journey planners
CapLvl2	**Point aware Accessibility Journey Planning**	Accessibility Data sets, e.g. TfL and NRE • Needs integrating with *NaPTAN* points.	• Existing Data management tools from suppliers with path & accessibility capability (Direct Enquiries, MDV?).	• Existing accessibility micro-planners. • Enhanced journey planners.
CapLvl3	**Navigation Path aware Accessibility Journey planning.**			
CapLvl4	**Delay aware Journey planning.**	• New. • Derive some from Accessibility Data. ?	• New tools to capture and set.	• Enhanced journey planners with access leg support.
CapLvl5	**Path link level In station navigation**	Accessibility Data sets, e.g. TfL NRE	• Existing Data management tools from suppliers with path & accessibility capability (Direct Enquiries, MDV?). • Import/Export of Transport Direct parking information.	• Existing accessibility micro-planners. • Enhanced journey planners with leg path support. • Personal navigation.
CapLvl6	**Full In station passenger information**			

Table 2-3 – Capability Levels and Processes

3 INTRODUCTION TO NAPTAN & NETEX EQUIVALENCES

3.1 Summary of NaPTAN 3.0 NeTEx Profile elements

3.1.1 NaPTAN 2.x & NeTEx Concepts & Equivalences

Table 3-2 introduces the key concepts used in current *NaPTAN* 2.x and *NPTG* and their NeTEx equivalents. On the left it shows colloquial terms used for common PT related terms. On the right it distinguishes specific concepts and indicates the ***NaPTAN*** and ***NeTEx*** entities used to represent them in the data models. It can be seen that in the existing *NaPTAN* 2.x use the correspondence between stop points and stations is already complex, and that *NaPTAN* stop points actual represent several different types of entity.

Domain	Colloquial terms	Concept	NaPTAN/ NPTG	*NeTEx*
NaPTAN	*Stop, Bus Stop, Halt, Station, Port, Interchange, Bay, Platform, Quay, Airport, Railway station, Metro Station, Underground station, Tram stop, Tram Station, Station Entrance*	Reference to a stop in a timetable, possibly regardless of platform.	***StopPoint, (AnnotatedRef)***	SCHEDULED STOP POINT
		The physical point at which public transport may be accessed, such as a platform, quay, single on street bus stop, airline gate, ferry berth.	***StopPoint*** [RPL, PLT etc]	QUAY
		A station, bus station, pair of stops, cluster of stops, or other transport interchange with a single name and that may be shown as a point on a route or described as the point of access	***StopPoint*** [RLY, MET, etc] ***and/ or StopArea*** [GRLS, GTMU etc]	STOP PLACE
		Physical Entrance to a station or interchange from street.	***StopPoint (***RSE, TMU etc)	ENTRANCE
		Reference to a physical stop	***StopPoint,***	PASSENGER STOP

		for example in a timetable, possibly but not necessarily with respect to a specific platform.	***AnnotatedRef***	ASSIGNMENT
	Group of stops, Stop cluster, Station, airport, Stop Area, interchange	An arbitrary grouping of stops for any purpose.	***StopArea*** [GRLS, GTMU etc]	STOP AREA
NPTG	*Locality, Place, Settlement, Town, City Village*	A named settlement that may be associated with a stop.	***NptgLocality***	TOPOGRAPHIC PLACE
	Administrative Area, Jurisdiction, region	An administrative unit responsible for data elements.	***AdministrativeArea***	RESPONSIBILITY SET =. RESPONSIBILITY ROLE ADMINISTRATIVE ZONE + ORGANISATION
	Administrative Region, Country,	A region of the country used to group Administrative areas, and an associated organisation to do it p	***Region***	ADMINISTRATIVE ZONE + ORGANISATION
Point of Interest +	*Site, Attraction, Venue, Point of interest*	A site or point of interested that may be a destination fro travel and which may have a designated entrance or entrances	**--**	SITE, POINT OF INTEREST, POINT OF INTEREST CLASSIFICATION

Table 3-1 – Basic PT Concepts in NaPTAN & NeTEx / IFOPT

3.1.2 NaPTAN 3.0 Profile NeTEx elements (CANDIDATE)

Table 3-2 summarises the *NeTEx* entities that are in the *NaPTAN* 3.0 profile. As previously, capability CapLvl0 corresponds to existing *NaPTAN* 2.x use. The majority of elements needed for CapLvl2 to CapLvl6 are additional to the current *NaPTAN* set. The entities are explained further in Part II of this document.

Level	Name	Type	Primary Entities	Ancillary Entities
CapLvl0	Current *NPTG* capability (***AdministrativeArea***, ***NptgLocality***)	Ref	TOPOGRAPHIC PLACE, RESPONSIBILITY SET,	ORGANISATION, ADMINISTRATIVE ZONE
	Current *NaPTAN* capability (StopPoint, StopArea)	Site	STOP PLACE, QUAY, ACCESS SPACE, ENTRANCE	ALTERNATIVE NAME, ADDRESS, COUNTRY SITE, SITE COMPONENT CONDITION
		Ref	SCHEDULED STOP POINT	PASSENGER STOP ASSIGNMENT
CapLvl1	Connection aware	Infra	ACCESS, CONNECTION,	(PLACE)
	Point of interest	Site	POINT OF INTEREST,	POINT OF INTEREST CLASSIFICATION, SITE
CapLvl2	Point aware Accessibility Journey Planning	Site	ACCESSIBILITY ASSESSMENT	USER NEED, LIMITATION
		Equip	ASSISTANCE SERVICE	EQUIPMENT
CapLvl3	Path aware Accessibility Journey planning.	Site	NAVIGATION PATH	PATH LINK IN SEQUENCE
CapLvl4	Delay aware Journey planning.	Site	CHECK CONSTRAINT	AVAILABILITY CONDITION, DAY TYPE, CALENDAR, OPERATING DAY

CapLvl5	In station navigation	Site	LEVEL, PATH LINK, PATH JUNCTION,	CHECK CONSTRAINT
	Detailed Properties of accessibility	Equip	ENTRANCE EQUIPMENT RAMP EQUIPMENT, STAIRCASE EQUIPMENT, ESCALATOR EQUIPMENT, TRAVELATOR EQUIPMENT, ROUGH SURFACE. CROSSING EQUIPMENT, QUEUING EQUIPMENT, PLACE LIGHTING	EQUIPMENT, EQUIPMENT PLACE
	Info equipment	Equip	PASSENGER INFO EQUIPMENT, PASSENGER SAFETY EQUIPMENT	
	Validity conditions	Site		AVAILABILITY CONDITION, DAY TYPE, CALENDAR, OPERATING DAY
CapLvl6	Full In station passenger information	Site	BOARDING POSITION	
	Signage	Equip	STOP PLACE SIGN, HEADING SIGN, OTHER SIGN	
	Equipment	Equip	TICKETING EQUIPMENT, TICKET VALIDATOR EQUIPMENT	
		Equip	LUGGAGE LOCKER EQUIPMENT, TROLLEY STAND EQUIPMENT	
		Equip	SHELTER EQUIPMENT, WAITING ROOM EQUIPMENT, SANITARY FACILITY	
	Services	Equip	COMPLAINTS SERVICE, LOST PROPERTY SER ICE, TICKETING SERVICE	CUSTOMER SERVICE,
	Maps	Map	SCHEMATIC MAP	SCHEMATIC MAP MEMBER

Table 3-2 – Capability Levels and NaPTAN 3.0 and NeTEx elements

3.1.3 NeTEx elements excluded from NaPTAN 3.0 profile

Table 3-2 summarises the *NeTEx* elements that are **excluded** from the *NaPTAN* 3.0 profile. All other *NeTEx* Tactical Planning and Network Description elements are also excluded.

- **Vehicle stopping position** data is relevant for some real-time operational systems but not to passengers and need not be included

- **Parking information** is relevant to many passengers. There is currently not a means to exchange available parking data, and the drive to points, pick up, and drive from points for stops, and parking are not properly supported in current journey planning. The gaps in the current data set make it hard to provide accurate journey advice for integrated car / PT journeys. The relationship of parking to transport is of particular interest to disabled users. *NeTEx* does have PARKING and other elements such as set down points that could be used to represent such data. Station car parks could be populated from Transport Direct's National car park dataset. However parking support is not a high priority for the Olympics.
  The new version of DATEX2 includes a compatible parking model that could also be used to exchange core parking data.

Level	Name	Type	Primary elements	Other elements
Exclude	Parking elements	Site	PARKING, PARKING ENTRANCE FOR VEHICLES, PARKING PASSENGER ENTRANCE	PARKING PROPERTIES, PARKING CAPACITY, PARKING AREA, PARKING BAY
Exclude	Vehicle Alignment	Operat-ional	VEHICLE STOPPING PLACE, VEHICLE STOPPING POSITION, VEHICLE QUAY ALIGNMENT	
Exclude	Train Part	Operat-ional	TRAIN STOP ASSIGNMENT	TRAIN, TRAIN ELEMENT

Table 3-3 – NeTEx elements excluded from NaPTAN 3.0 profile

3.1.4 NeTEx Framework elements for NaPTAN 3.0 profile

Table 3-2 summarises the generic supertypes and reusable elements from the *NeTEx* framework that are used by the *NaPTAN* 3.0 profile elements. These are prerequisites that will be used as necessary.

Level	Name		Primary elements	Other elements
CapLvl0	Current NPTG & NAPTAN capability	Ref	DATA MANAGED OBJECT	ORGANISATION, RESPONSIBILITY SET, VERSION
			POINT, ZONE	PROJECTION
CapLvl1	Access links	Site	PLACE, SITE, TRANSFER	SITE ELEMENT, SITE COMPONENT
CapLvl3	Accessible Site support	Site	LINK,	LINK SEQUENCE
CapLvl3	Equipment		EQUIPMENT, EQUIPMENT PLACE	
CapLvl3	Conditions		VALIDITY CONDITION, AVAILABILITY CONDITION	CALENDAR, DAY TYPE, PROPERTIES OF DAY
CapLvl0	General	General	MODE, VEHICLE TYPE	

Table 3-4 – Generic NeTEx Supertypes & Framework elements

3.2 Outline Mapping of existing NaPTAN 2.0 elements

All of the existing *NaPTAN* elements can be mapped into *NeTEx*. By way of introduction we summarise the mapping of existing *NaPTAN* 2.x to *NaPTAN* 3.0, relevant for CapLvl0 use of the *NaPTAN* 3.0 profile, that is, exchange of current data in *NeTEx / IFOPT* format. See Table 3-2 earlier for a tabular representation. See Section 7 later for a full mapping.

3.2.1 Mapping of *NaPTAN* Stop Points

Each *NaPTAN* point type is mapped to an *IFOPT* / NeTEx entity type, and identified with the same identifier i.e. ***AtcoCode***. The NaPTAN ***StopClassification*** and ***StopType*** can be used to determine how each type of stop is handled

- *NaPTAN* ***StopPoint*** (AccessArea) ➔ ***StopPlace.***
- *NaPTAN* ***StopPoint*** (Entrance) ➔ Stop Place / ***Entrance.***
- *NaPTAN* ***StopPoint*** (Stop i.e. on-street stop point) ➔ Stop Place / ***Quay.***

Additional logical associations of timetable references with the stop (e.g. TIPLOCs and CRS codes for rail) are mapped as stop assignments:

- *NaPTAN* ***AnnotatedModeRef*** (StopAssignment) ➔ ***StopPlaceAssignment.***

Any aliases are mapped as alternative names.

- *NaPTAN* ***AlternativeDescriptor*** (Stop) ➔ ***AlternativeName.***

Any NaPTAN stop validity conditions are mapped as *NeTEx* Validity Conditions.

- *NaPTAN* ***StopValidity*** (Stop) ➔ ***AvailabilityCondition.***

3.2.2 Use of existing references to NPTG

Existing references to *NPTG* entities are mapped as references to the corresponding *NeTEx* equivalent entity.

- Reference to a *NPTG* ***Locality*** (Entrance) ➔ Reference to a ***TopographicPlace.***
- Reference to an ***NPTG AdministrativeArea*** ➔ Reference to a ***ResponsibilitySet.***
- Reference to an ***NPTG PlusbusZone*** ➔ Reference to a ***TariffZone.***

3.2.3 Mapping of NaPTAN Stop Areas

NaPTAN stop areas may be used to obtain an indication of grouping of *NeTEx* stop place components, in particular for organising hierarchies of areas at a multimodal interchange. In some cases it, may also be relevant to create a NeTEx ***StopArea*** as well.

- *NaPTAN* ***ParentStopAreaRef*** ➔ ***ParentStopPlaceRef.***
- *NaPTAN* ***StopArea*** members ➔ ***StopPlace*** members.

3.2.4 Use of identifiers

Existing *NaPTAN* identifiers are used: the namespace can be declared in a document and indicated by a prefix e.g. '*napt:49007856473'*.

3.3 Additional elements to be populated from Accessibility Sources

To describe the detailed structure of an interchange including its accessibility attributes, paths and equipment, additional data elements need to be sourced and populated.

3.3.1 Additional elements to be populated from industry sources

Not all *NaPTAN* platform points are populated:

- *NeTEx* Full coverage of ***Quays*** for Railway ***platforms***.

3.3.2 Additional elements to be populated from accessibility sources

- *NeTEx* ***Coverage*** of ***Nested Quays*** and internal ***Entrances.***
- *NeTEx* ***PlaceAccessibility*** attributes for ***Quays***, ***Entrances***, ***Stop Places*** (CapLvl2).
- *NeTEx* ***NavigationPaths*** (CapLvl3).
- *NeTEx* ***PathLink*** & ***PathJunction (***CapLvl5).
- *NeTEx* ***Equipment*** (CapLvl5 & CapLvl6).

3.3.3 Additional elements to be populated to allow Connection times

- NeTEx / **Access** (CapLvl2).
- NeTEx / ***Connection*** (CapLvl2).

3.3.4 Additional elements that could be populated from other sources

- *NeTEx* ***Parking***, etc. From Transport Direct
- *NeTEx* ***Point of Interest,*** etc. From Regional systems.

4 SHORT OVERVIEW OF IFOPT / NETEX

This section provides a short summary of the *NeTEx* model, focusing on the elements relevant for the UK *NaPTAN* 3.0 profile. For a full treatment, refer to:

- The CEN *NeTEx* detailed specification.
- The *NeTEx* UML model (Note the *NeTEx* model includes some refinements to the original IFOPT model, including a generalisation of the SITE model to cover venues and points of interest as well as transport exchanges.
- The Draft prCEN NeTEx technical specification. (in progress)

4.1 NeTEx / IFOPT Introduction

The *NeTEx* standard enables the modelling of all the different elements 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.

IFOPT is the functional area of *NeTEx* concerned with describing physical stops and interchanges. This profile also covers some interchange related timetabling elements from the Tactical Planning functional area of NeTEx that cover connections and transfer times
NeTEx also has a few features which are not relevant for the UK purposes (e.g. vehicle positioning). These are not described in this summary.

4.2 Basic Elements of a Stop Place

4.2.1 *NeTEx* Stop Places, Quays, Entrances

The core elements of the *NeTEx* model are a STOP PLACE, and the various spaces of which it is comprised, such as platforms (QUAYs), and concourses (ACCESS SPACEs), etc. See Figure 4-1. A STOP PLACE identifies a named stop, pair of stops, or a station on a line. The physical point of access to transport is always a QUAY. ENTRANCEs describe the internal and external entrances to the STOP PLACE and its spaces for use by passengers.
Furthermore:

- Specific labelled points on a QUAYs 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 (as with the current use of *NaPTAN* stop areas) 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 (corresponding to some types of *NaPTAN* point) or internal, for example from an entrance concourse to a platform, (typically not described by *NaPTAN* 2.x).

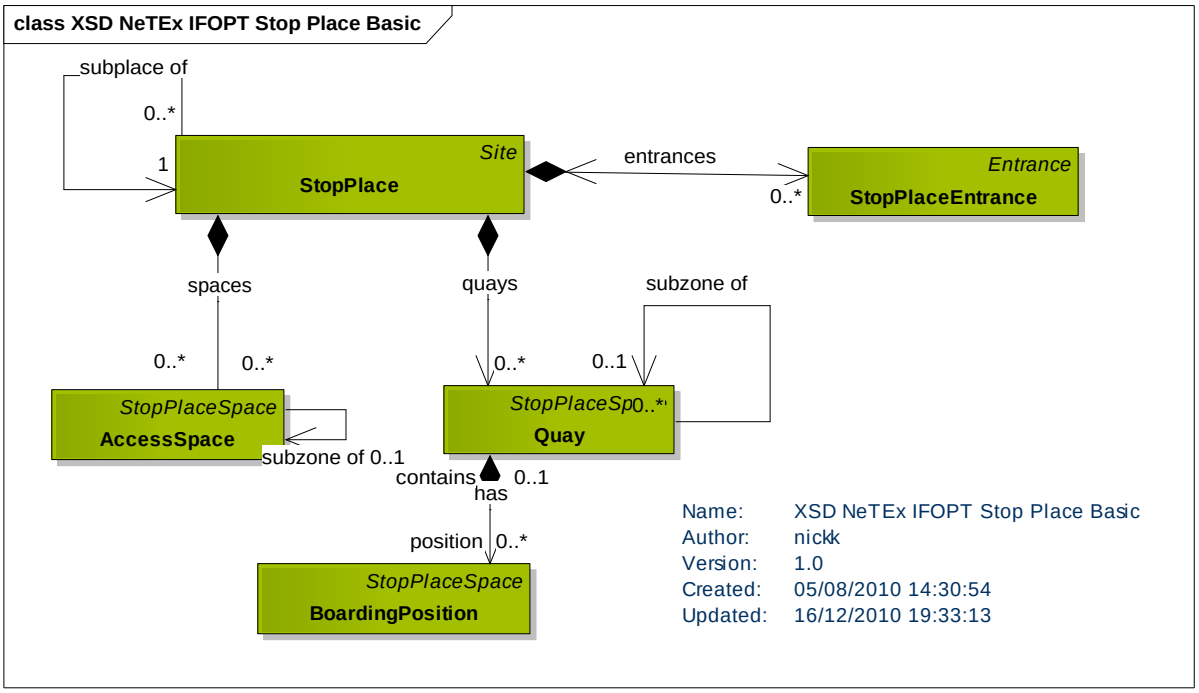


Figure 4-1 – UML Diagram of StopPlace model fundamentals

QUAYs can be given a type - See Table 4-1.

QUAY Type	Description	NaPTAN Stop Type	NaPTAN
airlineGate	Airline Gate	--	--
railPlatform	Rail Platform	RPL	1.0
metroPlatform	Metro Platform	PLT	1.0
coachStop	Coach Stop	BCT	1.0
busStop	Bus Stop	BCT	1.0
busBay	Bus Bay	BCS, BCQ	1.0
tramPlatform	Tram Platform	PLT	1.0
tramStop	Tram Stop	BCT	1.0
boatQuay	Boat Quay	BTH	1.0
ferryLanding	Ferry Landing	BTH	1.0
telecabinePlatform	Telecabine or cable car Platform	LPL	2.4
taxiStand	Taxi Stand	TXR	1.0
setDownPlace	Set Down Place	SDA	2.4
other	other	--	2.0

Table 4-1 – *NeTEx* Quay Types

➔ ***UK NOTE:*** The fundamental *NeTEx* elements correspond to the various classification of *NaPTAN* stop points (Entrances, Platforms, and Access Areas) found in the *NaPTAN* schema, variously populated for each mode. For example for rail, the main entrance is identified in NaPTAN, for bus the pole. *NaPTAN* does not currently have the concept of a BOARDING POSITION. See Table 3-1 earlier for a summary of equivalences. See Table 7-2 later for a detailed mapping of *NaPTAN* stop elements.

NaPTAN 2.4 Introduces new NaPTAN Stop types for Telecabine (LCB, LSE, LPL) and for car set down (SDN).

4.2.1.1*NeTEx* Example cases

Table 4-2 shows how *NeTEx* elements would be used to represent different types of stop.

	Stop	***NeTEx***	**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. EQUIPMENT
	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 either PARENT STOP PLACE REFs to link to main	
	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

Table 4-2 – Common *NeTEx* stop elements combinations

4.2.1.2 Examples of simple on street Stop Places

In this section we illustrate some of the commonly found combinations.
Figure 4-2 shows an on street bus stop as a simple STOP PLACE with a single QUAY for a single direction. Might commonly be found at a terminus of a service.

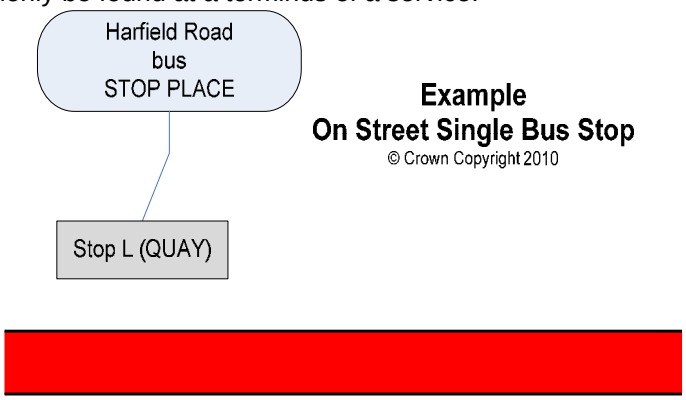


Figure 4-2 – Example of a single bus stop on street

Figure 4-3 shows an on street bus stop pair named '*St George's Road*' as a simple STOP PLACE with two QUAYs, one for each direction.

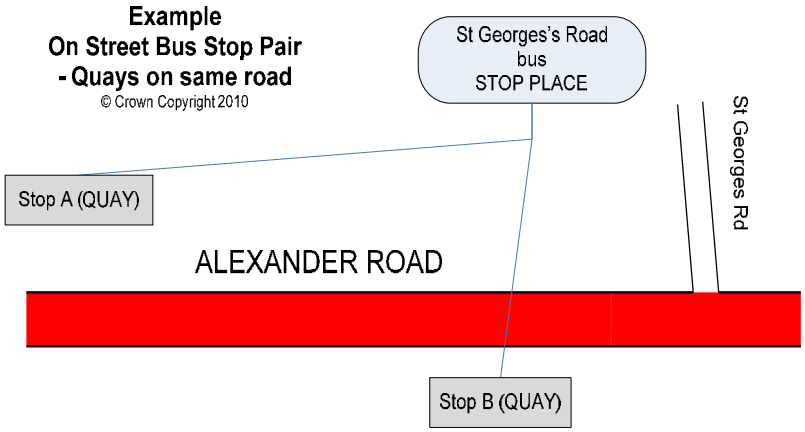


Figure 4-3 – Example pair of bus stops on street

Figure 4-4 shows an on street bus cluster as a simple STOP PLACE with four QUAYs.

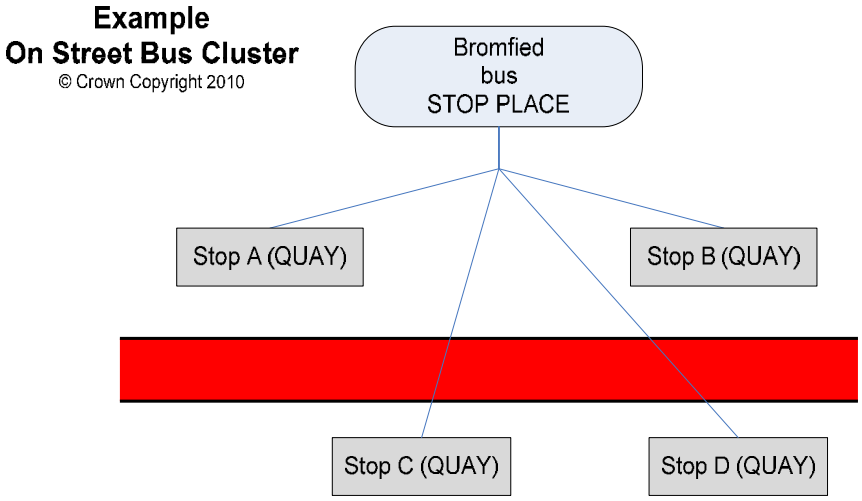


Figure 4-4 – Example bus cluster on street

4.2.1.3XML Example of Stop Place and Quay for an On-Street stop

The following XML code fragment shows an on street bus stop as a simple STOP PLACE with two QUAYs (only one of which is shown), using data from an equivalent NaPTAN 2.x representation.

```
<StopPlace created="2006-09-11T15:42:00">
        <Id>napt:490G0019043</Id>
        <Name>St George's Road (SW19)</Name>
        <Location srsName="UKOS">
                <Coordinates>524811   170666 </Coordinates>
        </Location>
        <types>
                <TypeOfPointRef>GPBS</TypeOfPointRef>
        </types>
        <ShortName>Wimbledon </ShortName>
        <PublicUse>true </ PublicUse >
        <TopographicPlaceRef>nptg:E0034695</TopographicPlaceRef>
        <TransportMode>bus</TransportMode>
        <TypeOfStopPlace>onstreetBus</TypeOfStopPlace>
        <ParentStopPlaceRef>napt:490G00272P</ParentStopPlaceRef>
        <quays>
                <Quay created="2010-04-17T09:30:47Z" dataSourceRef="NaPTAN">
                        <ResponsibilitySetRef>nptg:082</ResponsibilitySetRef>
                        <Id>napt:490014734A</Id>
                        <Name>Alexandra Road, Stop A</Name>
                        <Centroid>
                                <Location>
                                        <Longitude>-0.2067466166</Longitude>
                                        <Latitude>51.4222367962</Latitude>
                                </Location>
                        </Centroid>
                        <types>
                                <TypeOfPointRef>BCT</TypeOfPointRef>
                        </types>
                        <zoneTypes>
                                <TypeOfZoneRef>MKD</TypeOfZoneRef>
                        </zoneTypes>
                        <ShortName>Alexandra Road</ShortName>
                        <Covered>outdoors</Covered>
                        <RoadAddress>
                                <Id>Rd_Addr_08</Id>
                                <RoadName>Alexandra Road</RoadName>
                                <BearingCompass>N</BearingCompass>
                        </RoadAddress>
                        <SiteRef>napt:490G0019043</SiteRef>
                        <LevelRef>tbd:9100WIMBLDN_Lvl_S0</LevelRef>
                        <Description>Stop A is paired with Stop B on Alexandra Road St Georges Road</Description>
```

```
                    <BoardingUse>true</BoardingUse>
                    <AlightingUse>true</AlightingUse>
                    <PublicCode>1-2345</PublicCode>
                    <Label>Stop A</Label>
                    <CompassOctant>N</CompassOctant>
                    <QuayType>busStop</QuayType>
                </Quay>
                <Quay>                          …

        </quays>
    </StopPlace>
```

Figure 4-5 – XML Example of StopPlace

4.2.2 *NeTEx* Sites and Levels

Many of the characteristics of a STOP PLACE, such as entrances, paths, levels. etc are not unique to Transport Interchanges, but are also found in other types of SITE, such as sports stadiums, buildings and parks. Thus in the *NeTEx* model, a STOP PLACE is a specialisation of a more general SITE, and the components of a STOP PLACE are specialisations of STOP PLACE COMPONENTs - see Figure 4-6. A STOP PLACE inherits all the properties of a SITE.

SITEs have a number of properties relevant for navigation including LEVELs. Complex interchanges are often on multiple levels, each with a name. E.g. *'Arrivals', 'Departures', 'Platform Level', 'Entrance Level',* etc. *NeTEx* allows the definition of named LEVELs, which may be topologically significant. Other elements can then be assigned a LEVEL that indicates their relative position.

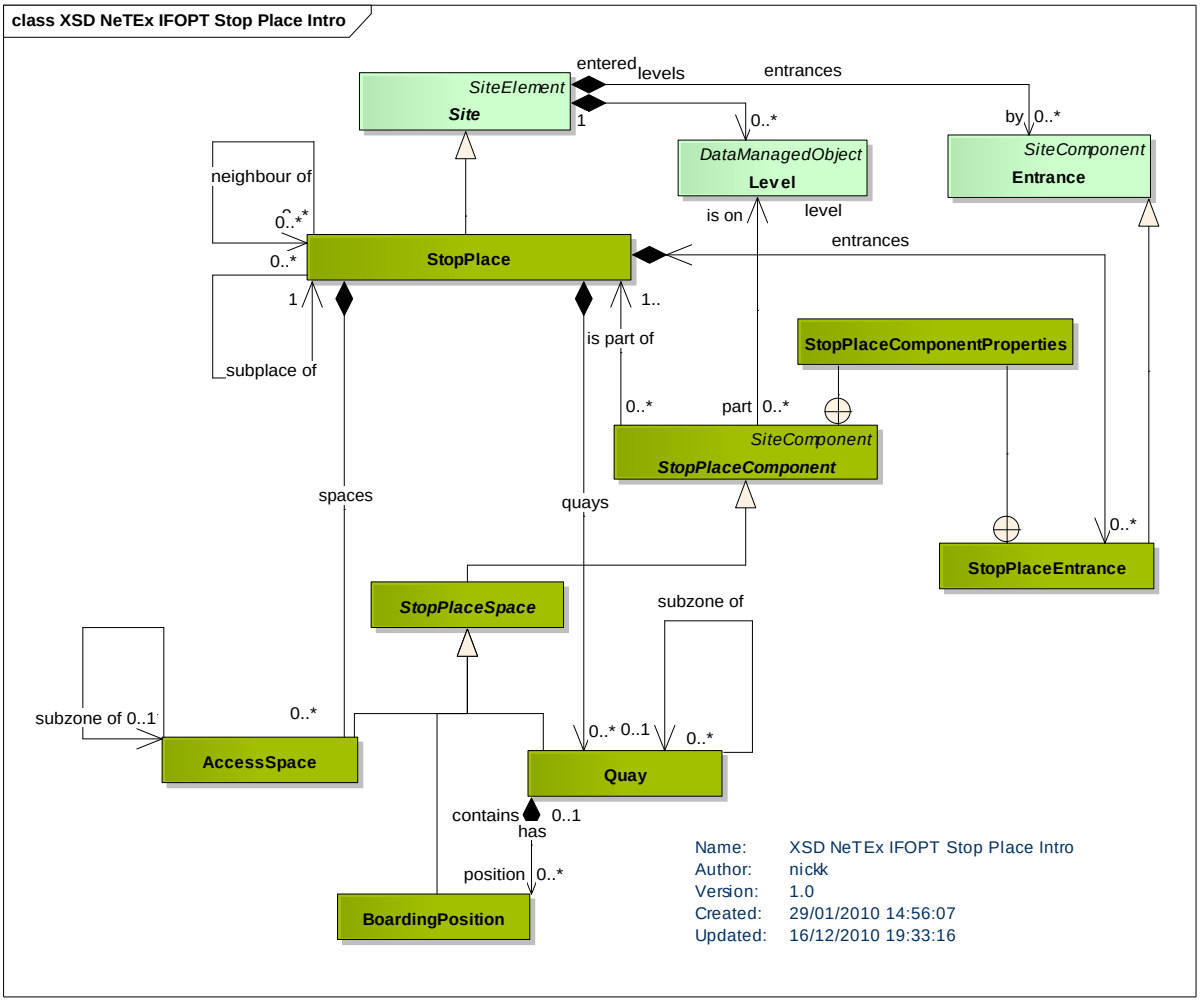


Figure 4-6 – UML Diagram of StopPlace Model - Intro

➔*UK NOTE:* LEVELs only need be specified if (a) there are more than one, or (b) the level is different from street level. Otherwise it will be assumed there is a single level.

4.2.3 *NeTEx* Further Stop Place properties

Figure 4-7 show further properties of a SITE within the *NeTEx* model.

- 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 further below. It is also possible to specify whether the component is indoors or outdoors, or with a gated area.

➔**UK NOTE:** *NaPTAN* supports alternative names, but ACCESSIBILITY, PATH LINKs, CHECK CONSTRAINTs, EQUIPMENT, etc, are additional function found only in *NeTEx*.

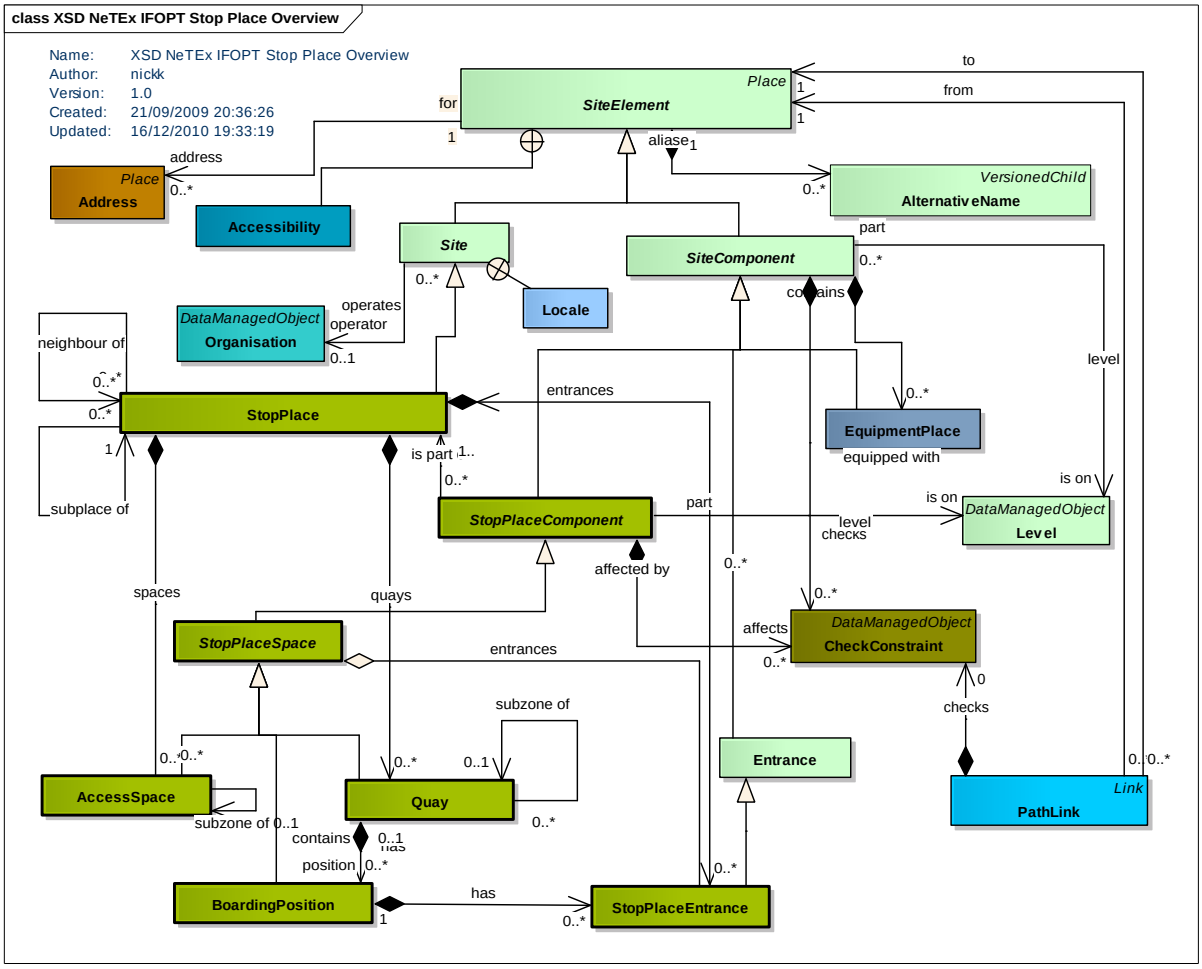


Figure 4-7 – UML Diagram of StopPlace Model

4.2.3.1 Simple Examples of Stations

Figure 4-8 shows a simple rail station with two platforms connected by a barrow crossing represented by two QUAYs and various different types of ACCESS SPACE.

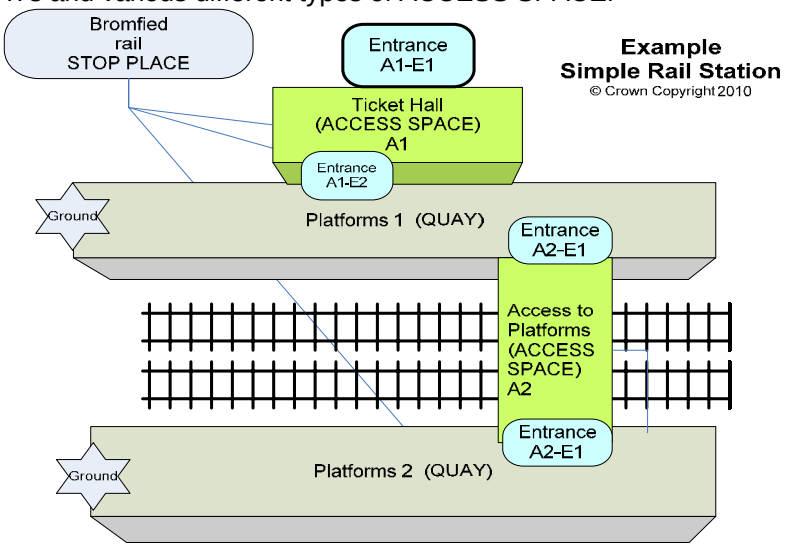


Figure 4-8 – Simple Rail Station Example – Barrow crossing

Figure 4-9 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.

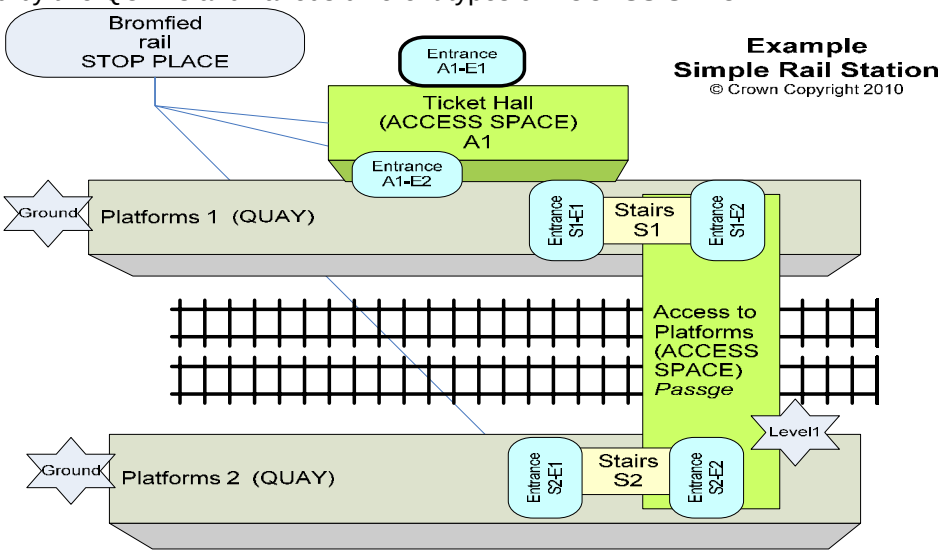


Figure 4-9 – Simple Rail Station Example – Crossing with stairs

Figure 4-10 shows a slightly more complicated example of rail station with four platforms connected by a bridge (or subway) and two ENTRANCEs on different LEVELs.

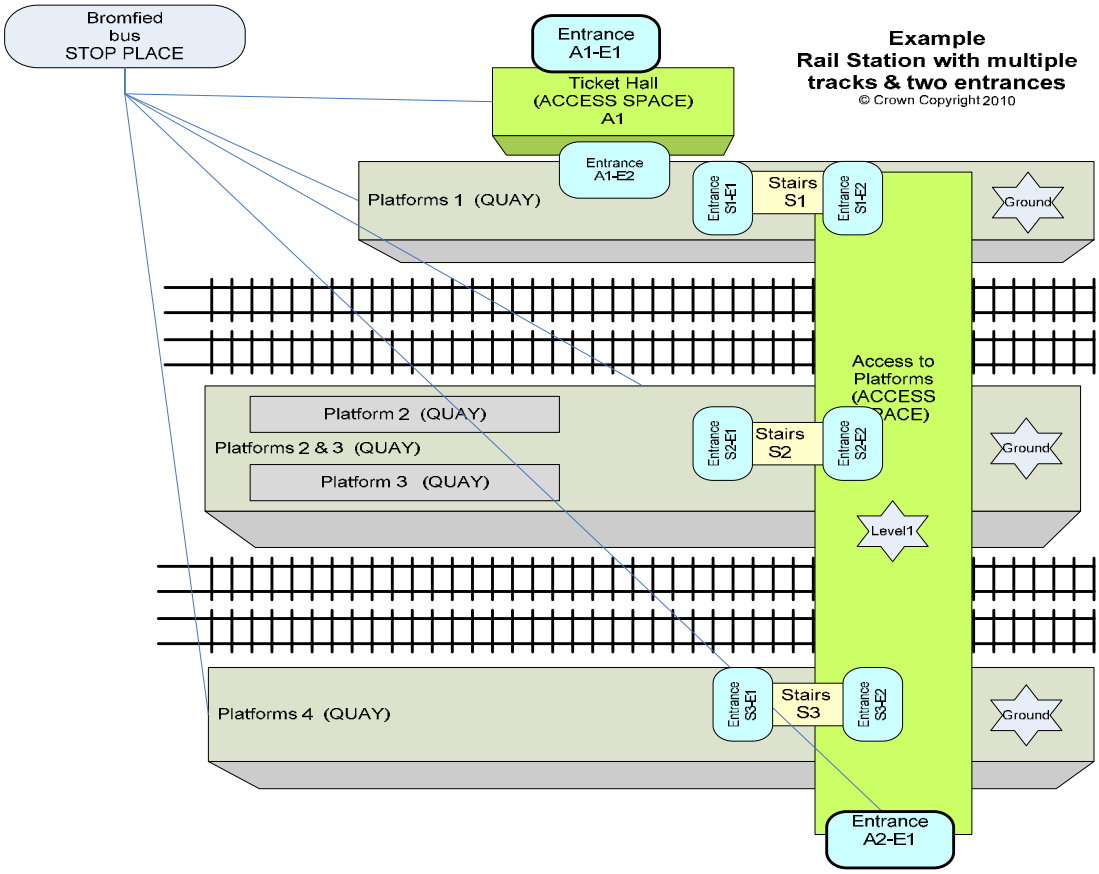


Figure 4-10 – Rail Station example with multiple platforms

4.2.3.2XML Example of a Stop Place for a Station with platforms

The following XML code fragment shows part of a STOP PLACE for a station, including a definition of a single ENTRANCE (further ones have been omitted from the fragment shown) and one of its platforms. The platform is two sided, so is described as a pair of QUAY instances nested inside another QUAY – see discussion of nested QUAYs in Section 4.2.5*.* The station is on two LEVELs. (Only the definition of the first is shown*.)*

The example uses actual *NaPTAN* data for Wimbledon, augmented with realistic data based on the Wimbledon example [WIM-2010].

Some other points of remark in the example code:

- The station's overall accessibility rating is described by an ACCESSIBILITY ASSESSMENT*.*
- The station has an ALTERNATIVE NAME.
- The station is tagged as being the main terminus for a TOPOGRAPHIC PLACE. (Corresponding to a reference to a *NTPG* Locality as the *NPTG* main locality).
- Individual ENTRANCEs and QUAY's are also tagged with an ACCESSIBILITY ASSESSMENT*.*

```
<StopPlace created="2006-09-11T15:42:00" modification="revise" dataSourceRef="NaPTAN">
        <ResponsibilitySetRef>napt:RS_110</ResponsibilitySetRef>
        <Id>napt:910GWIMBLDN</Id>
        <Name>Wimbledon Rail Station</Name>
        <Location srsName="UKOS">
                <Coordinates>524811 170666 </Coordinates>
        </Location>
        <types>
                <TypeOfPointRef>GRLS</TypeOfPointRef>
        </types>
        <AccessibilityAssessment>
                <MobilityImpairedAccess>true</MobilityImpairedAccess>
                <limitations>
                        <AccessibilityLimitation created="2010-05-17T09:30:47Z>
                                <WheelchairAccess>true</WheelchairAccess>
                                <StepFreeAccess>true</StepFreeAccess>
                                <EscalatorFreeAccess>true</EscalatorFreeAccess>
                                <LiftFreeAccess>true</LiftFreeAccess>
                                <AudibleSignalsAvailable>false</AudibleSignalsAvailable>
                                <VisualSignsAvailable>true</VisualSignsAvailable>
                        </AccessibilityLimitation>
                </limitations>
        </AccessibilityAssessment>
         <ShortName>Wimbledon Station</ShortName>
        <alternativeNames modificationSet="all">
                <AlternativeName created="2010-05-17T09:30:47Z" modification="new">
                        <NameType>label</NameType>
                        <Name>Wimbledon+ </Name>
                </AlternativeName>
        </alternativeNames>
        <Covered>mixed</Covered>
        <TopographicPlaceRef>E0034695</TopographicPlaceRef>
        <mainTerminusForPlaceRefs>
                <TopographicPlaceRef created="2005-04-08T00:00:00">E0034695</TopographicPlaceRef>
        </mainTerminusForPlaceRefs>

        <RoadAddress created="2010-05-17T09:30:47Z" modification="new">
                <Id>tbd:RdAddr_01</Id>
                <RoadName>Wimbledon Bridge +</RoadName>
        </RoadAddress>
        <!-- ============LEVELS ===================- -->
        <levels>
                <Level created="2010-04-17T09:30:47Z">
                        <Id>tbd:9100WIMBLDN_Lvl_G0</Id>
                        <Name>Ground </Name>
                        <LevelCode>G</LevelCode>
                </Level>
        .....
```

```
</levels>
<!-- ============ENTRANCEs ====================- -->
<entrances>
        <Entrance created="2010-05-17T09:30:47Z">
                <Id>tbd:9100WIMBLDN_A3_EE1</Id>
                <Name>External Entrance to Centre Court Ticket Hall from forecourt</Name>
                <validityConditions>
                        <AvailabilityConditionRef>AC_01_Main_Opening</AvailabilityConditionRef>
                </validityConditions>
                <ParentZoneRef>tbd:9100WIMBLDN_A3</ParentZoneRef>
                <AccessibilityAssessment>
                        <MobilityImpairedAccess>true</MobilityImpairedAccess>
                        <limitations>
                                <AccessibilityLimitation>
                                        <WheelchairAccess>true</WheelchairAccess>
                                        <StepFreeAccess>true</StepFreeAccess>
                                </AccessibilityLimitation>
                        </limitations>
                </AccessibilityAssessment>
                <LevelRef>tbd:9100WIMBLDN_Lvl_G0</LevelRef>
                <placeEquipments>
                        <EntranceEquipment>
                                <Door>true</Door>
                                <KeptOpen>true</KeptOpen>
                                <WheelChairPassable>true</WheelChairPassable>
                        </EntranceEquipment>
                </placeEquipments>
                <EntranceType>openDoor</EntranceType>
                <isExternal>true</isExternal>
                <isEntry>true</isEntry>
                <isExit>true</isExit>
                <Width>1.0</Width>
                <Height>2.0</Height>
        </Entrance>
 .........
 </entrances>
          <!-- ============QUAYs ====================- -->
<quays>
        <Quay created="2010-04-17T09:30:47Z">
                <Id>tbd:9100WIMBLDN5n6</Id>
                <Name>Platforms 5 &amp;amp; 6</Name>
                <Location srsName="UKOS">
                        <Coordinates>524811 170666 </Coordinates>
                </Location>
                <AccessibilityAssessment created="2010-05-17T09:30:47Z" modification="new">
                        <MobilityImpairedAccess>true</MobilityImpairedAccess>
                        <limitations>
                                <AccessibilityLimitation created="2010-05-17T09:30:47Z" modification="new">
                                        <WheelchairAccess>true</WheelchairAccess>
                                        <StepFreeAccess>true</StepFreeAccess>
                                        <EscalatorFreeAccess>true</EscalatorFreeAccess>
                                        <LiftFreeAccess>true</LiftFreeAccess>
                                        <AudibleSignalsAvailable>false</AudibleSignalsAvailable>
                                        <VisualSignsAvailable>true</VisualSignsAvailable>
                                </AccessibilityLimitation>
                        </limitations>
                </AccessibilityAssessment>
                <Covered>covered</Covered>
                <LevelRef>tbd:9100WIMBLDN_Lvl_U1</LevelRef>
                <Description>Platforms 5 &amp;amp; 6 </Description>
                <BoardingUse>true</BoardingUse>
                <AlightingUse>true</AlightingUse>
                <Label>5 and 6</Label>
                <destinations>
                        <DestinationDisplay>Clapham Junction</DestinationDisplay>
                        <DestinationDisplay>Waterloo</DestinationDisplay>
                </destinations>
                <QuayType>railPlatform</QuayType>
                <quayEntrances>
                        <EntranceRef>tbd:9100WIMBLDN5n6_EL1</EntranceRef>
```

```
                        <EntranceRef>tbd:9100WIMBLDN5n6_ES1</EntranceRef>
                </quayEntrances>
        </Quay>

        <Quay created="2010-04-17T09:30:47Z">
                <Id>napt:9100WIMBLDN5</Id>
                <Name>Platform 5</Name>
                <Description>Platform 5 is paired with platform 6 with separate lift and stair access </Description>
                <Label>5</Label>
                <QuayType>railPlatform</QuayType>
                <ParentQuayRef>tbd:9100WIMBLDN5n6</ParentQuayRef>
        </Quay>

        <Quay created="2010-04-17T09:30:47Z">
                <Id>napt:9100WIMBLDN6</Id>
                <Name>Platform 6</Name>
                <Description>Platform 5 is paired with platform 6 with separate lift and stair access</Description>
                <Label>5</Label>
                <QuayType>railPlatform</QuayType>
                <ParentQuayRef>tbd:9100WIMBLDN5n6</ParentQuayRef>
        </Quay>
         .........
</StopPlace>
```

Figure 4-11 – XML Example of StopPlace – Rail Station with Platforms

4.2.4 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 4-12.

- 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.

➔**UK NOTE**: The same precedence rules as are used for *NaPTAN* ***StopAreas*** should be used for nesting StopPlaces, thus: (i) Air, (ii) Ferry, (iii) Rail, (iv) Metro, (v) Bus/Coach.

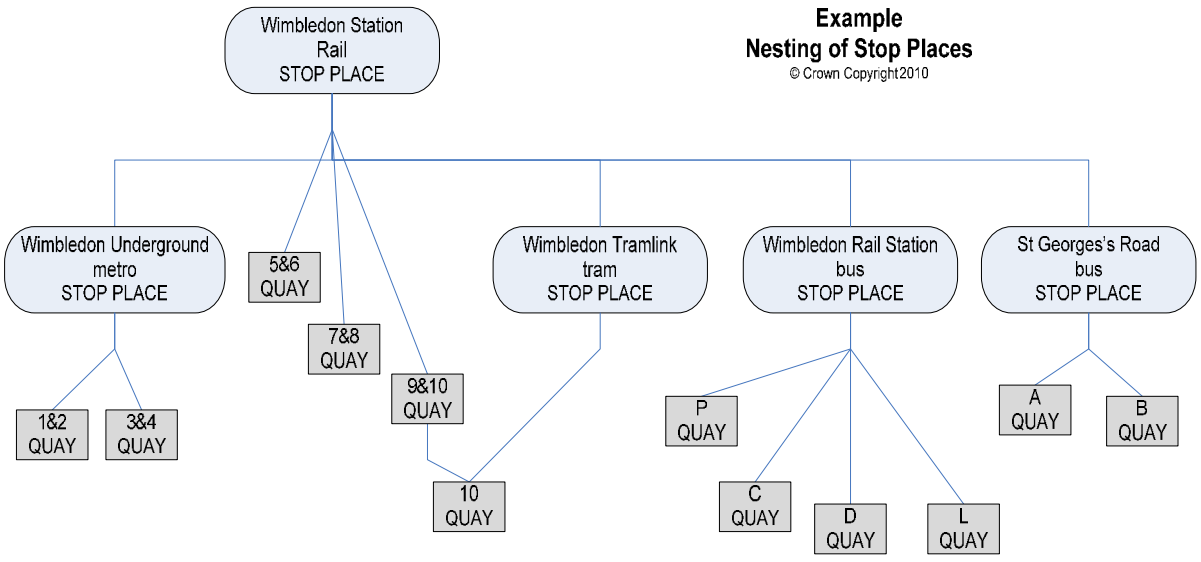


Figure 4-12 – Example Nesting of Stop Places

4.2.4.1XML Example of a Nested Stop Place

The following XML code fragment shows a STOP PLACE for a *metro* station that is itself a subsidiary part of another *rail* STOP PLACE (defined in the previous example)*.*

```
<StopPlace created="2006-09-11T15:42:00" modification="revise" changed="2009-02-26T15:47:00">
        <Id>napt:940GZZLUWIM</Id>
        <Name>Wimbledon Underground Station </Name>
        <Centroid>
                <Location>
                        <Longitude>-0.2065219984</Longitude>
                        <Latitude>51.4213610557</Latitude>
                </Location>
        </Centroid>
        <types>
                <TypeOfPointRef>GTMU</TypeOfPointRef>
        </types>
        <ShortName>Wimbledon</ShortName>
        <TopographicPlaceRef>nptg:E0034695</TopographicPlaceRef>
        <entrances>
……..
        </entrances>
        <PrivateCode>86286</PrivateCode>
        <TypeOfStopPlace>metroStation</TypeOfStopPlace>
        <TransportMode>metro</TransportMode>
        <ParentStopPlaceRef>napt:910GWIMBLDN</ParentStopPlaceRef>
        <quays>
                …
        </quays>
        <accessSpaces>
…..
        </accessSpaces>
</StopPlace>
```

Figure 4-13 – XML Example of Nested StopPlaces

4.2.5 Nesting Quays / Platforms

Several arrangements of composite platforms are commonly found in stations, for example one sided, two sided, etc. Figure 4-14 illustrates common configurations.

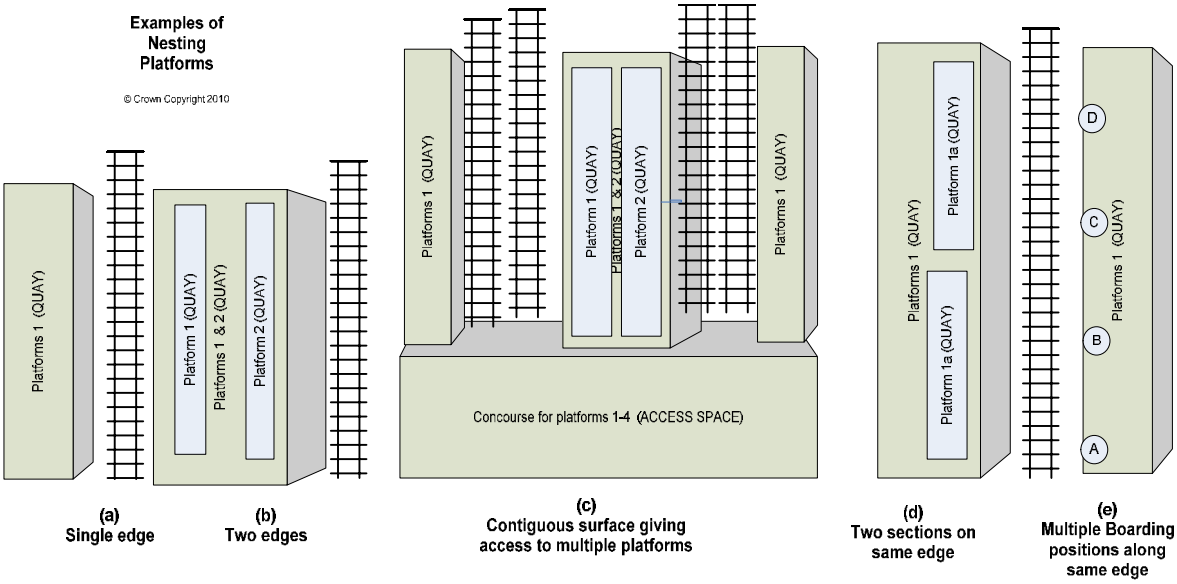


Figure 4-14 – Common QUAY configurations for station platforms

Table 4-3 summarises the common configurations along with a recommended representation using *NeTEx* 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 service this function.
- Nested QUAYs and ACCESS PLACES must always be on the same LEVEL as their parent.

➔**UK NOTE:** Where Platforms are present in current NaPTAN data they should represent the most detailed QUAY, that is, individual edges or sections within an edge.

Quay Arrangement	Description	Modelling in *NeTEx*
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. UK Examples; *Wimbledon 5 & 5*	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. UK Examples: *Cambridge*	A parent QUAY with separate nested child QUAYs for each section
Multiple sections both edges	A physical platform divided into sections on both sides. UK Examples:	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. Uk 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.

Table 4-3 – Nested QUAY configurations.

4.2.6 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.
For example, in the Wimbledon example [WIM-2010] there are distinct *Wimbledon Rail Station* and *Wimbledon Tram link* STOP PLACEs, even though they both share a platform 10 - see Figure 4-12.

- 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.
- There will typically be separate SCHEDULED STOP POINTS for the Tram and fro 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.

➔**UK NOTE:** NaPTAN uses a separate point for each mode to a separate STOP PLACE should be created as per (i) above.

4.2.6.1XML Example of a Multimodal use of the same platform

The following XML code fragment shows a rail STOP PLACE with a shared use QUAY.

```
<StopPlace created="2006-09-11T15:42:00" modification="revise" changed="2009-02-26T15:47:00">
        <Id>napt:910GWIMBLDN</Id>
        <Name>Wimbledon Rail Station</Name>
        <Location srsName="UKOS">
                <Coordinates>524811    170666 </Coordinates>
        </Location>
        <types>
                <TypeOfPointRef>GRLS</TypeOfPointRef>
        </types>
……
        <TypeOfStopPlace>railStation</TypeOfStopPlace>
        <TransportMode>rail</TransportMode>
        <otherModes>
                <OtherTransportMode>metro</OtherTransportMode>
                <OtherTransportMode>tram</OtherTransportMode>
        </otherModes>
…..
        <quays>
 ……
                <Quay created="2010-04-17T09:30:47Z">
                        <Id>napt:9100WIMBLDN10</Id>
                        <Name>Platform 10</Name>
                        <TransportMode>rail</TransportMode>
                        <otherModes>
                                <VehicleMode>tram</VehicleMode>
                        </otherModes>
                        <Description>Platform 10 is paired with platform 9 with separate lift and stair access. It has shared use
for tram</Description>
                        <Label>10</Label>
                        <destinations>
                                <DestinationDisplay>London</DestinationDisplay>
                        </destinations>
                        <QuayType>tramPlatform</QuayType>
                        <ParentQuayRef>tbd:9100WIMBLDN9n10</ParentQuayRef>
                </Quay>

                <QuayRef>tbd:9100WIMBLDN10</QuayRef>
        </quays>
```

The following XML code fragment shows an additional STOP PLACE for a tram station that references the same shared use platform defined above.

```
<StopPlace created="2006-09-11T15:42:00" modification="revise" changed="2009-02-26T15:47:00">
        <Id>napt:940GZZCRWIM</Id>
        <Name>Wimbledon Tramlink Station </Name>
        <Centroid>
                <Location>
                        <Longitude>-0.2065219984</Longitude>
                        <Latitude>51.4213610557</Latitude>
                </Location>
        </Centroid>
        <types>
                <TypeOfPointRef>GTMU</TypeOfPointRef>
        </types>
        <ShortName>Wimbledon</ShortName>
        <TopographicPlaceRef>nptg:E0034695</TopographicPlaceRef>
        <TypeOfStopPlace>tramStation</TypeOfStopPlace>
        <TransportMode>tram</TransportMode>
        <ParentStopPlaceRef>napt:910GWIMBLDN</ParentStopPlaceRef>
        <quays>
                <QuayRef>tbd:9100WIMBLDN10</QuayRef>
```

```
        </quays>
</StopPlace>
```

Figure 4-15 – XML Example of Shared Quay in a Rail StopPlace

4.2.7 Flexible Service Stop Places.

Hail and ride or zone based Flexible services which serve a section of road or an area can be represented in *NeTEx* using FLEXIBLE QUAY's.

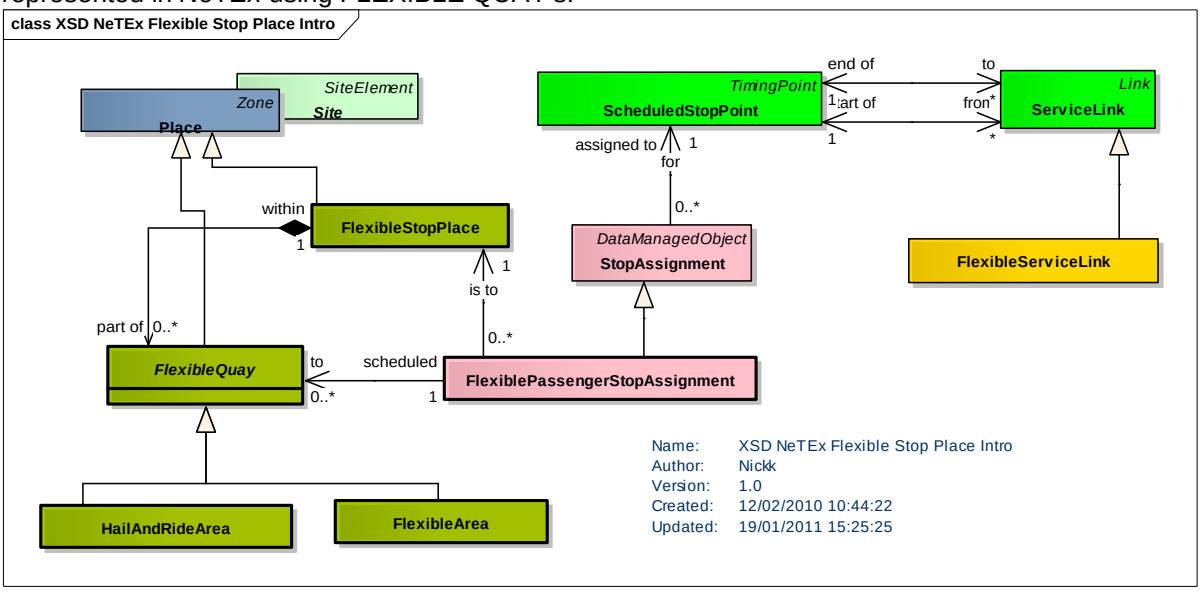


Figure 4-16 – UML Diagram of Flexible Stop Place

➔**UK NOTE:** These correspond to the HAR & FLX bus stop subtypes used in NaPTAN.

4.2.7.1Simple Examples Hail and Ride Stop

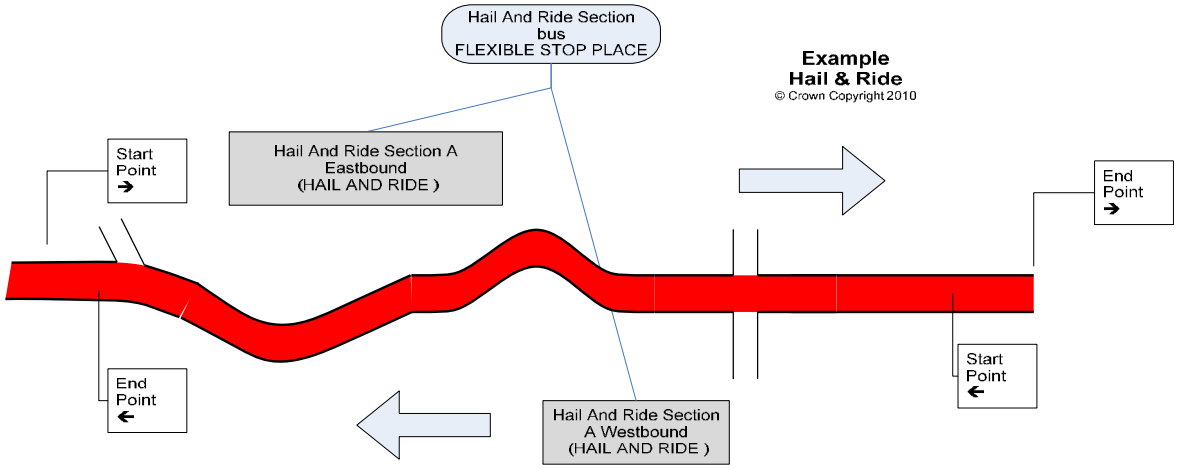


Figure 4-17 – Example of Hail and Ride Stop

4.2.7.2Simple Examples of Flexible Stop

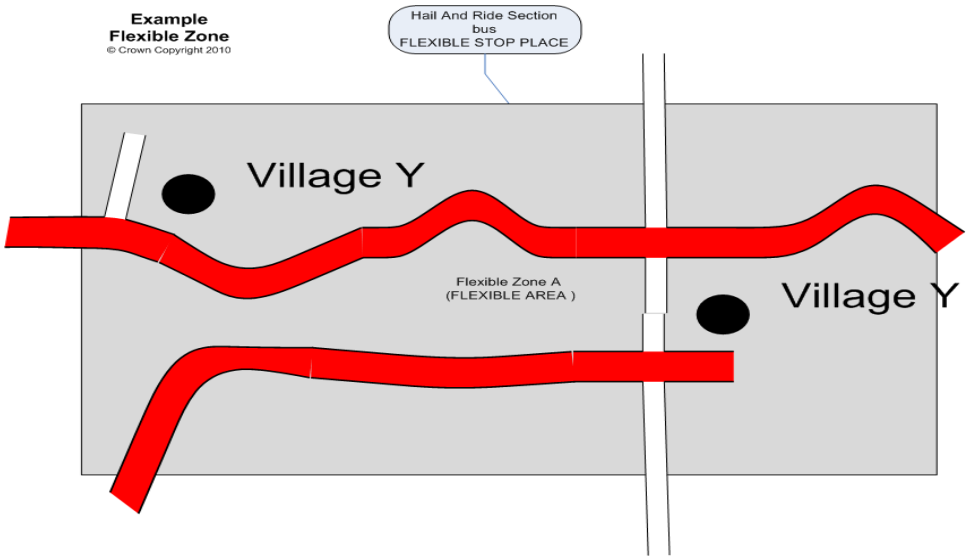


Figure 4-18 – Example of Flexible Zone

4.2.7.3Representing 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. *(*See Figure 4-34 for an example*).*

- ENTRANCEs are normally specified as properties of the overall SITE i.e. STOP PLACE.
- ENTRANCEs may be additionally referenced by the ACCESS SPACES and QUAYs which use them. In the example XML fragment immediately above, Entrance '9100WIMBLDN5n6_EL1' is declared as a child of StopPlace '9100WIMBLDN', but also referenced explicitly by Quay '9100WIMBLDN5n6'.

Note: Provided every ACCESS SPACE and QUAY references all of its own ENTRANCEs, there is sufficient data to infer a basic topology of a SITE even without the specification of PATH LINKs.

4.2.7.4Classifying Stop Places

A STOP PLACE can be further classified in terms of the places it serves (mainTerminusFor), whether it is public or private use, and whether it has limitations on its use (e.g. Isolated stop, no direct road access on paved paths, long walk to stop, very limited service, interchange only use).

A SCHEDULED STOP POINT can be classified as used by default for alighting, boarding, only by request,

4.3 Paths

4.3.1 *NeTEx* Path Links

- The *NeTEx* model represents the allowed paths between the points of an interchange as PATH LINKs. PATH LINKs connect the points of an interchange creating a network of possible paths. Each PATH LINK connects with a QUAY (i.e. platform or stop), 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.

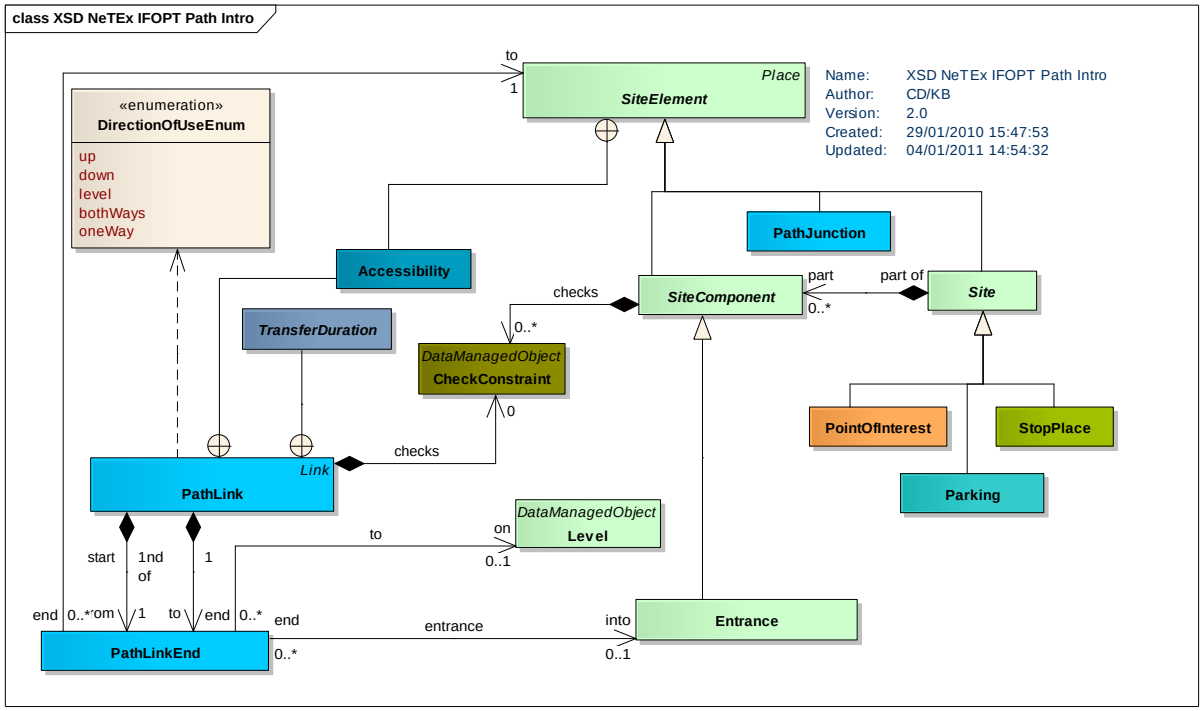


Figure 4-19 – UML Diagram of Path Link

4.3.1.1Simple examples of Path Links

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

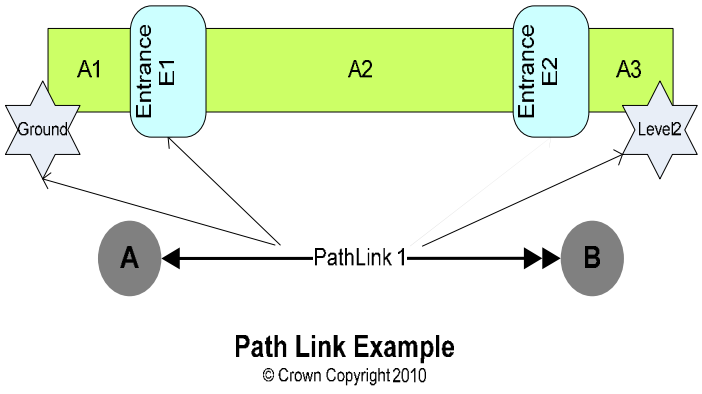


Figure 4-20 – Example of a single Path Link

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

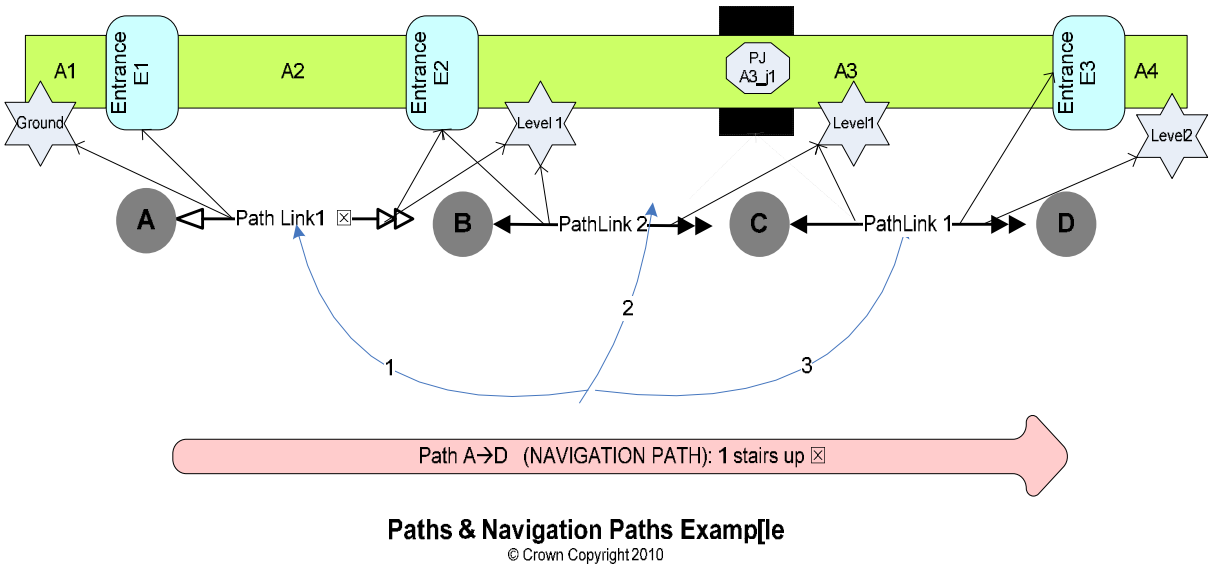


Figure 4-21 – Example of a sequence of Path Links

4.3.1.2Simple examples of Path Links in a Stop place

Figure 4-22 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.

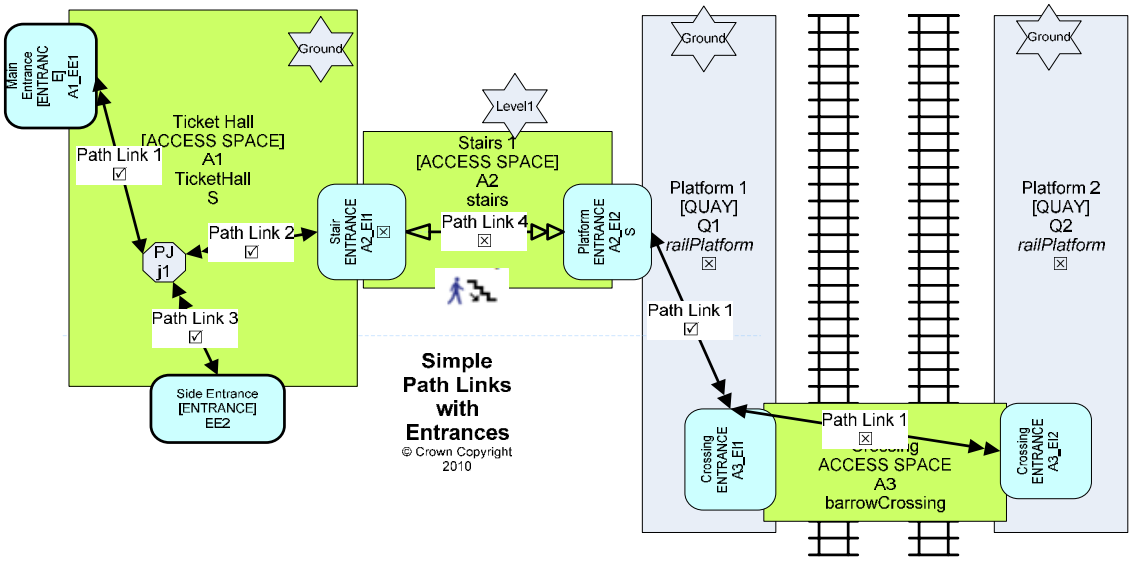


Figure 4-22 – Example of Path Links used to connect Access and platforms

Sometimes a path link is used simply to indicate that two spaces are connected, without specifying an ENTRANCE, for example where there a long open edge between them. Figure 4-23 shows a simple ferry stop with a long quay an open sided shelter opening onto an access area.

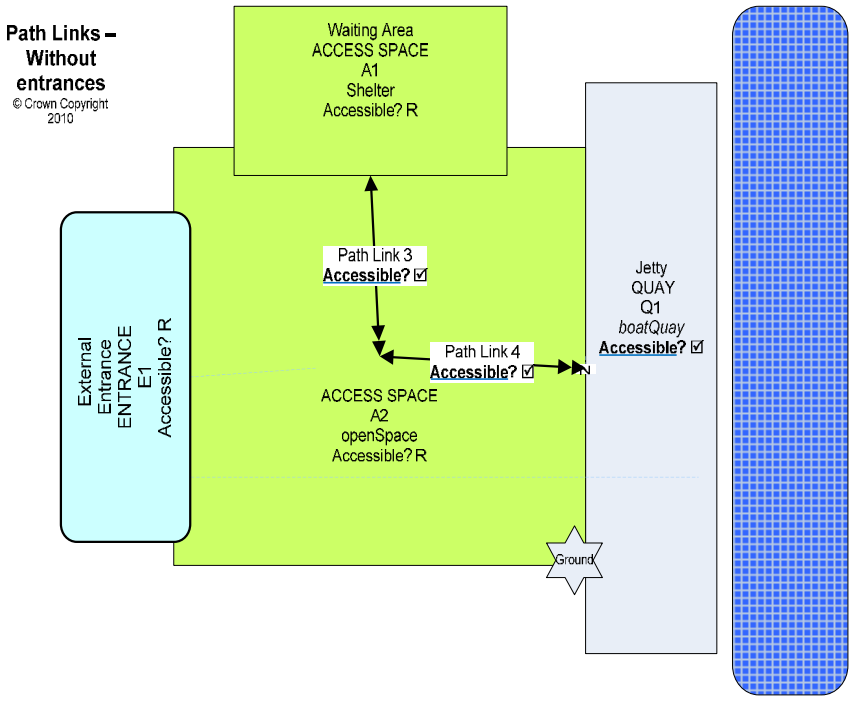


Figure 4-23 – Example of Path links between open areas.

4.3.1.3XML example of a Path Link - outdoors

The following XML code fragment shows a single PATH LINK that connects an ENTRANCE to a PATH JUNCTION out in the street.

```
<SitePathLink created="2010-05-17T09:30:47Z">
        <Id>tbd:9100WIMBLDN_lnk_A1_EE1_FC-j1</Id>
        <Name>From Forecourt main entrance to Path Junction w1 in forecourt</Name>
        <Covered>outdoors</Covered>
        <From>
                <PlaceRef>tbd:9100WIMBLDN_A1</PlaceRef>
                <EntranceRef>tbd:9100WIMBLDN_A1_EE1</EntranceRef>
        </From>
        <To>
                <PlaceRef>tbd:9100WIMBLDN_FC_J1</PlaceRef>
        </To>
        <Distance>5.00</Distance>
        <NumberOfSteps>0</NumberOfSteps>
        <AllowedUse>twoWay</AllowedUse>
        <FromToUpDown>level</FromToUpDown>
        <AccessFeatureType>street</AccessFeatureType>
        <LevelRef>tbd:9100WIMBLDN_Lvl_S0</LevelRef>
</SitePathLink>
```

Figure 4-24 – XML Example of external PathLink

4.3.1.4XML example of a Path Link – Indoors

The following XML code fragment shows a PATH LINK that connects an external ENTRANCE to an internal ENTRANCE. It is further marked with accessibility attributes.

```
<SitePathLink created="2010-05-17T09:30:47Z">
        <Id>tbd:9100WIMBLDN_lnk_A1-EE1_A1-EI1</Id>
        <Name>From Ticket hall external entrance to Upper concourse internal entrance</Name>
        <AccessibilityAssessment created="2010-05-17T09:30:47Z">
                <MobilityImpairedAccess>true</MobilityImpairedAccess>
                <limitations>
                        <AccessibilityLimitation created="2010-05-17T09:30:47Z">
                                <Id> tbd:9100WIMBLDN_lnk_A1-EE1_A1-EI1-acc01</Id>
```

```
                                    <WheelchairAccess>true</WheelchairAccess>
                                    <StepFreeAccess>true</StepFreeAccess>
                                    <EscalatorFreeAccess>true</EscalatorFreeAccess>
                                    <LiftFreeAccess>true</LiftFreeAccess>
                                </AccessibilityLimitation>
                        </limitations>
                </AccessibilityAssessment>
                <Covered>indoors</Covered>
                <From>
                        <PlaceRef>tbd:9100WIMBLDN_A1</PlaceRef>
                        <EntranceRef>tbd:9100WIMBLDN_A1_EE1</EntranceRef>
                        <LevelRef>tbd:9100WIMBLDN_Lvl_ST</LevelRef>
                </From>
                <To>
                        <PlaceRef>tbd:9100WIMBLDN_A1</PlaceRef>
                        <EntranceRef>tbd:9100WIMBLDN_A1_EI1</EntranceRef>
                        <LevelRef>tbd:9100WIMBLDN_Lvl_G0</LevelRef>
                </To>
                <Distance>4.0</Distance>
                <AllowedUse>twoWay</AllowedUse>
                <FromToUpDown>level</FromToUpDown>
                <MaximumFlowPerMinute>200</MaximumFlowPerMinute>
                <LevelRef>tbd:9100WIMBLDN_Lvl_G0</LevelRef>
                <checks>
                        <CheckConstraint>
                                <Id>Ck001</Id>
                                <CheckProcess>ticketValidation</CheckProcess>
                                <AccessFeatureType>barrier</AccessFeatureType>
                                <Congestion>queue</Congestion>
                                <MinimumLikelyDelay> PT30S </MinimumLikelyDelay>
                                <AverageDelay>PT5MS</AverageDelay>
                                <MaximumLikelyDelay> PT10M</MaximumLikelyDelay>
                        </Check>
                </checks>

        </SitePathLink>
```

Figure 4-25 – XML Example of PathLink within a Station

4.3.2 *NeTEx* Navigation Paths

Sequences of PATH LINKs can be assembled into named NAVIGATION PATHs to guide the user through an interchange. The model for NAVIGATION PATHs is thus two-level (Figure 4-26).

(i) The NAVIGATION PATH itself is a high level container that 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.

A NAVIGATION PATH normally contains a sequence of on ore more one 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.

It is possible for a NAVIGATION PATH to be used just as a summary – i.e. with out PATH LINKs, 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.

➔UK Note: In *JourneyWeb* 2.4 a LegPath response is added that can return a Navigation path. This consists of a sequence of points.

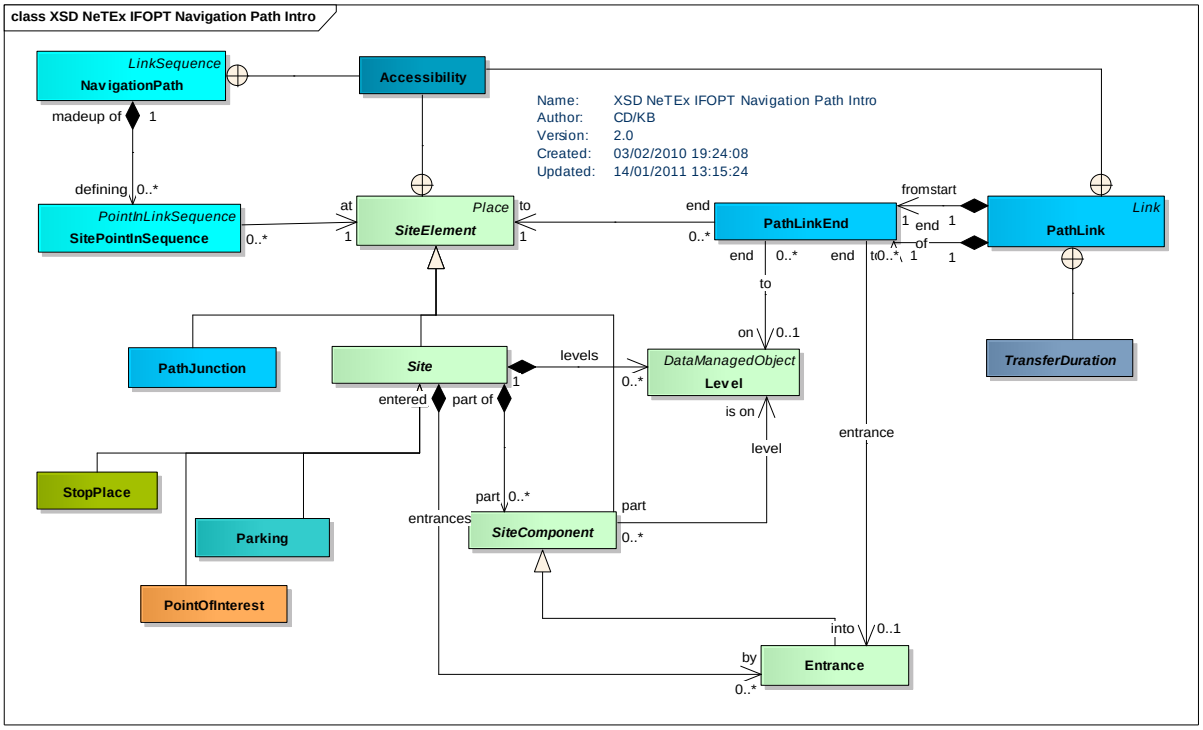


Figure 4-26 – UML Diagram of Navigation Path

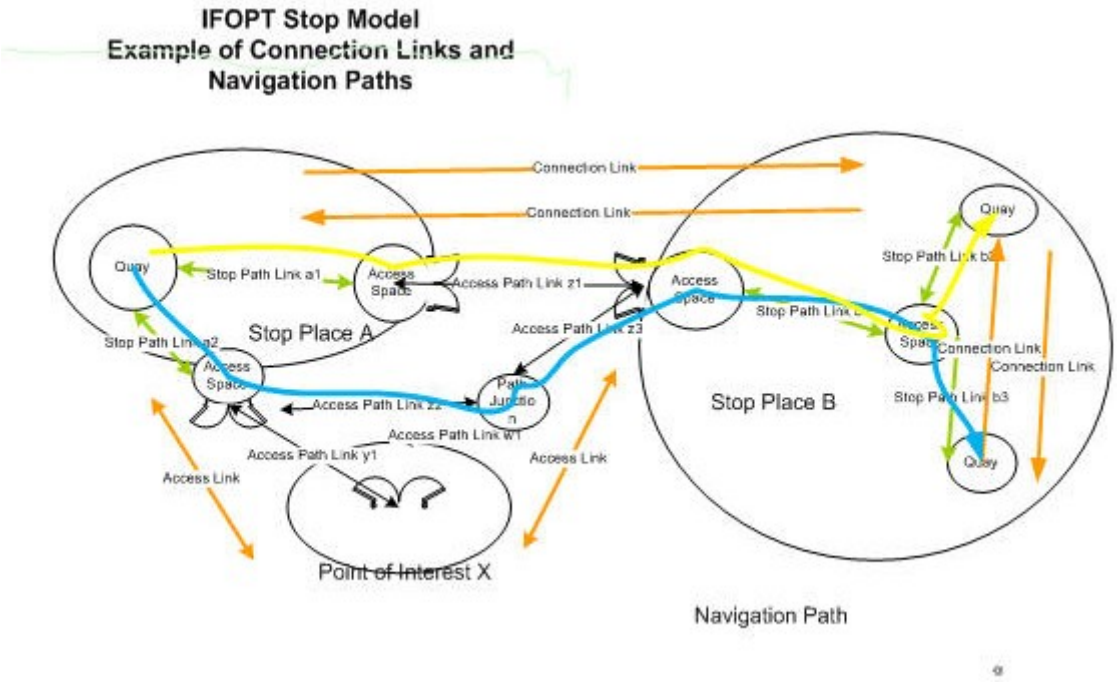


Figure 4-27 – *NeTEx* Path Links & Navigation Paths

4.3.2.1 Wimbledon example Navigation Path

Figure 4-28 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.

.

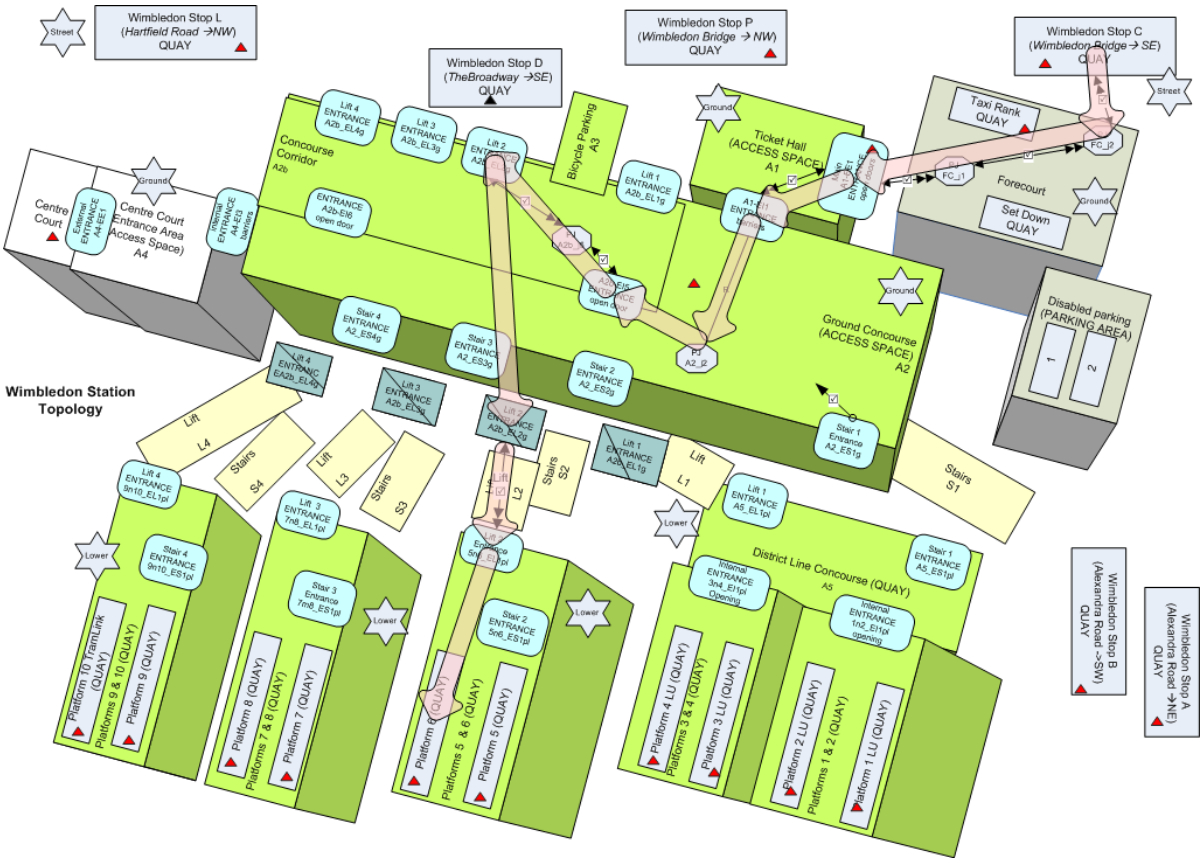


Figure 4-28 – Wimbledon Example path from Stop Q to Platform 6

4.3.2.2Creating Navigation paths

In an implementation, NAVIGATION PATHs can either be predefined statically by hand (as in the Wimbledon example [WIM-2010], the Direct Enquiries provides named paths for NRE Stations Made Easy) or be computed dynamically from path links by a micro journey planner, (as for the TfL local access search engine on DirectEnquiries.com). 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: corresponding to different routes.

Navigation Type	Description	Used
quayToQuay	Quay to Quay	STOP PLACE
streetToQuay	Street to Quay	STOP PLACE
quayToStreet	Quay to Street	STOP PLACE
hallToQuay	Ticket Hall to Quay	STOP PLACE, POI
quayToHall	Quay to Ticket Hall or Entrance Gallery	STOP PLACE, POI
streetToHall	Street to Ticket Hall	STOP PLACE, POI
hallToStreet	Ticket Hall to Street	STOP PLACE, POI
hallTo Space	Hall to spectator area	POI
spaceToHall	Spectator Area to Hall	POI
streetToSpace	Street to spectator area	POI
spaceToStreet	Spectator Area to Street	POI
spaceToSpace	Spectator Area to Spectator Area	POI

other	other	STOP PLACE, POI

Table 4-4 – Types of Navigation Path

4.3.3 *NeTEx* 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 by 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 used in one sense.
- 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 4-29 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.

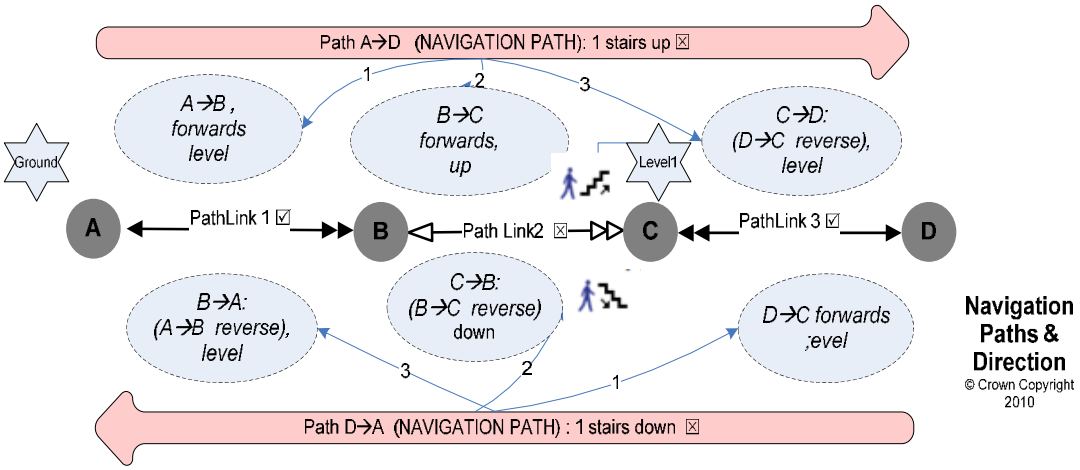


Figure 4-29 – *NeTEx* Direction of Path Links and Navigation Paths

4.3.3.1XML example of a Navigation Path

The following XML code fragment shows a NAVIGATION PATH from hall to quay using a lift (*Platform 5* to *Platform 6* in the Wimbledon example). It references six PATH LINKS (shown in the subsequent XML fragment below). The NAVIGATION PATH has overall accessibility attributes based on the properties of individual links.

XML fragment for Navigation Path

```
<NavigationPath created="2010-05-17T09:30:47Z" modification="new">
        <Id>tbd:9100WIMBLDN_A1-EE1_to_5n6-acc</Id>
        <AccessibilityAssessment created="2010-05-17T09:30:47Z" >
                <MobilityImpairedAccess>true</MobilityImpairedAccess>
                <limitations>
                        <AccessibilityLimitation>
                                <Id>tbd:9100WIMBLDN_A1-EE1_to_5n6-acc_01</Id>
                                <WheelchairAccess>true</WheelchairAccess>
                                <StepFreeAccess>true</StepFreeAccess>
                                <EscalatorFreeAccess>true</EscalatorFreeAccess>
                                <LiftFreeAccess>false</LiftFreeAccess>
                        </AccessibilityLimitation>
                </limitations>
```

```
        </AccessibilityAssessment>
        <features>
                <AccessSummary>
                        <AccessFeatureType>lift</AccessFeatureType>
                        <Count>1</Count>
                        <Transition>down</Transition>
                </AccessSummary>
        </features>
        <Name>Street to Platform 5 and 6 - Accessible</Name>
        <TypeOfNavigation>hallToQuay</TypeOfNavigation>

        <pathLinksInSequence>
                <PathLinkInSequence order="1">
                        <PathLinkRef>tbd:9100WIMBLDN_lnk_A2-EI1_A2-J2</PathLinkRef>
                        <Description>From Upper Concourse Main Entrance to Path Junction 2</Description>
                        <Reverse>false</Reverse>
                        <Transition>level</Transition>
                </PathLinkInSequence>

                <PathLinkInSequence order="2">
                        <PathLinkRef>tbd:9100WIMBLDN_lnk_A2b-EI5_A2-J2</PathLinkRef>
                        <Description>From Upper Concourse Internal Entrance 5 to Path Junction 2 in upper
concourse</Description>
                        <Reverse>true</Reverse>
                        <Heading>right</Heading>
                        <Transition>level</Transition>
                </PathLinkInSequence>

                <PathLinkInSequence order="3">
                        <PathLinkRef>tbd:9100WIMBLDN_lnk_ A2b-EI5_A2b-J5</PathLinkRef>
                        <Description>From Upper Concourse Lift area Internal Entrance 5 to Path Junction 5 in lift area
</Description>
                        <Reverse>false</Reverse>
                        <Transition>level</Transition>
                </PathLinkInSequence>

                <PathLinkInSequence order="4">
                        <PathLinkRef>tbd:9100WIMBLDN_lnk_A2b-EL2g_A2b-J5</PathLinkRef>
                        <Description>From Upper Concourse Lift Entrance 2 to Path Junction 5 in lift area</Description>
                        <Reverse>true</Reverse>
                        <Heading>left</Heading>
                        <Transition>level</Transition>
                </PathLinkInSequence>

                <PathLinkInSequence order="5">
                        <PathLinkRef>tbd:9100WIMBLDN_lnk_A2b-EL2g_5n6-EL1_by-L2</PathLinkRef>
                        <Description>From Upper Concourse to platform 5 and 6 by Lift </Description>
                        <Reverse>false</Reverse>
                        <Transition>down</Transition>
                </PathLinkInSequence>
        </pathLinksInSequence>
</NavigationPath>
```

Figure 4-30 – XML Example of Navigation Path

XML fragment for Path Links used in Navigation Path

The following XML code fragment shows the single PATH JUNCTION and six PATH LINKs referenced by the NAVIGATION PATH above.

```
<pathJunctions>
        <PathJunction created="2010-05-17T09:30:47Z">
                <Id>tbd:9100WIMBLDN_A2_J2</Id>
                <Name>Branch from main entrance to Rail stairs to 5 and 6</Name>
                <Centroid>
                        <Location>
                                <Longitude>-180</Longitude>
                                <Latitude>-90</Latitude>
                        </Location>
                </Centroid>
                <ParentZoneRef>tbd:9100WIMBLDN_A2</ParentZoneRef>
```

```
            <Covered>indoors</Covered>
        </PathJunction>
 </pathJunctions>

<pathLinks>

        <SitePathLink created="2010-05-17T09:30:47Z">
            <Id>tbd:9100WIMBLDN_lnk_A1-EI1_A2-J2</Id>
            <Name>From Upper Concourse Internal Entrance 1 to lift area to Path Junction 2 in Upper
concourse</Name>
            <AccessibilityAssessment>
                <MobilityImpairedAccess>true</MobilityImpairedAccess>
                <limitations>
                    <AccessibilityLimitation
                        <WheelchairAccess>true</WheelchairAccess>
                        <StepFreeAccess>true</StepFreeAccess>
                        <EscalatorFreeAccess>true</EscalatorFreeAccess>
                        <LiftFreeAccess>true</LiftFreeAccess>
                    </AccessibilityLimitation>
                </limitations>
            </AccessibilityAssessment>
            <Covered>indoors</Covered>
            <From>
                <PlaceRef>tbd:9100WIMBLDN_A2</PlaceRef>
                <EntranceRef>tbd:9100WIMBLDN_A2b-EIb2</EntranceRef>
            </From>
            <To>
                <PlaceRef>tbd:9100WIMBLDN_A2_J2</PlaceRef>
            </To>
            <Distance>5.00</Distance>
            <NumberOfSteps>0</NumberOfSteps>
            <AllowedUse>twoWay</AllowedUse>
            <FromToUpDown>level</FromToUpDown>
            <TransferDuration>
                <DefaultDuration>PT30S</DefaultDuration>
            </TransferDuration>
            <MaximumFlowPerMinute>200</MaximumFlowPerMinute>
            <LevelRef>tbd:9100WIMBLDN_Lvl_G0</LevelRef>
        </SitePathLink>

        <SitePathLink created="2010-05-17T09:30:47Z">
            <Id>tbd:9100WIMBLDN_lnk_A2b-EIb1_A2-J2</Id>
            <Name>From Upper Concourse Lift area Entrance 5 to Path Junction 2</Name>
            <AccessibilityAssessment>
                <MobilityImpairedAccess>true</MobilityImpairedAccess>
                <limitations>
                    <AccessibilityLimitation
                        <WheelchairAccess>true</WheelchairAccess>
                        <StepFreeAccess>true</StepFreeAccess>
                        <EscalatorFreeAccess>true</EscalatorFreeAccess>
                        <LiftFreeAccess>true</LiftFreeAccess>
                    </AccessibilityLimitation>
                </limitations>
            </AccessibilityAssessment>
            <Covered>indoors</Covered>
            <From>
                <PlaceRef>tbd:9100WIMBLDN_A2b</PlaceRef>
                <EntranceRef>tbd:9100WIMBLDN_A2b-EI5</EntranceRef>
            </From>
            <To>
                <PlaceRef>tbd:9100WIMBLDN_A2_J2</PlaceRef>
            </To>
            <Distance>5.00</Distance>
            <NumberOfSteps>0</NumberOfSteps>
            <AllowedUse>twoWay</AllowedUse>
            <FromToUpDown>level</FromToUpDown>
            <TransferDuration>
                <DefaultDuration>PT30S</DefaultDuration>
            </TransferDuration>
            <MaximumFlowPerMinute>200</MaximumFlowPerMinute>
            <LevelRef>tbd:9100WIMBLDN_Lvl_G0</LevelRef>
```

```
</SitePathLink>


<SitePathLink created="2010-05-17T09:30:47Z">
        <Id>tbd:9100WIMBLDN_lnk_A2b-EI5_A2b-J5</Id>
        <Name>From Upper Concourse Lift area Entrance 5 to Lift area Path Junction 5</Name>
        <AccessibilityAssessment>
                <MobilityImpairedAccess>true</MobilityImpairedAccess>
                <limitations>
                        <AccessibilityLimitation
                                <WheelchairAccess>true</WheelchairAccess>
                                <StepFreeAccess>true</StepFreeAccess>
                                <EscalatorFreeAccess>true</EscalatorFreeAccess>
                                <LiftFreeAccess>true</LiftFreeAccess>
                        </AccessibilityLimitation>
                </limitations>
        </AccessibilityAssessment>
        <Covered>indoors</Covered>
        <From>
                <PlaceRef>tbd:9100WIMBLDN_A2b</PlaceRef>
                <EntranceRef>tbd:9100WIMBLDN_A2b-EIb2</EntranceRef>
        </From>
        <To>
                <PlaceRef>tbd:9100WIMBLDN_A2b_J5</PlaceRef>
        </To>
        <Distance>5.00</Distance>
        <NumberOfSteps>0</NumberOfSteps>
        <AllowedUse>twoWay</AllowedUse>
        <FromToUpDown>level</FromToUpDown>
        <TransferDuration>
                <DefaultDuration>PT30S</DefaultDuration>
        </TransferDuration>
        <MaximumFlowPerMinute>200</MaximumFlowPerMinute>
        <LevelRef>tbd:9100WIMBLDN_Lvl_G0</LevelRef>
</SitePathLink>

<SitePathLink created="2010-05-17T09:30:47Z">
        <Id>tbd:9100WIMBLDN_lnk_A2b-EL2g_5n6-EL1_by-L2</Id>
        <Name>From Upper Concourse Lift Area to Platforms 5 and 6 by lift 2</Name>
        <AccessibilityAssessment>
                <MobilityImpairedAccess>true</MobilityImpairedAccess>
                <limitations>
                        <AccessibilityLimitation created="2010-05-17T09:30:47Z">
                                <WheelchairAccess>true</WheelchairAccess>
                                <StepFreeAccess>true</StepFreeAccess>
                                <EscalatorFreeAccess>true</EscalatorFreeAccess>
                                <LiftFreeAccess>false</LiftFreeAccess>
                        </AccessibilityLimitation>
                </limitations>
        </AccessibilityAssessment>
        <From>
                <PlaceRef>tbd:9100WIMBLDN_L2</PlaceRef>
                <LevelRef>tbd:9100WIMBLDN_Lvl_G0</LevelRef>
                <EntranceRef>tbd:9100WIMBLDN_A2b-EL2g</EntranceRef>
        </From>
        <To>
                <PlaceRef>tbd:9100WIMBLDN_L2</PlaceRef>
                <LevelRef>tbd:9100WIMBLDN_Lvl_PL</LevelRef>
                <EntranceRef>tbd:9100WIMBLDN_5n6_EL1pl</EntranceRef>
        </To>
        <Distance>0</Distance>
        <NumberOfSteps>0</NumberOfSteps>
        <AllowedUse>twoWay</AllowedUse>
        <FromToUpDown>down</FromToUpDown>
        <AccessFeatureType>lift</AccessFeatureType>
        <TransferDuration>
                <DefaultDuration>PT3M</DefaultDuration>
                <FrequentTravellerDuration>PT5M</FrequentTravellerDuration>
                <OccasionalTravellerDuration>PT5M</OccasionalTravellerDuration>
                <MobilityRestrictedTravellerDuration>PT10M</MobilityRestrictedTravellerDuration>
        </TransferDuration>
```

```
            <MaximumFlowPerMinute>200</MaximumFlowPerMinute>
            <checks>
                  <CheckConstraint>
                        <Id>tbd:9100WIMBLDN_lnk_A2b-EL2g_5n6-EL1_by-L2_C1</Id>
                        <validityConditions>
                              <AvailabilityCondition
                                    <Id>tbd:Av_openingHrs01</Id>
                                    <Description>Opening hours for Station</Description>
                              </AvailabilityCondition>
                        </validityConditions>
                        <CheckProcess>none</CheckProcess>
                        <CheckService>selfserviceMachine</CheckService>
                        <AccessFeatureType>lift</AccessFeatureType>
                        <Congestion>queue</Congestion>
                        <MinimumLikelyDelay>P1Y2M3DT10H30M</MinimumLikelyDelay>
                        <AverageDelay>P1Y2M3DT10H30M</AverageDelay>
                        <MaximumLikelyDelay>P1Y2M3DT10H30M</MaximumLikelyDelay>
                  </Check>
            </checks>
            <placeEquipments>
                  <LiftEquipment>
                        <Id>tbd:9100WIMBLDN_A2b_L2</Id>
                        <Name>Lift to Platforms 5 and 6</Name>
                        <Width>1.5</Width>
                        <WheelchairTurningCircle>1</WheelchairTurningCircle>
                        <ThroughLoader>false</ThroughLoader>
                        <Automatic>true</Automatic>
                  </LiftEquipment>
            </placeEquipments>
      </SitePathLink>

      <SitePathLink created="2010-05-17T09:30:47Z">
            <Id>tbd:9100WIMBLDN_lnk_A2b-EL2g_A2b-J5</Id>
            <Name>From Upper Concourse Lift Entrance 2 to Lift Area Path Junction 5</Name>
            <AccessibilityAssessment>
                  <MobilityImpairedAccess>true</MobilityImpairedAccess>
                  <limitations>
                        <AccessibilityLimitation
                              <WheelchairAccess>true</WheelchairAccess>
                              <StepFreeAccess>true</StepFreeAccess>
                              <EscalatorFreeAccess>true</EscalatorFreeAccess>
                              <LiftFreeAccess>true</LiftFreeAccess>
                        </AccessibilityLimitation>
                  </limitations>
            </AccessibilityAssessment>
            <Covered>indoors</Covered>
            <From>
                  <PlaceRef>tbd:9100WIMBLDN_A2b</PlaceRef>
                  <EntranceRef>tbd:9100WIMBLDN_A2b-EL2g</EntranceRef>
            </From>
            <To>
                  <PlaceRef>tbd:9100WIMBLDN_A2b_J5</PlaceRef>
            </To>
            <Distance>5.00</Distance>
            <NumberOfSteps>0</NumberOfSteps>
            <AllowedUse>twoWay</AllowedUse>
            <FromToUpDown>level</FromToUpDown>
            <AccessFeatureType>confinedSpace</AccessFeatureType>
            <TransferDuration>
                  <DefaultDuration>PT30S</DefaultDuration>
            </TransferDuration>
            <MaximumFlowPerMinute>200</MaximumFlowPerMinute>
            <LevelRef>tbd:9100WIMBLDN_Lvl_G0</LevelRef>
      </SitePathLink>
</pathLinks>
```

Figure 4-31 – XML Example of Navigation Path PathLinks

4.4 Use of *NeTEx* with partial data

NeTEx is designed so that the same data model may be used for an initial data set that is only partially populated, say just with basic stop names and locations, and for a fully populated data set that has all stop details including detailed PATH LINKs and EQUIPMENT. This allows for the incremental development of data sets over time. Different degrees of population enable different levels of function:

1. **Point**: Just the entrance and the platform is populated, implicit navigation paths can be inferred between entrance and platform, but accessibility may be unknown (Capability Level0).
2. **Structural/Geospatial**: Summary level accessibility is defined (Capability Level2) the rooms and platforms are identified and located in space, but the exact topology is not specified.
3. **Topological:** The rooms and platforms are identified and located in space, exact path links are provided through the interchange, with entrances and accessibility attributes all identified. (Capability Level3, Level5, Level6).

Figure 4-32, Figure 4-33 and Figure 4-34 illustrate this. Figure 4-32 shows a barebones description of a station as just an ENTRANCE and a platform i.e. QUAY. The QUAY might be additionally tagged with accessibility data to show for example that it can be reached without use of stairs or without use of lifts.

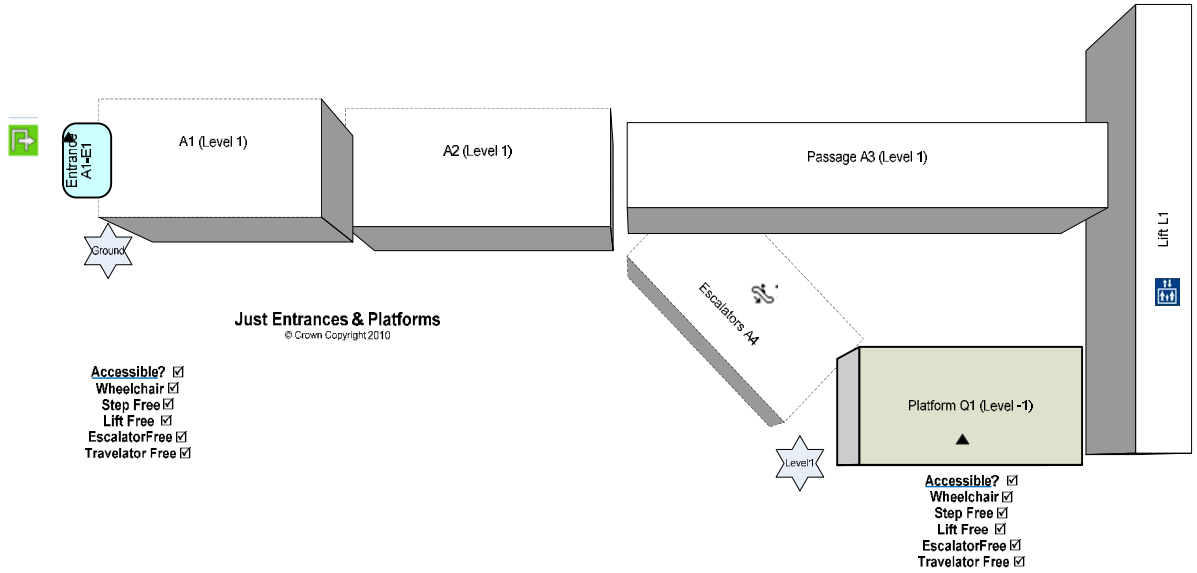


Figure 4-32 – Detail 1: Populating with Entrances and Quays only

Figure 4-33 shows in addition a summary level NAVIGATION PATH that indicates the accessibility of the platform regardless of route. In this case the NAVIGATION PATH is used at a summary level without detailed PATH LINKs.

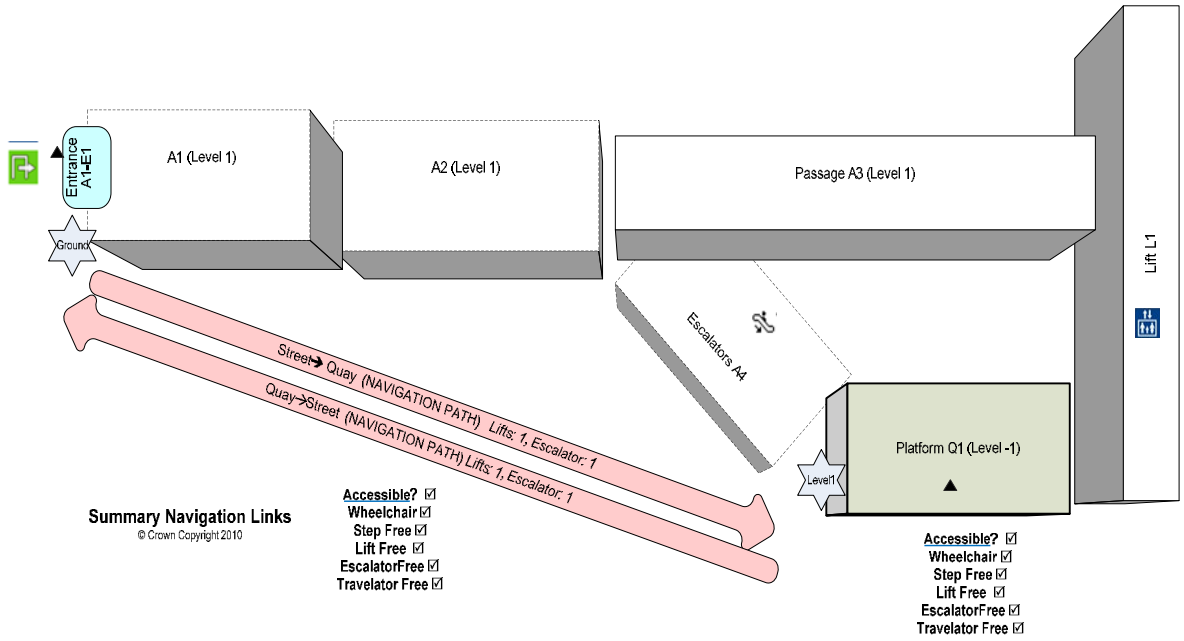


Figure 4-33 – Detail 2: Populating with summary navigation paths

Figure 4-34 shows the same station more fully populated with PATH LINKs and separately routed NAVIGATION PATHs for different accessibility conditions (*Lift free, Step free* etc).

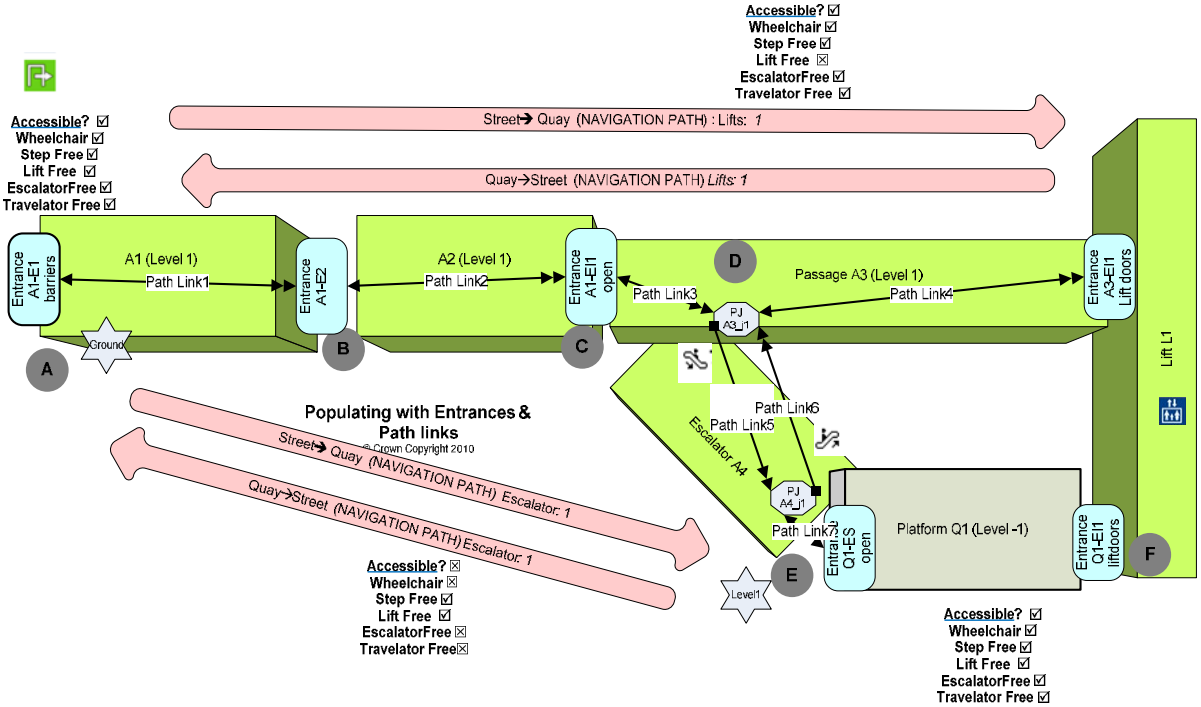


Figure 4-34 – Detail 3: Populating with links and branch points

4.5 Representing Lifts, Stairs, Escalators and Travelators,

For a journey planning, only a simple topological description of a station is needed, indicating the connectivity between QUAYs and external ENTRANCEs. For in station navigation, a more detailed representation that includes details every step of each path between two points may be useful.

Lifts and stairs and other access mechanisms such as escalators, travelators and ramps may be thus represented to different levels of detail in *NeTEx*, for example:

(a) As a summary count of features on a NAVIGATION PATH, e.g. the total number of lifts or escalators encountered on a path.
(b) As a PATH LINK describing the traversal direction for using the stairs or lift and the number of steps in each flight.
(c) As an ACCESS SPACE of type *lift* or *stairs, etc* allowing the stair well or lift shaft to be identified on a plan. This can have an associated ACCESS EQUIPMENT of a specific type such as LIFT EQUIPMENT, STAIR EQUIPMENT, ESCALATOR EQUIPMENT, etc describing the exact properties of the Lift or stairs (e.g. dimensions, capacity, handrails, controls etc).
(d) More than one item of EQUIPMENT can be positioned in an ACCESS SPACE, so for example there could be additional STAIR EQUIPMENT for each flight of stairs in a STAIRCASE, describing the number of stairs, handrail particulars, etc of each separate flight.
(e) To provide step by step guidance, intermediate PATH JUNCTIONs and PATH LINKs giving the distance to each flight could be provided.

To support the highest capability level it will be appropriate to include all of the above data. To support just a Capability Level2 it will generally be sufficient to use just NAVIGATION PATH and or a single ACCESS SPACE per Lift or escalator.

➔UK NOTE: Detailed step data is welcome where available.

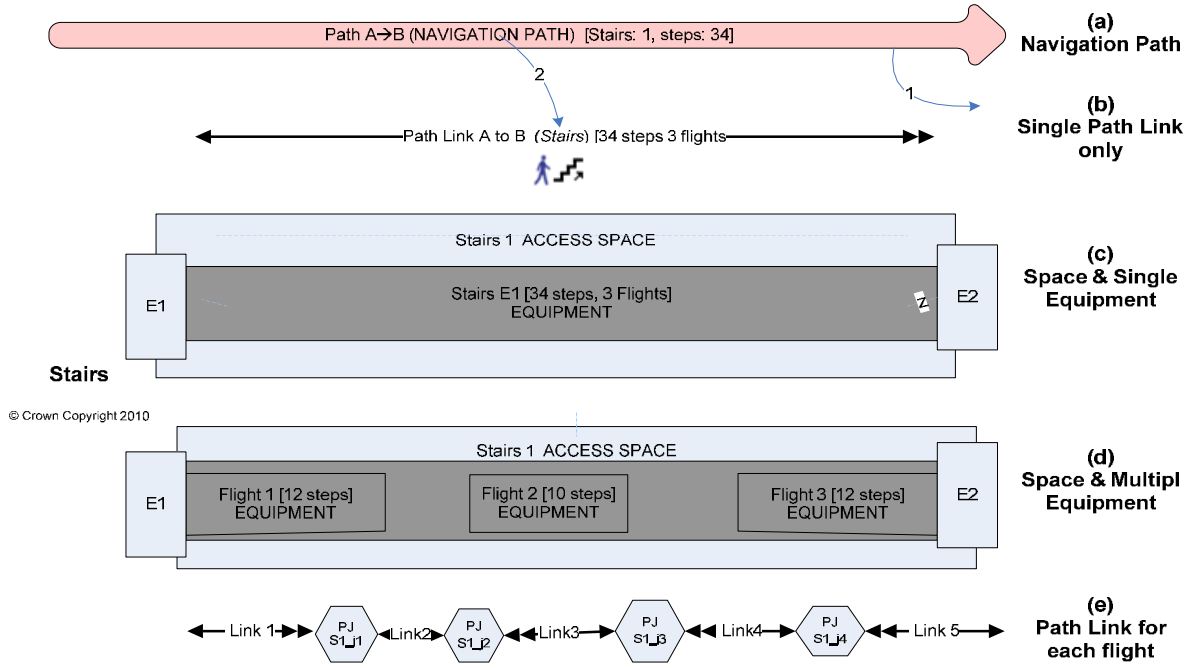


Figure 4-35 – Representing Stairs with different degrees of detail

4.5.1 XML Example of a Lift

The following XML code fragment shows an ACCESS SPACE of type *lift*. It has a LIFT EQUIPMENT associated with the space that applies to all use of the lift.

```
<AccessSpace created="2010-05-17T09:30:47Z">
        <Id>tbd:9100WIMBLDN_L1</Id>
        <Name>Lift Shaft to Underground</Name>
        <AccessibilityAssessment created="2010-05-17T09:30:47Z">
                <MobilityImpairedAccess>true</MobilityImpairedAccess>
                <limitations>
                        <AccessibilityLimitation created="2010-05-17T09:30:47Z">
                                <WheelchairAccess>true</WheelchairAccess>
                                <StepFreeAccess>true</StepFreeAccess>
                                <EscalatorFreeAccess>true</EscalatorFreeAccess>
                                <LiftFreeAccess>false</LiftFreeAccess>
                                <AudibleSignalsAvailable>false</AudibleSignalsAvailable>
                                <VisualSignsAvailable>true</VisualSignsAvailable>
                        </AccessibilityLimitation>
                </limitations>
        </AccessibilityAssessment>
        <Covered>indoors</Covered>
        <LevelRef> </LevelRef>
        <equipmentPlaces>
                <EquipmentPlace>
                        <Id>tbd:9100WIMBLDN_L1ep1</Id>
                        <placeEquipments>
                                <LiftEquipment>
                                        <Id>tbd:9100WIMBLDN_A2b_L2</Id>
                                        <Name>Lift to Platforms 5 and 6</Name>
                                        <Width>1.5</Width>
                                        <WheelchairTurningCircle>1</WheelchairTurningCircle>
                                        <ThroughLoader>false</ThroughLoader>
                                        <Automatic>true</Automatic>
                                </LiftEquipment>
                        </placeEquipments>
                </EquipmentPlace>
        </equipmentPlaces>
        <Description>Lift Shaft 1 to District line</Description>
        <AccessSpaceType>lift</AccessSpaceType>
        <accessSpaceEntrances>
                <EntranceRef>:Id>tbd:9100WIMBLDN_A2b-EL1g</EntranceRef>
                <EntranceRef>tbd:9100WIMBLDN_A5_EL1</EntranceRef>
        </accessSpaceEntrances>
</AccessSpace>
…..
```

Figure 4-36 – XML Example of Lift Access Space

4.5.2 XML Example of a Simple Stairs

The following XML code fragment shows a staircase represented just as a PATH LINK that has as a STAIR EQUIPMENT associated with it describing a staircase of 26 steps. This models the staircase as a single piece of equipment associated with a link.

```
<SitePathLink created="2010-05-17T09:30:47Z">
        <Id>tbd:9100WIMBLDN_lnk_S2_5n6_S2</Id>
        <Name>From Upper Concourse Corridor to Platforms 5 and 6 by stairs 2</Name>
        <AccessibilityAssessment created="2010-05-17T09:30:47Z">
                <MobilityImpairedAccess>false</MobilityImpairedAccess>
                <limitations>
                        <AccessibilityLimitation created="2010-05-17T09:30:47Z">
                                <WheelchairAccess>false</WheelchairAccess>
                                <StepFreeAccess>false</StepFreeAccess>
                                <EscalatorFreeAccess>true</EscalatorFreeAccess>
                                <LiftFreeAccess>true</LiftFreeAccess>
                        </AccessibilityLimitation>
                </limitations>
        </AccessibilityAssessment>
        <Covered>indoors</Covered>
```

```
        <From>
                <PlaceRef>tbd:9100WIMBLDN_A2</PlaceRef>
                <LevelRef>tbd:9100WIMBLDN_Lvl_G0</LevelRef>
                <EntranceRef>tbd:9100WIMBLDN_A2_ES2g</EntranceRef>
        </From>
        <To>
                <PlaceRef>tbd:9100WIMBLDN_5n6</PlaceRef>
                <LevelRef>tbd:9100WIMBLDN_Lvl_PL</LevelRef>
                <EntranceRef>tbd:9100WIMBLDN_5n6_ES1pl</EntranceRef>
        </To>
        <Distance>20.00</Distance>
        <NumberOfSteps>26</NumberOfSteps>
        <AllowedUse>twoWay</AllowedUse>
        <FromToUpDown>down</FromToUpDown>
        <AccessFeatureType>stairs</AccessFeatureType>
        <TransferDuration>
                <DefaultDuration>PT3M</DefaultDuration>
                <FrequentTravellerDuration>PT5M</FrequentTravellerDuration>
                <OccasionalTravellerDuration>PT5M</OccasionalTravellerDuration>
                <MobilityRestrictedTravellerDuration>PT10M</MobilityRestrictedTravellerDuration>
        </TransferDuration>
        <MaximumFlowPerMinute>200</MaximumFlowPerMinute>
        <placeEquipments>
                <StaircaseEquipment>
                        <Id>tbd:9100WIMBLDN_A2b_S2</Id>
                        <Name>Stairs to Platforms 5 and 6</Name>
                        <NumberOfSteps>26</NumberOfSteps>
                        <StepHeight>0.15</StepHeight>
                        <HandrailHeight>1.2</HandrailHeight>
                        <HandrailType>bothSides</HandrailType>
                        <SpiralStair>false</SpiralStair>
                </StaircaseEquipment>
        </placeEquipments>
</SitePathLink>
```

Figure 4-37 – XML Example of Stair Access Space

4.5.3 XML Example of a Multi-flight Staircase

The following XML code fragment shows a more elaborate representation of a staircase of 26 steps described as two flights of stairs – this would allow a step by step description or visualisation, but does not add further information the journey planning There is a ***AccessSpace*** for the staircase with an overall ***StairEquipment*** associated with it. There are two distinct ***SitePathLink*** instances, one for each flight of 13 steps and an intermediate path Junction.

```
<accessSpaces>
        <AccessSpace created="2010-05-17T09:30:47Z">
                <Id>tbd:9100WIMBLDN_A5</Id>
                <Name>Underground District Line Stairs</Name>
                <AccessibilityAssessment created="2010-05-17T09:30:47Z">
                        <MobilityImpairedAccess>true</MobilityImpairedAccess>
                        <limitations>
                                <AccessibilityLimitation created="2010-05-17T09:30:47Z">
                                        <WheelchairAccess>false</WheelchairAccess>
                                        <StepFreeAccess>false</StepFreeAccess>
                                        <EscalatorFreeAccess>true</EscalatorFreeAccess>
                                        <LiftFreeAccess>true</LiftFreeAccess>
                                </AccessibilityLimitation>
                        </limitations>
                </AccessibilityAssessment>
                <Covered>covered</Covered>
                <LevelRef>tbd:9100WIMBLDN_Lvl_PL</LevelRef>
                <equipmentPlaces>
                        <EquipmentPlace>
                                <Id>tbd:9100WIMBLDN_A5_PE</Id>
                                <Description>District line lower concourse with access to platforms</Description>
                                <AccessSpaceType>concourse</AccessSpaceType>
                                <accessSpaceEntrances>
                                        <EntranceRef>tbd:9100WIMBLDN_A5_EL1</EntranceRef>
                                        <EntranceRef>tbd:9100WIMBLDN_A5_SL1</EntranceRef>
```

```
                    </accessSpaceEntrances>
                        </AccessSpace>
                        <AccessSpace created="2010-05-17T09:30:47Z">
                    <Id>tbd:9100WIMBLDN_S1</Id>
                    <Name>Staircase to DL </Name>

                    <Covered>indoors</Covered>
                    <placeEquipments>
                        <StaircaseEquipment>
                            <Id>tbd:9100WIMBLDN_S1_Eq-Sc1</Id>
                            <Name>Stair case 1</Name>
                            <Width>2</Width>
                            <NumberOfSteps>26</NumberOfSteps>
                            <StepHeight>0.25</StepHeight>
                            <HandrailType>bothSides</HandrailType>
                            <SpiralStair>false</SpiralStair>
                            <NumberOfFlights>2</NumberOfFlights>
                        </StaircaseEquipment>
                    </placeEquipments>
                    <Description>Staircase down to DL concourse - two flights of 13 steps</Description>
                    <AccessSpaceType>staircase</AccessSpaceType>
                    <accessSpaceEntrances>
                        <EntranceRef>tbd:9100WIMBLDN_A5_ES1pl</EntranceRef>
                        <EntranceRef>tbd:9100WIMBLDN_A2_ES1g</EntranceRef>
                    </accessSpaceEntrances>
</AccessSpace>…..

<SitePathLink created="2010-05-17T09:30:47Z">
        <Id>tbd:9100WIMBLDN_lnk_A2_A5_S1-top</Id>
        <Name>From Upper Concourse to district line concourse by stairs 1 - top flight </Name>
        <Covered>indoors</Covered>
        <From>
            <PlaceRef>tbd:9100WIMBLDN_A2</PlaceRef>
            <LevelRef>tbd:9100WIMBLDN_Lvl_G0</LevelRef>
            <EntranceRef>tbd:9100WIMBLDN_A2_ES1g</EntranceRef>
        </From>
        <To>
            <PlaceRef>tbd:9100WIMBLDN_S1_j1</PlaceRef>
        </To>
        <Distance>10.00</Distance>
        <NumberOfSteps>13</NumberOfSteps>
        <AllowedUse>twoWay</AllowedUse>
        <FromToUpDown>down</FromToUpDown>
        <AccessFeatureType>stairs</AccessFeatureType>
        <TransferDuration>
            <DefaultDuration>PT30s</DefaultDuration>
            <MobilityRestrictedTravellerDuration>PT3M</MobilityRestrictedTravellerDuration>
        </TransferDuration>
</SitePathLink>

<SitePathLink created="2010-05-17T09:30:47Z">
        <Id>tbd:9100WIMBLDN_lnk_A2_A5_S1-bot</Id>
        <Name>From Upper Concourse to district line concourse by stairs 1 bottom flight </Name>
        <Covered>indoors</Covered>
        <From>
            <PlaceRef>tbd:9100WIMBLDN_S1_j1</PlaceRef>
        </From>
        <To>
            <PlaceRef>tbd:9100WIMBLDN_A5</PlaceRef>
            <LevelRef>tbd:9100WIMBLDN_Lvl_PL</LevelRef>
            <EntranceRef>tbd:9100WIMBLDN_A5_ES1</EntranceRef>
        </To>
        <Distance>10.00</Distance>
        <NumberOfSteps>13</NumberOfSteps>
        <AllowedUse>twoWay</AllowedUse>
        <FromToUpDown>down</FromToUpDown>
        <AccessFeatureType>stairs</AccessFeatureType>
        <TransferDuration>
            <DefaultDuration> PT30s </DefaultDuration>
            <MobilityRestrictedTravellerDuration>PT3M</MobilityRestrictedTravellerDuration>
        </TransferDuration>
```

```
</SitePathLink>
```

Figure 4-38 – XML Example of Multi-flight Stairs

4.5.4 XML Example of an Escalator

The following XML code fragment shows an ***EscalatorEquipment*** describing an escalator.

```
<EscalatorEquipment>
        <Id>tbd:9100WIMBLDN_A2b_E2</Id>
        <DirectionOfUse>down</DirectionOfUse>
        <PassengersPerMinute>70</PassengersPerMinute>
        <StepHeight>0.25</StepHeight>
        <HandrailHeight>035</HandrailHeight>
        <TactileActuators>true</TactileActuators>
        <EnergySaving>true</EnergySaving>
</EscalatorEquipment>
```

Figure 4-39 – XML Example of Escalator Equipment

4.5.5 XML Example of an Ramp

The following XML code fragment shows a ***RampEquipment*** describing a ramp.

```
<RampEquipment>
        <Id>tbd:9100WIMBLDN_P1_RM-1</Id>
        <Name>Ramp from car park</Name>
        <Width>2</Width>
        <DirectionOfUse>both</DirectionOfUse>
        <Length>40</Length>
        <GradientType>gentle</GradientType>
        <HandrailType>none</HandrailType>
</RampEquipment>
```

Figure 4-40 – XML Example of Ramp Equipment

4.5.6 XML Example of a Navigation Path Summary for Stairs

The following XML code fragment shows a staircase represented just in summary on a NAVIGATION PATH – the total number of stairs is mentioned but no other detail.

```
<NavigationPath created="2010-05-17T09:30:47Z">
        <Id>tbd:9100WIMBLDN_A1-EE1_to_DL-notacc</Id>
        <AccessibilityAssessment created="2010-05-17T09:30:47Z">
                <MobilityImpairedAccess>false</MobilityImpairedAccess>
                <limitations>
                        <AccessibilityLimitation created="2010-05-17T09:30:47Z>
                                <Id>tbd:9100WIMBLDN_A1-EE1_to_DL-notacc-01</Id>
                                <WheelchairAccess>false</WheelchairAccess>
                                <StepFreeAccess>false</StepFreeAccess>
                                <EscalatorFreeAccess>true</EscalatorFreeAccess>
                                <LiftFreeAccess>true</LiftFreeAccess>
                        </AccessibilityLimitation>
                </limitations>
        </AccessibilityAssessment>
        <features>
                <AccessSummary>
                        <AccessFeatureType>stairs</AccessFeatureType>
                        <Count>26</Count>
                        <Transition> down</Transition>
                </AccessSummary>
        </features>
        <Name>Street to District Line - By Stairs</Name>
        <TypeOfNavigation>streetToQuay</TypeOfNavigation>
</NavigationPath>
```

Figure 4-41 – XML Example of NavigationPath Summary

4.5.7 Representing a Lift between multiple floors

A lift that runs between more than two floors can be regarded as a single ACCESS SPACE with multiple ENTRANCEs, each on different LEVELs.

- It is not necessary to have a PATH LINK between every entrance and exit of a lift, since there is an implication of connectedness between all entrances to a lift. Instead PATH LINKs can be connected to the single Lift ACCESS SPACE at a specific LEVEL. Marking an ACCESS SPACE as a lift implies topology connection between every floor with an entrance.
- It is not always necessary to have an ACCESS SPACE for a simple flight of stairs – a PATH LINK with STAIR EQUIPMENT (see later) may suffice.

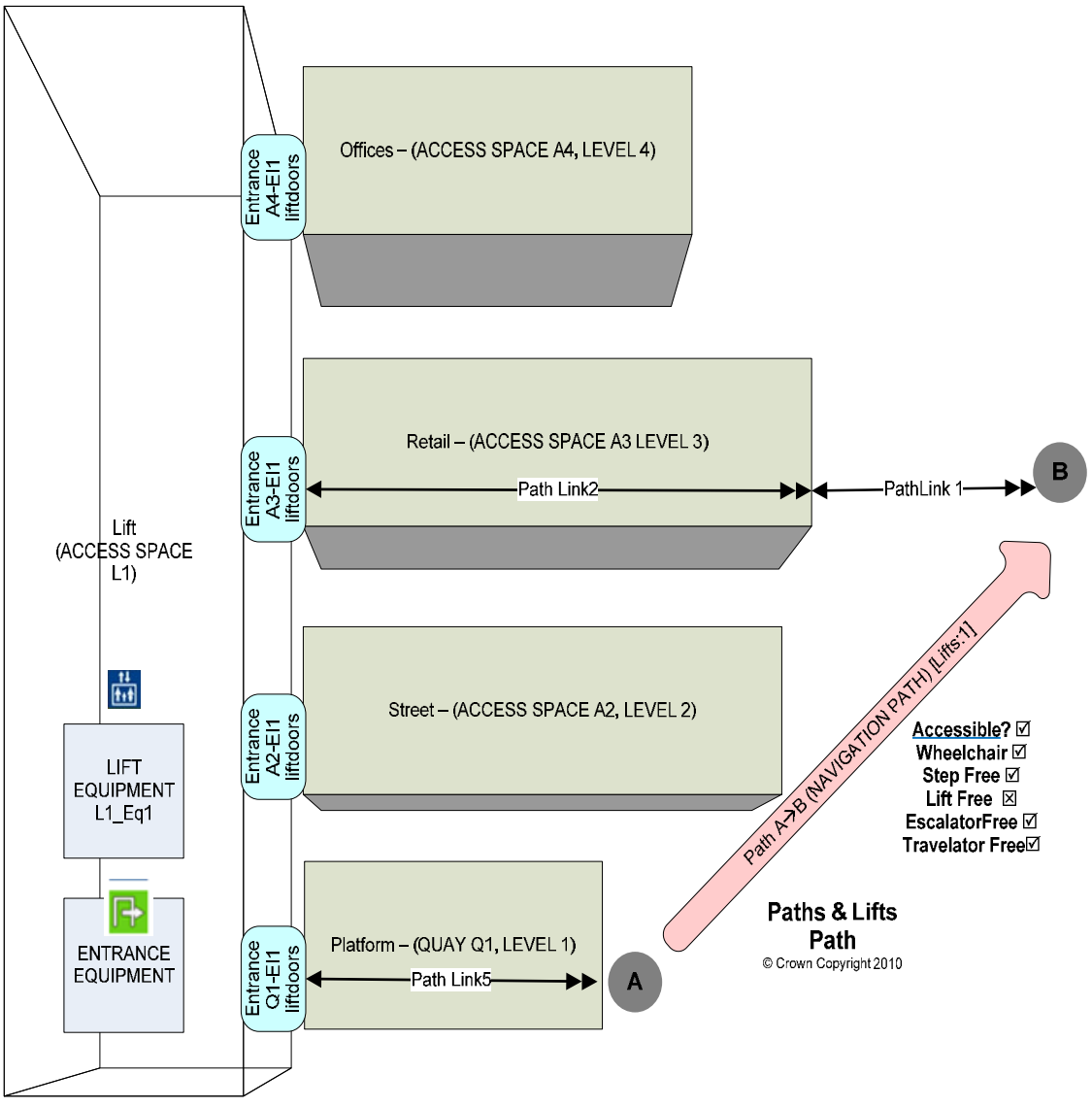


Figure 4-42 – *NeTEx* Path links and Lifts

4.5.8 Branched Navigation Paths

A NAVIGATION PATH may contain branches that show alternative courses for parts of the way. Figure 4-43 illustrates a visualisation of such a path.

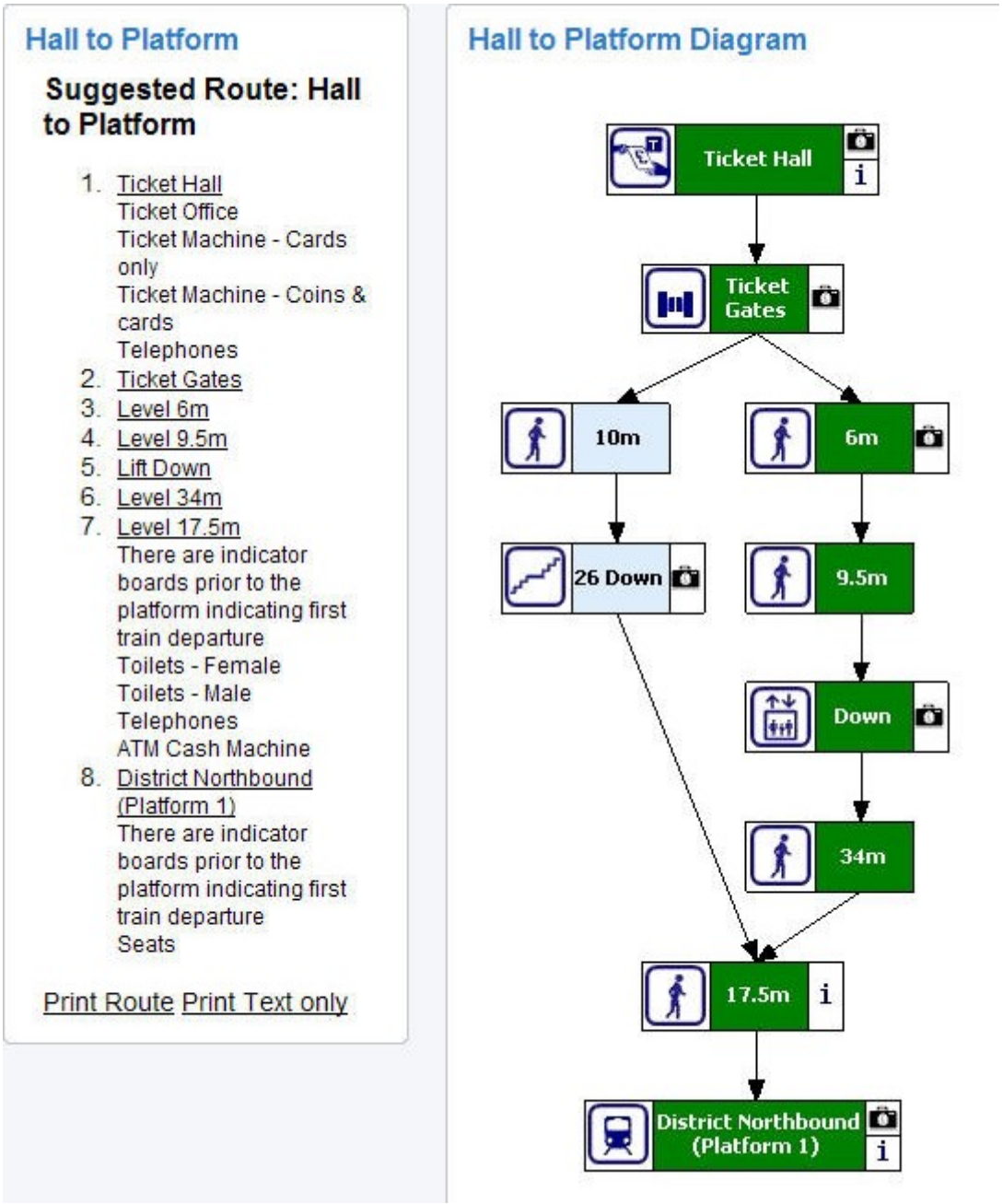


Figure 4-43 – Example visualisation of a branched Path (Direct Enquiries.com)

In this case the PATH is represented as using PATH JUNCTIONs for the branch points see, Figure 4-44. . The NAVIGATION PATH is specified as a sequence of PLACE REF IN SEQUENCE elements, each of which indicates one or more references to onward PATH LINKs.

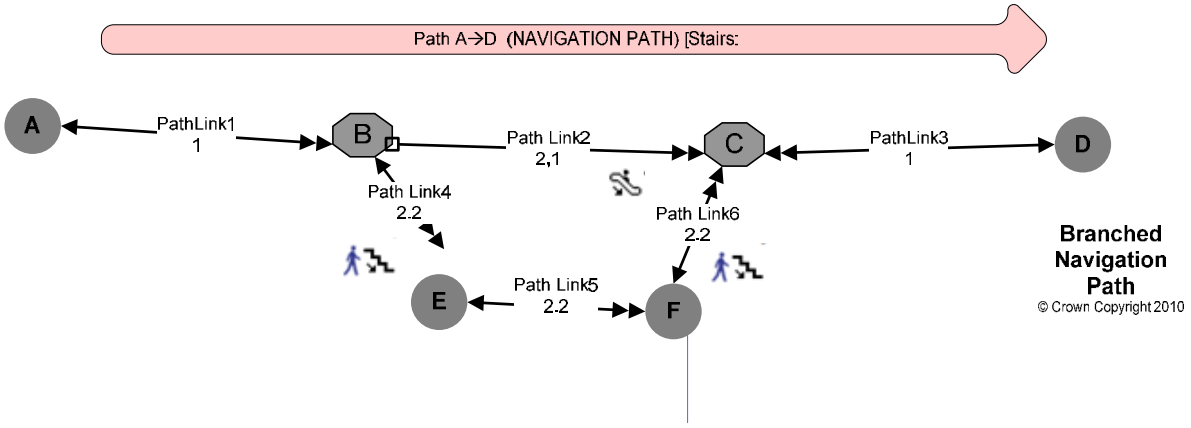


Figure 4-44 – *NeTEx* Branched Navigation Paths illustration

4.5.9 XML Example of a Branched Navigation Path

The following XML code fragment shows a branched path that has both Stair and Lift alternatives for the last part.

```
<NavigationPath created="2010-05-17T09:30:47Z">
        <Id>tbd:490G00272P_ST-StopD_to_DL</Id>
        <AccessibilityAssessment created="2010-05-17T09:30:47Z" modification="new"
dataSourceRef="XtraAccessibilityData">
                <MobilityImpairedAccess>true</MobilityImpairedAccess>
                <limitations>
                        <AccessibilityLimitation created="2010-05-17T09:30:47Z" modification="new"
                                <Id>tbd:490G00272P_ST-StopD_to_DL_01</Id>
                                <WheelchairAccess>true</WheelchairAccess>
                                <StepFreeAccess>true</StepFreeAccess>
                                <EscalatorFreeAccess>true</EscalatorFreeAccess>
                                <LiftFreeAccess>true</LiftFreeAccess>
                        </AccessibilityLimitation>
                </limitations>
        </AccessibilityAssessment>
        <Name>Ticket Hall District line- Branched by stairs</Name>
        <TypeOfNavigation>hallToQuay</TypeOfNavigation>

        <placeRefsInSequence>
                <PlaceRefInSequence order="1">
                        <PlaceRef>tbd:9100WIMBLDN_A1</PlaceRef>
                        <BranchLevel>1</BranchLevel>
                        <Description>Ticket Hall </Description>
                        <onwardLinks>
                                <PathLinkInSequence order="5">
                                        <PathLinkRef>tbd:9100WIMBLDN_lnk_A1-EI1_A2-j2</PathLinkRef>
                                        <Description>From Upper concourse internal entrance to path junction
2</Description>
                                        <Reverse>false</Reverse>
                                        <Heading>forward</Heading>
                                </PathLinkInSequence>
                        </onwardLinks>
                </PlaceRefInSequence>

                <PlaceRefInSequence order="2">
                        <PlaceRef>tbd:9100WIMBLDN_A2-j2</PlaceRef>
                        <BranchLevel>1</BranchLevel>
                        <Description>Path Junction j2 in Upper Concourse Ticket Hall (BRANCH POINT)</Description>
                        <onwardLinks>
                                <PathLinkInSequence order="1">
                                        <PathLinkRef>tbd:9100WIMBLDN_lnk_A2-j2-A2_j1</PathLinkRef>
                                        <Description>From Upper concourse path junction 2 in path junction 1
concourse</Description>
                                        <Reverse>true</Reverse>
                                </PathLinkInSequence>
```

```
                        <PathLinkInSequence order="1">
                            <PathLinkRef>tbd:9100WIMBLDN_lnk_A2b_EI1-A2-j2</PathLinkRef>
                            <Description>From Entrance1 to Lift Area in Upper concourse to path junction 2 in
Upper concourse</Description>
                            <Reverse>true</Reverse>
                        </PathLinkInSequence>
                    </onwardLinks>
                </PlaceRefInSequence>

                <PlaceRefInSequence order="2">
                    <PlaceRef>tbd:9100WIMBLDN_A2-j1</PlaceRef>
                    <BranchLevel>2.1</BranchLevel>
                    <Description>Path Junction j1 in Upper Concourse Ticket Hall </Description>
                    <onwardLinks>
                        <PathLinkInSequence order="1">
                            <PathLinkRef>tbd:9100WIMBLDN_lnk_A2-j1-A2_ES1g</PathLinkRef>
                            <Description>From Entrance to stairs 1 in Upper concourse to path junction 1 in Upper
concourse</Description>
                            <Reverse>true</Reverse>
                        </PathLinkInSequence>
                    </onwardLinks>
                </PlaceRefInSequence>

                <PlaceRefInSequence order="2">
                    <PlaceRef>tbd:9100WIMBLDN_S1</PlaceRef>
                    <BranchLevel>2.1</BranchLevel>
                    <Description>Stairs 1</Description>
                    <onwardLinks>
                        <PathLinkInSequence order="2">
                            <PathLinkRef>tbd:9100WIMBLDN_lnk_A2-ES2g-5n6_ES1pl</PathLinkRef>
                            <Description>From Upper Concourse Entrance to Stairs 1 to District Line Concourse
Entrance to stairs by stairs</Description>
                            <Reverse>false</Reverse>
                            <Transition>down</Transition>
                        </PathLinkInSequence>
                    </onwardLinks>
                </PlaceRefInSequence>

                <PlaceRefInSequence order="2">
                    <PlaceRef>tbd:9100WIMBLDN_A2b-j1</PlaceRef>
                    <BranchLevel>2.1</BranchLevel>
                    <Description>Upper Concourse Lift Area path junction 1</Description>
                    <onwardLinks>
                        <PathLinkInSequence order="3">
                            <PathLinkRef>tbd:9100WIMBLDN_lnk_A2b-EL2_A2b-EI2</PathLinkRef>
                            <Description>From Lift Entrance 1 in Lift Area in Upper concourse to path junction 1 in
Lift area in Upper concourse </Description>
                            <Reverse>false</Reverse>
                            <Heading>forward</Heading>
                        </PathLinkInSequence>
                    </onwardLinks>
                </PlaceRefInSequence>

                <PlaceRefInSequence order="3">
                    <PlaceRef>tbd:9100WIMBLDN_L2</PlaceRef>
                    <BranchLevel>2.1</BranchLevel>
                    <Description> Lift 2 to platform 5 and 6</Description>
                    <onwardLinks>
                        <PathLinkInSequence order="4">
                            <PathLinkRef>tbd:9100WIMBLDN_lnk_A2b-EL1g_A5-EL1pl</PathLinkRef>
                            <Description>From Lift AREA Lift 1 to Platform 5 and 6 Lift1 Entrance</Description>
                            <Reverse>false</Reverse>
                            <Transition>down</Transition>
                        </PathLinkInSequence>
                    </onwardLinks>
                </PlaceRefInSequence>
                <PlaceRefInSequence order="7">
                    <PlaceRef>tbd:9100WIMBLDN_DL</PlaceRef>
                    <BranchLevel>1</BranchLevel>
                    <Description>Platform 1</Description>
                </PlaceRefInSequence>
```

```
        </placeRefsInSequence>
</NavigationPath>
```

Figure 4-45 – XML Example of Branched Path

4.5.10 Controlling the appearance of Navigation Paths

A NAVIGATION PATH should be a topologically correct description of a route between two points including all the intermediate steps, each as a referenced PATH LINK. However it may be that the optimal or desired presentation of the route in a visual presentation omits or modifies some steps, This may be achieved by means of the PATH IN VIEW element which can be used to control the appearance of an individual step.

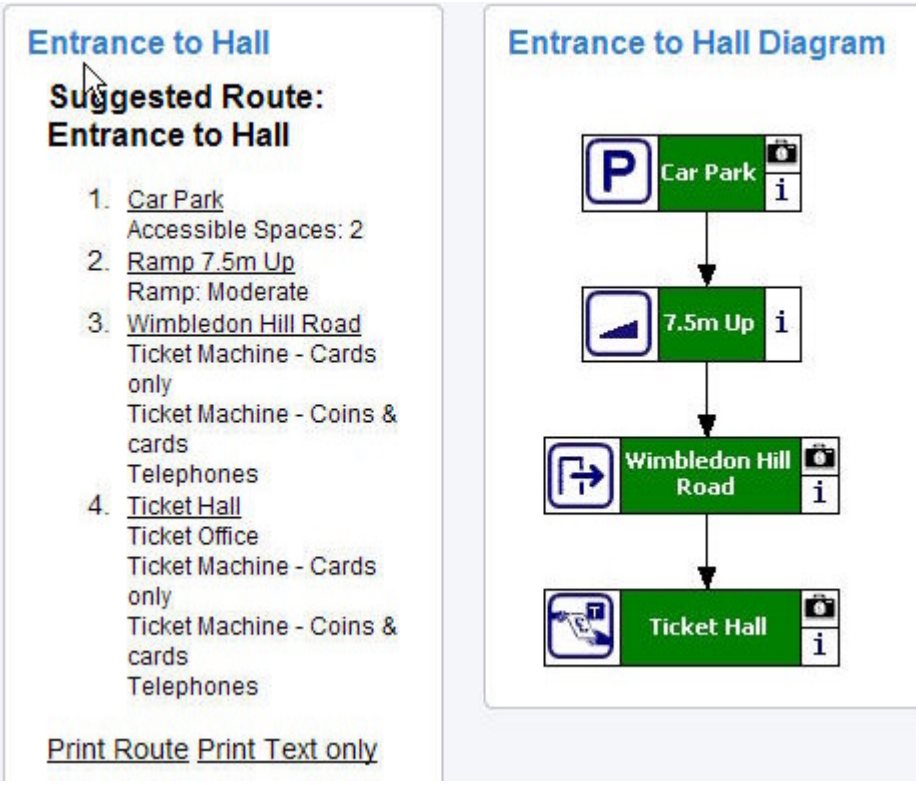


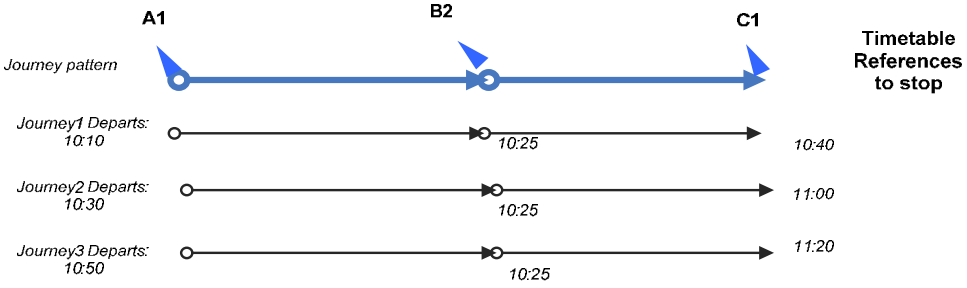
Figure 4-46 – View of a Navigation Path

[ADD EXAMPLE g three flights of stairs shown as single step]

4.6 *NeTEx* Stop Assignment

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).
Figure 4-47, Figure 4-48 and Figure 4-49 attempt to convey this distinction by showing the same three stops (a) as points on 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 4-47 – Stops as places on a line



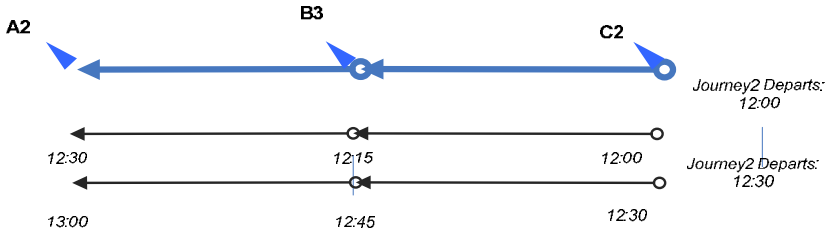


Figure 4-48 – Stops as stopping points in the timetable

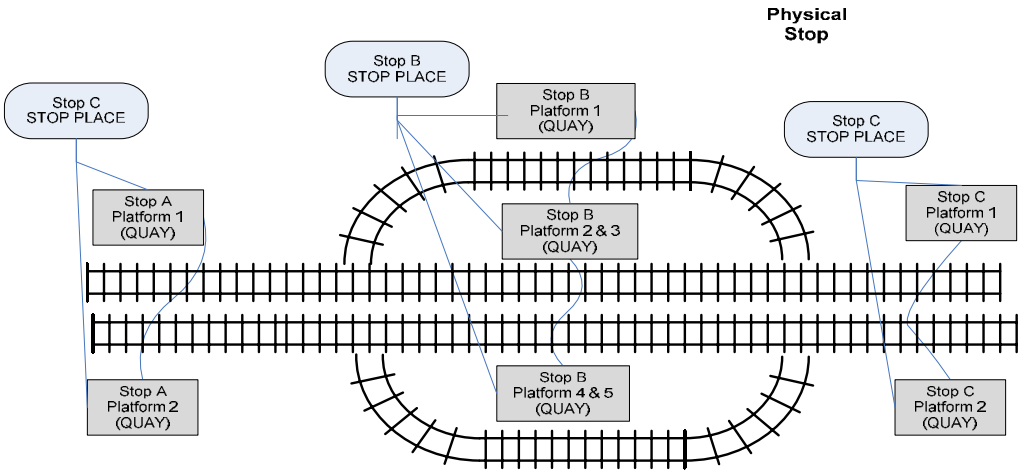


Figure 4-49 – Stops as physical places

NeTEx clarifies these various possible relationships. It represents the logical stop in the timetable as a distinct concept, the SCHEDULED STOP POINT. It represents the physical point of access as a QUAY i.e. platform or pole. 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, *NeTEx* 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 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.
There can potentially be multiple assignments of the same STOP PLACE.

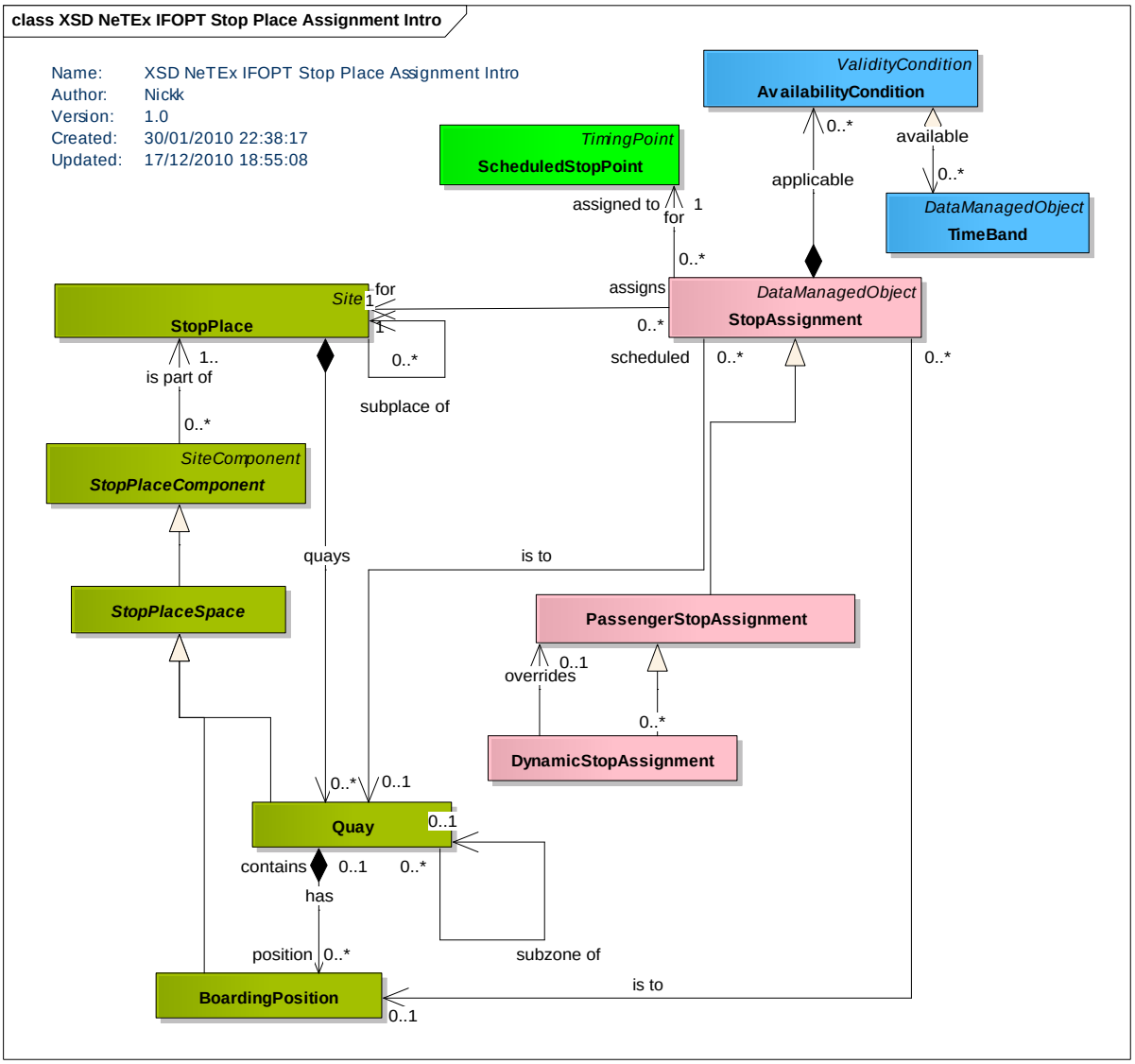


Figure 4-50 – UML Diagram of Stop Assignment: UML Model summary

➔ **UK NOTE:** Most current *NaPTAN* stop assignments for bus are implicit – the same code is used for the SCHEDULED STOP POINT and the QUAY.

For Rail and Metro, the explicit stop assignments are in effect currently described in the *NaPTAN* data set by the *NaPTAN annotated references.* For example for rail stations ***AnnotatedRailRef (***which holds TIPLOCS and CRS codes for the NaPTAN point***)***, for metro stations ***AnnotatedMetro-Ref***, etc, elements. These can be used to translate the codes used to reference the stop in the timetable to the NaPTAN equivalents. For example, for rail, one can use the CRS code to create a corresponding STOP ASSIGNMENT: so that the '*WIM'* SCHEDULED STOP POINT is assigned to 9100WIMBLEDON '*Wimbledon'*. . However a further platform level stop assignment would be needed to state more specifically that a train will stop at say *Platform 3* within the Wimbledon stop place.

Most UK rail and metro stop identifier actually encode the identifier SCHEDULED STOP POINT in the NaPTAN code so that that one may be derived from the other without an explicit assignment.

The NaPTAN stop type of a variable bay corresponds to a STOP ASSIGNMENT – a DYNAMIC STOP ASSIGNMENT can be used to assign to a variable bay to a specific bay.

4.6.1 Example of a Stop Assignment

Figure 4-51 shows some of the PASSENGER STOP ASSIGNMENTs for the Wimbledon Example. 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.

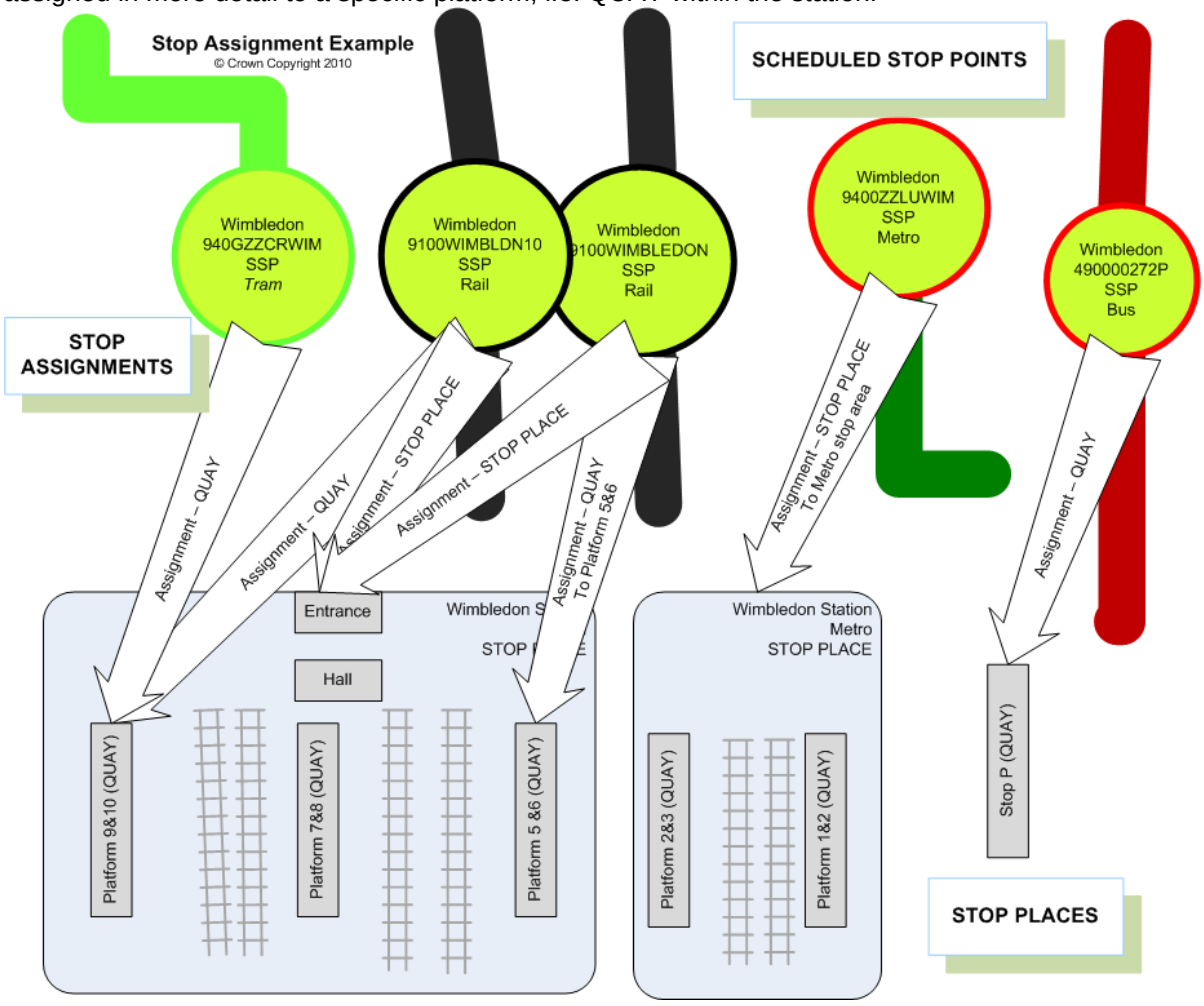


Figure 4-51 – Some Stop Assignments for the Wimbledon example

4.6.2 XML Example of a Stop Assignment

The following XML code fragment shows several PASSENGER STOP ASSIGNMENTs for a rail station.

The first example assigns a second train timetable reference i.e. SCHEDULED STOP POINT for the station (‘*napt:9100WIMBLDN10’*) that has a different code from that of STOP PLACE for the station *(‘napt:9100WIMBLDN’*).

```
<PassengerStopAssignment>
        <Id>tbd:wimass_01</Id>
        <Description>Rail Assignment</Description>
        <StopPlaceRef>napt:9100WIMBLDN</StopPlaceRef>
        <ScheduledStopPointRef>9100WIMBLDN10</ScheduledStopPointRef>
</PassengerStopAssignment>
```

The second example assigns a rail SCHEDULED STOP POINT to a specific platform i.e. QUAY of the rail station.

```
<PassengerStopAssignment>
        <Id>tbd:wimass_02</Id>
        <Description>Rail Assignment of n9100WIMBLDN10 to platform 5 and 6 </Description>
        <StopPlaceRef>napt:9100WIMBLDN</StopPlaceRef>
        <QuayRef>napt: 9100WIMBLDN5n6</QuayRef>
        <ScheduledStopPointRef>n9100WIMBLDN10</ScheduledStopPointRef>
</PassengerStopAssignment>
```

The third example assigns a Tram SCHEDULED STOP POINT to one of the rail platforms of the rail station STOP PLACE.

```
<PassengerStopAssignment>
        <Id>tbd:wimass_03</Id>
        <Description>Tram Assignment</Description>
        <StopPlaceRef>napt:9100WIMBLDN</StopPlaceRef>
        <QuayRef>napt:9100WIMBLDN10</QuayRef>
<ScheduledStopPointRef>napt:9400ZZCRWIM</ScheduledStopPointRef>
</PassengerStopAssignment>
```

Figure 4-52 – XML Example of Stop Assignment

4.7 NeTEx Transfers, Access and Connections

NeTEx can describe the general connectivity of places and sites. Figure 4-53 shows three different types of TRANSFER, each connecting two points:

1. 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.
2. CONNECTION – The possibility of making a connection between two SCHEDULED STOP POINTs or STOP AREAs. Used to define allowed points of connection between public transport access points.
3. SITE CONNECTION – The possibility of making a connection between two SITE / 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.

In addition, as shown earlier in (Figure 4-26), a NAVIGATION PATH indicates the existence of a path between two points and can include an overall transfer time..

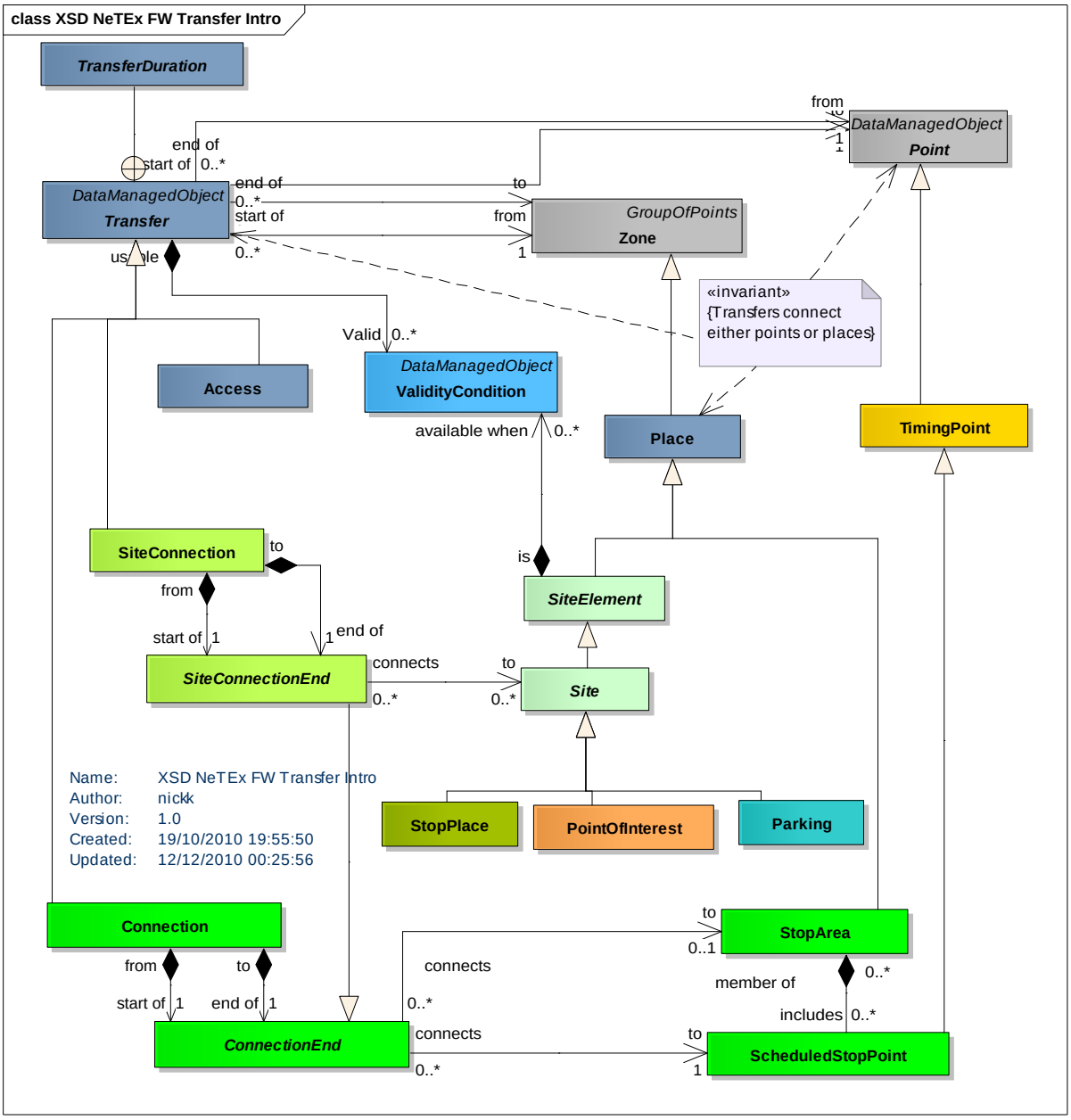


Figure 4-53 – UML Diagram of Access and Connections

4.7.1 NeTEx Connections and Transfer times

Most journey planners allow transfer times for an interchange to be specified to some degree – usually as default exchange times to use either all or at a specific station. The CEN *NeTEx* model allows a set of TRANSFER DURATIONs for journey planning to be exchanged with successive levels of precision: for example:

1. ACCESS –a default time for making it between two sites – 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.
2. DEFAULT CONNECTION –a default time for a transfer between modes on any SITE, to be used if there is no more specific value for the site
3. CONNECTION –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 –a default time for a transfer between a part of a SITE (which may also correspond to a SCHEDULED STOP POINTs or STOP AREAs).

In addition a third level of 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 stop. Whilst these may be the same, they are not necessarily so.**

➔ **UK Note:** Current UK standards do not cover the exchange of these values, though they are used in some journey planners.

The DIVA model in effect provides connection times.

4.7.2 UML Diagram of connections

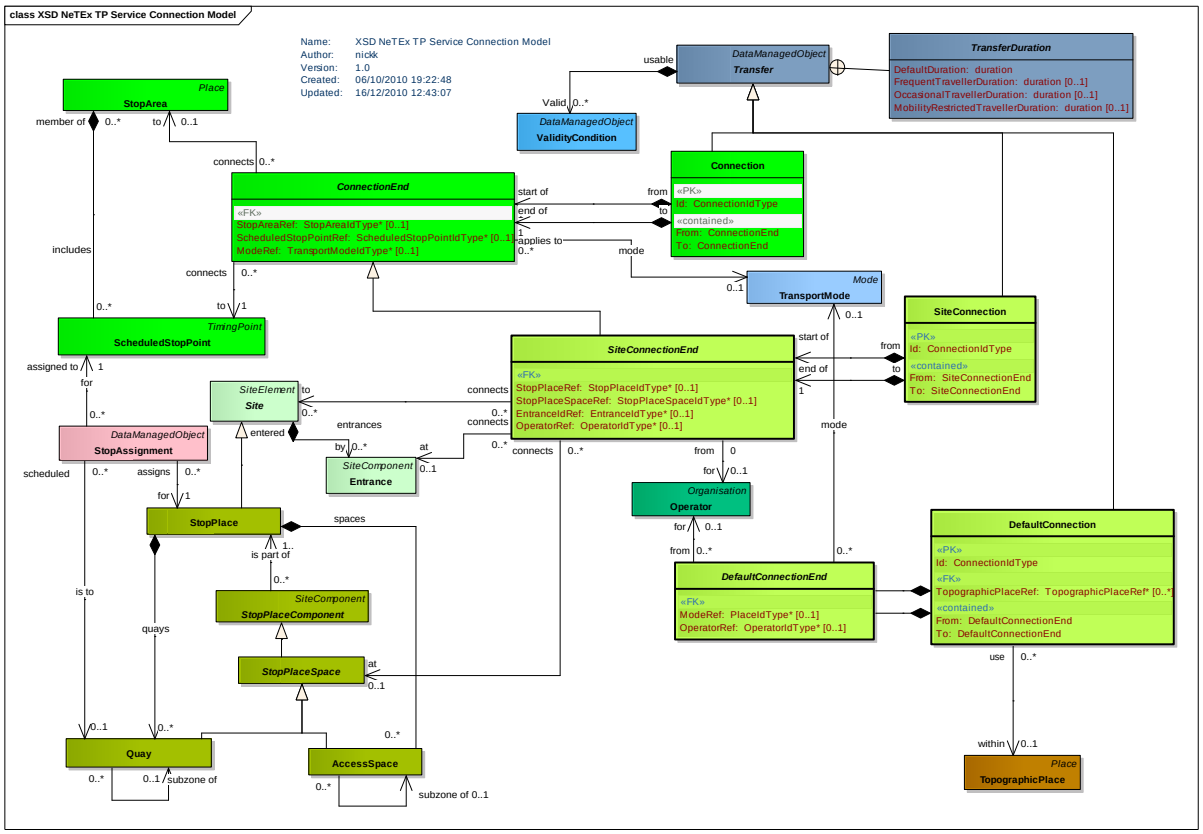


Figure 4-54 – UML Diagram of Connections

4.7.3 Example of Transfer Times

Figure 4-55 attempts to show the use of the different Transfer Times with an example based on [WIM-2010]. In the top half of the diagram are SCHEDULED STOP POINTs and CONNECTION LINKs. There are in fact two separate rail SCHEDULED STOP POINTs for Wimbledon. In the bottom half of the model some of the QUAYs, PATH LINKs (simplified) and a few NAVIGATION paths.

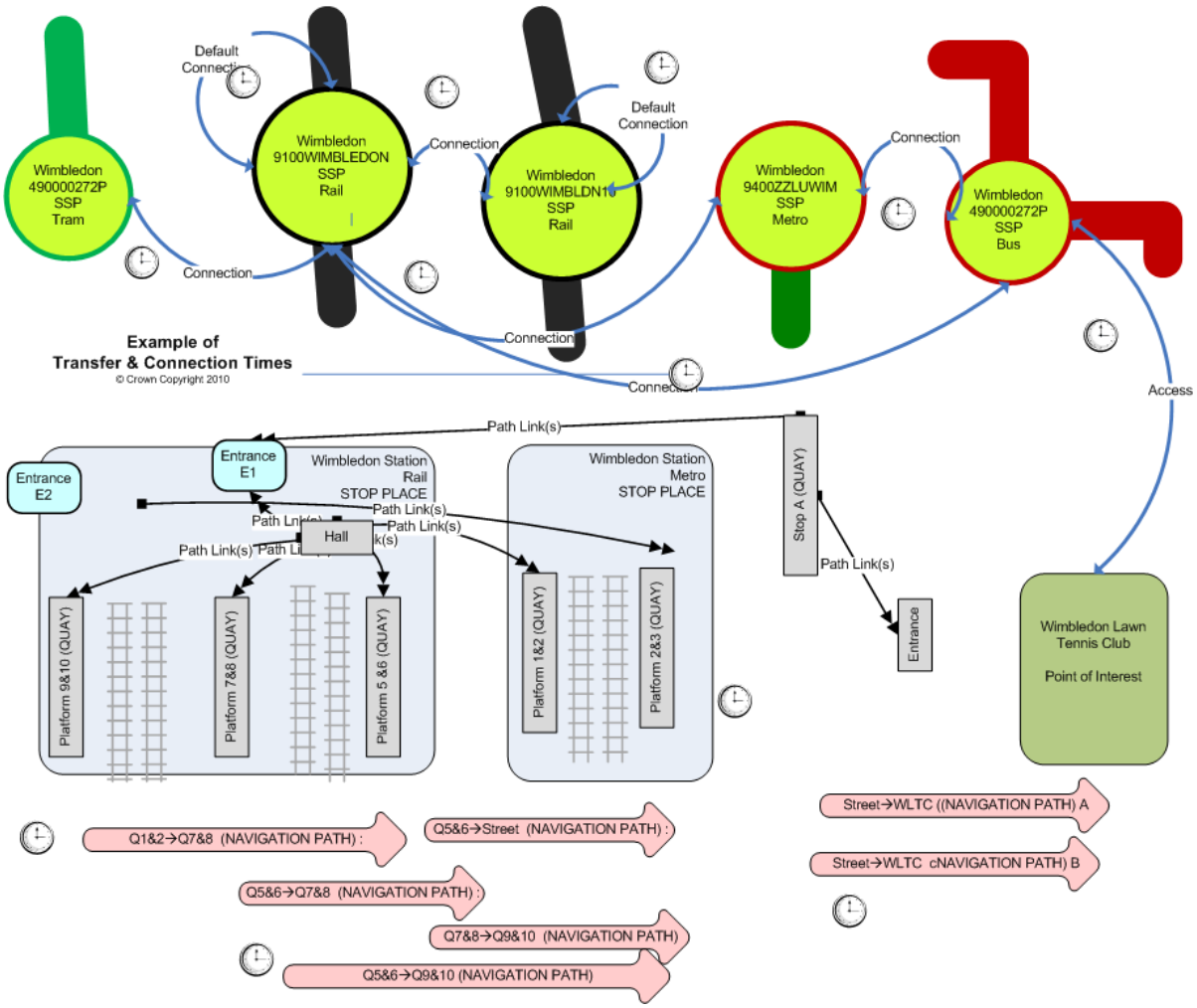


Figure 4-55 – Example of Transfer and connection times

4.7.4 Types of Transfer times

Up to four different transfer times may be specified in a given TRANSFER DURATION, though it is usually sufficient to have a single time and to use weighting factors to derive the others.

Value	Definition	
DefaultDuration	Default average transfer time	Always
FrequentTravellerDuration	Transfer time for a traveller familiar with the interchange	
OccasionalTravellerDuration	Transfer time for a traveller unfamiliar with the interchange	
MobilityRestrictedTravellerDuration	Transfer time for a mobility impaired traveller	

Table 4-5 – Transfer times in a TRANSFER DURATION

Two sets of times of travel times are available

- A default set to use for journey planning.
- An additional set to use for walk times, if different from the journey planning set.

➔ **UK Note:** UK practice is to use a single time – the Default Duration and to weighting factors to derive the others.

In the MDV dataset is equivalent to NAVIGATION PATH time between SPACES and QUAYs (The Parent Quay is used

4.7.5 Transfer times between Places

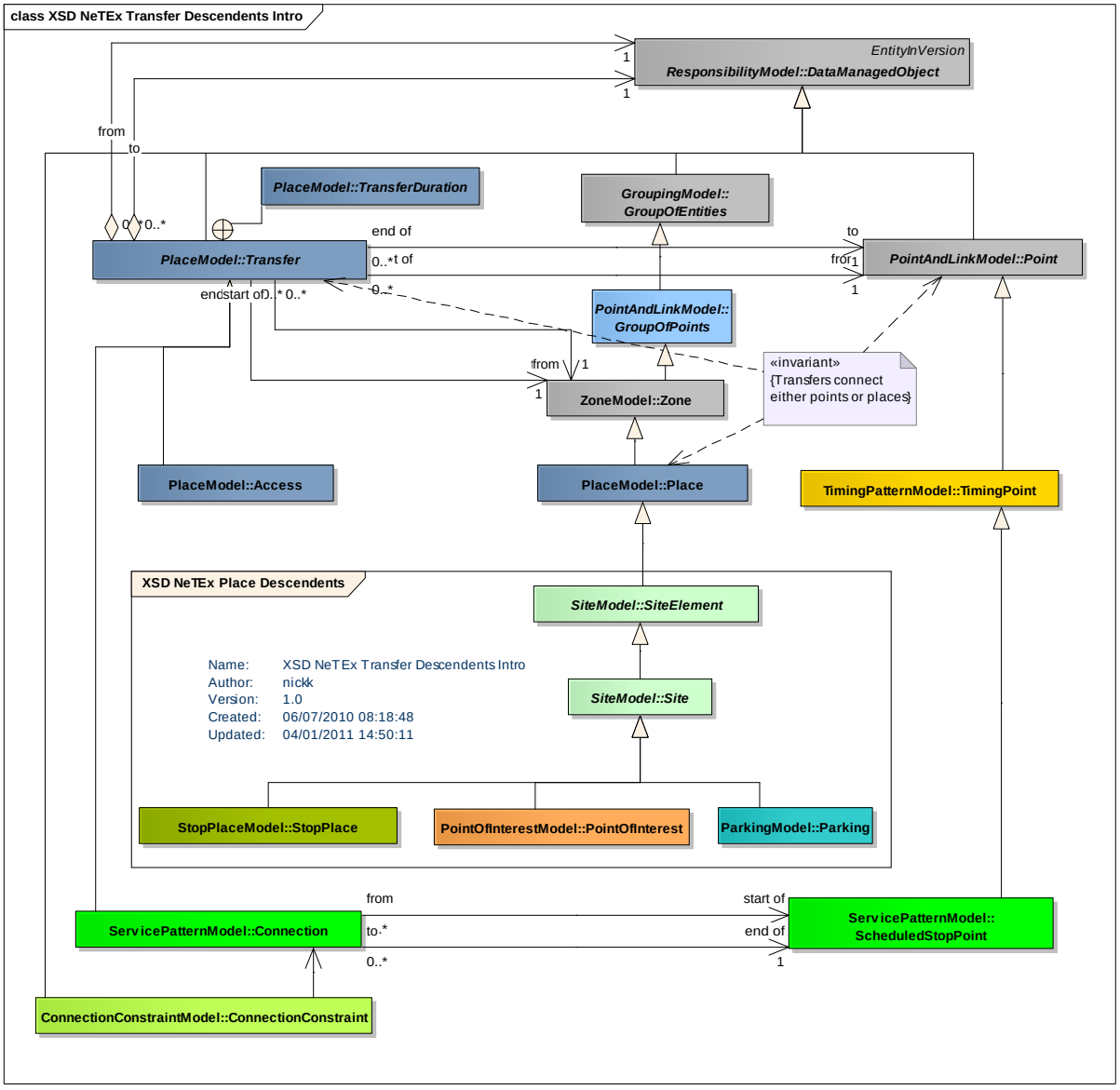


Table 4-6 – UML Diagram of Transfer times

4.7.6 Transfer times between Site components

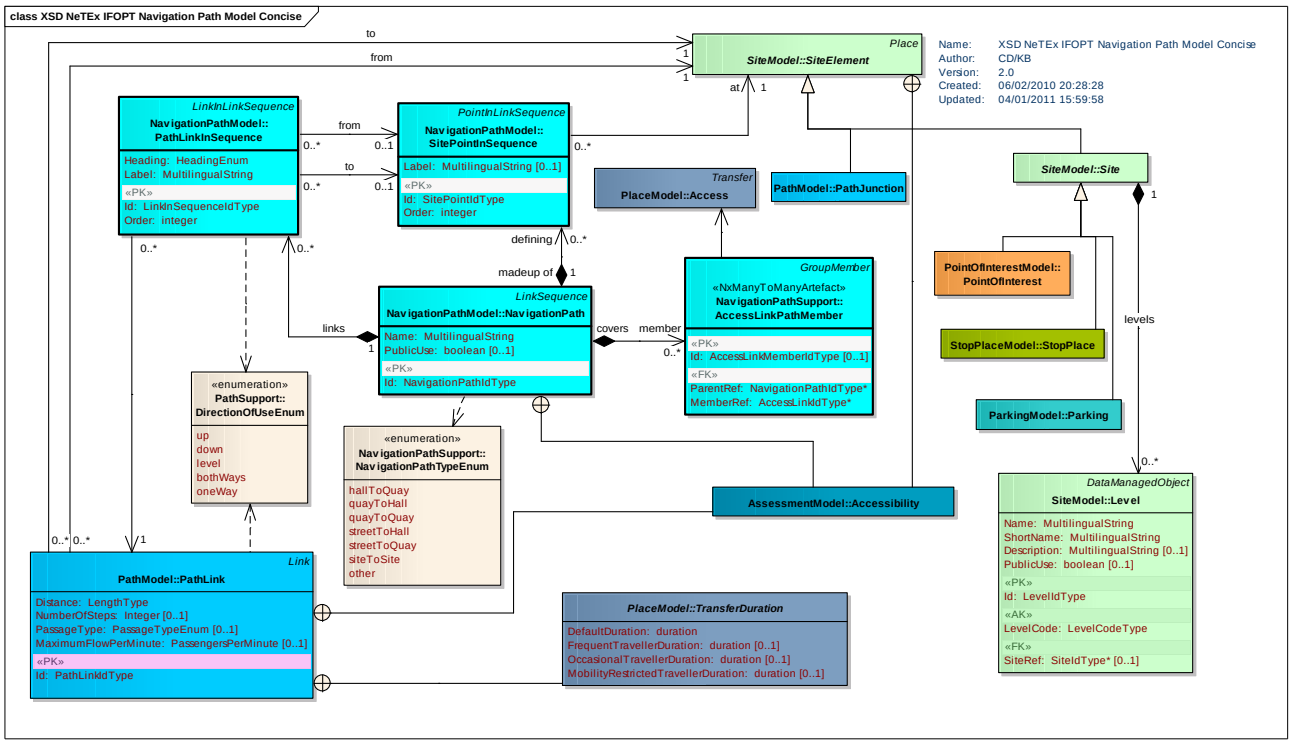


Figure 4-56 – UML Diagram of Site components with Access times

4.7.7 Data Examples of Transfer times within a Station

Table 4-7 (Courtesy of SELTA) lists the nodes used to represent Wimbledon in DIVA. Table 4-8 shows a connection to the nearby but distinct stop pair on Alexandra Road. These nodes correspond to most of the NaPTAN points, with the addition of some additional nodes that allow the description of a basic topology of the station for making transfers. The table has a level and the relation to a TOID in a mapping system.

Type	Area	Point	Name1	Name2	Ext Name	Coord	(OSGR)	GeoRef	Usage	Lvl
Area	1		Bus	Bus	490G00272P	524830	170614	25421942	Entrance and PT	0
Point	C		WIMBLEDON STATION (SW19)	490000272C		524805	170643	25489596+		
Point	D		WIMBLEDON STATION (SW19)	490015472D		524883	170618	25422046+		
Point	L		WIMBLEDON STATION (SW19)	490015472L		524798	170556	25503472+		
Point	P		WIMBLEDON STATION (SW19)	490000272P		524777	170609	25489596+		
Area	2		Tram	Croydon Tramlink	9400ZZCRWMB1	524839	170650	2006005249	Only PT	-1
Point		20026		WMB SN	524837	170651		2006005249+		
Area	3		MAIN	MAIN STATION ENTR	490000272003	524777	170639	25489596	Entrance and B+R	0

Area	4		Under	Underground	9400ZZLUWIM1	524793	170673	2006005082	Only PT	-1
Point		86386	Wimbledon			524793	170673	2006005082+		
Area	5		BookH	Booking	Hall	524787	170649	1999503402	Mezzanine	0
Area	6		RPL-R	RPL >RaynesPark	9100WDON1	524825	170680	1999503402	Only PT	-1
Area	7		RPL-S	RPL->Sutton	9100WIMBLDN1	524836	170670	1999502965	Only PT	-1

Table 4-7 – Wimbledon nodes in DIVA (SELTA database)

#	Type	Stop	Name	PlaceId	PlaceName				
1	connected	19043	Wimbledon,	St	Georges	Road	(SW19)	31117132	Wimbledon

Table 4-8 – Wimbledon nodes in DIVA (SELTA database) - Bus

The nodes are then connected with a “Footpath matrix” of point-to-point transfers between nodes, including transfer times that can be used when planning a journey. There can be separate transfers by Lift, Stairs**,** or that are Step free. These in effect define a set of topological links between nodes.

From	Stop	272	272	272	272	272	272	272	19043
To	Area	1	2	3	4	5	6	7	
Stop	Area	Name	Bus	Tram	MAIN	Under	BookH	RPL-R	RPL-S
272	1	Bus	2.0	4.0	1.0	4.0	2.0	5.0	5.0
272	2	Tram	4.0	2.0	3.0	4.0	2.0	5.0	5.0
272	3	MAIN	1.0	3.0	3.0	1.0	4.0	4.0	
272	4	Under	4.0	4.0	3.0	2.0	2.0	5.0	5.0
272	5	BookH	2.0	2.0	1.0	2.0	3.0	3.0	
272	6	RPL-R	5.0	5.0	4.0	5.0	3.0	6.0	6.0
272	7	RPL-S	5.0	5.0	4.0	5.0	3.0	6.0	6.0
19043	0	5.0	7.0	4.0	7.0	5.0	8.0	8.0	

When using the TfL Journey Planner, any or all of four accessibility limitations

4.7.8 XML Examples of Transfer Times

4.7.8.1XML Example of Default Transfer Times for a Stop Place

The following XML code fragment of a CONNECTION shows an example of a default TRANSFER DURATION at a SCHEDULED STOP POINT regardless of platform - the ‘from’ and ‘to’ points are the same.

```
<Connection>
        <Id>tbd:wimcon_01</Id>
        <FromPointRef>910GWIMBLDN</FromPointRef>
        <ToPointRef>910GWIMBLDN</ToPointRef>
        <Name>Default transfer duration for Wimbledon</Name>
        <TransferDuration>
                <DefaultDuration>PT5M</DefaultDuration>
                <FrequentTravellerDuration>PT2M</FrequentTravellerDuration>
                <OccasionalTravellerDuration>PT5M</OccasionalTravellerDuration>
                <MobilityRestrictedTravellerDuration>PT15M</MobilityRestrictedTravellerDuration>
        </TransferDuration>
</Connection>
```

Figure 4-57 – XML Example of Default Transfer times

4.7.8.2XML Example of Default Transfer Times between two points

The following XML code fragment shows an example of a default TRANSFER DURATION for transferring between a tram SCHEDULED STOP POINT and a tube SCHEDULED STOP POINT.

```
<Connection>
        <Id>tbd:wimcon_01</Id>
        <FromPointRef>napt:9400ZZCRWIM</FromPointRef>
        <ToPointRef>mapt:9940GZZLUWIM</ToPointRef>
        <Name>Default transfer duration for Wimbledon between tram and Tube</Name>
        <TransferDuration>
                <DefaultDuration>PT8M</DefaultDuration>
                <FrequentTravellerDuration>PT4M</FrequentTravellerDuration>
                <OccasionalTravellerDuration>PT8M</OccasionalTravellerDuration>
                <MobilityRestrictedTravellerDuration>PT19M</MobilityRestrictedTravellerDuration>
        </TransferDuration>
</Connection>
```

Figure 4-58 – XML Example of Transfer Times between two points

4.7.8.3XML Example of Navigation Path specific Transfer Time

The following XML code fragment shows an example of a NAVIGATION PATH with a summary TRANSFER DURATION set. The times this should be derived from the sum of it's the times of the individual PATH LINKs.

```
<NavigationPath created="2010-05-17T09:30:47Z" modification="new">
        <Id>tbd:9100WIMBLDN_5n6_to_7n8-acc</Id>
        <AccessibilityAssessment created="2010-05-17T09:30:47Z">
                <MobilityImpairedAccess>true</MobilityImpairedAccess>
                <limitations>
                        <AccessibilityLimitation created="2010-05-17T09:30:47Z" modification="new">
                                <Id>tbd:9100WIMBLDN_5n6_to_7n8-acc_01</Id>
                                <WheelchairAccess>true</WheelchairAccess>
                                <StepFreeAccess>true</StepFreeAccess>
                                <EscalatorFreeAccess>true</EscalatorFreeAccess>
                                <LiftFreeAccess>false</LiftFreeAccess>
                        </AccessibilityLimitation>
                </limitations>
        </AccessibilityAssessment>
        <features>
                <AccessSummary>
                        <AccessFeatureType>lift</AccessFeatureType>
                        <Count>1</Count>
                        <Transition>down</Transition>
                </AccessSummary>
        </features>
        <TransferDuration>
                <DefaultDuration>PT5M</DefaultDuration>
                <MobilityRestrictedTravellerDuration>PT10<</MobilityRestrictedTravellerDuration>
        </TransferDuration>
        <Name>Platform 5 and 6 to Platform 7 and 8 - Accessible</Name>
        <TypeOfNavigation>quayToQuay</TypeOfNavigation>
        <pathLinksInSequence>
                <PathLinkInSequence order="1">


                <SitePathLink created="2010-05-17T09:30:47Z">
                                        <Id>tbd:9100WIMBLDN_lnk_A2b-EI5_A2-J2</Id>
                                        <Name>From Upper Concourse Lift area Entrance EI1 to Path Junction
2</Name>
                                        <Covered>indoors</Covered>
                                        <From>
                                                <PlaceRef>tbd:9100WIMBLDN_A2b</PlaceRef>
                                                <EntranceRef>tbd:9100WIMBLDN_A2b_EI5</EntranceRef>
                                        </From>
                                        <To>
                                                <PlaceRef>tbd:9100WIMBLDN_A2_J2</PlaceRef>
                                        </To>
```

```
            <Distance>5.00</Distance>
            <NumberOfSteps>0</NumberOfSteps>
            <AllowedUse>twoWay</AllowedUse>
            <FromToUpDown>level</FromToUpDown>
            <AccessFeatureType>confinedSpace</AccessFeatureType>
            <TransferDuration>
                  <DefaultDuration>PT30S</DefaultDuration>
            </TransferDuration>
            <LevelRef>tbd:9100WIMBLDN_Lvl_G0</LevelRef>
      </SitePathLink>
```

Figure 4-59 – XML Example of Transfer Times on a Navigation Path

4.8 *NeTEx* Accessibility

NeTEx supports a detailed description of the accessibility of a SITE for both computable and browsing/navigation uses.

- For **computable** use the data can be used by a journey planner when calculating a journey that meets a given set of user criteria, for example, both to choose stations or paths that are wheelchair accessible when planning a point-to-point journey and to direct a user to the entrances and exits most suitable according to their needs.
- For **browsing/navigation** use the data can be used to show the exact properties of a given interchange so that a user may rehearse a trip ahead of making it and make their own judgement as to the best path through an interchange..

If one is aiming to journey plan across systems then one needs to use a uniform set of summary assessment criteria for the end-to-end journey planning to establish possible routes of an equivalent level of accessibility – and *NaPTAN* 3.0 proposes these.

4.8.1.1Types of Accessibility information

To describe accessibility, *NeTEx* models as separate and distinct aspects: (a) the description of the USER'S NEEDs – for example *wheelchair, hearing impaired, vision impaired, lift-averse* etc; and (b) the ACCESSIBILITY LIMITATION, i.e. description of the limitations of a SITE ELEMENT to support a specific need, for example *Wheelchair, Step free, Escalator free, Lift free* – the last two also corresponding to some cognitive aversions (e.g. claustrophobia..

In addition, further information relevant for detailed accessibility is contained on many of the different EQUIPMENT elements – See Table 4-15 later below. For example, Lift dimensions and controls, Step heights , handrails and the number of steps in a staircase, Ramp gradients, whether barriers are wheelchair passable, etc.

4.8.2 *NeTEx* Accessibility

The accessibility of SITE components is described using an ACCESSIBILITY ASSESSMENT: this allows any SITE COMPONENT to be described both in terms of suitability for specific USER NEEDs (using a SUITABILITY element) and in terms of LIMITATIONs. USER NEEDs allow a richer description.

➔***UK Note***: For simplicity, only LIMITATIONs are used to describe ACCESSIBILITY ASSESSMENT of a STOP PLACE in JourneyWeb. **Not** SUITABILITies Thus matching is done directly see below.

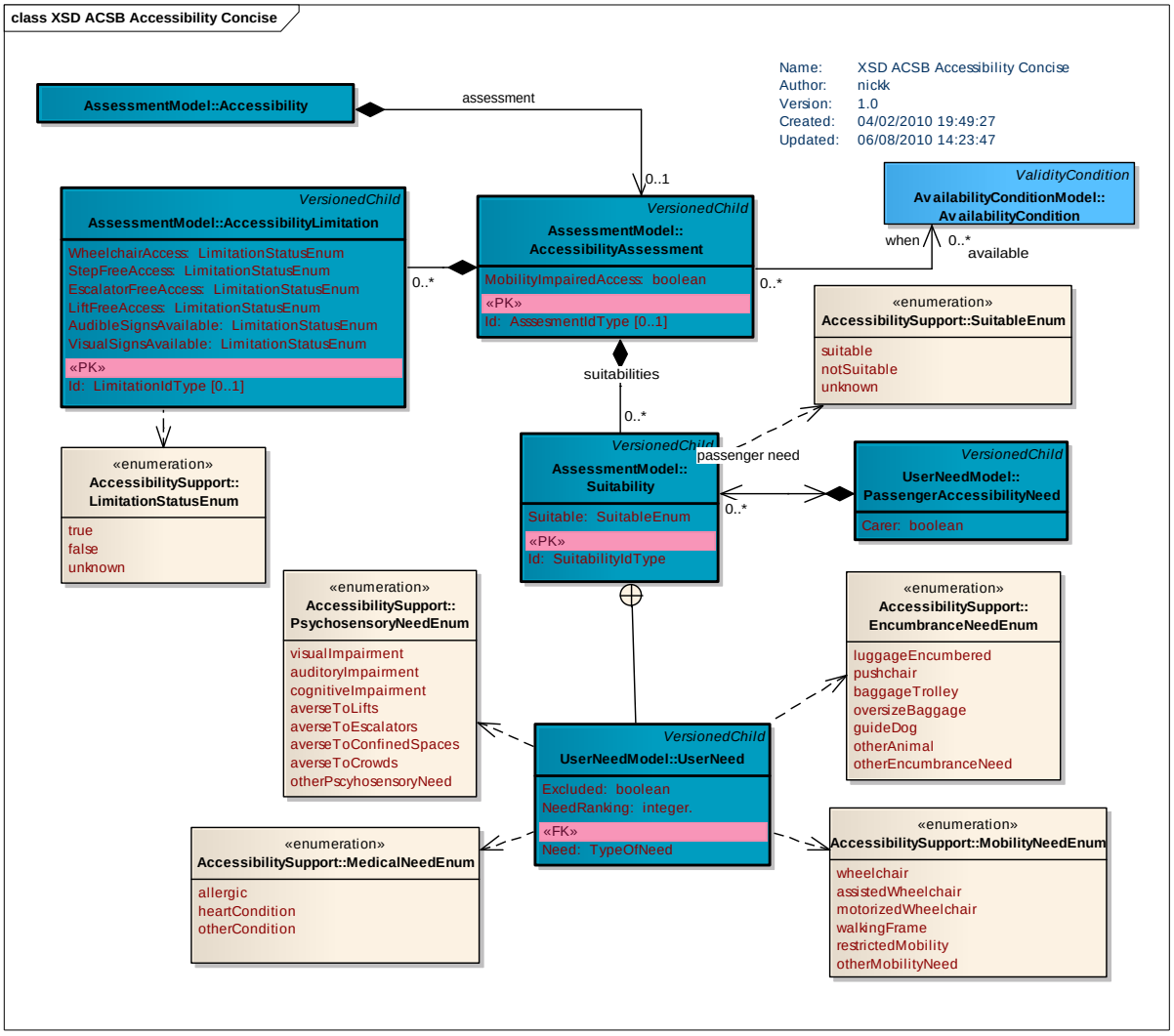


Figure 4-60 – UML Diagram of Accessibility elements

4.8.2.1Associating Accessibility Assessments with Site Components

NeTEx allows accessibility criteria to be associated with both SITE COMPONENTS, PATH LINKs and NAVIGATION PATHs – see Figure 4-61.

In order to be able to search for the optimum path for a given set of user accessibility needs it is desirable to specify accessibility data at the most detailed level – on every PATH LINK and QUAY and ACCESS SPACE within a SITE. However in order to provide efficient journey planning it is helpful to summarise at various levels. Thus for example, if all the QUAYs of a STOP PLACE are wheelchair accessible, the STOP PLACE may be marked as wheelchair accessible; if all the PATH LINKs of a NAVIGATION PATH are accessible, then the whole NAVIGATION PATH can be marked as accessible; or if there is at least one wheelchair accessible NAVIGATION PATH between two QUAYs, then the CONNECTION can be marked as accessible.
Summarisation can in principle be derived automatically from the bottom up by looking at the EQUIPMENT and other properties of PATH LINKs and SITE COMPONENTs. For example if a PATH LINK in a NAVIGATION PATH involves the use of a *Lift,* then the PATH should be flagged as ***not*** *LiftFree*.

- Nested QUAYs and ACCESS PLACEs must always be on the same level as their parent and can be assumed to have the same accessibility assessment.

➔UK NOTE: All QUAYs, ACCESSes, Path LINKs.

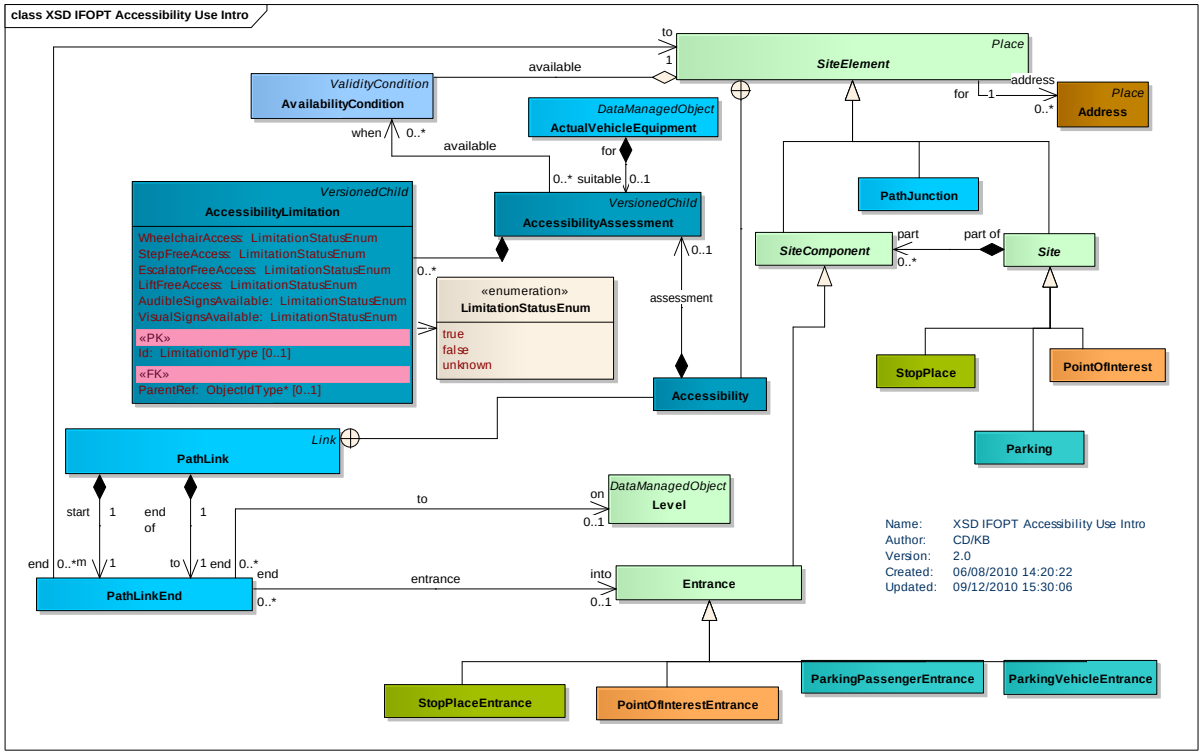


Figure 4-61 – UML Diagram of Accessibility Associations

4.8.2.2Use of Accessibility Limitations on Site components

The limitations should be assessed for individual SITE COMPONENTs as shown in Table 4-9.

	Place i.e. ACCESS SPACE, QUAY	PATH, PATH LINK, STOP PLACE
WheelchairAccess	May be reached by someone in a wheelchair. (possibly using a Lift)	May be traversed by someone in a wheelchair.
LiftFreeAccess	Does not require the use of a Lifts to reach it.	Does not require the use of a Lift to traverse it.
StepFreeAccess	Does not require the use of Steps to reach it.	Does not require the use of Steps to traverse it.
EscalatorFreeAccess	Does not require the use of Escalators to reach it.	Does not require the use of Escalators to traverse it.
TravelatorFreeAccess	Does not require the use of Travelators to reach it.	Does not require the use of Travelators to traverse it.

Table 4-9 – Accessibility Limitations for Site Components

4.8.3 Accessibility Coverage

All ENTRANCEs, QUAYs, ACCESS SPACEs and STOP PLACEs should be given the basic ACCESSIBILITY LIMITATION attributes for each of the five standard criteria.

These take 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.

4.8.4 Stop Place Accessibility Coverage

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

- A STOP PLACE s accessible (*true*) for a given criteria if **all** of its QUAYs can be reached from an external entrance by at least one NAVIGATION PATH that fulfils that criteria.
- A STOP PLACE is **not** accessible (*false*) STOP PLACE for a given criteria if at least one of its QUAYs can **not** be reached from an external entrance by at least one NAVIGATION PATH that fulfils that criteria.

4.8.4.1Default Accessibility values for a Stop Place:

- STOP PLACEs should be stated as accessible ***unknown*** unless explicitly known otherwise.

4.8.5 Quay and Access Space Accessibility Coverage

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

- A QUAY or ACCESS SPACE is accessible (*true*) for a given criteria if it can be reached from an external entrance by at least one NAVIGATION PATH that fulfils that criteria.
- A QUAY or ACCESS SPACE is **not** accessible for a given criteria (*false*) if it **cannot** be reached from an external entrance by at least one NAVIGATION PATH that fulfils that criteria.

4.8.5.1Defaulting values

- 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.

	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*	

Table 4-10 – Accessibility Attributes for level 1

4.8.6 Path Link Accessibility Coverage

PATH LINKs within a STOP PLACE should be classified as one of the three values:

- A PATH LINK is accessible (*true*) for a given criteria if it can be traversed according to that criteria.
- A PATH LINK is not accessible (*false*) for a given criteria if it cannot be traversed according to that criteria.

4.8.6.1Default Accessibility values for a Path Link

- A PATH LINK is should be stated as accessible ***true*** unless known otherwise.

4.8.7 Navigation Path Accessibility Coverage

NAVIGATION PATHs should be classified as one of the three values:

- A NAVIGATION PATH is accessible (*true*) for a given criteria if it **can** be traversed along at least one branch according to that criteria.
- A NAVIGATION PATH is not accessible (*false*) for a given criteria if it **cannot** be traversed along **any** branch according to that criteria.

The accessibility of a NAVIGATION PATH can be derived from its PATH LINKs. Figure 4-62 shows an example of summarizing the individual links of an access path to derive the overall accessibility of a path. The second link involves steps – this sets the minimum accessibility of the whole path :

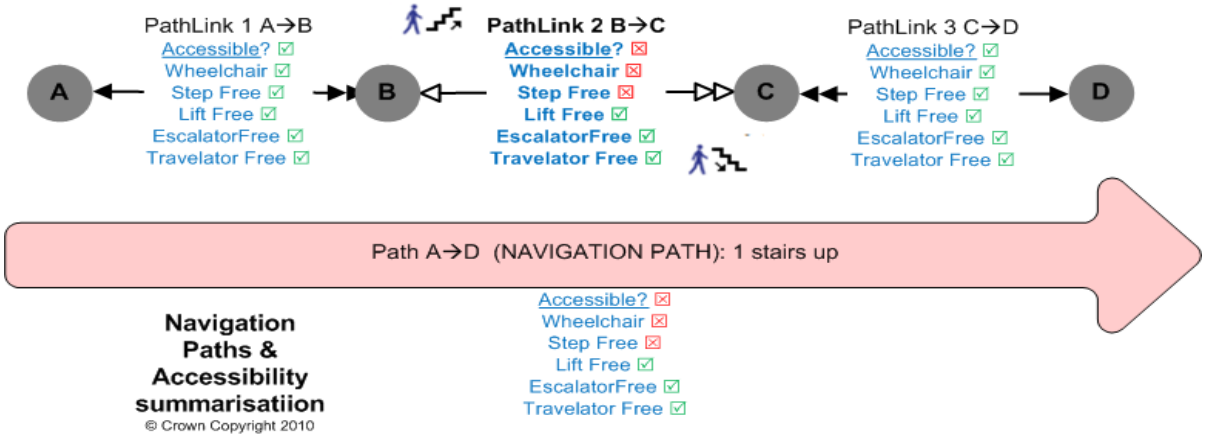


Figure 4-62 – Example of simple NAVIGATION PATH accessibility

Figure 4-63 shows an example of the derivation of the accessibility of a branched NAVIGATION PATH. One branch requires the use of steps, the other of an escalator. The NAVIGATION PATH may thus be described overall as having Lift Free and Escalator Free (If lift is used) access but is not wheelchair accessible.

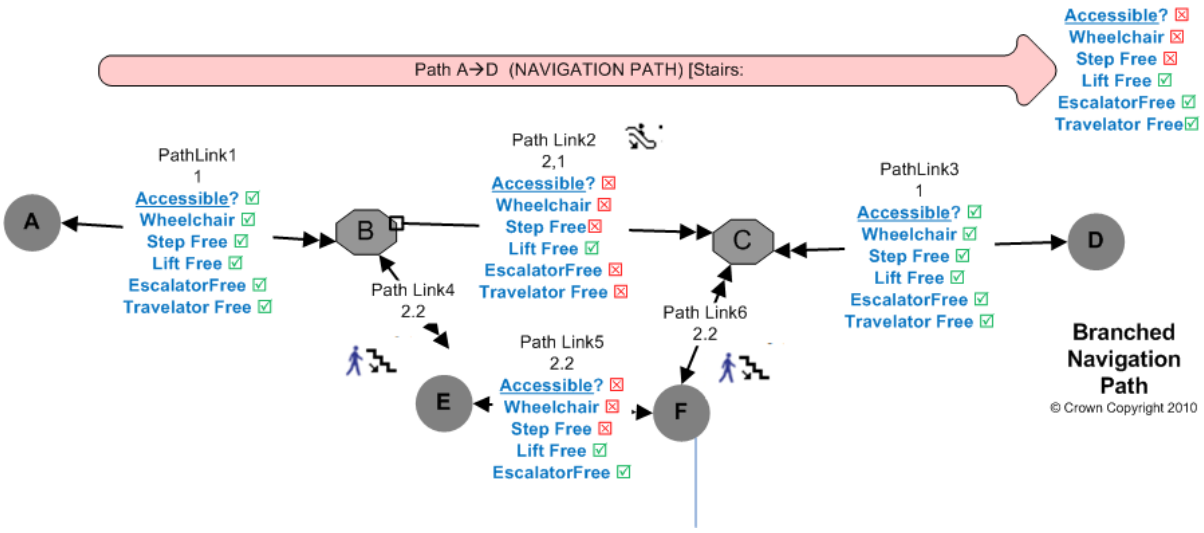


Figure 4-63 – Example Accessibility Criteria for a Navigation path

4.8.7.1Default Accessibility values for a Stop Place

- NAVIGATION PATHs should be stated as accessible ***unknown*** unless explicitly known otherwise.

4.8.7.2Accessibility Limitation constraints

Certain of the Accessibility LIMITATIONs are mutually exclusive – See Table 4-11.

	LiftFree	StepFree	EscalatorFree	TravelatorFree	Criterion
Wheelchair	***Wheelchair*** access may involve the use of lifts	***Wheelchair*** access must be step free	***Wheelchair*** access must be escalator free	***Wheelchair*** access must be travelator free	*To be able to drive a wheelchair unassisted*

LiftFree	--	***LiftFree*** access may involve the use of steps	***LiftFree*** access may involve the use of escalators	***LiftFree*** access may involve the use of travelators	*To avoid being enclosed in a lift*
StepFree	***StepFree*** access may involve the use of lifts	--	***StepFree*** access must be escalator free too	***StepFree*** access may still involve the use of travelators	*To avoid routes that demand high mobility*
EscalatorFree	***EscalatorFree*** access may involve the use of lifts	***EscalatorFree*** access may involve the use of steps	--	**EscalatorFree** *access may still* involve the use of *travelators*	*To avoid routes that demand high mobility*
TravelatorFree	***TravelatorFree*** access may involve the use of lifts	***TravelatorFree*** access may involve the use of steps	***TravelatorFree*** access must be escalator free	--	*To avoid routes that demand high mobility*

Table 4-11 – Accessibility Attribute constraints

4.8.7.3XML Example of Quay Accessibility Assessment Limitation

The following code fragment shows an ACCESSIBILITY ASSESSMENT for a QUAY using both ACCESSIBILITY LIMITATIONs and SUITABILITies Other examples of ACCESSIBILITY ASSESSMENT can be seen elsewhere in context for PATH LINKs, NAVIGATION PATHs, ENTRANCEs, etc. Note that SUITABILITies are not used in the UK Profile.

```
<Quay created="2010-04-17T09:30:47Z">
        <Id>tbd:9100WIMBLDN5n6</Id>
        <Name>Platforms 5 &amp;amp; 6</Name>
        <Location srsName="UKOS">
                <Coordinates>524811 170666 </Coordinates>
        </Location>
        <AccessibilityAssessment created="2010-05-17T09:30:47Z" modification="new">
                <MobilityImpairedAccess>true</MobilityImpairedAccess>
                <limitations>
                        <AccessibilityLimitation created="2010-05-17T09:30:47Z" modification="new">
                                <WheelchairAccess>true</WheelchairAccess>
                                <StepFreeAccess>true</StepFreeAccess>
                                <EscalatorFreeAccess>true</EscalatorFreeAccess>
                                <LiftFreeAccess>true</LiftFreeAccess>
                                <AudibleSignalsAvailable>false</AudibleSignalsAvailable>
                                <VisualSignsAvailable>true</VisualSignsAvailable>
                        </AccessibilityLimitation>
                </limitations>

                <suitabilities>
                        <Suitability>
                                <Suitable>suitable</Suitable>
                                        <UserNeed>
                                        <MobilityNeed> wheelchair</MobilityNeed>
                                </UserNeed>
                        </Suitability>
                                <Suitability>
                                <Suitable>suitable</Suitable>
                                <UserNeed>
                                        <MobilityNeed> assistedWheelchair</MobilityNeed>
                                </UserNeed>
                        </Suitability>
                        <Suitability>
                                <Suitable>suitable</Suitable>
                                <UserNeed>
                                        <MobilityNeed> motorizedWheelchair</MobilityNeed>
                                </UserNeed>
                        </Suitability>
                        <Suitability>
                                <Suitable>suitable</Suitable>
```

```
                <UserNeed>
                    <EncumbranceNeed>pushchair</EncumbranceNeed>
                </UserNeed>
            </Suitability>
            <Suitability>
                <Suitable>suitable</Suitable>
                <UserNeed>
                    <EncumbranceNeed>oversizeBaggage</EncumbranceNeed>
                </UserNeed>
            </Suitability>
            <Suitability>
                <Suitable>suitable</Suitable>
                <UserNeed>
                    <EncumbranceNeed>guideDog</EncumbranceNeed>
                </UserNeed>
            </Suitability>
            <Suitability>
                <Suitable>suitable</Suitable>
                <UserNeed>
                    <EncumbranceNeed>baggageTrolley</EncumbranceNeed>
                </UserNeed>
            </Suitability>
            <Suitability>
                <Suitable>suitable</Suitable>
                <UserNeed>
                    <MedicalNeed>heartCondition</MedicalNeed>
                </UserNeed>
            </Suitability>
            <Suitability>
                <Suitable>suitable</Suitable>
                <UserNeed>
                    <MedicalNeed>allergic</MedicalNeed>
                </UserNeed>
            </Suitability>
            <Suitability>
                <Suitable>suitable</Suitable>
                <UserNeed>
                    <PsychosensoryNeed>visualImpairment</PsychosensoryNeed>
                </UserNeed>
            </Suitability>
             <Suitability>
                <Suitable>suitable</Suitable>
                <UserNeed>
                    <PsychosensoryNeed>auditoryImpairment</PsychosensoryNeed>
                </UserNeed>
            </Suitability>
            <Suitability>
                <Suitable>notSuitable</Suitable>
                <UserNeed>
                    <PsychosensoryNeed>averseToCrowds</PsychosensoryNeed>
                </UserNeed>
            </Suitability>
            <Suitability>
                <Suitable>suitable</Suitable>
                <UserNeed>
                <PsychosensoryNeed>averseToConfinedSpaces</PsychosensoryNeed>
                </UserNeed>
            </Suitability>
                <Suitability>
                    <Suitable>suitable</Suitable>
                <UserNeed>
                    <PsychosensoryNeed>averseToLifts</PsychosensoryNeed>
                </UserNeed>
            </Suitability>
            <Suitability>
                <Suitable>suitable</Suitable>
                <UserNeed>
                    <PsychosensoryNeed>averseToEscalators</PsychosensoryNeed>
                </UserNeed>
            </Suitability
    </suitabilities>
```

```
</AccessibilityAssessment>
```

Figure 4-64 – XML Example of Accessibility on a Quay

4.8.7.4 Using Accessibility Data in Journey Planning

The USER NEEDs can be used to describe inputs to a journey planner to identify the special requirements the user has that may need to be taken into account when seeking journeys. For example, an Assisted wheelchair could use a route that involved a limited number of steps and the use of doors. An unassisted wheelchair would not.

Matching a given set of USER NEEDs to the limitations of a SITE is potentially complex and may involve relative weightings of different aspects. It may be that there is no perfect match so a least bad or "satisficing" match may be .needed. Table 4-12 illustrates general relationships between user needs and limitations.

Limitation	**Wheelchair**	**Lift Free**	**Step Free**	**Escalator Free**	**Travelator Free**	**Visual Signs**	**Auditory Signs**
User Need							
Wheelchair	Strongly prefer	(Neutral)	Strongly prefer	Essential	Prefer?	(Neutral)	(Neutral)
Assisted Wheelchair	Strongly prefer	(Neutral)	Prefer	Essential	(Neutral)	(Neutral)	(Neutral)
Motorized Wheelchair	Strongly prefer	(Neutral)	Strongly prefer	Essential	Prefer?	(Neutral)	(Neutral)
Averse to Escalators	(Neutral)	(Neutral)	(Neutral)	Strongly prefer	Prefer?	(Neutral)	(Neutral)
Averse to Lifts	(Neutral)	Strongly prefer	(Neutral)	(Neutral)	(Neutral)	(Neutral)	(Neutral)
Averse to confined spaces	(Neutral)	Strongly prefer	(Neutral)	low	(Neutral)	(Neutral)	(Neutral)
Restricted mobility	Prefer	(Neutral)	Prefer	Prefer	Prefer	(Neutral)	(Neutral)
Walking frame	Prefer	(Neutral)	(Neutral)	(Neutral)	(Neutral)	(Neutral)	(Neutral)
Guide Dog	(Neutral)	(Neutral)	(Neutral)	Prefer	Prefer	(Neutral)	(Neutral)
Pushchair	Prefer	(Neutral)	Prefer	Prefer	(Neutral)	(Neutral)	(Neutral)
Baggage Encumbered	(Neutral)	(Neutral)	Prefer	Prefer	(Neutral)	(Neutral)	(Neutral)
Baggage Trolley	Prefer	(Neutral)	(Neutral)	Essential	(Neutral)	(Neutral)	(Neutral)
Visual Impairment	(Neutral)	Prefer	Prefer?	Prefer	Prefer	(Neutral)	Strongly prefer
Auditory Impairment	(Neutral)	(Neutral)	(Neutral)	(Neutral)	(Neutral)	Strongly prefer	(Neutral)

Table 4-12 – User needs versus Limitations

NeTEx has a quite detailed user need model and it is possible for journey planners to apply sophisticated matching or partial matching algorithms – however for basic accessibility journey planning it suffices to choose a subset of values corresponding to the simple limitations, as used for example by TfL in London.

➔ ***UK Note***: UK will simplify this by avoiding the use of USER NEEDs.. *JourneyWeb* will use ACCESSIBILITY LIMITATIONs as simple user needs inputs. These can be matched directly to the data held for each element. Thus rather than say using *'Averse to Escalators' , 'Averse to Lifts'*, and any of the many supported detailed SUITABILITies, etc it just uses the five limitation categories of *Wheelchair, Lift Free, Escalator free* and *Travelator free* as the inputs. This gives a simpler matching process and requires less data. Certain limitations are mutually exclusive or mutually reinforcing. For example, a wheelchair route will always be escalator free, and usually be step free.

Certain of the limitations are mutually exclusive –as indicated by Table 4-13

Implies	Criterion	LiftFree	StepFree	EscalatorFree	TravelatorFree
Resulting Limitation					
Wheelchair	*To be able to drive a wheelchair unassisted*	***Wheelchair*** access can use lifts	***Wheelchair*** access must be step free	***Wheelchair*** access must be escalator free	***Wheelchair*** access must be travelator free
LiftFree	*To avoid being enclosed in a lift*	--	***LiftFree*** access may have steps	***LiftFree*** access may have escalators	LiftFree access may have travelators
StepFree	*To avoid routes that demand mobility*	***StepFree*** access may have lifts	--	***StepFree*** access must be escalator free too	***StepFree*** access may have travelators
EscalatorFree	*To avoid routes that demand mobility*	***EscalatorFree*** access may have lifts	***EscalatorFree*** access may have steps	--	**EscalatorFree** *access may have travelators*
TravelatorFree	*To avoid routes that demand mobility*	***TravelatorFree*** access may have lifts	May have steps	***TravelatorFree*** access must be escalator free	--

Table 4-13 – Accessibility Attributes for Capability Level 1

The ***MobilityImpairedAccess*** value provides an overall summary assessment of an element as accessible or not. Table 4-14 shows suggested derivation from the lower level values.

	Value	***MobilityImpairedAccess***
Wheelchair	*false*	*false*
	true	*true*
	unknown	*false*
LiftFree	*false*	No effect
	true	No effect
	unknown	No effect
StepFree	*false*	*false*
	true	No effect
	unknown	*false*
EscalatorFree	*false*	*false*
	true	No effect
	unknown	*false*
TravelatorFree	*false*	No effect
	true	No effect
	unknown	No effect

Table 4-14 – Rules for summarising Accessibility

4.8.8 Accessibility & Equipment

As well as ACCESSIBILITY ASSESSMENTs, a number of different other types of element are relevant for accessibility. These include (see Figure 4-65) various types of EQUIPMENT (see later below) such as stairs, Lifts etc which describe detailed properties and CHECK CONSTRAINTs,.

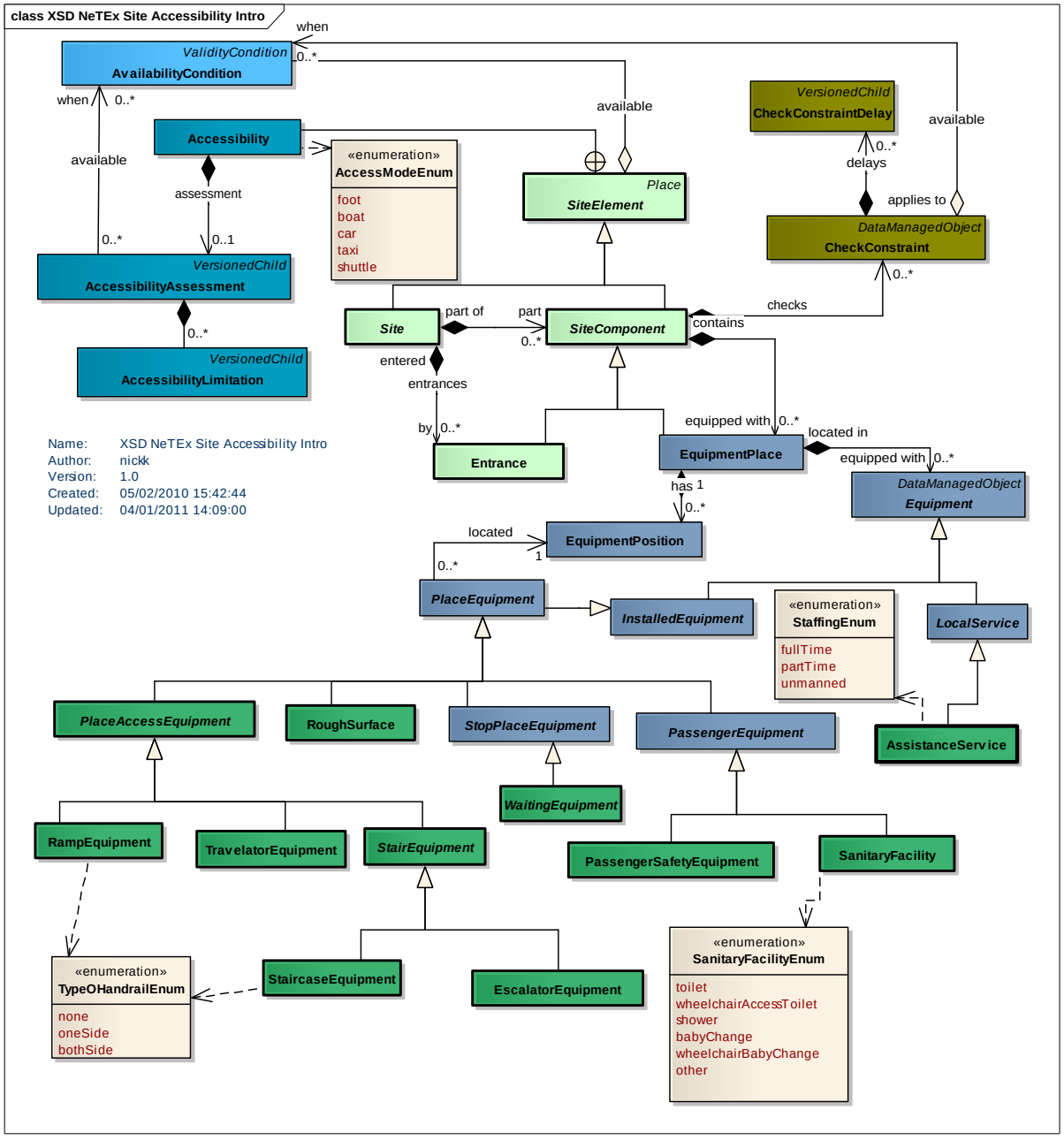


Figure 4-65 – UML diagram of Accessibility related elements

4.9 *NeTEx* Equipment

The topological components of a STOP PLACE 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. *NeTEx* 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.

4.9.1 Types of Equipment

The different types of equipment are summarised in Figure 4-66. and listed in Table 4-15 Each of these may have specific attributes.

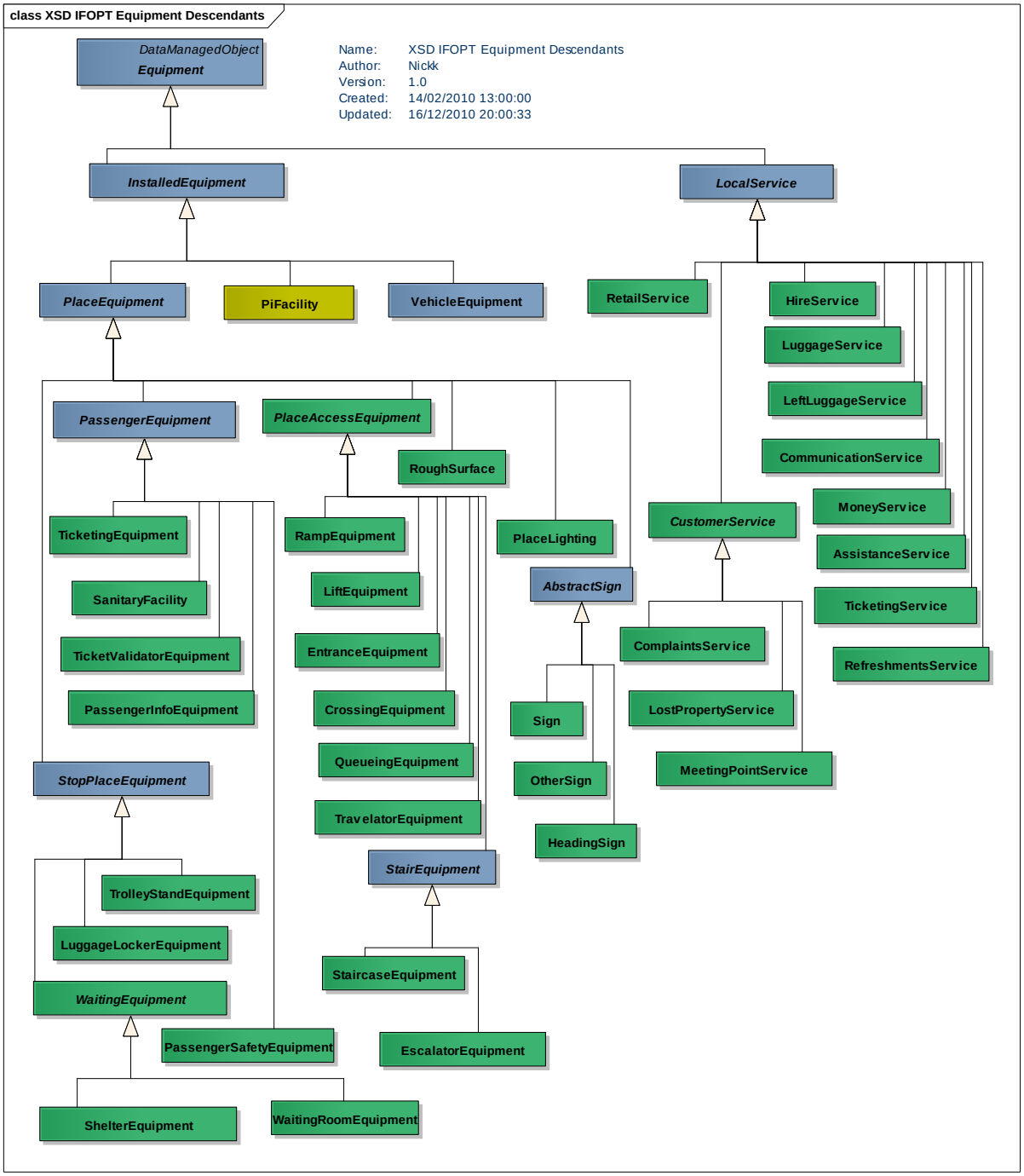


Figure 4-66 – UML Overview of Equipment types

4.9.2 Associating Equipment with Places

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.

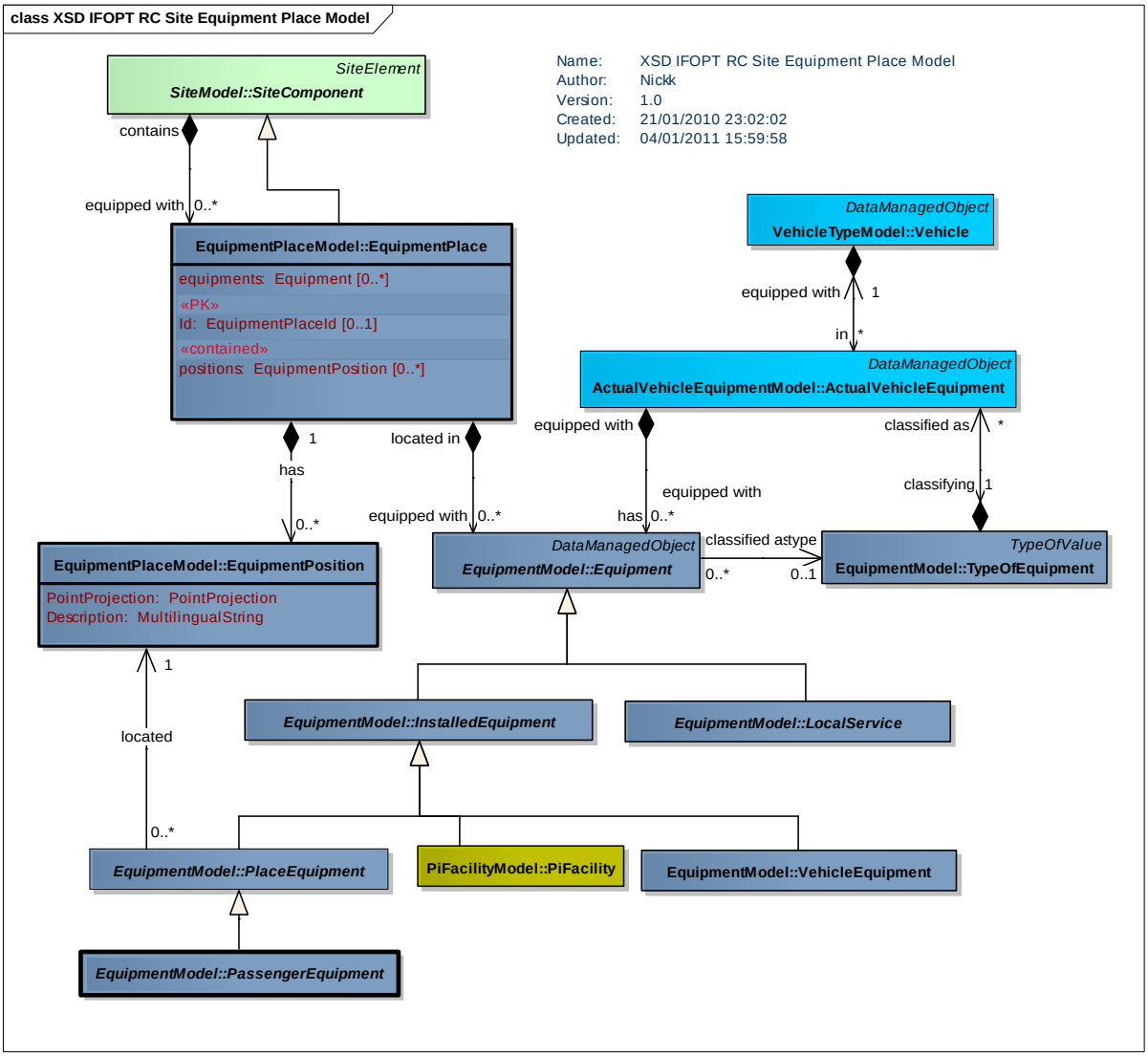


Figure 4-67 – UML diagram of Equipment Hierarchy

4.9.3 Equipment types and NaPTAN 3.0

Table 4-15 shows the relevance of different types of equipment for different levels of capability in *NaPTAN* 3.0. The Accessibility Attributes column lists specific properties of ***Equipment*** that are relevant for accessibility.

➔UK NOTE: Items shown in bold should always be populated for Capability Level3 , i.e. to enable proper computation of paths.

Group	Subgroup	Equipment	Use	Accessibility attributes
Place-Equipment	Access-Equipment	***RoughSurface***	Level3	SurfaceType
		EntranceEquipment	Level3	**Dimensions**, **wheelchair passable,** controls, acoustic sensor, automatic
		StaircaseEquipment	Level3	Handrail, handrail height, **step height, number of steps**
		LiftEquipment	Level3	**Dimensions**, **wheelchair passable, Wheelchair turning circle**

		EscalatorEquipment	Level3	**Width**
		TravelatorEquipment	Level3	**Width**
		RampEquipment	Level3	**Dimensions, gradient,** handrail, bands, strips
		QueuingEquipment	Level6	
		CrossingEquipment	Level3	Strips, sounds, sensors, acoustic aids dropped curb
	SignEquipment	***StopPlaceSign***	(Level5)	
		HeadingSign	(Level5)	
		OtherSign	(Level5)	
	Ticketing	***TicketingEquipment***	Level3	Low Counter Access
		TicketValidatorEquipment	Level6	
	StopPlace	***LuggageLockerEquipment***	Level6	
		ShelterEquipment	Level6	Number of seats, Dimensions, StepFree, Wheelchair Area Width, Wheelchair Area Depth
		TrolleyStandEquipment	Level6	
		WaitingRoomEquipment	Level6	Number of seats, Dimensions, StepFree, Wheelchair Area Width, Wheelchair Area Depth
	Passenger-Equipment	***PassengerInfoEquipment***	Level3	AccessibilityInfo
		PassengerSafetyEquipment	Level3	ccTV, Panic button, SOS Phones, Height of SOS Panel, Acoustic Announcements
		SanitaryFacility	Level6	Gender, Type Of Sanitary Facility Wheelchair turning circle
Loca-lService	Customer	***AssistanceService***	Level3	
		CustomerService	Level6	

Table 4-15 – Equipment types for use in NaPTAN 3.0

4.9.4 *NeTEx* Signage 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. The *NeTEx* model treats signs as a kind of EQUIPMENT whose contents and locations can be exactly specified. 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.

➔ UK NOTE: Sign equipment is not currently sourced.

4.9.5 XML Examples of Equipment

Further Examples of Equipment can be seen on the section on representing Stairs & Lifts.

4.9.5.1XML Example of Entrance Equipment

The following XML code fragment shows an ***Entrance*** barrier with ***EntranceEquipment*** for six non-wheelchair accessible gates and one wheelchair accessible gate. The Equipment is not precisely located.

```
<
        <Entrance created="2010-05-17T09:30:47Z">
                <Id>tbd:9100WIMBLDN_A1_EI1</Id>
                <Name>Internal Entrance to Upper Concourse from Ticket Hall</Name>
                <ParentZoneRef>tbd:9100WIMBLDN_A2</ParentZoneRef>
                <LevelRef>tbd:9100WIMBLDN_Lvl_G0</LevelRef>
                <placeEquipments>
                        <EntranceEquipment>
                                <Id>tbd:9100WIMBLDN_A2_EE1_B1</Id>
                                <Width>0.5</Width>
                                <NumberOfGates>6</NumberOfGates>
```

```
                    <EntranceRequiresTicket>true</EntranceRequiresTicket>
                    <WheelChairPassable>false</WheelChairPassable>
                </EntranceEquipment>
                <EntranceEquipment>
                    <Id>tbd:9100WIMBLDN_A2_EE1_B2</Id>
                    <Width>2</Width>
                    <NumberOfGates>1</NumberOfGates>
                    <EntranceRequiresTicket>true</EntranceRequiresTicket>
                    <WheelChairPassable>true</WheelChairPassable>
                </EntranceEquipment>
            </placeEquipments>
            <EntranceType>ticketBarrier</EntranceType>
            <isExternal>false</isExternal>
            <isEntry>true</isEntry>
            <isExit>true</isExit>
            <Width>1.0</Width>
            <Height>2.0</Height>
        </Entrance >
```

Figure 4-68 – XML Example of Entrance Equipment

4.9.5.2XML Example of Local Services

The following XML code fragment shows a TICKETING SERVICE describing available ticketing that might be associated with a STOP PLACE.

```
        <TicketingService created="2010-05-17T09:30:47Z">
            <validityConditions>
                <AvailabilityCondition created="2010-05-17T09:30:47Z">
                    <Id> tbd:AC_01_Main_Opening </Id>
                </AvailabilityCondition>
            </validityConditions>
            <TicketCounterService>true</TicketCounterService>
            <PaymentMethod> cash creditCard debitCard cheque </PaymentMethod>
            <TicketType>all</TicketType>
            <TicketingServiceType>all</TicketingServiceType>
        </TicketingService>
```

Figure 4-69 – XML Example of Local Service Equipment

4.9.5.3Equipment Visualisation examples for browsing

EQUIPMENT and LOCAL SERVICE items can be used to adorn a schematic map or other interactive visualisation of data on a mobile or fixed device.

Some examples of using equipment data are shown in Figure 4-70.

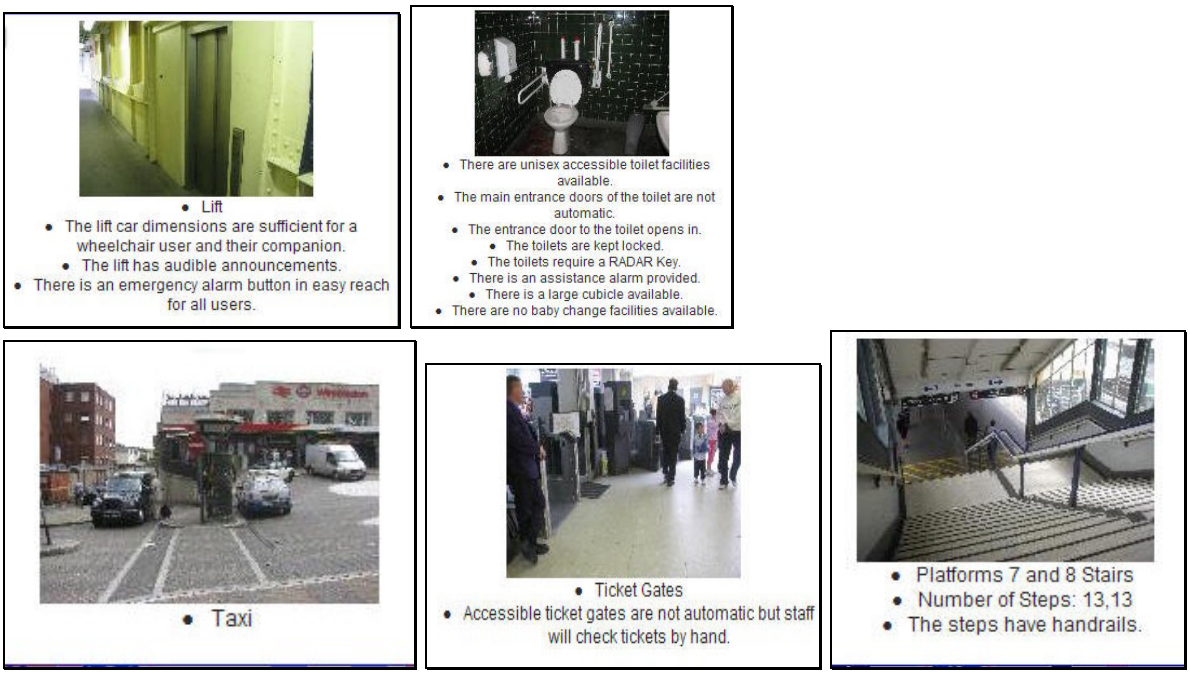
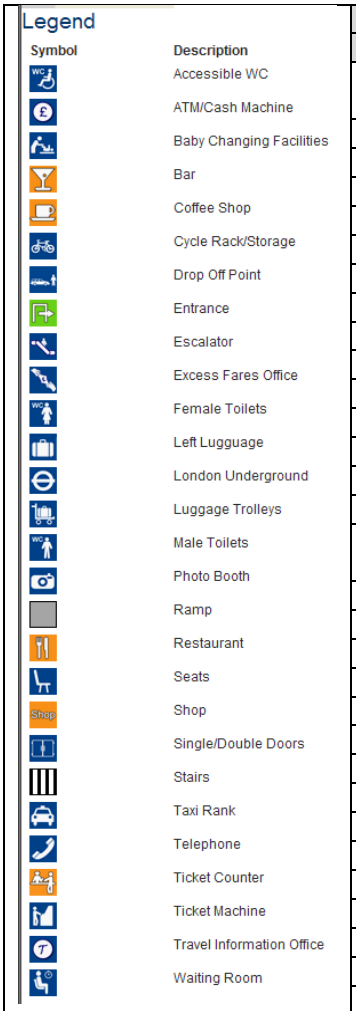


Figure 4-70 – Hover windows for selected Equipment (NRE Stations Made Easy)

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



Facility	Element	Attribute
Accessible WC	***SanitaryEquipment***	wheelchairAccessible
Cash Machine	***RefreshmentService***	cashMachine
Baby Changing	***SanitaryEquipment***	babyChange
Bar	***RefreshmentService***	bar
Coffee Shop	***RefreshmentService***	coffeeShop
Cycle Rack	***CycleStorageEquipment***	racks
Drop Off Point	QUAY [SDA] + ***SignEquipment***	setDown
Entrance	ENTRANCE + ***SignEquipment***	entrance
Escalator	***EscalatorEquipment***	
Excess Fares	***TicketingEquipment***	excessFares
Female Toilets	***SanitaryEquipment***	femaleOnly
LeftLuggage	***LuggageLockerEquipment***	
Metro	ENTRANCE +***SignEquipment***	
Luggage Trolleys	***TrolleyStandEquipment***	
Male Toilets	***SanitaryEquipment***	maleOnly
Photo Booth	***RetailService***	photoBooth
Ramp	***RampEquipment***	
Restaurant	***RefreshmentService***	restaurant
Seats	***WaitingRoomEquipment***	seats
Shop	***RetailEquipment***	
Doors	***EntranceEquipment***	
Stairs	***StairEquipment***	
Taxi	QUAY [TXS]+ S***ignEquipment***	
Telephone	***CommunicationService***	phone
Ticket Counter	***TicketingEquipment***	counterService
Ticket Machine	***TicketingEquipment***	TicketMachines
Info Office	***AssistanceService***	information
Waiting Room	***WaitingRoomEquipment***	
Lost Property	***LostPropertyService***	
Internet	***CommunicationService***	internet
Postbox	***CommunicationService***	postbox

Figure 4-71 – NRE Station Made Easy: Legend (From Euston Station)

4.10 *NeTEx* Check Constraints

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. *NeTEx* allows one or more CHECK CONSTRAINTs to be associated with STOP PLACE COMPONENTs, each specifying a process type and a delay. 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, and 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.

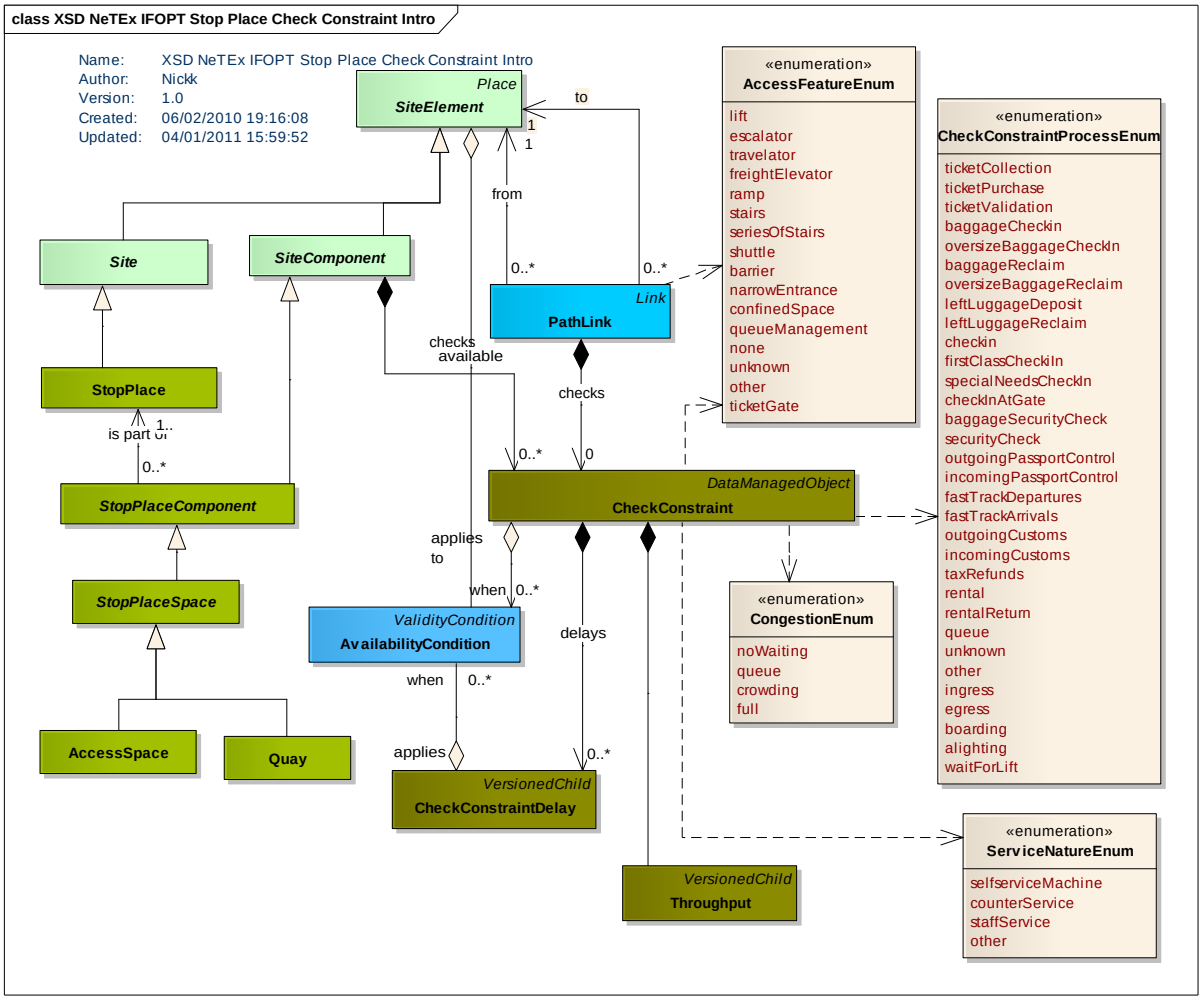


Figure 4-72 – UML Diagram of Check Constraint Model

4.10.1 XML Example of CheckConstraint

The following XML code fragment shows three CHECK CONSTRAINTs associated with a PATH LINK. One of them specifies a delay on using the ticket barrier at any time and applies to both directions. The other two specify delays for using the ticket counter for two different times of day; in rush hour and otherwise, as specified by a VALIDITY CONDITION – this only applies in a forwards direction..

4.10.1.1Availability Condition associated with Element

```
<SitePathLink created="2010-05-17T09:30:47Z">
        <Id>tbd:9100WIMBLDN_lnk_A1-EE1_A1-EI1</Id>
        <Name>From Ticket hall external entrance to Upper concourse internal entrance</Name>
        <From>
                <PlaceRef>tbd:9100WIMBLDN_A1</PlaceRef>
                <EntranceRef>tbd:9100WIMBLDN_A1_EE1</EntranceRef>
        </From>
        <To>
                <PlaceRef>tbd:9100WIMBLDN_A1</PlaceRef>
                <EntranceRef>tbd:9100WIMBLDN_A1_EI1</EntranceRef>
        </To>
        ……..
```

```
        <AllowedUse>twoWay</AllowedUse>
        <LevelRef>tbd:9100WIMBLDN_Lvl_G0</LevelRef>
        <checks>
            <CheckConstraint>
                <Id>tbd:9100WIMBLDN_A1_Ck001</Id>
                <Name>Queue for Ticket Barrier</Name>
                <CheckProcess>ticketValidation</CheckProcess>
                <CheckService>selfService</CheckService>
                <AccessFeatureType>barrier</AccessFeatureType>
                <Congestion>queue</Congestion>
                <MinimumLikelyDelay>PT0S</MinimumLikelyDelay>
                <AverageDelay>PT30S</AverageDelay>
                <MaximumLikelyDelay>P12M</MaximumLikelyDelay>
            </CheckConstraint>

            <CheckConstraint>
                <Id>tbd:9100WIMBLDN_A1_Ck002</Id>
                <Name>Ticket Collection at counter in normal times</Name>
                <validityConditions>
                <AvailabilityConditionRef>tbd:AC_01_Main_Opening</AvailabilityConditionRef>
                </validityConditions>
                <Order>2</Order>
                <CheckDirection>forwards</CheckDirection>
                <CheckProcess>ticketCollection</CheckProcess>
                <CheckService>counterService</CheckService>
                <Congestion>queue</Congestion>
                <MinimumLikelyDelay>PT1M</MinimumLikelyDelay>
                <AverageDelay>PT3M</AverageDelay>
                <MaximumLikelyDelay>P5M</MaximumLikelyDelay>
            </CheckConstraint>

            <CheckConstraint>
                <Id>tbd:9100WIMBLDN_A1_Ck003</Id>
                <Name>Ticket Collection in rush hour</Name>
                <validityConditions>
                <AvailabilityConditionRef>tbd:AC_03:RushHourMF</AvailabilityConditionRef>
                </validityConditions>
                <Order>1</Order>
                <CheckDirection>forwards</CheckDirection>
                <CheckProcess>ticketCollection</CheckProcess>
                <CheckService>counterService</CheckService>
                <Congestion>queue</Congestion>
                <MinimumLikelyDelay>PT5M</MinimumLikelyDelay>
                <AverageDelay>PT10M</AverageDelay>
                <MaximumLikelyDelay>P20M</MaximumLikelyDelay>
            </CheckConstraint>
        </checks>

    </SitePathLink>
```

Figure 4-73 – XML Example of CheckConstraint

4.11 *NeTEx* Validity Conditions

There may be elements in the STOP PLACE or SITE that are only available at certain times. For example a given ENTRANCE of a SITE might be open only at certain times. Knowledge of these conditions allows journey planners and other applications to give more correct times.
NeTEx includes a general purpose VALIDITY CONDITION which can be used to specify temporal constraints for many different purposes, including for the availability of *NeTEx* elements This can be refined with a more precise AVAILABILITY CONDITION to specify specific temporal properties. Each AVAILABILITY CONDITION is composed of one or more DAY TYPES. Each DAY TYPE is described in terms of the PROPERTIEs OF DAY

➔ ***UK Note***: Some validity conditions can be found in the Direct Enquiries data set. Some aspects of the NaPTAN Stop Validity can also be described through use of an availability condition

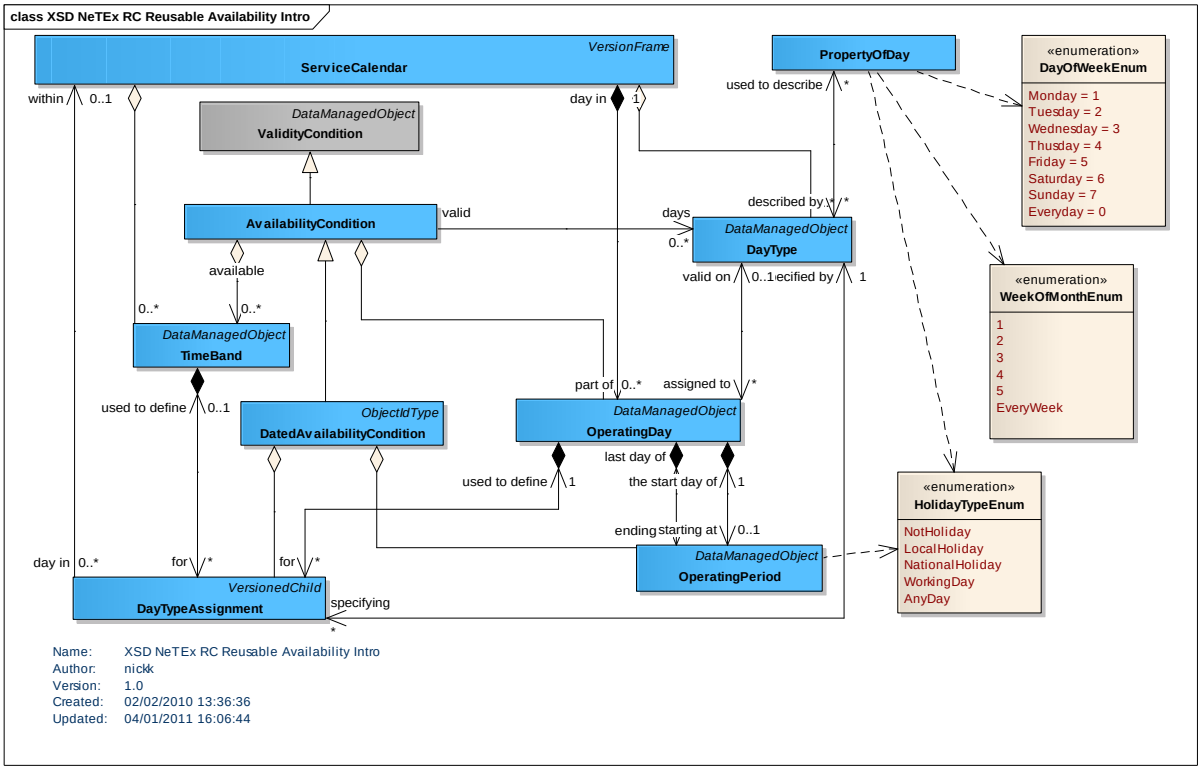


Figure 4-74 – UML Diagram of Availability condition model

4.11.1 Service Calendar

To relate a validity condition to a specific operating data a SERVICE CALENDAR can be provided. This uses a DAY ASSIGNMENT to assign day types to particular OPERATING DAYS, i.e. dates in the SERVICE CALENDAR.

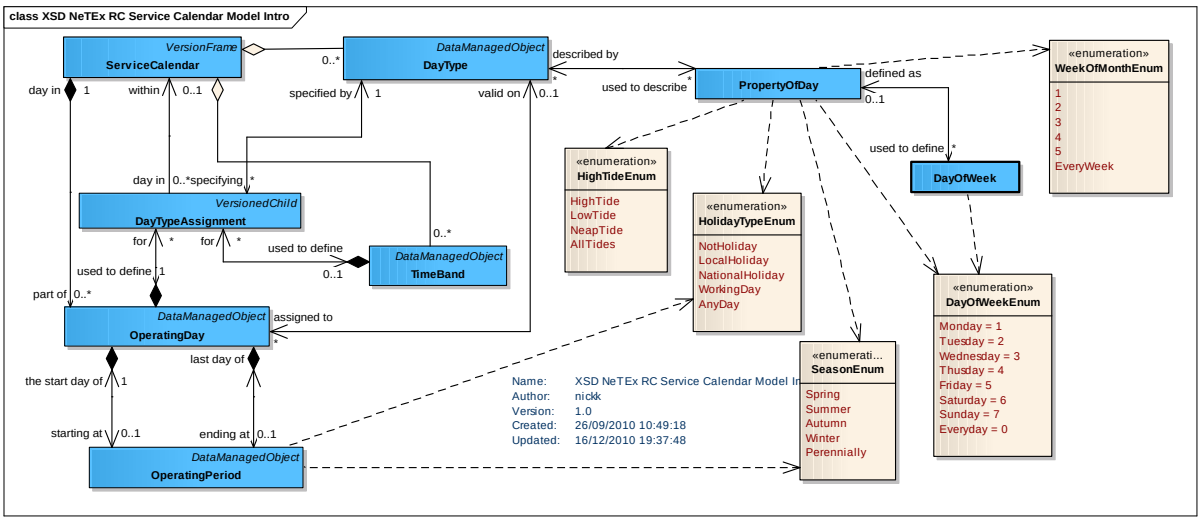


Figure 4-75 – UML Diagram of Service Calendar Model

4.11.2 Scope of Validity Conditions

Validity conditions apply to their elements

- A VALIDITY CONDITION on a SITE is assumed to apply to all of its children unless overridden.
- A VALIDITY CONDITION on a nested QUAY or nested ACCESS SPACE is assumed to apply to all its children unless explicitly overridden.
- A VALIDITY CONDITION on EQUIPMENT is assumed to be the same as its containing place unless explicitly overridden.

A VALIDITY CONDITION on any single element of a NAVIGATION PATH such as a ENTRANCE or individual PATH LINK means the at the whole NAVIGATION PATH is similarly constrained.

4.11.3 XML Example of Validity Condition

The following XML code fragment shows a VALIDITY CONDITION On an ENTRANCE barrier which is open during opening hours.

4.11.3.1Availability Condition associated with Element

```
<Entrance created="2010-05-17T09:30:47Z">
        <Id>tbd:9100WIMBLDN_A1_EE1</Id>
        <Name>External Entrance to Ticket Hall</Name>
        <validityConditions>
                <AvailabilityConditionRef> tbd:AC_01_Main_Opening</AvailabilityConditionRef>
        </validityConditions>
        <ParentZoneRef>tbd:9100WIMBLDN_A1</ParentZoneRef>
        <LevelRef>tbd:9100WIMBLDN_Lvl_G0</LevelRef>
                <EntranceType>openDoor</EntranceType>
        <isExternal>true</isExternal>
        <isEntry>true</isEntry>
        <isExit>true</isExit>
        <Width>3.0</Width>
        <Height>2.0</Height>
</Entrance>
```

4.11.3.2Availability Condition definitions

The condition is made up of a number of day types

```
<AvailabilityCondition>
        <Id> tbd:AC_01_Main_Opening</Id>
        <dayTypes>
                <DayTypeRef> tbd:DT001Open_MF</DayTypeRef>
                <DayTypeRef> tbd:DT002Open_Sat</DayTypeRef>
                <DayTypeRef> tbd:DT003Open_Sun</DayTypeRef>
        </dayTypes>
</AvailabilityCondition>

<AvailabilityCondition>
        <Id> tbd:AC_02_CC_Opening</Id>
        <dayTypes>
                <DayTypeRef> tbd:DT004Open_MFS</DayTypeRef>
                <DayTypeRef> tbd:DT005Open_Sun</DayTypeRef>
        </dayTypes>

</AvailabilityCondition>
```

4.11.3.3Day types definitions

Each day type defines

```
<DayType>
        <Id> tbd:DT004Open_MFS</Id>
        <properties>
                <PropertyOfDay>
                        <DaysOfWeek>Monday Tuesday Wednesday Thursday Friday Saturday</DaysOfWeek>
                        <HolidayTypes>WorkingDay</HolidayTypes>
                        </PropertyOfDay>
```

```
        </properties>
        <timebands>
            <Timeband>
                <StartTime>08:30:00</StartTime>
                <EndTime>20:00:00</EndTime>
            </Timeband>
        </timebands>
</DayType>

<DayType>
        <Id> tbd:DT005Open_Sun</Id>
        <properties>
            <PropertyOfDay>
                <DaysOfWeek>Sunday</DaysOfWeek>
            </PropertyOfDay>
        </properties>
        <timebands>
            <Timeband>
                <StartTime>10:30:00</StartTime>
                <EndTime>18:00:00</EndTime>
            </Timeband>
        </timebands>
</DayType>
```

4.12 Points of Interest

4.12.1 Points of Interest model

STOP PLACEs are a type of SITE that provide 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.

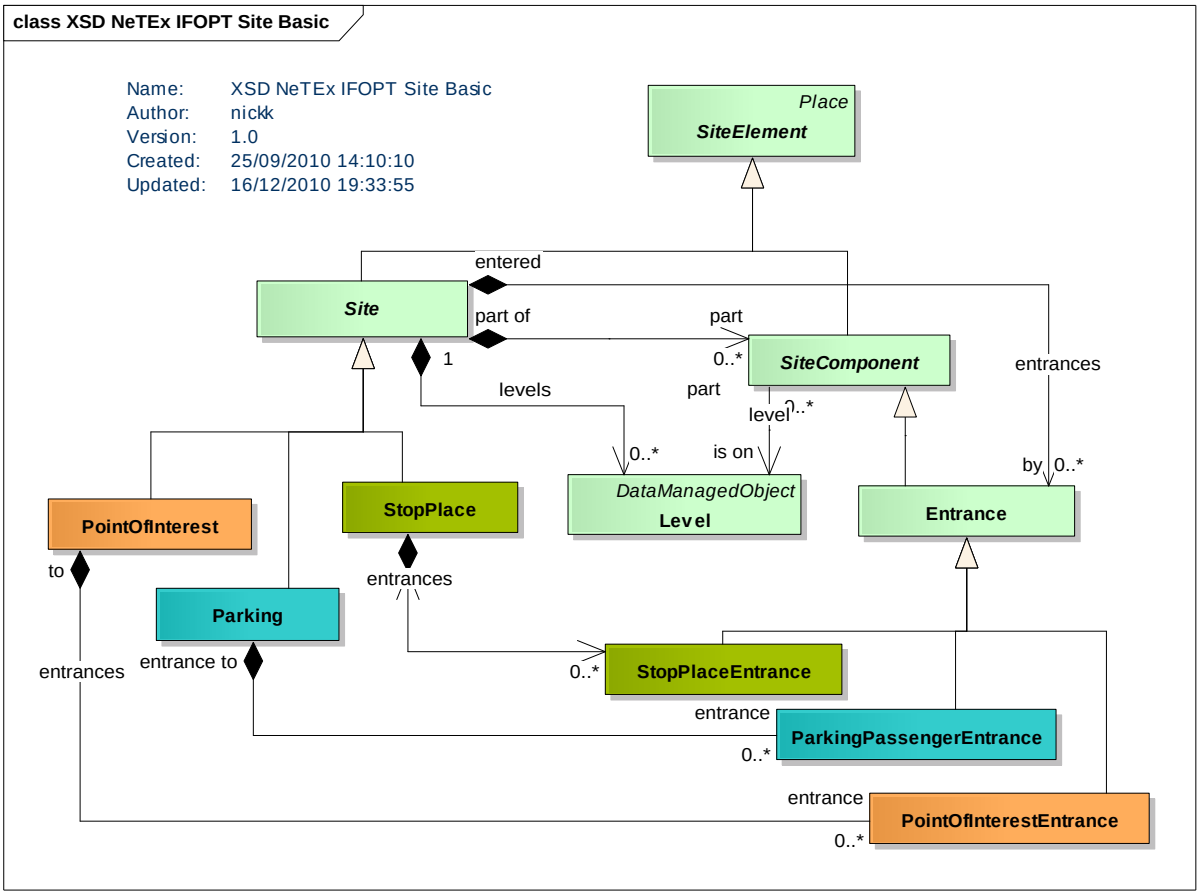


Figure 4-76 – UML Diagram of Sites with Point of Interest

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

➔ ***UK Note***: *:* In the UK Point X provides a commercial source for POI data, using a proprietary format.. Some regional planners, such as transport for London also have POI data and POI classifications. For the 2012 Olympics it is proposed to use a set of NaPTAN identifiers that would allow Sites to be used in journey planning.

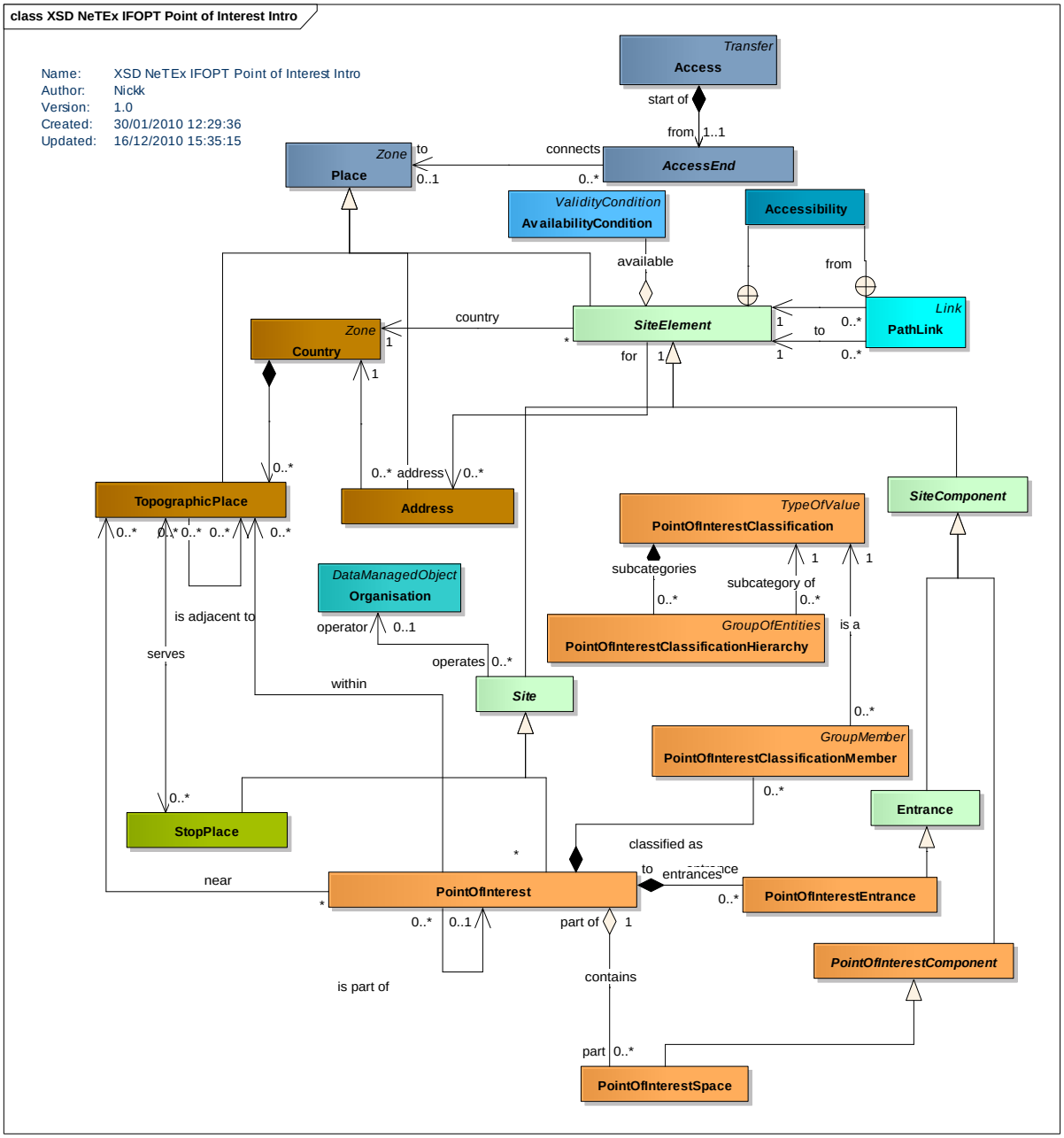


Figure 4-77 – UML Diagram of Point of Interest Model

4.12.2 Example of Point of Interest - Basic

Figure 4-78 shows the use of SITE COMPONENTs to describe just the entrances and existence of a stadium with four separate ENTRANCEs – similar to a NaPTAN 2.0 level of detail.

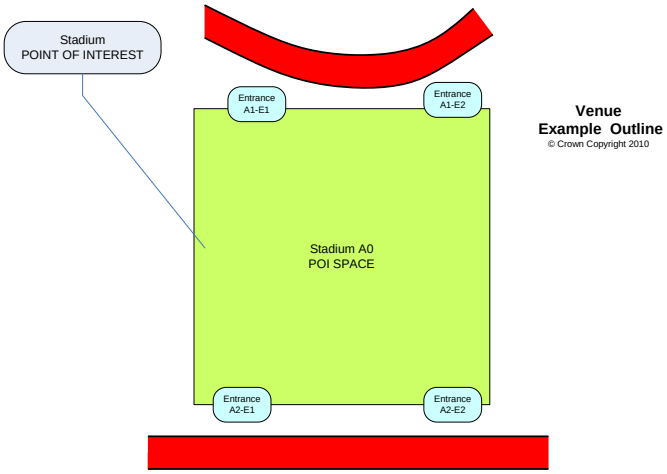


Figure 4-78 – Example Basic Point of interest

4.12.3 Example of Point of Interest

Figure 4-79 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

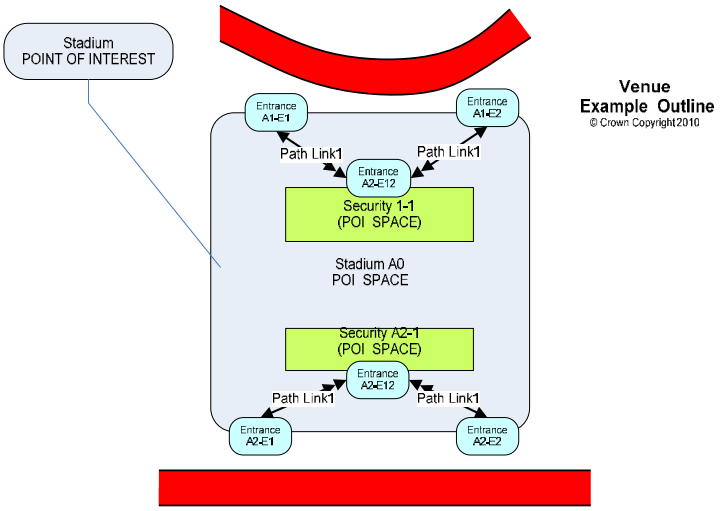


Figure 4-79 – Example Point Of Interest –Stadium Outline

4.12.4 Example of Point of Interest

Figure 4-80 shows the use of SITE COMPONENTs to further describe the internal parts of a the stadium sufficient to indicate the Entrance to use to reach a given set of seats..

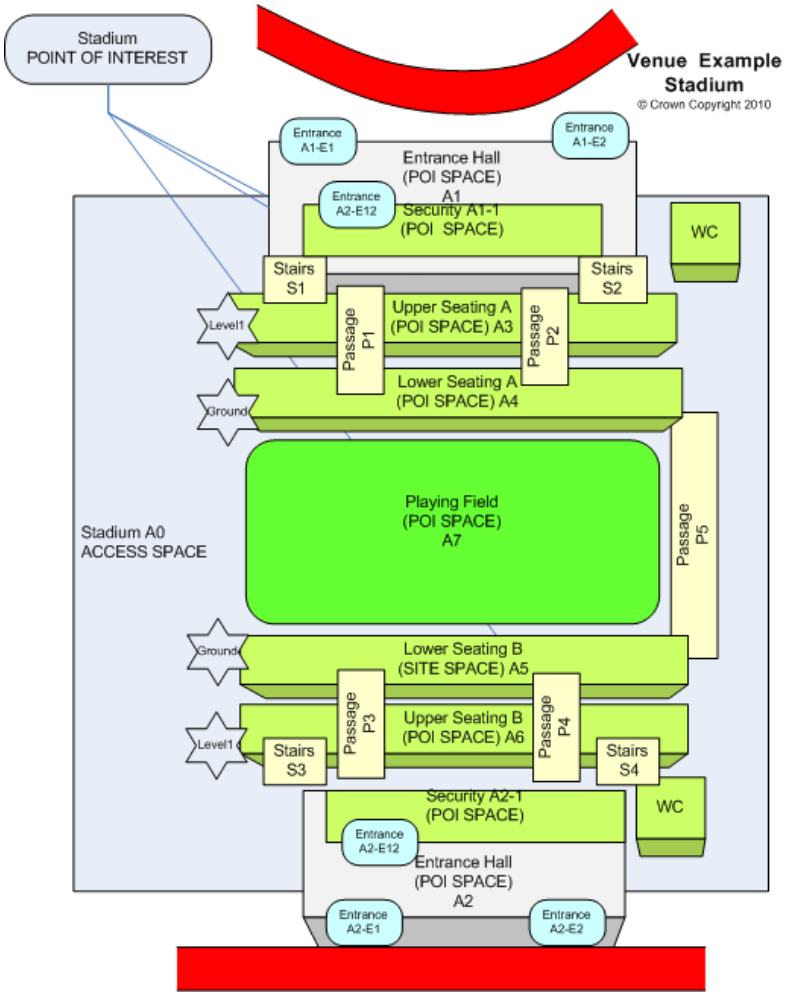


Figure 4-80 – Example Point Of Interest –Stadium

4.12.5 Example of Point of Interest

Figure 4-81shows the use of SITE COMPONENTs to describe the seat number ranges within a large stadium so that the appropriate entry can be selected.

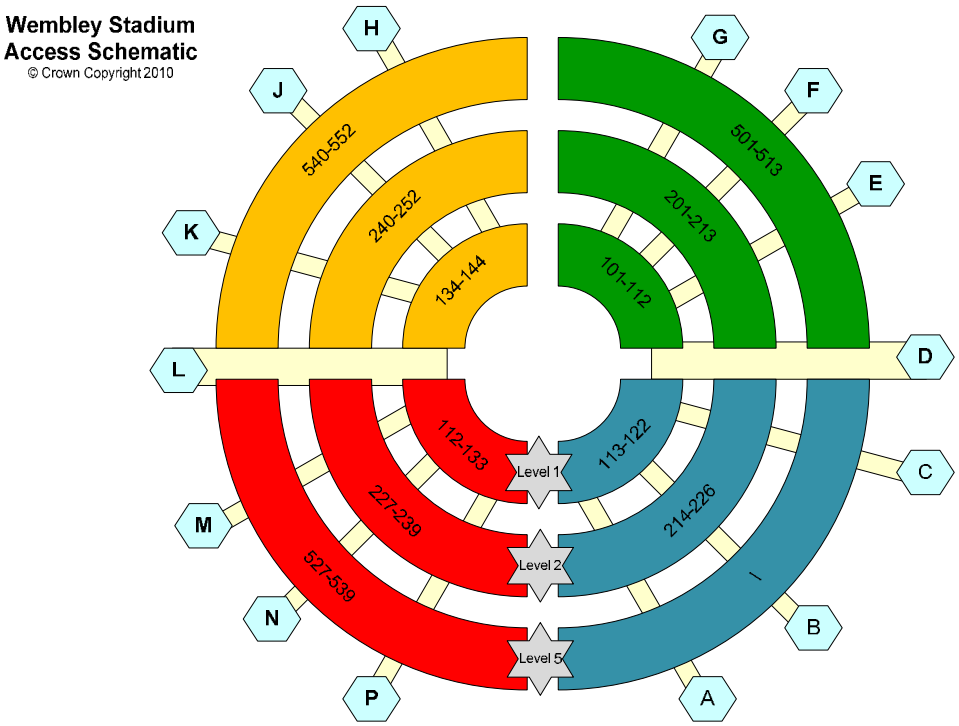


Figure 4-81 – Example Point Of Interest – Stadium with Numbered sections

4.12.6 XML Example of Point of Interest

The following XML code fragment shows part of a POINT OF INTEREST for a Stadium that identifies the pixel coordinates for two ENTRANCEs the entrances).

```
<PointOfInterest>
        <ResponsibilitySetRef>tbdLRS_01</ResponsibilitySetRef>
        <Id>tbd:POI_23</Id>
        <Name>Frampton Football Stadium</Name>
        <Description>normalizedString</Description>
        <Centroid>
                <Location>
                        <Longitude>-180</Longitude>
                        <Latitude>-90</Latitude>
                        <Altitude>-1000</Altitude>
                        <Precision>0.0</Precision>
                </Location>
        </Centroid>
        <AccessibilityAssessment>
                <MobilityImpairedAccess>true</MobilityImpairedAccess>
                <Id>ACID_21</Id>
                <limitations>
                        <AccessibilityLimitation>
                                <WheelchairAccess>true</WheelchairAccess>
                                <StepFreeAccess>true</StepFreeAccess>
                                <EscalatorFreeAccess>true</EscalatorFreeAccess>
                                <LiftFreeAccess>true</LiftFreeAccess>

                        </AccessibilityLimitation>
                </limitations>
        </AccessibilityAssessment>
        <accessModes>
                <AccessMode>foot</AccessMode>
        </accessModes>
        <ShortName>Frampton FC</ShortName>
        <Image>http://www.amy.com/stad.gif</Image>
        <CrossRoad>Foo St</CrossRoad>
```

```
<PublicUse>true</PublicUse>
<Covered>indoors</Covered>
<Gated>gatedArea</Gated>
<Lighting>wellLit</Lighting>
<TopographicPlaceRef>678</TopographicPlaceRef>
<PostalAddress>
        <Id>normalizedString</Id>
        <BuildingName>normalizedString</BuildingName>
        <AddressLine1>23 Foo St</AddressLine1>
        <Town>Frampton</Town>
        <Suburb>normalizedString</Suburb>
        <PostCode>FgR 457</PostCode>
</PostalAddress>

<levels>
        <Level>
                <Id>tbd:POI_23_Lvl_01</Id>
                <Name>Ground</Name>
                <ShortName>Ground</ShortName>
                <LevelCode>G</LevelCode>
        </Level>
        <Level>
                <Id> tbd:POI_23_Lvl_02</Id>
                <Name>Upper Terrace</Name>
                <ShortName>Upper</ShortName>
                <LevelCode>T1</LevelCode>
        </Level>
</levels>
<entrances>
        <Entrance>
                <Id>tbd:POI_23_A1_E1</Id>
                <Name>Foo St Entrance A</Name>
```

……..
etc

4.13 Parking

4.13.1 Parking

NeTEx 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. The NeTEx model is intended to be interoperable with the proposed Datex2 representation,

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.
- Charges may be specified using a PARKING TARIFF and PARKING TARIFF CHARGE BAND elements.

➔ UK NOTE:

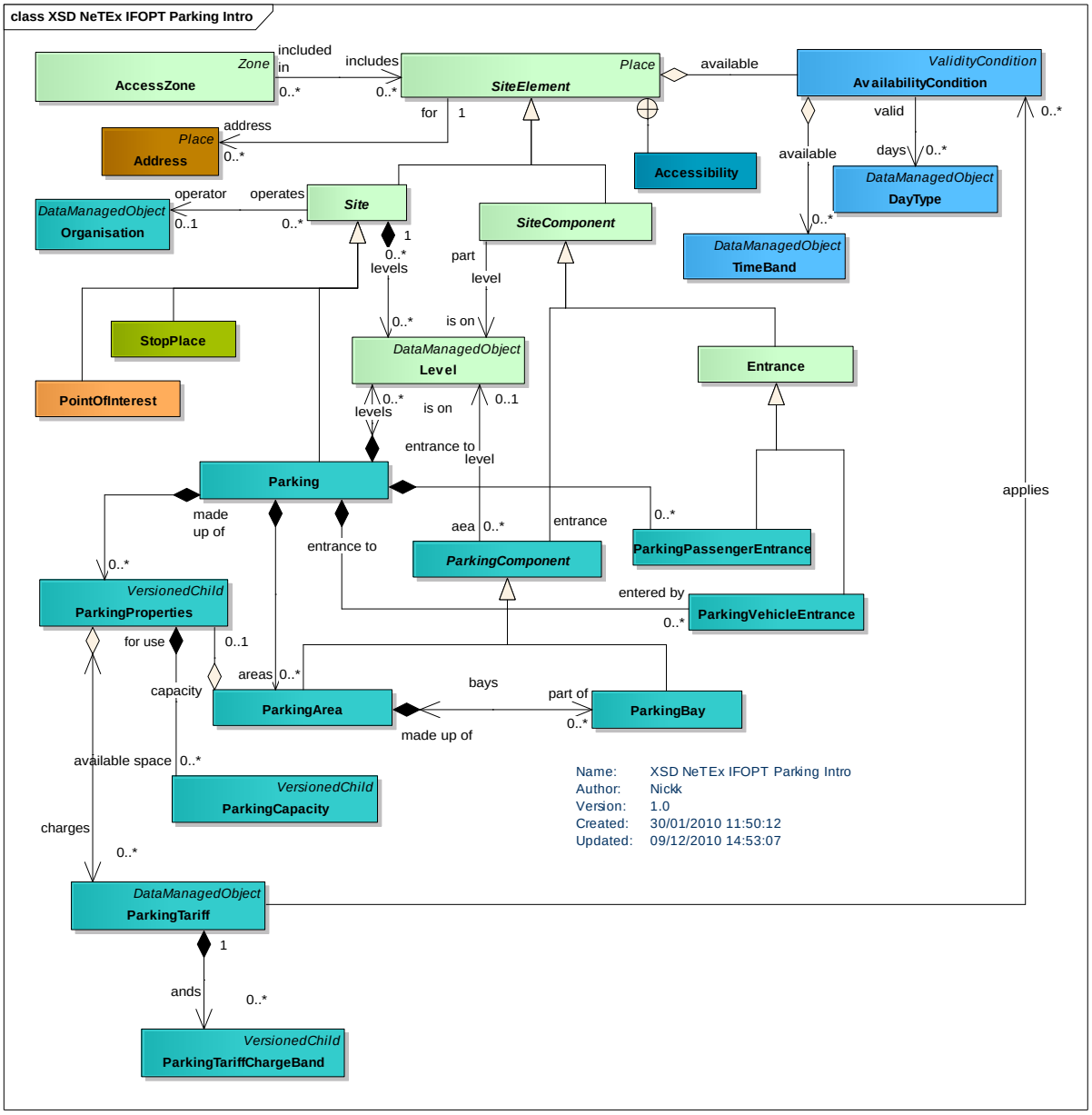


Figure 4-82 – UML Diagram of Parking elements

4.13.2 XML Example of Parking

The following XML code fragment shows part of a PARKING linked to a Stop Place by a ramp

```
<Parking>
        <ResponsibilitySetRef>napt:RS_80</ResponsibilitySetRef>
        <Id>tbd:9100WIMBLDN_A2b_P1</Id>
        <Name>Station Psrking</Name>
        <Description>Forecourt parking</Description>
        <Centroid>
                <Location>
                        <Longitude>-180</Longitude>
                        <Latitude>-90</Latitude>
                </Location>
        </Centroid>
        <PublicUse>true</PublicUse>
```

```
            <Covered>outdoors</Covered>
            <Lighting>wellLit</Lighting>
            <pathLinks>
                  <SitePathLink>
                        <ResponsibilitySetRef>apt:RS_80</ResponsibilitySetRef>
                        <Id>tbd:9100WIMBLDN_A2b_P1</Id>
                        <Name>Link from parking to forecourt</Name>
                        <From>
                              <PlaceRef>tbd:9100WIMBLDN_P1</PlaceRef>
                        </From>
                        <To>
                              <PlaceRef>tbd:9100WIMBLDN_FC-J1</PlaceRef>
                        </To>
                        <Description>From car park to forecourt path junction 1</Description>
                        <Distance>10   </Distance>
                        <NumberOfSteps>0</NumberOfSteps>
                        <FromToUpDown>up</FromToUpDown>
                        <AccessFeatureType>ramp</AccessFeatureType>
                        <TransferDuration>
                              <DefaultDuration>PT1M</DefaultDuration>
                        </TransferDuration>
                        <LevelRef>tbd:9100WIMBLDN_Lvl_G0</LevelRef>
                        <placeEquipments>
                              <RampEquipment>
                                    <Id>tbd:9100WIMBLDN_P1_Eq-1</Id>
                                    <Name>Ramo from carpark</Name>
                                    <Width>2</Width>
                                    <DirectionOfUse>both</DirectionOfUse>
                                    <Length>40</Length>
                                    <GradientType>gentle</GradientType>
                                    <HandrailType>none</HandrailType>
                              </RampEquipment>
                        </placeEquipments>
                  </SitePathLink>
            </pathLinks>
            <ParkingType>trainStationParking</ParkingType>
            <ParkingLayout>openSpace</ParkingLayout>
            <TotalCapacity>4</TotalCapacity>
            <parkingProperties>
                  <ParkingProperties>
                        <Id>tbd:9100WIMBLDN_P1_pp2</Id>
                        <ParkingUserType>allUsers</ParkingUserType>
                        <ParkingStayType>shortStay</ParkingStayType>
                        <MaximumStay>PT2H</MaximumStay>
                        <spaces>
                              <ParkingCapacity>
                                    <Id>tbd:9100WIMBLDN_A2b_P1-p1</Id>
                                    <ParkingVehicleType>largeCar</ParkingVehicleType>
                                    <ParkingStayType>shortStay</ParkingStayType>
                                    <NumberOfSpaces>4</NumberOfSpaces>
                              </ParkingCapacity>
                        </spaces>
                  </ParkingProperties>
            </parkingProperties>
      </Parking>
```

4.14 Address

4.14.1 Address elements

NeTEx uses generic elements for road addresses. These can be embedded in other elements, e.g. STOP PLACE, QUAY etc to describe the address. Figure 4-83 introduces the ROAD ADDRESS & POSTAL ADDRESS elements

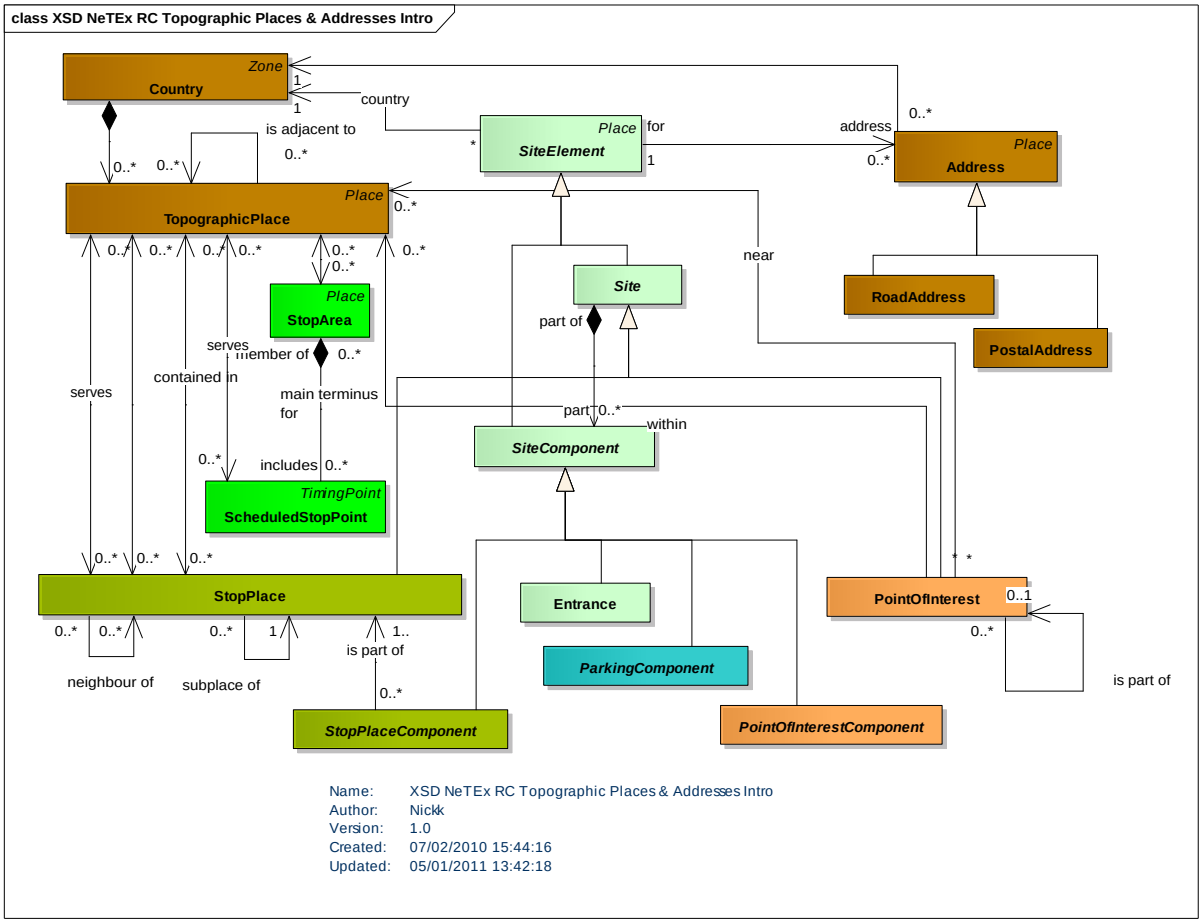


Figure 4-83 – UML Diagram of Addresses - Overview

4.15 NeTEx Schematic Map

The published passenger Information for a complex transport interchange often includes schematic maps to show the relative parts and facilities located within the interchange. In an interactive presentation to passengers using an electronic device, these maps may be linked to other elements, for example, to see the properties of an piece of equipment. NeTEx includes a generic representation of such a map that map be linked to NeTEx elements independently of any specific rendering in a specific mark-up such as HTML or JavaScript.

➔UK NOTE: An optional feature for Capability Level6 support.

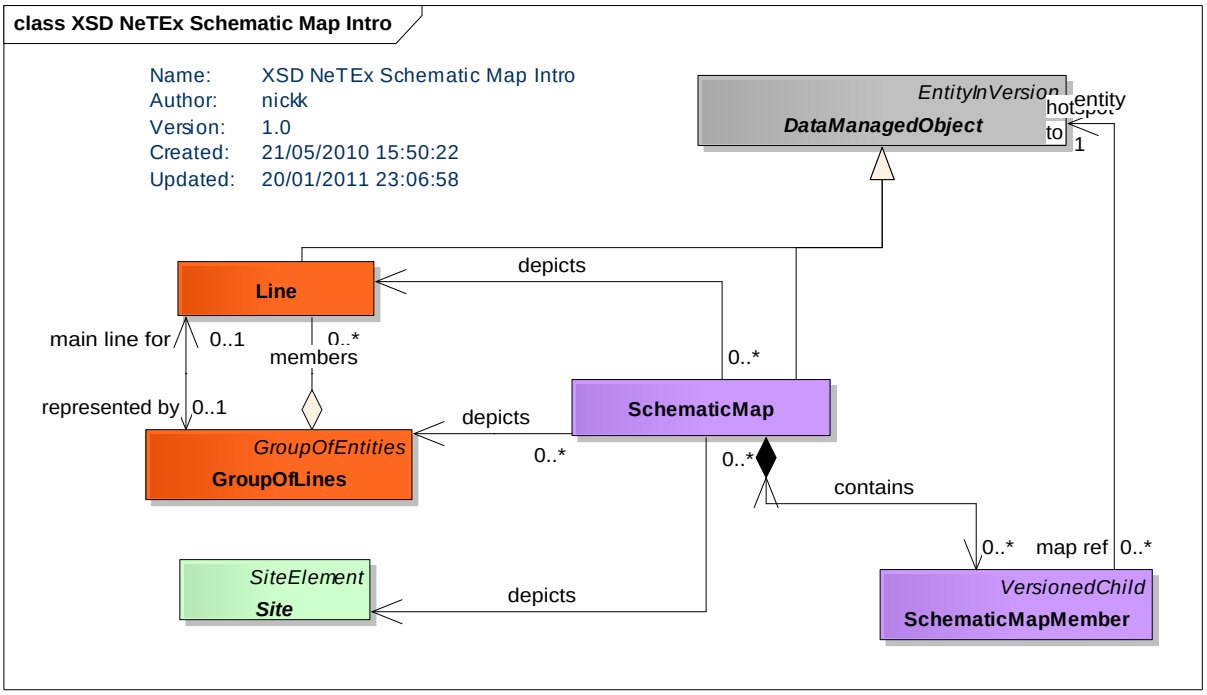


Figure 4-84 – UML Diagram of Schematic Map - Overview

4.15.1 Example of a Schematic Map

Figure 4-85 and Figure 4-86 show examples of a SCHEMATIC MAP for Wimbledon station.

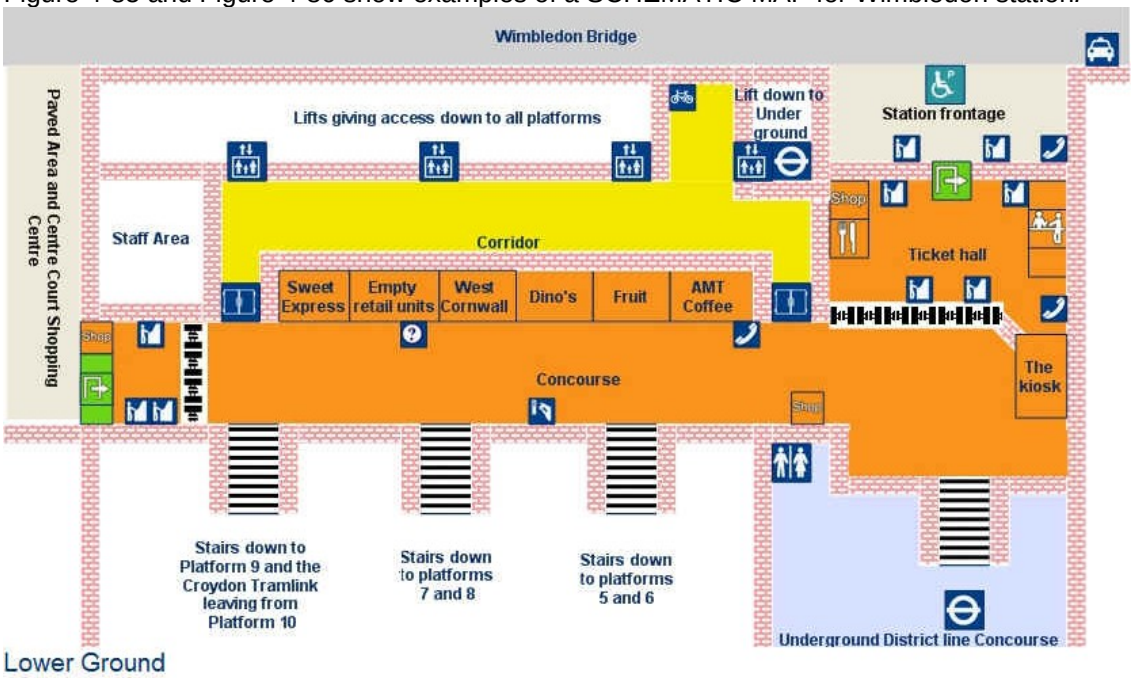


Figure 4-85 – Wimbledon Station plan: Ground floor (NRE Stations Made Easy)

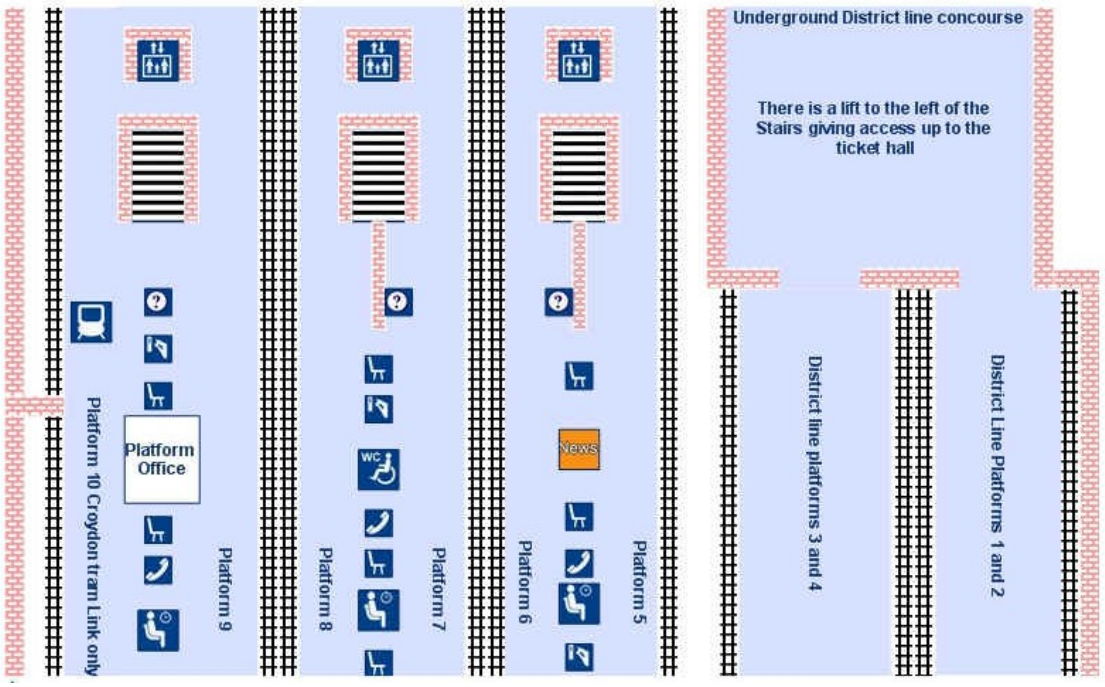


Figure 4-86 – Wimbledon Station plan: Lower Ground floor (NRE Stations Made Easy)

4.15.2 XML Example of a Schematic Map

The following XML code fragment shows part of a ***SchematicMap*** for a rail station that identifies the pixel coordinates for two entrances (ENTRANCEs) and a toilet. (i.e. SANITARY EQUIPMENT)**.**

```
<schematicMaps>
        <SchematicMap created="2001-12-17T09:30:47Z">
                <Id>tbd:WimMap_001</Id>
                <Name>Map of Wimbledon Station - Upper Level</Name>
                <ImageUri>http://www.tbde.com/WimbledonPlan1.jpg</ImageUri>
                <DepictedObjectRef nameOfRefClass="StopPlace">napt:910GWIMBLDN</DepictedObjectRef>
                <members modificationSet="all">
                        <SchematicMapMember>
                                <Id>tbd:WimMap_001_01</Id>
                                <Name>Entrance</Name>
                                <SchematicMapMemberRef nameOfRefClass="Entrance"> ttbd:9100WIMBLDN_A1_EE1
</SchematicMapMemberRef>
                                <x>0123</x>
                                <y>346</y>
                        </SchematicMapMember>
                        <SchematicMapMember>
                                <Id>tbd:WimMap_001_01</Id>
                                <Name>Side Entrance</Name>
                                <SchematicMapMemberRef nameOfRefClass="Entrance"> tbd:9100WIMBLDN_A4_EE1
</SchematicMapMemberRef>
                                <x>014</x>
                                <y>344</y>
                        </SchematicMapMember>
                                                <SchematicMapMember>
                                <Id>tbd:WimMap_001_01</Id>
                                <Name>Men and Women's Toilets</Name>
                                <SchematicMapMemberRef nameOfRefClass="SanitaryEquipment">
tbd:9100WIMBLDN_A2_Eq-WC1 </SchematicMapMemberRef>
                                <x>0145</x>
                                <y>365</y>
                        </SchematicMapMember>
                </members>
……
```

```
        </SchematicMap>
</schematicMaps>
```

4.16 Grouping elements in NeTEx for data exchange

NeTEx includes VERSION FRAME elements that allow the grouping of compatible sets of instances that together form a coherent version that may be exchanged and used as a whole. There are a number of different types of VERSION FRAME. For NaPTAN 3.0, two are relevant: the SITE FRAME and the SERVICE CALENDAR. Figure 4-87 shows the elements of a SITE FRAME.

The SITE FRAME contains elements relating to a stop including the STOP PLACE and SCHEDULED STOP POINTs. A SITE FRAME may reference a SERVICE CALENDAR frame for its calendar - see earlier.

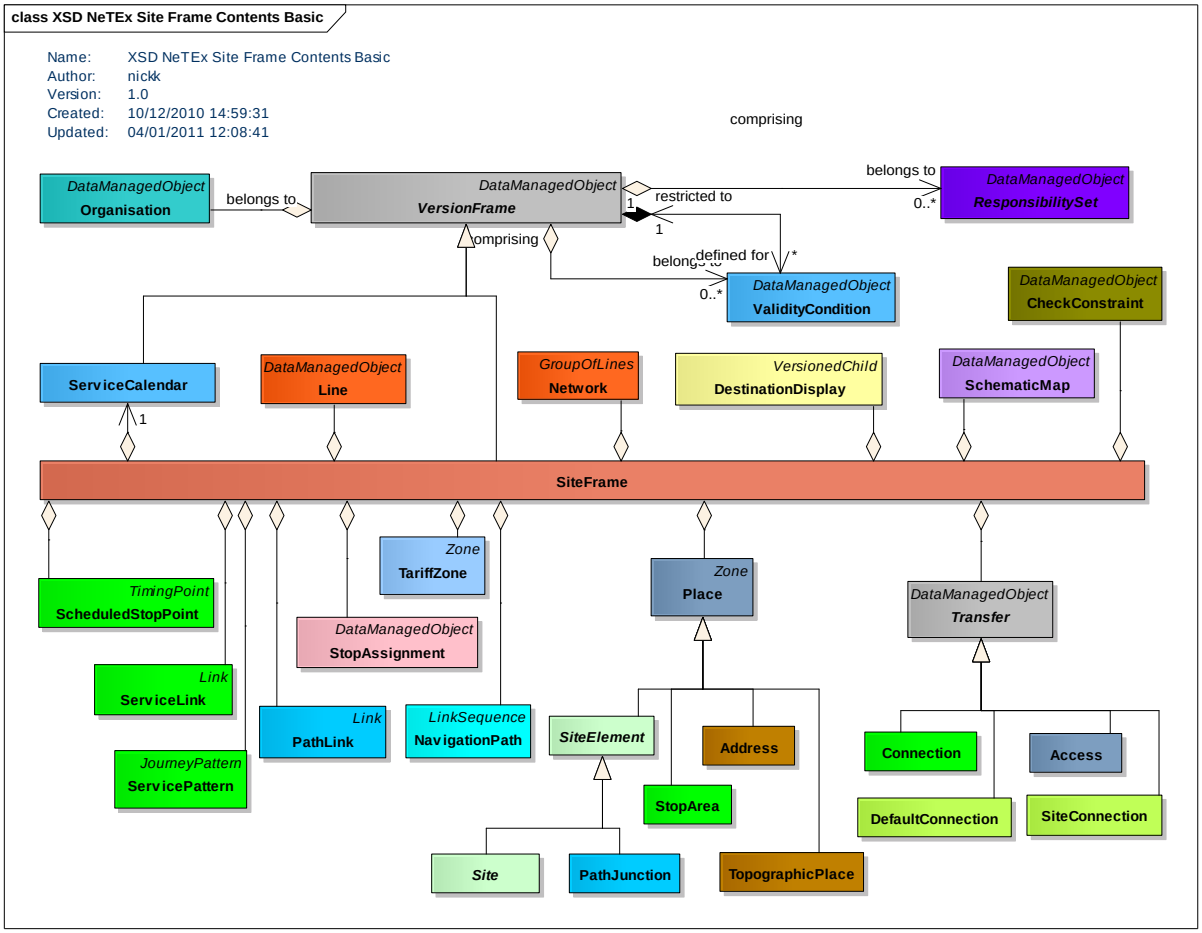


Figure 4-87 – UML Diagram of Site Frame Elements

4.16.1 XML Example of Site Frame

The following XML code fragment shows part of a SITE FRAME that contains many child elements

```
<SiteFrame>
                <!-- == For each NPTG Admin area responsibility is created : = -->
                <responsibilitySets>
                        <!-- Generalisation of NPTG ability to associate data with an area and Equivalent to NPTG areas = -->
                        <ResponsibilitySet created="2010-05-17T09:30:47Z" modification="revise" changed="2010-05-
17T09:30:47Z" version="1.0" id="napt:RS_82">
                                <ResponsibilitySetRef ref="napt:RS_nptg">..</ResponsibilitySetRef>
                                <roles>
```

```
                    .....
                </ResponsibilitySet>
            </responsibilitySets>
            <organisations>
                <Authority>
                    <Id>tbd:Org_Tfl</Id>
                    <Name>Transport For London</Name>
                    <ShortName>TfL</ShortName>
                    <OrganisationType>authority</OrganisationType>
                </Authority>
                 .....
            </organisations>
            <contentValidityConditions>
                <AvailabilityCondition>
                    <Id>tbd:AC_02_CC_Opening</Id>
                    <dayTypes>
                        <DayTypeRef ref="tbd:DT004Open_MFS"></DayTypeRef>
                        <DayTypeRef ref="tbd:DT005Open_Sun"></DayTypeRef>
                    </dayTypes>
                </AvailabilityCondition>
             .....
            </contentValidityConditions>
            <!-- ===Topographic places - equivalent to NPTG Regions == -->
            <topographicPlaces>
                <TopographicPlace created="2005-10-05T10:52:25" changed="2005-10-05T10:52:25">
                    <Id>nptg:Region_L</Id>
                    <Name lang="en">Greater London</Name>
                    ……..
                </TopographicPlace>
                <!-- ===Topographic places - equivalent to NPTG Districts == -->
            </topographicPlaces>
                <!-- == Schematic Maps ========== -->
            <schematicMaps>
                <SchematicMap created="2001-12-17T09:30:47Z">
                    <Id>tbd:WimMap_001</Id>
                    <Name>Map of Wimbledon Station - Upper Level</Name>
                    <ImageUri>http://www.tbde.com/Wimbledonplan1.jpg</ImageUri>
                    .....
                </SchematicMap>
            </schematicMaps>
            <!-- ===STATION S=== -->
            <stopPlaces>
                <!-- ========== RAIL========= -->
                <StopPlace created="2006-09-11T15:42:00" modification="revise" dataSourceRef="NaPTAN"
hanged="2009-02-26T15:47:00">
                    <!--              <StopAreaCode>910GWIMBLDN</StopAreaCode> -->
                    <!--      <AdministrativeAreaRef> -->
                    <Id>napt:910GWIMBLDN</Id>
                    <Name>Wimbledon Rail Station</Name>
                    .....
                </StopPlace>
                <!-- ========== UNDERGROUND ========= -->
            </stopPlaces>
            <scheduledStopPoints>
                <!-- Scheduled stop ponts -->
                <ScheduledStopPoint>
                    <Id>napt:9100WIMBLDN</Id>
                    <Name>Wimbledon Rail Station</Name>
                    <VehicleModes>rail</VehicleModes>
                    <ForAlighting>true</ForAlighting>
                    <ForBoarding>true</ForBoarding>
                </ScheduledStopPoint>
                .....
            </scheduledStopPoints>
            <stopAreas>
                <StopArea>
                    <Id>napt:490G00272</Id>
                    <Name>Wimbledon Bus</Name>
                    <StopAreaCode/>
                </StopArea>
            </stopAreas>
```

```
        <!-- ==Connections ========== -->
        <connections>
            <SiteConnection>
                <Id>tbd:wimcon_01</Id>
                <Name>Default transfer duration for wimbledon</Name>
                ……
            </SiteConnection>
            <!-- === bus-->
        </connections>
        <!-- == Stop Assignments =========== -->
        <stopAssignments>
            <PassengerStopAssignment>
                <Id>tbd:wimass_r01</Id>
                <Description>Rail Assignment - could be implicit </Description>
                <StopPlaceRef ref="napt:9100WIMBLDN">..</StopPlaceRef>
                <QuayRef ref=" ">..</QuayRef>
                <ScheduledStopPointRef ref="napt:9100WIMBLDN">..</ScheduledStopPointRef>
            </PassengerStopAssignment>
            ......
        </stopAssignments>

    </SiteFrame>
```

5 *NETEX* MULTI-MODAL STATION EXAMPLE

5.1 Introduction

The UK NaPTAN 3.0 Profile is accompanied by two XML example files that provide an extended and coherent example of encoding a complex transport interchange. The interchange is Wimbledon Station in London, as described in [WIM-2010]. Wimbledon has rail, tram, metro and bus connections.
Most of the XML fragments shown elsewhere in this profile are taken from the Wimbledon *NeTEx* XML example document.

5.1.1 Example XML documents

The files can be found at

- Http://www.neteg.org,uk/schemas/

5.1.2 Cautions and Notes

The *NeTEx* XML schema used in the example is based on the draft *NeTEx* 1.0a schema and may be subject to further small modifications.

NB The examples have been encoded by hand and may contain minor errors. Some data such as geospatial coordinate of station elements has not been populated or has been populate with dummy data.

Existing namespaces have been used for *NaPTAN* and *NPTG* data elements. Hypothetical namespaces have been added for additional data elements.

In a few cases variations from the actual station have been added in order to illustrate additional points. For example:

- An example of a staircase with multiple flights.
- An example of a lift between multiple floors.
- In station signage [TO DO]

5.2 Wimbledon Example showing Nodes and Path Links

Figure 5-1, taken from the Wimbledon example [WIM-2010], 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.

- A corresponding SCHEMATIC MAP can be seen earlier in Figure 4-85 and Figure 4-86.
- Black triangles indicate elements that correspond to *NaPTAN* points.
- The path links (arrowed lines) are shown that 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.

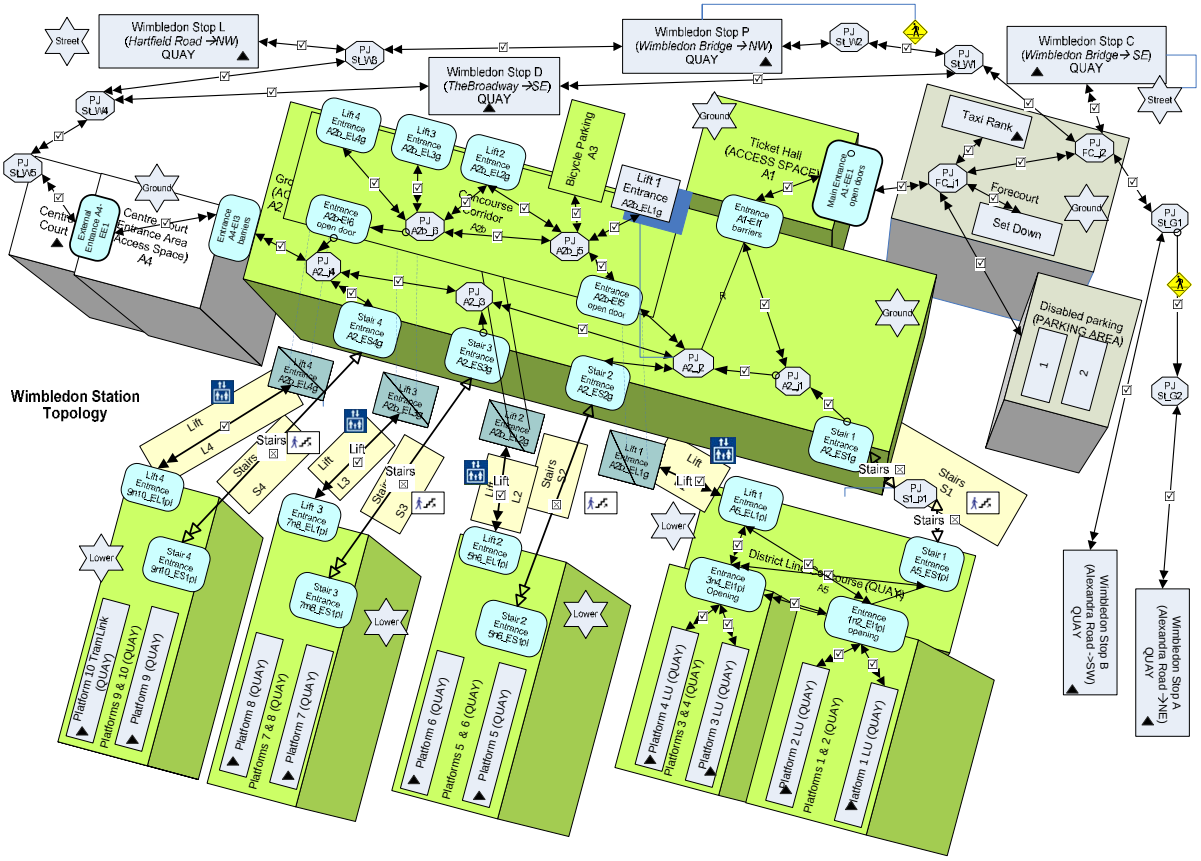


Figure 5-1 – Wimbledon Nodes & Path links

5.3 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 5-2 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.

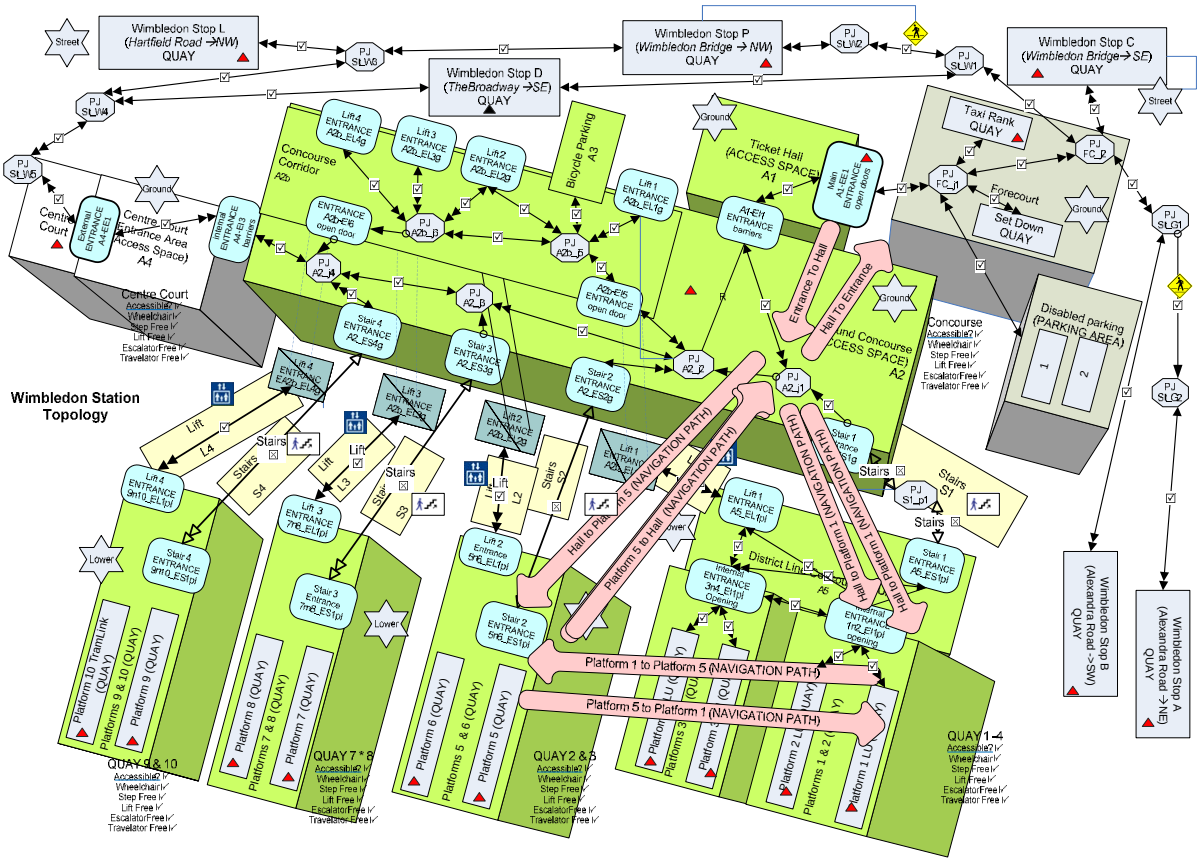


Figure 5-2 – Some Navigation Paths for Wimbledon

Wimbledon Example includes:

- Multiple Levels.
- Multiple modes (Rail, bus, metro, tram).
- Multiple platforms (QUAYs) for a mode.
- Platforms shared between modes.
- Terminus stop (Metro, Tram, bus)
- Intermediate stop (Rail, bus)
- Multiple ENTRANCEs to STOP PLACE.
- Complex STOP PLACE topology with PATH LINKs.
- Multiple NAVIGATION PATHs, branched NAVIGATION PATHs.
- Multiple SCHEDULED STOP POINTs for the same mode.
- ACCESS EQUIPMENT: Lifts, Stairs, Ramps Ticketing, barriers,.
- EQUIPMENT – WCs, signs, seats,.
- SCHEMATIC MAP
- Taxi.

Wimbledon Example doesn't include:

- Multilevel lifts.
- EQUIPMENT: Escalators

6 FURTHER DETAILS OF THE NETEX / *NETEX* MODEL

For reference, this section contains UML diagrams showing the detailed attributes of the elements introduced above.

6.1 Site Model details

6.1.1 Site Model details

Figure 6-1 shows detailed attributes of the SITE model.

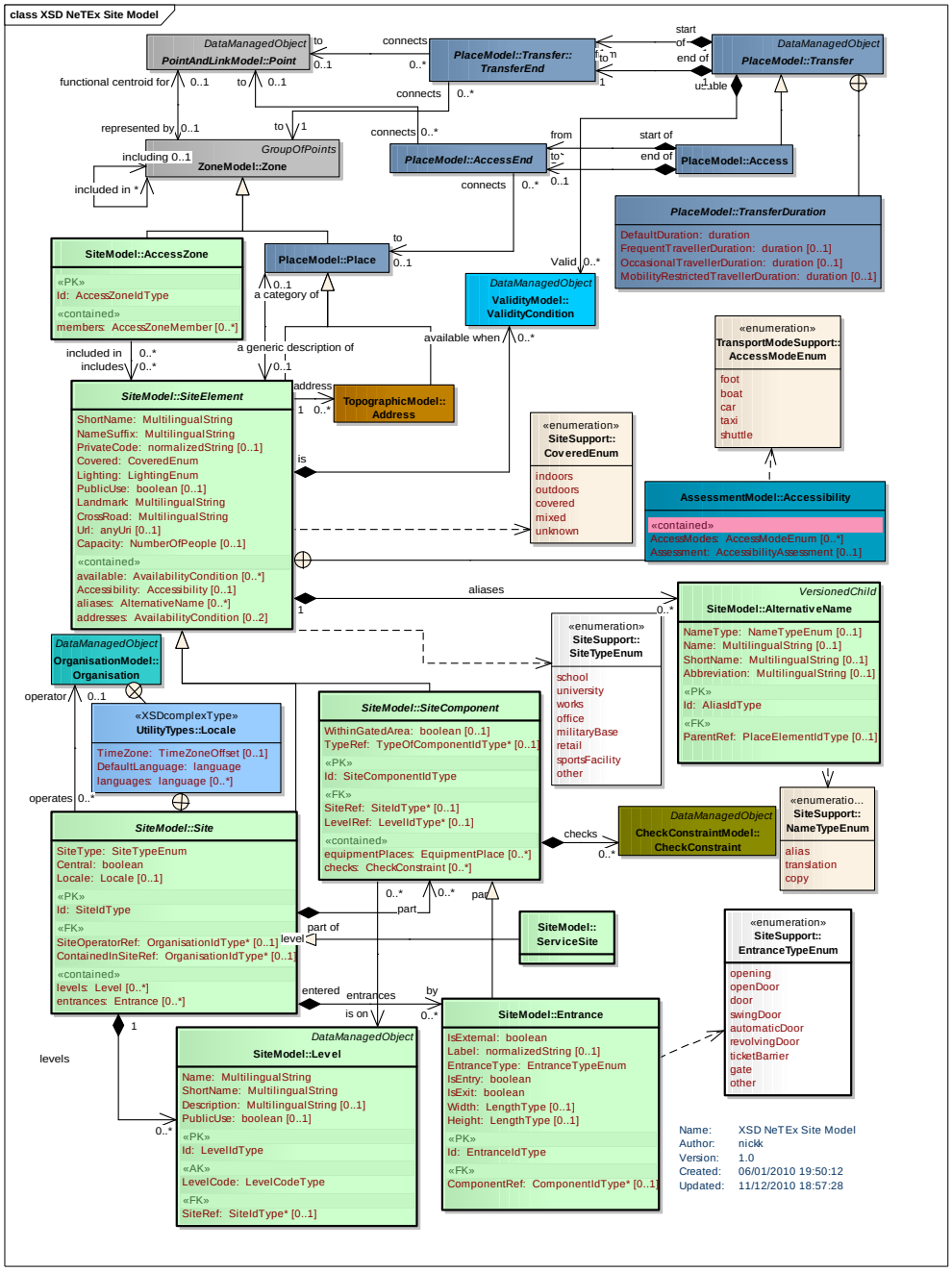


Figure 6-1 – UML Diagram of Site Model – Details

6.1.2 PathLink Model details

6.1.3 CheckConstraint Model details

Figure 6-2 shows detailed attributes of the CHECK CONSTRAINT model.

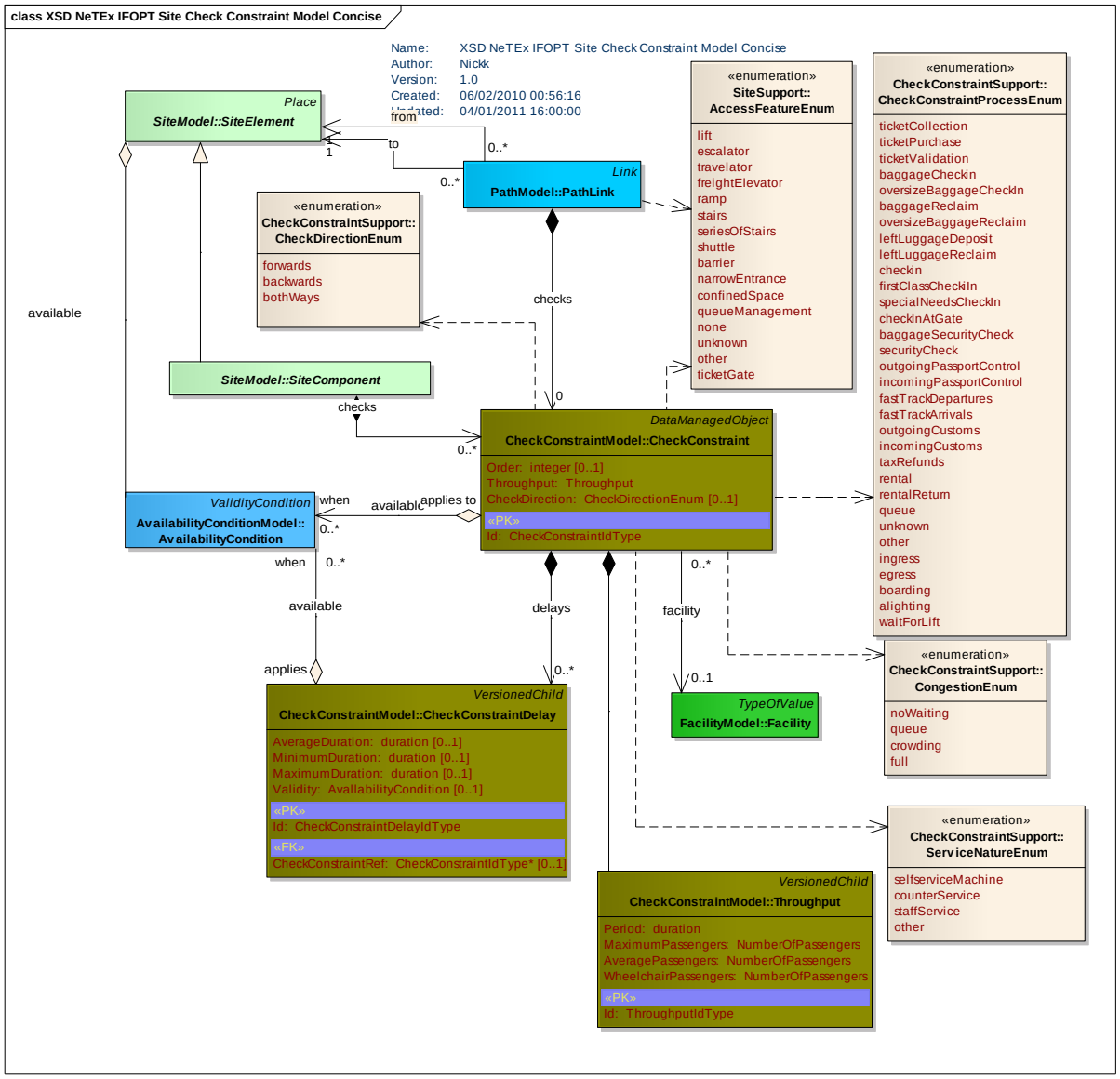


Figure 6-2 – UML Diagram of CheckConstraint Model – Details

6.2 StopPlace Model details

6.2.1 Stop Place Model details

Figure 6-3 shows detailed attributes of the STOP PLACE model.

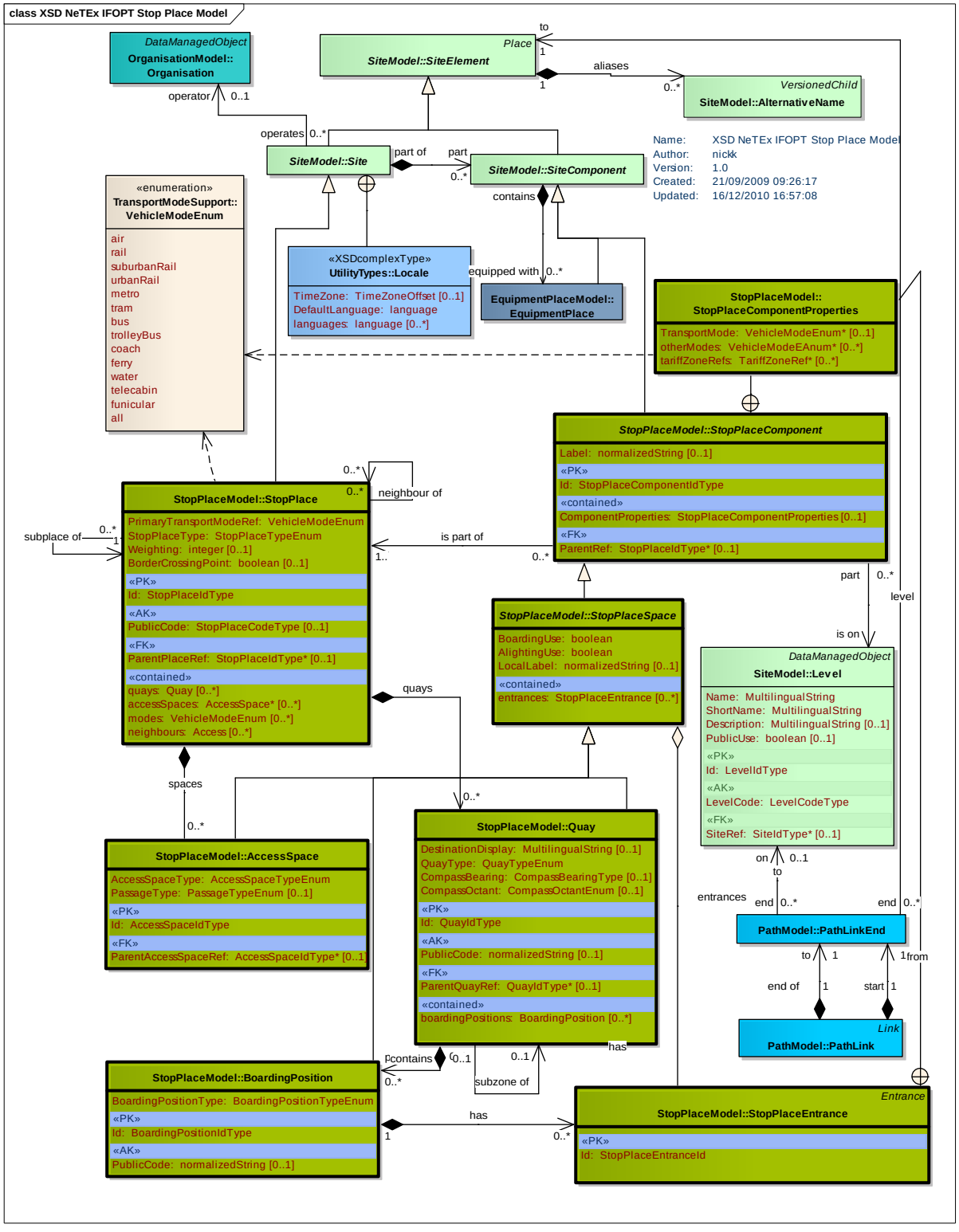


Figure 6-3 – UML Diagram of StopPlace Model - Details

6.2.2 Flexible Stop Place details

Figure 6-4 shows detailed attributes of the FLEXIBLE STOP PLACE model.

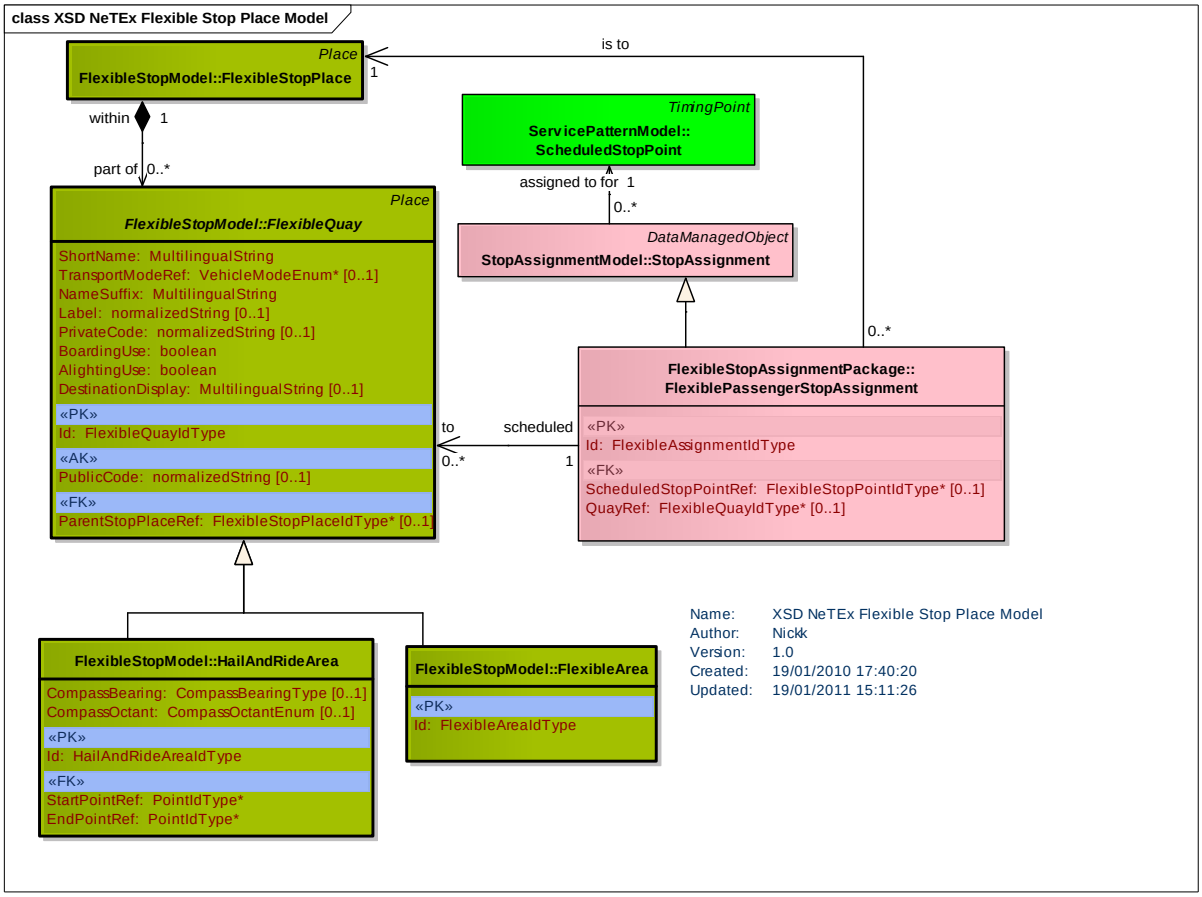


Figure 6-4 – UML Diagram of Flexible StopPlace Model – Details

6.3 Point Of Interest Model details

6.3.1 Point Of Interest details

Figure 6-5 shows detailed attributes of the POINT OF INTEREST model.

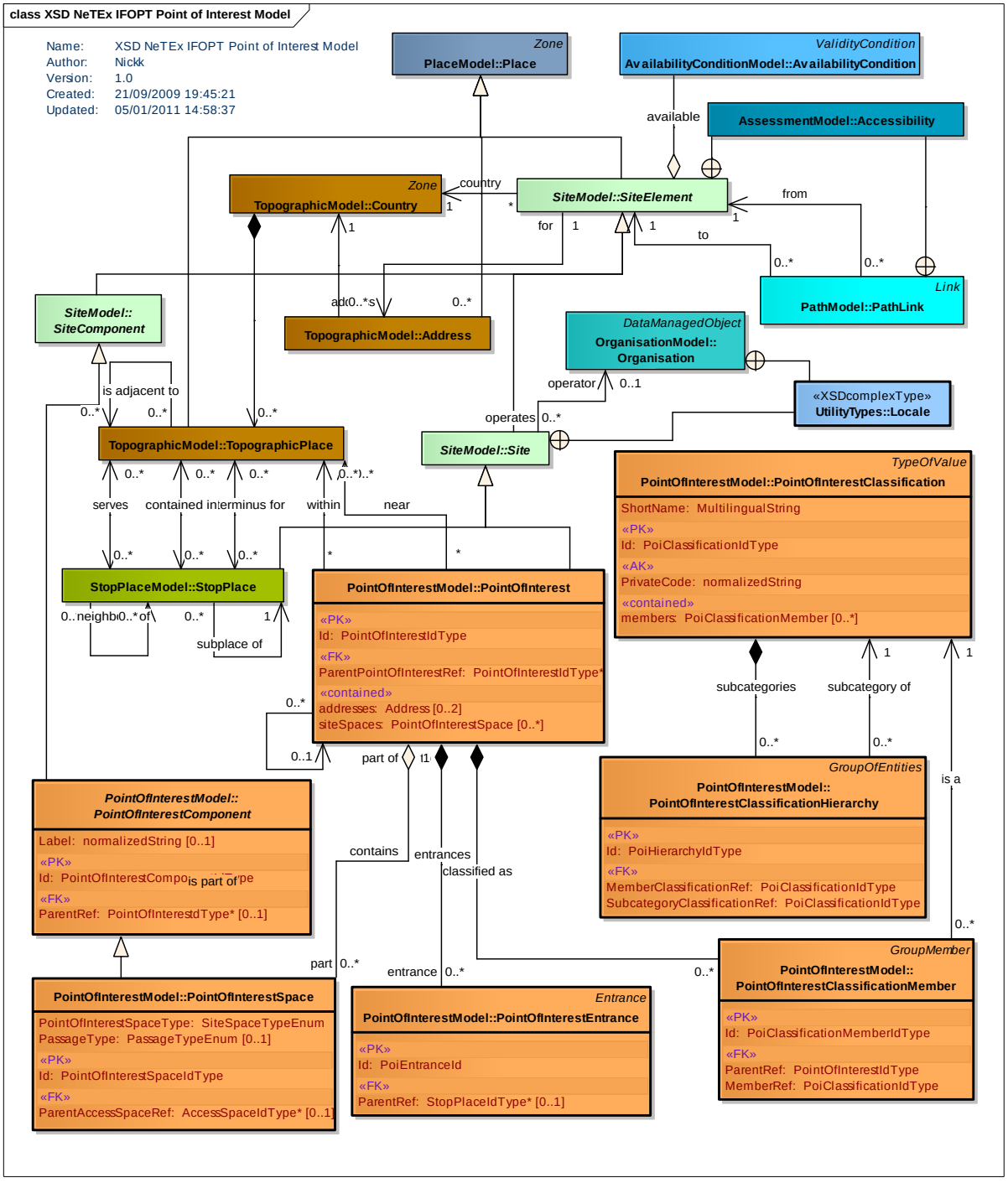


Figure 6-5 – UML Diagram of Point Of Interest Model - Details

6.4 Parking Model details

6.4.1 Detailed properties of a Parking

Figure 6-6 shows detailed attributes of the PARKING model.

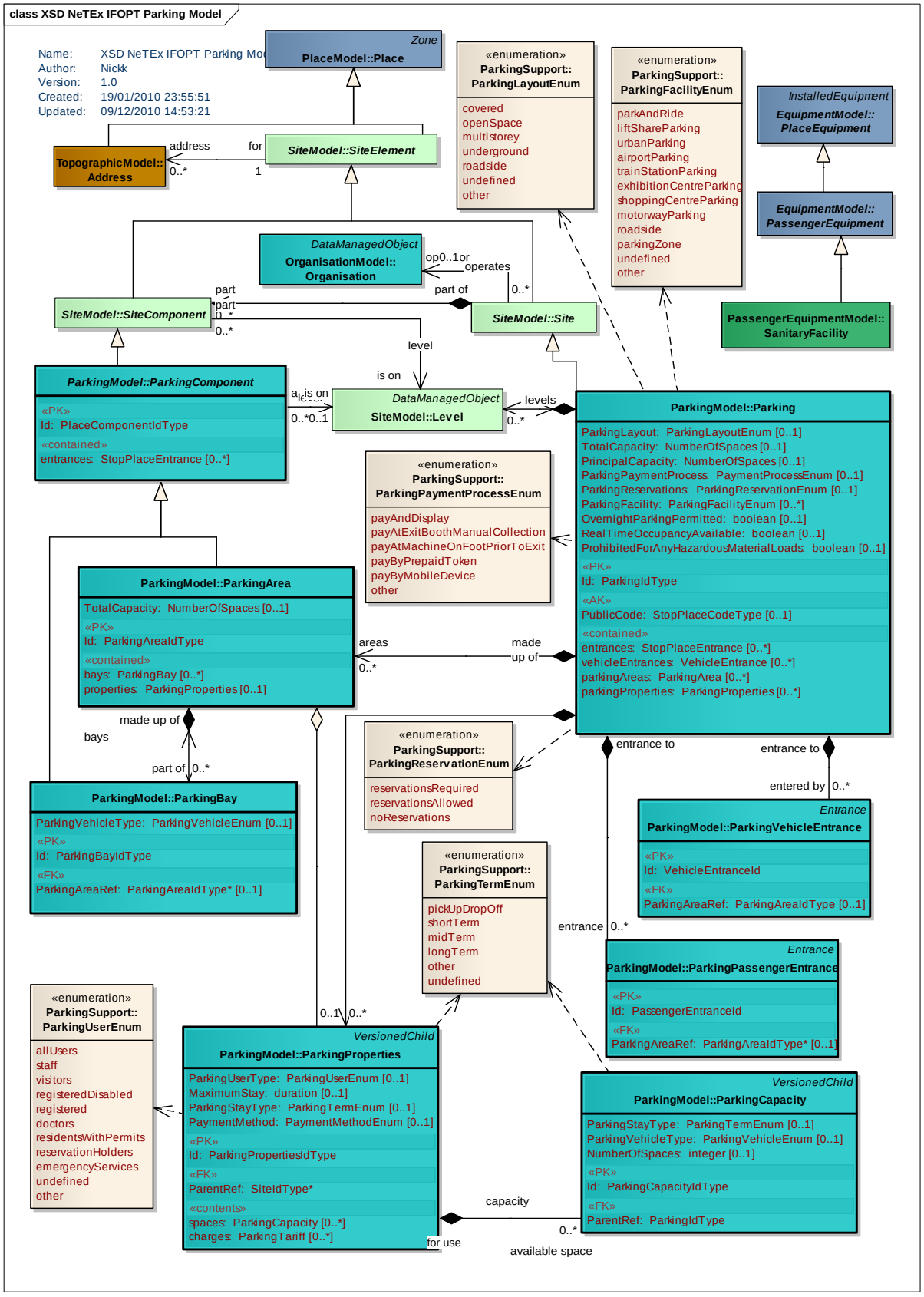


Figure 6-6 – UML Diagram of Parking Model - Details

6.4.2 Detailed properties of a Parking Tariff

Figure 6-7 shows detailed attributes of the PARKING TARIFF sub model.

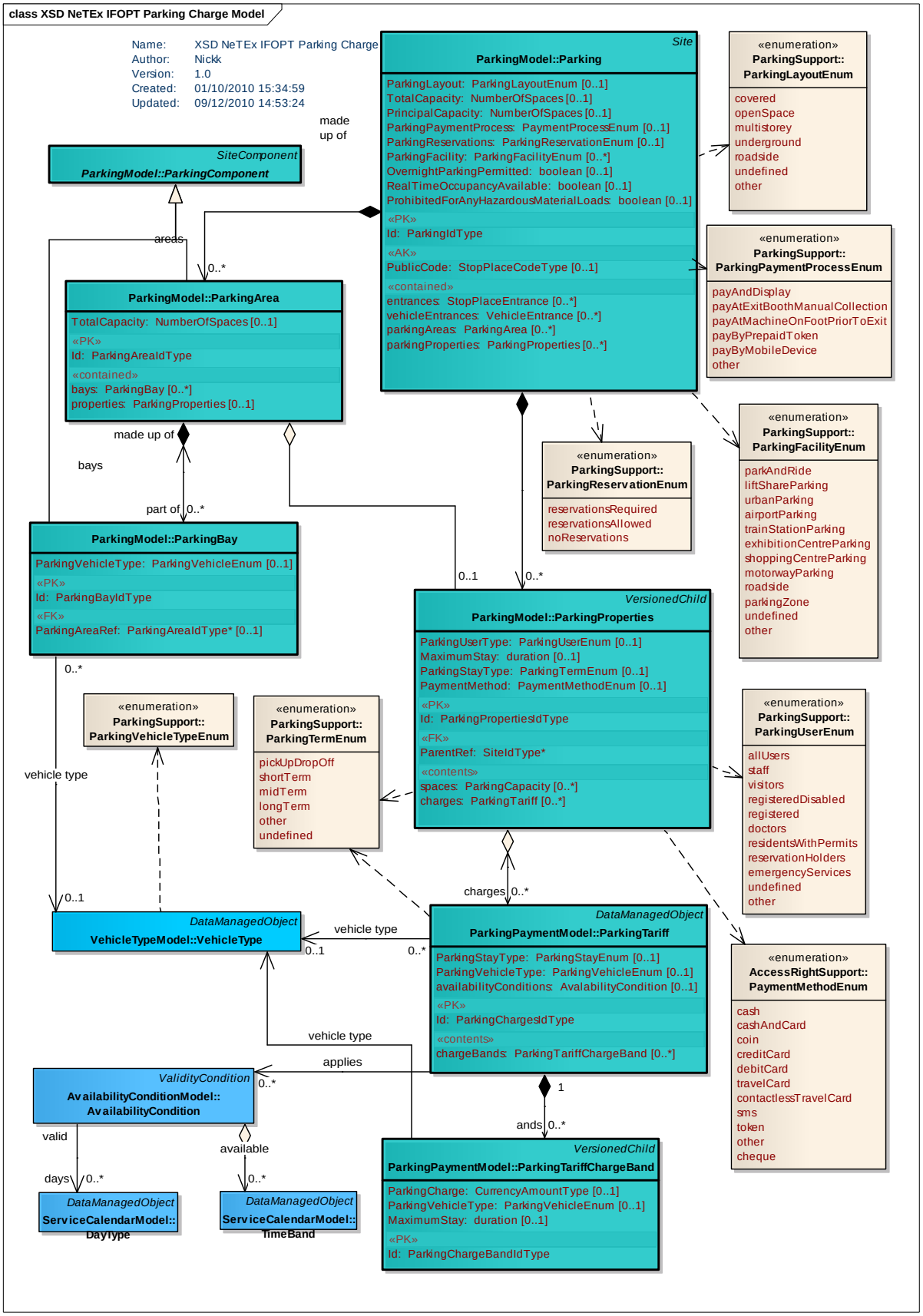


Figure 6-7 – UML Diagram of Parking Tariff Model - Details

6.5 Address Model details

6.5.1 Topographic Place Address elements

Figure 6-8 shows detailed attributes of the ROAD ADDRESS & POSTAL ADDRESS elements

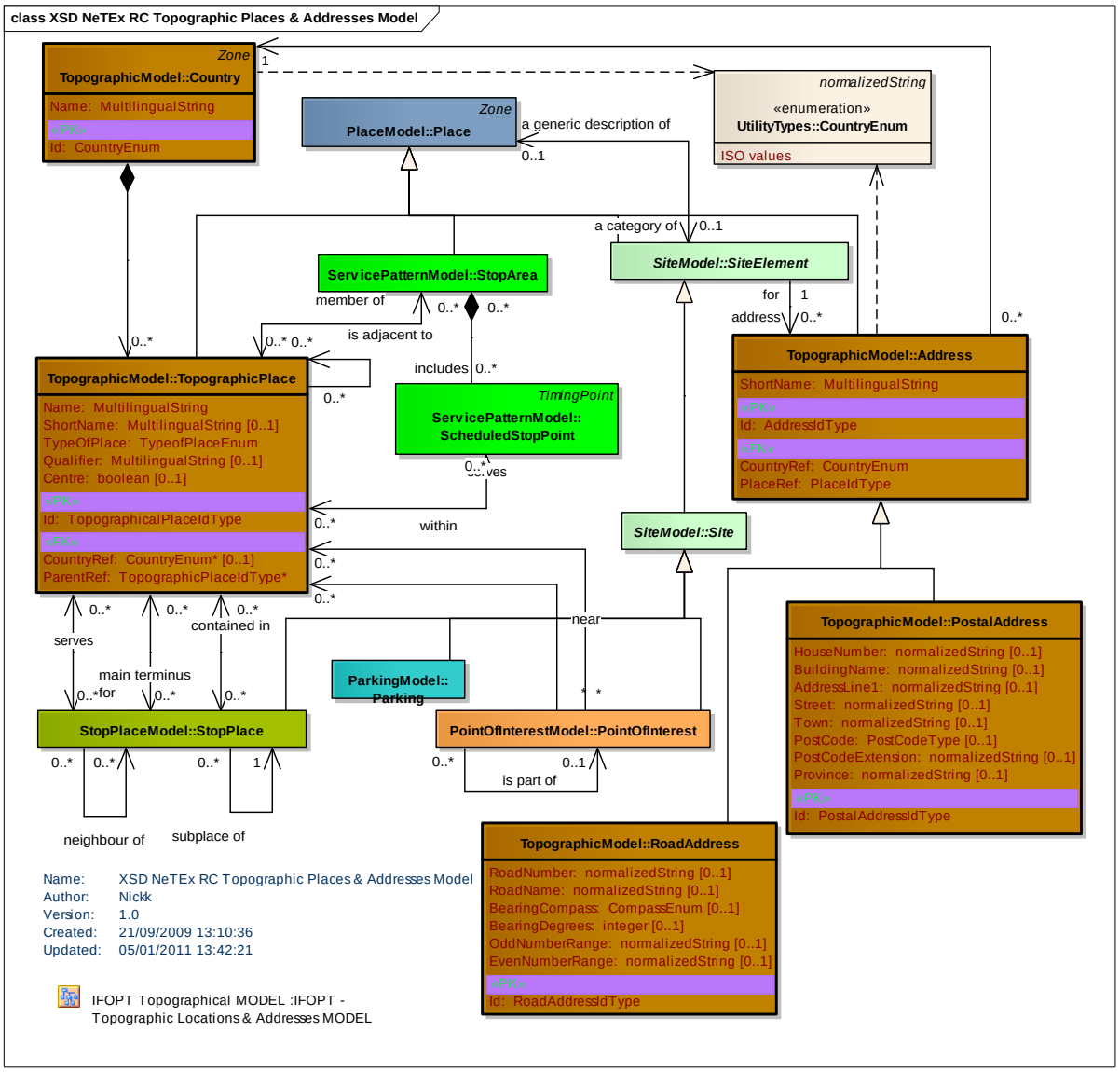


Figure 6-8 – UML Diagram of Addresses - Detail

6.6 Connection Model Details

6.6.1 Connection Model elements

Figure 6-10 shows detailed attributes of the CONNECTION model elements

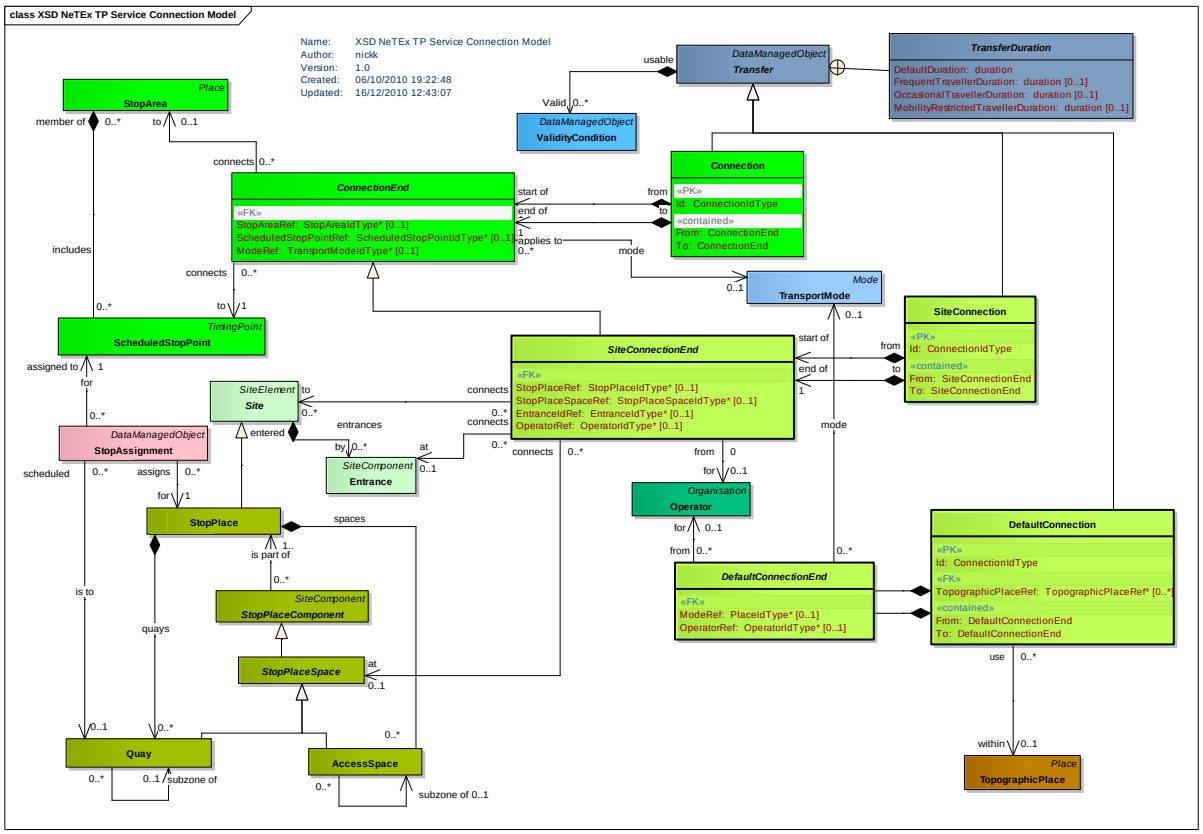


Figure 6-9 – UML Diagram of Connection - Detail

6.7 Day Type & Availability Condition

6.7.1 Day Type Model elements

Figure 6-10 shows detailed attributes of the DAY TYPE model elements

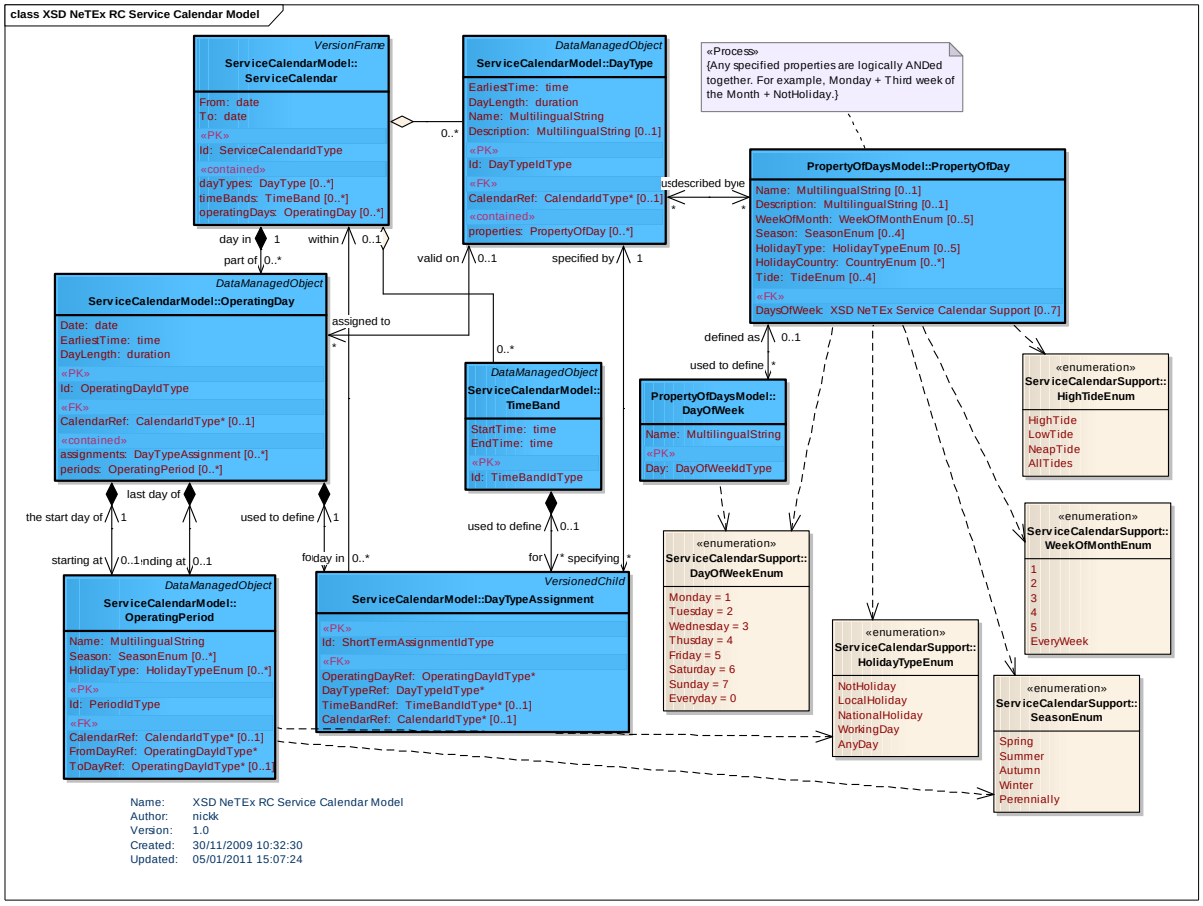


Figure 6-10 – UML Diagram of Day Types - Detail

6.8 Equipment Model details

6.8.1 Access Equipment elements

Figure 6-11 shows detailed attributes of the ACCESS EQUIPMENT model elements

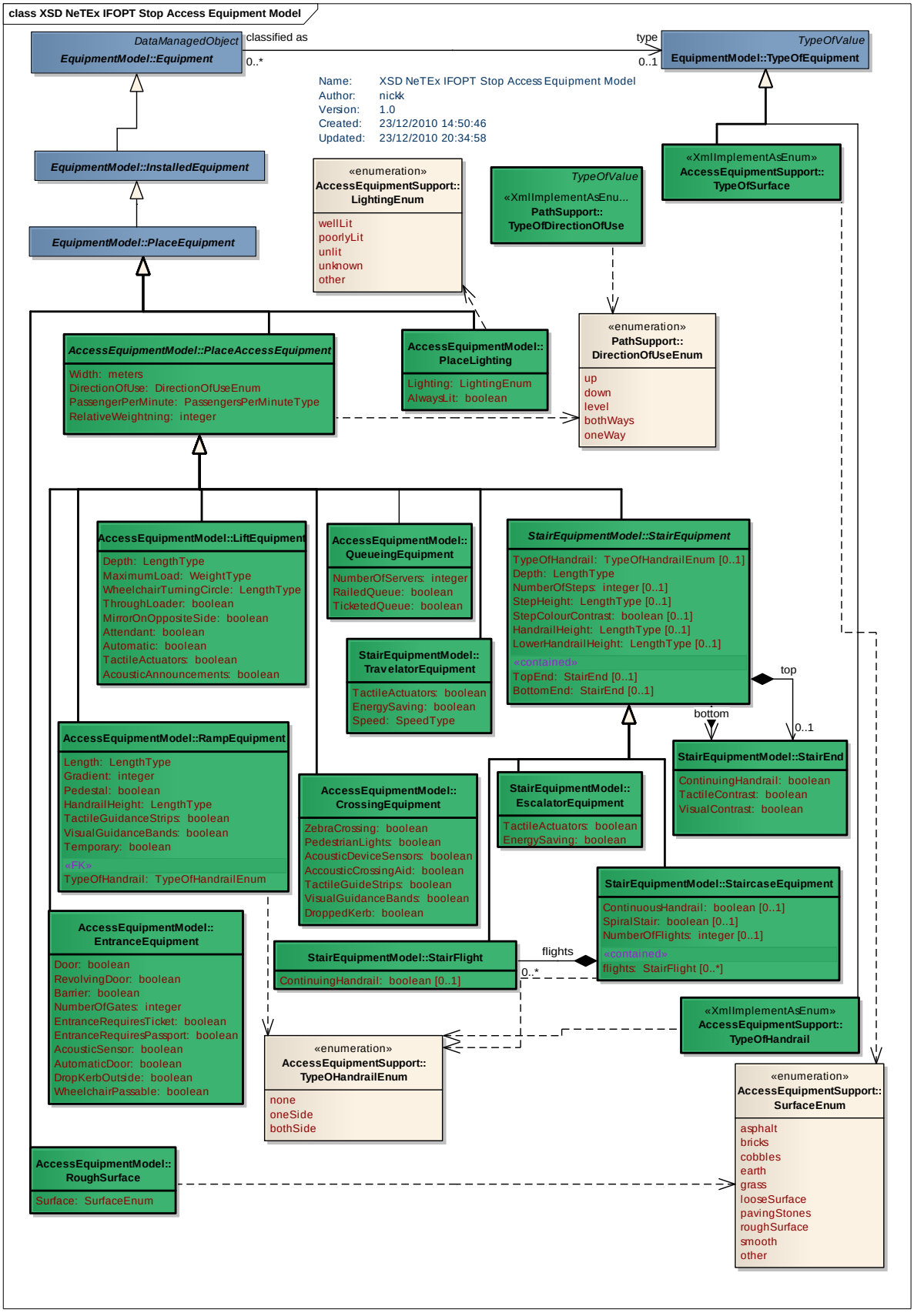


Figure 6-11 – UML Diagram of Access Equipment - Detail

6.8.2 Waiting Equipment elements

Figure 6-12 shows detailed attributes of the WAITING EQUIPMENT model elements

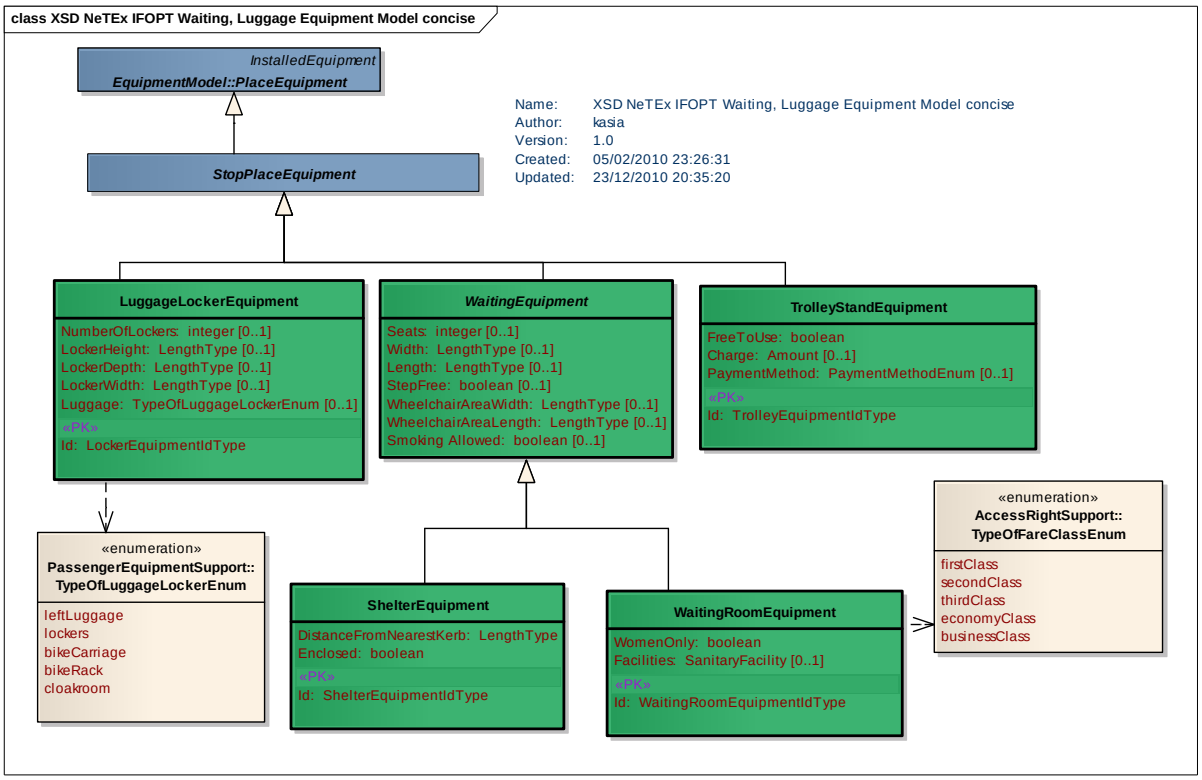


Figure 6-12 – UML Diagram of Waiting Equipment – Detail

6.8.3 Passenger Equipment elements

Figure 6-13 shows detailed attributes of the PASSENGER EQUIPMENT model elements

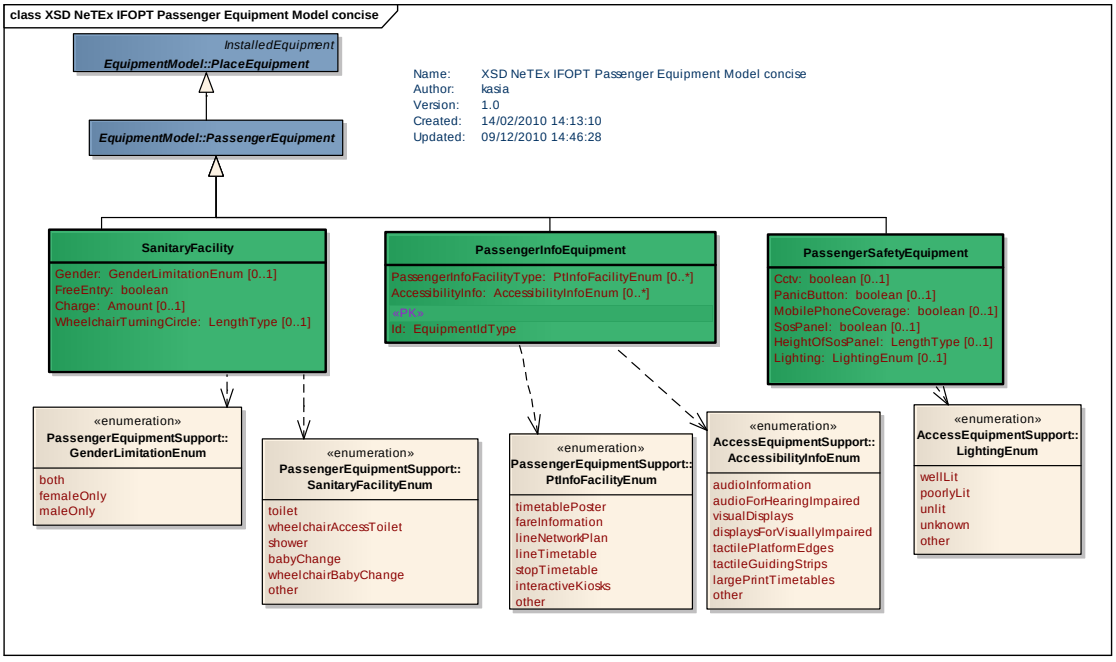


Figure 6-13 – UML Diagram of Passenger Equipment - Detail

6.8.4 Local Service Equipment elements

Figure 6-14 shows detailed attributes of the LOCAL SERVICE EQUIPMENT model elements

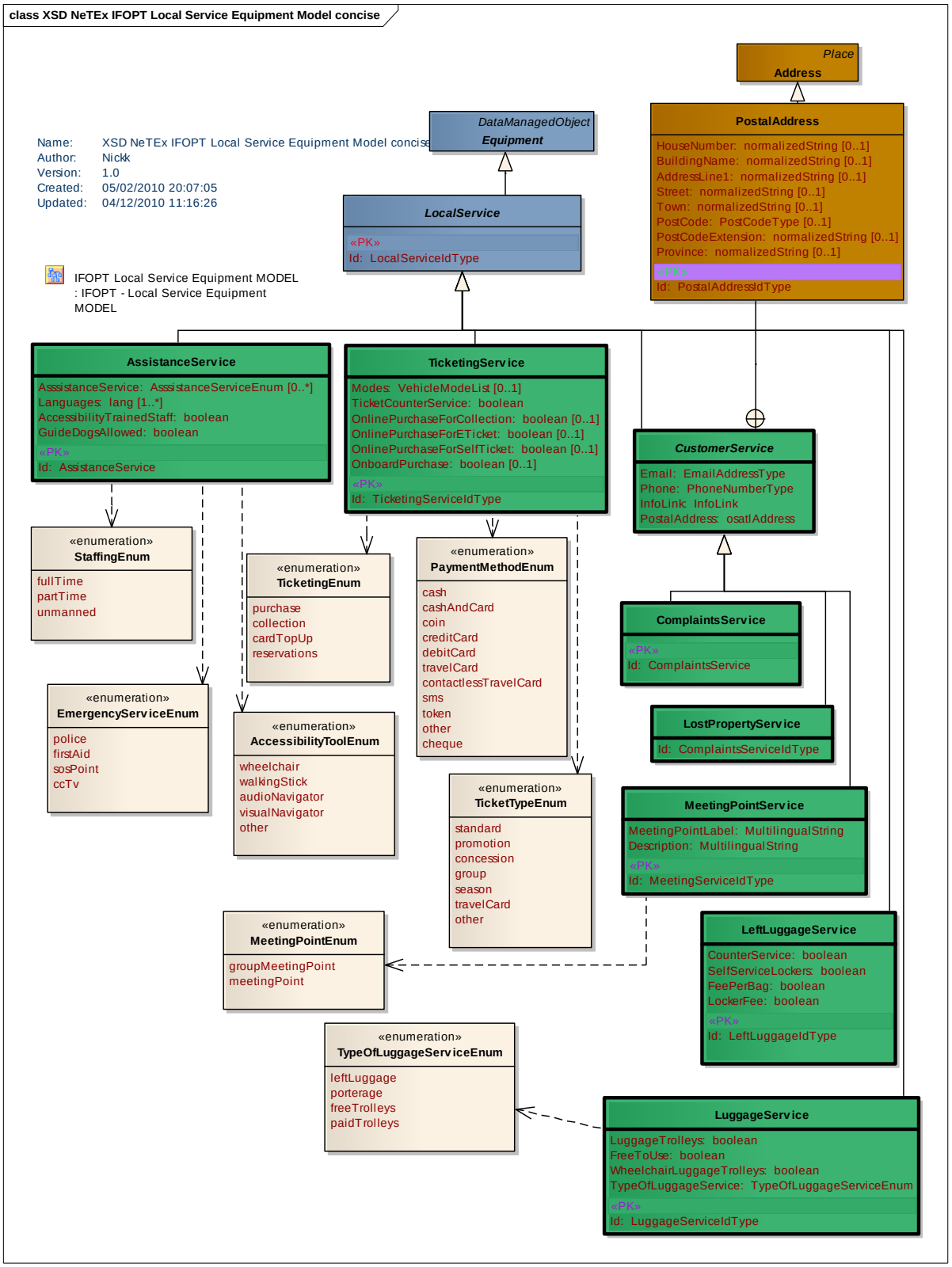


Figure 6-14 – UML Diagram of Local Service Equipment - Detail

6.8.5 Commercial Service Equipment elements

Figure 6-15 shows detailed attributes of the commercial LOCAL SERVICE EQUIPMENT model elements.

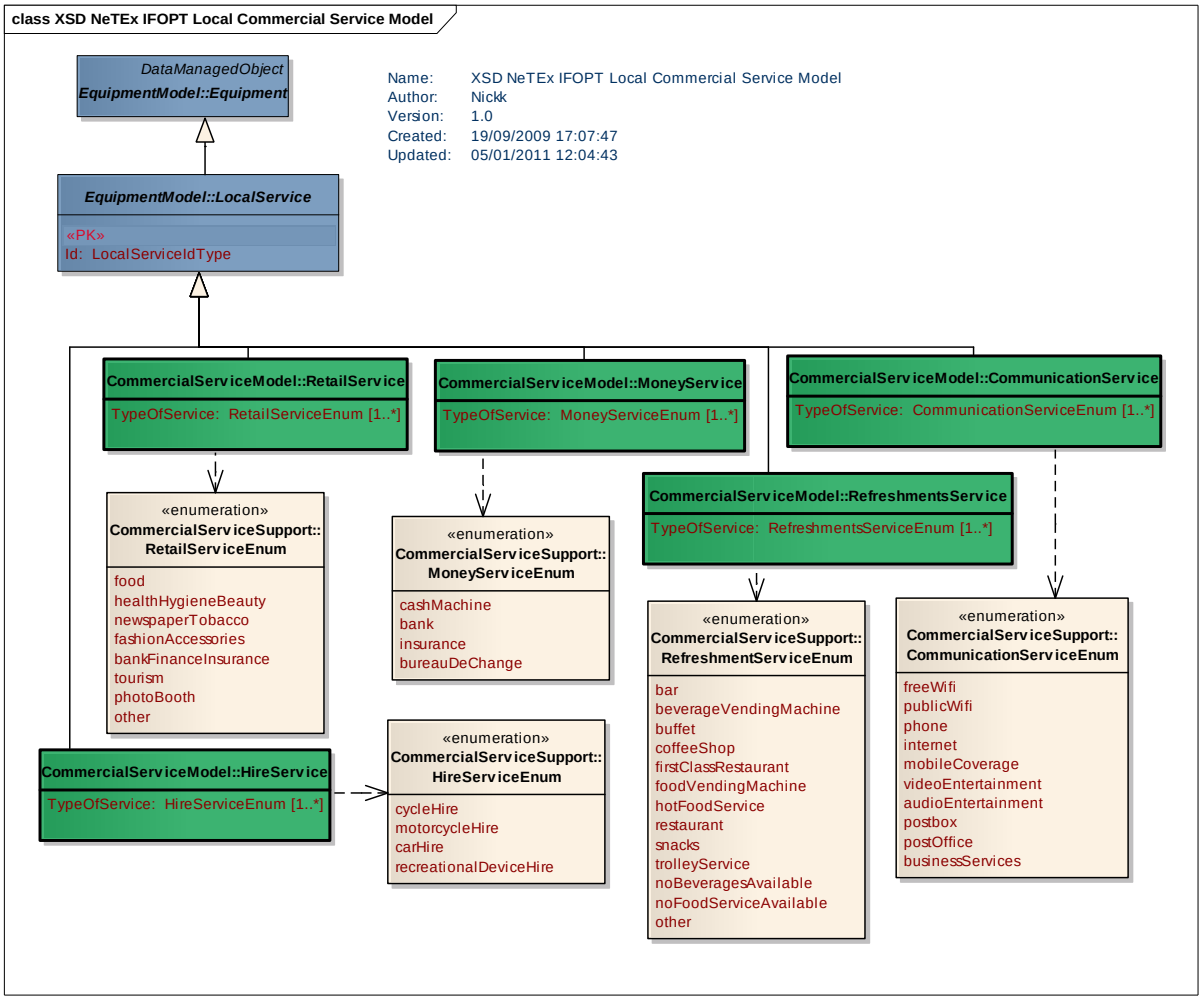


Figure 6-15 – UML Diagram of Commercial Local Service Equipment - Detail

6.8.6 Ticketing Equipment elements

Figure 6-17 shows detailed attributes of the TICKETING EQUIPMENT model elements

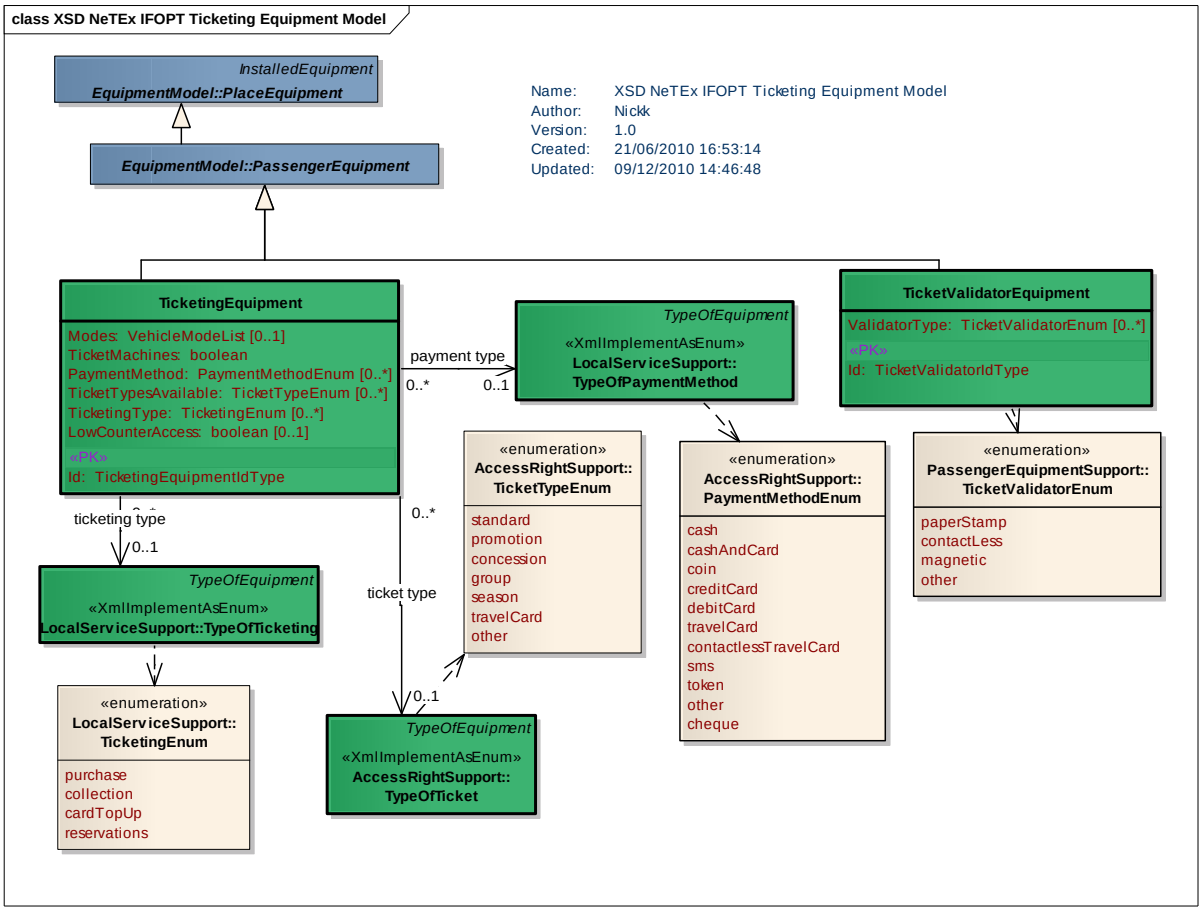


Figure 6-16 – UML Diagram of Ticketing Equipment – Detail

6.8.7 Sign Equipment elements

Figure 6-17 shows detailed attributes of the SIGN EQUIPMENT model elements

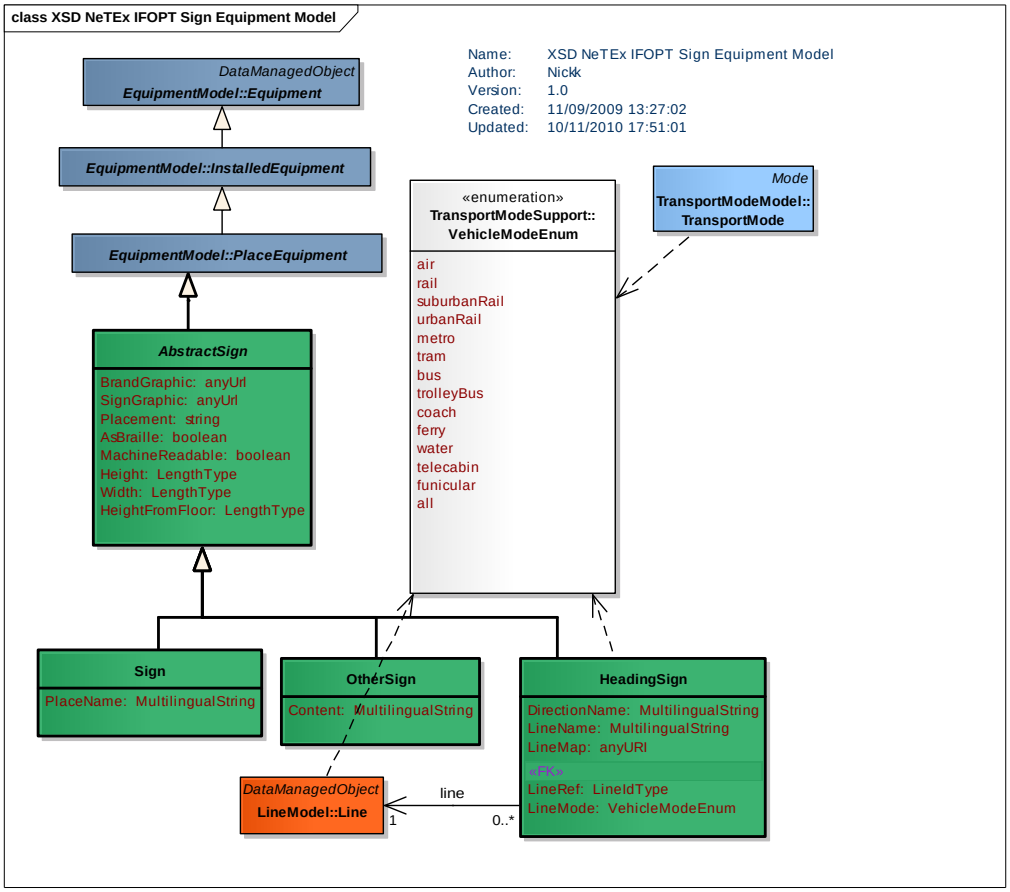


Figure 6-17 – UML Diagram of Sign Equipment – Detail

6.8.8 Parking Equipment elements

Figure 6-18 shows detailed attributes of the PARKING EQUIPMENT model elements

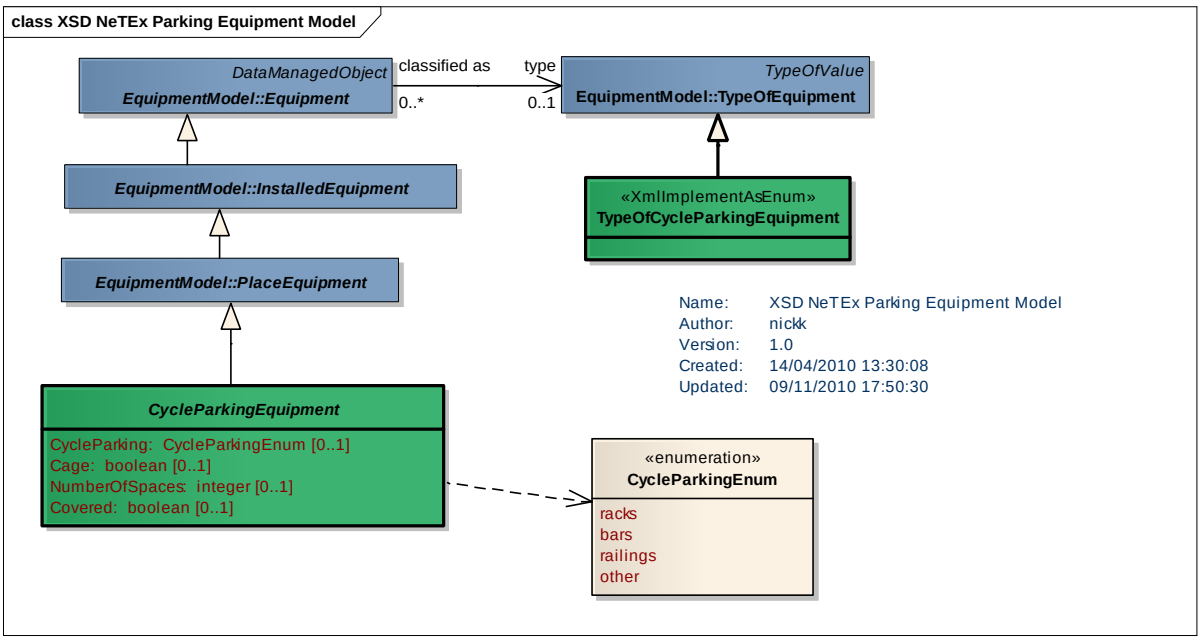


Figure 6-18 – UML Diagram of Parking Equipment – Detail

7 MAPPING NAPTAN 2.X TO NAPTAN 3.0 AND *NETEX*

This section discusses on detail the use of *NeTEx* to hold *NaPTAN* data.

7.1 Basic mapping

7.1.1 Mapping of NaPTAN Stop Points & Stop Areas

For each *NaPTAN* ***StopPoint,*** one or more corresponding *NeTEx* / *NeTEx* elements are created. The types of element created will depend on the *NaPTAN* ***StopType***. See Table 7-1. The *NaPTAN* ***StopAreas*** associated with Stations, and other parts of an interchange may be used additionally to determine which further relationships should be added to each ***StopPlace*** created, see next section.

NaPTAN Classification	NaPTAN stop type	Mode	*NeTEx*	*NeTEx* TYPE	Note
AccessArea	GAT	Air	STOP PLACE (+SCHEDULED STOPPOINT+ STOP ASSIGNMENT))	*airport*	Create a ***StopPlace*** to represent the *NaPTAN* point. There is an implicit assignment as Scheduled StopPoint id is the same. In addition, use any associated ***StopArea*** (ie with a similar identifier) to (a) find components (b) find parent / child Stop Places
	RLY	Rail		*railStation*	
	FER	Ferry		*ferryPort, harbourPort*	
	MET	Metro		*metroStation, tramStation*	
	BCS	Bus		*busStation, (coachStation)*	
	LCB	Telecabine		*telecabine*	
	POI		POINT OF INTEREST		Additional capability
Entrance	AIR	Air	ENTRANCE	*door*	Use ***StopArea*** to associate entrance with ***StopPlace***
	RSE	Rail		*door*	
	FTD	Ferry		*door*	
	TMU	Metro		*door*	
	BCE	Bus		*door*	
	LCE	Tele-cabine		*door*	
	PIE	PointOfInterest		*door*	Point of interest entrance
Quay (Bay Pole)	RPL	Rail	QUAY	*railPlatform*	Populate a ***Quay***
	FBT	Ferry		*boatQuay*	
	PLT	Metro		*metroPlatform, tramPlatform*	
	BCQ	bus	SCHEDULED STOP POINT + DYNAMIC STOP-ASSIGNMENT	*busStop*	Assign to Bay within a STOP PLACE
	BCT	bus	QUAY	*busBay*	If there is already an existing ***StopArea*** associated with the stop, create a ***StopPlace*** place for it. If no ***StopArea*** exists, then, as well as a ***Quay*** create a ***StopPlace*** with the same common name.
	LPL	Tele cabine		*Lift Platform*	
	TXR, SHR	Taxi		*taxiStand*	
	SDA	Car		*setDownArea*	
	PIA	Point Of Interest		*accessSpace*	Spectator area

Annotatedxxx-Ref	**Annotated AirRef**	Air	SCHEDULED STOP POINT + STOP - ASSIGNMENT		Additional assignments can be created to allocated other scheduled stop points to the same stop place.
	Annotated RailRef	Rail			
	Annotated FerryRef	Ferry			
	Annotated MetroRef	Metro			
	Annotated CoachRef	Coach			

Table 7-1 – NaPTAN Stop types

7.1.2 Stop Example cases

Table 7-2 shows the handling of common stop configurations found in NaPTAN data.

	NaPTAN	*NeTEx*	Comment
Unmarked bus stop on street	***1 StopPoint*** (CUS)	***1 StopPlace*** + 1 ***Quay***	Scheduled stop point has same code so stop assignment can be implicit
Single bus stop on street	***StopPoint*** (MKD)	***1 StopPlace*** + 1 ***Quay***	Implicit stop assignment.
Pair of bus stops on a route bus stop on street	***2 StopPoints*** (MKD) + ***1 StopArea*** (GBPS)	***1 StopPlace*** + 2 ***Quays***	In current *NaPTAN* data sets ***StopArea*** is not always populated for on street pairs. Implicit stop assignment.
On street bus cluster	***x StopPoints*** (MKD) + ***1 StopArea*** (GCLS)	***1 StopPlace*** + n ***Quays***	In current *NaPTAN* data sets ***StopArea*** is not always populated. Implicit stop assignment.
Hail & Ride Zone	***1 StopPoint (HAR)***	***1 StopPlace*** + 1 ***FlexibleQuay***	Use two point projections for a hail and ride section (start and end) . Use a Zone projection for flexible section
FlexibleZone	***1 StopPoint (FLX)***	***1 StopPlace*** + 1 ***FlexibleQuay***	Zone projection for flexible area
Single mode rail station	***1 StopPoint*** (RLY) + ***x StopPoints*** (RSE) for each entrance ***y StopPoints*** (RPL for each platform + ***z AnnotatedRailRefs*** for each timetable code ***1 StopArea*** (GRLS)+	***1 StopPlace*** + x ***Quays +*** ***x Scheduled-StopPoints***	In current *NaPTAN* data sets rail platforms are not populated.
Single mode metro station	***1 StopPoint*** (MET) + ***x StopPoints*** (TMU) for each entrance ***y StopPoints*** (PLT for each platform + ***z AnnotatedMetroRefs*** for each timetable code ***1 StopArea*** (GTMU)+	***1 StopPlace*** + x ***Quays +*** ***x Scheduled-StopPoints***	In current *NaPTAN* data sets platforms are not usually populated
Bus or Coach station	***StopPoint*** (BST) + ***x StopPoints*** (RSE) for each entrance. ***y StopPoints*** (BCS | BCQ) for each bay + 1 ***StopArea*** (GBCS)+ z ***AnnotatedCoachRefs***	***1 StopPlace*** + x ***Quays +*** ***x Scheduled-StopPoints***	BST is not populated., but GBCS can be used instead to determine grouping. BCE is not populated. BCQ is in effect used as a ScheduledStopPoint - Variable bay should be a dynamic StopAssignment
Airport	***StopPoint*** (GAT) + ***x StopPoints*** (AIR) for each		

	entrance ***1 StopArea*** (GAIR)		
Multi mode interchange	As for single mode with p ***ParentStopAreaRefs***	As for single mode with p ***Parent-StopPlaceRefs***	*NaPTAN* has hierarchy Air, Ferry, Rail, Metro, Bus/Coach

Table 7-2 – Common NaPTAN stop combinations

7.1.3 Mapping of NaPTAN relationships

Where a *NaPTAN* stop is grouped with other stops by association with a ***StopArea***, the ***StopArea*** may be used to determine other QUAYS and Entrances in the Stop Place. The ***StopArea*** will have a related identifier to the primary *NaPTAN* point for a station, for example eg 910G1234567 vs 91001234567

NaPTAN Classification	NaPTAN stop type	Mode	*NeTEx*	Note
StopArea	GAIR	Air	StopPlace (+ScheduledStopPoint + StopAssignment))	Use to augment the ***StopPlace*** to to identify the member stops and related ***StopPlace*** instances. Can also create an *NeTEx* StopArea with members
	GRLS	Rail		
	GFTD	Ferry		
	GTMU	Metro		
	GBCS	Bus		
Entrance	AIR	Air	***Entrance***	Use ***StopArea*** to associate entrance with ***StopPlace***

Table 7-3 – NaPTAN relationships

7.2 NaPTAN: / *NeTEx* StopPoint Mapping

Many of the attributes of *NaPTAN* ***StopPoint*** & ***StopArea*** elements have a simple one- to-one mapping to the corresponding *NeTEx* equivalent. A detailed element by element mapping of the attributes is shown below.

- Table 7-4 – StopPoint.
- Table 7-5 – Alternative Name
- Table 7-6 – Stop Availability

7.2.1 Detailed Mapping of NaPTAN StopPoint to *NeTEx* Stop Place Components

NaPTAN					**NeTEx / *NeTEx***				
Parent Element	**Intermediate Element**	**Element**	**Type**	**Note**	**Parent Element**	**Intermediate Element**	***Element***	**Type**	Capability Level
StopPoint	..	***AtcoCode***	*AtcoCodeType*	Map	^SiteElement	..	***Id***	QuayIdType | StopPlaceIdType	CapLvl
		NaptanCode	*NaptanCode-Type*	Map	^SiteElement	..	***PublicCode***		CapLvl0
StopPoint	..	***PrivateCode***	*xsd;normalized-String*	Map	^SiteElement	..	***PrivateCode***		CapLvl
StopPoint	..	***PlateCode***	*nmtoken*	Map	Quay	..	***PlateCode***		CapLvl0
StopPoint	..	***CleardownCode***	*int*	Map	Quay	..	***CleardownCode***		CapLvl0
StopPoint	..	***FormerStop-PointRef***	*AtcoCodeType*	Map (#1)	^SiteElement	..	***???***	QuayIdType | StopPlaceIdType	CapLvl0
--	--	--	--	Extra	^SiteElement	***Access-ibility-Assess-ment***	***MobilityImpaired-Access***	boolean	
--	--	--	--	Extra	^SiteElement	***Access-ibility-Assess-ment / Limitation***	***WheelchairAccess***	true | false | unknown	CapLvl
--	--	--	--	Extra	^SiteElement		***StepFreeAccess***		CapLvl
--	--	--	--	Extra	^SiteElement		***LiftFreeAccess***		CapLvl
--	--	--	--	Extra	^SiteElement		***EscalatorFreeAccess***		CapLvl
--	--	--	--	Extra	^SiteElement		***TravelatorFreeAccess***		CapLvl
--	--	--	--	Extra	^SiteElement		***AudibleSignsAvailable***		CapLvl
--	--	--	--	Extra	^SiteElement		***VisibleSignsAvailable***		CapLvl
--	--	--	--	Extra	^SiteElement	***Access-Modes***			Can be populated from stop type code
StopPoint	..	***Public***	*Xsd:boolean*	Map2.4	^SiteElement		***PublicUse***	boolean	CapLvl0
--	--	--		Extra	^SiteElement		***Covered***	boolean	CapLvl6
--	--	--		Extra	^SiteElement		***Lighting***	LightingEnum	CapLvl6
StopPoint	***Descriptor***	***CommonName***	*placeName*	Map	^Place		***Name***	MultilingualString	CapLvl0
StopPoint	***Descriptor***	***ShortCommonName***	*placeName*	Map	^Site | ^SiteComponent		***ShortName***	MultilingualString	CapLvl0

NaPTAN					**NeTEx / *NeTEx***				
Parent Element	**Intermediate Element**	**Element**	**Type**	**Note**	**Parent Element**	**Intermediate Element**	***Element***	**Type**	Capability Level
StopPoint	***Descriptor***	***Landmark***	*name*	Map	^SiteElement		***Landmark***		CapLvl0
StopPoint	***Descriptor***	***Street***	*placeName*	Map	^Site | ^SiteComponent	***Road-Address***	***Street***	MultilingualString	CapLvl0
StopPoint	***Descriptor***	***Crossing***	*placeName*	Map	^SiteElement		***CrossRoad***		CapLvl0
StopPoint	***Descriptor***	***Indicator***	*placeName*	Map	^SiteElement		***NameSuffix***		CapLvl0
StopPoint	***Descriptor***	***Bearing***	*bearing*	Map	***Quay***	***Road-Address***	***CompassOctant***	CompassBearingEnum	CapLvl0
--	--	--	--	Extra	Quay		***Label***		
StopPoint	****Alternative Descriptors***	➔Descriptor		Map (#	SiteElement	***alternative Names***	***➔AlternativeNam***		
--	--	--	--	Extra			***Covered***		
--	--	--	--	Extra	^SiteComponent		***TransportMode***	ModeEnum	
--	--	--	--	Extra	^SiteComponent	***otherModes***	***TransportMode***		
--	--	--	--	Extra	^SiteComponent		***LevelRef***		
--	--	--	--	Extra	^SiteComponent	checks			
--	--	--	--	Extra	^SiteComponent	equipment Places	***➔EequipmentPlace***		
--	--	--	--	Extra					
--	--	--	--	Extra	^StopPlaceSpace		***BoardingUse***		
--	--	--	--	Extra	^StopPlaceSpace		***AlightingUse***		
StopPoint	***Place***	***NptgLocalityRef***	**FK**	Map			***TopographicPlaceRef***		CapLvl0
StopPoint	***Place***	***LocalityName***	*placeName*	Derive			***[Derive] ??***		CapLvl0
StopPoint	***Place***	***AlternativeNptg-LocalitiyRefs***	*NptgLocalityCode*	D				Topographic-PlaceRef	CapLvl0
StopPoint	***Place***	***MainNptg-LocalitiyRefs***	*NptgLocalityCode*	D				[Derive]	CapLvl0
StopPoint	***Place***	***Town***	*placeName*	Map	^SiteComponent	Postal-Address	***Town***	MultilingualString	CapLvl0
StopPoint	***Place***	***Suburb***	*placeName*	Map	^SiteComponent	Postal-Address	***Suburb***		CapLvl0
StopPoint	***Place***	***LocalityCentre***	*xsd:boolean*	Map	^Site,		***Central***		*1.0
	Location	***Id***	*LocationIdType*	Map			***id***		
StopPoint	***Location***	***GridType***	*gridType*	Map	^Place	Location	***srsName***		CapLvl0
StopPoint	***Location***	***Easting***	*easting*	Map	^Place	Location	***Coordinates***		CapLvl0
StopPoint	***Location***	***Northing***	*northing*	Map	^Place	Location	***Coordinates***		CapLvl0
StopPoint	***Location***	***Longitude***	*longitude*	Map	^Place	Location	***Longitude***		CapLvl0

NaPTAN					**NeTEx / *NeTEx***				
Parent Element	**Intermediate Element**	**Element**	**Type**	**Note**	**Parent Element**	**Intermediate Element**	***Element***	**Type**	Capability Level
StopPoint	***Location***	***Latitude***	*latitude*	Map	^Place	Location	***Latitude***		CapLvl0
StopPoint	***Location***	***Precision***		Map	^Place	Location	***Precision***		
	Location	***--***			^Place	Location	***Altitude***		
StopPoint		***StopType***	enum	Y	StopPoint/types	types	***TypeOfPointRef***		CapLvl0
Bus		***BusStopType***	enum	N					CapLvl0
Bus		***TimingStatus***	enum	N					CapLvl0
Bus		***DefaultWaitTime***	duration	N			****		
StopPoint		***Notes***	*nlString*	N	^StopPlaceSpace	..	***Description***	MultilingualString	1.0
StopPoint		***Public***				..			
StopPoint		***Administrative-AreaRef***	*AdminArea-CodeType*	Y	^DataManagedObject	(#1)	**ResponsibiliuySetRef**		+2.0
StopPoint	***StopAreas**	***StopAreaRef***	*StopAreaCode*			(#2) On Zone	**StopAreaMember (1)**		
StopPoint	***Plusbus-Zones**	***PlusbusZoneRef***	*PlusbusZoneCode*	On zone		(#3) On Zone	**(TarrrifZoneMember)**		
StopPoint	***Stop-Availability**	***StopValidity***				..	**(validityCondition)**		
						..			
						..			
^versioned	..	***CreationDateTime+***	*xsd:dateTime*	Map	^versionedObject	..	**created**	*xsd:dateTime*	CapLvl0
^versioned	..	***ModificationDateTime***	*xsd:dateTime*	Map	^versionedObject	..	**changed**	*xsd:dateTime*	CapLvl0
^versioned	..	***Revision-Number+***	*revision*	Map	^versionedObject	..	**version**	version	CapLvl0
^versioned	..	***Modification***	*modification*	Map	^versionedObject	..	**modification**	integer	CapLvl0
^versioned	..	***Status***	*RecordStatus*	Map	^versionedObject	..	**status**		CapLvl0
StopArea	..	***StopAreaCode***	*StopArea-CodeType*	Map	^SiteElement	..	**Id**	QuayIdType | StopPlaceIdType	CapLvl0
StopArea		***Name***	*nlString*	Map	SiteElement	..	**name**		CapLvl0
StopArea	..	***PrivateCode***	*xsd;normalized-String*	Map	^SiteElement	..	**PrivateCode**	SiteElement	CapLvl0
StopArea	..	***ParentStopArea-Ref***	*StopArea-CodeType*	Map	^SiteElement	..	**StopPlaceRef**		CapLvl0
StopArea		***StopAreaType***	*StopAreaType*	Map	^SiteElement	..	StopPlaceTyoe		CapLvl0

Table 7-4 – NaPTAN / *NeTEx* Stop Point Attribute Mapping

7.2.2 Detailed Mapping of NaPTAN Alternative Descriptor to *NeTEx* : AlternativeName

Note: NeTEx uses a general purpose ALTERNATIVE NAME element which can be given a ***TypeOfName***, whereas NaPTAN has a specific Alternative Stop name element (ie with ***Indicator***, ***Landmark*** and ***Indicator*** elements). This means that several instance of the *NeTEx* element may be needed to represent a single NaPTAN element.

NaPTAN					**NeTEx / *NeTEx***				
Parent Element	**Intermediate Element**	**Element**	**Type**	**Note**	**Parent Element**	**Intermediate Element**	***Element***	**Type**	V
Descriptor	**..**	***AtcoCode***	*AtcoCodeType*	Map	AlternativeName	..	***Id***	QuayIdType | StopPlaceIdType	CapLvl1
--	--	--	--			..	***lang***		
--	--	--	--	(1)		..	***TypeOfName***		
Descriptor	**..**	***CommonName***	*placeName*	Map	AlternativeName	..	***Name***	MultilingualString	
Descriptor	**..**	***ShortName***	*placeName*	Map	AlternativeName	..	***ShortName***	MultilingualString	CapLvl1
Descriptor	**..**	***Landmark***	*placeName*	Map	AlternativeName	..			Napt-2.0
Descriptor	**..**	***Street***	*placeName*	Map	AlternativeName	..			Napt-2.0
Descriptor	**..**	***Crossing***	*placeName*		AlternativeName	..			Napt-2.4
Descriptor	**..**	***Indicator***	*placeName*	Extra	AlternativeName	..	***QualifierName***	boolean	
^versioned	..	CreationDateTime+	*xsd:dateTime*	Map	^versionedObject	..	***created***	xsd:dateTime	+2.0
^versioned	..	ModificationDateTime	*xsd:dateTime*	Map	^versionedObject	..	***changed***	xsd:dateTime	*1.0
^versioned	..	RevisionNumber+	*revision*	Map	^versionedObject	..	***version***	version	+2.0
^versioned	..	Modification	*modification*	Map	^versionedObject	..	***modification***	Modificationnum	1.0
^versioned	..	Status	*RecordStatus*	Map	^versionedObject	..	***status***		1.0

Table 7-5 – NaPTAN / *NeTEx* Alternative Name Mapping

7.2.3 Detailed Mapping of NaPTAN: Stop Availabilities to *NeTEx* Validity Condition

NaPTAN					**NeTEx / *NeTEx***				
Parent Element	**Intermediate Element**	**Element**	**Type**	**Note**	**Parent Element**	**Intermediate Element**	***Element***	**Type**	V
StopAvailability	**..**	***AtcoCode***	*AtcoCodeType*	Map	AvailabilityCondition	..	***Id***	QuayIdType | StopPlaceIdType	CapLvl1

NaPTAN					NeTEx / *NeTEx*				
Parent Element	**Intermediate Element**	**Element**	**Type**	**Note**	**Parent Element**	**Intermediate Element**	***Element***	**Type**	V
StopAvailability	--	***StartDate***	*xsd:date*		availabilityCondition	..			
StopAvailability	--	***EndDate***	*xsd:date*	(1)	availabilityCondition	..			
StopAvailability	**..**	***AvailabilityStatus***	*Enum (Active | Suspended | Transferred)*	Map	availabilityCondition	..		MultilingualString	
StopAvailability	**..**	***Note***	*nlString*	Map	availabilityCondition	..	***Description***	MultilingualString	CapLvl1
StopAvailability	**..**	***TransferStop-AtcoCode***	*AtcoCodeType*	Map	availabilityCondition	..	TBD		Napt-2.0
^versioned	..	CreationDateTime+	*xsd:dateTime*	Map	^versionedObject	..	***created***	xsd:dateTime	+2.0
^versioned	..	ModificationDateTime	*xsd:dateTime*	Map	^versionedObject	..	***changed***	xsd:dateTime	*1.0
^versioned	..	RevisionNumber+	*revision*	Map	^versionedObject	..	***version***	version	+2.0
^versioned	..	Modification	*modification*	Map	^versionedObject	..	***modification***	Modificatoponnum	1.0
^versioned	..	Status	*RecordStatus*	Map	^versionedObject	..	***status***		1.0

Table 7-6 – NaPTAN / Stop Availabilities Mappinng

7.2.4 References to NPTG elements

As noted in the introduction, NPTG provides both an administrative responsibility model that indicates who is to manage *NaPTAN* data for an area, and a topographical gazetteer that is used to locate stops relative to towns and cities. The *NeTEx* model generalises and extends many of the *NPTG* concepts of administrative areas and roles, so formally *NeTEx* has a more complex responsibility model than NPTG. For example, compared to a NPTG Administrative Area, a *NeTEx* RESPONSIBILITY SET allows different roles to be distinguished and different organisational and administrative structures (as found elsewhere in different countries) to be represented.

Although it is possible to represent most aspects of the *NPTG* model in the *NeTEx* format, for the purposes of this profile it is not necessary to do so. *NPTG* data can be treated in *NaPTAN* 3.0 as simple external references as follows:

- For each of the current *NPTG* Administrative areas, a *NeTEx* ***ResponsibilitySet*** is assumed whose identifier is the ***AdministrativeAreaCode***. Thus the current ***AdministrativeAreaRef*** simply becomes a ***ResponsibilitySet Ref***.
- For each of the current *NPTG* Localities, an *NeTEx* ***TopographicalPlace*** is assumed whose identifier is the ***NptgLocalityCode***. Thus the current ***NptgLocalityRef*** simply becomes a ***TopographicalPlaceRef***.
- . For each of the current Plusbus ones an *NeTEx* ***TariffZone*** is assumed whose identifier is the ***NptgLocalityCode*** . Thus the current ***PlusbusZoneRef*** simply becomes a ***ZoneRef***.

Figure 9-7 summarises the current *NaPTAN* schema use of *NPTG* elements

7.2.5 NPTG reference example

The following XML code fragment shows a definition of a responsibility set corresponding to the NPTG Administrative Area that can be assumed to exist.

```
<ResponsibilitySet created="2010-05-17T09:30:47Z" modification="revise" changed="2010-05-17T09:30:47Z" version="1.0" id="napt:RS_82">
    <roles>
        <ResponsibilityRoleAssignment created="2010-05-17T09:30:47Z">
            <DataRoleType>collects</DataRoleType>
            <ResponsibleRef>tbd:Org_TL001</ResponsibleRef>
            <ResponsibleAreaRef>napt:82</ResponsibleAreaRef>
            <Description>490 London</Description>
        </ResponsibilityRoleAssignment>
    </roles>
</ResponsibilitySet>
```

The following fragment shows a stop point that references the Resppnsibility Set

```
<stopPlaces>
    <StopPlace created="2006-09-11T15:42:00" modification="revise" changed="2009-02-26T15:47:00">
        <!--    <AdministrativeAreaRef> -->

        <ResponsibilitySetRef>napt:RS_110</ResponsibilitySetRef>
        <Id>napt:910GWIMBLDN</Id>
        <Name>Wimbledon Rail Station</Name>
        <Location srsName="UKOS">
            <Coordinates>524811   170666 </Coordinates>
        </Location>
        <types>
            <TypeOfPointRef>GRLS</TypeOfPointRef>
        </types>
```

7.3 Further details

7.3.1 Versioning Attributes

The element versioning attributes (created, changed, modification) should be populated as for *NaPTAN* 2.x.

7.3.2 NaPTAN Identifiers

The *NeTEx* ***Id*** used as the primary identifier of each existing *NaPTAN* element should be the *NaPTAN* Identifier e.g. the ***AtcoCode***.

7.3.2.1Use of namespaces in identifiers

The single *NaPTAN* namespace (http://www.naptan.org.uk/naptan) can be declared and indicated. for all elements derived from *NaPTAN* 2.x data.

For example.

```
<StopPoint>
    <AtcoCode>:490G0019043</ AtcoCode >
```

becomes

```
<StopPlace>
    <Id>napt:490G0019043</Id>
```

Whilst identifiers of additional elements from other sources can be assigned to a different namespace as appropriate. For example

```
<Enrance>
    <Id>de:011-45</Id>
```

or

```
<PointOfIneterest>
    <Id>pointx:023456</Id>
```

7.3.2.2Identification of child entities

Identifiers can be allocated for child elements of a stop place, such as entrances & quays using a suffix.

```
<Quay>
    <Id>napt:490G0019043_P1</Id>
```

7.3.3 NaPTAN Stop Types

The UK ***StopType*** (RLY, BCE etc) can still be retained in the NeTEx / *NeTEx* ***TypeOfPoint*** Element. This is an open set of values rather than a list of enumerated values.

Only the Official UK data values should be used.

```
<quays>
    <Quay created="2010-04-17T09:30:47Z" dataSourceRef="NaPTAN">
        <ResponsibilitySetRef>nptg:082</ResponsibilitySetRef>
        <Id>napt:490014734A</Id>
        <Name>Alexandra Road, Stop A</Name>
        <Centroid>
            <Location>
                <Longitude>-0.2067466166</Longitude>
                <Latitude>51.4222367962</Latitude>
            </Location>
        </Centroid>
        <types>
            <TypeOfPointRef>BCT</TypeOfPointRef>
        </types>
        <zoneTypes>
            <TypeOfZoneRef>MKD</TypeOfZoneRef>
```

```
</zoneTypes>
<ShortName>Alexandra Road</ShortName>
<Covered>outdoors</Covered>
<RoadAddress>
        <Id>Rd_Addr_08</Id>
        <RoadName>Alexandra Road</RoadName>
        <BearingCompass>N</BearingCompass>
</RoadAddress>
<SiteRef>napt:490G0019043</SiteRef>
<CapLvlRef>tbd:9100WIMBLDN_Lvl_S0</CapLvlRef>
```

7.3.4 NaPTAN Bus Stop Types

The HAR and FLX become types of Flexible QUAY. The NaPTAN code can be retained as shown above

Value		Description		Bus NaPTAN subtype	NeTEx
MKD	marked	Marked (pole, shelter etc)	Point	***MarkedPoint***	***Quay***
CUS	Custom	Custom (unmarked, or only marked on road)	Point	***UnmarkedPoint***	***Quay***
HAR	hailAndRide	Hail & Ride – requires Hail & Ride sub-record	Line	***HailAndRideSection***	***HailAndRideArea***
FLX	Flexible	Flexible zone – Flexible Zone sub-record	Polygon	***FlexibleZone***	***FlexibleArea***

Table 7-7 – Allowed Values for BusStopType

7.3.4.1 Use of Default Wait time

The ***DefaultWaitTime*** allowed on MKD stops needs special treatment It should be a Mapped to a separate NeTEx ***TimeDemandWaitTime*** associated with the ScheduledStopPoint

-

[ADD EXAMPLE OR DROP THIS ELEMENT?]

7.3.5 NaPTAN Stop Classifiers

The *NaPTAN* stop classifier can be used to determine how the stop should be mapped.

- AccessArea ➔ **STOP PLACE**
- Entrance➔ ENTRANCE
- Platform/Berth ➔ QUAY

7.3.6 NaPTAN Stop Annotated References

The ***AnnotatedStopReferences*** can QUAY be map to SCHEDULED STOP ASSIGNMENT for a mode. Properties of the annotated reference correspond to properties of the scheduled stop point

	Annotated-AirRef	***Annotated-FerryRef***	***Annotated-RailRef***	***Annotated-MetroRef***	***AnnotatedCoachRef***
ScheduledStopRef	IataRef		*CrsRef,*		CoachRef,
			TiplocRef		OperatorRef
Description	Name	Name	StationName	Name	Name
ScheduledStopPoint / Description					LongName
ScheduledStopPoint / Location	--	Location	Location	Location	Location

Table 7-8 – NaPTAN Annotated Stop references

7.3.7 Stop Availability

A Validity Condition Can be used to state the StopAvailability of a stop.

There is not currently a means to indicate a stop transfer.

[TODO]

A status: one of the following:]

- ***Active***: Stop is active at its current location.
- ***Suspended:*** Stop is suspended from use.
- ***Transferred***: Stop is suspended from use and activity transferred to the stop indicated by the ***StopPointRef***. The referenced stop should be different to the current stop.

7.4 Location Element

The ***Location*** element) describes the spatial position of a stop. *NeTEx* supports both WGS and Coordinates are used with a srsName of UKOS

```
<!-- ========== RAIL========= -->
<StopPlace created="2006-09-11T15:42:00" modification="revise" dataSystemRef="NaPTAN"
changed="2009-02-26T15:47:00">
    <ResponsibilitySetRef>napt:RS_110</ResponsibilitySetRef>
    <Id>napt:910GWIMBLDN</Id>
    <Name>Wimbledon Rail Station</Name>
    <Location srsName="UKOS">
        <Coordinates>524811  170666 </Coordinates>
    </Location>
    <types>
        <TypeOfPointRef>GRLS</TypeOfPointRef>
    </types>
```

8 POPULATING THE NAPTAN 3.0 DATABASE

This section provides some guidance on entering data into the *NaPTAN 3.0* model to cover additional elements (Basic elements are covered by the NaPTAN 2.xschema guide)

- ***CapLvl0*** : All ENTRANCEs, concourses (ACCESS SPACEs) and Platforms (QUAYs) should be populated and assigned to a STOP PLACE.

- ***CapLvl2***: Basic Accessibility date should be specified for the elements above.
  - At the STOP PLACE level this indicates whether the STOP PLACE is rated as accessible or not according to each ACCESSIBILITY LIMITATION criteria (wheelchair, LiftFreeUse etc).
  - At the QUAY, ACCESS SPACE whether the component can be reached from the exterior.

- ***CapLvl3***: Concourses which represent internal routing points within the station should be populated, and NAVIGATION PATHs added
  - There should be a named NAVIGATION PATH from each main ENTRANCE to each platform *QUAY*, and between each platform (*QUAY*).Where platforms are adjacent a single Parent QUAY can be used.
  - The NAVIGATION PATH should be given ACCESSIBILITY LIMITATION attributes, indicating whether it meets the standard limitations.

- ***CapLvl5***: PATH JUNCTIONs should be added and explicit PATH LINKs should be added between all Nodes, indicating the ENTRANCE where relevant.
  - Each PATH LINK should be given ACCESSIBILITY LIMITATION attributes, indicating whether it meets the standard limitations.

- ***CapLvl6***: all passenger EQUIPMENT and facilities in the interchange should be described, including images and AVAILABILITY CONDITIONs.

In general the minimum number of nodes, links and paths to describe the topology should be used. For example, where QUAYs are nested, PATH LINKs should connect to the parent QUAY, rather than to individual links.

8.1.1 Choosing NaPTAN 3.0 Paths

To develop a path data set for an interchange will typically involve the following preparatory processes

1. A site survey to locate and describe a site, identify features and equipment and collect images.
2. Creation of a schematic map with which to label and describe the relative positions of elements.

The data collected can be used to populate a software model. Adding detailed path information for an interchange will involve using an interactive tool with the ability to draw nodes and links over a map and typically will involve steps to:

1. Identify the end points corresponding to existing *NaPTAN* points: as ENTRANCEs, QUAYs, (and possibly ACCESS AREAs)
2. Identify the other additional ACCESS SPACEs needed to describe the Interchange – for example upper concourse, lower concourse, tunnel to platform, lift shafts etc. and add instances.
3. Identify the additional entrances to the ACCESS SPACEs that are internal to the interchange and add ENTRANCEs.
4. Add PATH JUNCTIONs for waypoints where a branch is needed, or an intermediate PATH LINK for example landings.

5. Create PATH LINKs between each node (i.e. ACCESS SPACE or PATH JUNCTION), noting the ENTRANCE where relevant
6. Add detailed ACCESSIBILITY LIMITATION attributes for each ENTRANCE, ACCESS SPACE and QUAY
7. Add summary ACCESSIBILITY LIMITATION attributes for each STOP PLACE
8. Add detailed ACCESSIBILITY LIMITATION attributes for each PATH LINK.
9. Add summary ACCESSIBILITY LIMITATION attributes for each NAVIGATION PATH.
10. Add EQUIPMENT elements for each ENTRANCE, (e.g. doors, barriers,)
11. Add ACCESS EQUIPMENT elements ACCESS SPACE, eg Lifts, Ramps.
12. Add EQUIPMENT elements to PATH LINKs, e.g. stairs.

8.1.2 Other information for CapLvl6 support

Adding full interchange information for an interchange typically will involve:

1. Adding EQUIPMENT elements for other facilities (BARRIERs, TICKETING EQUIPMENT, RETAIL EQUIPMENT, SANITARY FACILITies, RETAIL SERVICES, LEFT LUGGAGE, etc) etc) , including images and attributes
2. Adding SCHEMATIC MAPs if available with references to the schema elements.

8.1.3 Hierarchy of Stop Places

In NAPTAN a Hierarchy is applied to the nesting of stop places (i) Air (ii) Rail (iii) Ferry (iv) Metro (v) Bus /Coach. This should be followed when nesting STOP PLACEs.

8.2 Accessibility

8.2.1 Accessibility Coverage

All ENTRANCEs, QUAYs, ACCESS SPACES and STOP PLACEs should be given the basic ACCESSIBILITY LIMITATION attributes – see below.

8.2.2 Deriving Accessibility Values

A default set of values for the Standard ACCESSIBILITY LIMITATION can be inferred from the presence of specific types of ACCESS EQUIPMENT such as lifts, stairs or escalators.
from

Derivation	**Wheelchair**	**LiftFree**	**StepFree**	**Escalator Free**	**TravelatorFree**
Equipment					
Lift	*true*	*false*	--	--	--
Stairs	false	--	false	--	--
Escalator	*unknown*	*unknown*	false	*false*	*false*
Travelator	*unknown*	*unknown*	--	-	*false*

Figure 8-1 – Deriving Attributes from Equipment for QUAYS and ACCESS SPACES

8.2.3 Accessibility attributes

To populate an ACCESSIBILITY ASSESSMENT the ACCESSIBILITY LIMITATION attributes should always be populated.

Provision of ACCESSIBILITY SUITABILITY is optional and additional.

If unavailable ACCESSIBILITY LIMITATION should be defaulted as shown by Table 8-1.

	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*

Table 8-1 – Default Accessibility Attributes for STOP PLACE

Appendices

9 APPENDIX 1 - SUMMARY RECAP OF THE NPTG AND NAPTAN MODELS

In this Appendix we provide for comparison and convenient reference a short summary of the physical data models underlying the *NaPTAN and NPTG* schemas. Both are relatively simple models with a small number of point or zone entities.

9.1 Overview of NaPTAN Model

Figure 9-1 shows the main elements of the *NaPTAN* schema. The two fundamental entities of the *NaPTAN* schema are ***StopPoint*** and ***StopArea***. These can both be associated with an AdministrativeArea. A ***StopPoint*** is associated with a ***NptgLocality***.

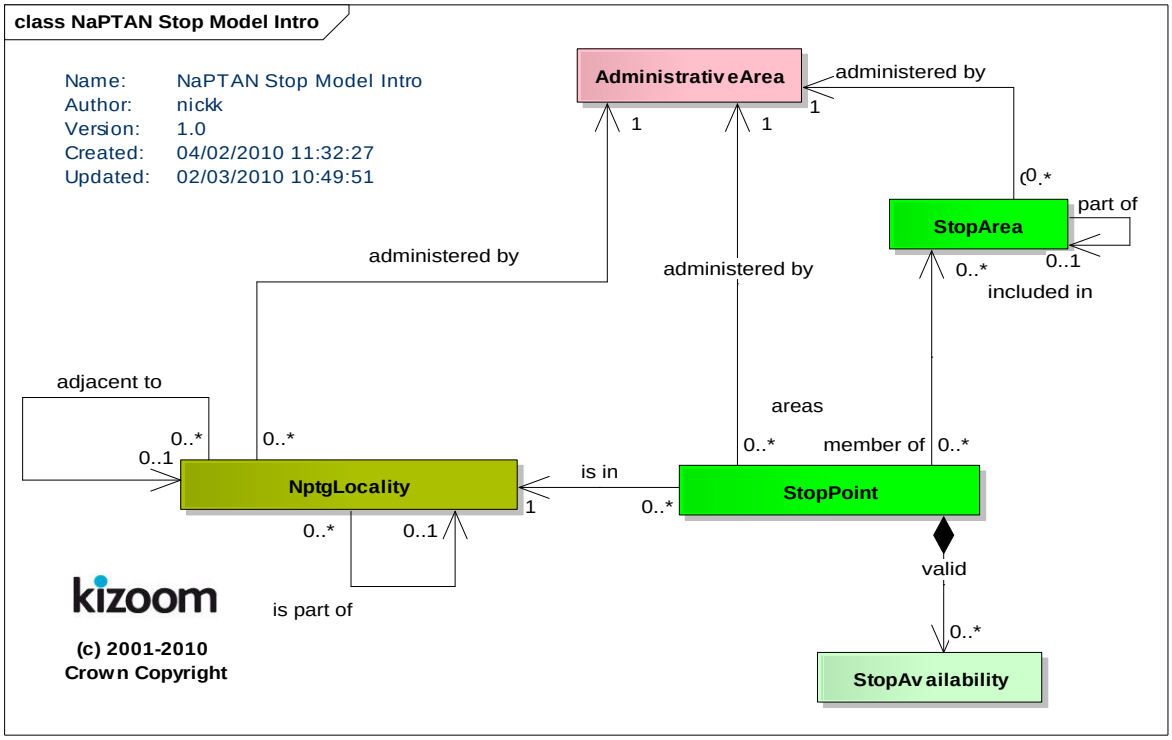


Figure 9-1 – UML Diagram of primary NaPTAN elements

9.1.1 NaPTAN Stop Points & Stop Areas

Figure 9-2 elaborates the main elements of the *NaPTAN* schema slightly.
A ***StopPoint*** represents a point of access to public transport, for any mode of travel – bus, rail, air, taxi, etc – including bus stops, stations, and ferry ports.

- The type of stop point is described by a ***StopClassification***– this is discussed further in the next section.
- The ***StopPoint*** embeds a ***Descriptor*** element, which groups the textual elements used to describe and name the stop systematically. A ***StopPoint*** may also have multiple ***AlternativeDescriptor*** instances by which it is known; alternate descriptors may also be used to provide bilingual names.
- Every ***StopPoint*** has a ***Place*** element, which describes its ***Location*** (geocode) and other information about the locality in which it is situated.
    - Every ***StopPoint*** is assigned to a primary ***NptgLocality*** element, which describes the settlement within which it is sited.

- A ***StopPoint*** may optionally also be assigned to additional adjacent ***NptgLocality*** instances which are nearby.
- Those few ***StopPoint*** which represent the main points of access to public transport for a locality (a bus station, railway station, or port) may be assigned as a *Main Access point* for a locality in a separate association with the ***NptgLocality*** element to that of the primary locality.

A ***StopArea*** represents a grouping of related stop points. Stop areas may themselves be grouped hierarchically into larger stop areas using an 'is part of' relationship.

- A ***StopArea*** has a ***Location*** (geocode) and other descriptive elements.
- Every ***StopPoint*** and ***StopArea*** must belong to an NPTG ***AdministrativeArea*** , which is responsible for managing it and its data.

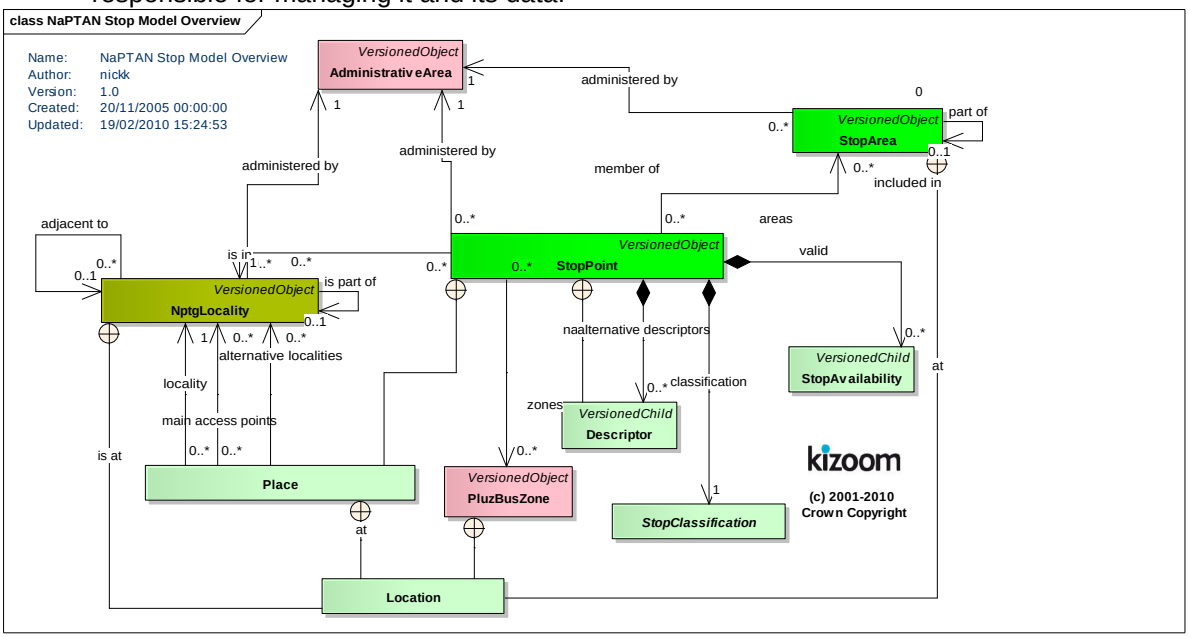


Figure 9-2 – UML Diagram of NaPTAN Model: Overview

9.1.2 NaPTAN Stop Point Types

There are a number of different types of ***StopPoint*** in the *NaPTAN* schema, some of which, for example bus stops, require additional details to be specified. *Figure 9-4* shows, the *NaPTAN* stop type hierarchy, organised under the ***StopClassification*** element. Stops are organised into ***OnStreet*** and ***OffStreet*** types:

- ***OffStreet*** types represent stations and airports and other interchange facilities. For each mode of transport (***Air, Bus, Coach, Tram, Ferry, Metro and Rail***), an off-street stop point type may be either:
    - An ***Entrance*** representing a physical point of access to the facility (the nature of this will depend on mode).
    - An ***AccessArea***, that is the general air-side, dockside or platform interchange area. Note that a more detailed model of interchange structure is planned for the future that will refine this area.
    - A ***Bay*** Gate or ***Platform*** element, used to represent the physical access point within the Interchange Building.
    - For bus and coach stations, a ***VariableBay*** can be used to indicate a stop point that is allocated to different bays at different times.

  Additionally, optional ***AnnotatedAirRef***, ***AnnotatedCoachRef, AnnotatedRailRef, AnnotatedFerryRef,*** and ***AnnotatedMetroRef*** elements can be used to hold mode-specific codes to associate *NaPTAN* data with other reference systems.
- ***OnStreet*** types represent points on streets, grouped by transport mode (***Bus*** and ***Taxi***
    - For ***OnStreet*** / ***Bus*** stop points (also covering coach additional subelements may be required depending on type, for example ***FlexibleZone***a nd ***HailAndRideSection*** instances describe details about flexible zone and hail and ride stops respectively.

Figure 9-3 shows a summary of NaPTAN stop types.

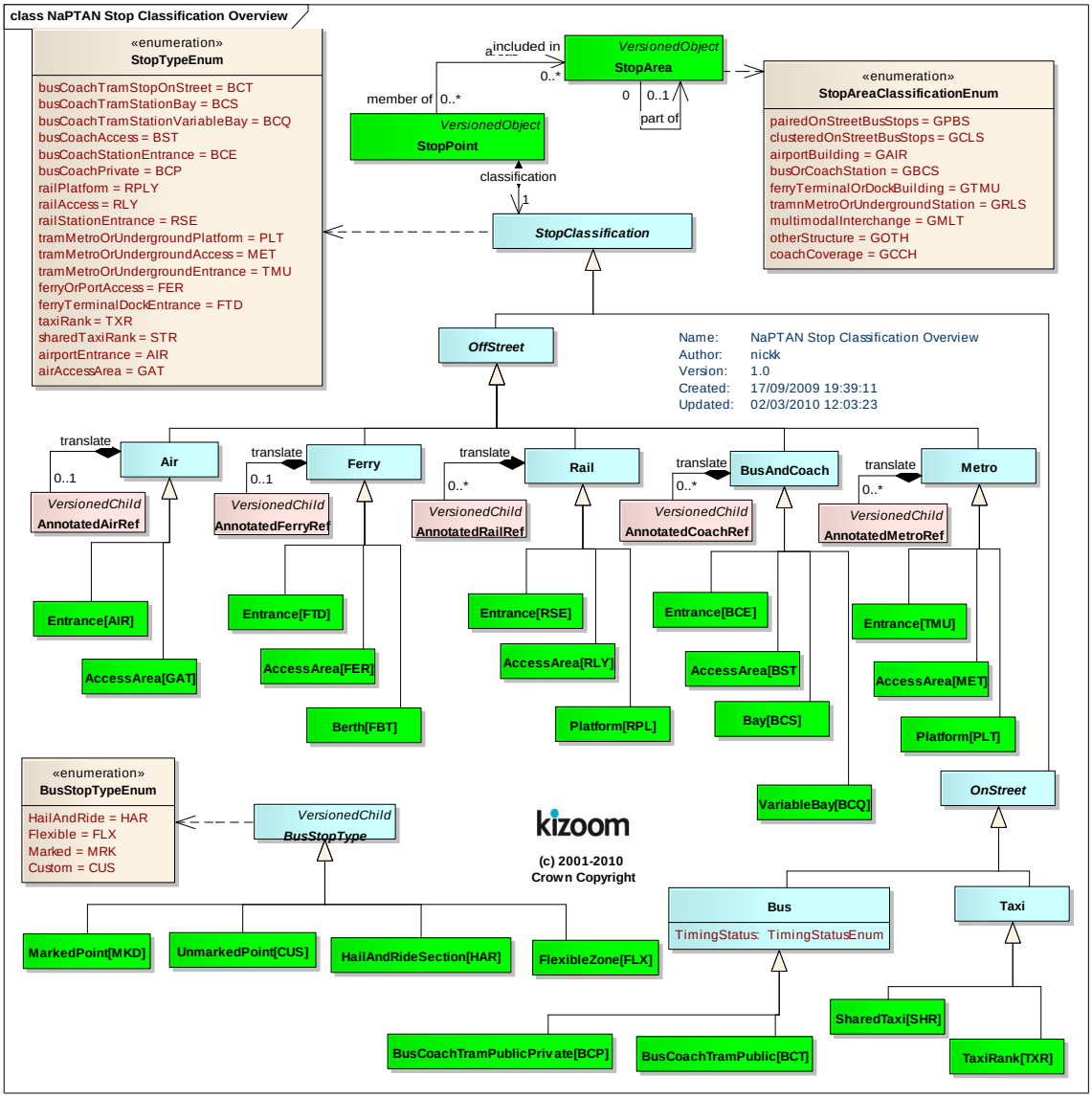


Figure 9-3 – UML Diagram of NaPTAN Stop Types

9.1.3 NaPTAN Stop Area Types

StopArea instances are also classified by transport mode – including some multimodal stop area types to combine stops of different modes.

- Each ***StopArea*** has a four character ***StopAreaType*** code, classifying the area type; stop points of a particular type may be associated with stop areas of particular types. *Table 9-1* shows the relationship between ***StopPoint*** classification elements (and ***StopType*** codes***)*** and stop area classifications. Brackets indicates not used.

Stop Point Type							Stop Area
Group	**Mode**	**Description**	***Entrance***	***Access Area***	**Bay / Pole**	**Sub Type**	**Primary Area**
Off Street	***Air***	Airport	*AIR*	*GAT*		--	*GAIR*
	Ferry	Ferry / Port	*FTD*	*FER*	*FBT*	--	*GFTD*
	Rail	Rail Station	*RSE*	*RLY*	*RPL*	--	*GRLS*
	Metro & Tram	Metro Station	*TMU*	*MET*	*PLT*	--	*GTMU*
	Telecabine	Lift or Cablecar station	*LCE*	*LCB*	*LPL*		*GLCB*
	Bus & Coach	Bus or Coach Station	*(BCE)*	*(BST)*	*BCS*	*MKD*	*GBCS*
			-	-	*BCQ*	*MKD*	
On Street	***Bus***	Bus Coach on Street	-	--	*BCT*	*MKD*	*GBPS, GCLS, GCCH*
					BCT	*CUS*	
					BCT	*HAR*	
					BCT	*FLX*	
	Taxi	Taxi Rank	*TXR*	--		--	--
		Shared Taxi Rank	*STR*	--		--	--

Table 9-1 – Combining Stop Point & Stop Area Classifications

9.1.4 NaPTAN Off-street Stop Types

Figure 9-4 shows further details for *NaPTAN* **off-street** stop types.

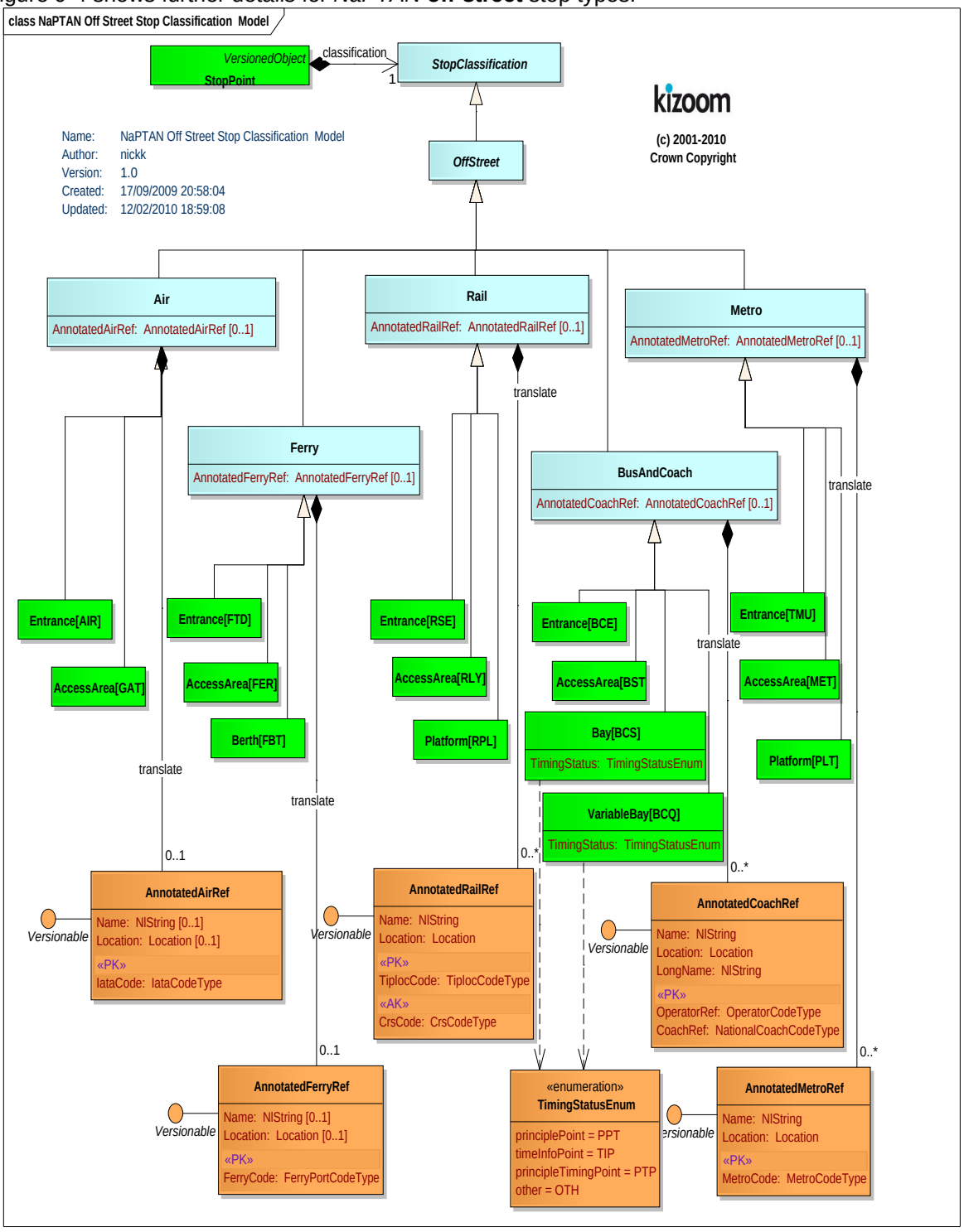


Figure 9-4 – UML Diagram of NaPTAN Off-Street Stop Point Types

Figure 9-5 shows further details for *NaPTAN* **on-street** stop types

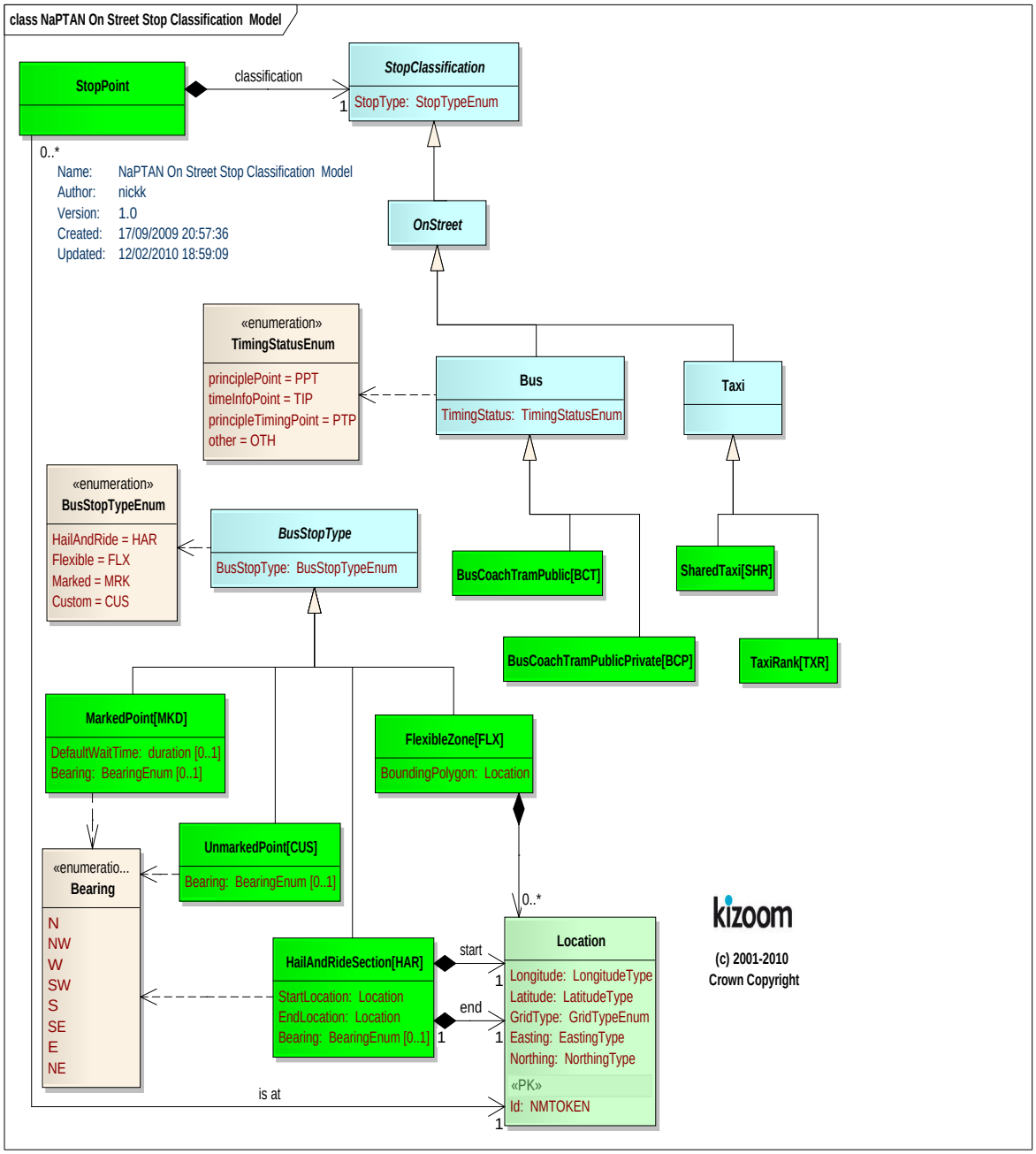


Figure 9-5 – UML Diagram of On street Stop Types

9.2 Use of NPTG

The *NaPTAN* model itself depends on the National Public Transport Gazetteer (NPTG) model to provide (i) an administrative structure with which to assign ownership of data management of particular stops, and (ii) a Gazetteer of UK settlements ("NPTG Localities") which can be used to provide a locational context for stops and (iii) Plusbus zones. The *NeTEx* model includes equivalents as (i) a "RESPONSIBILITY model" and (ii) a "TOPOGRAPHICAL PLACE" model and (iii) a TARIFF ZONE.

9.2.1 NPTG model elements

The NPTG Administrative Area elements provide a simple hierarchy of ownership. Figure 9-6 summarises the current NPTG administrative model.
The country is divided into Regions, each of which is divided into Administrative areas

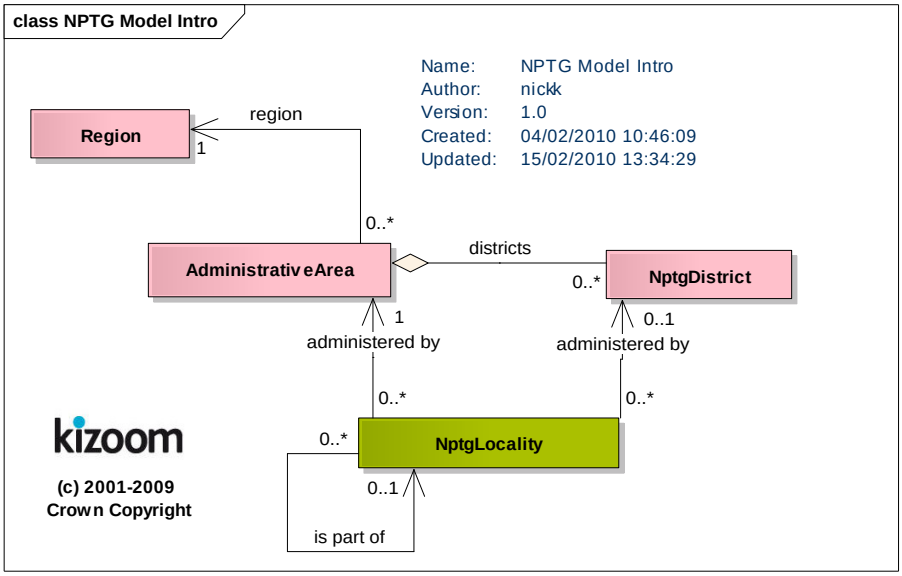


Figure 9-6 – UML Diagram of NPTG Administrative Model: Overview

9.2.2 References to NPTG elements

Figure 9-7 summarises the current *NaPTAN* schema use of *NPTG* elements

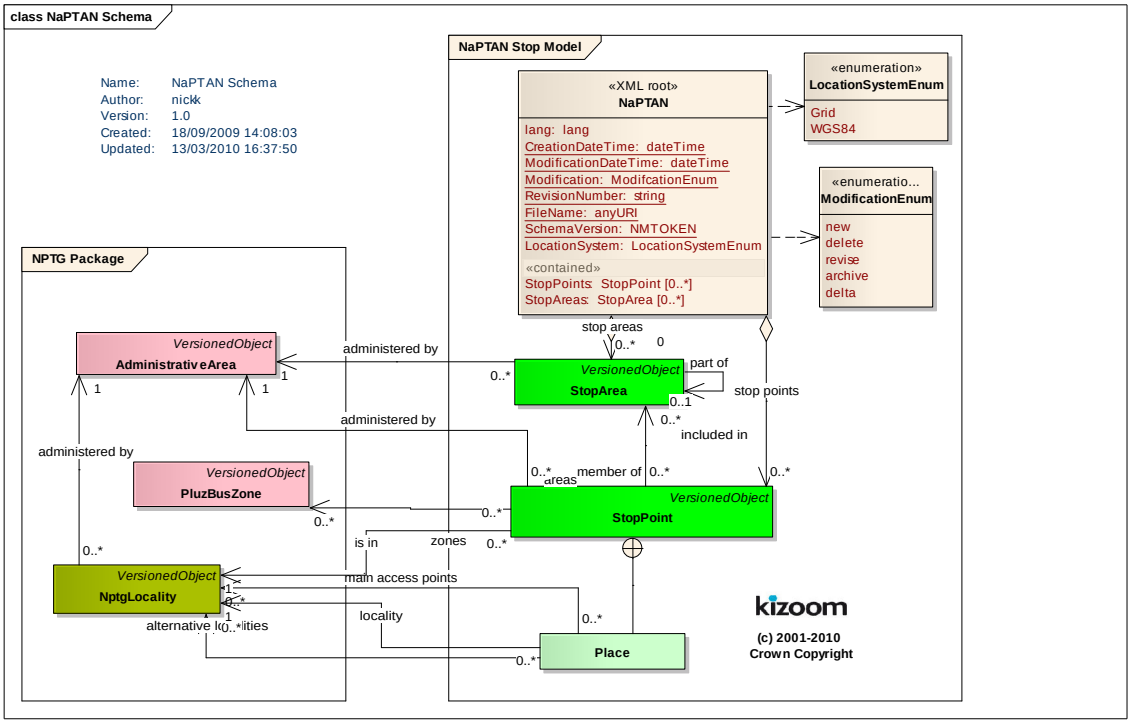


Figure 9-7 – UML Diagram of NaPTAN Schema