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
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NaPTANSchemaUkProfile

1A10001 NaPTANSchemaUkProfile-3.0a-v0.14.doc
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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.]
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 NaPTAN2x to NaPTAN3x.
   - 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 publicly 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 relationship 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](image)

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.

<table>
<thead>
<tr>
<th>Transmodel 5.1</th>
<th>IFOPT</th>
<th>NeTEx</th>
<th>NaPTAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conceptual</td>
<td>Y</td>
<td>(Y)</td>
<td>Y</td>
</tr>
<tr>
<td>Physical</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>XML Schema</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

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 as a stream over a TCP/IP 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

1.6.3.1 Modelling 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.

1.6.3.2 Terminology 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.

1.6.3.3 Open 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.

Use of Conceptual & Physical Models
To design implementations for data exchange

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.

- [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:

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.
  - 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.
- [DE-Acc] Direct Enquiries.com (http://directenquiries.com) and data samples.
- [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.

<table>
<thead>
<tr>
<th>Level</th>
<th>Capability</th>
<th>Summary</th>
<th>Example capability enabled by capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>CapLvl0</td>
<td>Stop Identification: current NaPTAN capability</td>
<td>Identification of entrance, stations, platforms as points.</td>
<td>Integrated multimodal journey planning (computable). Examples: <em>Current Transport Direct &amp; TfL point to point journey planners.</em></td>
</tr>
<tr>
<td>CapLvl1</td>
<td>Connection</td>
<td>Ability to state the</td>
<td>Journey plans that more accurately reflect connection</td>
</tr>
</tbody>
</table>
### CapLvl2 - Point aware Accessibility Journey Planning

<table>
<thead>
<tr>
<th>aware Journey Planning</th>
<th>explicit average transfer times at all interchanges and at a specific interchange. Addition of Pints of interests and access as well as Stop places</th>
<th>times. Example: (Data not currently exchanged for Transport Direct but implemented internally to various degrees by each journey planner using system parameters).</th>
</tr>
</thead>
</table>

### CapLvl3 - Navigation Path aware Accessibility Journey planning.

<table>
<thead>
<tr>
<th>Navigation Path aware Accessibility Journey planning.</th>
<th>Support for point to point path connections within interchange according to accessibility characteristics.</th>
<th>Detailed journey planning advice on accessible use of an interchange. Constraints (computable). Examples: - TfL Journey planning with accessibility constraints. - TfL. - New Journey Web 2.4 accessibility attributes on input and results.</th>
</tr>
</thead>
</table>

### CapLvl4 - Delay aware Journey planning.

<table>
<thead>
<tr>
<th>Delay aware Journey planning.</th>
<th>Support for process delays.</th>
<th>Detailed Journey planning able to include process delays at particular points at particular times.</th>
</tr>
</thead>
</table>

### CapLvl5 - Path link level In station navigation.

<table>
<thead>
<tr>
<th>Path link level In station navigation.</th>
<th>Support for detailed paths.</th>
<th>Detailed visualisation of journeys (narrative). - TfL access exit paths on web site.</th>
</tr>
</thead>
</table>

### CapLvl6 - Full In station passenger information.

<table>
<thead>
<tr>
<th>Full In station passenger information.</th>
<th>Data support for visualisation tools such as schematic maps with hover points that connect to details.</th>
<th>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.</th>
</tr>
</thead>
</table>

#### 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 2-1 by 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.

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.

![Diagram](image)

**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.

<table>
<thead>
<tr>
<th>NaPTAN 2.x Aspect</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 A standard method for identifying and describing access points to public transport.</td>
<td>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.</td>
</tr>
<tr>
<td>#2 An XML Schema for describing the NaPTAN data when it is exchanged as XML documents, based on a conceptual model</td>
<td>NaPTAN 3.0 can be regarded as variant XML schema for the same data, with many added elements.</td>
</tr>
<tr>
<td>#3 An alternative exchange format for exchanging stop data as CSV files</td>
<td>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</td>
</tr>
<tr>
<td>#4 A process for gathering information about changes to stop data and compiling it into the central database</td>
<td>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.</td>
</tr>
<tr>
<td>#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</td>
<td>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.</td>
</tr>
<tr>
<td>#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</td>
<td>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.</td>
</tr>
</tbody>
</table>

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.

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

<table>
<thead>
<tr>
<th>Domain</th>
<th>Colloquial terms</th>
<th>Concept</th>
<th>NaPTAN/ NPTG</th>
<th>NeTEx</th>
</tr>
</thead>
<tbody>
<tr>
<td>NaPTAN Stop</td>
<td>Stop, Bus Stop, Halt, Station, Port, Interchange, Bay, Platform, Quay, Airport, Railway station, Metro Station, Underground station, Tram stop, Tram Station, Station Entrance</td>
<td>Reference to a stop in a timetable, possibly regardless of platform.</td>
<td>StopPoint, (AnnotatedRef)</td>
<td>SCHEDULED STOP POINT</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The physical point at which public transport may be accessed, such as a platform, quay, single on street bus stop, airline gate, ferry berth.</td>
<td>StopPoint [RPL, PLT etc]</td>
<td>QUAY</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.</td>
<td>StopPoint [RLY, MET, etc] and/or StopArea [GRLS, GTMU etc]</td>
<td>STOP PLACE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Physical Entrance to a station or interchange from street.</td>
<td>StopPoint (RSE, TMU etc)</td>
<td>ENTRANCE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reference to a physical stop</td>
<td>StopPoint</td>
<td>PASSENGER STOP</td>
</tr>
</tbody>
</table>
### Table 3-1 – Basic PT Concepts in NaPTAN & NeTEx / IFOPT

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

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

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

#### 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.
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.

<table>
<thead>
<tr>
<th>Level</th>
<th>Name</th>
<th>Type</th>
<th>Primary elements</th>
<th>Other elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>CapLvl0</td>
<td>Current NPTG &amp; NaPTAN capability</td>
<td>Ref</td>
<td>DATA MANAGED OBJECT</td>
<td>ORGANISATION, RESPONSIBILITY SET, VERSION</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>POINT, ZONE</td>
<td>PROJECTION</td>
</tr>
<tr>
<td>CapLvl1</td>
<td>Access links</td>
<td>Site</td>
<td>PLACE, SITE, TRANSFER</td>
<td>SITE ELEMENT, SITE COMPONENT</td>
</tr>
<tr>
<td>CapLvl3</td>
<td>Accessible Site support</td>
<td>Site</td>
<td>LINK</td>
<td>LINK SEQUENCE</td>
</tr>
<tr>
<td>CapLvl3</td>
<td>Equipment</td>
<td></td>
<td>EQUIPMENT, EQUIPMENT PLACE</td>
<td></td>
</tr>
<tr>
<td>CapLvl3</td>
<td>Conditions</td>
<td></td>
<td>VALIDITY CONDITION, AVAILABILITY CONDITION</td>
<td>CALENDAR, DAY TYPE, PROPERTIES OF DAY</td>
</tr>
<tr>
<td>CapLvl0</td>
<td>General</td>
<td>General</td>
<td>MODE, VEHICLE TYPE</td>
<td></td>
</tr>
</tbody>
</table>

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.
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 Local (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 (CapLv2).
- NetEx NavigationPaths (CapLv3).
- NetEx PathLink & PathJunction (CapLv5).
- NetEx Equipment (CapLv5 & CapLv6).

3.3.3 Additional elements to be populated to allow Connection times

- NetEx / Access (CapLv2).
- NetEx / Connection (CapLv2).

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.

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

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.

<table>
<thead>
<tr>
<th>Stop</th>
<th>NeTEx</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>On street</td>
<td>Single bus stop</td>
<td>1 STOP PLACE + 1 QUAY</td>
</tr>
</tbody>
</table>
### 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**

### Flexible Zone
- **1 STOP PLACE + 1 FLEXIBLE QUAY**

#### Zone projection for flexible area

<table>
<thead>
<tr>
<th>Off-street</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single mode rail station</td>
<td><strong>1 STOP PLACE + n QUAYS</strong> + x ACCESS SPACES + y ENTRANCES.</td>
</tr>
<tr>
<td>Single mode metro station</td>
<td><strong>1 STOP PLACE + n QUAYS</strong> + x ACCESS SPACES + y ENTRANCES.</td>
</tr>
<tr>
<td>Bus or Coach station</td>
<td><strong>1 STOP PLACE + n QUAYS</strong> + x ACCESS SPACES + y ENTRANCES.</td>
</tr>
<tr>
<td>Airport</td>
<td><strong>1 STOP PLACE + n QUAYS</strong> + x ACCESS SPACES + y ENTRANCES.</td>
</tr>
</tbody>
</table>

#### Use PATH LINKs + NAVIGATION PATHs for connectivity.

<table>
<thead>
<tr>
<th>Multi modal interchange</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discrete places for each mode</td>
<td>As for single mode either PARENT STOP PLACE REFs to link to main</td>
</tr>
<tr>
<td>Shared use of platforms by different modes</td>
<td><strong>1 STOP PLACE + n QUAYS</strong> + x ACCESS SPACES + y ENTRANCES. Distinct SCHEDULED STOP POINTs for each mode, with STOP ASSIGNMENTS.</td>
</tr>
</tbody>
</table>

#### 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.

**Example**

**On Street Bus Cluster**

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![Figure 4-4 – Example bus cluster on street](image)

4.2.1.3 XML 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.

```xml
<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>St Georges Road</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>None</BearingCompass>
      </RoadAddress>
      <SiteRef>napt:490G0019043</SiteRef>
      <LevelRef>tbd:9100WIMBLDN_LVL_50</LevelRef>
      <Description>Stop A is paired with Stop B on Alexandra Road St Georges Road</Description>
    </Quay>
    <Quay created="2010-04-17T09:30:47Z" dataSourceRef="NaPTAN">
      <ResponsibilitySetRef>nptg:082</ResponsibilitySetRef>
      <Id>napt:490014734B</Id>
      <Name>Alexandra Road, Stop B</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>None</BearingCompass>
      </RoadAddress>
      <SiteRef>napt:490G0019043</SiteRef>
      <LevelRef>tbd:9100WIMBLDN_LVL_50</LevelRef>
      <Description>Stop B is paired with Stop A on Alexandra Road St Georges Road</Description>
    </Quay>
  </quays>
</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*.
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.

**Example Simple Rail Station**

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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.

![Simple Rail Station Example](image)

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.

![Rail Station example with multiple platforms](image)

Figure 4-10 – Rail Station example with multiple platforms
4.2.3.2 XML 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.

```xml
<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>
    <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>
  </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>
</StopPlace>
```
Overview of IFOPT with NaPTAN data

```xml
<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; 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>false</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; 6</Description>
      <BoardingUse>true</BoardingUse>
      <AlightingUse>true</AlightingUse>
      <Label>5 and 6</Label>
      <destinations>
        <DestinationDisplay>Clapham Junction</DestinationDisplay>
        <DestinationDisplay>Waterloo</DestinationDisplay>
      </destinations>
    </Quay>
  </quays>
```

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

```xml
<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>6</Label>
  <QuayType>railPlatform</QuayType>
  <ParentQuayRef>tbd:9100WIMBLDN5n6</ParentQuayRef>
</Quay>
```

---

**Figure 4-12 – Example Nesting of Stop Places**

![Diagram showing nesting of stop places](image-url)
4.2.4.1 XML 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).

```xml
<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>
  <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.

<table>
<thead>
<tr>
<th>Quay Arrangement</th>
<th>Description</th>
<th>Modelling in NetEx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single edged platform</td>
<td>A single physical platform with a track along a single side</td>
<td>A single QUAY</td>
</tr>
<tr>
<td>Double edged platform</td>
<td>A single physical platform with tracks along both sides. UK Examples: Wimbledon 5 &amp; 5</td>
<td>A parent QUAY with two nested child QUAYs for each side.</td>
</tr>
<tr>
<td>Multiple section same edge</td>
<td>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</td>
<td>A parent QUAY with separate nested child QUAYs for each section</td>
</tr>
<tr>
<td>Multiple sections both edges</td>
<td>A physical platform divided into sections on both sides. UK Examples:</td>
<td>A parent QUAY with nested child QUAYs for each side, and separate nested child QUAYs for each section</td>
</tr>
<tr>
<td>Contiguous surface giving access to multiple platforms</td>
<td>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</td>
<td>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.</td>
</tr>
</tbody>
</table>

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 from 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.

4.2.6.1 XML Example of a Multimodal use of the same platform

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

```xml
<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>
      <QuayRef>tbd:9100WIMBLDN10</QuayRef>
    </Quay>
    <QuayRef>tbd:9100WIMBLDN10</QuayRef>
  </quays>
</StopPlace>
```

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

```xml
<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>
  <QuayRef>tbd:9100WIMBLDN10</QuayRef>
</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.

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

### 4.2.7.1 Simple Examples Hail and Ride Stop

**Figure 4-17 – Example of Hail and Ride Stop**
4.2.7.2 Simple Examples of Flexible Stop

![Diagram: Example Flexible Zone](image)

**Figure 4-18 – Example of Flexible Zone**

4.2.7.3 Representing an Entrance between two adjacent spaces

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

4.2.7.4 Classifying 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**

4.3.1.1 Simple 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.
4.3.1.2 Simple 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.

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.
4.3.1.3 XML 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.

```xml
<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 4-23 – Example of Path links between open areas.

4.3.1.4 XML 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.

```xml
<SitePathLink created="2010-05-17T09:30:47Z">
  <Id>tbd:9100WIMBLDN_link_A1_EE1_EE1-1</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_link_A1-EE1_A1-E11-acc01</Id>
      </AccessibilityLimitation>
    </limitations>
  </AccessibilityAssessment>
</SitePathLink>
```

Figure 4-24 – XML Example of external PathLink
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```xml
<WheelchairAccess>true</WheelchairAccess>
<StepFreeAccess>true</StepFreeAccess>
<EscalatorFreeAccess>true</EscalatorFreeAccess>
<LiftFreeAccess>true</LiftFreeAccess>
</AccessibilityLimitation>
</AccessibilityAssessment>

<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_GO</LevelRef>
</To>

<Distance>4.0</Distance>
<AllowedUse>twoWay</AllowedUse>
<FromToUpDown>level</FromToUpDown>
<MaximumFlowPerMinute>200</MaximumFlowPerMinute>
<LevelRef>tbd:9100WIMBLDN_Lvl_GO</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.
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.
4.3.2.2 Creating 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.

<table>
<thead>
<tr>
<th>Navigation Type</th>
<th>Description</th>
<th>Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>quayToQuay</td>
<td>Quay to Quay</td>
<td>STOP PLACE</td>
</tr>
<tr>
<td>streetToQuay</td>
<td>Street to Quay</td>
<td>STOP PLACE</td>
</tr>
<tr>
<td>quayToStreet</td>
<td>Quay to Street</td>
<td>STOP PLACE</td>
</tr>
<tr>
<td>hallToQuay</td>
<td>Ticket Hall to Quay</td>
<td>STOP PLACE, POI</td>
</tr>
<tr>
<td>quayToHall</td>
<td>Quay to Ticket Hall or Entrance Gallery</td>
<td>STOP PLACE, POI</td>
</tr>
<tr>
<td>streetToHall</td>
<td>Street to Ticket Hall</td>
<td>STOP PLACE</td>
</tr>
<tr>
<td>hallToStreet</td>
<td>Ticket Hall to Street</td>
<td>STOP PLACE, POI</td>
</tr>
<tr>
<td>hallToSpace</td>
<td>Hall to spectator area</td>
<td>POI</td>
</tr>
<tr>
<td>spaceToHall</td>
<td>Spectator Area to Hall</td>
<td>POI</td>
</tr>
<tr>
<td>streetToSpace</td>
<td>Street to spectator area</td>
<td>POI</td>
</tr>
<tr>
<td>spaceToStreet</td>
<td>Spectator Area to Street</td>
<td>POI</td>
</tr>
<tr>
<td>spaceToSpace</td>
<td>Spectator Area to Spectator Area</td>
<td>POI</td>
</tr>
</tbody>
</table>
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](image)

4.3.3.1 XML 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

```xml
<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>  <AccessibilityLimitation>    <Id>tbd:9100WIMBLDN_A1-EE1_to_5n6-acc_01</Id>    <WheelchairAccess>true</WheelchairAccess>    <StepFreeAccess>true</StepFreeAccess>    <EscalatorFreeAccess>true</EscalatorFreeAccess>    <LiftFreeAccess>false</LiftFreeAccess>  </AccessibilityLimitation>  </AccessibilityAssessment>
</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.

```xml
<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>
  </PathJunction>
</pathJunctions>
```
<SitePathLink created="2010-05-17T09:30:47Z">
  <Id>tbd:9100WIMBLDN_in_A1-E11_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>
      <MobilityImpairedAccess>true</MobilityImpairedAccess>
    </limitations>
  </AccessibilityAssessment>
  <Covered>indoors</Covered>
  <From>
    <PlaceRef>tbd:9100WIMBLDN_A2</PlaceRef>
    <EntranceRef>tbd:9100WIMBLDN_A2b-E1b2</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_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>
      <MobilityImpairedAccess>true</MobilityImpairedAccess>
    </limitations>
  </AccessibilityAssessment>
  <Covered>indoors</Covered>
  <From>
    <PlaceRef>tbd:9100WIMBLDN_A2b</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_El5_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_Elb2</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>
    <FrequentTravellerDuration>PT5M</FrequentTravellerDuration>
    <OccasionalTravellerDuration>PT5M</OccasionalTravellerDuration>
    <MobilityRestrictedTravellerDuration>PT10M</MobilityRestrictedTravellerDuration>
  </TransferDuration>
</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>
</SitePathLink>
<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.

![Diagram](image)

**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 Level 2 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.

```xml
<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>
                <VisualSignalsAvailable>true</VisualSignalsAvailable>
            </AccessibilityLimitation>
        </limitations>
        <Covered>indoors</Covered>
        <LevelRef/></LevelRef>
        <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>
    </AccessibilityAssessment>
    <Description>Lift Shaft 1 to District line</Description>
</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.

```xml
<SitePathLink created="2010-05-17T09:30:47Z">
    <Id>tbd:9100WIMBLDN_Ink_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>
        <Covered>indoors</Covered>
    </AccessibilityAssessment>
</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.

```xml
<accessSpaces>
  <AccessSpace created="2010-05-17T09:30:47Z">
    <id>tbd:9100WIMBLDN_A5</id>
    <Name>Underground District Line Stairs</Name>
    <MobilityImpairedAccess created="2010-05-17T09:30:47Z" true=
    <MobilityImpairedAccess>
      <AccessibilityLimitation created="2010-05-17T09:30:47Z">
        <WheelchairAccess>false</WheelchairAccess>
        <StepFreeAccess>false</StepFreeAccess>
        <EscalatorFreeAccess>true</EscalatorFreeAccess>
        <LiftFreeAccess>true</LiftFreeAccess>
      </AccessibilityLimitation>
    </MobilityImpairedAccess>
    <Covered>true</Covered>
    <LevelRef>tbd:9100WIMBLDN_Lvl_PL</LevelRef>
    <equipmentPlaces>
      <EquipmentPlace>
        <id>tbd:9100WIMBLDN_A5_PE</id>
        <Description>Staircase and platform access</Description>
        <AccessSpaceType>concourse</AccessSpaceType>
        <accessSpaceEntrances>
          <EntranceRef>tbd:9100WIMBLDN_A5_EL1</EntranceRef>
          <EntranceRef>tbd:9100WIMBLDN_A5_SL1</EntranceRef>
        </accessSpaceEntrances>
      </EquipmentPlace>
    </equipmentPlaces>
  </AccessSpace>
</accessSpaces>
```
Overview of IFOPT with NaPTAN data

```xml
<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>
```
4.5.4 XML Example of an Escalator

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

```xml
<EscalatorEquipment>
  <Id>tbd:9100WIMBLDN_A2b_E2</Id>
  <DirectionOfUse>down</DirectionOfUse>
  <PassengersPerMinute>70</PassengersPerMinute>
  <StepHeight>0.25</StepHeight>
  <HandrailHeight>0.35</HandrailHeight>
  <TactileActuators>true</TactileActuators>
  <EnergySaving>true</EnergySaving>
</EscalatorEquipment>
```

**Figure 4-39 – XML Example of Escalator Equipment**

4.5.5 XML Example of a Ramp

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

```xml
<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.

```xml
<NavigationPath created="2010-05-17T09:30:47Z">
  <Id>tbd:9100WIMBLDN_A1_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_to_DL-notacc-01</Id>
        <WheelchairAccess>false</WheelchairAccess>
        <StepFreeAccess>false</StepFreeAccess>
        <EscalatorFreeAccess>true</EscalatorFreeAccess>
        <ElevatorFreeAccess>true</ElevatorFreeAccess>
      </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.
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.
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.

```xml
<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">
        <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_Ink_A1-E11_A2-j2</PathLinkRef>
          <Description>From Upper concourse internal entrance to path junction 2</Description>
        </PathLinkInSequence>
      </onwardLinks>
    </PlaceRefInSequence>

    <PlaceRefInSequence order="2">
      <PlaceRef>tbd:9100WIMBLDN_A2-j2</PlaceRef>
      <BranchLevel>1</BranchLevel>
      <Description>Path Junction 2 in Upper Concourse Ticket Hall (BRANCH POINT)</Description>
      <onwardLinks>
        <PathLinkInSequence order="1">
          <PathLinkRef>tbd:9100WIMBLDN_Ink_A2-j2-A2-j1</PathLinkRef>
          <Description>From Upper concourse path junction 2 in path junction 1 concourse</Description>
        </PathLinkInSequence>
      </onwardLinks>
    </PlaceRefInSequence>
  </placeRefsInSequence>
</NavigationPath>
```

Figure 4.44 – NeTEx Branched Navigation Paths illustration
<PathLinkInSequence order="1">
  <PathLinkRef>tbd:9100WIMBLDN_Ink_A2b_E11-A2-j2</PathLinkRef>
  <Description>From Entrance 1 to Lift Area in Upper concourse to path junction 2 in Upper concourse</Description>
</PathLinkInSequence>

<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 to stairs by stairs</Description>
      <Reverse>false</Reverse>
      <Transition>down</Transition>
    </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 Concours</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_Ink_A2b-EL1g_A5-EL1pl</PathLinkRef>
      <Description>From Lift AREA Lift 1 to Platform 5 and 6 Lift 1 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>
  <onwardLinks>
    <PathLinkInSequence order="8">
      <PathLinkRef>tbd:9100WIMBLDN_lnk_A2b-ES2g-5n6_ES1pl</PathLinkRef>
      <Description>From Upper Concours Entrance to Stairs 1 to District Line Concourse</Description>
      <Reverse>true</Reverse>
    </PathLinkInSequence>
  </onwardLinks>
</PlaceRefInSequence>
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 4-45 – 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.
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 AnnotatedMetroRef, 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:9100WIMBLDN56</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>n9400ZZCRWIM</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.
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.
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.

<table>
<thead>
<tr>
<th>Value</th>
<th>Definition</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>DefaultDuration</td>
<td>Default average transfer time</td>
<td>Always</td>
</tr>
<tr>
<td>FrequentTravellerDuration</td>
<td>Transfer time for a traveller familiar with the interchange</td>
<td></td>
</tr>
<tr>
<td>OccasionalTravellerDuration</td>
<td>Transfer time for a traveller unfamiliar with the interchange</td>
<td></td>
</tr>
<tr>
<td>MobilityRestrictedTravellerDuration</td>
<td>Transfer time for a mobility impaired traveller</td>
<td></td>
</tr>
</tbody>
</table>

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

![Diagram of Transfer times]

Table 4-6 – UML Diagram of Transfer times
4.7.6 Transfer times between Site components

![UML Diagram of Site components with Access times]

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.

<table>
<thead>
<tr>
<th>Type</th>
<th>Ar</th>
<th>Point</th>
<th>Name1</th>
<th>Name2</th>
<th>Ext Name</th>
<th>Coord</th>
<th>GeoRef</th>
<th>Usage</th>
<th>Lv</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area</td>
<td>1</td>
<td>Bus</td>
<td>Bus</td>
<td>490000272P</td>
<td>524830</td>
<td>170614</td>
<td>25421942</td>
<td>Entrace and PT</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>C</td>
<td>WIMBLEDON STATION (SW19)</td>
<td>490000272C</td>
<td>524805</td>
<td>170643</td>
<td>25489596+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>WIMBLEDON STATION (SW19)</td>
<td>490015472D</td>
<td>524883</td>
<td>170618</td>
<td>25422046+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>WIMBLEDON STATION (SW19)</td>
<td>490015472L</td>
<td>524798</td>
<td>170556</td>
<td>25503472+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P</td>
<td>WIMBLEDON STATION (SW19)</td>
<td>490000272P</td>
<td>524777</td>
<td>170609</td>
<td>25489596+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area</td>
<td>2</td>
<td>Tram</td>
<td>Croydon TramLink</td>
<td>9400ZZ CRWMB 1</td>
<td>524839</td>
<td>170650</td>
<td>2006005249</td>
<td>Only PT</td>
<td>-1</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>WMB SN</td>
<td>524837</td>
<td>170651</td>
<td>2006005249</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area</td>
<td>3</td>
<td>MAIN STATION ENTR</td>
<td>49000027203</td>
<td>524777</td>
<td>170639</td>
<td>25489596</td>
<td>Entrace and B+R</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
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.

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.

```xml
<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
4.7.8.2 XML 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.

```xml
<Connection>
  <Id>tbd:wimcon_01</Id>
  <FromDate>2010-05-17T09:30:47Z</FromDate>
  <ToTime>2010-05-17T10:00:00Z</ToTime>
  <TransferDuration>
    <DefaultDuration>PT5M</DefaultDuration>
    <FrequentTravellerDuration>PT19M</FrequentTravellerDuration>
    <MobilityRestrictedTravellerDuration>PT10M</MobilityRestrictedTravellerDuration>
  </TransferDuration>
</Connection>
```

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

4.7.8.3 XML 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.

```xml
<NavigationPath created="2010-05-17T09:30:47Z" modification="new"/>
  <Id>tbd:9100WIMBLDN_5n6_to_7n8-acc</Id>
  <AccessibilityAssessment created="2010-05-17T09:30:47Z"/>
  <MobilityRestrictedAccess true MobilityImpairedAccess>
    <Id>tbd:9100WIMBLDN_5n6_to_7n8-acc_01</Id>
    <WheelchairAccess>true</WheelchairAccess>
    <StepFreeAccess>true</StepFreeAccess>
    <EscalatorFreeAccess>true</EscalatorFreeAccess>
    <LiftFreeAccess>false</LiftFreeAccess>
  </MobilityRestrictedAccess>
  <MobilityImpairedAccess>
    <Id>tbd:9100WIMBLDN_5n6_to_7n8-acc_02</Id>
    <LiftFreeAccess>true</LiftFreeAccess>
    <StepFreeAccess>true</StepFreeAccess>
    <EscalatorFreeAccess>true</EscalatorFreeAccess>
    <WheelchairAccess>true</WheelchairAccess>
  </MobilityImpairedAccess>
  <MobilityImpairedAccess>
    <Id>tbd:9100WIMBLDN_5n6_to_7n8-acc_03</Id>
    <LiftFreeAccess>true</LiftFreeAccess>
    <StepFreeAccess>true</StepFreeAccess>
    <WheelchairAccess>true</WheelchairAccess>
    <EscalatorFreeAccess>true</EscalatorFreeAccess>
  </MobilityImpairedAccess>
  <MobilityRestrictedAccess>
    <Id>tbd:9100WIMBLDN_5n6_to_7n8-acc_04</Id>
    <LiftFreeAccess>true</LiftFreeAccess>
    <StepFreeAccess>true</StepFreeAccess>
    <WheelchairAccess>true</WheelchairAccess>
    <EscalatorFreeAccess>true</EscalatorFreeAccess>
  </MobilityRestrictedAccess>
  <MobilityImpairedAccess>
    <Id>tbd:9100WIMBLDN_5n6_to_7n8-acc_05</Id>
    <LiftFreeAccess>true</LiftFreeAccess>
    <StepFreeAccess>true</StepFreeAccess>
    <WheelchairAccess>true</WheelchairAccess>
    <EscalatorFreeAccess>true</EscalatorFreeAccess>
  </MobilityImpairedAccess>
  <MobilityRestrictedAccess>
    <Id>tbd:9100WIMBLDN_5n6_to_7n8-acc_06</Id>
    <LiftFreeAccess>true</LiftFreeAccess>
    <StepFreeAccess>true</StepFreeAccess>
    <WheelchairAccess>true</WheelchairAccess>
    <EscalatorFreeAccess>true</EscalatorFreeAccess>
  </MobilityRestrictedAccess>
  <MobilityRestrictedAccess>
    <Id>tbd:9100WIMBLDN_5n6_to_7n8-acc_07</Id>
    <LiftFreeAccess>true</LiftFreeAccess>
    <StepFreeAccess>true</StepFreeAccess>
    <WheelchairAccess>true</WheelchairAccess>
    <EscalatorFreeAccess>true</EscalatorFreeAccess>
  </MobilityRestrictedAccess>
  <MobilityRestrictedAccess>
    <Id>tbd:9100WIMBLDN_5n6_to_7n8-acc_08</Id>
    <LiftFreeAccess>true</LiftFreeAccess>
    <StepFreeAccess>true</StepFreeAccess>
    <WheelchairAccess>true</WheelchairAccess>
    <EscalatorFreeAccess>true</EscalatorFreeAccess>
  </MobilityRestrictedAccess>
  <MobilityRestrictedAccess>
    <Id>tbd:9100WIMBLDN_5n6_to_7n8-acc_09</Id>
    <LiftFreeAccess>true</LiftFreeAccess>
    <StepFreeAccess>true</StepFreeAccess>
    <WheelchairAccess>true</WheelchairAccess>
    <EscalatorFreeAccess>true</EscalatorFreeAccess>
  </MobilityRestrictedAccess>
  <MobilityRestrictedAccess>
    <Id>tbd:9100WIMBLDN_5n6_to_7n8-acc_10</Id>
    <LiftFreeAccess>true</LiftFreeAccess>
    <StepFreeAccess>true</StepFreeAcc...
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.

4.8.1.1 Types 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 SUITABILITY! Thus matching is done directly see below.
Figure 4.60 – UML Diagram of Accessibility elements

4.8.2.1 Associating 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.
4.8.2.2 Use of Accessibility Limitations on Site components

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

```
<table>
<thead>
<tr>
<th>Place i.e. ACCESS SPACE, QUAY</th>
<th>PATH, PATH LINK, STOP PLACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>WheelchairAccess</td>
<td>May be reached by someone in a wheelchair. (possibly using a Lift)</td>
</tr>
<tr>
<td>LiftFreeAccess</td>
<td>Does not require the use of a Lifts to reach it.</td>
</tr>
<tr>
<td>StepFreeAccess</td>
<td>Does not require the use of Steps to reach it.</td>
</tr>
<tr>
<td>EscalatorFreeAccess</td>
<td>Does not require the use of Escalators to reach it.</td>
</tr>
<tr>
<td>TravelatorFreeAccess</td>
<td>Does not require the use of Travelators to reach it.</td>
</tr>
</tbody>
</table>
```

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 is 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 fulfills 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 fulfills that criteria.

4.8.4.1 Default 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 fulfills 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 fulfills that criteria.

4.8.5.1 Defaulting 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.

<table>
<thead>
<tr>
<th>Rail / Metro</th>
<th>On Street Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOP PLACE</td>
<td>QUAY</td>
</tr>
<tr>
<td>Wheelchair</td>
<td>unknown</td>
</tr>
<tr>
<td>LiftFree</td>
<td>unknown</td>
</tr>
<tr>
<td>StepFree</td>
<td>unknown</td>
</tr>
<tr>
<td>EscalatorFree</td>
<td>unknown</td>
</tr>
<tr>
<td>TravelatorFree</td>
<td>true</td>
</tr>
</tbody>
</table>

**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.

4.8.6.1 Default 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

4.8.7.1 Default Accessibility values for a Stop Place

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

4.8.7.2 Accessibility Limitation constraints

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

<table>
<thead>
<tr>
<th>LiftFree</th>
<th>StepFree</th>
<th>EscalatorFree</th>
<th>TravelatorFree</th>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheelchair</td>
<td>Wheelchair access may involve the use of lifts</td>
<td>Wheelchair access must be step free</td>
<td>Wheelchair access must be escalator free</td>
<td>Wheelchair access must be travelator free</td>
</tr>
</tbody>
</table>
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.

```xml
<Quay created="2010-04-17T09:30:47Z">
   <!--id:b9100W1BLD1N5n6"/id-->
   <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>
      </suitabilities>
   </AccessibilityAssessment>
</Quay>
```

<table>
<thead>
<tr>
<th></th>
<th>LiftFree</th>
<th></th>
<th>LiftFree</th>
<th></th>
<th>LiftFree</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>--</td>
<td>LiftFree access may involve the use of escalators</td>
<td>LiftFree access may involve the use of escalators</td>
<td>LiftFree access may involve the use of travelators</td>
<td>To avoid being enclosed in a lift</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>StepFree</td>
<td>StepFree access may involve the use of lift</td>
<td>StepFree access must be escalator free too</td>
<td>StepFree access may still involve the use of travelators</td>
<td>To avoid routes that demand high mobility</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>EscalatorFree</td>
<td>EscalatorFree access may involve the use of lift</td>
<td>EscalatorFree access may involve the use of steps</td>
<td>EscalatorFree access may still involve the use of travelators</td>
<td>To avoid routes that demand high mobility</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TravelatorFree</td>
<td>TravelatorFree access may involve the use of lift</td>
<td>TravelatorFree access may involve the use of steps</td>
<td>TravelatorFree access must be escalator free</td>
<td>To avoid routes that demand high mobility</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4-11 – Accessibility Attribute constraints
<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>
    <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>suitable</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>
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.

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

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 SUITABILITties, 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

<table>
<thead>
<tr>
<th>Implies</th>
<th>Criterion</th>
<th>LiftFree</th>
<th>StepFree</th>
<th>EscalatorFree</th>
<th>TravelatorFree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheelchair</td>
<td>To be able to drive a wheelchair unassisted</td>
<td>Wheelchair access can use lifts</td>
<td>Wheelchair access must be step free</td>
<td>Wheelchair access must be escalator free</td>
<td>Wheelchair access must be travelator free</td>
</tr>
<tr>
<td>LiftFree</td>
<td>To avoid being enclosed in a lift</td>
<td>LiftFree access may have steps</td>
<td>LiftFree access may have escalators</td>
<td>LiftFree access may have travelators</td>
<td></td>
</tr>
<tr>
<td>StepFree</td>
<td>To avoid routes that demand mobility</td>
<td>StepFree access may have lifts</td>
<td>StepFree access must be escalator free too</td>
<td>StepFree access may have travelators</td>
<td></td>
</tr>
<tr>
<td>EscalatorFree</td>
<td>To avoid routes that demand mobility</td>
<td>EscalatorFree access may have lifts</td>
<td>EscalatorFree access may have steps</td>
<td>EscalatorFree access may have travelators</td>
<td></td>
</tr>
<tr>
<td>TravelatorFree</td>
<td>To avoid routes that demand mobility</td>
<td>TravelatorFree access may have lifts</td>
<td>May have steps</td>
<td>TravelatorFree access must be escalator free</td>
<td>--</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Value</th>
<th>MobilityImpairedAccess</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheelchair</td>
<td>false</td>
</tr>
<tr>
<td></td>
<td>true</td>
</tr>
<tr>
<td></td>
<td>unknown</td>
</tr>
<tr>
<td>LiftFree</td>
<td>false</td>
</tr>
<tr>
<td></td>
<td>true</td>
</tr>
<tr>
<td></td>
<td>unknown</td>
</tr>
<tr>
<td>StepFree</td>
<td>false</td>
</tr>
<tr>
<td></td>
<td>true</td>
</tr>
<tr>
<td></td>
<td>unknown</td>
</tr>
<tr>
<td>EscalatorFree</td>
<td>false</td>
</tr>
<tr>
<td></td>
<td>true</td>
</tr>
<tr>
<td></td>
<td>unknown</td>
</tr>
<tr>
<td>TravelatorFree</td>
<td>false</td>
</tr>
<tr>
<td></td>
<td>true</td>
</tr>
<tr>
<td></td>
<td>unknown</td>
</tr>
</tbody>
</table>

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.
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.
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.
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.

<table>
<thead>
<tr>
<th>Group</th>
<th>Subgroup</th>
<th>Equipment</th>
<th>Use</th>
<th>Accessibility attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place-</td>
<td>Access-Equipment</td>
<td>RoughSurface</td>
<td>Level3</td>
<td>SurfaceType</td>
</tr>
<tr>
<td>Equipment</td>
<td></td>
<td>EntranceEquipment</td>
<td>Level3</td>
<td>Dimensions, wheelchair passable, controls, acoustic sensor, automatic</td>
</tr>
<tr>
<td></td>
<td></td>
<td>StaircaseEquipment</td>
<td>Level3</td>
<td>Handrail, handrail height, number of steps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LiftEquipment</td>
<td>Level3</td>
<td>Dimensions, wheelchair passable, Wheelchair turning circle</td>
</tr>
</tbody>
</table>
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.

4.9.5.1 XML 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_E11</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>
    </EntranceEquipment>
  </placeEquipments>
</Entrance>
```
4.9.5.2 XML Example of Local Services

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

```xml
<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**

4.9.5.3 Equipment 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.

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

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 TIL 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.

4.10.1.1 Availability Condition associated with Element

```
<SitePathLink created="2010-05-17T09:30:47Z">
  <Id>tbd:9100WIMBLDN InkWell_A1-E1_A1-E1</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>
```

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
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.

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 an 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.

4.11.3.1 Availability Condition associated with Element

```xml
<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>
```

4.11.3.2 Availability Condition definitions

The condition is made up of a number of day types

```xml
<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>
```

4.11.3.3 Day types definitions

Each day type defines

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

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.
4.12.5 Example of Point of Interest

Figure 4-81 shows 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).

```xml
<PointOfInterest>
  <ResponsibilitySetRef>tb:dLRS_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>
</PointOfInterest>
```
<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>
  </Entrance>
  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:
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 Parking</Name>
    <Description>Forecourt parking</Description>
    <Centroid>
        <Location>
            <Longitude>-180</Longitude>
            <Latitude>-90</Latitude>
        </Location>
    </Centroid>
    <PublicUse>true</PublicUse>
</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
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.
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).

```xml
<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">tbd: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.

4.16.1 XML Example of Site Frame

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

```xml
<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"/>
</ResponsibilitySet>
</responsibilitySets>
</SiteFrame>
```
...<ResponsibilitySet>
  <responsibilitySets>
    <Authority>
      <Id>tbd:Org_Tfl</Id>
      <Name>Transport For London</Name>
      <ShortName>TFL</ShortName>
      <OrganisationType>authority</OrganisationType>
    </Authority>
  </responsibilitySets>
  <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>
    <TopographicPlaces>
        <Id>nptg:Region_L</Id>
        <Name lang="en">Greater London</Name>
      </TopographicPlace>
    </TopographicPlaces>
    <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>
    <stopPlaces>
      <StopPlace created="2006-09-11T15:42:00" modification="revise" dataSourceRef="NaPTAN" hanged="2009-02-26T15:47:00">
        <StopAreaCode>910GWIMBLDN</StopAreaCode>
        <AdministrativeAreaRef/>
        <Name>Wimbledon Rail Station</Name>
      </StopPlace>
    </stopPlaces>
    <scheduledStopPoints>
      <ScheduledStopPoint>
        <Id>napt:910GWIMBLDN</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>
      </StopArea>
    </stopAreas>
  </organisations>
</contentValidityConditions>

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5 \textbf{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 \textit{NeTEx} XML example document.

5.1.1 Example XML documents
The files can be found at
\begin{itemize}
  \item Http://www.neteg.org.uk/schemas/
\end{itemize}

5.1.2 Cautions and Notes
The \textit{NeTEx} XML schema used in the example is based on the draft \textit{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 \textit{NaPTAN} and \textit{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:
\begin{itemize}
  \item An example of a staircase with multiple flights.
  \item An example of a lift between multiple floors.
  \item In station signage [TO DO]
\end{itemize}

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 ENTRANCESes 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.

![UML Diagram of Site Model – Details](image-url)
6.1.2 PathLink Model details

6.1.3 CheckConstraint Model details

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

![UML Diagram of CheckConstraint Model – Details](image)

6.2 StopPlace Model details

6.2.1 Stop Place Model details

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

![UML Diagram of Addresses - Detail](image)

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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

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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

![UML Diagram of Addresses - Detail](image)
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.
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

![Diagram of Waiting Equipment](image)

**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

![Diagram of Passenger Equipment](image)

**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

[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.

```xml
<complexType name="CommercialServiceModel::RetailService">
  <complexContent>
    <restriction base="xsd:string">
      <enumeration value="food"/>
      <enumeration value="healthHygieneBeauty"/>
      <enumeration value="fashionAccessories"/>
      <enumeration value="bankFinanceInsurance"/>
      <enumeration value="tourism"/>
      <enumeration value="photoBooth"/>
      <enumeration value="other"/>
    </restriction>
  </complexContent>
</complexType>

<complexType name="CommercialServiceModel::MoneyService">
  <complexContent>
    <restriction base="xsd:string">
      <enumeration value="cashMachine"/>
      <enumeration value="bank"/>
      <enumeration value="insurance"/>
      <enumeration value="bureauDeChange"/>
    </restriction>
  </complexContent>
</complexType>

<complexType name="CommercialServiceModel::RetailService">
  <complexContent>
    <restriction base="xsd:string">
      <enumeration value="food"/>
      <enumeration value="healthHygieneBeauty"/>
      <enumeration value="newspaperTobacco"/>
      <enumeration value="fashionAccessories"/>
      <enumeration value="bankFinanceInsurance"/>
      <enumeration value="tourism"/>
      <enumeration value="photoBooth"/>
      <enumeration value="other"/>
    </restriction>
  </complexContent>
</complexType>

<complexType name="CommercialServiceModel::RefreshmentsService">
  <complexContent>
    <restriction base="xsd:string">
      <enumeration value="bar"/>
      <enumeration value="beverageVendingMachine"/>
      <enumeration value="buffet"/>
      <enumeration value="coffeeShop"/>
      <enumeration value="firstClassRestaurant"/>
      <enumeration value="foodVendingMachine"/>
      <enumeration value="hotFoodService"/>
      <enumeration value="restaurant"/>
      <enumeration value="snacks"/>
      <enumeration value="trolleyService"/>
      <enumeration value="noBeveragesAvailable"/>
      <enumeration value="noFoodServiceAvailable"/>
      <enumeration value="other"/>
    </restriction>
  </complexContent>
</complexType>

<complexType name="CommercialServiceModel::CommunicationService">
  <complexContent>
    <restriction base="xsd:string">
      <enumeration value="freeWifi"/>
      <enumeration value="publicWifi"/>
      <enumeration value="phone"/>
      <enumeration value="internet"/>
      <enumeration value="mobileCoverage"/>
      <enumeration value="videoEntertainment"/>
      <enumeration value="audioEntertainment"/>
      <enumeration value="postbox"/>
      <enumeration value="postOffice"/>
      <enumeration value="businessServices"/>
    </restriction>
  </complexContent>
</complexType>
```

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

6.8.7 Sign Equipment elements

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

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

<table>
<thead>
<tr>
<th>NaPTAN Classification</th>
<th>NaPTAN stop type</th>
<th>Mode</th>
<th>NeTEx</th>
<th>NeTEx TYPE</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AccessArea</strong></td>
<td></td>
<td></td>
<td>STOP PLACE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GAT</td>
<td>Air</td>
<td></td>
<td>airport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RLY</td>
<td>Rail</td>
<td></td>
<td>railStation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FER</td>
<td>Ferry</td>
<td></td>
<td>ferryPort,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MET</td>
<td>Metro</td>
<td></td>
<td>harbourPort,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BCS</td>
<td>Bus</td>
<td></td>
<td>metroStation,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>tramStation,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>busStation,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(coachStation)</td>
<td></td>
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<td>BCE</td>
<td>Bus</td>
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<td>BCQ</td>
<td>bus</td>
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<td>SCHEDULED STOP POINT + DYNAMIC STOP ASSIGNMENT</td>
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<td>Assign to Bay within a STOP PLACE</td>
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<td>BCT</td>
<td>bus</td>
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<td>busBay</td>
<td>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.</td>
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<td>Lift Platform</td>
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<td>Taxi</td>
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### Annotatedxxx-Ref

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<th>Annotated MetroRef</th>
<th>Annotated CoachRef</th>
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<td>Ferry</td>
<td>Metro</td>
<td>Coach</td>
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### 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.

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<th>NaPTAN</th>
<th>NeTEx</th>
<th>Comment</th>
</tr>
</thead>
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<tr>
<td>Unmarked bus stop on street</td>
<td>1 StopPoint (CUS)</td>
<td>1 StopPlace + 1 Quay</td>
</tr>
<tr>
<td>Single bus stop on street</td>
<td>StopPoint (MKD)</td>
<td>1 StopPlace + 1 Quay</td>
</tr>
<tr>
<td>Pair of bus stops on a route (bus stop on street)</td>
<td>2 StopPoints (MKD) + 1 StopArea (GBPS)</td>
<td>1 StopPlace + 2 Quays</td>
</tr>
<tr>
<td>On street bus cluster</td>
<td>x StopPoints (MKD) + 1 StopArea (GCLS)</td>
<td>1 StopPlace + n Quays</td>
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<tr>
<td>Hail &amp; Ride Zone</td>
<td>1 StopPoint (HAR)</td>
<td>1 StopPlace + 1 FlexibleQuay</td>
</tr>
<tr>
<td>Flexible Zone</td>
<td>1 StopPoint (FLX)</td>
<td>1 StopPlace + 1 FlexibleQuay</td>
</tr>
<tr>
<td>Single mode rail station</td>
<td>1 StopPoint (RLY) + x StopPoints (RSE) for each entrance y StopPoints (RPL for each platform + z AnnotatedRailRefs for each timetable code 1 StopArea (GRLS)+</td>
<td>1 StopPlace + x Quays + x Scheduled-StopPoints</td>
</tr>
<tr>
<td>Single mode metro station</td>
<td>1 StopPoint (MET) + x StopPoints (TMU) for each entrance y StopPoints (PLT for each platform + z AnnotatedMetroRefs for each timetable code 1 StopArea (GTMU)+</td>
<td>1 StopPlace + x Quays + x Scheduled-StopPoints</td>
</tr>
<tr>
<td>Bus or Coach station</td>
<td>StopPoint (BST) + x StopPoints (RSE) for each entrance. y StopPoints (BCS</td>
<td>1 StopPlace + x Quays + x Scheduled-StopPoints</td>
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<tr>
<td>Airport</td>
<td>StopPoint (GAT) + x StopPoints (AIR) for each</td>
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</table>
Overview of IFOPT with NaPTAN data

### Multi mode interchange

<table>
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<th>StopPlace</th>
<th>Mode</th>
<th>NeTEx</th>
<th>Note</th>
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<tbody>
<tr>
<td>StopArea</td>
<td>GAIR</td>
<td>Air</td>
<td>StopPlace</td>
<td>Use to augment the StopPlace to identify the member stops and related StopPlace instances.</td>
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<tr>
<td></td>
<td>GRLS</td>
<td>Rail</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>GFTD</td>
<td>Ferry</td>
<td>(+ScheduledStopPoint + StopAssignment!)</td>
<td>Can also create an NeTEx StopArea with members</td>
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<tr>
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<td>GBCS</td>
<td>Bus</td>
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### 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

© Crown Copyright 2009-2011
### 7.2.1 Detailed Mapping of NaPTAN StopPoint to NeTEx Stop Place Components

<table>
<thead>
<tr>
<th>NaPTAN Parent Element</th>
<th>Intermediary Element</th>
<th>NeTEx / NeTEx Parent Element</th>
<th>Intermediary Element</th>
<th>NeTEx</th>
<th>Type</th>
<th>Capabilities Level</th>
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<td>xsd:dateTime</td>
</tr>
<tr>
<td>*versioned</td>
<td>..</td>
<td>Revision-</td>
<td>revision</td>
<td>Map ^versionedObject</td>
<td>..</td>
<td>version</td>
<td>version</td>
</tr>
<tr>
<td>*versioned</td>
<td>..</td>
<td>Modification</td>
<td>modification</td>
<td>Map ^versionedObject</td>
<td>..</td>
<td>modification</td>
<td>integer</td>
</tr>
<tr>
<td>*versioned</td>
<td>..</td>
<td>Status</td>
<td>RecordStatus</td>
<td>Map ^versionedObject</td>
<td>..</td>
<td>status</td>
<td></td>
</tr>
<tr>
<td>StopArea</td>
<td>..</td>
<td>StopAreaCode</td>
<td>StopArea-CodeType</td>
<td>Map ^SiteElement</td>
<td>..</td>
<td>Id</td>
<td>QuayIdType</td>
</tr>
<tr>
<td>StopArea</td>
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<td>SiteElement</td>
<td>Map SiteElement</td>
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<td>name</td>
<td></td>
</tr>
<tr>
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<td>..</td>
<td>PrivateCode</td>
<td>xsd:normalized-String</td>
<td>Map ^SiteElement</td>
<td>..</td>
<td>PrivateCode</td>
<td>SiteElement</td>
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<td>StopArea</td>
<td>..</td>
<td>ParentStopAreaRef</td>
<td>StopArea-CodeType</td>
<td>Map ^SiteElement</td>
<td>..</td>
<td>StopPlaceRef</td>
<td>CapLevel0</td>
</tr>
<tr>
<td>StopArea</td>
<td>StopAreaType</td>
<td>StopAreaType</td>
<td>Map ^SiteElement</td>
<td>..</td>
<td>StopPlaceType</td>
<td>CapLevel0</td>
<td></td>
</tr>
</tbody>
</table>
7.2.2 Detailed Mapping of NaPTAN Alternative Descriptors to NeTEx: AlternativeName

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

<table>
<thead>
<tr>
<th>NaPTAN</th>
<th>Intermediate Element</th>
<th>Element</th>
<th>Type</th>
<th>Note</th>
<th>NaPTAN / NeTEx</th>
<th>Intermediate Element</th>
<th>Element Type</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent Element</td>
<td>Descriptor</td>
<td><strong>AtcoCode</strong></td>
<td>AtcoCodeType</td>
<td>Map</td>
<td>AlternativeName</td>
<td>Parent Element</td>
<td><strong>Id</strong></td>
<td>QuayIdType</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>StopPlaceIdType</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CapLvl1</td>
</tr>
<tr>
<td>Descriptor</td>
<td></td>
<td><strong>CommonName</strong></td>
<td>placeName</td>
<td>Map</td>
<td>AlternativeName</td>
<td></td>
<td><strong>Name</strong></td>
<td>MultilingualString</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>CapLvl1</td>
</tr>
<tr>
<td>Descriptor</td>
<td></td>
<td><strong>ShortName</strong></td>
<td>placeName</td>
<td>Map</td>
<td>AlternativeName</td>
<td></td>
<td><strong>ShortName</strong></td>
<td>MultilingualString</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CapLvl1</td>
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<td>placeName</td>
<td>Map</td>
<td>AlternativeName</td>
<td></td>
<td></td>
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</tr>
<tr>
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<td></td>
<td></td>
<td></td>
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<td>Napt-2.0</td>
</tr>
<tr>
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<td></td>
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<td>placeName</td>
<td>Map</td>
<td>AlternativeName</td>
<td></td>
<td></td>
<td>Napt-2.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Napt-2.4</td>
</tr>
<tr>
<td>Descriptor</td>
<td></td>
<td><strong>Indicator</strong></td>
<td>placeName</td>
<td>Extra</td>
<td>AlternativeName</td>
<td></td>
<td><strong>QualifierName</strong></td>
<td>boolean</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CapLvl1</td>
</tr>
<tr>
<td><em>versioned</em></td>
<td></td>
<td><strong>CreationDateTime</strong></td>
<td>xsd:dateTime</td>
<td>Map</td>
<td><em>versionedObject</em></td>
<td></td>
<td><strong>created</strong></td>
<td>xsd:dateTime</td>
</tr>
<tr>
<td><em>versioned</em></td>
<td></td>
<td><strong>ModificationDateTime</strong></td>
<td>xsd:dateTime</td>
<td>Map</td>
<td><em>versionedObject</em></td>
<td></td>
<td><strong>changed</strong></td>
<td>xsd:dateTime</td>
</tr>
<tr>
<td><em>versioned</em></td>
<td></td>
<td><strong>RevisionNumber</strong></td>
<td>revision</td>
<td>Map</td>
<td><em>versionedObject</em></td>
<td></td>
<td><strong>version</strong></td>
<td>version</td>
</tr>
<tr>
<td><em>versioned</em></td>
<td></td>
<td><strong>Modification</strong></td>
<td>modification</td>
<td>Map</td>
<td><em>versionedObject</em></td>
<td></td>
<td><strong>modification</strong></td>
<td>Modificationnum</td>
</tr>
<tr>
<td><em>versioned</em></td>
<td></td>
<td><strong>Status</strong></td>
<td>RecordStatus</td>
<td>Map</td>
<td><em>versionedObject</em></td>
<td></td>
<td><strong>status</strong></td>
<td>Status</td>
</tr>
</tbody>
</table>

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

7.2.3 Detailed Mapping of NaPTAN: Stop Availability to NeTEx Validity Condition

<table>
<thead>
<tr>
<th>NaPTAN</th>
<th>Intermediate Element</th>
<th>Element</th>
<th>Type</th>
<th>Note</th>
<th>NaPTAN / NeTEx</th>
<th>Intermediate Element</th>
<th>Element Type</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent Element</td>
<td>StopAvailability</td>
<td><strong>AtcoCode</strong></td>
<td>AtcoCodeType</td>
<td>Map</td>
<td>AvailabilityCondition</td>
<td>Parent Element</td>
<td><strong>Id</strong></td>
<td>QuayIdType</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>StopPlaceIdType</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CapLvl1</td>
</tr>
</tbody>
</table>
## Overview of IFOPT with NaPTAN data

<table>
<thead>
<tr>
<th>NaPTAN</th>
<th>NeTEx / NeTEx</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parent Element</strong></td>
<td><strong>Intermediate Element</strong></td>
</tr>
<tr>
<td>StopAvailability</td>
<td>--</td>
</tr>
<tr>
<td>StopAvailability</td>
<td>--</td>
</tr>
<tr>
<td>StopAvailability</td>
<td>--</td>
</tr>
<tr>
<td>StopAvailability</td>
<td>..</td>
</tr>
<tr>
<td>StopAvailability</td>
<td>--</td>
</tr>
<tr>
<td>*versioned</td>
<td>..</td>
</tr>
<tr>
<td>*versioned</td>
<td>..</td>
</tr>
<tr>
<td>*versioned</td>
<td>..</td>
</tr>
<tr>
<td>*versioned</td>
<td>..</td>
</tr>
<tr>
<td>*versioned</td>
<td>..</td>
</tr>
</tbody>
</table>

**Table 7-6 – NaPTAN / Stop Availability Mapping**
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 ResponsibilitySetRef.
- 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.

```xml
<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 Responsibility Set

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

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.

7.3.2.1 Use 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>
</StopPoint>
```

becomes

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

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

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

or

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

7.3.2.2 Identification 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/>
</Quay>
```

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/>
    <Id nptg:490014734A/>
    <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>MARK</TypeOfZoneRef>
    </zoneTypes>
  </Quay>
</quays>
```
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.

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
<th>Bus NaPTAN subtype</th>
<th>NeTEx</th>
</tr>
</thead>
<tbody>
<tr>
<td>MKD</td>
<td>marked</td>
<td>Point</td>
<td>Quay</td>
</tr>
<tr>
<td>CUS</td>
<td>Custom</td>
<td>Point</td>
<td>Quay</td>
</tr>
<tr>
<td>HAR</td>
<td>hailAndRide</td>
<td>Line</td>
<td>HailAndRideArea</td>
</tr>
<tr>
<td>FLX</td>
<td>Flexible</td>
<td>Polygon</td>
<td>FlexibleArea</td>
</tr>
</tbody>
</table>

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.

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

```xml
<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>
</StopPlace>
```
8 POPULATING THE NAPTA N 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.x schema 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 CapLv6 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) , 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.

<table>
<thead>
<tr>
<th>Derivation</th>
<th>Wheelchair</th>
<th>LiftFree</th>
<th>StepFree</th>
<th>Escalator Free</th>
<th>TravelatorFree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lift</td>
<td>true</td>
<td>false</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Stairs</td>
<td>false</td>
<td>--</td>
<td>false</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Escalator</td>
<td>unknown</td>
<td>unknown</td>
<td>false</td>
<td>false</td>
<td>false</td>
</tr>
<tr>
<td>Travelator</td>
<td>unknown</td>
<td>unknown</td>
<td>--</td>
<td>--</td>
<td>false</td>
</tr>
</tbody>
</table>

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.
### Table 8-1 – Default Accessibility Attributes for STOP PLACE

<table>
<thead>
<tr>
<th>Accessibility Attribute</th>
<th>Rail / Metro</th>
<th>On Street Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheelchair</td>
<td>unknown</td>
<td>true</td>
</tr>
<tr>
<td>LiftFree</td>
<td>unknown</td>
<td>true</td>
</tr>
<tr>
<td>StepFree</td>
<td>unknown</td>
<td>true</td>
</tr>
<tr>
<td>EscalatorFree</td>
<td>unknown</td>
<td>true</td>
</tr>
<tr>
<td>TravelatorFree</td>
<td>true</td>
<td>true</td>
</tr>
</tbody>
</table>
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.

![UML Diagram of primary NaPTAN elements](crown-copyright.png)

**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 and 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.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mode</th>
<th>Description</th>
<th>Stop AreaType</th>
<th>Bay / Pole</th>
<th>Sub Type</th>
<th>Primary Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off Street</td>
<td>Air</td>
<td>Airport</td>
<td>AIR</td>
<td>GAT</td>
<td>--</td>
<td>GAIR</td>
</tr>
<tr>
<td></td>
<td>Ferry</td>
<td>Ferry / Port</td>
<td>FTD</td>
<td>PER</td>
<td>FBT</td>
<td>GFTD</td>
</tr>
<tr>
<td></td>
<td>Rail</td>
<td>Rail Station</td>
<td>RSE</td>
<td>RLY</td>
<td>RPL</td>
<td>GRLS</td>
</tr>
<tr>
<td>Metro &amp; Tram</td>
<td>Metro Station</td>
<td>TMU</td>
<td>MET</td>
<td>PLT</td>
<td>--</td>
<td>GTMU</td>
</tr>
<tr>
<td></td>
<td>Telecine</td>
<td>Lift or Cablecar station</td>
<td>LCE</td>
<td>LCB</td>
<td>LPL</td>
<td>GLCB</td>
</tr>
<tr>
<td></td>
<td>Bus &amp; Coach</td>
<td>Bus or Coach Station</td>
<td>(BCE)</td>
<td>(BST)</td>
<td>BCS</td>
<td>MKD</td>
</tr>
<tr>
<td></td>
<td>On Street</td>
<td>Bus Coach on Street</td>
<td>-</td>
<td>-</td>
<td>BCT</td>
<td>GBPS, GCLS, GCCH</td>
</tr>
<tr>
<td></td>
<td>Taxi</td>
<td>Taxi Rank</td>
<td>TXR</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td>Shared Taxi Rank</td>
<td>STR</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

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.

![UML Diagram of NaPTAN Off-Street Stop Point Types](image-url)

**Figure 9-4 – UML Diagram of NaPTAN Off-Street Stop Point Types**
Figure 9-5 shows further details for NaPTAN 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](image)

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