



Department
for Transport



UK Fares and NeTEx Profile – Suppliers Workshop

CPT London 29 August 2019



Common framework for UK NeTEx

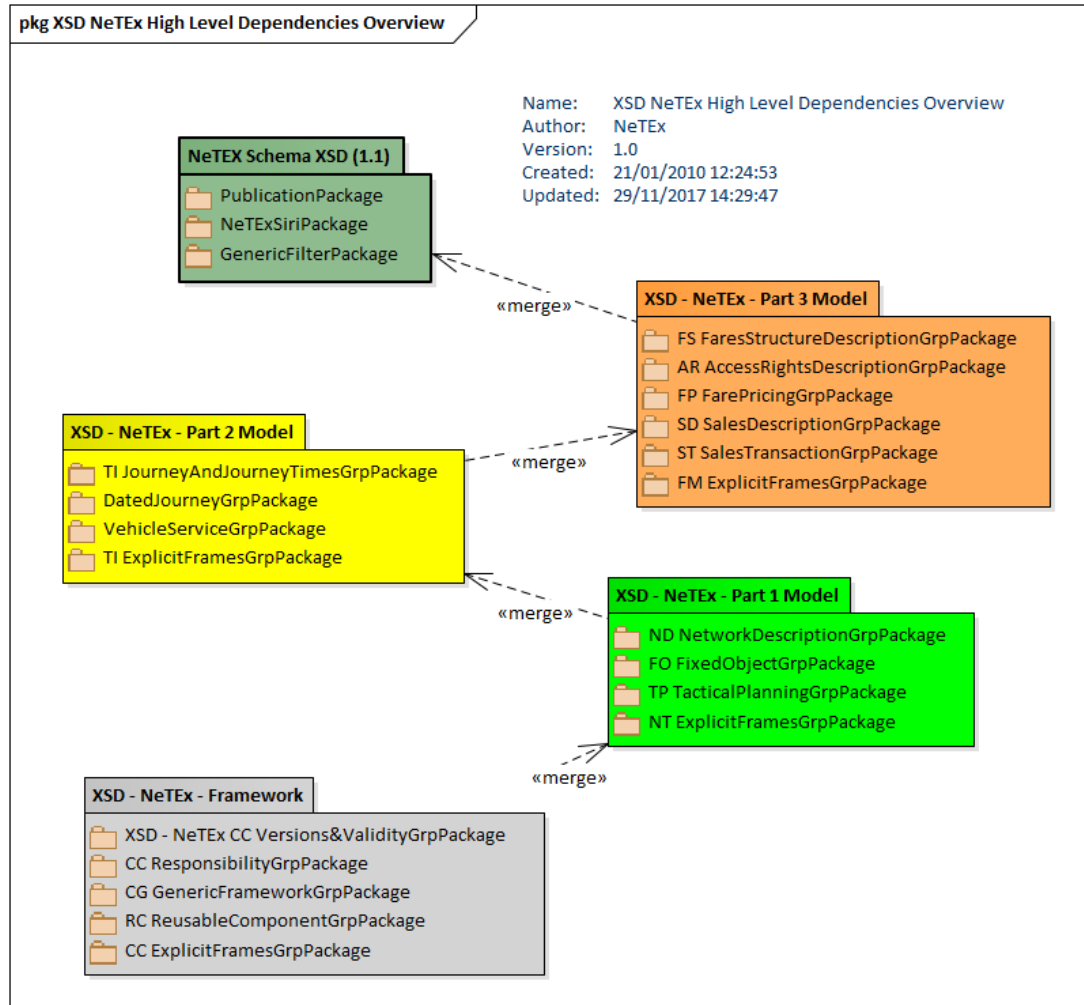


UK Profile – Common Framework





Modular dependencies



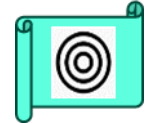


Data Identifiers



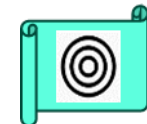
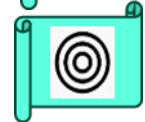
▶ Persistent Unique Identifiers for all components

- Allow for distributed allocation of ids by Operator.
- Allow for world-wide peer-to peer integration of data sets
- Operator defines namespace as W3C URI
- May be qualified by a VERSION



▶ Use existing where available

- ▶ Topographic localities
 - NPTG
- ▶ Stops
NaPTAN,
- ▶ Tariff Zones / Fare Stages
 - PlusBus : (NPTG Already has)
 - Operator Defined Zones : Within NOC?
 - Local Authority Defined Zones : Within NPTG Admin code?
- ▶ Operators
 - NOC: Clarify process etc



▶ Most components must be unique within Operator:

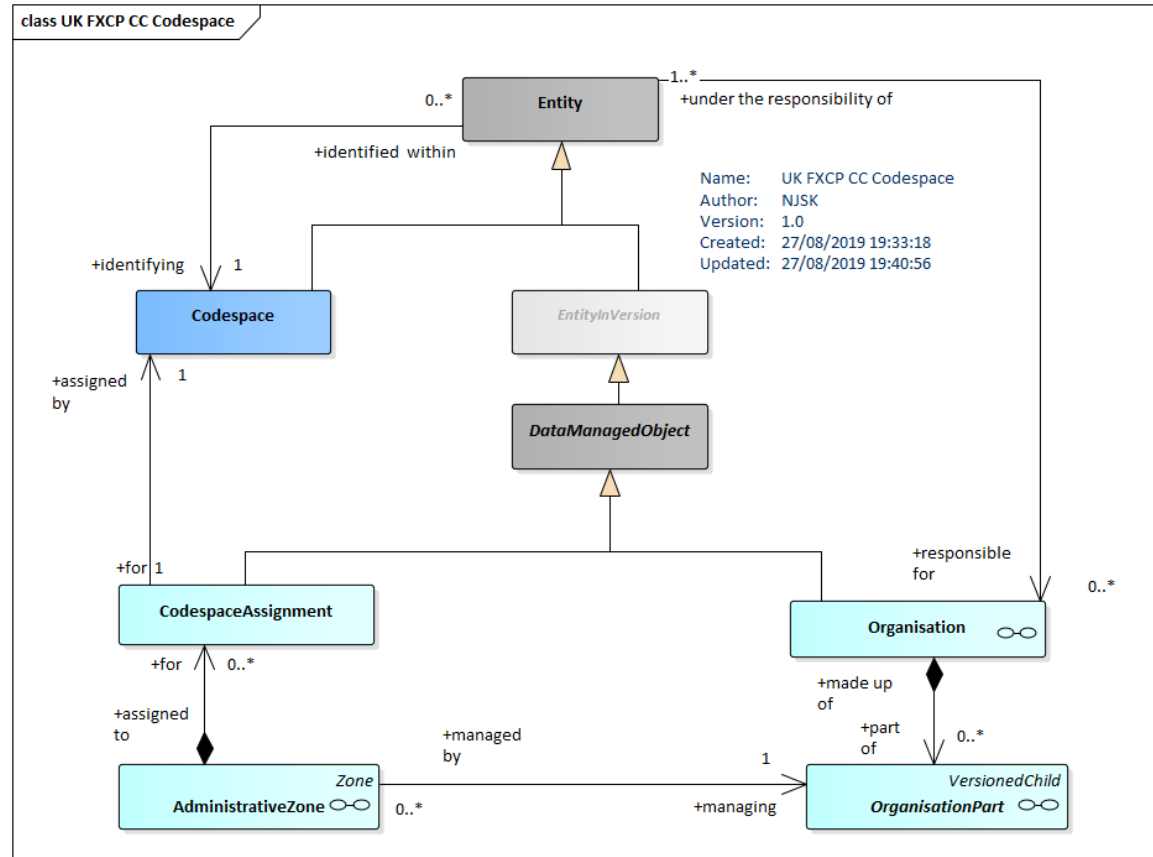
- ▶ Lines, Timetables/Services, Tariffs, etc





Codespaces

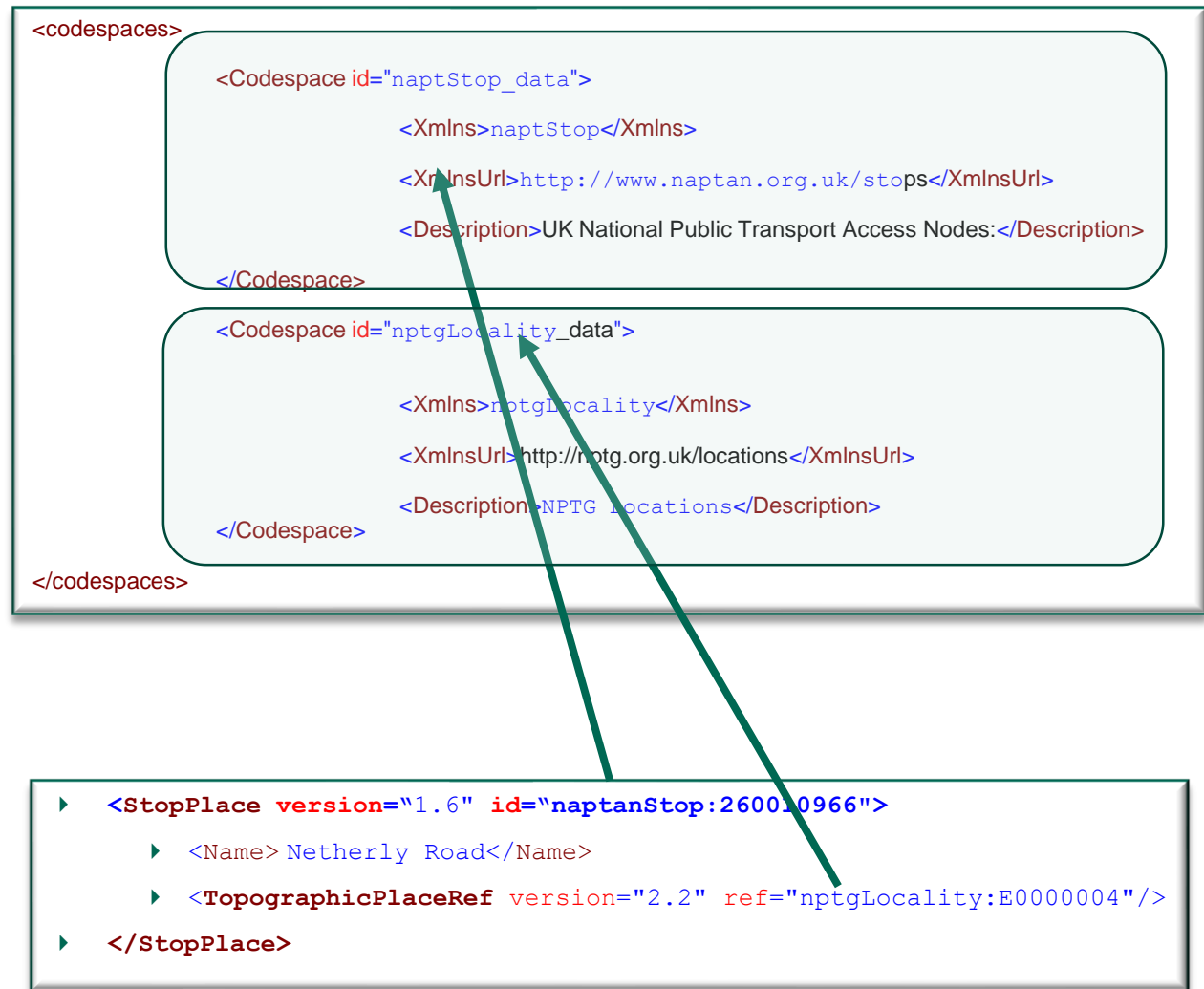
- ▶ All objects have a CODESPACE for their identifier.
- ▶ Like W3 name- space – but for instance data:
 - A) Uniqueness scope
 - B) Code structure
- ▶ Associate with a W3C domain to give unique scope
- ▶ Can assign responsibility to allocate to a region and organisation or subdivision





Codespaces & Identifiers - Example

- ▶ Like W3 namespace – but for instance data.
 - A) Uniqueness scope
 - B) Code structure
- ▶ Associate with a W3C domain to give unique scope





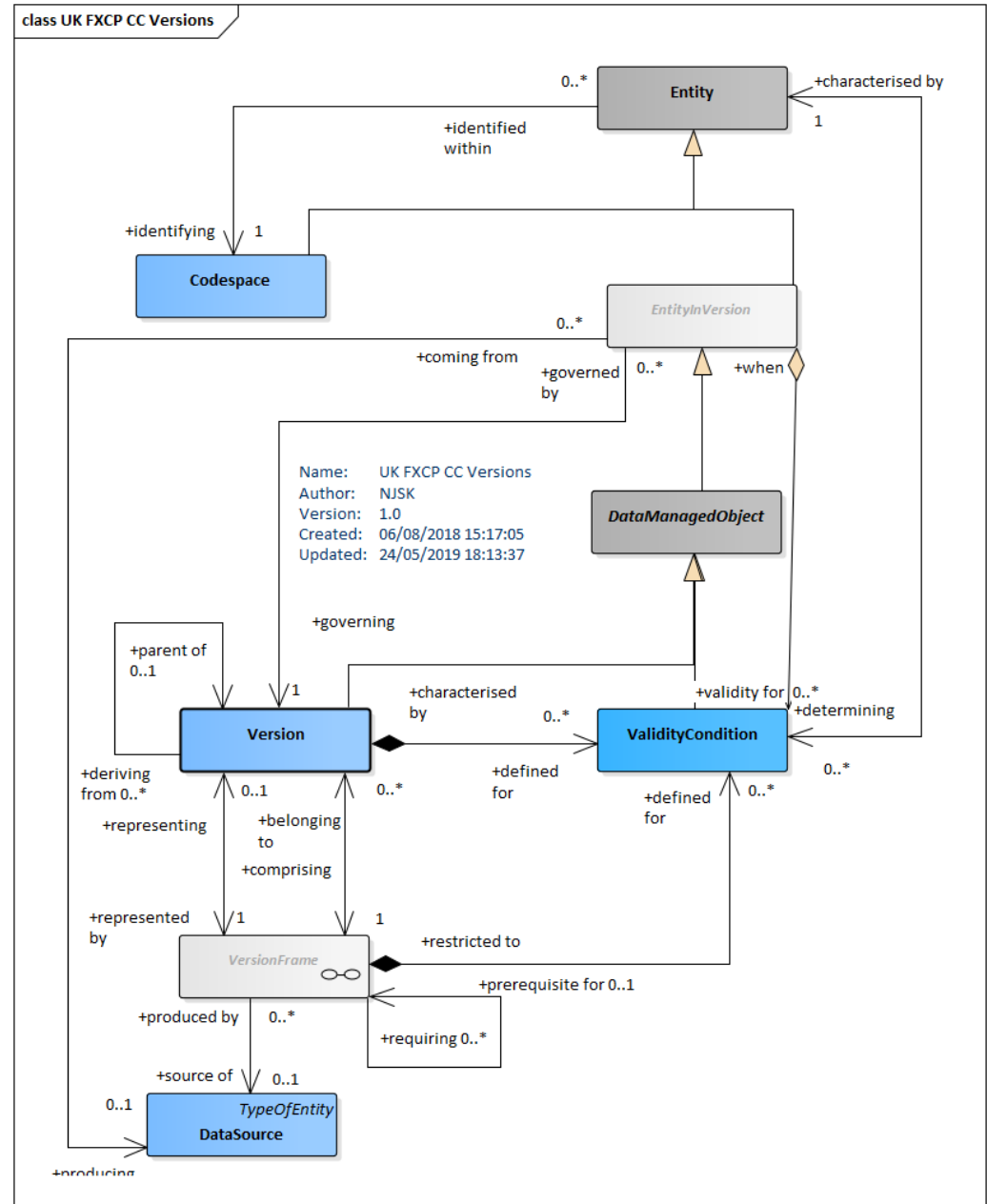
Codespaces for UK Data Elements

Data Set	Content	NeTEx Element	Codespace	Preferred prefix
Administrative Areas	NPTG registrar data (Country, Region, District, AdministrativeArea)	ADMINISTRATIVE AREA, (+GENERAL ORGANISATION)	nptg.org.uk/admin	<i>nptgAdminArea:</i>
Locations	NPTG payload (<i>NptgLocality</i>)	TOPOGRAPHICAL AREA	nptg.org.uk/locality	<i>nptgLocality:</i>
National Tariff Zones	NPTG payload (<i>PlusBusZone</i>)	FARE ZONEs that are PlusBusZones	nptg.org.uk/tariff_zones	<i>nptgTariffZone:</i>
NPTG profile data	NPTG metadata	Fixed code values for classifying localities TYPE OF ZONE etc	nptg.org.uk/nptg	<i>nptg:</i>
NaPTAN profile data	NaPTAN metadata	Fixed code values for classifying stops TYPE OF ZONE etc	naptan.org.uk/napt	<i>napt:</i>
Stops, Stop areas	NaPTAN payload (StopPoint, StopArea)	SCHEDULED STOP POINT, STOP AREA	naptan.org.uk/stops	<i>naptStop:</i>
Operators	National Operator Code (NOC)	OPERATOR	traveline.org.uk/noc	<i>noc:</i>
TransXChange profile data	TransXChange metadata	Fixed code values for fares	transxchange.org.uk/operators	<i>txc:</i>
TransXChange day types	TransXChange metadata	DAY TYPE, SERVICE CALENDAR	transxchange.org.uk/operators	<i>txc:</i>
Timetables	TransXChange payload	Various NeTEx timetable elements	Individual provider	--
FareXChange profile data	FareXChange metadata	Fixed code values for classifyingfares	netex.org.uk/fxc	<i>fxc:</i>
FareXChange profile	FareXChange metadata	Frame types for profile	netex.org.uk/fxc	<i>fxc</i>
Fare data	FareXChange payload	VariousNeTEx fare elements	Individual provider	--



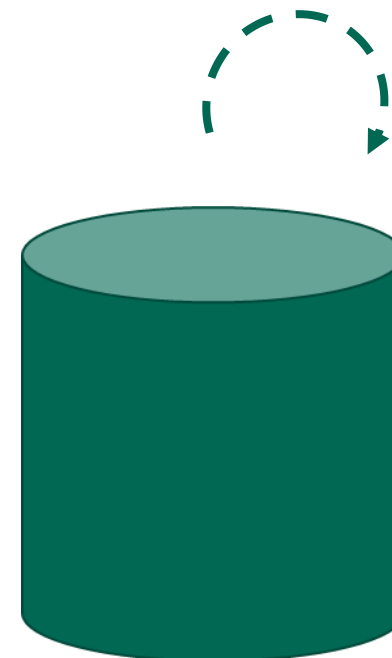
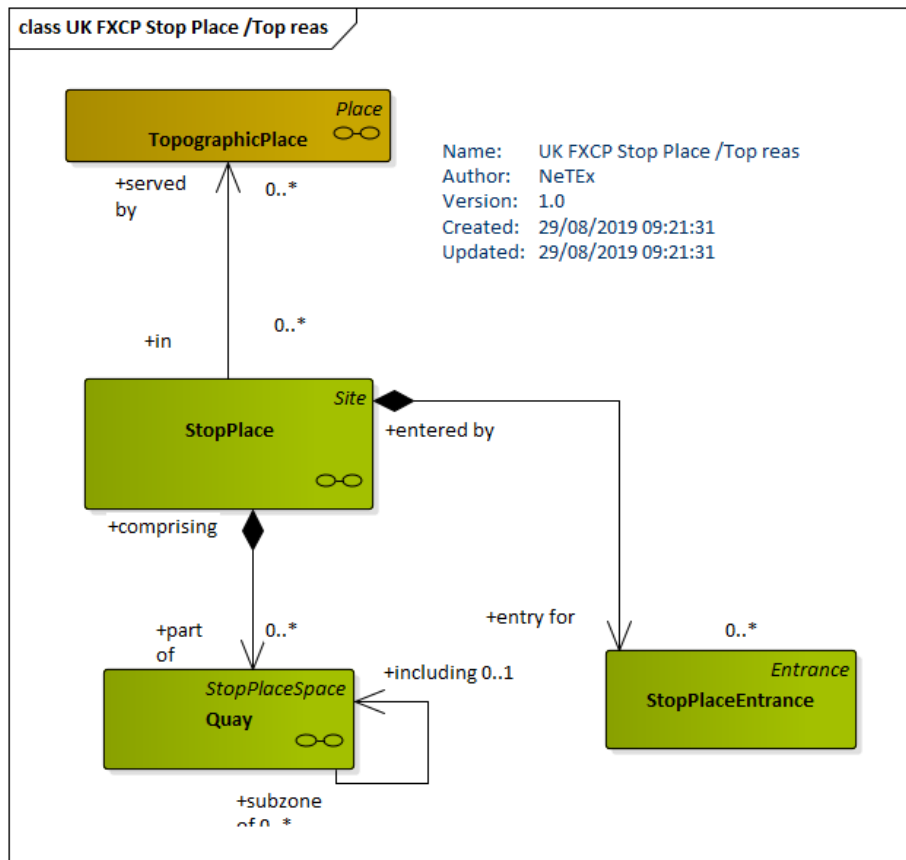
Versions

- All entities can be versioned.
 - Fine grained or at frame level
- A NeTEx XML file contains specific version of each entities
 - References are versioned
 - Can be dummy version
- Can also have a Data SOURCE and a VALIDITY CONDITION





Serilising relationships





Internal versus External references



- ▶ Referenced entity
- ▶ INTERNAL REFERENCE: must be present in same document : XML validator will reject if not satisfied
- ▶ EXTERNAL REFERENCE: does not have to be present in same document. XML Validator will ignore.
- ▶ Recommendation: use versionRef to indicate external
- ▶ Recommendation: By convention, annotate external references

```

▶ <TopographicPlace version="2.2" id="nptg:E0000004">
  ▶ <Name> Aberdeen</Name>
▶ </TopographicPlace>

```

```

▶ <StopPlace version="1.6" id="naptanStop:260010966">
  ▶ <Name> Netherly Road</Name>
  ▶ <TopographicPlaceRef version="2.2" ref="nptg:E0000004"/>
▶ </StopPlace>

```

```

▶ <StopPlace version="1.6" id="naptanStop:260010966">
  ▶ <Name> Netherly Road</Name>
  ▶ <TopographicPlaceRef ref="nptg:E0000004"/>
▶ </StopPlace>

```

```

▶ <StopPlace version="1.6" id="naptanStop:260010966">
  ▶ <Name> Netherly Road</Name>
  ▶ <TopographicPlaceRef versionRef="2.2" ref="nptg:E0000004"/>
▶ </StopPlace>

```

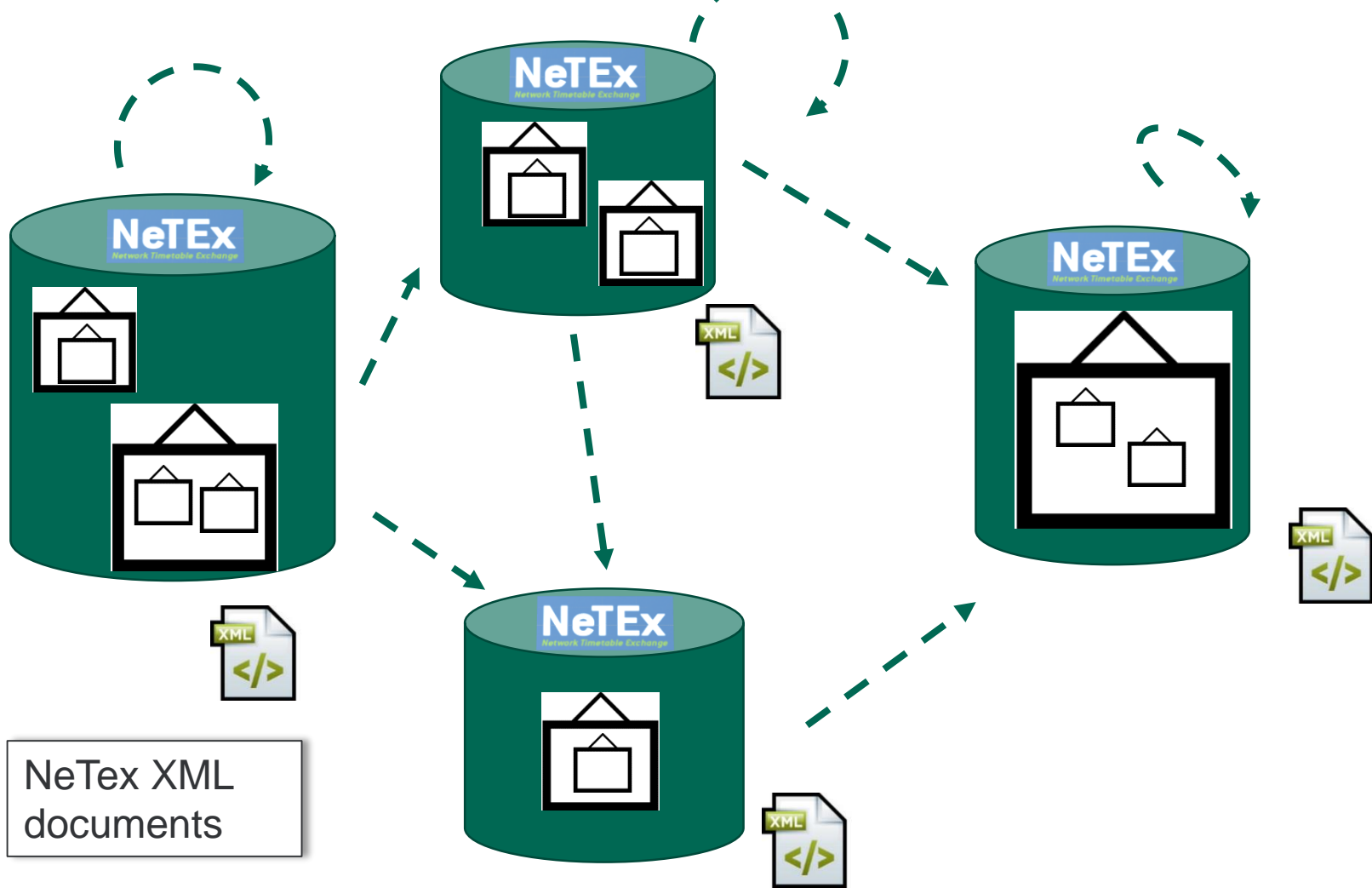
```

▶ <TopographicPlaceRef versionRef="2.2" ref="nptg:E0000004 ">Aberdeen</TopographicPlaceRef>

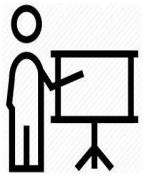
```



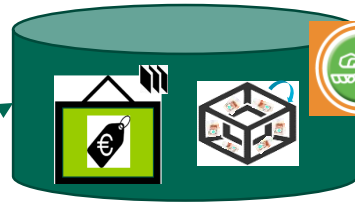
Flexible Modularisation; cross-references may be internal or external



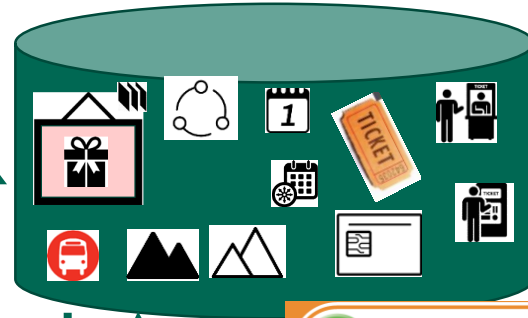
How to partition a Multi-operator product



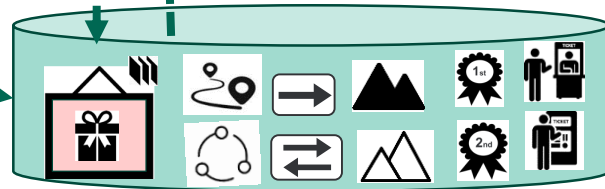
Plusbus Prices



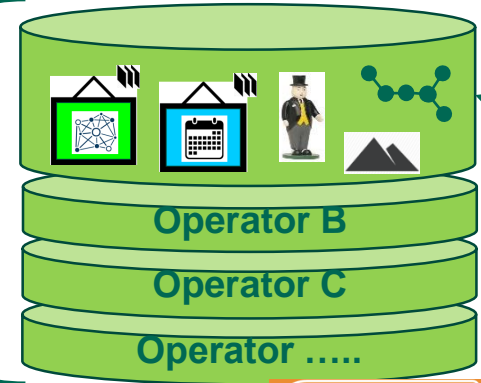
Plusbus Product definitions



National Rail Travel Products



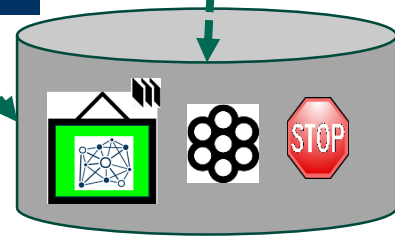
National Rail Railcard Products



Operator specific Lines & exceptions



Common Plus Bus definitions



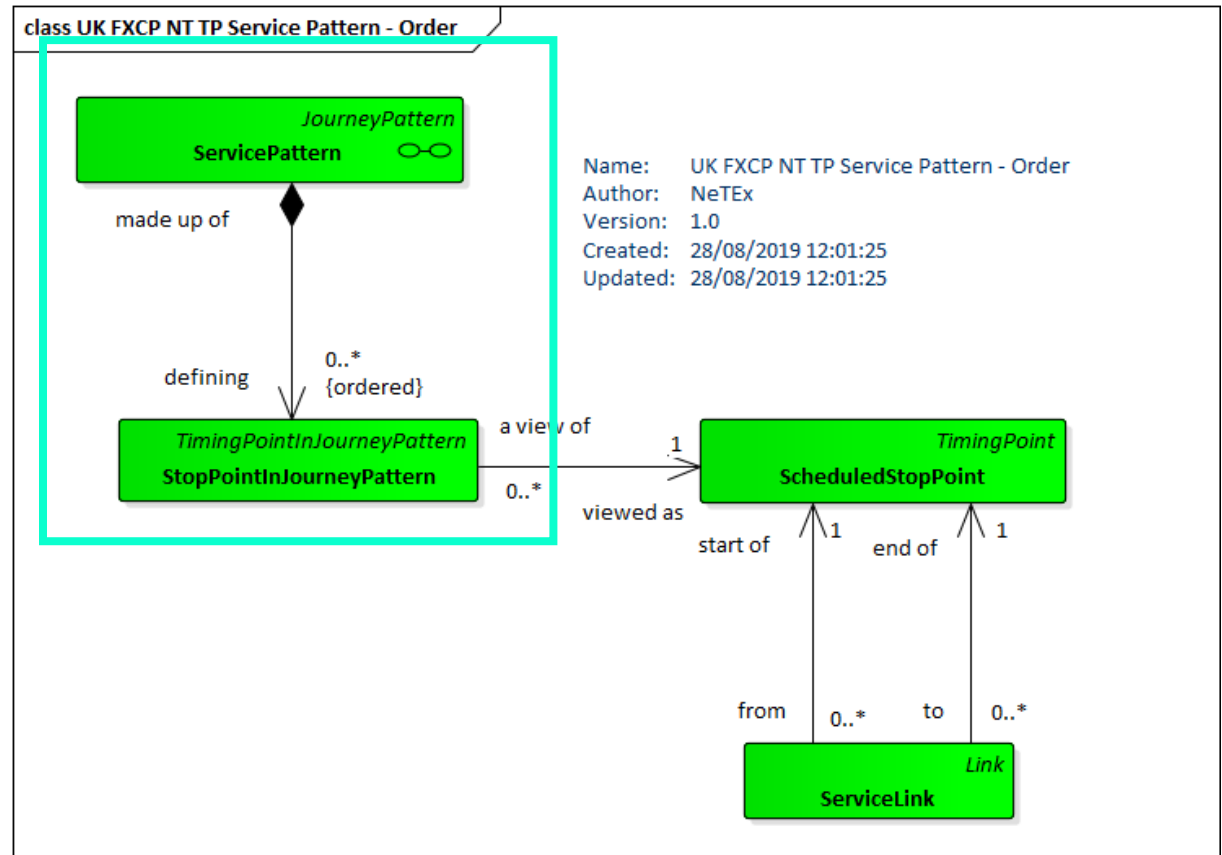
National Stop & Plusbus Zone definitions (NPTG & NAPTAN)





Identifiers of subcomponents

- ▶ Strong aggregation
 - Id may depend on parent
 - Use order id as subkey





Ids of dependent subcomponents

Can use "order" attribute as subkey

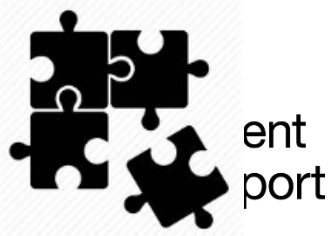
```
▶ <ServicePattern id="mb:MB@1@Outbound@JP1" version="1.1">
▶   <StopPointInSequence id=" mb:MB@1@Outbound@JP1" version="1.1" order="1">
▶     <ScheduledStopPointRef ref=" naptStop:3420678954" version="any"/>
▶   </StopPointInSequence>
▶   <StopPointInSequence id=" mb:MB@1@Outbound@JP1" version="1.1" order="2">
▶     <ScheduledStopPointRef ref=" naptStop:3420678972" version="any"/>
▶   </StopPointInSequence>
▶   <StopPointInSequence id=" mb:MB@1@Outbound@JP1" version="1.1" order="3">
▶     <ScheduledStopPointRef ref=" naptStop:3420678851" version="any"/>
▶   </StopPointInSequence>
▶   Etc etc
▶ </ServicePattern>
```



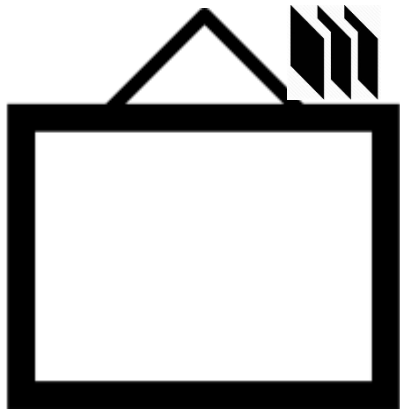


VERSION FRAMES & UK PROFILE TYPES OF FRAME

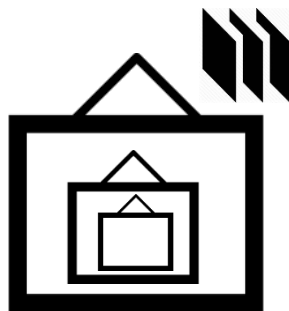




Version Frames



VERSION FRAME



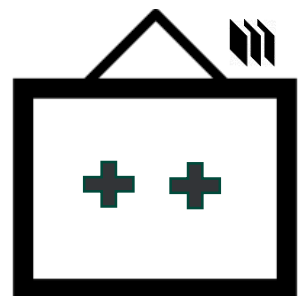
COMPOSITE FRAME



RESOURCE FRAME



SERVICE CALENDAR FRAME



GENERAL FRAME



INFRASTRUCTURE FRAME



SITE FRAME



SERVICE FRAME



TIMETABLE FRAME



FARE FRAME



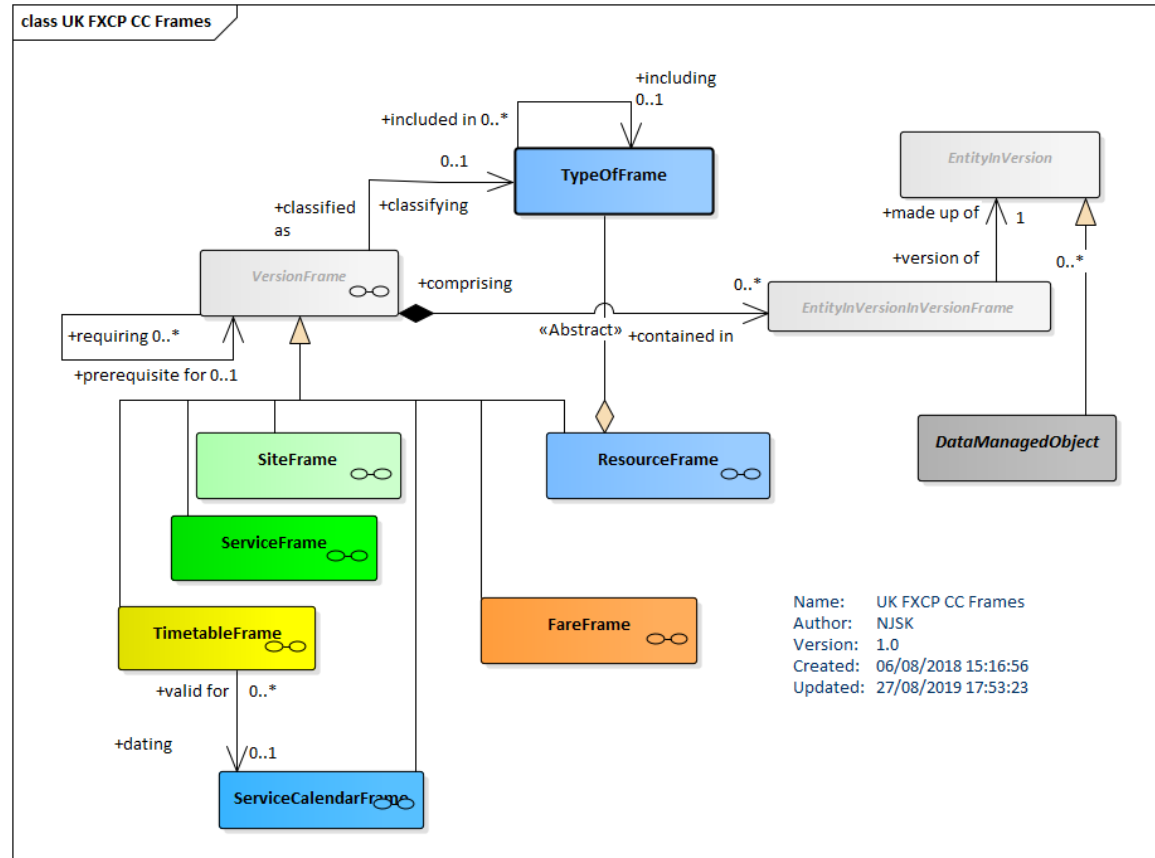
SALES TRANSACTION FRAME





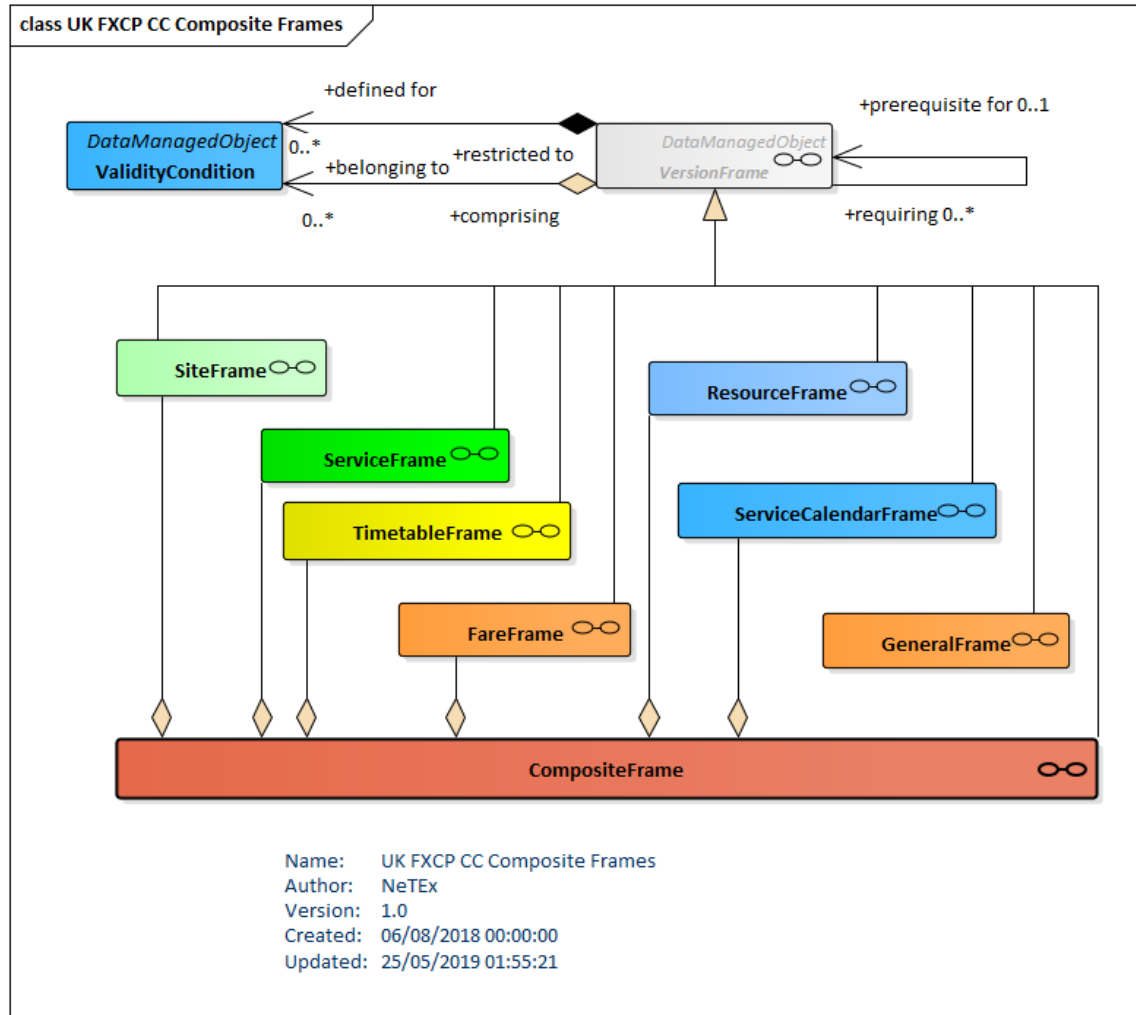
Specific Frames

- All frames share common VERSION FRAME properties
- Each specific frame contains specific types of element, e.g. LINES, FARE PRODUCTS, etc
- The TYPE OF FRAME further restricts frame contents to a specific profile, e.g. UK FXCP.
- A FRAME may state prerequisites FRAMES





Composite Frames

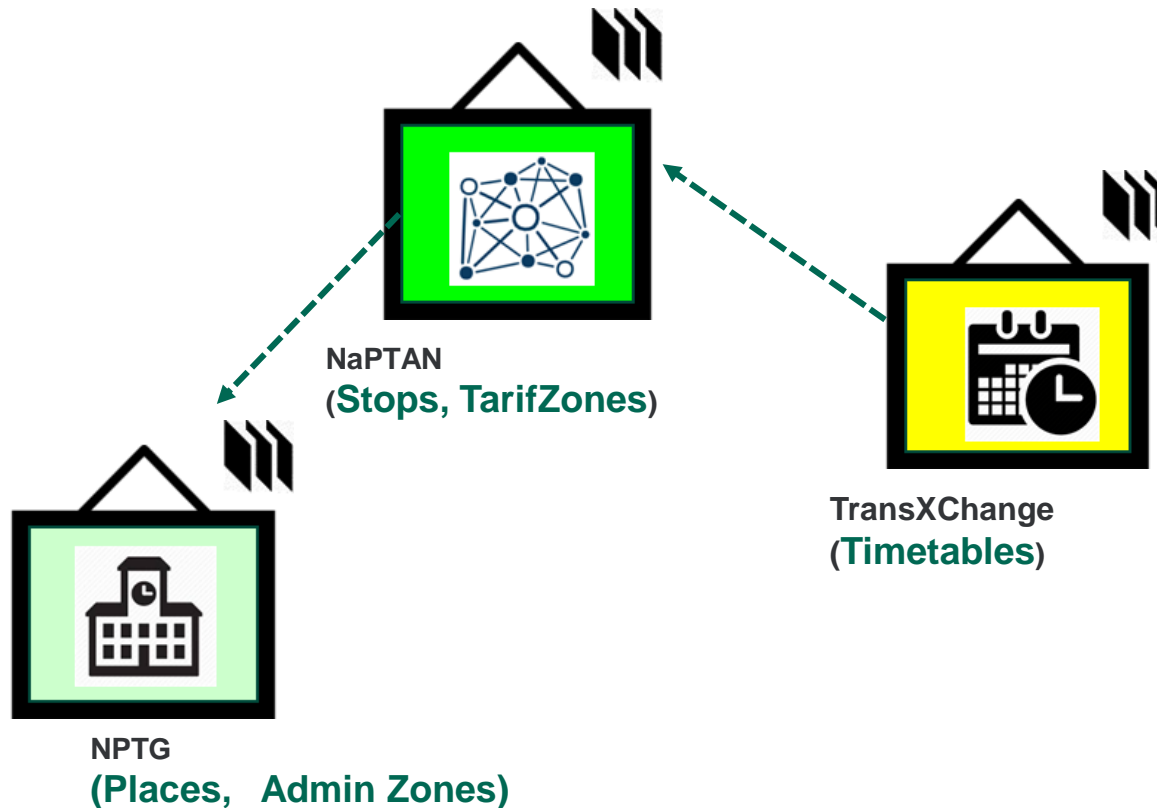




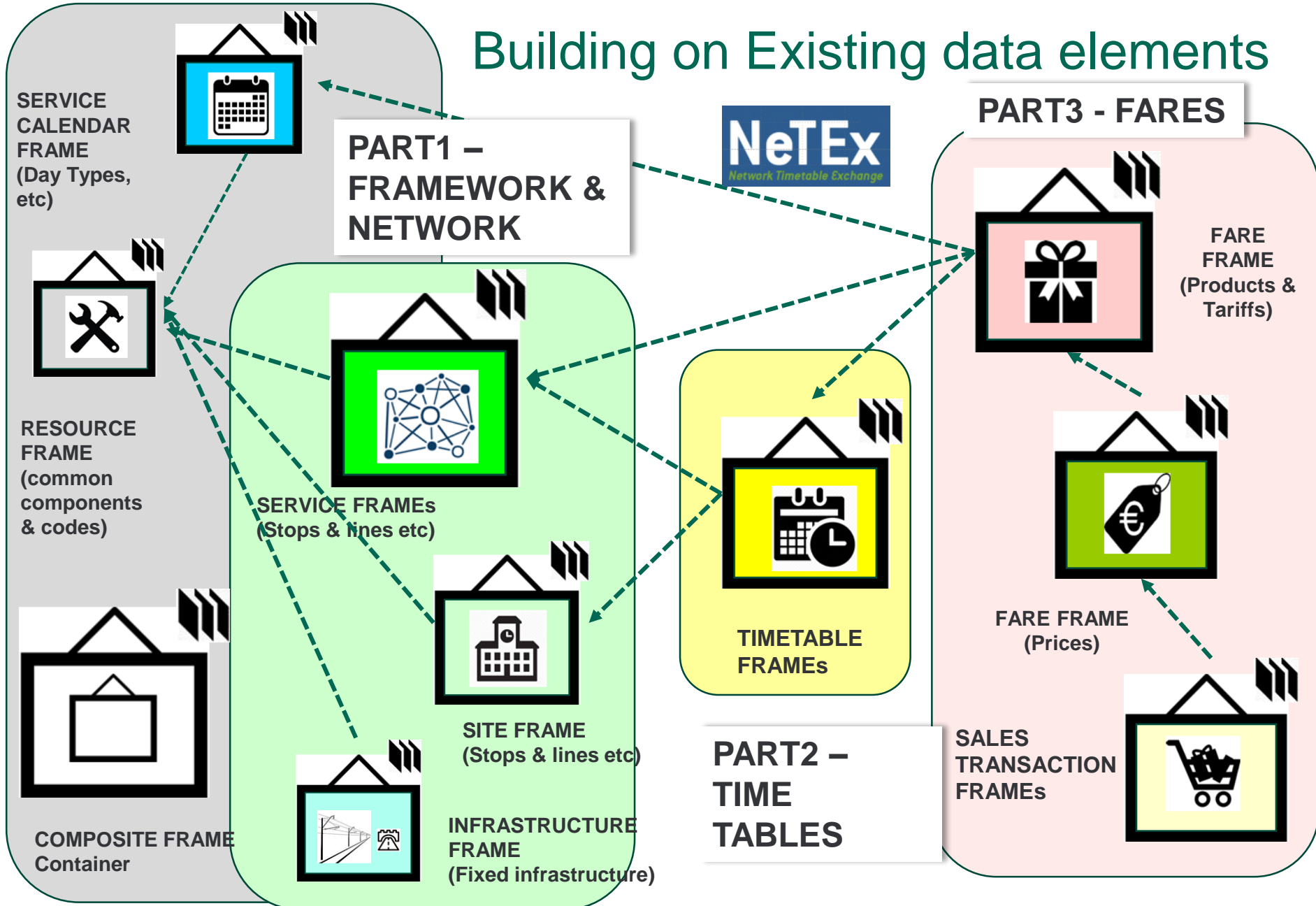
Comparison with Existing UK Schemas: NPTG, NaPTAN, TransXChange



NPTG

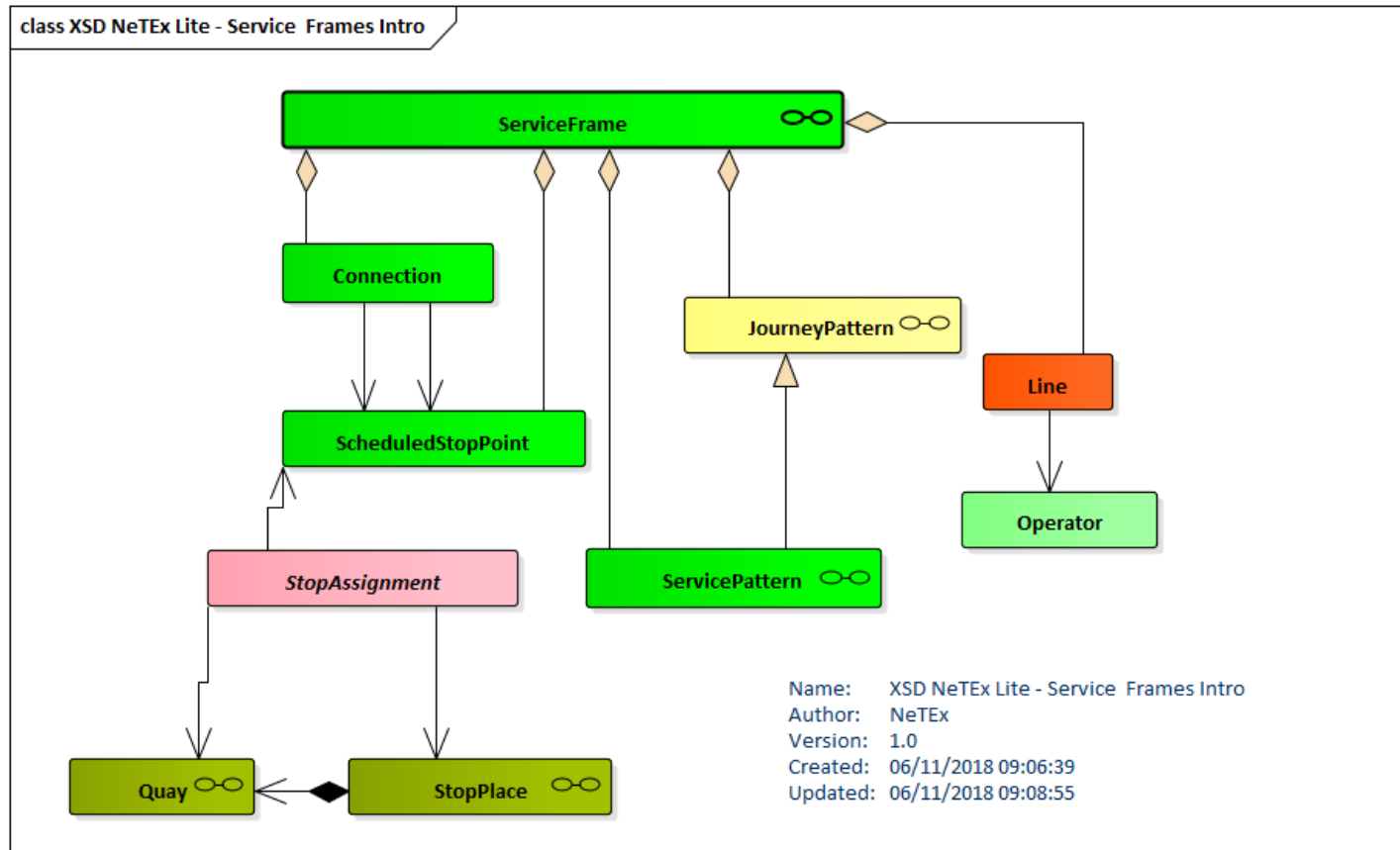


Building on Existing data elements



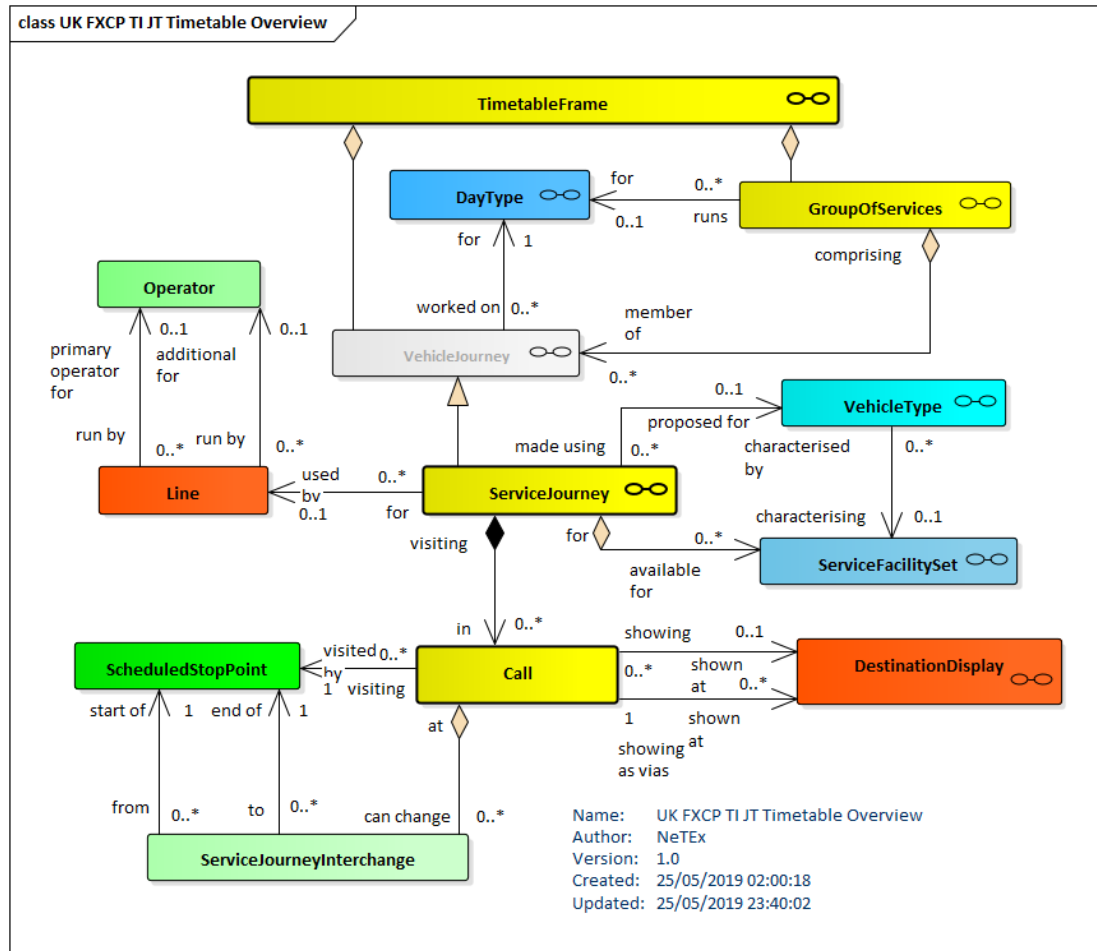


Basic SERVICE FRAME elements for exchanging stops





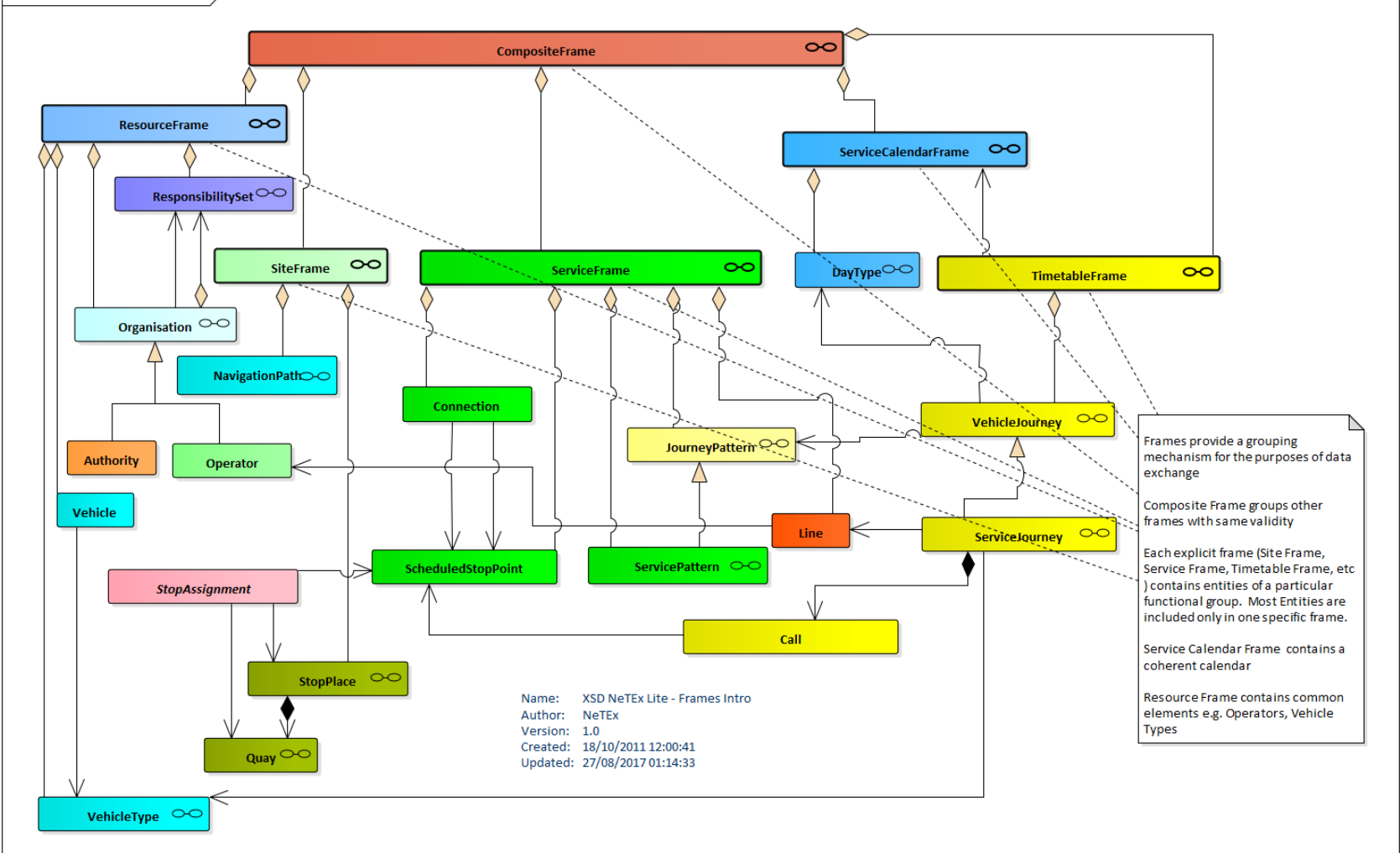
Basic Timetable Frame





Composite frames for a timetable

class XSD NeTeX Lite - Frames Intro





Granularity



Type Of Composite Frame	Stops	Timetables	Fares
<i>Stop Offer</i>	Stops for Area		Stops & Tariff Zones for Area
<i>Line Offer</i>	Stops for Line	Timetable for Line	Fares for Line
<i>Network Offer</i>	Stops for Network	(Timetables for Network)	Fares for Network

Example file names:

FX-PI-01_UK_METR_LINE-FARE_L01_20160302.xml

FX-PI-01_UK_FEBR_NETWORK-FARE_WOE-060+086+110_20230909.xml

FX-PI-01_UK_DFT_STOP-FARE_NPTG-Plusbus-UK_20150705.xml



Example Frame Types – Timetable

```
<TimetableFrame
  id="epd:UK:FYOR:TimetableFrame-UK_PI_TIMETABLE:FYOR@26"
  version="2.78" >
  <TypeOfFrameRef ref="UK:DFT:TypeOfFrame_UK_PI_TIMETABLE:FXCP"
    versionRef="1.0"/>
    :::etc., Specific Frame contents:::
</TimetableFrame>

<ServiceCalendarFrame
  id="epd:UK:FYOR:ServiceCalendarFrame-UK_PI_CALENDAR:FYOR"
  version="1.6" >
  <TypeOfFrameRef ref="fxc:UK:DFT:TypeOfFrame_UK_PI_CALENDAR:FXCP"
    versionRef="1.0" />
    :::etc., Specific Frame contents:::
</ServiceCalendarFrame>
```



Types Of Specific Frame: UK Basic Profile

<i>UK_PI_STOP'</i>	objects necessary for STOP PLACE and SITE descriptions	STOP PLACEs, QUAYs, ENTRANCEs, POINTs OF INTEREST, etc.
<i>UK_PI_NETWORK</i>	objects necessary for NETWORK descriptions	(LINEs, ROUTEs, JOURNEY PATTERNs, etc.
<i>UK_PI_TIMETABLE</i>	objects related to timing information	VEHICLE JOURNEYs, PASSING TIMEs, etc.
<i>UK_PI_CALENDAR</i>	objects related to calendars and types of day..	DAY TYPE, SERVICE CALENDAR etc
<i>UK_PI_COMMON</i>	common and generic object types possibly used across multiple other frames	TYPE OF VALUE, OPERATOR, etc



Example Frame nesting – Timetable

```

<CompositeFrame version="3.0" id="epd:UK:FYOR:CompositeFrame-UK_PI_LINE_OFFER:FYOR@26" responsibilitySetRef="frst:data">
  <ValidBetween>
    <FromDate>2010-12-17T09:30:47.0Z</FromDate>
    <ToDate>2011-12-17T09:30:47.0Z</ToDate>
  </ValidBetween>
  <TypeOfFrameRef ref="fxc:UK:DFT:UK_PI_LINE_OFFER" versionRef="fxc:1.0" />
  <frames>
    <SiteFrame version="5.6" id="epd:UK:FYOR:SiteFrame-UK_PI_STOP:FYOR@26">
      <TypeOfFrameRef ref="fxc:UK:DFT:TypeOfFrame_UK_PI_STOP:FXCP" versionRef="1.0"/>
      <Etc., etc., Specific Frame contents>
    </SiteFrame>
    <ServiceFrame version="2.8" id="epd:UK:FYOR:ServiceFrame-UK_PI_NETWORK:FYOR@26">
      <TypeOfFrameRef ref="fxc:UK:DFT:TypeOfFrame_UK_PI_NETWORK:FXCP" versionRef="1.0"/>
      <Etc., etc., Specific Frame contents>
    </ServiceFrame>
    <TimetableFrame version="2.78" id="epd:UK:FYOR:TimetableFrame-UK_PI_TIMETABLE:FYOR@26">
      <TypeOfFrameRef ref="UK:DFT: TypeOfFrame_UK_PI_TIMETABLE:FXCP" versionRef="1.0"/>
      <Etc., etc., Specific Frame contents>
    </TimetableFrame>
    <ServiceCalendarFrame version="1.6" id="epd:UK:FYOR:ServiceCalendarFrame-UK_PI_CALENDAR:FYOR">
      <TypeOfFrameRef ref="fxc:UK:DFT:TypeOfFrame_UK_PI_CALENDAR:FXCP" versionRef="1.0" />
      <Etc., etc., Specific Frame contents>
    </ServiceCalendarFrame >
    <ResourceFrame version="1.6" id="epd:UK:FYOR:ResourceFrame-UK_PI_COMMON:FYOR">
      <TypeOfFrameRef ref="fxc:UK:DFT:TypeOfFrame_UK_PI_COMMON:FXCP" versionRef="1.0" />
      <Etc., etc., Specific Frame contents>
    </ResourceFrame>
    <ResourceFrame version="1.0" id="epd:UK:DFT:ResourceFrame-UK_PI_METADATA:FXCP"
      <Etc., etc., Specific Frame contents>
  " />
  <Etc., etc., Specific Frame Fixed contents>
</CompositeFrame>

```



Types Of Composite Frame: UK BASIC Profile

	Purpose	Specific Frames
UK_PI_STOP_OFFER	Gather all the stop information related to a spatial area	UK_PI_COMMON' 'UK_PI_STOP',
UK_PI_LINE_OFFER	<i>Gather</i> all the stop & timetable information related to a single LINE.	UK_PI_COMMON' 'UK_PI_STOP', 'UK_PI_NETWORK', 'UK_PI_CALENDAR' 'UK_PI_TIMETABLE'.
UK_PI_NETWORK_OFFER	Gather all the stop & timetable information related to a single NETWORK (i.e. multiple lines); There may be multiple instances of a given frame type, e.g. each line may have a 'UK_PI_NETWORK' & 'UK_PI_TIMETABLE' frame.	UK_PI_COMMON,' 'UK_PI_CALENDAR', 'UK_PI_STOP', 'UK_PI_NETWORK' 'UK_PI_TIMETABLE'



Example Frame nesting - Fares

```
> <CompositeFrame version="1.0" id="epd:UK:myb:CompositeFrame_UK_PI_LINE_FARE_OFFER:Trip@Line_3"
dataSourceRef="myb:Mybus" responsibilitySetRef="myb:tariffs">
>   <ValidBetween>
>     <FromDate>2019-01-01T00:00:00</FromDate>
>     <ToDate>2020-12-31T12:00:00</ToDate>
>   </ValidBetween>
>   <Name>Mybus 1 0 - Fares Example</Name>
>   <TypeOfFrameRef ref="fxc:UK:DFT:TypeOfFrame_UK_PI_LINE_FARE_OFFER:FXCP" versionRef="fxc:v1.0"/>
>   ::::
>   <frames>
>     <!--===== FARE PAYLOAD ===== -->
>     <ServiceFrame version="1.0" id="epd:UK:myb:ServiceFrame_UK_PI_NETWORK:Line_3:myb"
dataSourceRef="myb:Mybus" responsibilitySetRef="myb:tariffs">
>       :::: FRAME CONTENTS:::::
>     </ServiceFrame>
>     <FareFrame version="1.0" id="epd:UK:myb:FareFrame_UK_PI_FARE_PRODUCT:Trip@Line_3:myb"
dataSourceRef="myb:Mybus" responsibilitySetRef="myb:tariffs">
>       :::: FRAME CONTENTS:::::
>     </FareFrame>
>     <FareFrame version="1.0" id="epd:UK:myb:FareFrame_UK_PI_FARE_PRICE:Trip@Line_3:myb"
dataSourceRef="myb:Mybus" responsibilitySetRef="myb:tariffs">
>       :::: FRAME CONTENTS:::::
>     </FareFrame>
>     <!--===== OPERATOR COMMON RESOURCES===== -->
>     <ResourceFrame version="1.0" id="epd:UK:MYBUS:ResourceFrame_UK_PI_COMMON:MYBUS:myb"
dataSourceRef="myb:Mybus" responsibilitySetRef="myb:tariffs">
>       :::: FRAME CONTENTS:::::
>     </ResourceFrame>
>   </frames>
> </CompositeFrame>
```

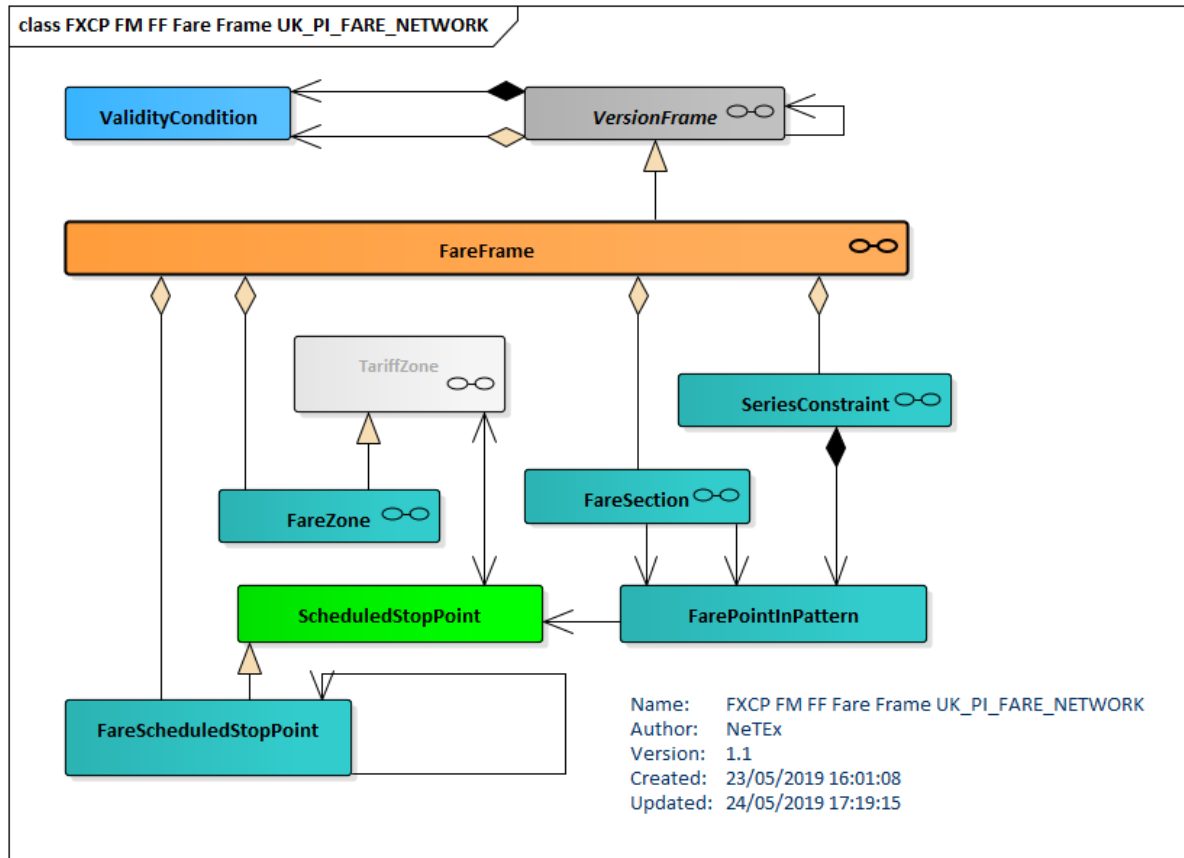


Types Of Specific Frame: UK FARE Profile

Frame	Purpose	Model Elements
<i>UK_PI_FARE_NETWORK</i>	objects describing network elements used in fare products for a LINE or NETWORK	FARE SCHEDULED STOP POINTs, TARIFF ZONE FARE ZONE FARE SECTION , SERIES CONSTRAINT , etc.
<i>UK_PI_FARE_PRODUCT</i>	objects describing product data for a LINE or NETWORK	TARIFF, GEOGRAPHICAL INTERVAL, TIME INTERVAL, DISTANCE MATRIX ELEMENT, FARE DEMAND FACTOR, FARE STRUCTURE ELEMENT, USAGE PARAMETER, FARE PRODUCT, VALIDABLE ELEMENT, GENERIC PARAMETER ASSIGNMENT, TYPE OF TRAVEL DOCUMENT, SALES OFFER PACKAGE, TYPE OF TRAVEL DOCUMENT, DISTRIBUTION CHANNEL,, etc
<i>UK_PI_FARE_PRICE</i>	objects describing prices of fare products for a LINE or NETWORK	PRICING PARAMETERS, PRICING RULE, PRICE UNIT, ROUNDING, FARE TABLE, FARE PRICE, PRICE GROUP , etc.



UK_PI_FARE_NETWORK

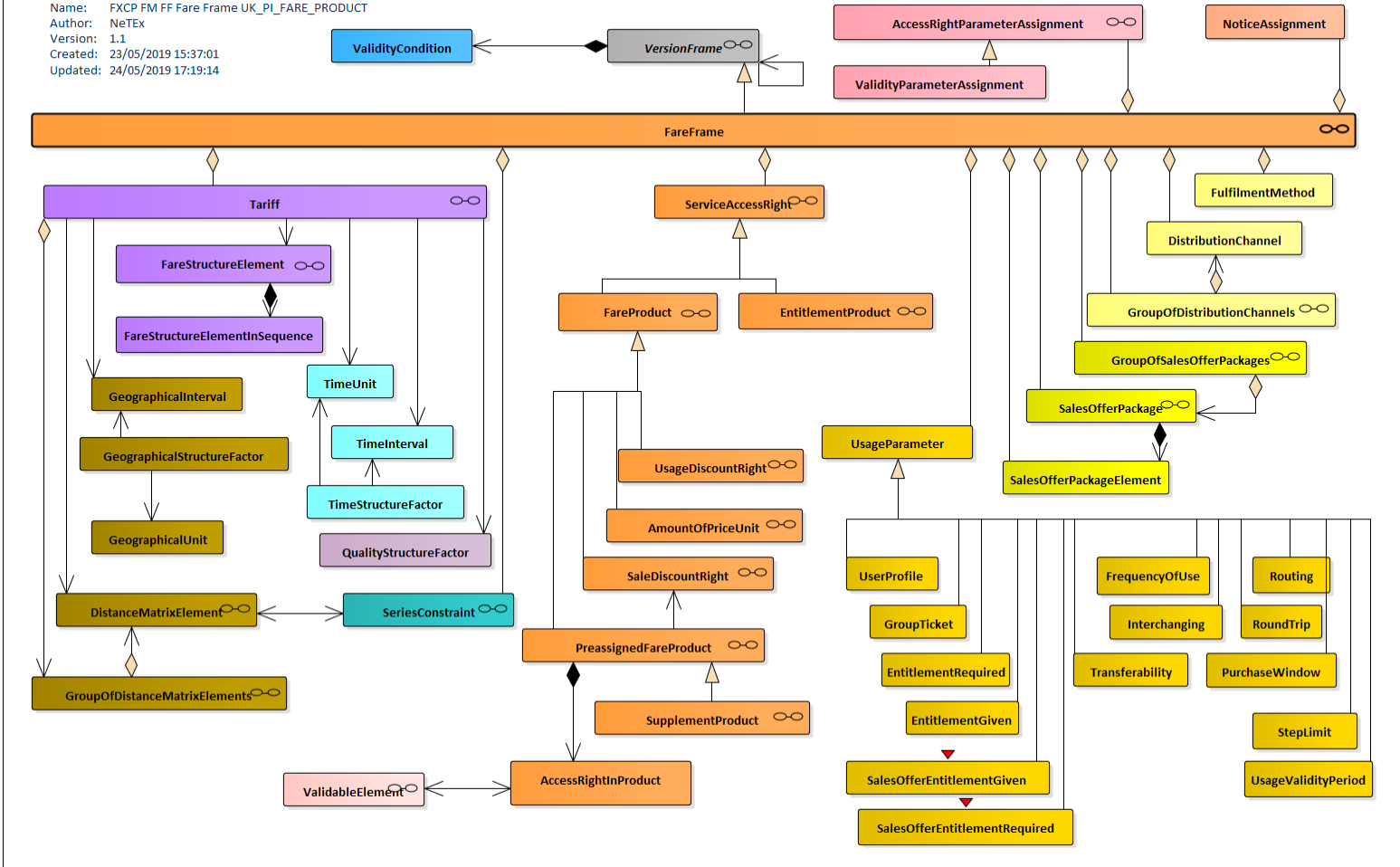




UK_PI_FARE_PRODUCT

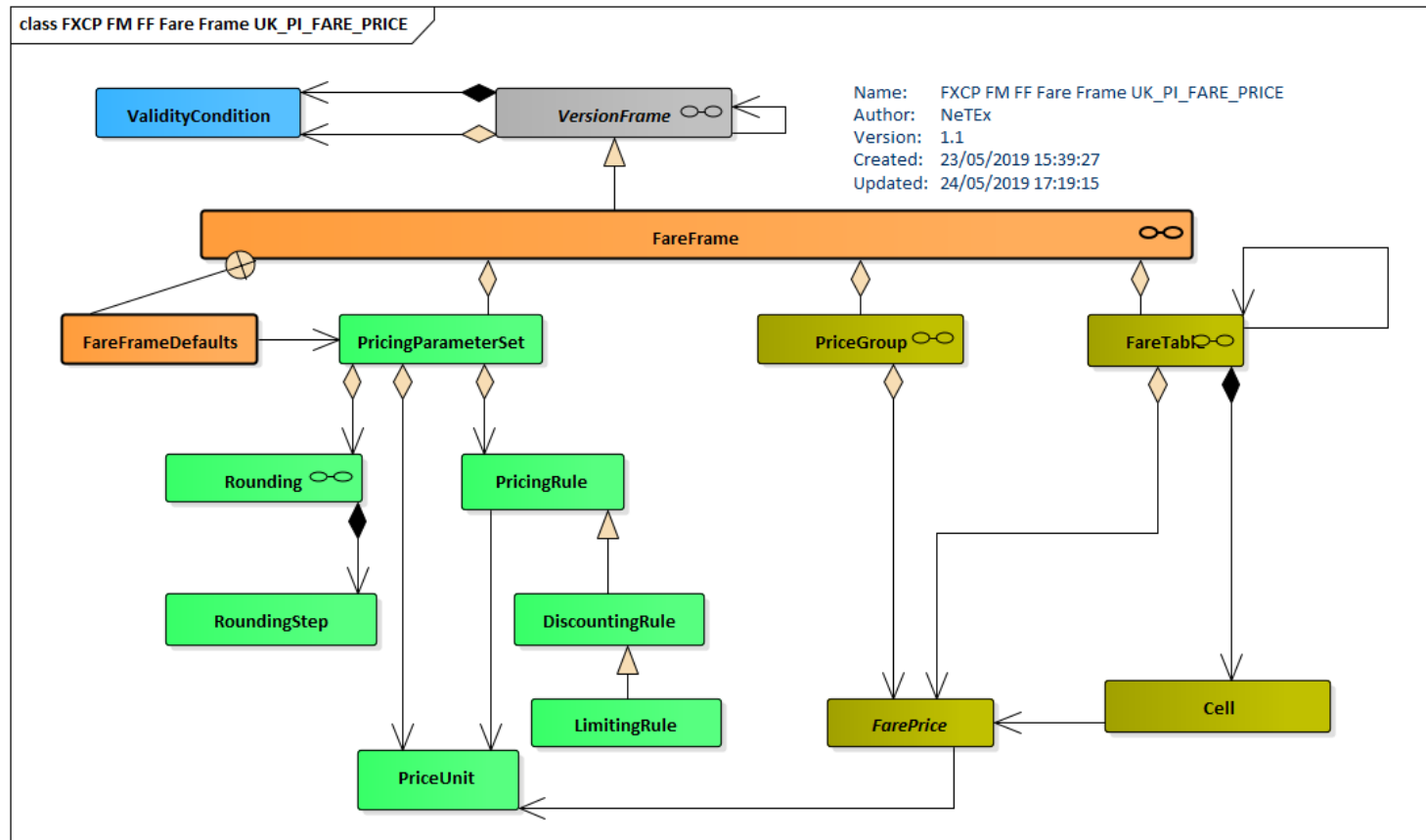
class FXCP FM FF Fare Frame UK_PI_FARE_PRODUCT

Name: FXCP FM FF Fare Frame UK_PI_FARE_PRODUCT
Author: NeTeX
Version: 1.1
Created: 23/05/2019 15:37:01
Updated: 24/05/2019 17:19:14





UK_PI_FARE_PRICE





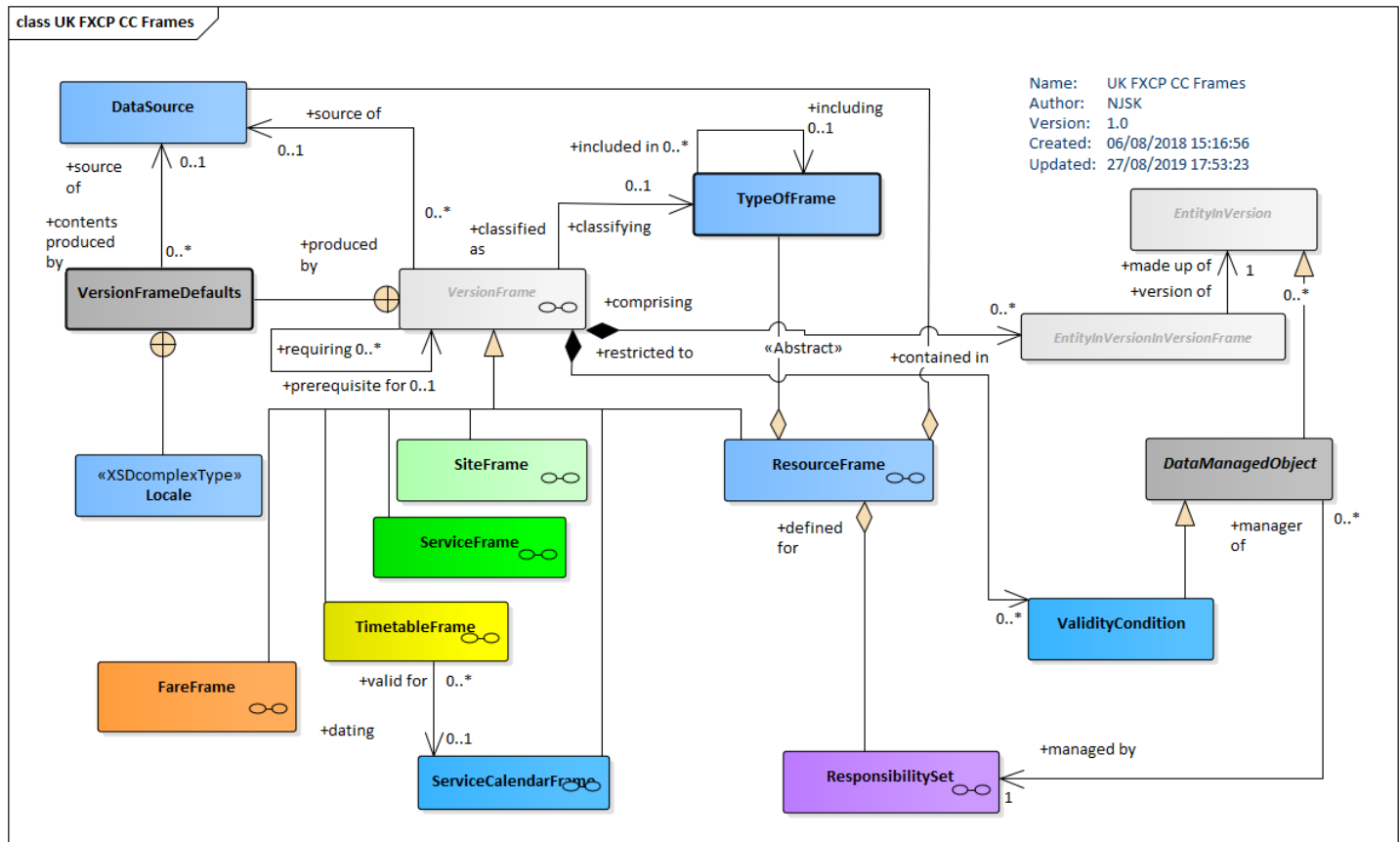
Types Of Composite Frame: UK FARE Profile

Type of Frame Name	Purpose	Contains
<i>UK_PI_STOP_FARE_OFFER</i>	Gather all the Stop elements related to a single LINE	<i>UK_PI_COMMON'</i> <i>'UK_PI_STOP'</i> <i>'UK_PI_FARE_NETWORK.</i>
<i>UK_PI_LINE_FARE_OFFER</i>	Gather all the fare product data for a single LINE.or NETWORK	<i>UK_PI_COMMON'</i> <i>'UK_PI_STOP'</i> <i>'UK_PI_NETWORK',</i> <i>'UK_PI_CALENDAR'</i> <i>'UK_PI_FARE_NETWORK.</i> <i>"UK_PI_FARE_PRODUCT'</i> <i>'UK_PI_FARE_PRICE'</i>
<i>UK_PI_NETWORK_FARE OFFER</i>	Gather all the fare product data for a NETWORK .	As for LINE OFFER



Other Frame Level properties

- VALIDITY CONDITION
- DATA SOURCE
- Frame Defaults
- RESPONSIBILITY SET





Recommended convention for NeTEx Profile XML FILE NAMES (As for EPIP)

[prefix] - [fxcp-version] _ [country-code] _ [provider-code] _ [profile-type] _ [doc-topic] _ [creation-date]

Where:

- [prefix]** A fixed prefix agreed upon by the exchange partners, here 'FX-PI'
- [fxcp-version]** Major version number of the FXCP; currently '01'
- [country-code]** Country ISO code.
- [provider-code]** Producer code (use 'NAP' if coming from a national access point). Variable length. Normally this will be the same as the provider code on the composite frame within the NeTEx document.
- [profile-type]** FXCP Offer Profile type (LINE, NETWORK or STOP).
- [doc-topic]** Topic according to profile subtype (as for the frame topic).
 - For 'UK_PI_NETWORK_OFFER', short name or code of network;
 - For 'UK_PI_LINE_OFFER': LINE number or name if no number is available
 - For 'UK_PI_STOP_OFFER', name or code of LINE, NPTG ADMINISTRATIVE ZONE or TOPOGRAPHIC PLACE for which the stops are included.
- [creation-date]** Date of creation of the XML document (YYMMDD). If multiple versions need to be distinguished within the same day a time-HHMM can be appended.

Example file names:

```
FX-PI-01_UK_DFT_STOP_NaPTAN-AdminArea-110_20160302.xml
FX-PI-01_UK_DFT_STOP_NaPTAN-AdminArea-060+086+110_20230909.xml
FX-PI-01_UK_DFT_STOP_NPTG-UK_20150705.xml
FX-PI-01_UK_METR_LINE_METR-1_20200812.xml
FX-PI-01_UK_FYOR_LINE_FYOR-48_20200704.xml
FX-PI-01_UK_FBRI_NETWORK_FBRI-WOE_20190202.xml
```



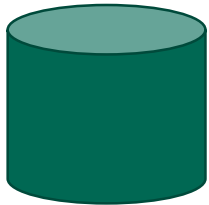
Meta data for discovery / indexing

- ▶ A NeTEx XML document contains a *<PublicationDelivery>* element as its root
- ▶ A *PublicationDelivery* comprises:
 - ▶ Timestamp, etc for delivery
 - ▶ A record of the request parameters, as *Topics*
 - ▶ One or more COMPOSITE FRAME instances containing the actual result data
 - ▶ The Topics explain the content and correspond to the components of the NeTEx XML document name



Frame Topics Example

FX-PI-01 UK METR LINE METR-L1 20200812.xml



```

> <PublicationDelivery version="ntx:1.1" xsi:schemaLocation="http://www.netex.org.uk/netex/NeTEx_publication.xsd
>   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
>   <PublicationTimestamp>2020-12-17T09:30:47.0Z</PublicationTimestamp>
>   <ParticipantRef>my:is:SYS001</ParticipantRef>
>   <PublicationRequest version="1.0">
>     <RequestTimestamp>2020-12-17T09:30:47.0Z</RequestTimestamp>
>     <topics>
>       <NetworkFrameTopic>
>         <Current />
>         <NetworkFilterByValue>
>           <objectReference>
>             <TypeOfFrameRef ref="fxc:UK_PI_LINE_OFFER" versionRef="1.0" />
>             <OperatorRef version="1.0" ref="nc:METR" />
>             <LineRef ref="nc:L1" />
>           </objectReferences>
>           <places>
>             <CountryRef ref="uk" refPrincipality="iso1366-2:GB-ENG" />
>             <TopographicPlaceRef ref="nptgLocality:E0054812">Crawley</TopographicPlaceRef>
>           </places>
>         </NetworkFilterByValue>
>       </NetworkFrameTopic>
>     </topics>
>   </PublicationRequest>
>   <dataObjects>
>     <CompositeFrame version="3.0" id="epd:UK:FYOR:CompositeFrame-UK_PI_LINE_OFFER:FYOR@26"
responsibilitySetRef="frst:data">
>       <ValidBetween>
>         <FromDate>2020-08-01T00:02:30.0Z</FromDate>
>         <ToDate>2021-01-01T00:02:30.0Z</ToDate>
>       </ValidBetween>
>       <TypeOfFrameRef ref="fxc:UK:DFT:UK_PI_LINE_OFFER" versionRef="fxc:1.0" />
>       .....etc

```




Fare Scope Use Case - Data Distribution

► Provide fare products & fare prices as open data for third party use (in journey planners, etc.)?

- Describe **available fare products** and their **eligibility** conditions.
- Relate **fare products to network (stops and tariff zones)** and services (**journeys & times of travel** if relevant) so trip planners can compute fare products and fare prices for trips, show available products for area, etc.
- Allow products to be **bundled** together as a single **sales offering**, or offered as **different packages** on **different media**.
- Allow the **separate exchange of prices** from fare structures & products.
- Expose a **justification of the fare** (Distance, discounts etc) Support both **machine readable & human readable** representation of validity parameters (**user types, media**, etc) and conditions
- Include information about how/where products **can be bought**.
- Include fares valid for **specific** and **multiple operators**.





Reusable Framework Components for fares



▶ Organisations

- Operator (RU)
- Country

▶ Transport Modes

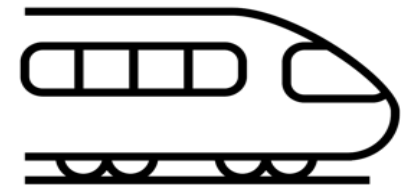
▶ Submodes

▶ Units

- Kilometers, Currency

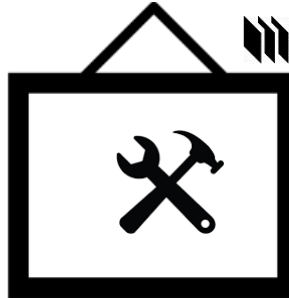
▶ Value Sets (Use to establish common EU values)

- Train categories
- Seat Classes (first, second, etc)





Common Components– e.g. Operator XML Code Snippet



► Declared once

► Referenced elsewhere

```

<Resource Frame id="era: Tariff" version="01" >
.....
<organisations>
  <Operator id="uic:3181" version="01" >
    <PublicCode>TFC</PublicCode>
    <Name lang="ro">Transferoviar Călători S.R.L.</Name>
    <ContactDetails>
      <Email>ilete@tfc-online.ro</Email>
      <Phone>0238 434 380</Phone>
      <Fax>021.310.43.88</Fax>
      <Url>http://www.transferoviarcalatori.ro</Url>
    </ContactDetails>
    <CountryRef ref="ro"/>
    <Address>
      <HouseNumber>nr. 2-4</HouseNumber>
      <Street lang="ro">Strada Tudor Vladimirescu</Street>
      <Town lang="ro">Cluj Napoca</Town>
      <PostCode>ap 1 et 1 sector 1 </PostCode>
      <Province lang="ro">Județul Cluj</Province>
    </Address>
  </Operator>
</organisations>

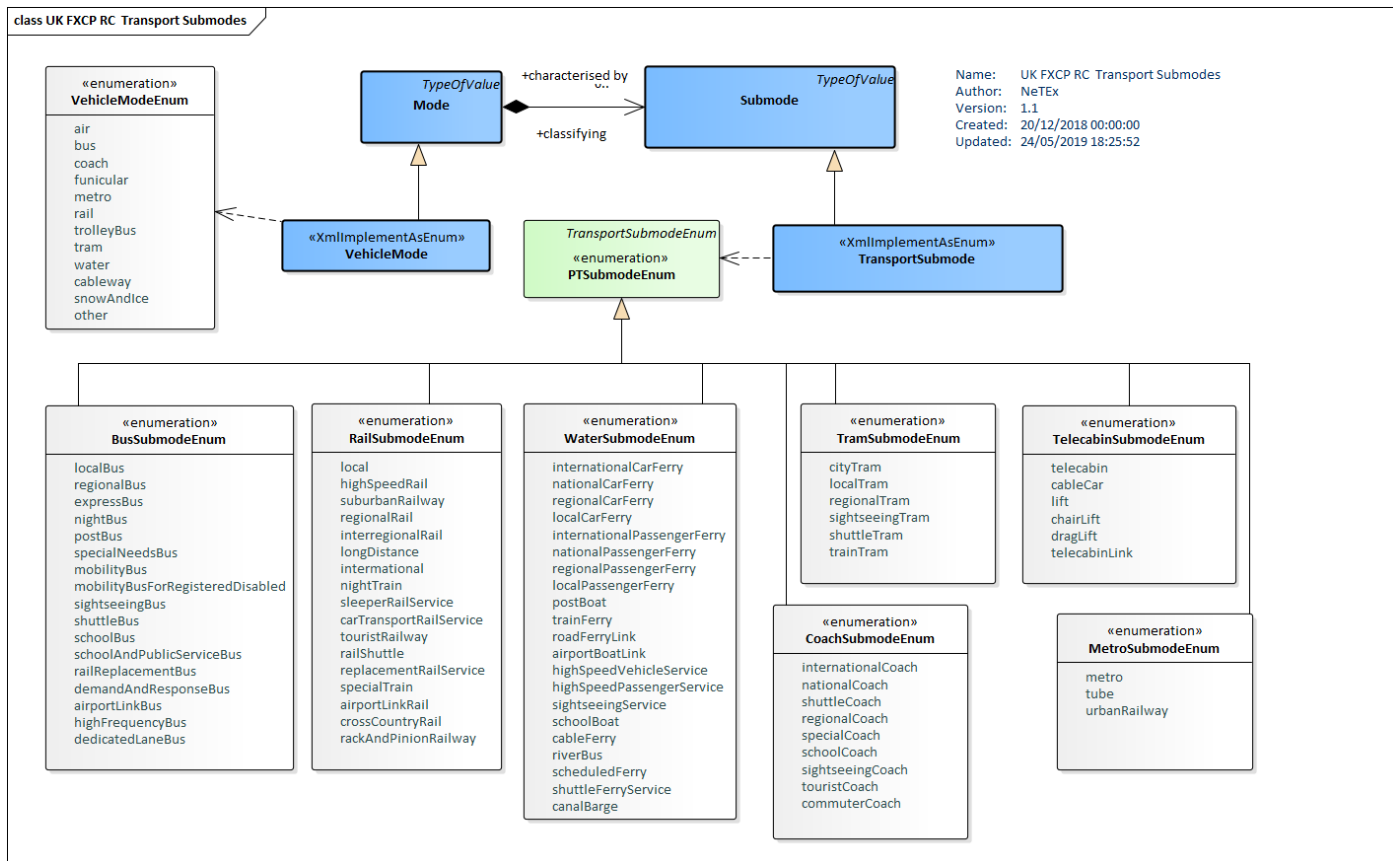
```

```

<Tariff id="Special" version="1">
  <OperatorRef ref="uic:3181" version="01" />
  ....

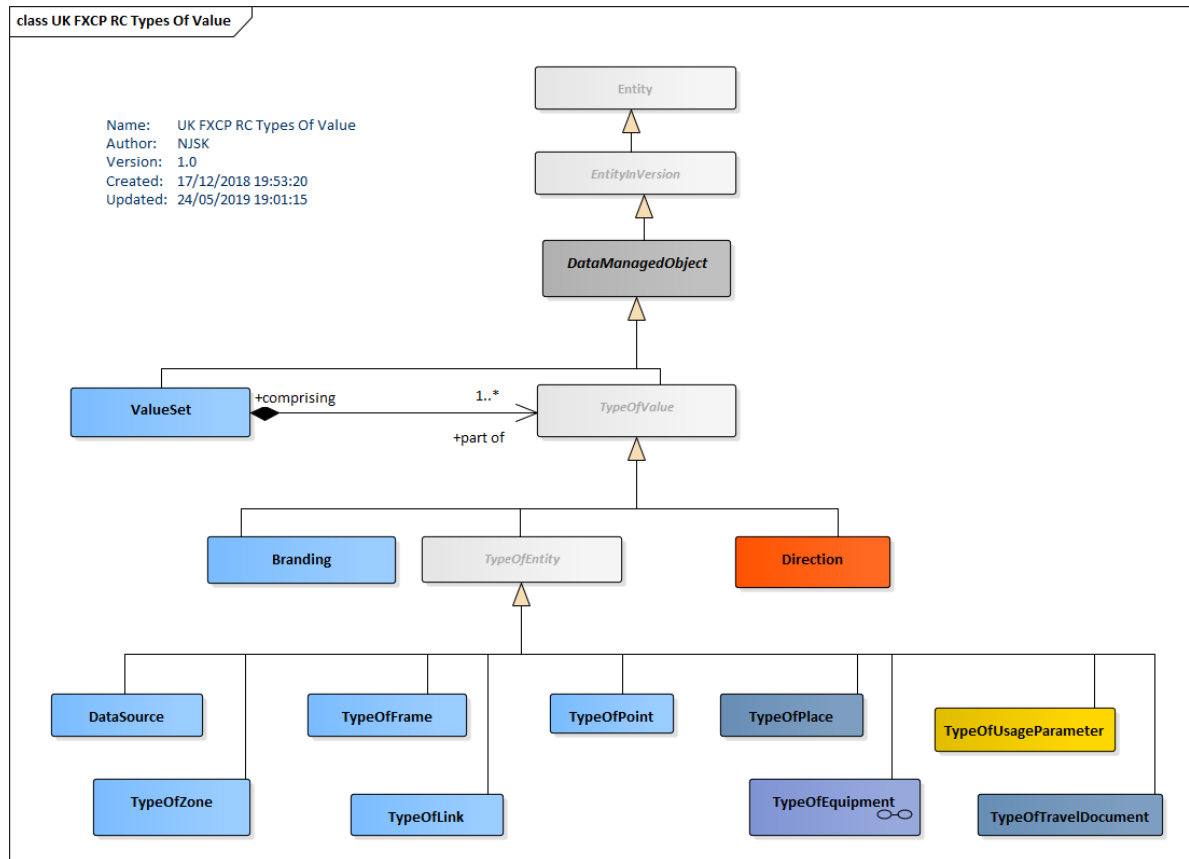
```







Types of Value



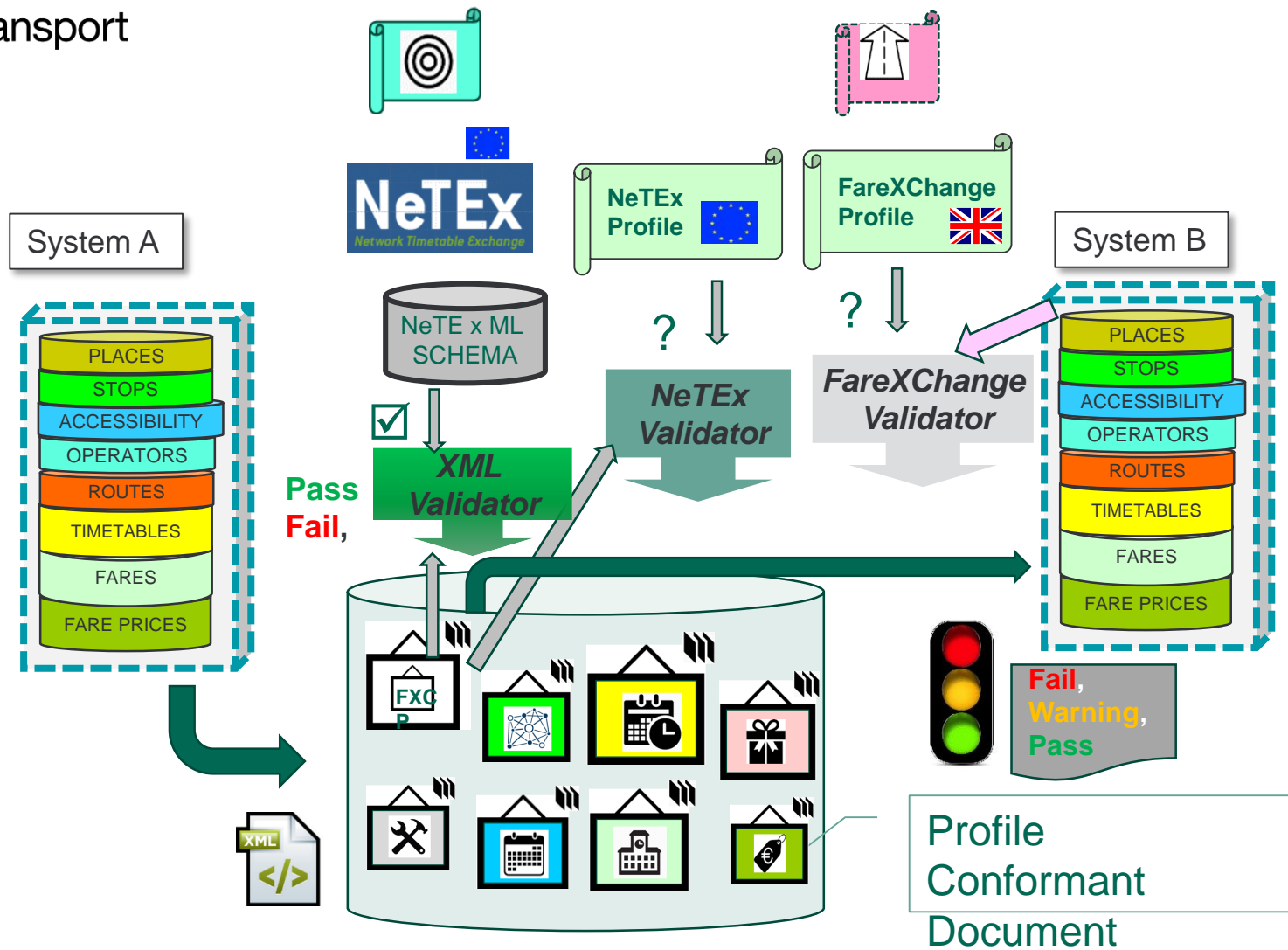


UK Profile General Issues





NeTEx Validators & Profiles





Validation checks

- ▶ XML Schema validator;
 - ▶ tags, tag sequence, data types, referential integrity
 - ▶ Referential integrity can be used to check orifile code sets
- ▶ Programmatic checks
 - NeTEx semantics
 - ❑ External references are present in external files
 - ❑ Modes/Sybmodes/
 - ❑ Monotonically increasing times / DayOffsets
 - Data Plausibility: dates, distances, speeds, spatial relationsetc etc
 - Specific Profile semantics
 - Data completeness: all the required types of element are present
 - Reference data is present in databases
 - Irrelevant elements are not included

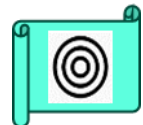
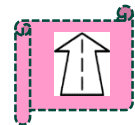
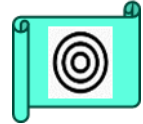
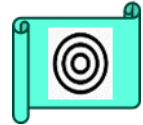


Validation



▶ Validation Mechanisms

- ▶ Schema integrity rules : XML Validator
- ▶ Code lists: UK official code sets : XML Validator (If metadata included)
- ▶ Additional business rules, applied by a validator program e.g. “NeTEx Publisher”?
 - General Tex semantics
 - UK specific (e.g. NaPTAN codes)





Department
for Transport

Summary



Benefits of Transmodel / NeTEx Approach to Fares

Powerful Component based representation

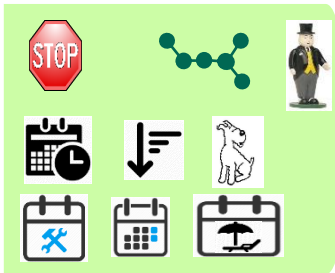
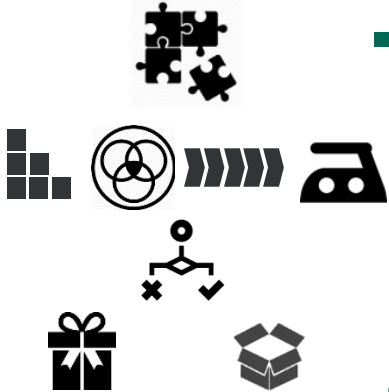
- Allows many different tariff combinations to be described with the same set of atomic components
- Allows complex conditions to be expressed
- Allows necessary packaging of products into different offers
- Gives highly reusable implementations

Joined up conceptual model - Reuses existing Network & Timetable elements

- Network (Stops, tariff zones, modes, operators, etc)
- Timetable elements, services etc
- Temporal conditions and day types, validities

Robust, Flexible, Extensible Technology

- XML allows selective use, validation integrity checking etc
- UML provides tool supported system documentation
- Conceptual model for Account Based Ticketing and future developments





Some Drawbacks to a Component based Approach

- ▶ **Skills Investment needed to understand Concepts & Components**
 - Tariff structures, Access rights
 - Uses of different parameters
 - Product and Sales Offer packaging
- ▶ **Component based semantics require attention to assembly and compounding behaviour**
 - Restrict to simple combinations, single organisations
 - Exchange of data does not guarantee exchange of behaviour!