Using NeTEx for Stops, Routes and Timetables

1. Introduction
Recap: Standards for Stops, Routes and Timetables

- Transmodel covers many PT functional domains
  - Timetables, fares, scheduling, driver management, etc
- NeTEx implements a subset of Transmodel
  - Stops, Timetables, Fares, etc
- EU Minimum NeTEx profile (EPIP) covers a subset of NeTEx for passenger information
  - Stops, Timetables, Interchanges, etc
- TransXChange includes NeTEx elements not in EPIP
  - Data elements for Operations, etc
  - Operations, etc
  - Calls, etc
- TransXChange includes some UK specific concepts not in Transmodel or NeTEx
  - EBSR registration info (TXC)
  - Traveline Region (NPTG), etc
The UK NeTEx Profile for Stops, Routes and Timetables will be an enhanced version of the European Passenger Information Profile (EPIP) – the “EU Minimum”
Mandated by EC (Priority Action A), but developed by CEN committee of which UK is member (and will remain a member post-Brexit)

Much of the consideration as to what is needed in a PI profile has already been done – just adjust for UK

“UK plc” will want to trade with Europe – having common standards will help sell systems to Europe

Conversely, will be able to buy “off the shelf” products from Europe for UK usage ⇒ lower costs

Data sharing UK / EU (e.g. Northern Ireland / Republic of Ireland)
EPIP vs UK NeTEx Profile

- **EPIP**
  - Minimum data set for passenger information
  - Can be populated fully from NaPTAN/TXC data
    - EC requirements satisfied
  - Does not have all elements found in TransXChange
    - E.g. operational data, Dead Runs, layover points, Registrations etc
  - Does not have “view” elements to optimise encoding
    - E.g. CALL (Point in Pattern + Passing times + Destination Display + op data)
EPIP vs UK NeTEx Profile

- **UK NeTEx Profile**
  - EPIP conformant
  - Doesn’t remove anything that EPIP requires, but adds in additional elements for UK usage
  - Topological Places (localities), Stops, Lines, Timetables, Interchanges
  - Include CALLs to simplify timetable mapping to TXC and aid diagnostics / validation
  - Additional allowable attributes or values over and above what is in EPIP
  - Standardise on classifications and “metadata” (e.g. day types) for UK usage.
UK NeTEx Profile vs TXC BODS Profile

- TXC BODS Profile is a subset of TXC
  - Simplifications in usage
  - Standardisation of ways of populating data into schema

- UK NeTEx Profile will contain elements that allow “round trip” conversion
  - TXC $\rightarrow$ NeTEx $\rightarrow$ TXC
  - No loss of information

- Simplifications to TXC $\Rightarrow$ Simplifications to UK NeTEx Profile
Using NeTEx for Stops, Routes and Timetables
• Minimal: Can be summarised on seven diagrams
  o **Network:** (2)
    ▪ Stops, Lines & Routes, Service Patterns
  o **Timetables:** (3)
    ▪ Vehicle Journeys (As Points in pattern), +Compound Journeys
    ▪ Day Types . Service Calendars:
  o **Accessibility:** (1)

• Key Differences from TransXChange representation
  o No TIMING PATTERNS, just the passing times
  o No operational data
    ▪ DEAD RUNs, LAYOVER POINTs, BLOCKs, VEHICLE TYPE, DUTY CREWs, REVERSING MANOEVREs, etc
  o Added capability:
    ▪ Accessibility, COUPLED JOURNEYS
EPIP: Key Differences from TransXChange

• Functional
  o No TIMING PATTERNs, timings, just the resolved passing times ⇒ UK Profile Extension
  o No operational data ⇒ UK will omit, for now
    • DEAD RUNs, LAYOVER POINTS, BLOCKs, DUTY CREWs, Ticket Machine Codes, etc
  o No EBSR Registration elements ⇒ UK will omit, for now
    • Registration, VOA numbers, Licences etc, Service Classification, Service Information, etc,

• Representational
  o POINT IN PATTERN representation of Service patterns, journey patterns, journeys
    • (No CALLs, POINTs rather than LINKS, etc) ⇒ UK profile extension will include some of this information
  o No use of SECTIONs to reduce volume
  o Separation of Time and Frequency/Headway based Journeys
  o Simpler DAY Types

• Some Terminology differences, e.g.
  o TXC Service → TIMETABLE
  o TXC Route → SERVICE PATTERN (and DIRECTION)
1. Stops

- Similar to NPTG NaPTAN

NPTG: Locality

Naptan: StopArea

Naptan: StopPoint
EPIP
2. Lines and Routes

- Similar to TransXChange
  - POINTs IN PATTERN rather than LINK IN PATTERN

TXC: Operator
TXC: Line
TXC: Track
EPIP
3. Service Patterns

• Similar to NPTG NaPTAN
• DESTINATION DISPLAY is a reusable heading

TXC: Line
TXC: Route
TXC: RoutePoint
TXC: StopPoint
TXC: VehicleJourney
TXC: Call + StopUsage
4. Journeys and Passing Times

- Uses POINTs IN JOURNEY PATTERN rather than CALLs
- NeTEx has Generic mechanism for notices
• Not In TXC
EPIP
6. Day Types and Service Calendar

- Defines day types and mapping to calendar
- Equivalent to TXC operating profile elements
• Allows accessibility of Services, stop places and lines to be described
• Not in TXC 2.1,
• Some in NapTAN & TXC 2.5 but not populated?

EPIP
7. Accessibility

NaPTANv2.5: StopPoint

TXCv2.5: VehicleJourney
Using NeTEx for Stops, Routes and Timetables

3. Key Equivalencies
# Key Equivalencies between NPTG/NaPTAN and NeTEx

<table>
<thead>
<tr>
<th>UK NPTG / NaPTAN / TXC</th>
<th>Transmodel / NeTEx</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nptg:AdminArea</td>
<td>ADMINISTRATIVE ZONE + ORGANISATION PART</td>
<td>Link to any element using Responsibility</td>
</tr>
<tr>
<td>Nptg:NptgLocality</td>
<td>TOPOGRAPHICAL PLACE</td>
<td></td>
</tr>
<tr>
<td>Nptg:PlusBusZone</td>
<td>FARE ZONE</td>
<td></td>
</tr>
<tr>
<td>Naptan:StopPoint</td>
<td>STOP PLACE + QUAY + ACCESSIBILITY</td>
<td>Assigned to SCHEDULED STOP POINT for TXC</td>
</tr>
<tr>
<td>Naptan:StopArea</td>
<td>STOP PLACE</td>
<td>Assigned to SCHEDULED STOP POINT for TXC</td>
</tr>
</tbody>
</table>
## Key Equivalencies between TXC and NeTEx

### 1. Network Elements

<table>
<thead>
<tr>
<th>TXC</th>
<th>Transmodel / NeTEx</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>StopPoint</td>
<td>SCHEDULED STOP POINT (STOP ASSIGNMENT + STOP PLACE + QUAY)</td>
<td>Revised representation of logical + Physical stop</td>
</tr>
<tr>
<td>StopArea</td>
<td>STOP AREA + STOP PLACE</td>
<td></td>
</tr>
<tr>
<td>Operator</td>
<td>OPERATOR / AUTHORITY</td>
<td>Operator UK licences for Registration</td>
</tr>
<tr>
<td>Line</td>
<td>LINE</td>
<td></td>
</tr>
<tr>
<td>Service</td>
<td>TIMETABLE FRAME</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Service direction)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GROUP OF SERVICEs + DIRECTION + DAY TYPE</td>
<td></td>
</tr>
<tr>
<td>OperatingProfile</td>
<td>DAY TYPE + PROPERTY OF DAY SERVICE + SERVICE CALENDAR + DAY TYPE ASSIGNMENT</td>
<td>Revised representation</td>
</tr>
<tr>
<td>LayoverPoint</td>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>
## Key Equivalencies between TXC and NeTEx

### 2. Journey Patterns

<table>
<thead>
<tr>
<th>UK NPTG / NaPTAN / TXC</th>
<th>Transmodel / NeTEx</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Txc:Track</td>
<td>ROUTE LINK</td>
<td></td>
</tr>
<tr>
<td>Txc:Route</td>
<td>SERVICE PATTERN</td>
<td>Named changed from TM 5.1</td>
</tr>
<tr>
<td>Txc:RouteSection</td>
<td>GENERAL SECTION</td>
<td></td>
</tr>
<tr>
<td>Txc:RouteLink</td>
<td>SERVICE LINK</td>
<td></td>
</tr>
<tr>
<td>Txc:JourneyPattern</td>
<td>JOURNEY PATTERN + TIMING PATTERN</td>
<td></td>
</tr>
<tr>
<td>Txc:JourneyPatternSection</td>
<td>GENERAL SECTION</td>
<td></td>
</tr>
<tr>
<td>Txc:JourneyPatternTimingLink + StopUsage</td>
<td>TIMING LINK + RUN TIME + WAIT TIME</td>
<td></td>
</tr>
<tr>
<td>Txc:JourneyPatternInterchange</td>
<td>INTERCHANGE</td>
<td></td>
</tr>
</tbody>
</table>
### Key Equivalencies between TXC and NeTEx

#### 3. Journeys

<table>
<thead>
<tr>
<th>UK NPTG / NaPTAN / TXC</th>
<th>Transmodel / NeTEx</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Txc:VehicleJourney</td>
<td>SERVICE JOURNEY</td>
<td>From passenger perspective. For vehicle, operationally, this is VEHICLE JOURNEY</td>
</tr>
<tr>
<td>Txc:VehicleJourneyTimingLink + StopUsage</td>
<td>PASSING TIMES</td>
<td>Run times / wait times included in CALL (EPIP extension in UK profile)</td>
</tr>
<tr>
<td>Txc:VehicleJourneyStopUsage</td>
<td>POINT IN JOURNEY PATTERN + PASSING TIME</td>
<td>EPIP extension in UK profile to included CALL / ARRIVAL, CALL DEPARTURE</td>
</tr>
<tr>
<td>Txc:VariableStopAllocation</td>
<td>STOP ASSIGNMENT</td>
<td></td>
</tr>
<tr>
<td>Txc:DefaultStopAllocation</td>
<td>STOP ASSIGNMENT</td>
<td></td>
</tr>
<tr>
<td>Txc:Interval</td>
<td>JOURNEY FREQUENCY GROUP, HEADWAY FREQUENCY GROUP, RHYTHMICAL FREQUENCY</td>
<td>Use with TEMPLATE vehicle Journey</td>
</tr>
<tr>
<td>Txc:VehicleJourneyInterchange</td>
<td>SERVICE JOURNEY INTERCHANGE</td>
<td></td>
</tr>
</tbody>
</table>
### Key Equivalencies: NaPTAN vs EPIP vs UK Profile

<table>
<thead>
<tr>
<th>Feature</th>
<th>NaPTAN / NPTG</th>
<th>European Profile</th>
<th>UK FXCP Timetable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative Zone</td>
<td>Combines with RESPONSIBILITY SET + ORGANISATION</td>
<td>ADMINISTRATIVE ZONE</td>
<td>ADMINISTRATIVE ZONE</td>
</tr>
<tr>
<td>Responsibility</td>
<td>Combines with RESPONSIBILITY SET + ORGANISATION</td>
<td>RESPONSIBILITY SET</td>
<td>RESPONSIBILITY SET</td>
</tr>
<tr>
<td>Places</td>
<td>NPTG Locality</td>
<td>TOPOGRAPHIC PLACE</td>
<td>TOPOGRAPHIC PLACE</td>
</tr>
<tr>
<td>Stops</td>
<td>Combines STOP PLACE with SCHEDULED STOP POINT</td>
<td>STOP PLACE / QUAY</td>
<td>STOP PLACE / QUAY</td>
</tr>
<tr>
<td>Stop Area</td>
<td>STOP AREA (but some stop areas are Stop Places)</td>
<td>STOP AREA</td>
<td>STOP AREA</td>
</tr>
</tbody>
</table>
### Key Equivalencies : TXC vs EPIP vs UK Profile

<table>
<thead>
<tr>
<th>Feature</th>
<th>TransXChange</th>
<th>European Profile</th>
<th>UK FXCP Timetable</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stops</strong></td>
<td>Combines STOP PLACE with SCHEDULED STOP POINT</td>
<td>SCHEDULED STOP POINT</td>
<td>SCHEDULED STOP POINT, Naptan</td>
</tr>
<tr>
<td><strong>Routes, Journey Patterns &amp; ServicePatterns</strong></td>
<td>Sequence of LINKs</td>
<td>Sequence of POINTs</td>
<td>Sequence of POINTs + ONWARD SERVICE LINKs</td>
</tr>
<tr>
<td><strong>Use of Sections</strong></td>
<td>Mandatory use of sections for Route Links and Journey Pattern Timing Links</td>
<td>Not Used</td>
<td>Optional SECTION</td>
</tr>
<tr>
<td><strong>Journeys</strong></td>
<td>VEHICLE JOURNEY</td>
<td>SERVICE JOURNEY</td>
<td>Also allow CALLs for efficiency</td>
</tr>
<tr>
<td></td>
<td>Sequence of CALLs</td>
<td>Sequence of STOP POINTs IN PATTERN &amp; PASSING TIMEs only</td>
<td>Annotate with timings</td>
</tr>
<tr>
<td><strong>Day types</strong></td>
<td>Not shareable, (but inheritance)</td>
<td>First class objects</td>
<td>First class objects</td>
</tr>
<tr>
<td><strong>Timing Information</strong></td>
<td>Timing info only, no passing time</td>
<td>No timing values, passing time only</td>
<td>Addition of RUN TIMEs and WAIT TIMEs allowed. No Views</td>
</tr>
<tr>
<td><strong>Optimisations</strong></td>
<td>TIMING LINK Views &amp; LINK inheritance to reduce size</td>
<td>Not used</td>
<td>Not used</td>
</tr>
<tr>
<td><strong>Operational data</strong></td>
<td>DEAD RUNs, GARAGEs, LAYOVER points, Route Instructions, etc</td>
<td>Not used</td>
<td>Not included – Future implementation</td>
</tr>
<tr>
<td><strong>Registrations</strong></td>
<td>TANs, Nature of change, Stop changes, notice periods, etc</td>
<td>Not Supported</td>
<td>Not supported – Future Proposal</td>
</tr>
</tbody>
</table>
Using NeTEx for Stops, Routes and Timetables

4. Examples
Example of encoding a timetable in NeTEx
1. Operator

<Operator created="2003-06-09T14:20:00-05:00" changed="2004-05-09T14:20:00-05:00" modification="revise" version="2" id="noc:SCWW">
  <PublicCode>SCWW</PublicCode>
  <ExternalOperatorRef type="dvsa:LicenceNumber" ref="dvsa:PD0000479"/>
  <Name>Stagecoach</Name>
  <ShortName>Stagecoach</ShortName>
  <LegalName>Midland Red South Ltd</LegalName>
  <TradingName>Stagecoach in Warwickshire</TradingName>
  <ContactDetails>
    <Email>schedules.warwickshire@stagecoachbus.com</Email>
    <Phone>01788 566068</Phone>
  </ContactDetails>
  <typesOfOrganisation>
    <TypeOfOrganisationRef ref="txc:LicenceClassification@StandardNational" modification version="txc:v2.1"/>
  </typesOfOrganisation>
  <Address id="noc:SCCW" version="2">…</Address>
  <PrimaryMode>bus</PrimaryMode>
  <CustomerServiceContactDetails><Phone>0871 2002233</Phone></CustomerServiceContactDetails>
</Operator>
Example of encoding a timetable in NeTEx

2a. Lines

```xml
<Line version="1" id="stg:SCWW@86">
    <Name>86</Name>
    <Description>Stagecoach Rugby Line 86</Description>
    <PublicCode>86</PublicCode>
    <OperatorRef version="2" ref="noc:SCWW"/>
    <TypeOfServiceRef version="txc:v2.1" ref="txc:ServiceClassification@NormalStopping"/>
    <allowedDirections>
        <AllowedLineDirection version="1" id="stg:SCWW@86@outbound">
            <DirectionRef version="1" ref="stg:SCWW@86@outbound"/>
        </AllowedLineDirection>
        <AllowedLineDirection version="1" id="stg:SCWW@86@inbound">
            <DirectionRef version="1" ref="stg:SCWW@86@inbound"/>
        </AllowedLineDirection>
    </allowedDirections>
</Line>
```
Example of encoding a timetable in NeTEx

2b. Lines with same number, different identifiers

```xml
<Line version="any" id="frst:985654">
  <Name>86</Name>
  <Description>First West of England Bristol Line 86</Description>
  <PublicCode>86</PublicCode>
</Line>

<Line version="any" id="frst:67534">
  <Name>86</Name>
  <Description>First York Line 86</Description>
  <PublicCode>86</PublicCode>
</Line>

<Line version="any" id="mb:York@86">
  <Name>86</Name>
  <Description>Metrobus York Line 86</Description>
  <PublicCode>86</PublicCode>
</Line>
```
Example of encoding a timetable in NeTEx
3. Stop References

```xml
<ScheduledStopPoint version="1" id="naptStop:4200F009301">
   <Name>Oakdale Road</Name>
   <NameSuffix>Opp</NameSuffix>
   <StopType>onstreetBus</StopType>
   <TopographicPlaceView>
      <Name>Binley Woods</Name>
   </TopographicPlaceView>
</ScheduledStopPoint>
```
Example of encoding a timetable in NeTEx
4a. Service Journey (TXC: VehicleJourney) with passing times

```xml
<ServiceJourney version="1" id="sta:SCWW@894416">
  <DepartureTime>07:32:00</DepartureTime>
  <dayTypes>
    <DayTypeRef version="any" ref="hde:DT_02-Monday+Sunday_NotHoliday"/>
  </dayTypes>
  <ServiceJourneyPatternRef ref="sta:SCWW@894416@1"/>
  <DirectionType>outbound</DirectionType>
  <groupsOfServices>
    <GroupOfServicesRef version="1" ref="sta:Service@R86@out@monday-to-friday"/>
  </groupsOfServices>
  <passingTimes>
    <TimetabledPassingTime version="any" id="sta:SCWW@894416_01">
      <StopPointInJourneyPatternRef version="any" ref="sta:SCWW@894416@1" order="1"/>
      <DepartureTime>07:32:00Z</DepartureTime>
    </TimetabledPassingTime>
    <TimetabledPassingTime version="any" id="sta:SCWW@894416_02">
      <StopPointInJourneyPatternRef version="any" ref="sta:SCWW@894416@1" order="2"/>
      <DepartureTime>07:40:00.0Z</DepartureTime>
    </TimetabledPassingTime>
  </passingTimes>
</ServiceJourney>
```
Example of encoding a timetable in NeTEx
4b. Service Journey (TXC: VehicleJourney) with added calls

<calls>
  <Call id="sta:SCCW@894416" version="1" order="1">
    <ScheduledStopPointRef version="1" ref="naptStop:43000001304"/>
    <OnwardTimingLinkView>
      <TimingLinkRef version="1" ref="sta89441:JourneyPatternTimingLink@4"/>
      <RunTime>PT8M0S</RunTime>
    </OnwardTimingLinkView>
    <TimingPointStatus>timingPoint</TimingPointStatus>
    <Arrival><ForAlighting>false</ForAlighting></Arrival>
    <Departure><Time>07:32:00Z</Time></Departure>
  </Call>
  <Call>
    ...
  </Call>
</calls>
</ServiceJourney>
Example of encoding a timetable in NeTEx
5. Day Types

<ServiceCalendarFrame version="txc:v2.1" id="fxc:UK:DFT:ServiceCalendarFrame_UK_PICALENDAR:TXC:txc"
responsibilitySetRef="txc:TransXChange_metadata" dataSourceRef="txc:dft">
  <Name>Built in day types for TransXChange</Name>
  <codespaces>
    <CodespaceRef ref="txc_metadata"/>
  </codespaces>
  <dayTypes>
    <DayType version="txc:v2.1" id="txc:RegularDayType@monday-to-friday">
      <Name>Weekdays</Name>
      <properties>
        <PropertyOfDay>
          <DaysOfWeek>Monday Tuesday Wednesday Thursday Friday</DaysOfWeek>
        </PropertyOfDay>
      </properties>
    </DayType>
    ...
  </dayTypes>
</ServiceCalendarFrame>
Using NeTEx for Stops, Routes and Timetables

5. Next Steps
What does this mean for me?

• At this stage, nothing!
  
  o BOD will not require NeTEx in short to medium term
    ▪ BOD will legislate for TXC initially for routes and timetables
  
  o NeTEx is an exchange format – will not affect how systems / UI operate
    ▪ Although, in longer term, some systems may change to better accommodate NeTEx way of doing things
  
  o Fares referencing to timetables will reference TXC
  
  o UK “National Access Point” *may* convert your BOD TXC for you

• Although…
  
  o Get on top of your National Operator Codes!
    ▪ Critical for distinguishing data
Can I have NeTEx now?

- If you want to!
- But…
  - Remember that BOD will not require NeTEx in short to medium term
  - BOD will legislate for TXC initially for routes and timetables
  - EBSR will continue to use TXC
  - DfT will need to consult on how your NeTEx timetables reach the National Access Point
Summary and Next Steps

• For UK NeTEx Profile for Stops, Routes and Timetables, the UK will initially adopt an “augmented” EPIP
  o Enhancements for UK usage, while remaining compliant
  o Additional attributes / elements allowed
  o Aid in “round trip” conversions

• NeTEx can use elements / references from NPTG, NaPTAN and TXC
  o No need to move from one standard to another in a "big bang"
  o Standards can co-exist

• UK will need a fuller profile to fully replace NPTG, NaPTAN and TXC
  o Requires more consideration of use cases, ways of encoding
  o Lessons learnt from TXC implementation
  o Simplification?

• Users / Operators should start to assess & correct data e.g. Operator Codes
THANK YOU

Any questions?

Please contact Julie Williams

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