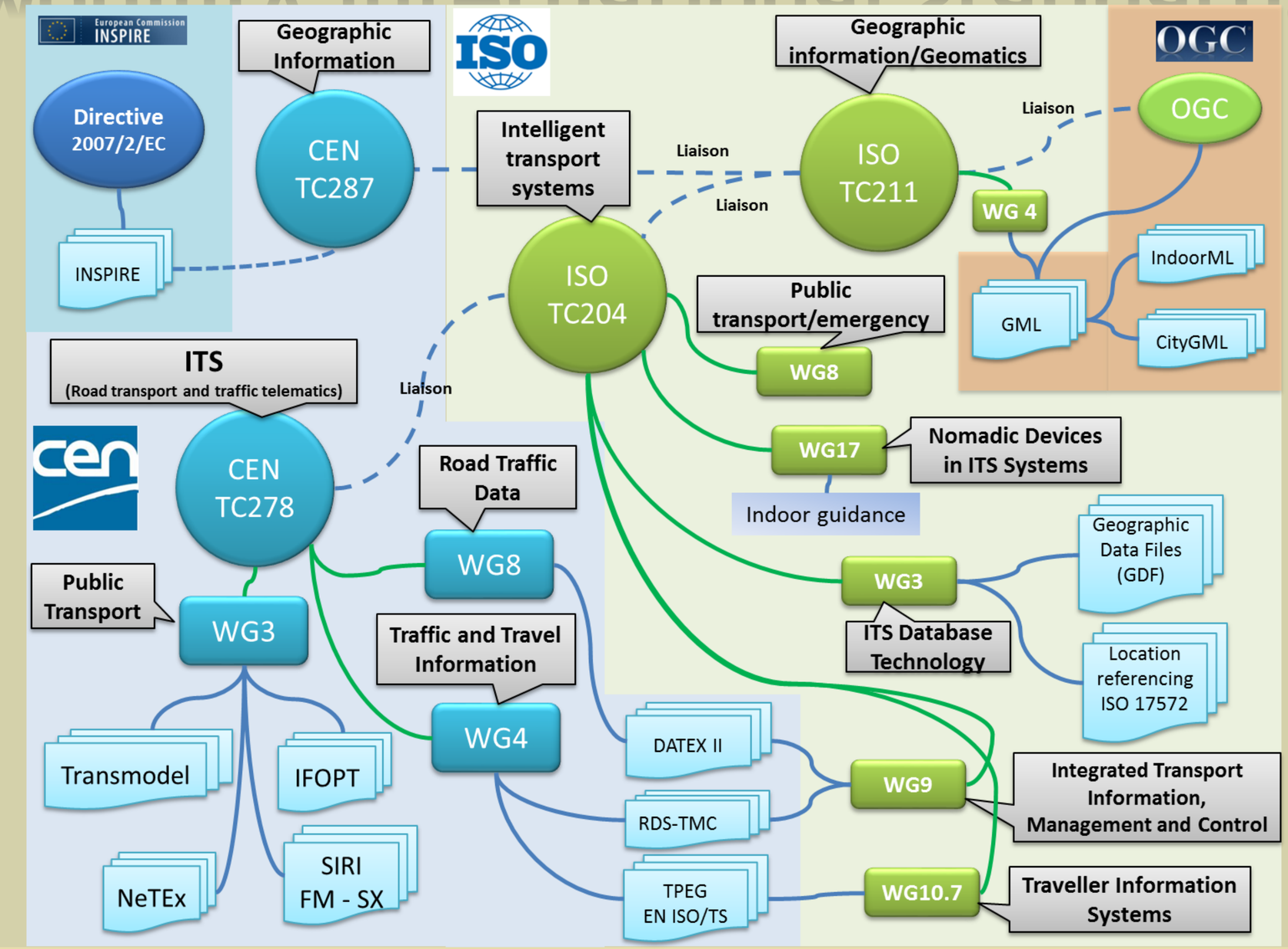
CEN PT STANDARDS OVERVIEW

Christophe Duquesne

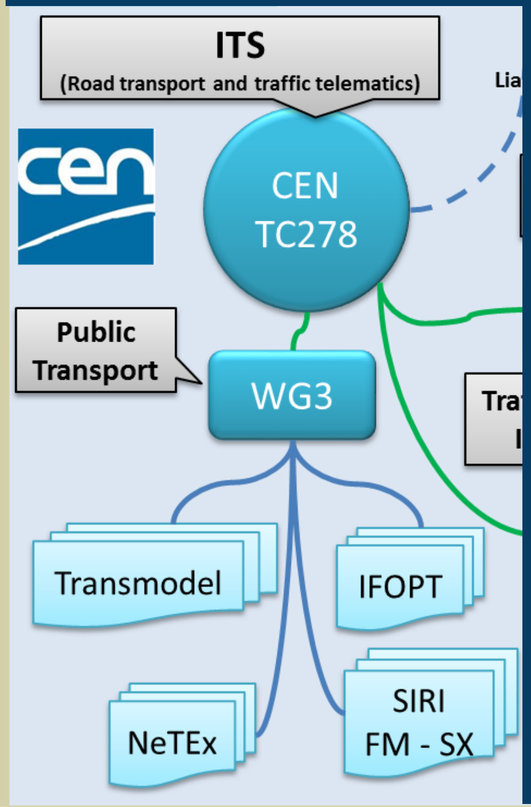
Transmodel

CEN PT STANDARDS OVERVIEW

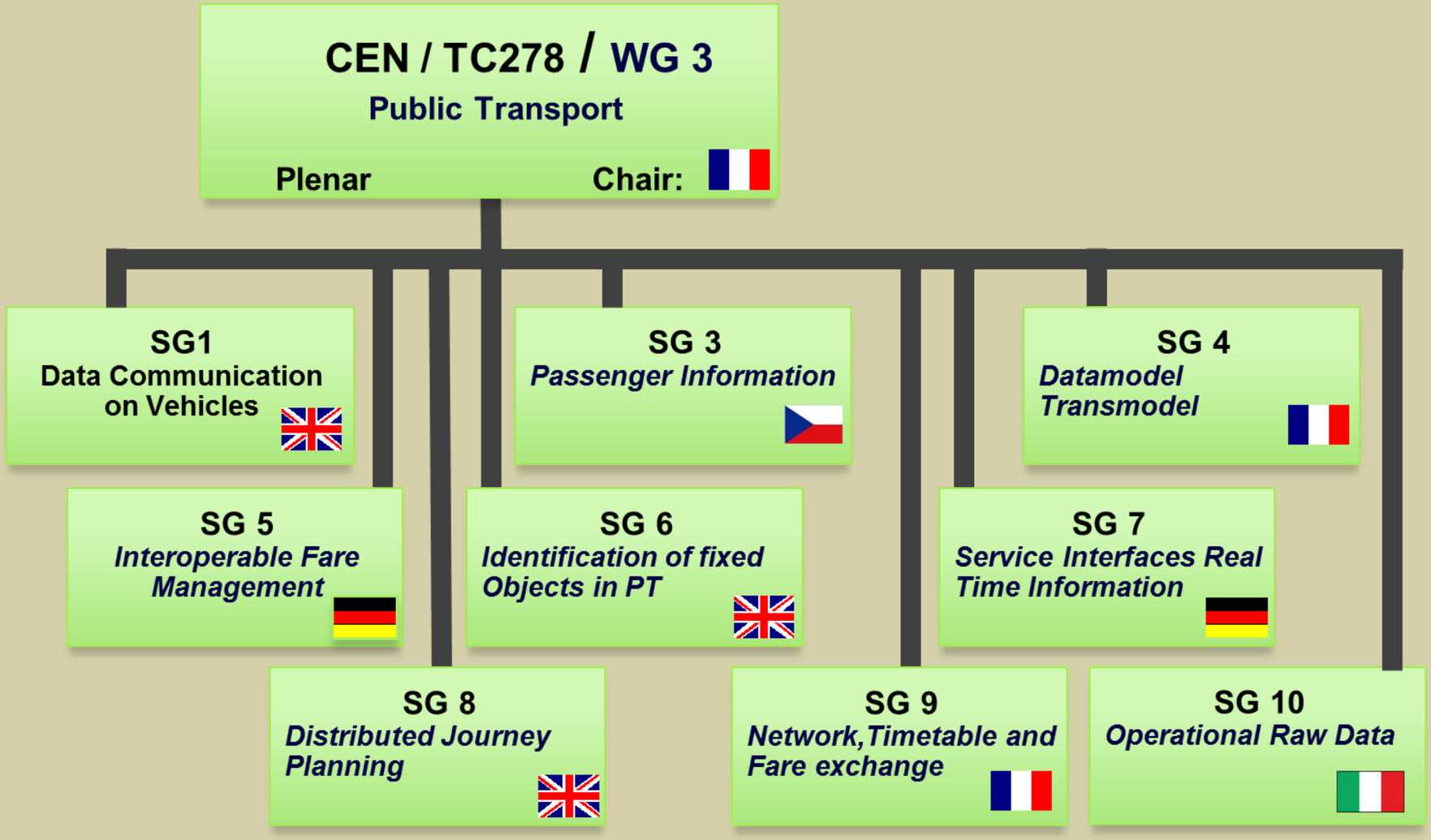
Mobility international standards



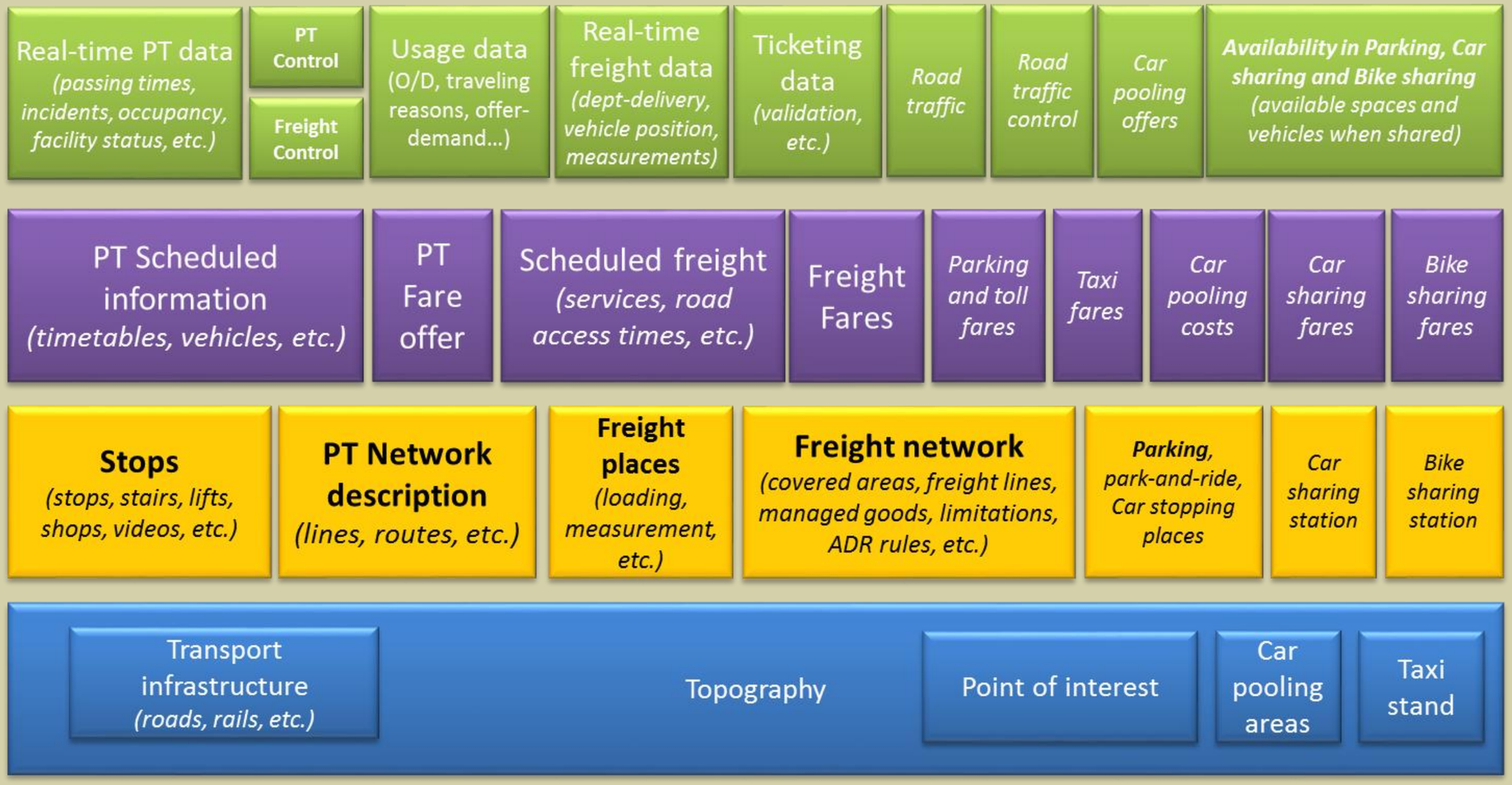
Mobility international standards



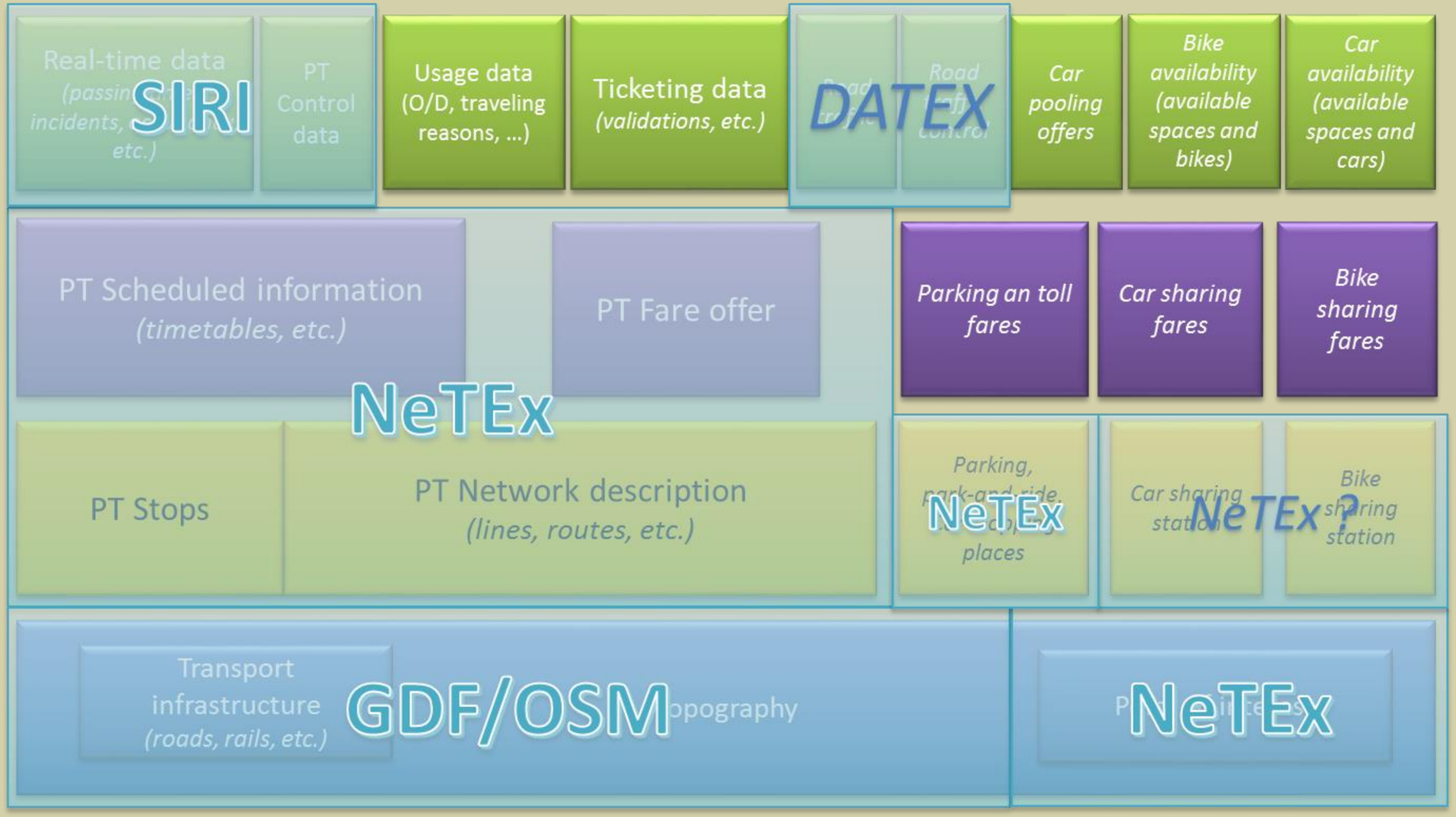
CEN TC278 *(ITS)* WG3 *(Public Transport)*



Data categories in mobility



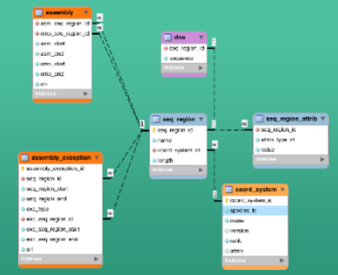
PT standard coverage



PT Standard dependencies

TRANSMODEL

Conceptual data model covering
all the public transport data domaine



NeTEx

Exchange data format for scheduled information

SIRI

Exchange data format for real time information

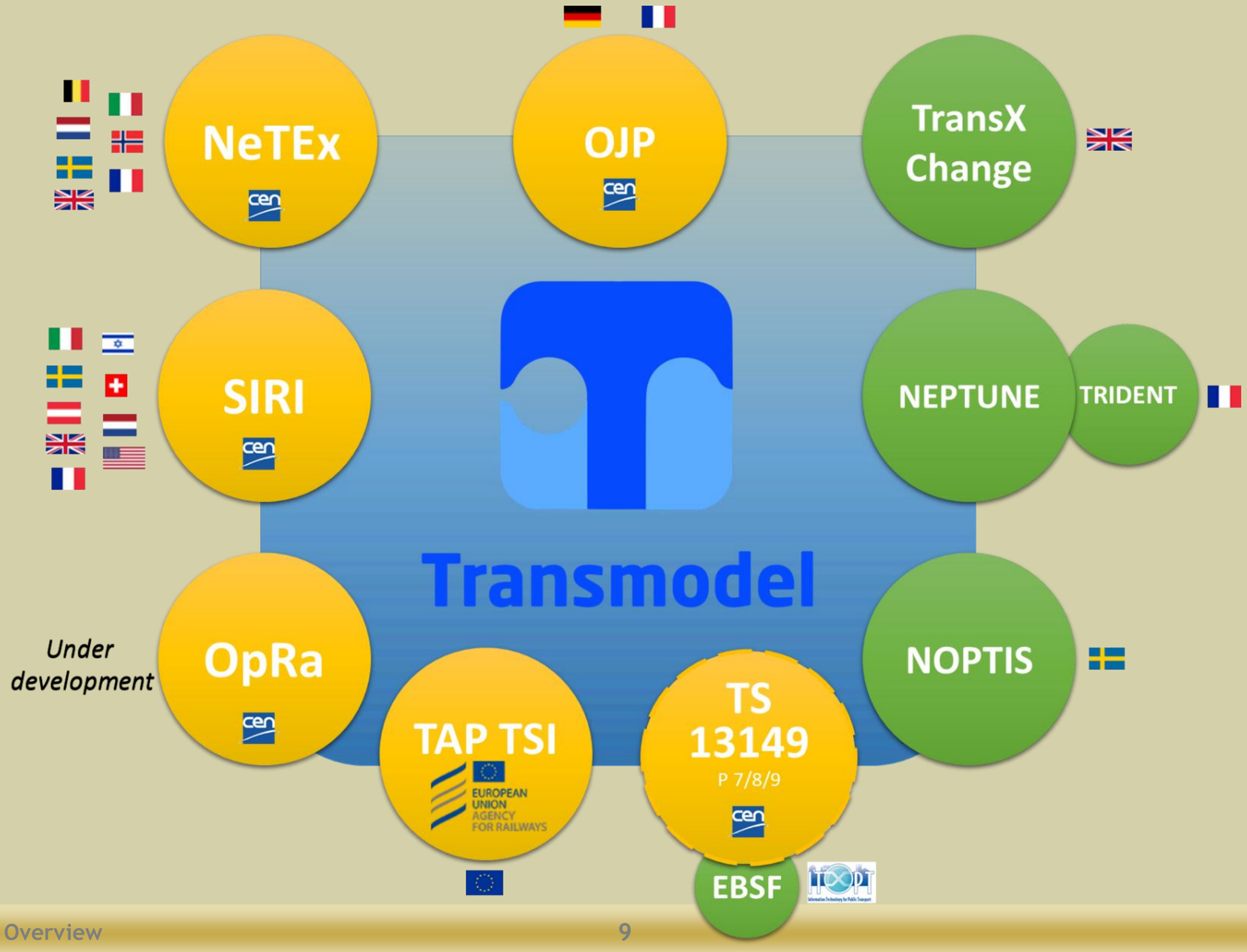
OpRa

Exchange data format for observed information

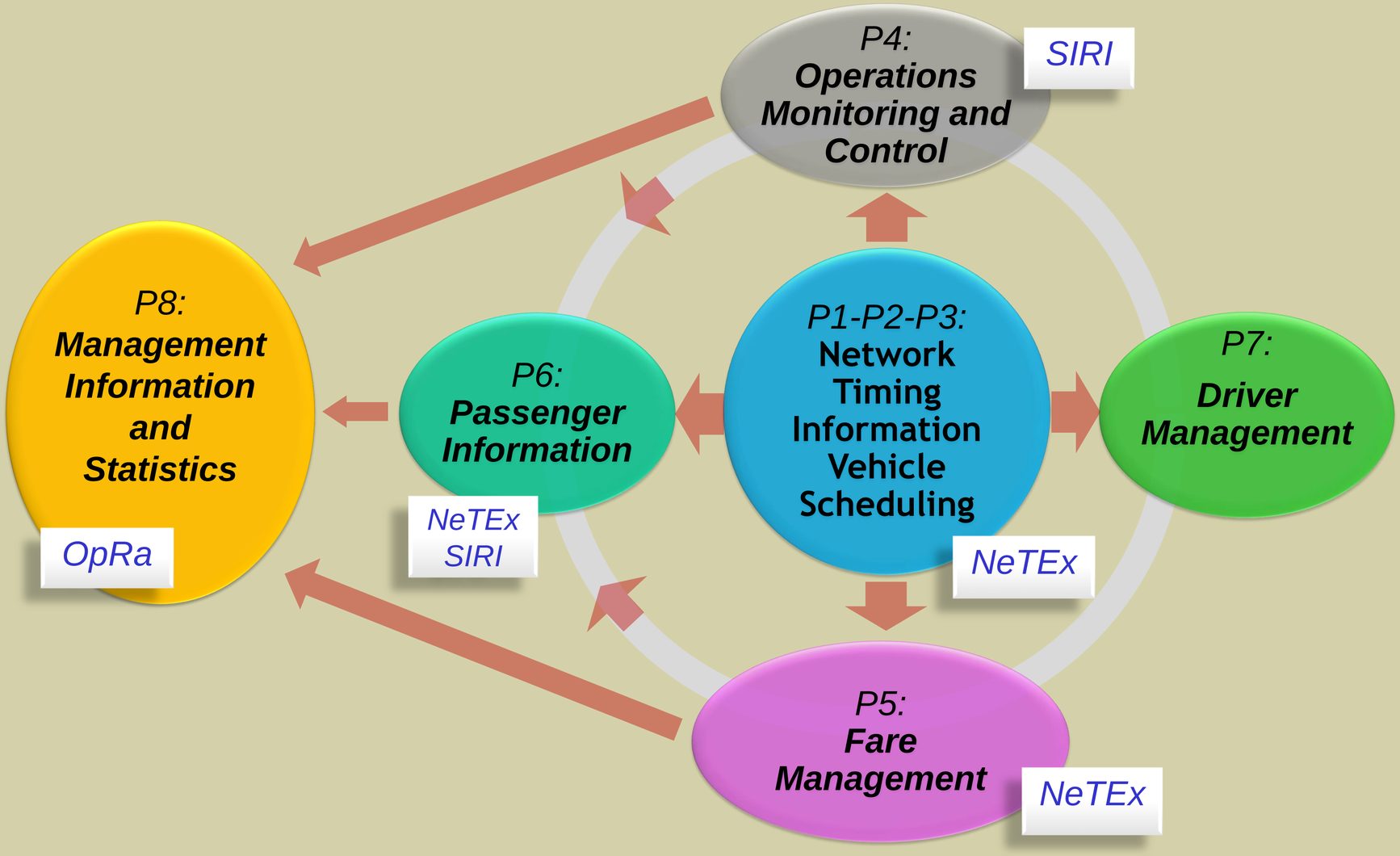
GTFS

GTFSRT

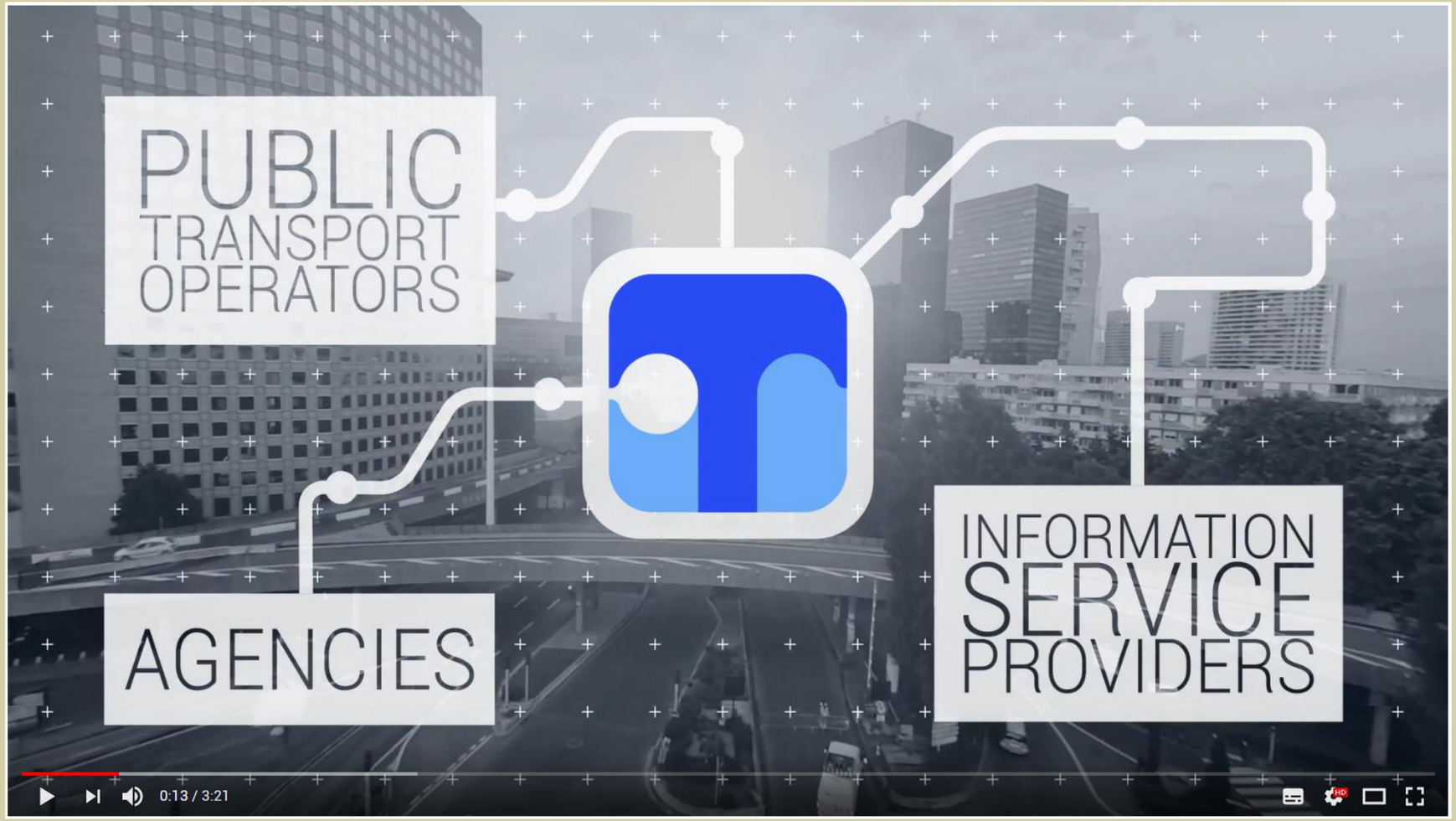
Transmodel Ecosystem



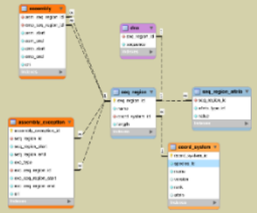
Transmodel content
and associated exchange standards



Transmodel overview video



http://www.transmodel-cen.eu



A Data Model
(example of concept)

INSTALLED EQUIPMENT

PLACE EQUIPMENT

+ Units :nonNegativeInteger

«UID»
+ Id

PLACE ACCESS EQUIPMENT

+ Width :meters
+ DirectionOfUse :DirectionOfUseEnum
+ PassengerPerMinute :PassengersPerMinuteType
+ RelativeWeighting :integer

«UID»
+ Id :PlaceAccessEquipmentIdType

LIFT EQUIPMENT

+ Depth :LengthType [0..1]
+ MaximumLoad :WeightType [0..1]
+ WheelchairPassable :boolean [0..1]
+ WheelchairTurningCircle :LengthType [0..1]
+ InternalWidth :LengthType [0..1]
+ HandrailHeight :LengthType [0..1]
+ CallButtonHeight :LengthType [0..1]
+ DirectionButtonHeight :LengthType [0..1]
+ LowerHandrailHeight :LengthType [0..1]
+ RaisedButtons :boolean [0..1]
+ BrailleButtons :boolean [0..1]
+ ThroughLoader :boolean [0..1]
+ MirrorOnOppositeSide :boolean [0..1]
+ Attendant :boolean [0..1]
+ Automatic :boolean [0..1]
+ AlarmButton :boolean [0..1]
+ TactileActuators :boolean [0..1]
+ AcousticAnnouncements :boolean [0..1]
+ SignageToLift :boolean [0..1]
+ SuitableForCycles :boolean [0..1]

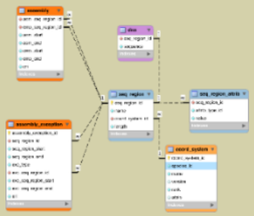
«UID»
+ Id

EQUIPEMENT D'ACCES DE LIEU

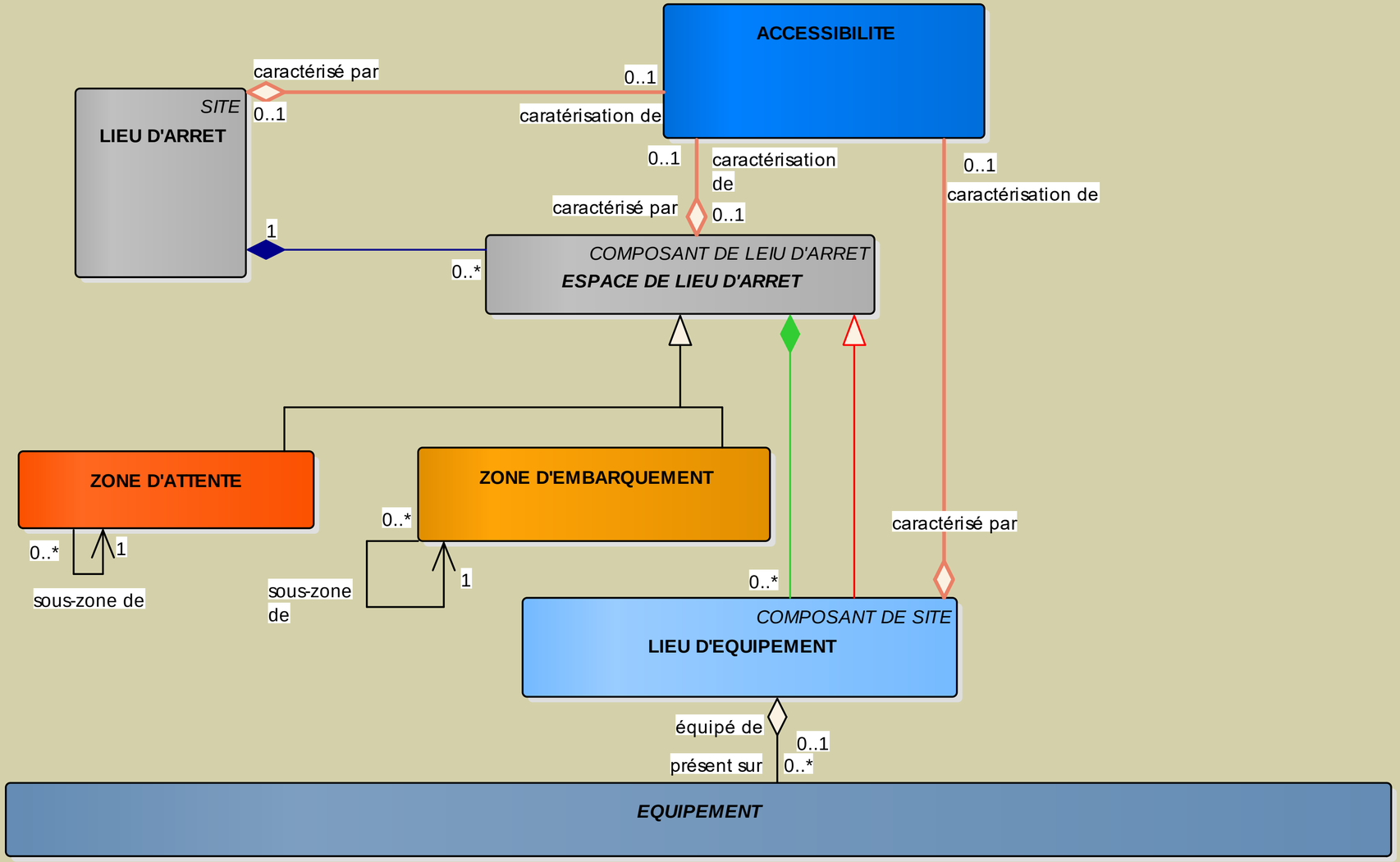
EQUIPEMENT PASSAGE PIETON

+ SignalAcoustique: boolean [0..1]
+ SenseurAcoustique: boolean [0..1]
+ TypeDePassage: CrossingtTypeEnum [0..1]
+ BordureSurbaissée: boolean [0..1]
+ Feux: boolean [0..1]
+ RevêtemetTactile: boolean [0..1]
+ BandeGuidageVisuel: boolean [0..1]
+ Zebra: boolean [0..1]

«PK»
+ id: CrossingIdType



A Data Model
(example of relations)



Exchange formats

Exchange formats (i.e, NeTEx, SIRI and OpRa):

1. Are based on a subpart of Transmodel depending on their use cases
2. Are implemented using an exchane language (XML/XSD, JSON)
3. May group or simplify several concept in « views » when they don’t need all the details provided by Transmodel (but MUST stay consistant with Transmodel)
4. Define an XSD (XML Schema Definition) and Web Services when needed

Exchange formats *(example)*

```
<!-- Frame NETEX_ARRÊT-->
<GeneralFrame version="001" id="AURIGE:TypeOfFrame:NETEX_ARRET-Le-Corbusier:LOC">
	<Name>Frame NETEX_ARRET Le Corbusier</Name>
	<Description>Frame NETEX_ARRET pour l'exemple d'arrêt Le Corbusier</Description>
	<TypeOfFrameRef ref="FR:TypeOfFrame:NETEX_ARRET">version="1.01:FR-NETEX_ARRET-1.0"</TypeOfFrameRef>
	<members modificationSet="all">

		<!-- ======================================== -->
		<!-- LIEU D'ARRET MONOMODAL Jules Michelet -->
		<StopPlace version="001" id="FR:78197:StopPlace:00004:LOC">
			<!-- le "LOC" sera supprimé si l'on dispose d'un référentiel d'arrêt partagé -->
			<Name>Jules Michelet</Name>
			<Description>Lieu d'arrêt monomodal Jules Michelet</Description>
			<Centroid>
				<Location id="AURIGE:Location:00011:LOC">
					<Longitude>2.071341</Longitude>
					<Latitude>48.766715</Latitude>
				</Location>
			</Centroid>
			<placeTypes>
				<TypeOfPlaceRef ref="monomodalStopPlace"/>
			</placeTypes>
			<RoadAddress version="any" id="AURIGE:RoadAddress:address11:LOC">
				<RoadName>Rue Le Corbusier</RoadName>
			</RoadAddress>
			<Landmark>Face à l'école maternelle Jeanne Moreau</Landmark>
			<TopographicPlaceRef ref="INSEE:TopographicPlace:78297"/>
			<OrganisationRef version="001" ref="AURIGE:Operator:768:LOC"/>
			<!-- Fait partie du Pôle Monomodal Le Corbusier -->
			<ParentSiteRef version="001" ref="FR:78197:StopPlace:00001:LOC"/>
			<TransportMode>bus</TransportMode>
			<StopPlaceType>onstreetBus</StopPlaceType>
			<quays>
				<QuayRef ref="AURIGE:Quay:008:LOC" version="001"/>
				<QuayRef ref="AURIGE:Quay:008:LOC" version="001"/>
			</quays>
		</StopPlace>
		<Quay version="001" id="AURIGE:Quay:008:LOC">
			<Name>Jules Michelet</Name>
```

Transmodel

Name : Transmodel
Reference : EN 12896
Status : European Norm, Version 5.1 available, version 6 under development

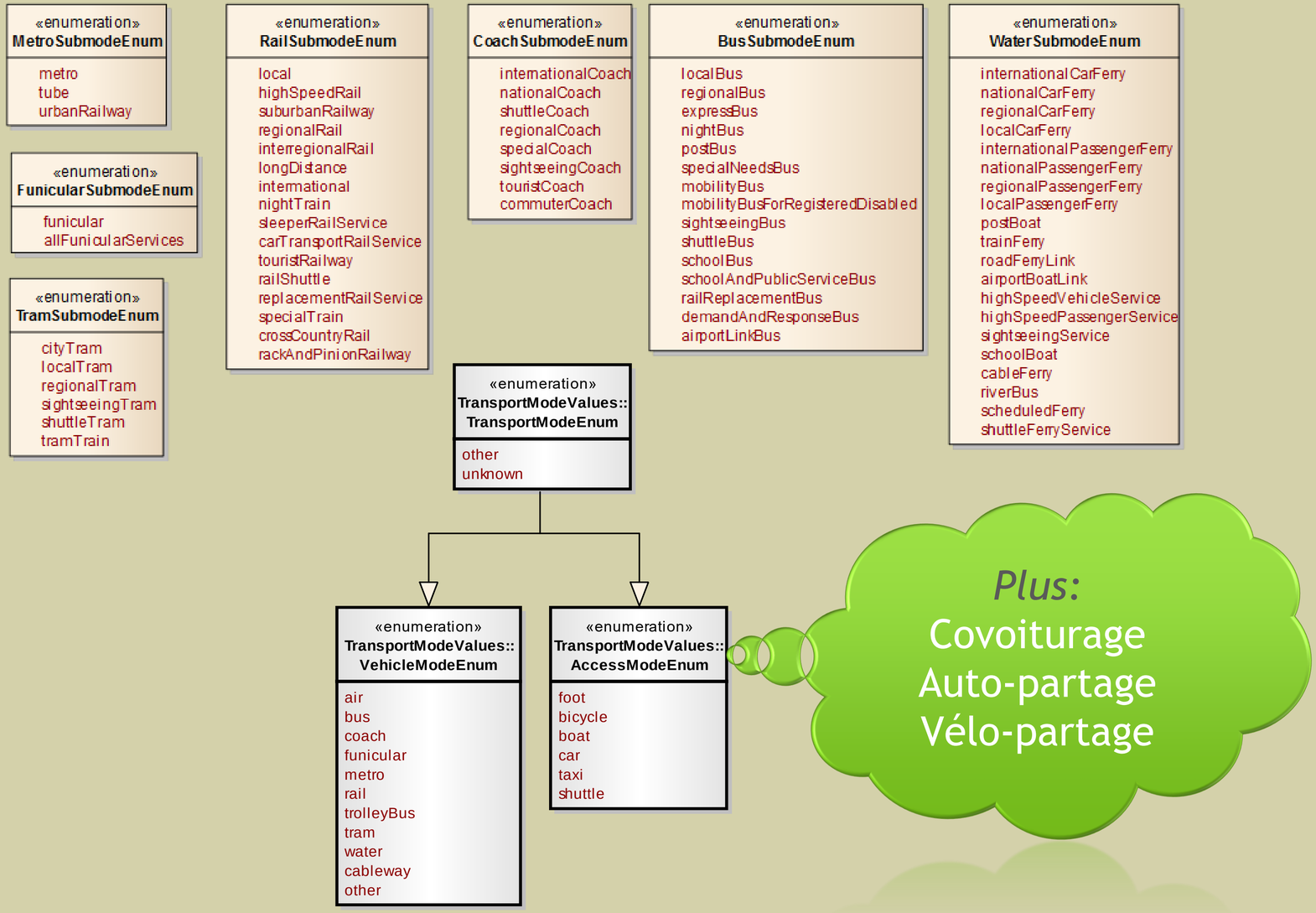
Conceptual model : yes
Exchange format : no
Data category : all PT data
Temporal scope : all

Main scope : Conceptual data model covering most of the data domain of public transport

Example of covered objects : Line, Vehicle Journey, Scheduled stop point, timing point, passing time, block, fare product, acces rights, etc.

Web site http://www.transmodel.org or http://transmodel-cen.eu/

Transmodel's transport modes



Transmodel: main use cases

Shared vocabulary

Definition of consistent exchange protocols

Definition od database model

Usefull for any Public Transport business case

Consistency accross systems: base of interoperability

NeTEx

Name : NeTEx

Reference : CEN TS 16614-1, 16614-2 and 16614-3

Status : Part 1,2 and 3: CEN Technical Specification

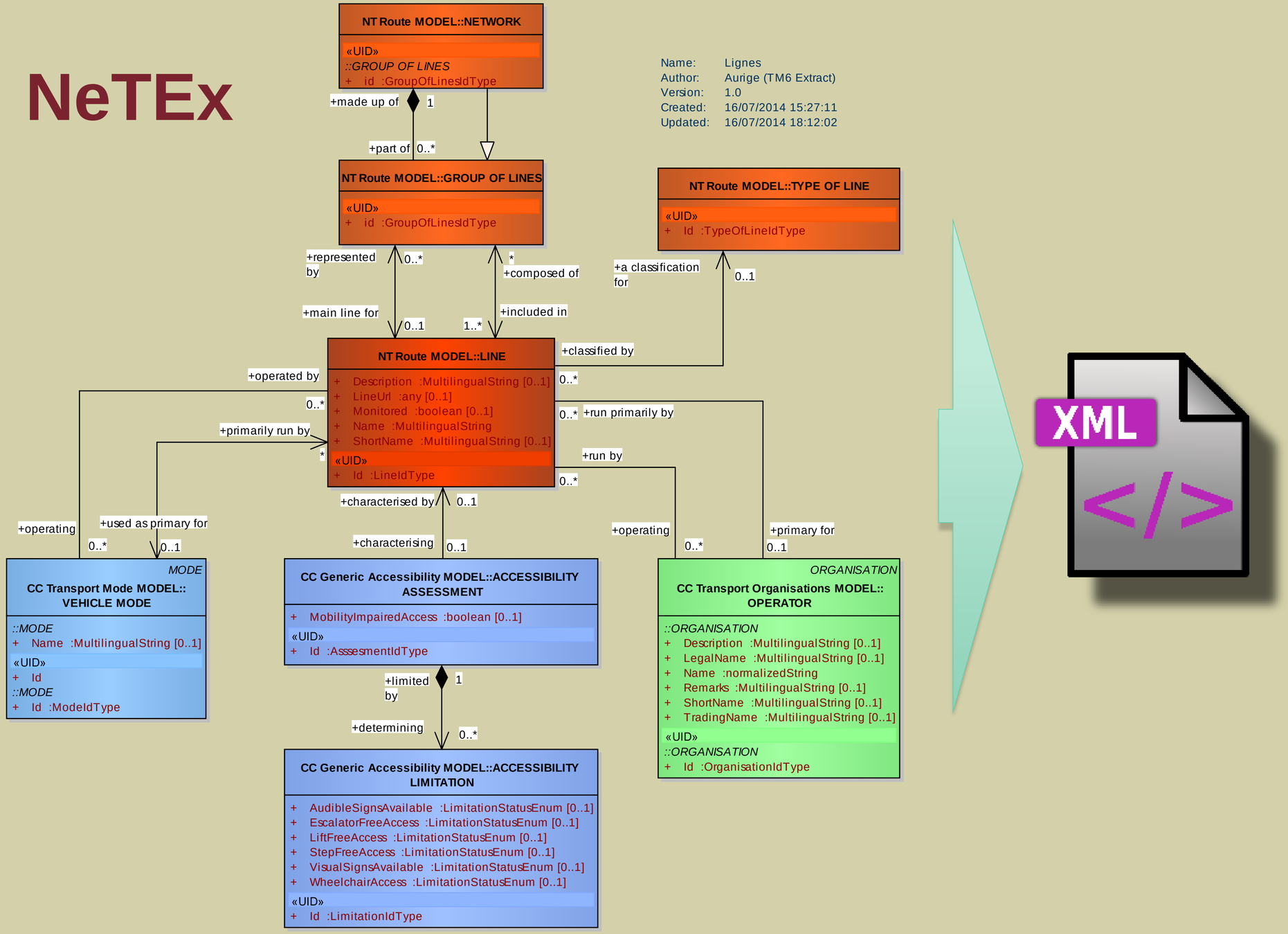
Conceptual model :	*no (based on Transmodel, aligned with Transmodel 6)*
Exchange format :	*yes*
Data category :	*Public transport scheduled data (operational and passenger information data)*
Temporal scope :	*Scheduled data, and static data*

Main scope : Network description, timetables and fares.

Example of covered objects : Stop Place, Timing point, Equipment, Facilities, Line, Route, Fare product, Access rights, Accessibility, etc.

Web site http://netex-cen.eu

NeTEx


NT Route MODEL::NETWORK
«UID»
::GROUP OF LINES
+ id :GroupOfLinesIdType
+made up of
1
+part of
0..*
NT Route MODEL::GROUP OF LINES
«UID»
+ id :GroupOfLinesIdType
NT Route MODEL::TYPE OF LINE
«UID»
+ Id :TypeOfLineIdType
+represented by
0..*
*
+composed of
+a classification for
0..1
+main line for
0..1
1..*
+included in
NT Route MODEL::LINE
+ Description :MultilingualString [0..1]
+ LineUrl :any [0..1]
+ Monitored :boolean [0..1]
+ Name :MultilingualString
+ ShortName :MultilingualString [0..1]
«UID»
+ Id :LineIdType
+classified by
0..*
+operated by
0..*
+run primarily by
+primarily run by
*
+run by
0..*
+characterised by
0..1
+operating
0..*
+used as primary for
0..1
+characterising
0..1
+operating
0..*
+primary for
0..1
MODE
CC Transport Mode MODEL:: VEHICLE MODE
::MODE
+ Name :MultilingualString [0..1]
«UID»
+ Id
::MODE
+ Id :ModeIdType
CC Generic Accessibility MODEL::ACCESSIBILITY ASSESSMENT
+ MobilityImpairedAccess :boolean [0..1]
«UID»
+ Id :AsssesmentIdType
+limited by
1
+determining
0..*
CC Generic Accessibility MODEL::ACCESSIBILITY LIMITATION
+ AudibleSignsAvailable :LimitationStatusEnum [0..1]
+ EscalatorFreeAccess :LimitationStatusEnum [0..1]
+ LiftFreeAccess :LimitationStatusEnum [0..1]
+ StepFreeAccess :LimitationStatusEnum [0..1]
+ VisualSignsAvailable :LimitationStatusEnum [0..1]
+ WheelchairAccess :LimitationStatusEnum [0..1]
«UID»
+ Id :LimitationIdType
ORGANISATION
CC Transport Organisations MODEL:: OPERATOR
::ORGANISATION
+ Description :MultilingualString [0..1]
+ LegalName :MultilingualString [0..1]
+ Name :normalizedString
+ Remarks :MultilingualString [0..1]
+ ShortName :MultilingualString [0..1]
+ TradingName :MultilingualString [0..1]
«UID»
::ORGANISATION
+ Id :OrganisationIdType
Name: Lignes
Author: Aurige (TM6 Extract)
Version: 1.0
Created: 16/07/2014 15:27:11
Updated: 16/07/2014 18:12:02
XML

NeTEx: use cases examples

To feed journey planner

Passenger information system feed

Open data feed (often as an ehanced complement to GTFS)

AVMS feed

Exchange for co-operated network

Late schedule update (on a specific day) dissemination

Ticketing system feed

Etc.

SIRI

Name : SIRI *(Service Interface for Real-time Information)*
Reference : EN 15531-1 - Business case
EN 15531-2 - Communication
EN 15531-3 - Services
TS 15531-4 - Facility monitoring service
TS 15531-5 - Situation exchange service

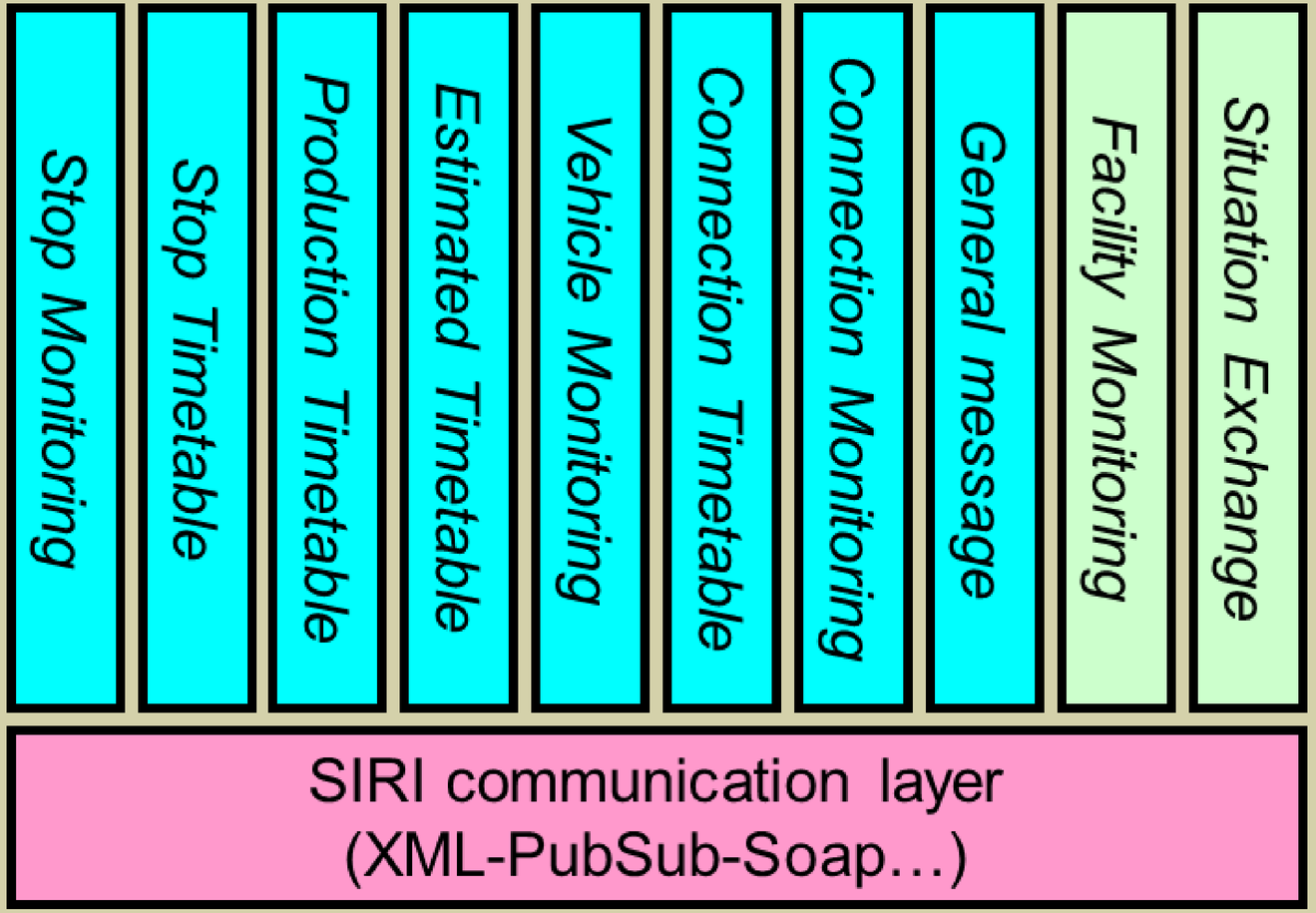
Status : Part 1, 2 and 3 are European Norms
Part 4 and 5 are Technical Spécifications

Conceptual model : No
Exchange format : Yes
Data category : Public transport real-time data
Temporal scope : Planed events end real time

Main scope : Public transport real-time information.
Example of covered objects : dated journey, passing time, situations, vehicle location.

Web site http://www.siri.org.uk/ or https://www.vdv.de/siri.aspx

SIRI


Stop Monitoring
Stop Timetable
Production Timetable
Estimated Timetable
Vehicle Monitoring
Connection Timetable
Connection Monitoring
General message
Facility Monitoring
Situation Exchange
SIRI communication layer
(XML-PubSub-Soap…)

SIRI: uses cases example

Realtime data hub feed

Journey planner feed

Realtime display system feed

Control Center feed and dissemination

Multi-operator connection operation

Situation management and publication

Multi-operator, shared vehicle operation (i.e. EBSF)

Etc.

Priority Action A

- The **Priority Action A** of the **ITS Directive** requires *the provision of EU-wide multimodal travel information services*
- Adopted on May 31st
  - Require each member state to set up a **National Access Point** (NAP) providing all public transport data from the country
  - Recommended use of CEN Open API for Distributed Journey Planning Standardised Interface
  - Published in the official journal on October 21st

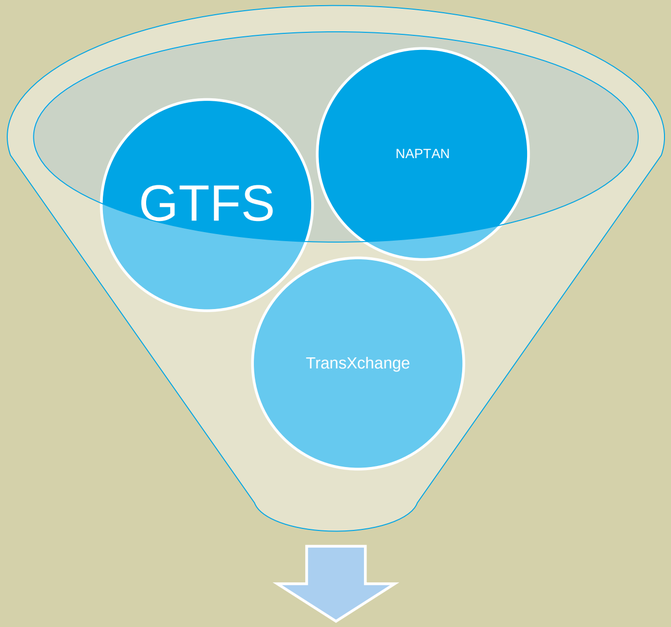
Priority Action A

- Data in NAPs
  - Pre-existing public and private data within Member States, no requirements to collect or digitize information
    Requirements for at least **static data**, dynamic data at the discretion of the Member States
  - Identified data prioritized into 3 groups – phased approach to complete NAP

Static Dataset	Comprehensive TEN-T incl. Urban Nodes	Other parts of the network
Timetables, access nodes, accessibility PRM, network topology etc.	2019	2023
Bike-sharing & car-sharing stations, vehicle facilities, basic common standard fares, how and where to buy tickets etc.	2020	
Detailed cycling network attributes, estimated travel times etc.	2021	

Priority Action A

- Implemation: **NeTEx** as only ouput format



NeTEx at NAP

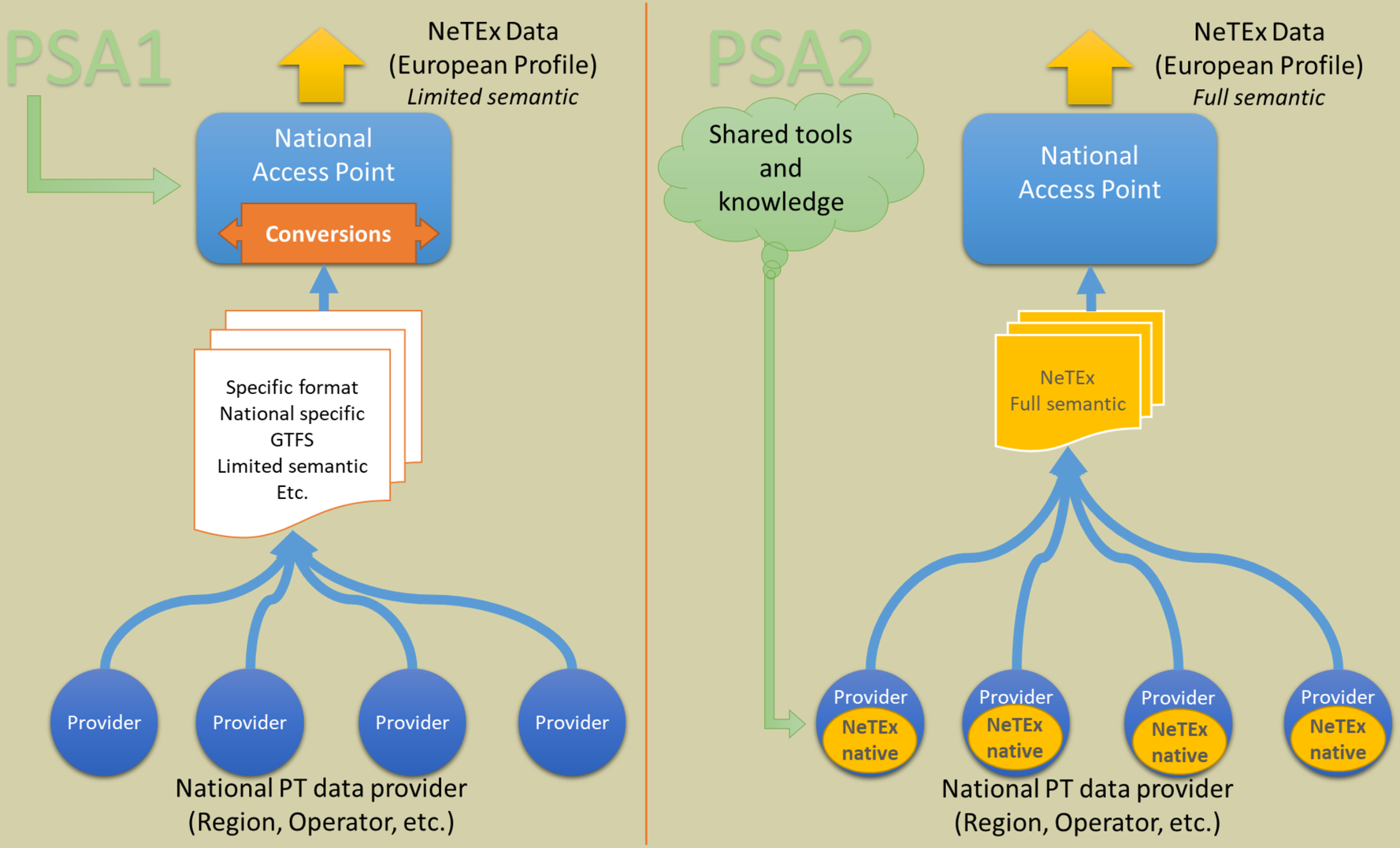
NeTEx in PTO

NeTEx in NAP

PSAs

- A first PSA was launched in 2017 (call ended in July 2017) to help member states to setup their NAP
  - 5 M€ split amongst member states
  - National projects only, no collaboration
  - Mainly conversion of existing data to NeTEx

PSAs


PSA1
NeTEx Data
(European Profile)
Limited semantic
National
Access Point
Conversions
Specific format
National specific
GTFS
Limited semantic
Etc.
Provider
Provider
Provider
Provider
National PT data provider
(Region, Operator, etc.)
PSA2
Shared tools
and
knowledge
NeTEx Data
(European Profile)
Full semantic
National
Access Point
NeTEx
Full semantic
Provider
NeTEx
native
Provider
NeTEx
native
Provider
NeTEx
native
Provider
NeTEx
native
National PT data provider
(Region, Operator, etc.)

PSAs

The action to be supported shall consist of technical and organisational activities to facilitate the **development and deployment** of the European public transport data standards **Transmodel, NeTEx and SIRI** for the provision of Union-wide multimodal travel information services which apply to the TEN-T network including **urban nodes**.

In total, a maximum of **2m EUR** funding (**80% co-funding rate**) will become available to support this action. A consortium made up of at least **9 Member States** is required and the project duration may not exceed **48 months**. **Only one proposal shall be accepted** and the project may begin as early as **January 2019**. **A MS or organisation can coordinate the project**. EEA countries (NO, CH) can participate.

PSAs

Support the technical development of Transmodel, NeTEx and SIRI to fulfil the needs of multimodal travel information service providers

- Conduct technical artefact maintenance
- Develop data validation tools and test platform
- Conduct required updates for all standards
- Support development of National or local profiles
- Develop EU SIRI profile and further NeTEx profiles

PSAs

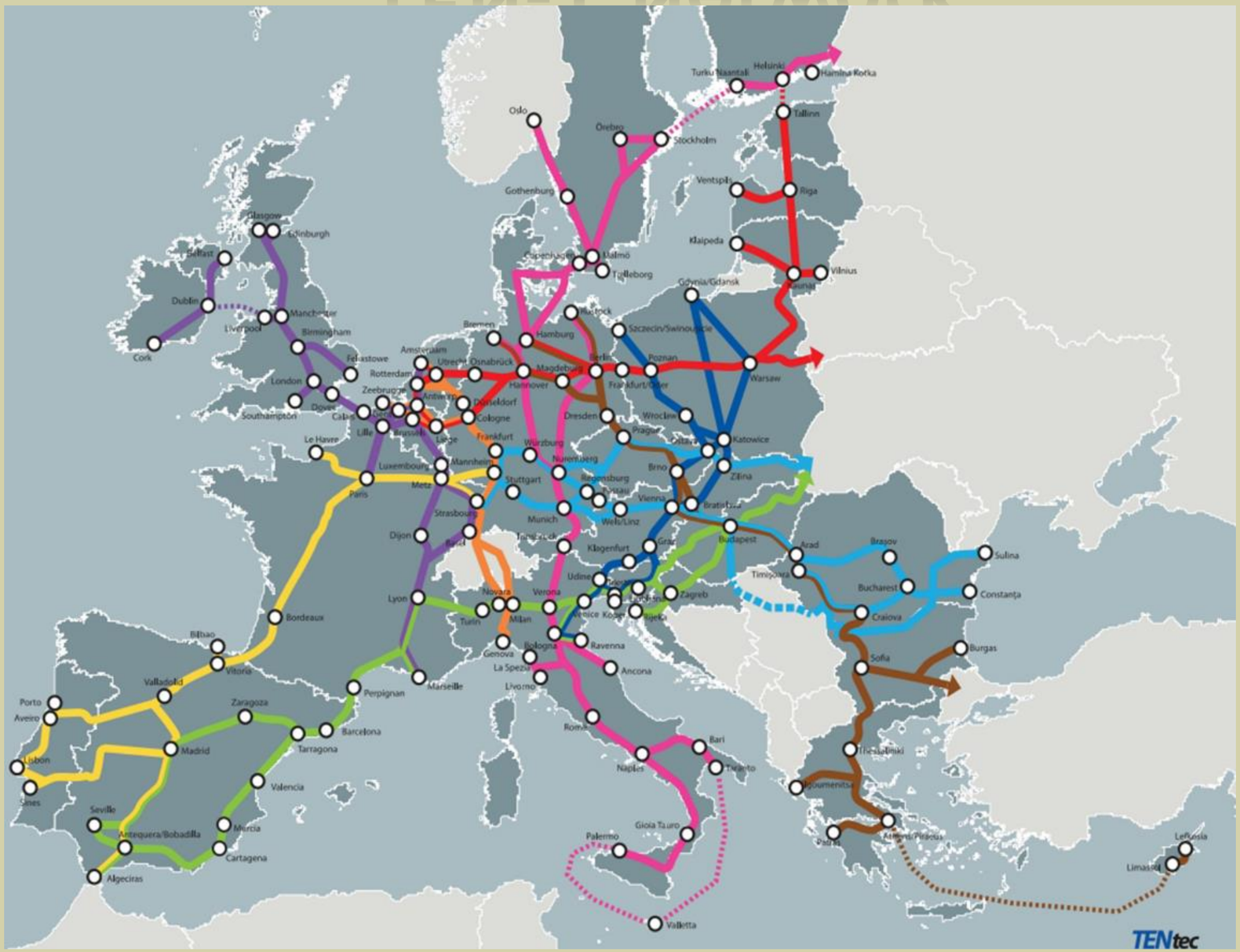
Develop the Transmodel, NeTEx and SIRI end-user community

Facilitate the operational use of Transmodel, NeTEx and SIRI standards by PTOs and PTAs

- Conduct technical conversion and operational use based on the developed shared European validation tools
- Exchange of best practice

Priority Action A for TEN-T network

TEN-T Network



Priority Action A => December 2019

(a) Location search (origin/destination)

I) Address identifiers (building number, street name, postcode)

II) Topographic places (city, town, village, suburb, administrative unit)

III) Points of interest (related to transport information) to which people may wish to travel

Priority Action A => December 2019

(b) Trip plans

I) Operational Calendar, mapping day types to calendar dates

(c) Location search (access nodes)

I) Identified access nodes (all scheduled modes)

II) Geometry/map layout structure of access nodes (all scheduled modes)

Priority Action A => December 2019

(d) Trip plan computation – scheduled modes

I) Connection links where interchanges may be made, default transfer times between modes at interchanges

II) Network topology and routes /lines (topology)

III) Transport operators

IV) Timetables

V) Planned interchanges between guaranteed scheduled services

VI) Hours of operation

Priority Action A => December 2019

(d) Trip plan computation - scheduled modes

VII) Stop facilities access nodes (including platform information, help desks/information points, ticket booths, lifts/stairs, entrances and exit locations)

VIII) Vehicles (low floor; wheelchair accessible.)

IX) Accessibility of access nodes, and paths within an interchange (such as existence of lifts, escalators)

X) Existence of assistance services (such as existence of on-site assistance)

Priority Action A => December 2019

(e) Trip plan computation – road transport (for personal modes)

I) Road network

II) Cycle network (segregated cycle lanes, on-road shared with vehicles, on-path shared with pedestrians)

III) Pedestrian network and accessibility facilities

Priority Action A => December 2020

(f) Location search (demand-responsive modes)

- I) Park & Ride stops
- II) Bike sharing stations
- III) Car-sharing stations
- IV) Publicly accessible refuelling stations for petrol, diesel, CNG/LNG, hydrogen powered vehicles, charging stations for electric vehicles
- V) Secure bike parking (such as locked bike garages)

Priority Action A => December 2020

(g) Information service

I) Where and how to buy tickets for scheduled modes, demand responsive modes and car parking (all scheduled modes and demand-responsive incl. retail channels, fulfilment methods, payment methods)

(h) Trip plans, auxiliary information, availability check

I) Basic common standard fares (all scheduled modes)

i) Fare network data (fare zones/stops and fare stages)

ii) Standard fare structures (point to point including daily and weekly fares, zonal fares, flat fares)

II) Vehicle facilities such as classes of carriage, on-board wifi.

Priority Action A => December 2021

(i) Detailed common standard and special fare query (all scheduled modes)

I) Passenger classes (classes of user and classes of travel such as 1st, 2nd.)

II) Common fare products (access rights such as zone/point-to-point including daily and weekly tickets/single/return, eligibility of access, basic usage conditions such as validity period/operator/time of travel/interchanging, standard point to point fares prices for different point to point pairs including daily and weekly fares/zonal fare prices/flat fare prices)

III) Special Fare Products: offers with additional special conditions such as promotional fares, group fares, season passes, aggregated products combining different products and add on products such as parking and travel, minimum stay

IV) Basic commercial conditions such as refunding/replacing/exchanging/ transferring and basic booking conditions such as purchase windows, validity periods, routing restrictions zonal sequence fares, minimum stay.

Priority Action A => December 2021

(j) Information service (all modes)

- I) How to pay tolls (incl. retail channels, fulfilment methods, payment methods)
- II) How to book car sharing, taxis, cycle hire etc. (incl. retail channels, fulfilment methods, payment methods)
- III) Where how to pay for car parking , public charging stations for electric vehicles and refuelling points for CNG/LNG, hydrogen, petrol and diesel powered vehicles (incl. retail channels, fulfilment methods, payment methods)

Priority Action A => December 2021

(k) Trip plans

I) Detailed cycle network attributes (surface quality, side-by-side cycling, shared surface, on/off road, scenic route, ‘walk only’, turn or access restrictions (e.g. against flow of traffic)

II) Parameters needed to calculate an environmental factor such as carbon per vehicle type or passenger mile or per distance walked

III) Parameters such as fuel consumption needed to calculate cost

(l) Trip plan computation

I) Estimated travel times by day type

Priority Action A for non TEN-T network

2023 at latest

PROFILEs

Profiles: why ?

Standards are by their nature, **consensus documents**, taking into account a wide range of requirement

Standards may contains some features in order to take into account some **national specific way of doing**

- For example, the German way of numbering Stop (1 on first use of stop in a journey, 2 on second use, etc)

The scope of a standard most often goes **much further than** the one of **a single use case**

Standards' documents are often quite **large and detailed** (also due to the expected detail level and stand writing editorial rules)

Standards contains a lot of **non mandatory features** (services, attributes, processes, etc.)

Specific local rules (coding, local processes, etc.) are not described in standards

- For example, reference to NaPTAN (national Stop reference database) in UK

Profiles: why ?

As a summary

A profile

- **facilitates the implementation** of a standards
- improves **interoperability**

by

- focusing only on **what is needed**
- **filling the small gaps** voluntarily left by the standard
- taking into account the **local context.**

Profiles: what ?

The profile contains information such as:

- Details of used services
- Details of the objects used in an exchange
- Details on the options proposed by the standard
- Details on optional elements
- Precision on the codifications to be used
- …

To define a profile you need to:

- Define/identify use cases and requirements
- Identify local constraints (processes, coding rules, reference data, etc.)
- Select in the standard what is necessary or useful to fulfil the two above
- Complement the standard with some specific (but standard compliant) local rules

From a practical point of view, profiles can be seen as an implementation guideline for a certain standard.

Profiles

NeTEx

SIRI

Passenger information Profile

Stop & accessibility Profile

Fare Profile

Passenger information Profile

Eléments communs

Arrêts

Réseau

Horaires

Accessibilité

Offre tarifaire

îledeFrance mobilités

Information voyageur

Information voyageur FR

Ressources

http://www.transmodel-cen.eu/

http://netex-cen.eu/

https://www.vdv.de/siri.aspx *(should be updated)*

http://www.normes-donnees-tc.org/page-d-exemple/modeles-de-donnees/transmodel/

http://www.normes-donnees-tc.org/format-dechange/donnees-temps-reel/

http://www.normes-donnees-tc.org/format-dechange/donnees-theoriques/netex/

http://www.normes-donnees-tc.org/wp-content/uploads/2016/10/SOL_IVTR_Cas-dusages_v1.0.pdf

Profils NeTEx (France)

http://www.normes-donnees-tc.org/wp-content/uploads/2015/11/NF_Profil-NeTEx-%C3%A9l%C3%A9ments-communsF-v1.5-v.pdf

http://www.normes-donnees-tc.org/wp-content/uploads/2015/11/NF_Profil-NeTEx-pour-les-arr%C3%AAtsF-v3.4-v.pdf

http://www.normes-donnees-tc.org/wp-content/uploads/2015/11/NF_Profil-NeTEx-pour-les-R%C3%A9seauxF-v1.5.pdf

http://www.normes-donnees-tc.org/wp-content/uploads/2015/11/NF_Profil-NeTEx-pour-les-HorairesF-v1.4.pdf

Profils SIRI(France)

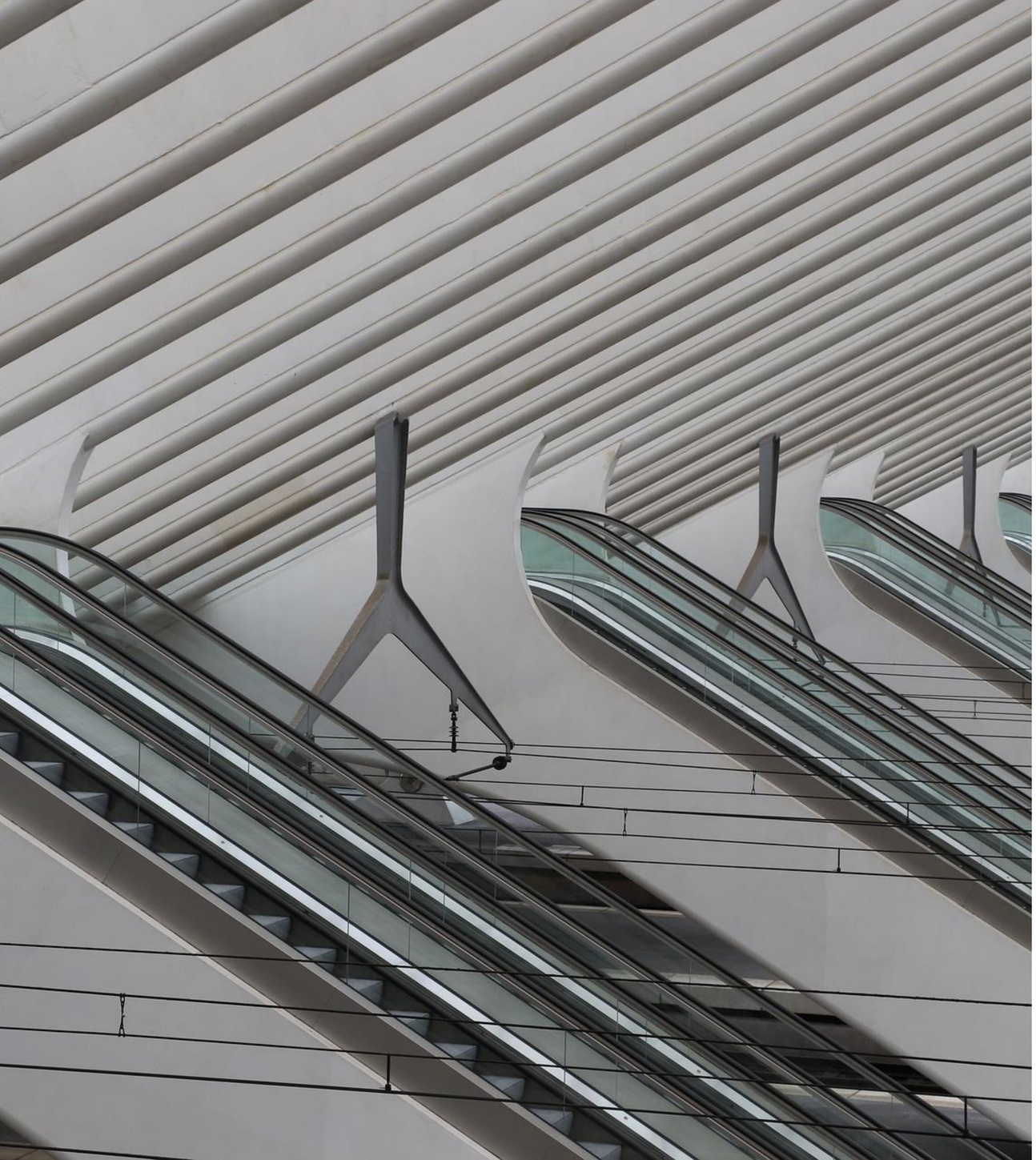
http://www.normes-donnees-tc.org/wp-content/uploads/2014/05/Profil_Siri_IDF_V2-4-STIF-20130712.pdf

http://www.normes-donnees-tc.org/wp-content/uploads/2017/01/Proposition-Profil-SIRI-Lite-initial-v1-2.pdf

Thanks for your attention

Christophe Duquesne

christophe.duquesne@aurigetech.com



THANK YOU

See You Next Time

EMAIL

info@transmodel-cen.eu

WEB

www.transmodel-cen.eu