European Standardisation for Public Transport
Data and Interface Standards

ITS Conference, Beijing, July 2012

Kasia Bourée

Outline

1. Standardisation Organisational Aspects
   - Organisations and committees
   - Main Topics
   - Development Process
   - Documentation Types

2. CEN Data & Interface Standards
   - Rationale & Approach
   - Main standards: Transmodel, IFOPT, NeTEx & SIRI

3. The Reference Data Model of Public Transport – Transmodel in Brief
   - Methodology and examples
   - Domains covered
   - Current status & usage

Standardisation Organisational Aspects

- Organisations and committees
  - Main Topics
- Development Process
- Documentation Types

Main Organisations

WORLDWIDE

- Main organisation

ISO International Organization for Standardization

- Other organisations

IEC : international Electrotechnical Commission

ITU: International Telecommunications Union

etc

EUROPE

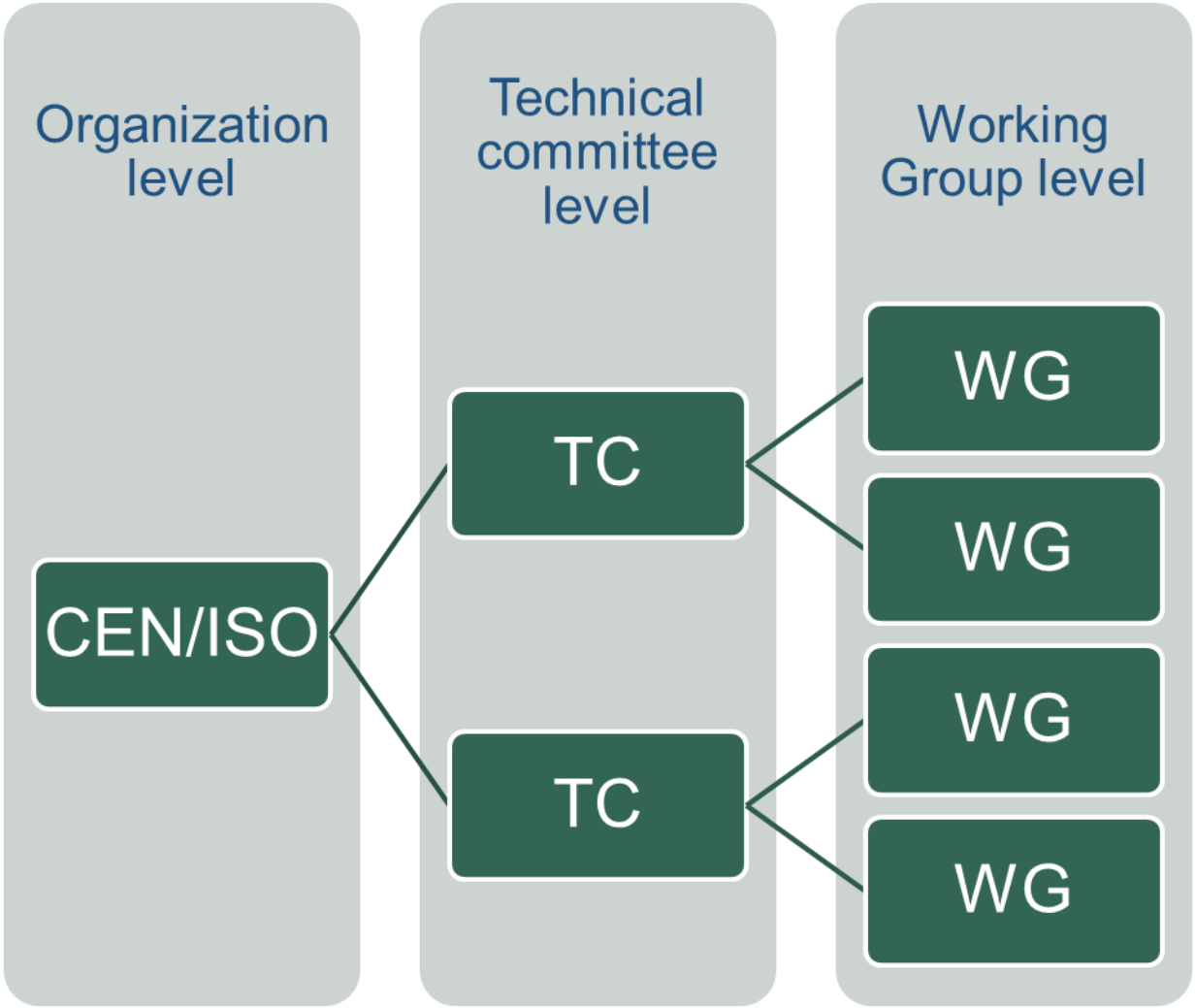
- European level

CEN ETSI CENELEC

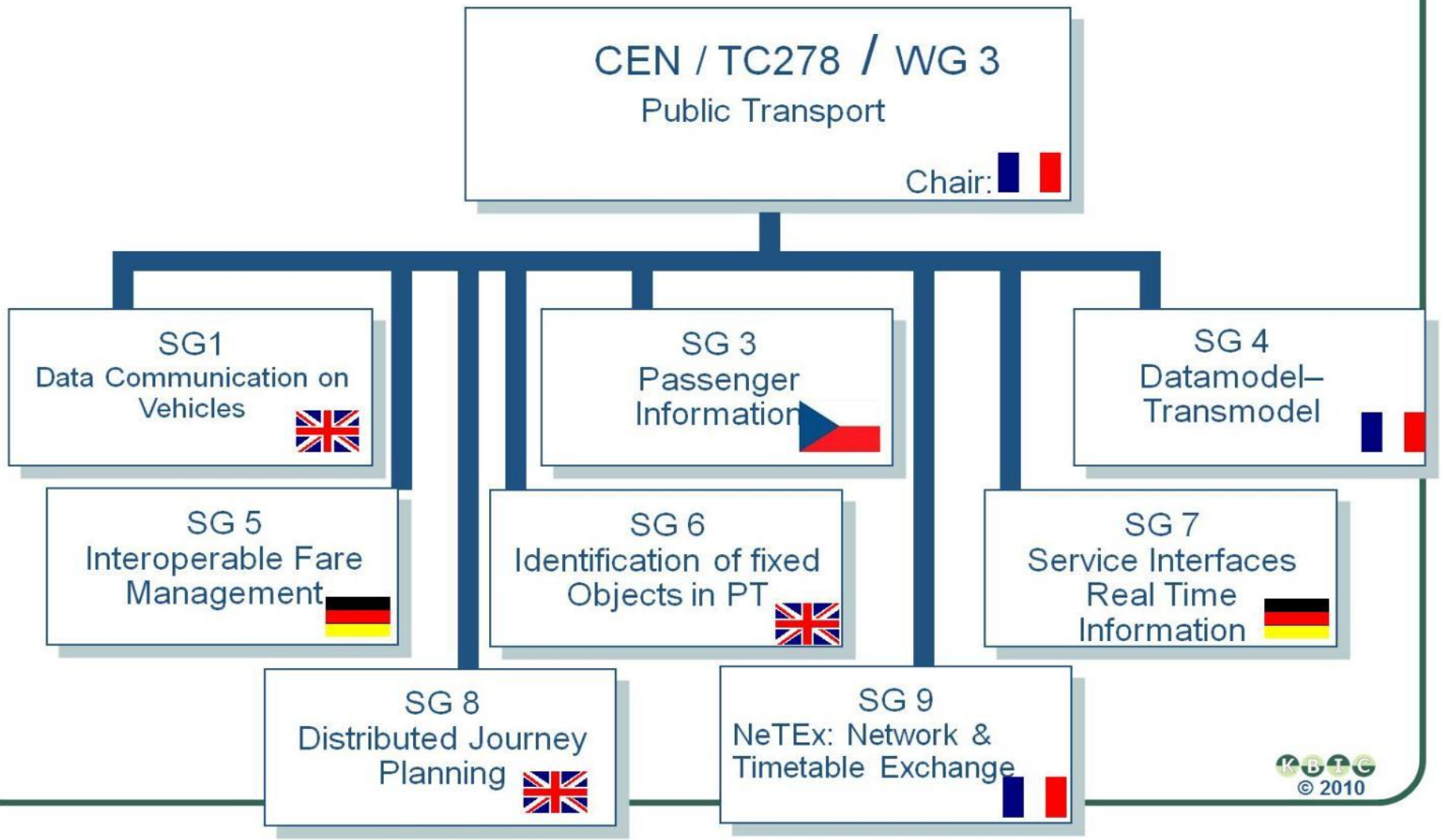
- National level

E.g. France afnor

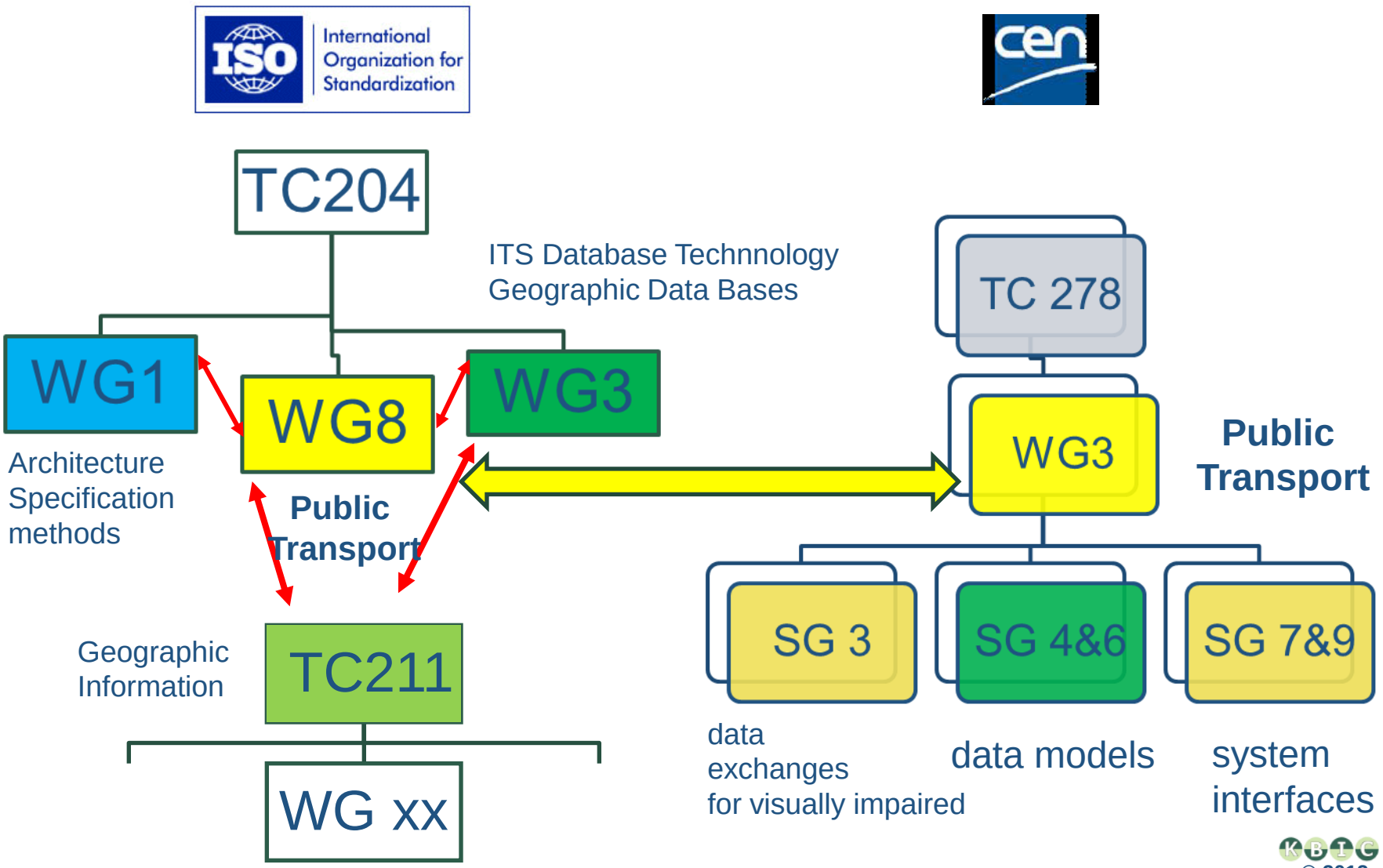
CEN/ISO Technical Committees & Working Groups



Overview of the sub-working groups



Multi-Modal Information: Main ISO – CEN Links



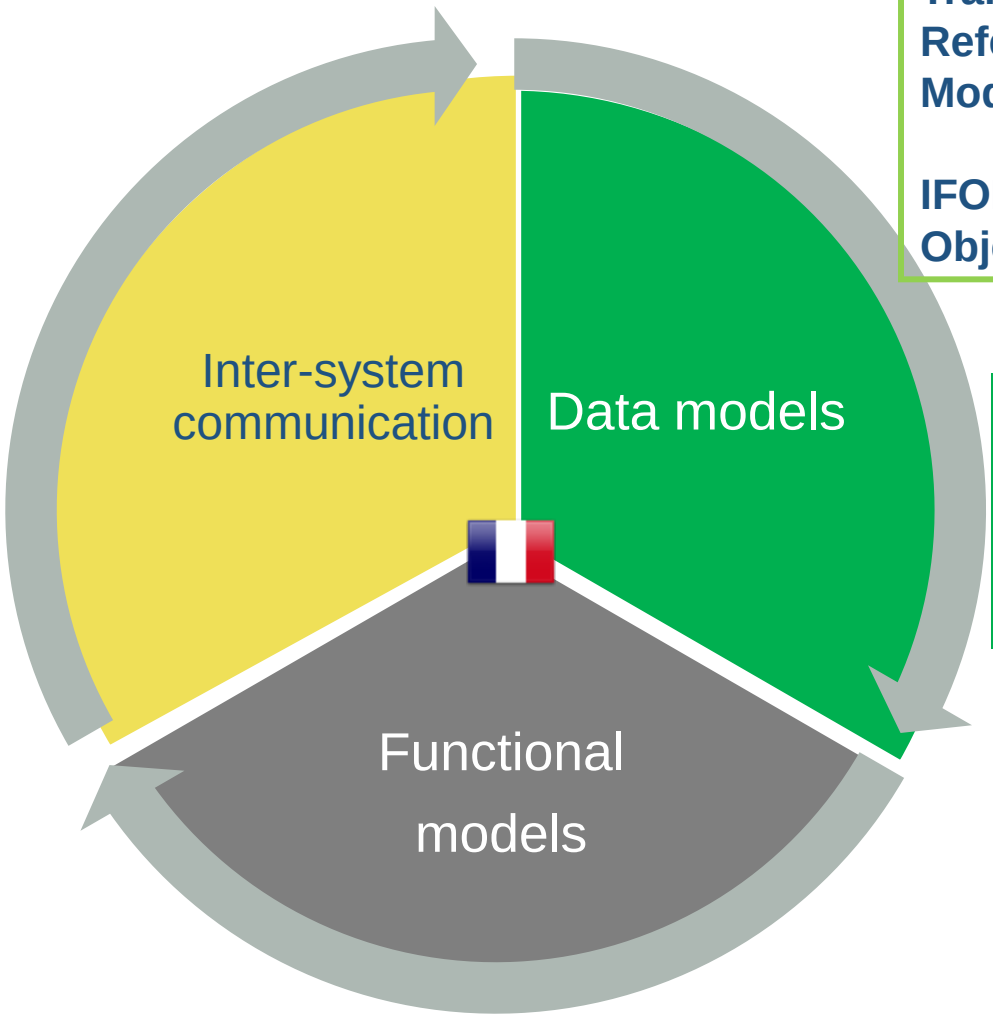
Multimodal Information Standardisation Topics in CEN

SIRI : Service Interface for Real-time Information

NeTEx: Network & Timetable Exchange

DJPS: Distributed Journey Planning (planned)

TI-VIP: Traveller Information for Visually Impaired (dormant)

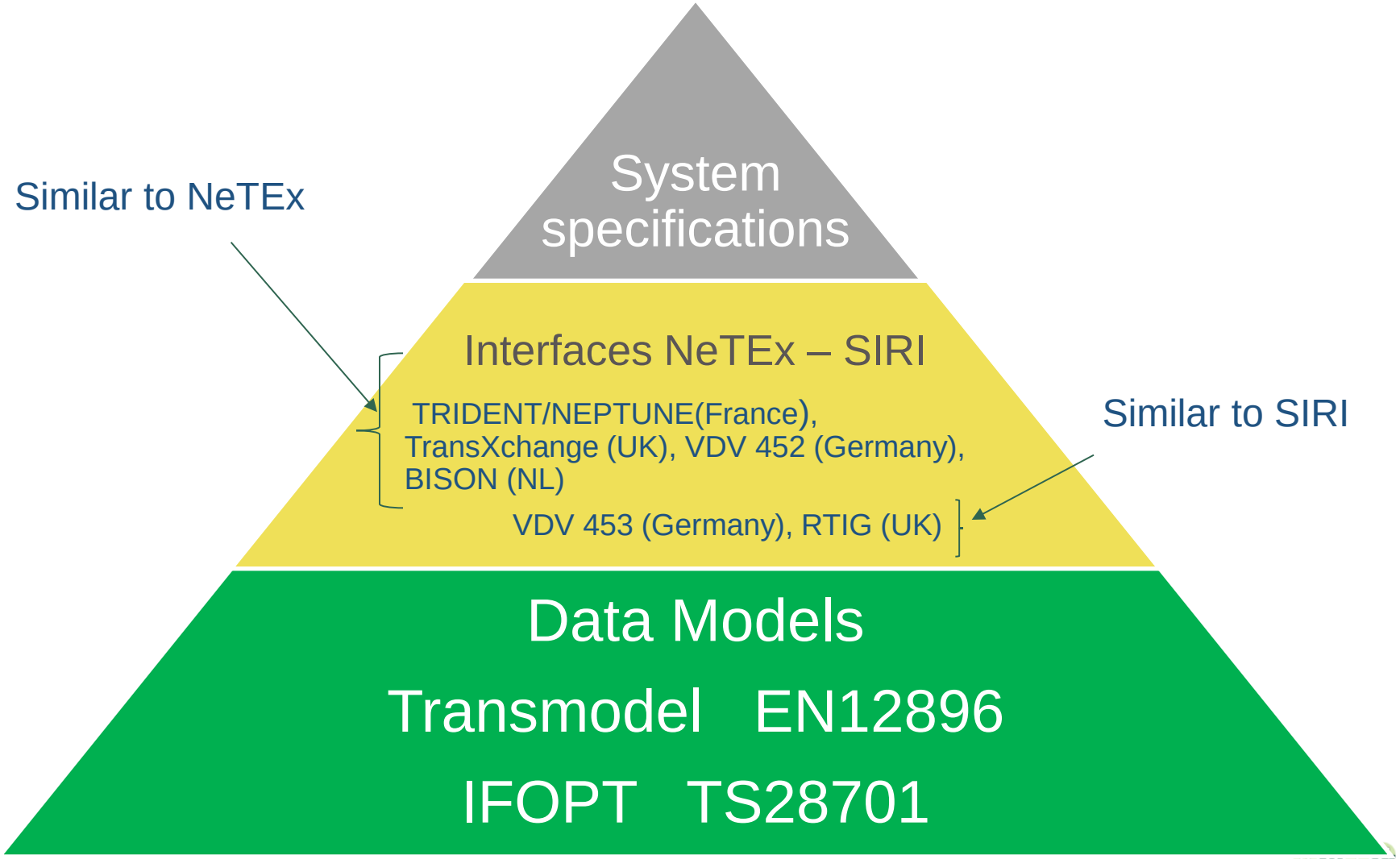


Transmodel: Reference Data Model for PT

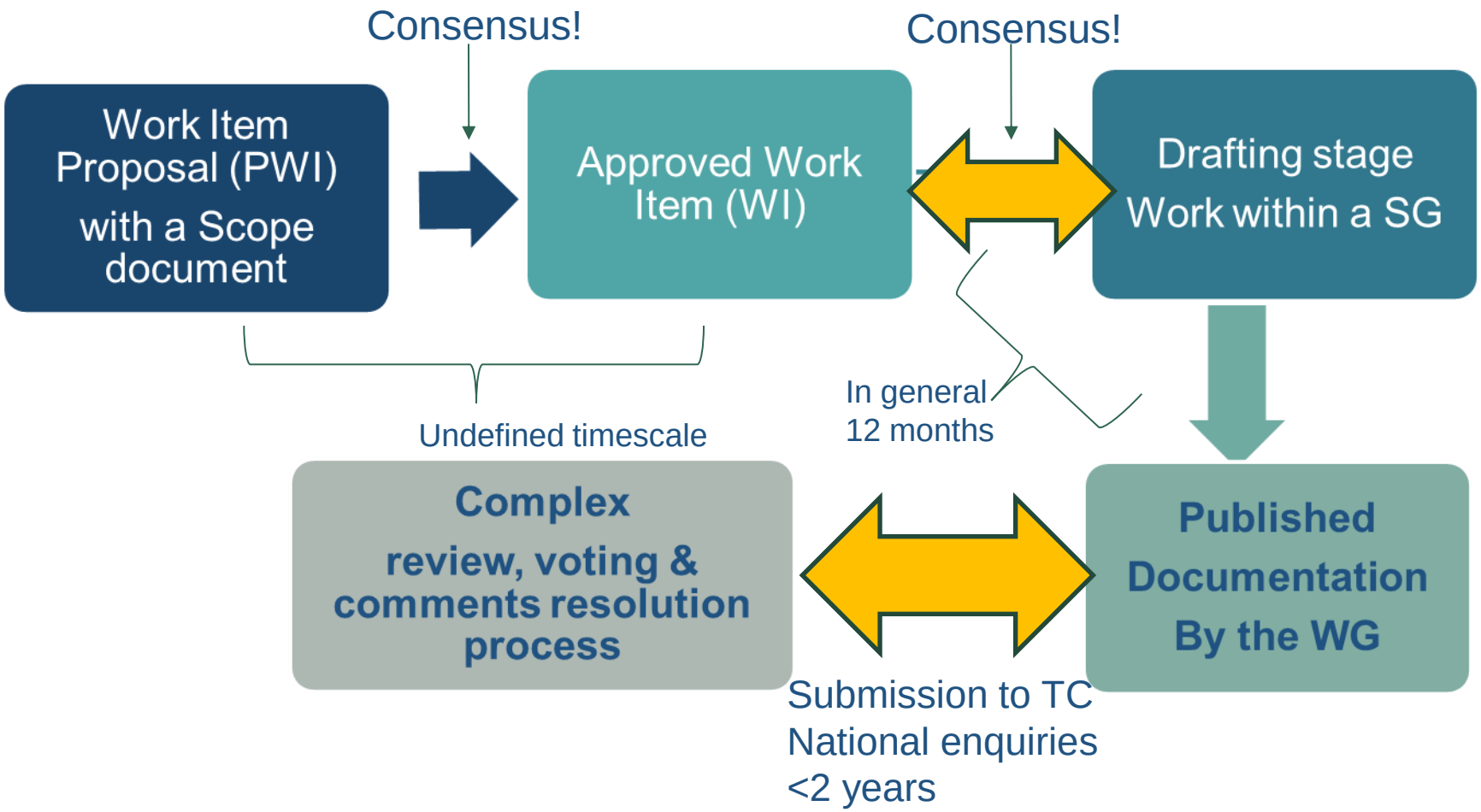
IFOPT: Fixed Objects for PT

ISO/ GDF: Geographic data Files

Interfaces: National Developments



CEN Standards Development Process : a Schematic View



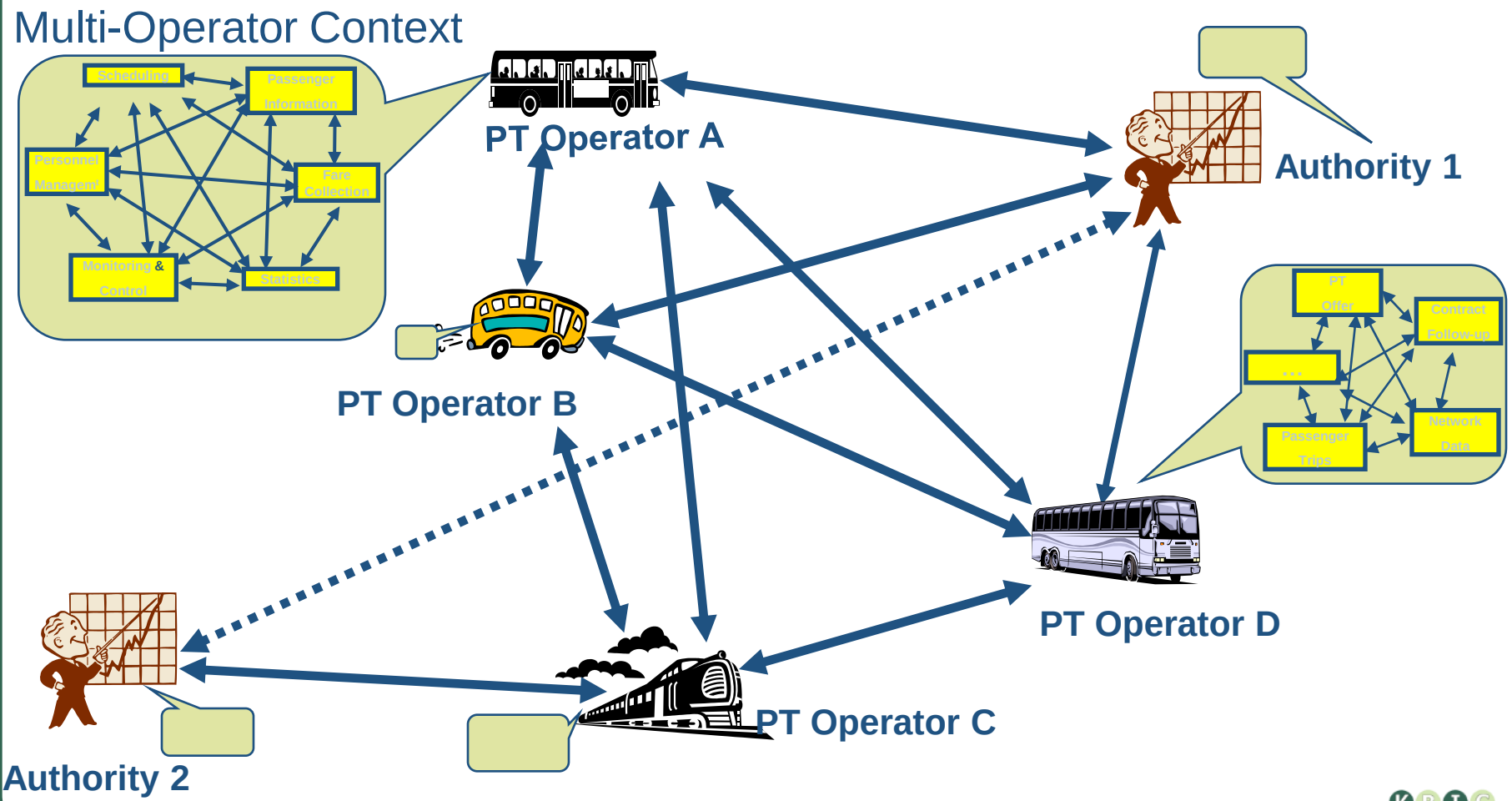
Documentation Types and Characterisitcs

- Result of standardisation: textual documentation (e.g. functional specification of a system, terminology, data model specification, interface specification, etc)
- Standards are in general not mandatory (except a small percentage)
- Have a different status from regulations/directives which are mandatory

CEN Data and Interface Standards

- Rationale & Approach
- Main standards:
  - Transmodel
  - IFOPT
  - NeTEx
  - SIRI

Rationale: Lack of Interfaces between Applications & Difficult Communication between Organisations



Data Modelling Levels

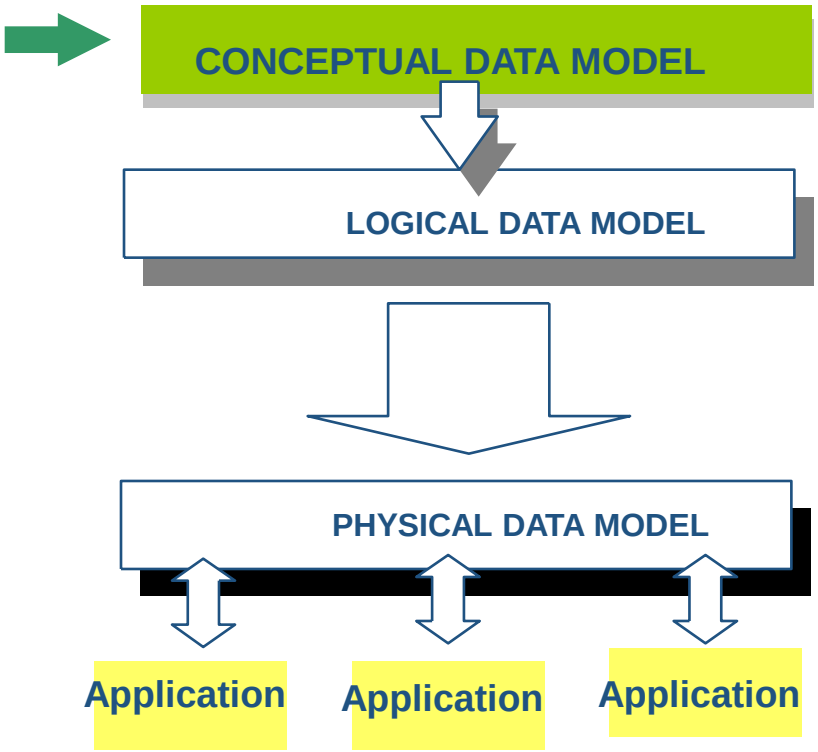
Three main steps:

- Semantics of a domain
- Hardware Independent
- No redundancy

- Choice of a data base type

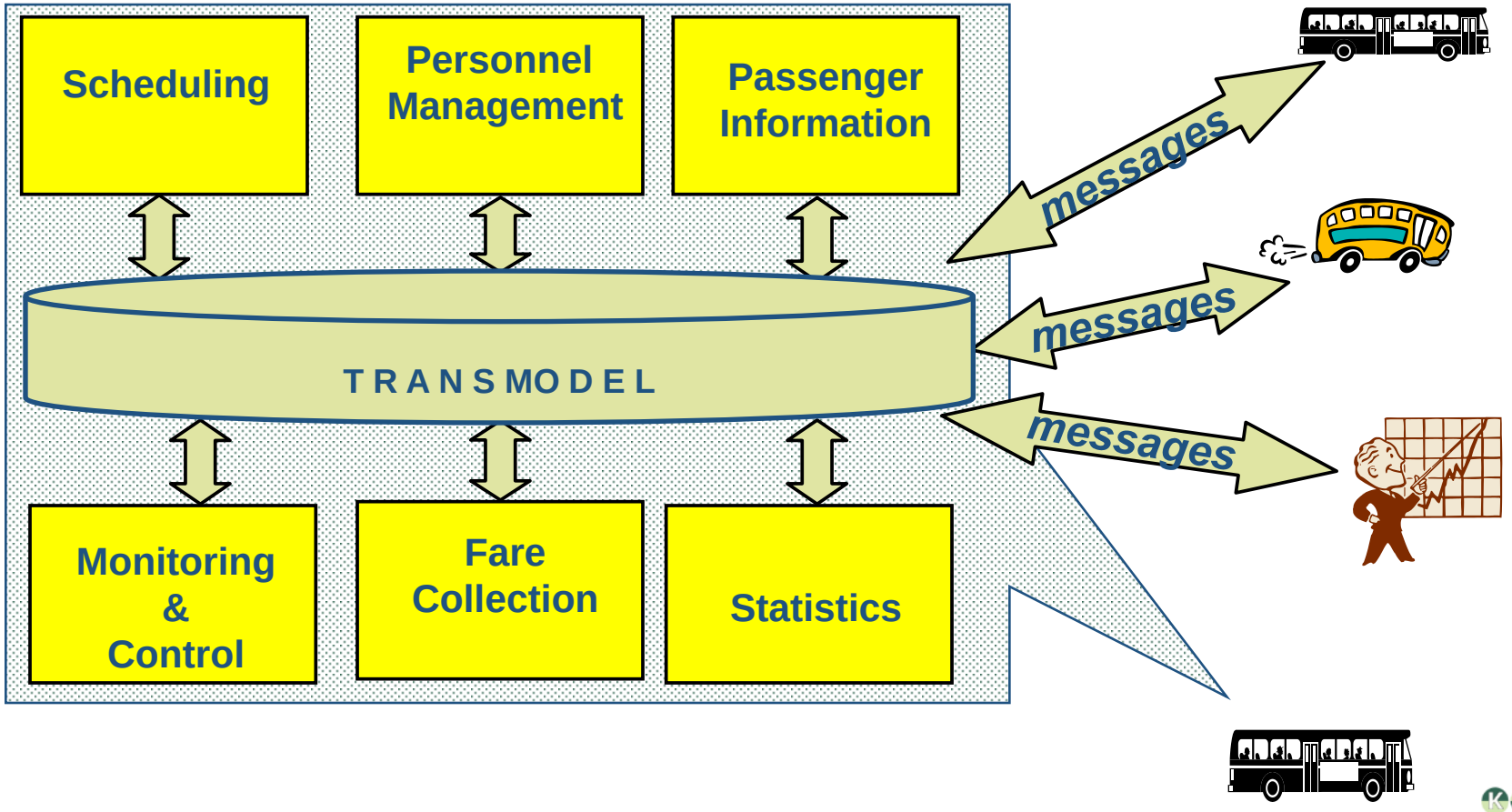
- Additional attributes
- Data formats
- Choice of a DBMS

- Controlled normalization optimisations & redundancies
- Organisational rules



Common Reference Data Model

offers the possiblity to generate a data repository or exchange messages based on a common semantical basis



Transmodel : Business Domains Considered

- Network (Spatial) Description
- Vehicle Scheduling
- Timetable Planning
- Driver Scheduling
- Rostering
- Driving Personnel Disposition
- Operations Monitoring and Control
- Passenger Information
- Fare Collection
- Management Information/Statistics
- Multi-modal Operation
- Multi-operator Context

- ***Transmodel is a EN***

IFOPT means: Identification of Fixed Objects for Public Transport

IFOPT is a Data Model

Major functional needs covered:

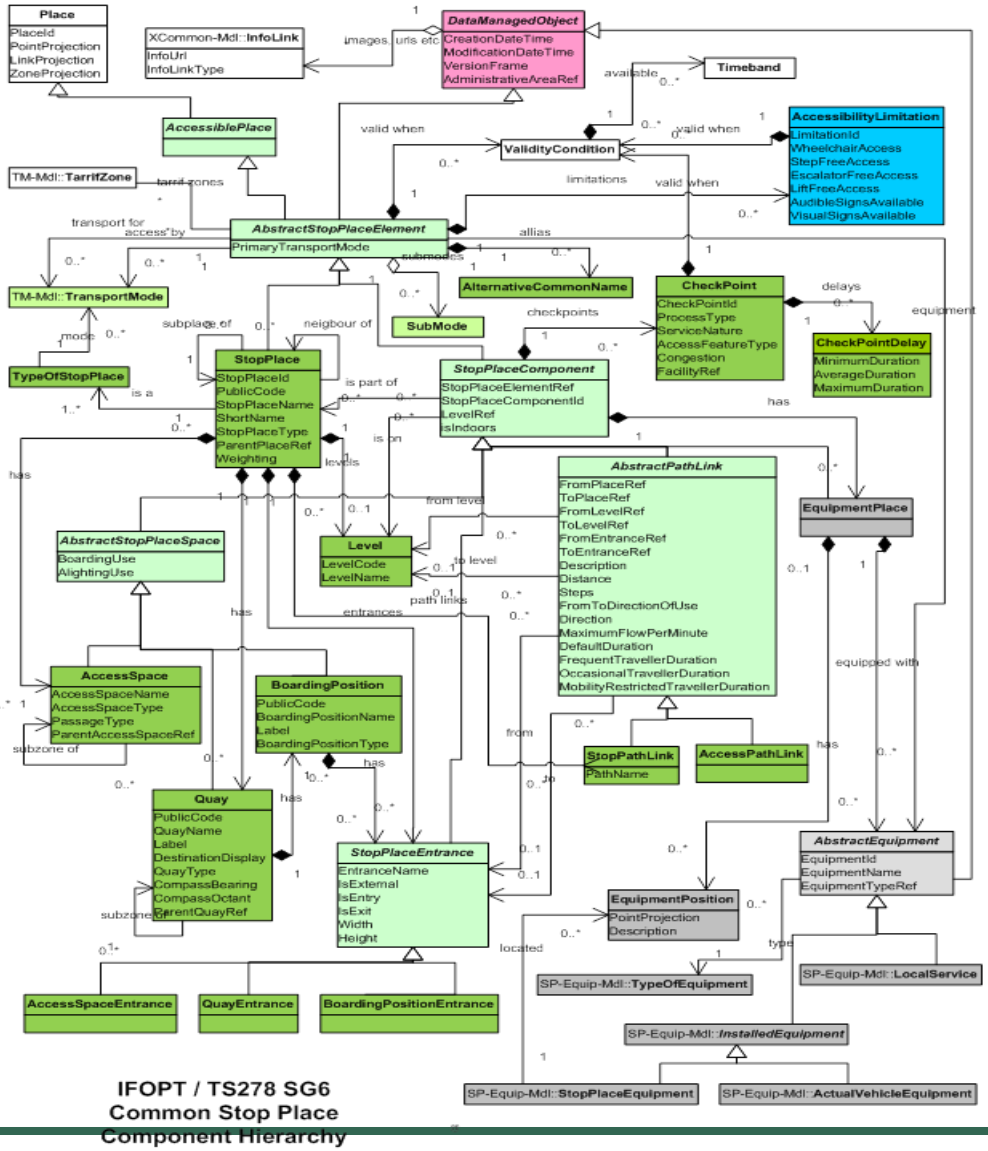
- Detailed representation of complex transfer nodes
- Advanced journey planning
- Clarification of the « Stop Point » concept
- Passenger guidance (at connections or through complex stations)
- Real time network situation description
- Dynamic quay assignment
- Trip preparation help for disabled
- PT accessibility support
- Etc

- ***IFOPT is a TS***
- ***Proposed to become an EN***

IFOPT Stop Place Model

- Gives a precise definition of the concept STOP POINT and its physical «reality »:
- Dedicated zone
- Quay
- Boarding position
- Vehicle stopping position
- Entrance,
- …

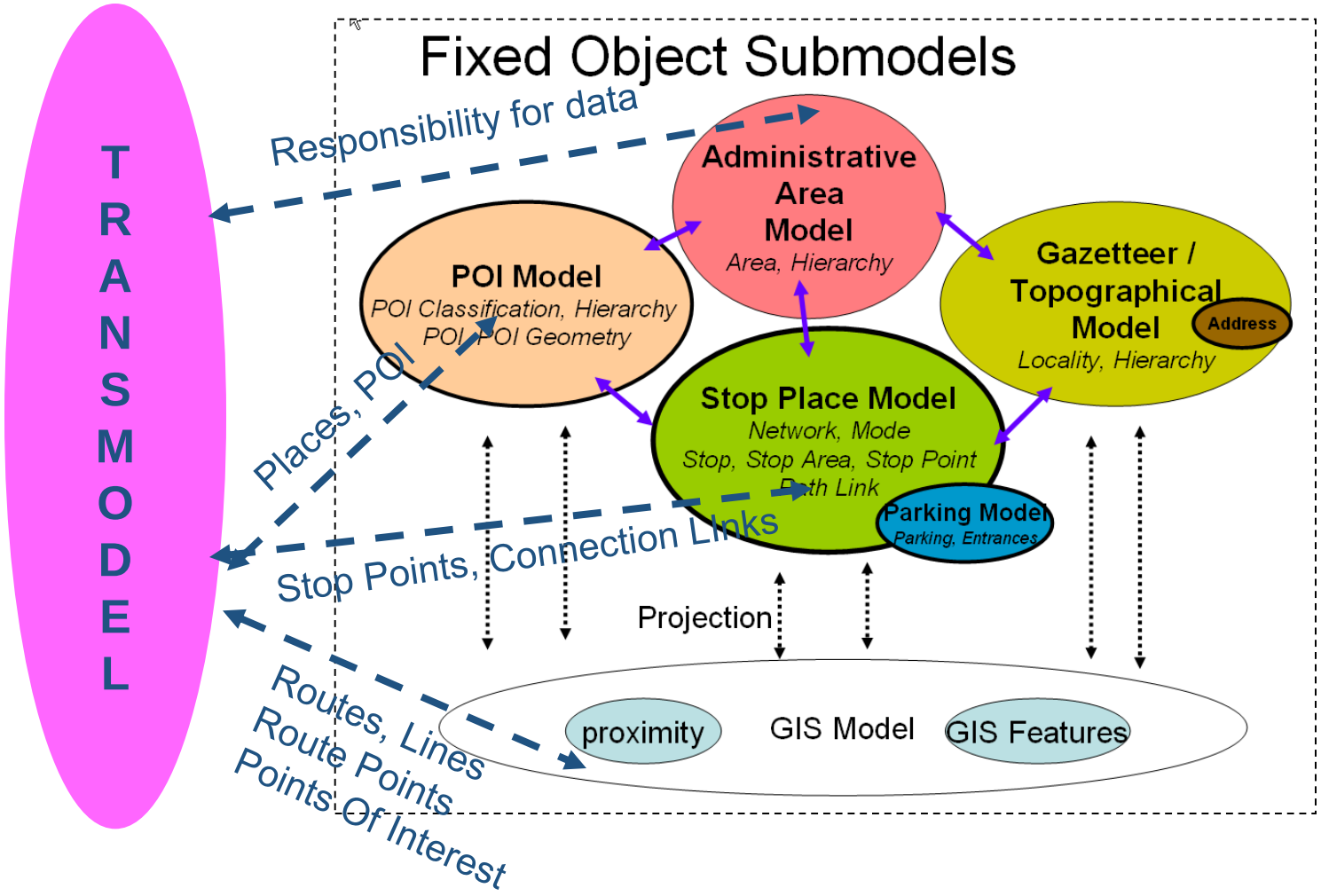
IFOPT Basic Stop Place Model



IFOPT / TS278 SG6
Common Stop Place
Component Hierarchy

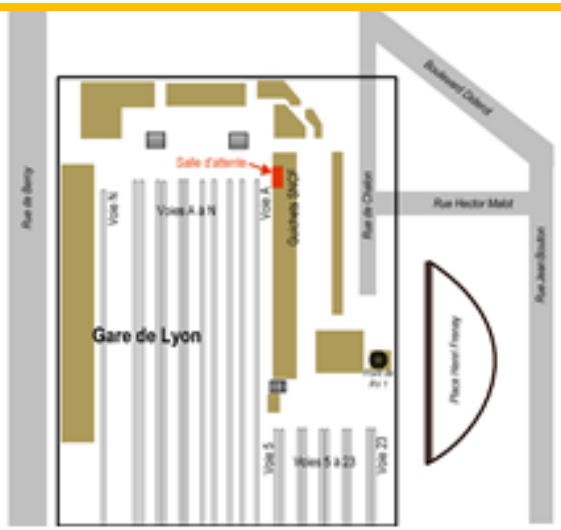
- The IFOPT Data Model is rich in attributes.
- It describes stop locations for passengers and for vehicles
- Locations dedicated to equipment are identified and a detailed model for Stop Place Equipmet is developed

IFOPT: Model Structure



Link IFOPT – Transmodel

Physical/geographic view

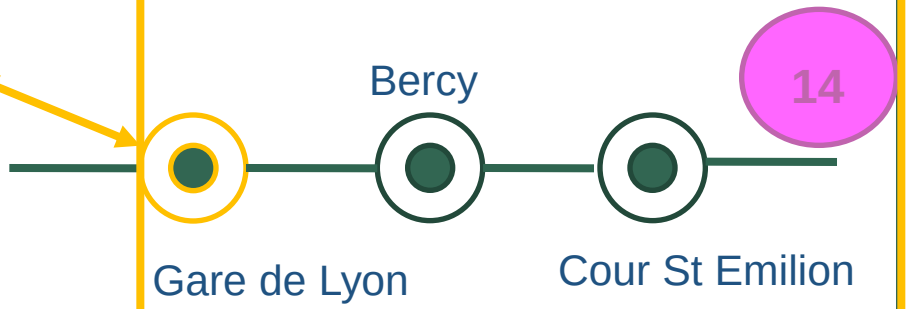


IFOPT

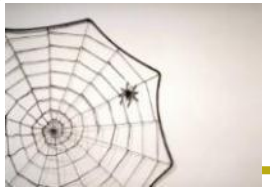
Details of a stop

Logical/macroscopic view

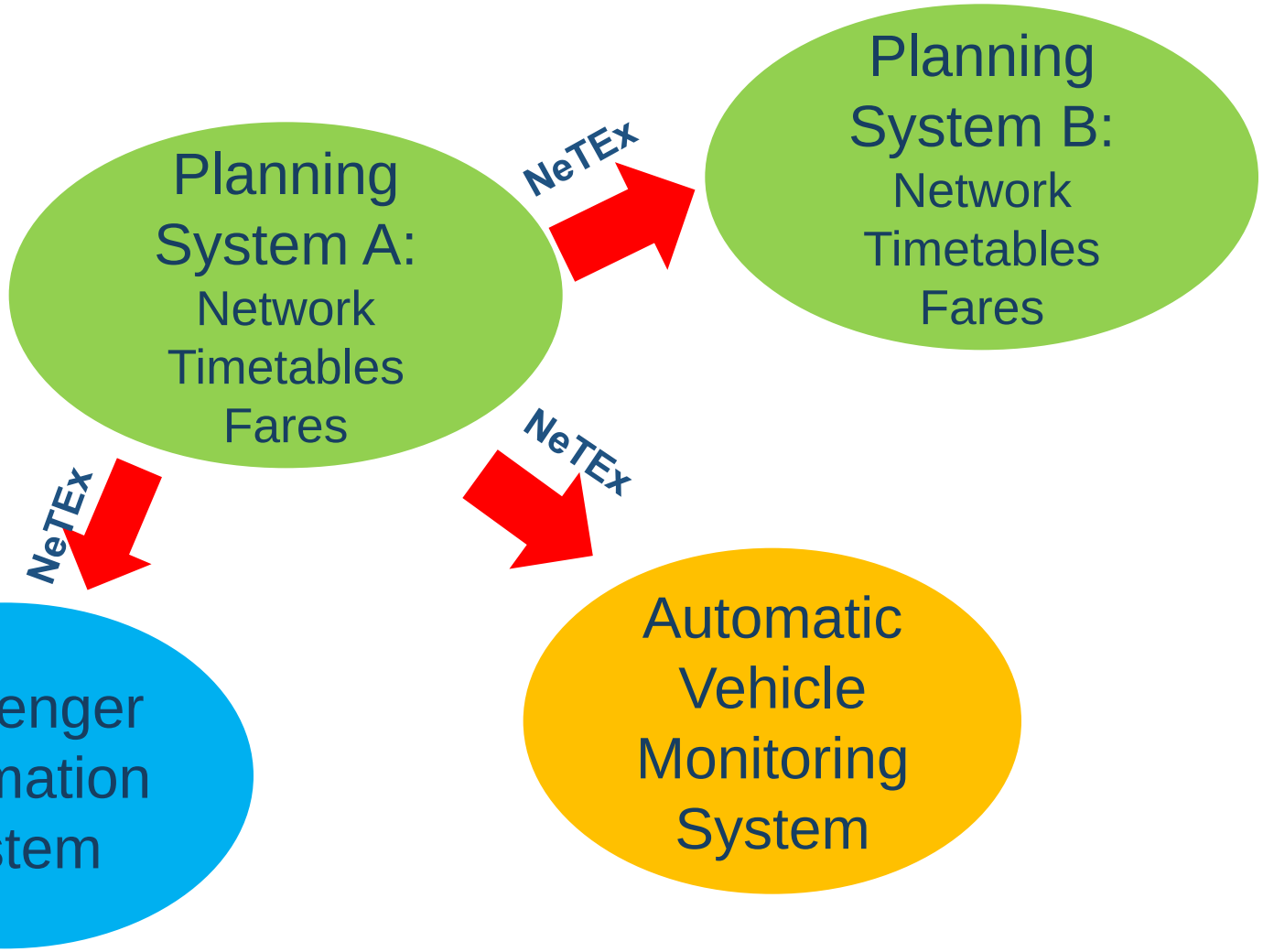
Transmodel



Global view of a stop



NeTEx Interfaces

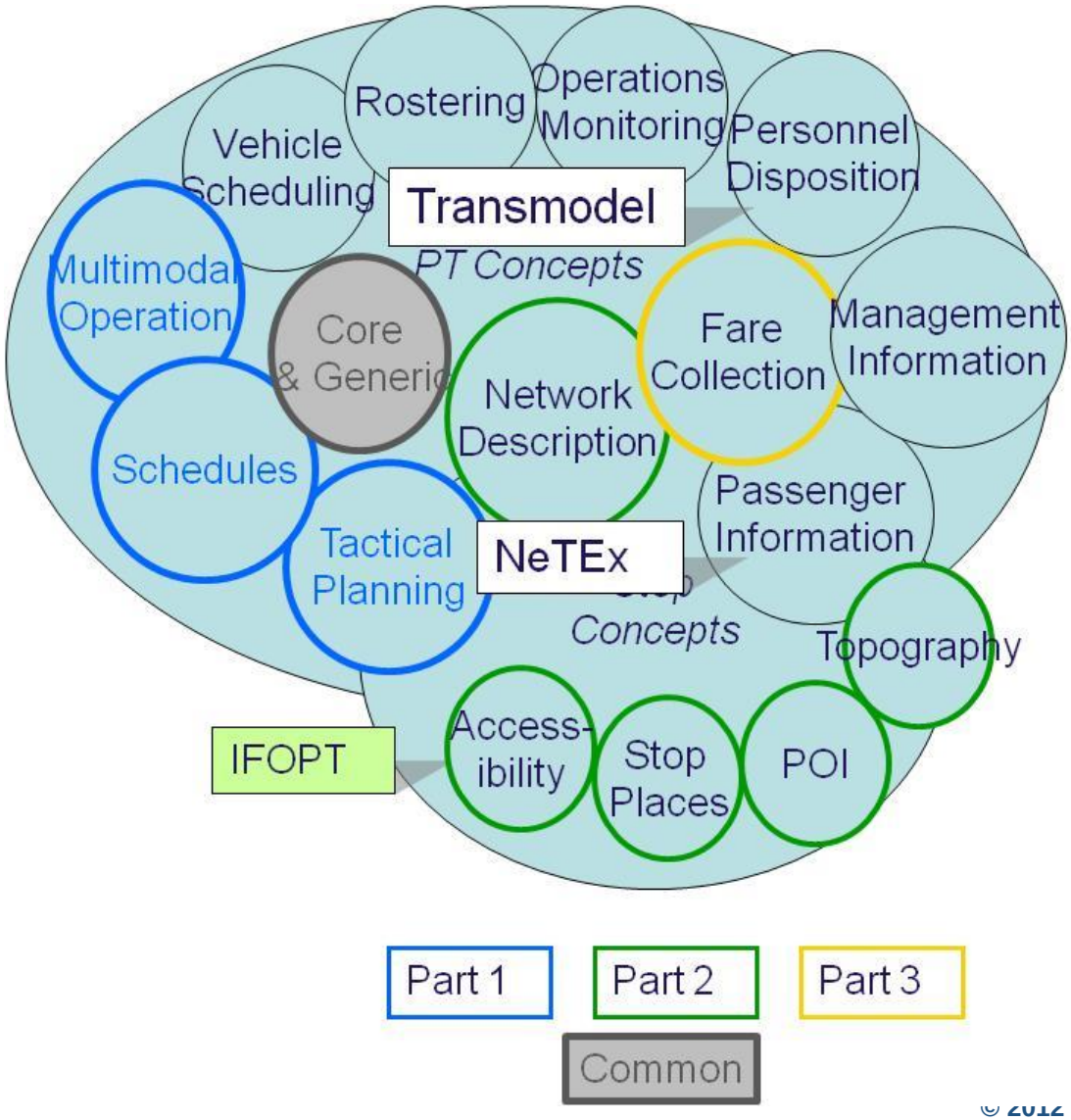


NeTEx is a TS – main parts to be published end 2012

NeTEx Approach

From Transmodel to NeTEx

1. Modularised: Transmodel Domain Model + harmonised with IFOPT
2. Created: a physical UML model: add attributes, formats, etc
3. Encoded: as XML schema
   - Reusable, Modular subpackages
   - Well defined dependencies
   - Uniform versioning and data ownership model
   - Validation with Examples of data from each country



Transmodel: PT model

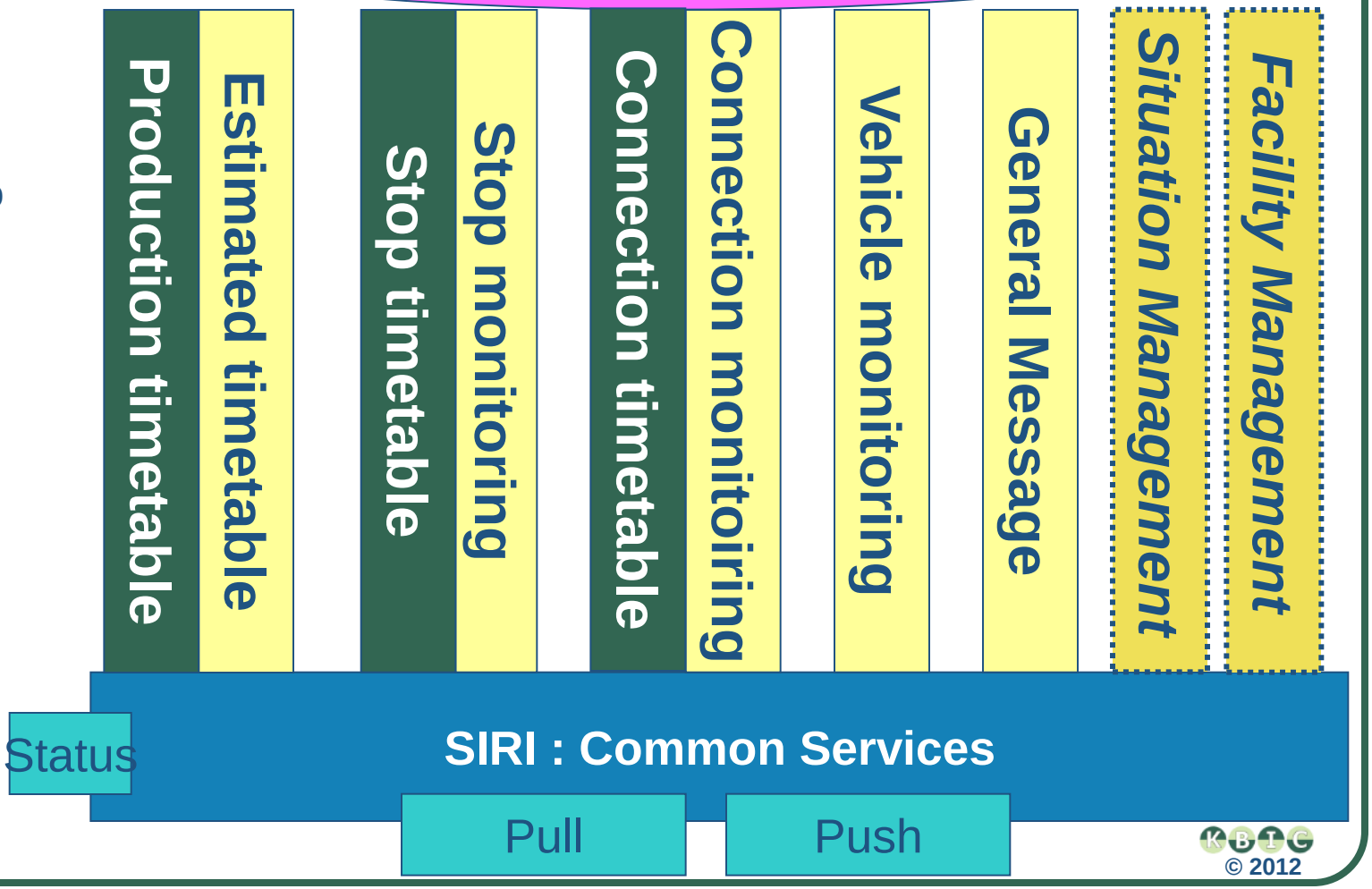
Stop Points, Vehicle Journeys, Lines, Journey Patterns, Vehicles, etc

SIRI is for Real Time Information Exchange

Structured into a range of services

Common data transport layer

SIRI is a TS



Currently known SIRI Users

EU : Germany , France, Ireland, Norway, Sweden, UK

Switzerland, Australia - considered

Israel

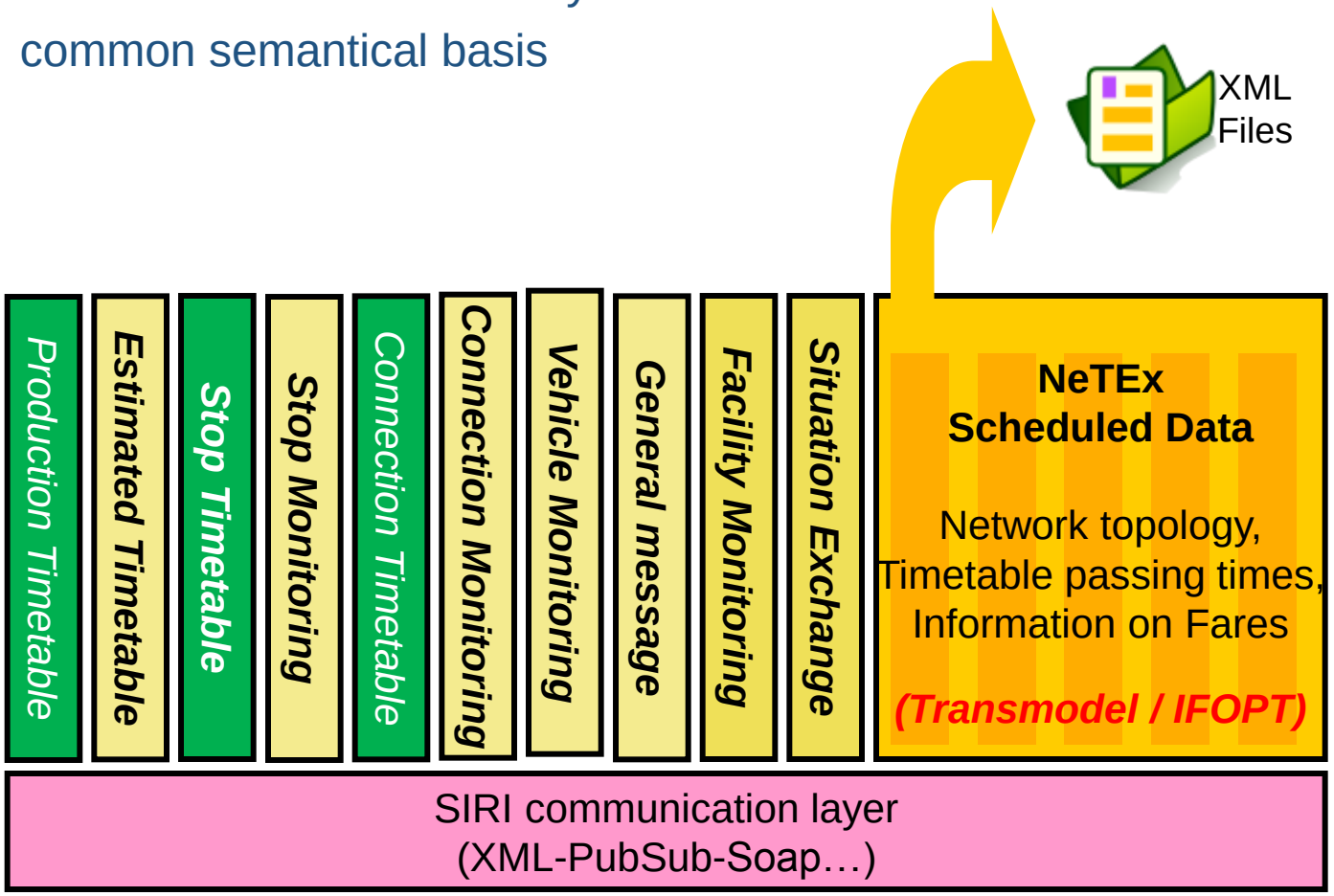
Canada, USA

China (Shanghai)

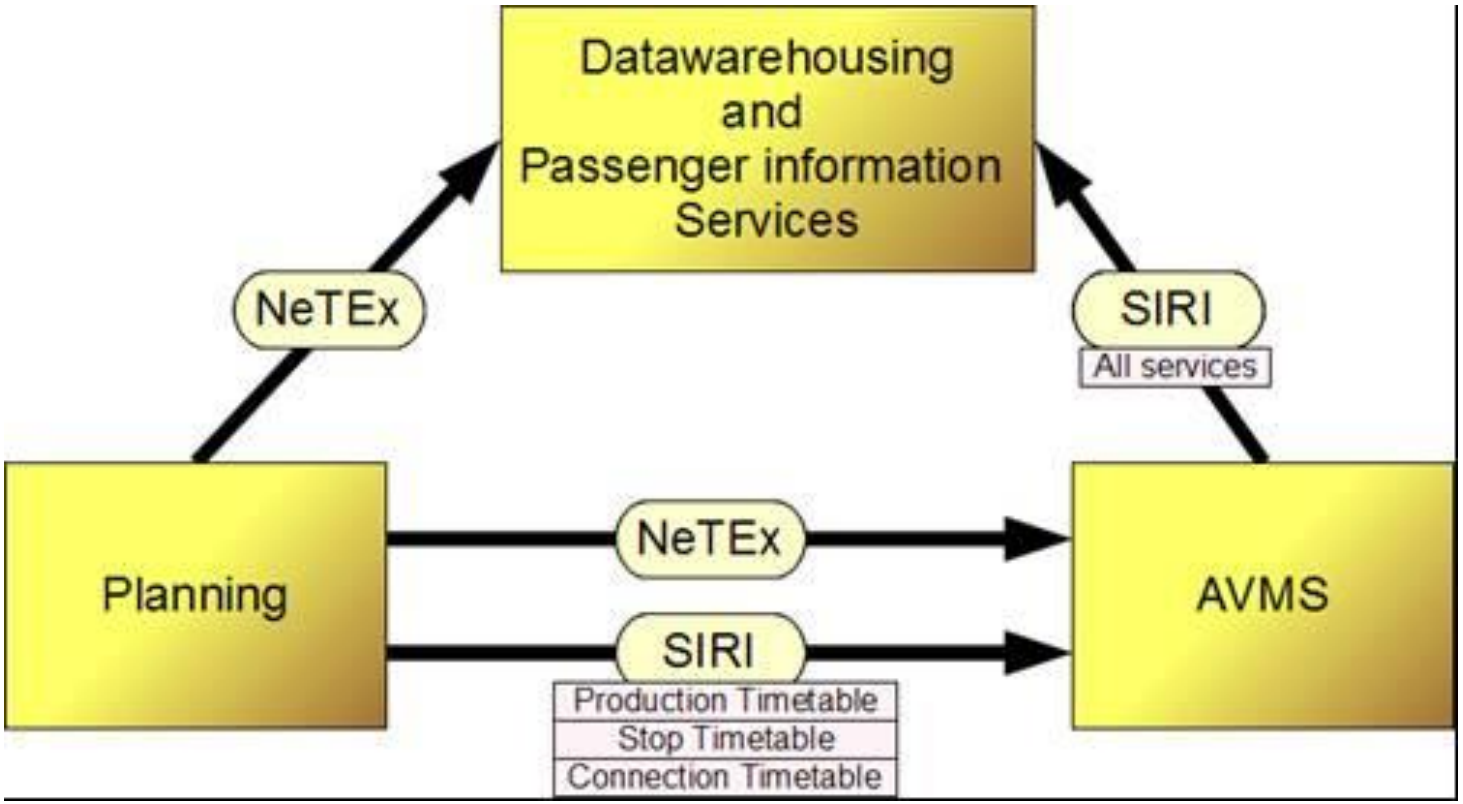
https://groups.google.com/group/siri-developers

Link NeTEx – SIRI (1)

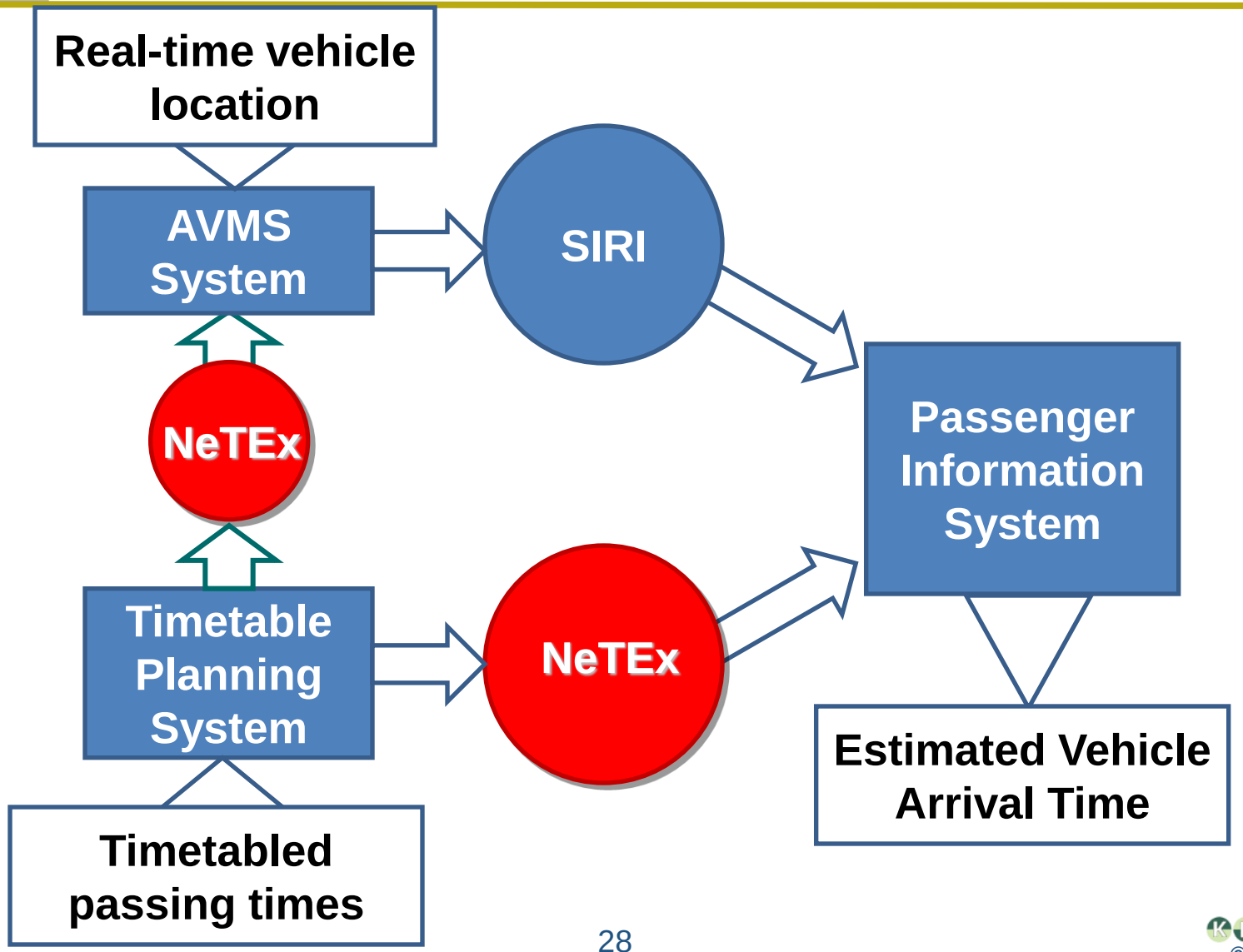
- common communication layer
- common semantical basis



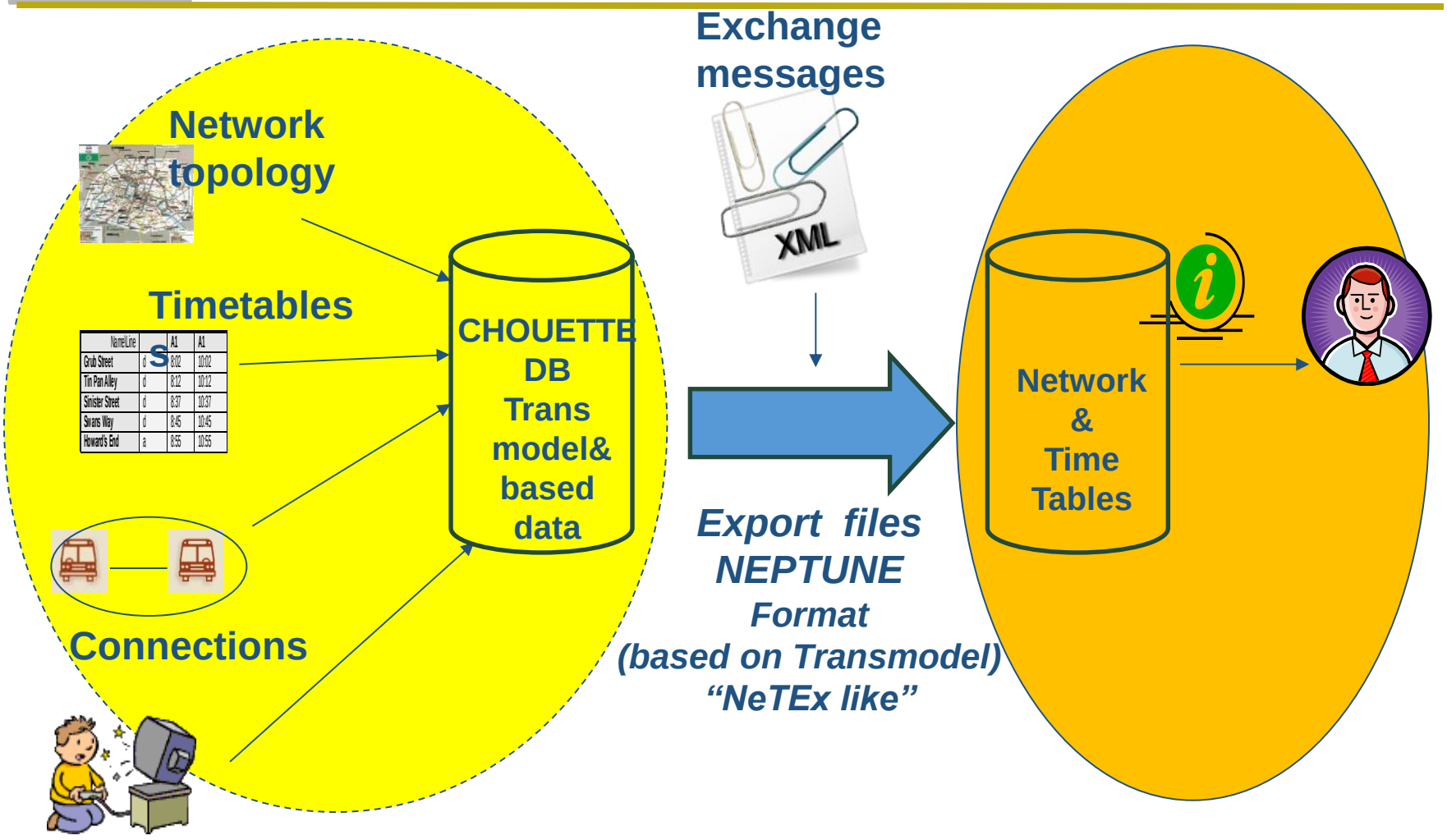
Link NeTEx – SIRI (2)



NeTEx & SIRI : example of a Use Case



Use of Standards Suite in France: Standard based DB and Interface



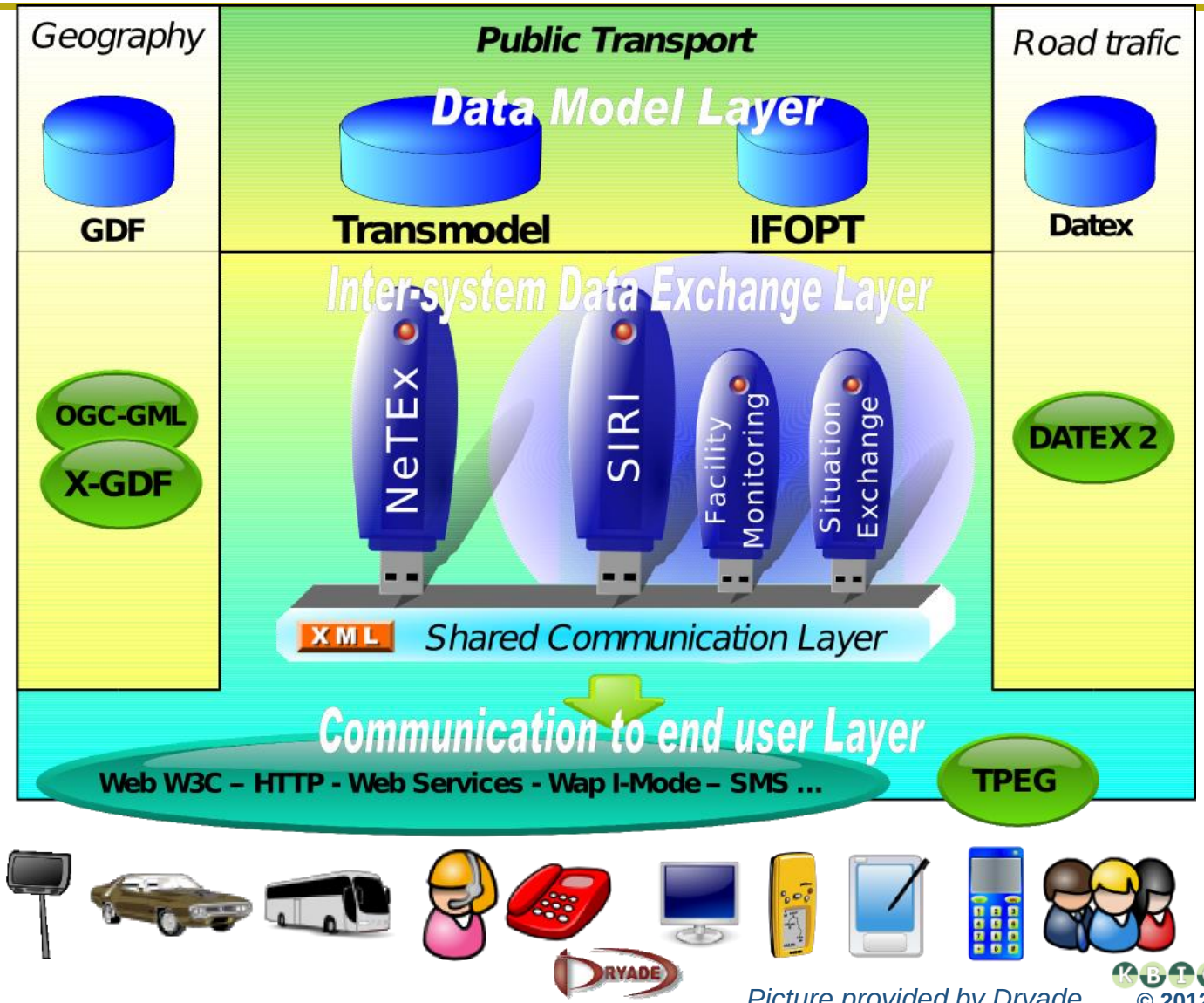
CHOUETTE - tool: data capture & export

Overwiew on PT data standards

Data Model

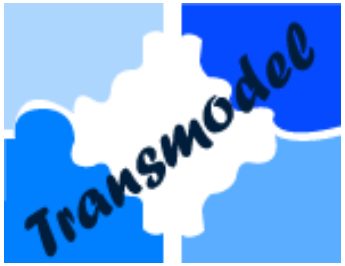
Inter-System Data Exchange

End-user communication



Picture provided by Dryade

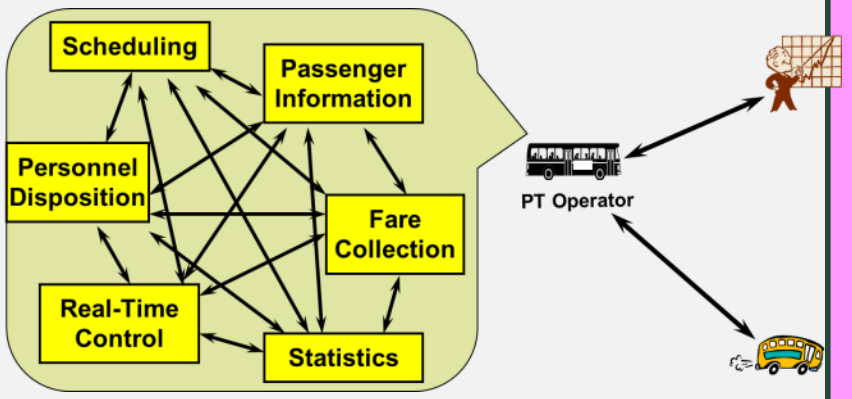
Transmodel in Brief



- Methodology and examples
- Domains covered
- Current status & usage

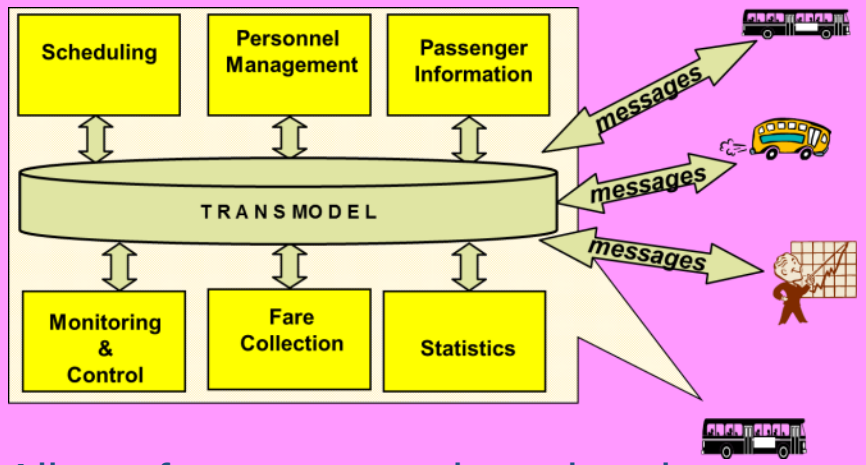
System Complexity & Lack of Interoperability

Complex System Architecture



- Information system complexity
- lack of interoperability
- proprietary applications
- lack of open, common system specifications

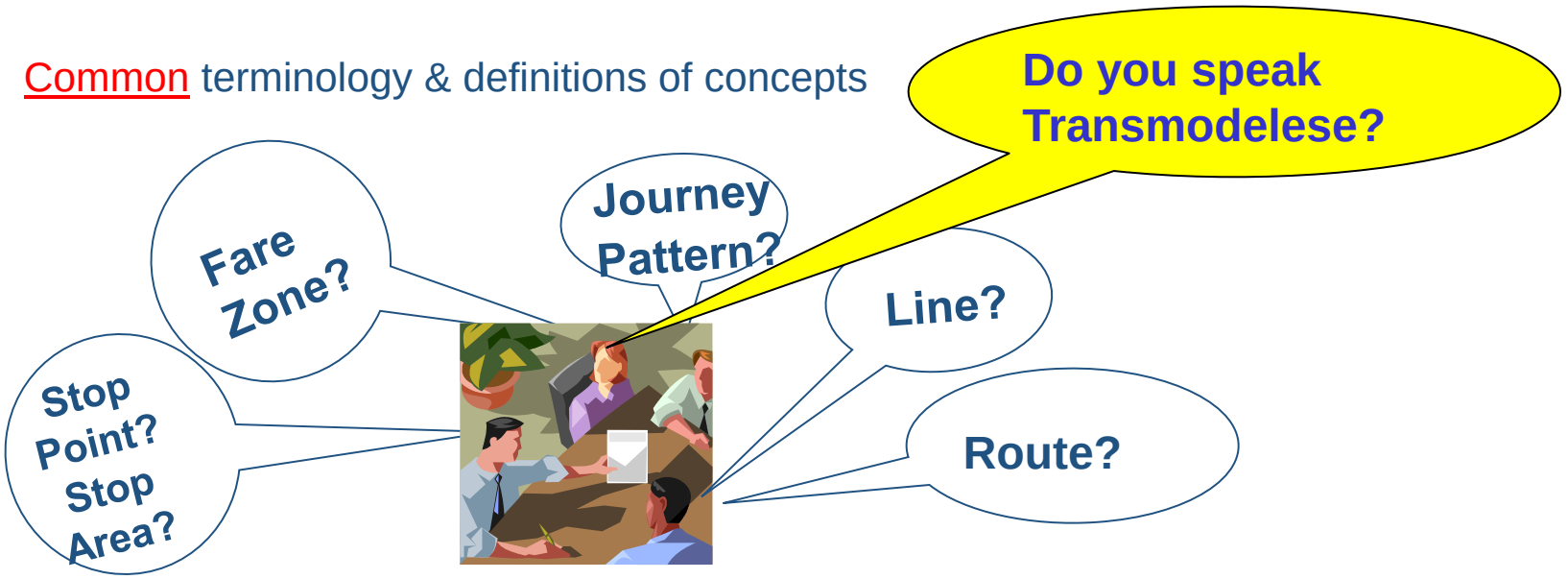
TRANSMODEL – based System Architecture



- Allows for a progressive migration
- Opens the market
- Reduces development costs
- Considers intermodality & multi-operators
- Is hardware independent
- Considers a variety of European practices

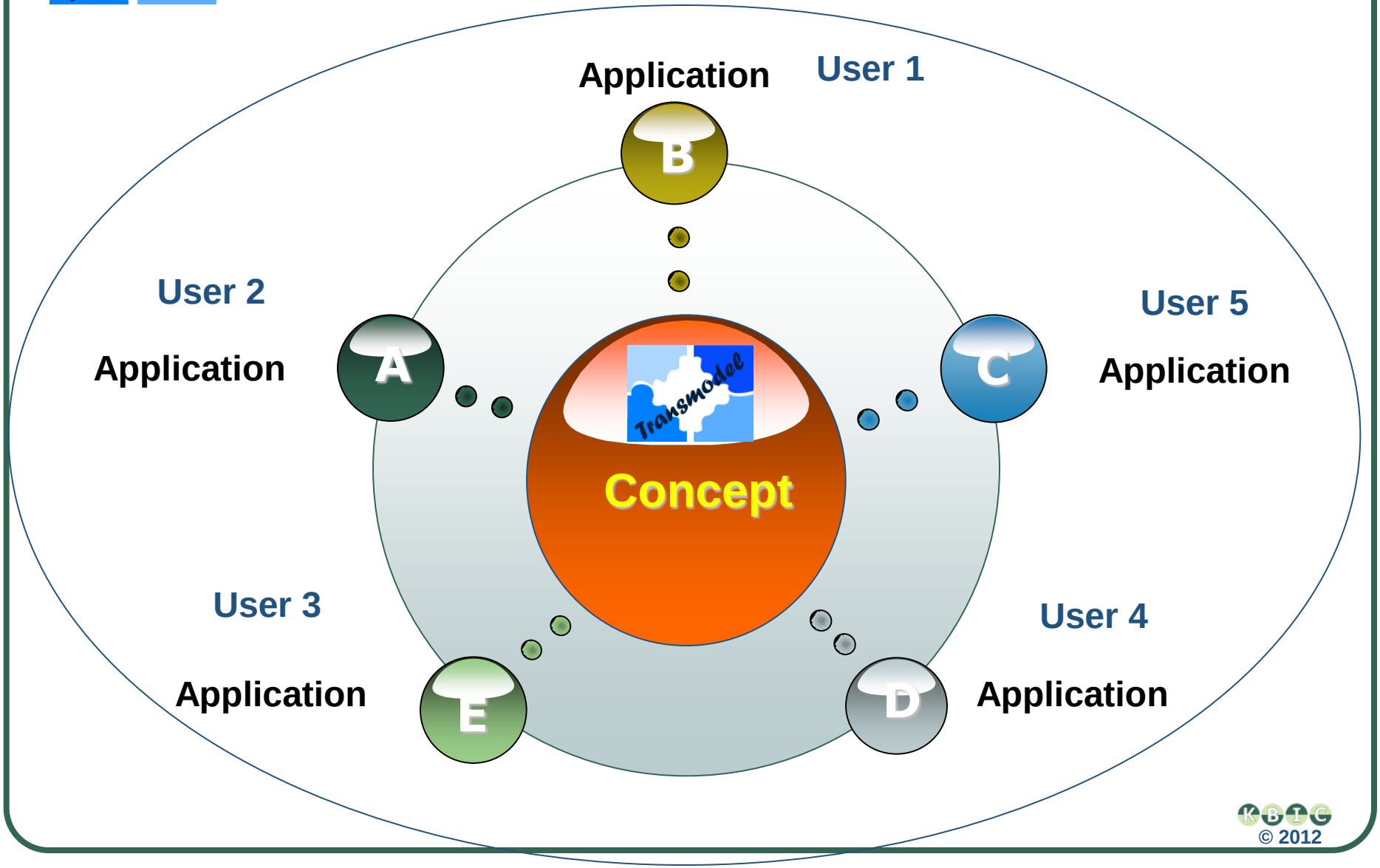
Characteristics : a Communication Tool

- Common terminology & definitions of concepts

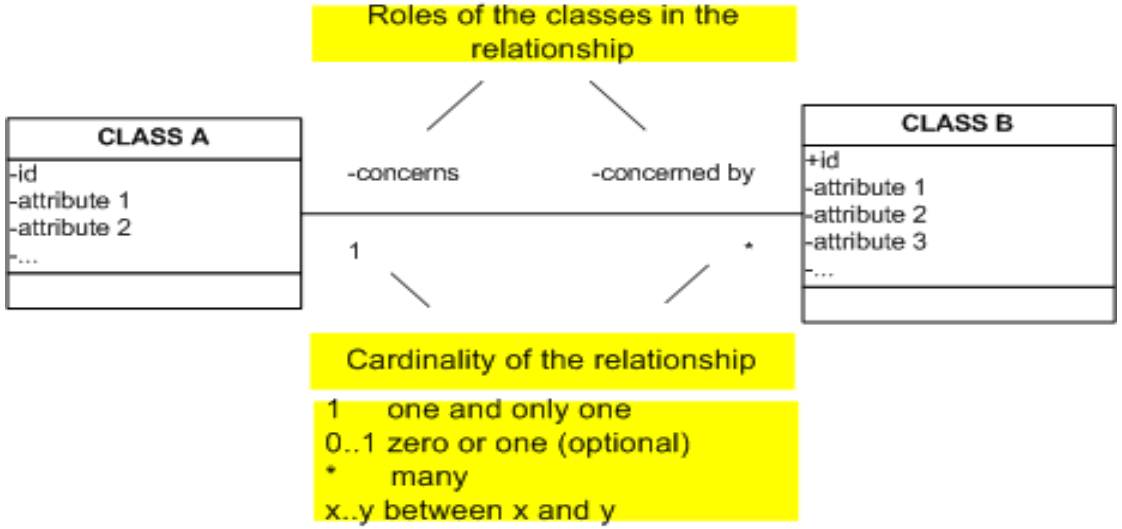


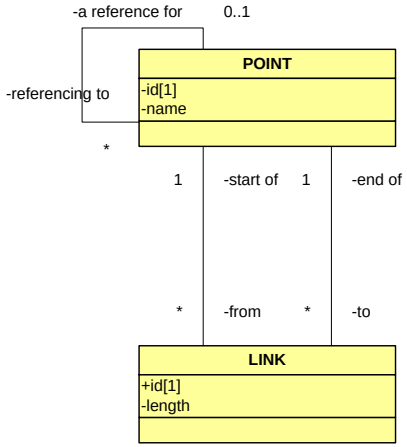
- Genericity: necessity for a separation of concerns
- Elementary information: out of which other information may be derived

Transmodel "Philosophy"



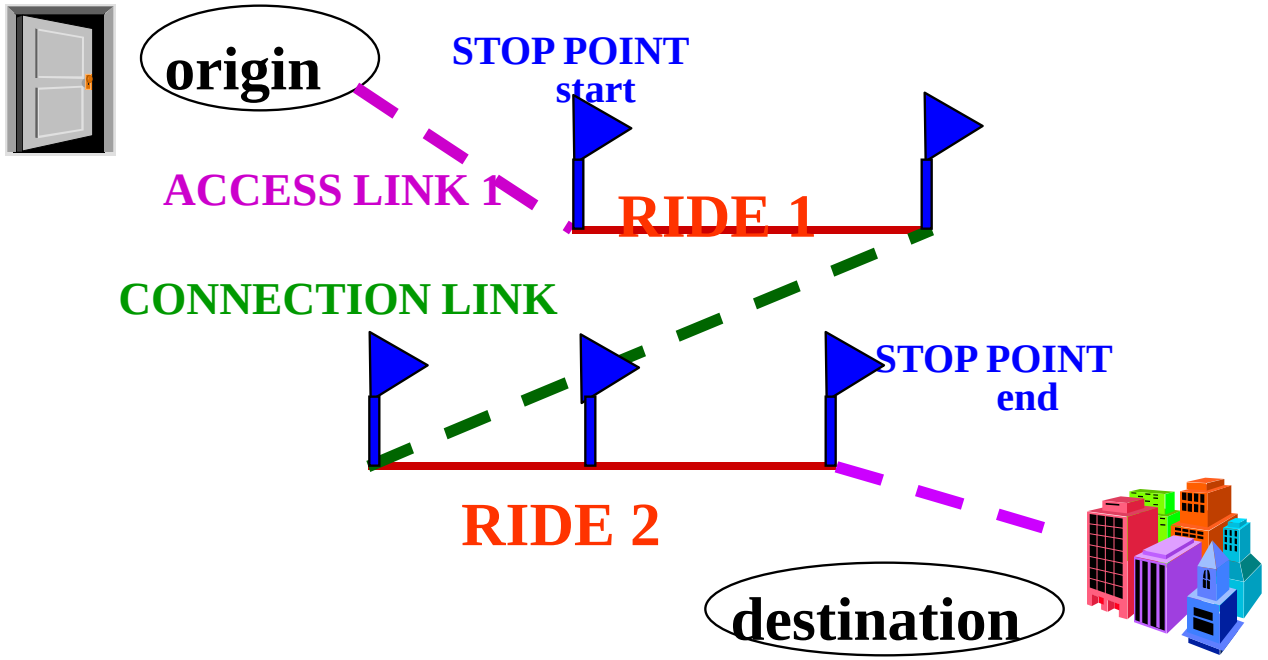
Transmodel in UML



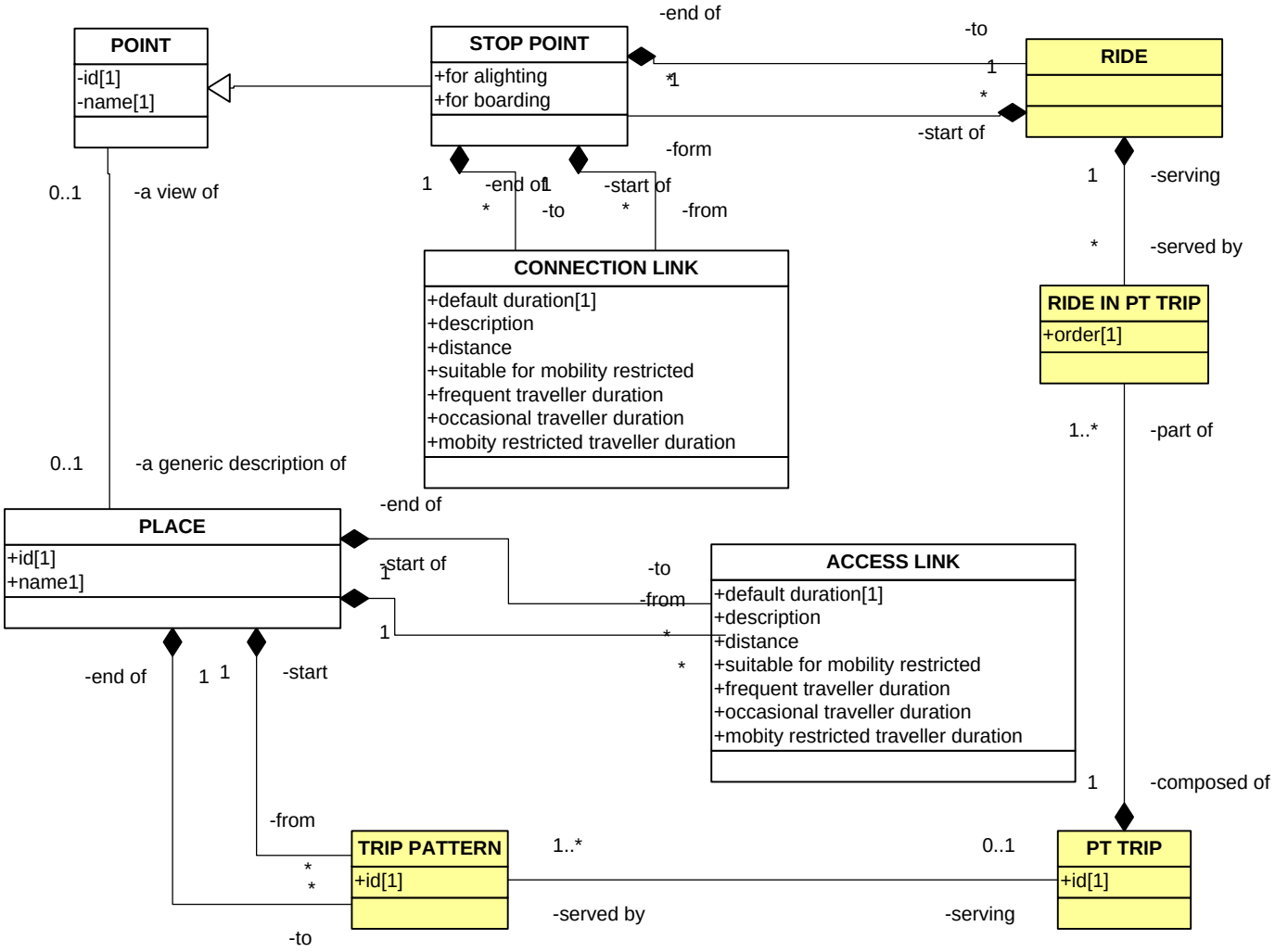


- A link between two points (here stop points)

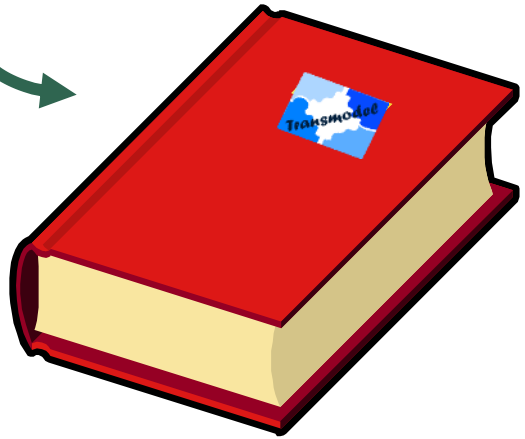
- Modelling ot the concept of « Passenger Trip »



Modelling of a Passenger Trip: Necessary Data Structure

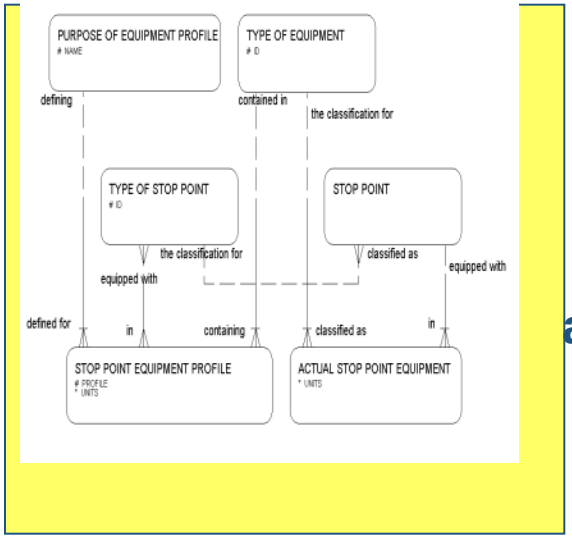


Data Dictionary: 357 terms



azertqsd
fggghhs
dffghjkk
wxcvbb
bnnjjwc
hjkx

Data Structures: 61 diagrams



E/R Barker « Oracle » formalism

expressed also in UML

Textual explanations

Normative part (around 200 pages)
Informative appendices (around 400 pages)

Documentation : CEN TC278 : www.transmodel.org

How to work with Transmodel

Transmodel - dedicated to urban PT - considers several functional domains and practices throughout Europe

- Is large & complex (but reality is complex…)
- Is abstract in some aspects
- Additional analysis is necessary before implementation:
  - Extracts: what do we need ? what is not necessary for us?
  - Additions: do we need additional concepts? attributes?
  - Optimisations: e.g. do we need to access some data frequently?
  - Definition of data formats

Historical Background and Current Status

1989
1996

European Projects:
Cassiope, EuroBus, Harpist

Transmodel V4.1
ENV 12896

E/R "Oracle" formalism

1997
1999

European Project
TITAN 1 & 2
Implementations
Transmodel V5.0: multi-modality, real-time control, layers, data versioning

2000
2003

French/German
Project SITP
Transmodel V5.1

UML formalism added

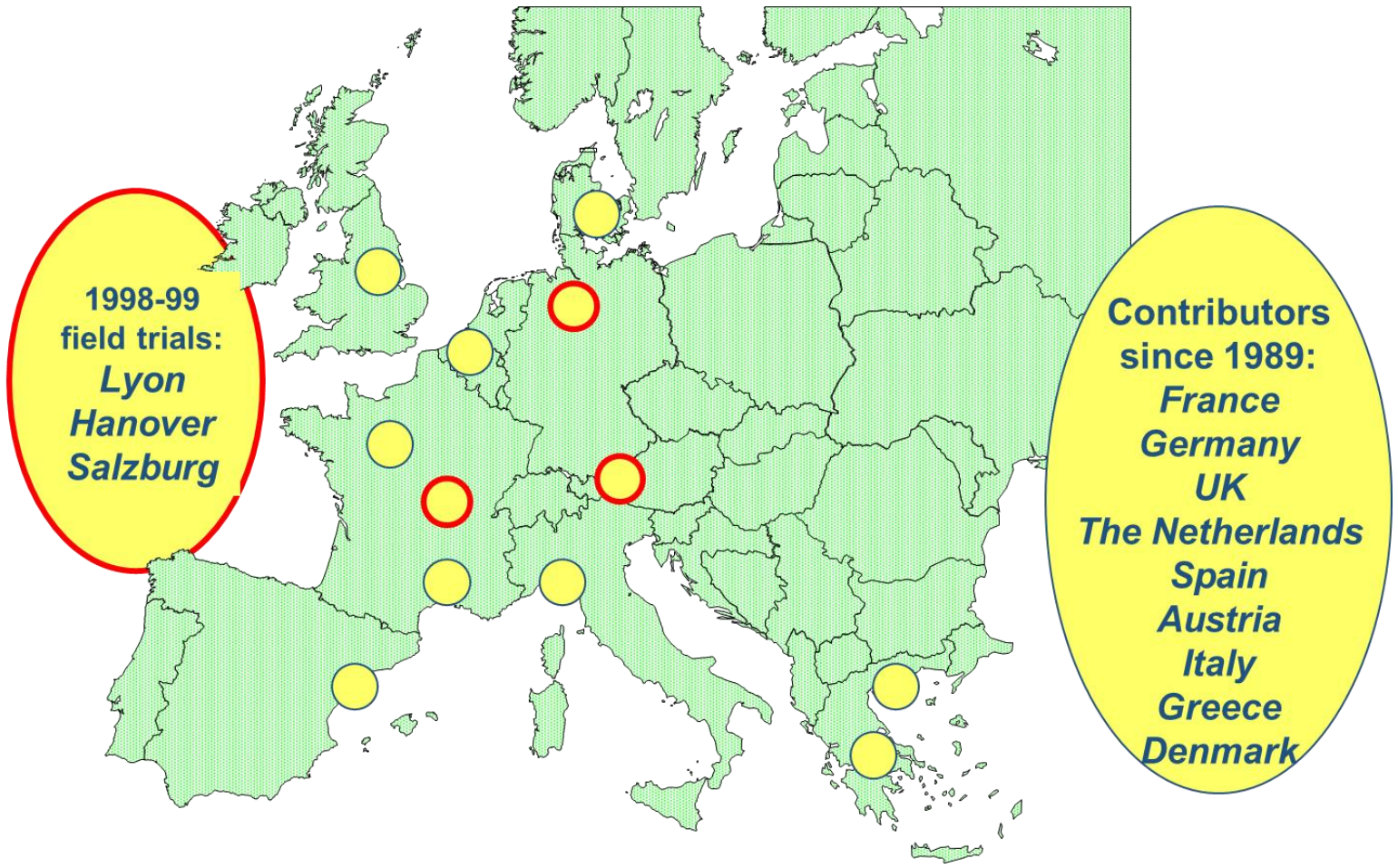
2006

CEN TC278 WG3 SG4:
Transmodel V5.1
voted as EN12896

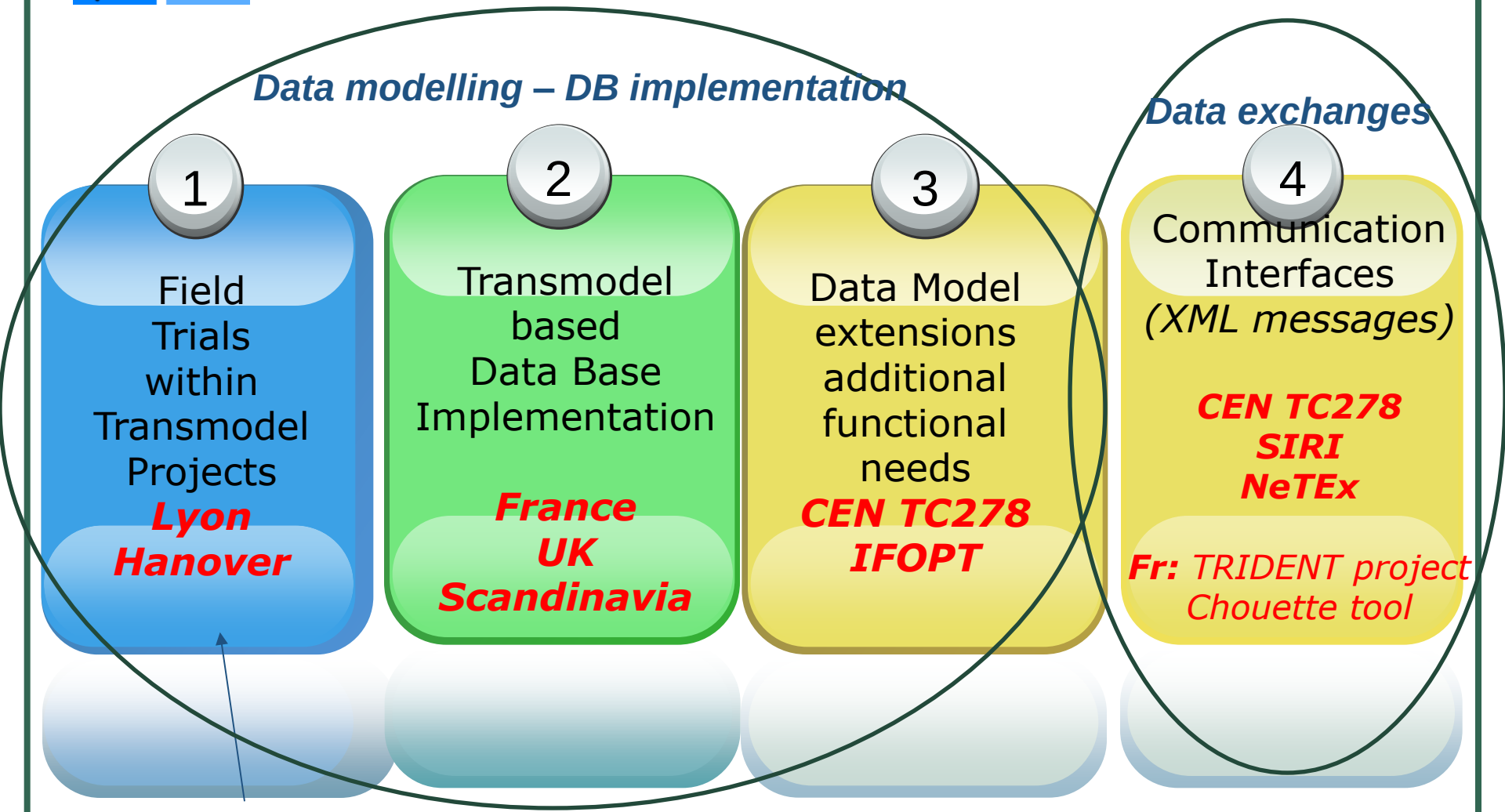
2011: decision for revision

Covers:
Network description
Versions management
Tactical planning
Personnel (driver) disposition
Operations monitoring and control
Passenger information
Fare collection
Management information and statistics
Multi-modal PT operation
Multiple operators environment

Contributors



Transmodel is used in may ways



Field Trial in Lyon/France: TITAN project

Stop Point Management

Scheduling (vehicle+driver)

Schedule Assignment, Budget Management

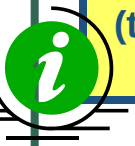
Data Access System

TITAN Data Base

Transmodel

On-line Control System

Production follow-up



Passenger information (telematic and telephone servers, displays)

in operation

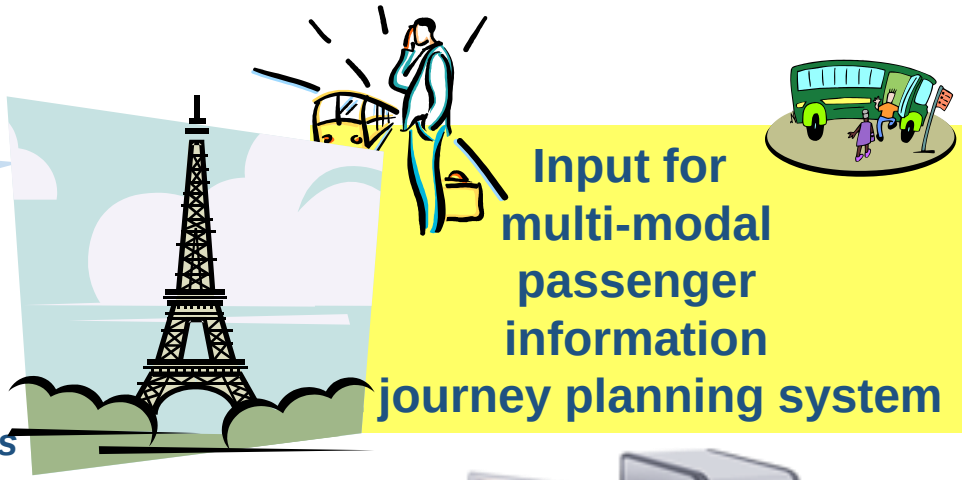
Personnel Disposition, Payroll

Transmodel-based Network and Timetable Exchange in France

in operation

OPTILE

Association of PT operators of the Greater Paris Area



Input for multi-modal passenger information journey planning system

SNCF

RATP

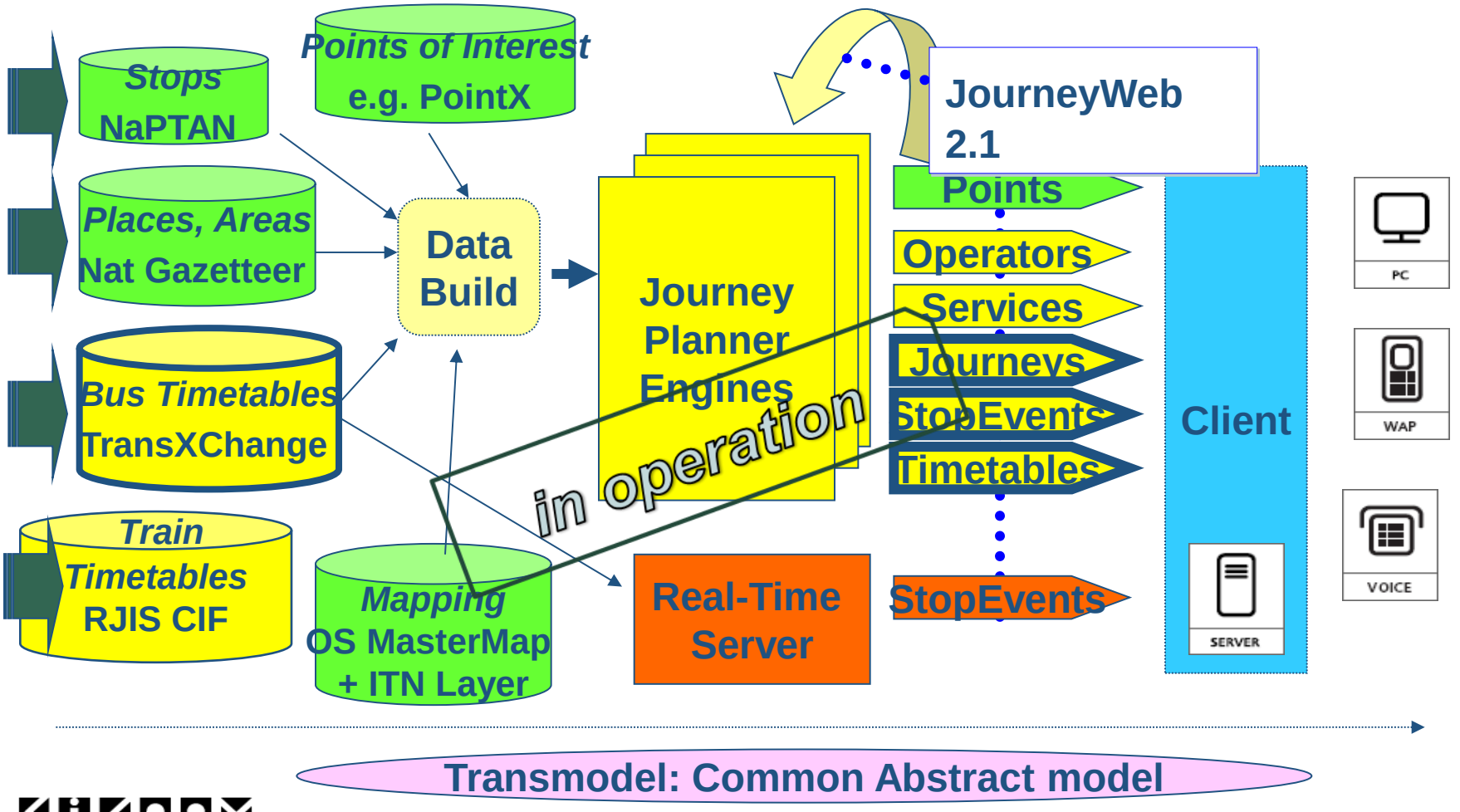
STIF

timetables

PT Authority of the Greater Paris Area

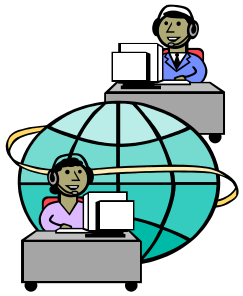
Transmodel based NEPTUNE export

Transmodel-based Implementations in UK



To sum up Transmodel…

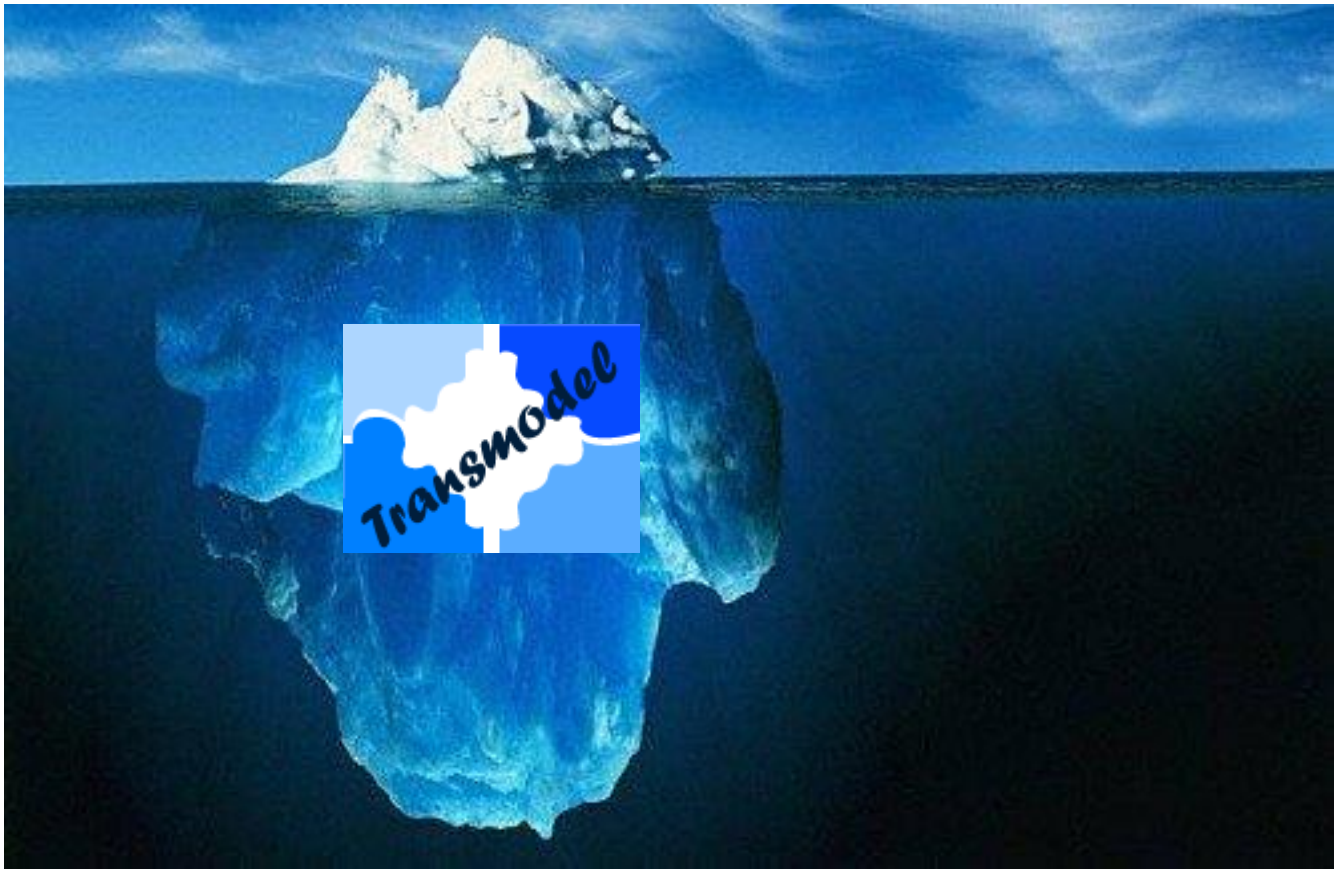
- Transmodel is a generic data representation,
- often considered as abstract, complex and large…
  - represents a consensus at European level
  - takes into account a variety of practices
  - users may only implement parts of it or use it as a reference



Transmodel is USEFUL

- for multi-system interoperability:
  - avoids misunderstandings at least Europewide
  - Is currently considered as a comparison reference for other Data Standards **at ISO**
- for new system design:
  - saves re-specification effort
  - enables a progressive integration
- to ensure data consistency
  - avoids redundancy, reduces errors at several levels
  - facilitates interface design
- to reference inconsistencies

A Robust Basis for Information System Architecture



http://www.normes-donnees-tc.org/spip.php?rubrique22
http://www.transmodel.org

谢谢

Thank you !

Thanks to my CEN TC278 WG3 colleagues Christophe Duquesne and Nick Knowles for providing some of the pictures for this presentation

kbouree@wanadoo.fr

http://kasia.bouree.fr