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Summary

Developers of multimodal information systems need to collect, aggregate and process multi-source data that is often heterogeneous. Not only the purely technical format of such data may be different, but often also the semantics of the provided information, as different data providers have a different interpretation of what, for instance, a stop point or a multimodal transfer node is. A Standard Reference Data Model for Public Transport Network and Stops has the advantage to allow different partners to understand each other. This is particularly true in a situation where interfaces have to be built between the world of urban Public Transport and long distance rail and in general in multi-operator & multi-modal regional environment. In Europe, standards like Transmodel, IFOPT highly contribute to applications such as NeTEx for data exchanges or CAMERA for the passenger information on accessibility of stop places.

1. Introduction

Current techniques allow for development of information systems relying on data that are collected by various organisations. This multi-source data are processed (e.g. compared, aggregated, etc.) on specific platforms in order to be used for the different business processes. It may happen that agreements between companies determine precisely which data have to be provided, i.e. the semantics of the different information elements are defined together with the exchange format. In such case, even if there is a certain complexity in data administration, data interpretation is straightforward.

However, there exist several situations, where organisations in the same business domain don't have a common understanding of their concepts. This is in particular the case in the Public Transport domain. In the '90ies the European Project Transmodel developed a European Reference Data Model for Public Transport that became a European norm in 2006 (EN12896).

2. European Developments of Standard Data Models

Transmodel is a conceptual data model, i.e. it describes the semantics of a data domain without being bound to one specific software: it provides the structures of the data, i.e. data dependencies and precise data definitions, i.e. a data dictionary.

One of the main features, Transmodel has followed all along its development process is to be generic.

This means in particular, independence from

- a particular application
- a particular user.

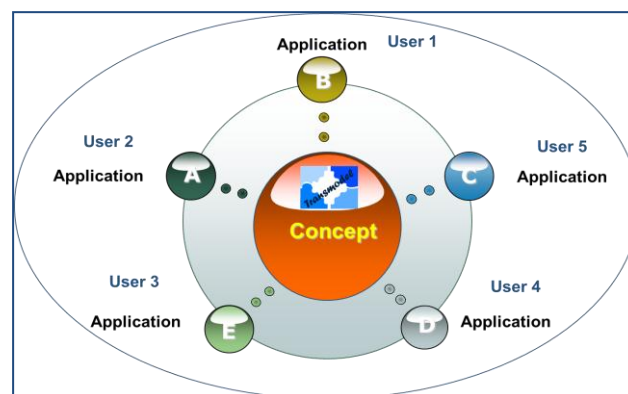


Figure 1. Concepts in European PT data models are user- end application independent

One example of a concept understood differently by different users is the concept of a *Route*. For some users, considering the view of passenger information, a *Route* may mean the physical path taken by pedestrians.

For others, it is the physical path, along the road network, taken by vehicles.

For Transmodel ... it is neither the first nor the second: it is an ordered list of located points defining one single path through the road (or rail) network.
In other words it may be viewed as a *schematic representation* of the physical path taken by vehicles.



Figure 2. Transmodel Route

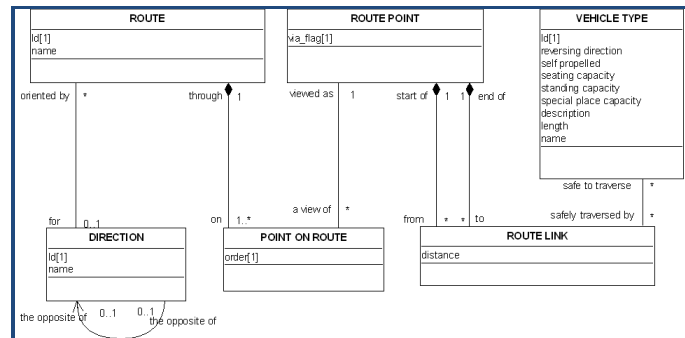


Figure 3. UML model of a Transmodel Route

Another typical example of multiple data definition provides the concept of *Stop*. It may either mean

- an area where passengers board or alight from vehicles, or
- a group of points located near each other and known to the public by a common name, or
- a precise location where vehicles stop, or
- the location of a an equipment indicating a stopping place,
- etc.

In order to clarify this concept, the technical specification called IFOPT (Identification of Fixed Objects for Public Transport), proposes a Stop Place Data Model. IFOPT, developed already some years ago has been adopted recently as a European norm (EN 28701).



Figure 4. A complex stop place

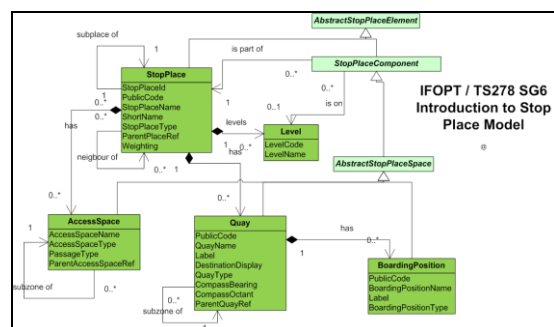


Figure 5. IFOPT UML basic model of a Stop Place

Data models such as EN 12896 or EN 28701 allow several partners to agree on similar data semantics: common definitions and common data structures.

3. Some Use Cases

Current work based on the conceptual data models Transmodel and IFOPT, in particular within the European project NeTEx (Network and Timetable Exchange), allows for more accuracy as regards data formats and data exchanges than the conceptual level may provide.

Physical models of IFOPT and relevant parts of Transmodel (in particular those concerning the PT Network and Timetable information) have been elaborated as a first step for the definition of “ready to be implemented” (XML) exchange messages. These are developed in a modular way, so that, for instance, only network topology-related data or only stop place-related data may be exchanged if necessary, independently from each other, between interested parties.

The use of reference data models, in particular the Network and Stop Model is particularly useful when, for instance data from different transport organisations are collected by a public transport authority in order to be processed in a multi-modal information system or for the elaboration of management information.

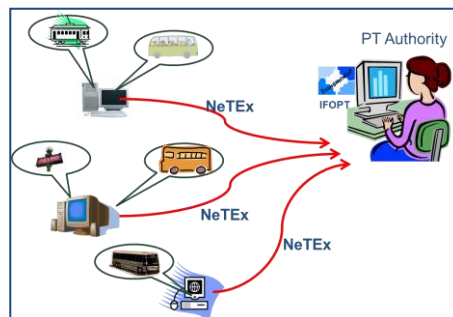


Figure 6. Uses Case “Multisource Data Collection by a PT Authority”

More than that, in the case of inter-regional multimodal trip planning (see figure below schematically representing a trip originating in Paris), when different inter-regional information systems have to be connected, it is crucial to unambiguously describe and identify the Public Transport stops: they are the building blocks of the interface between such systems.

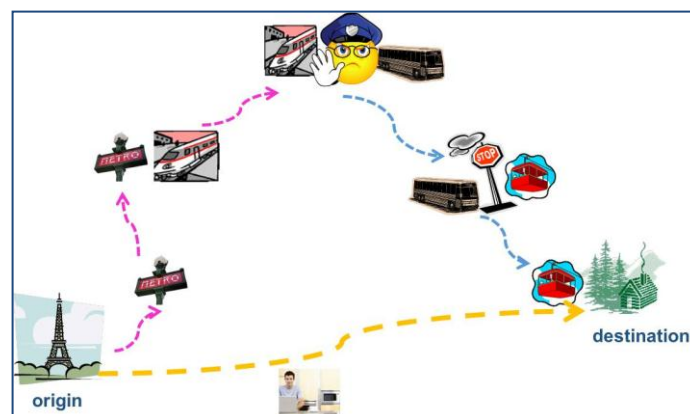


Figure 7. Use Case “Inter-regional Trip Planning”

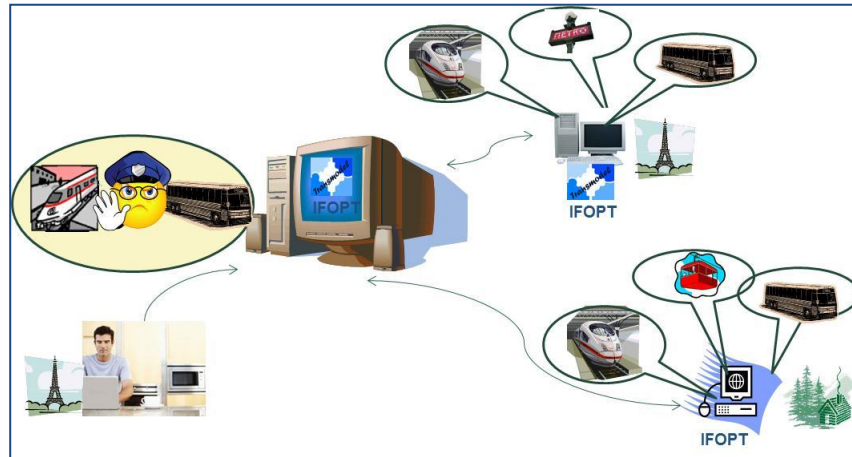


Figure 8. Use Case "Inter-connection of Trip Planning Systems" using identification of stop places

The French R&D project CAMERA (PREDIM) has implemented the Stop Place Model, focusing, in particular on accessibility parameters and definition of navigation paths through important stop places, in particular railway stations. The CAMERA pilot projects allow for calculation and graphical representation of navigation paths according to chosen accessibility constraints, e.g. for a disabled user, unable to climb stairs, a specific navigation path is calculated.

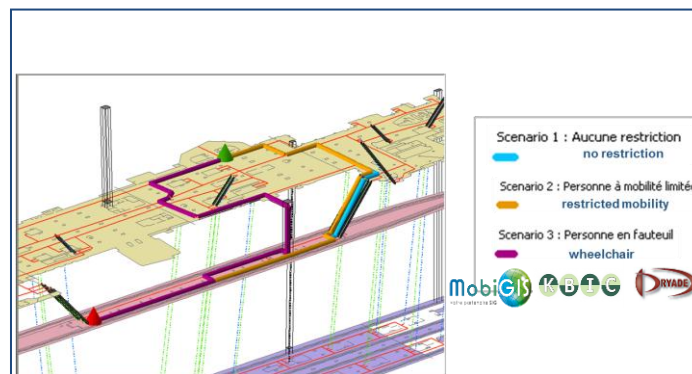


Figure 9. Use Case "Accessibility of stop places: navigation paths"

The model is sufficiently generic to take into account a multi-modal context and to easily represent a local situation. In the CAMERA pilot projects, already the data collection stage has been related to the standard data model: a standard data model-related template has allowed for the preparation of data capture, avoiding repeated data collection actions.

A standard-based data base ensures an easy data exchange of raw stop place data, for instance with the public transport authority or with external partners that would be in charge of the maintenance of stop place maps.

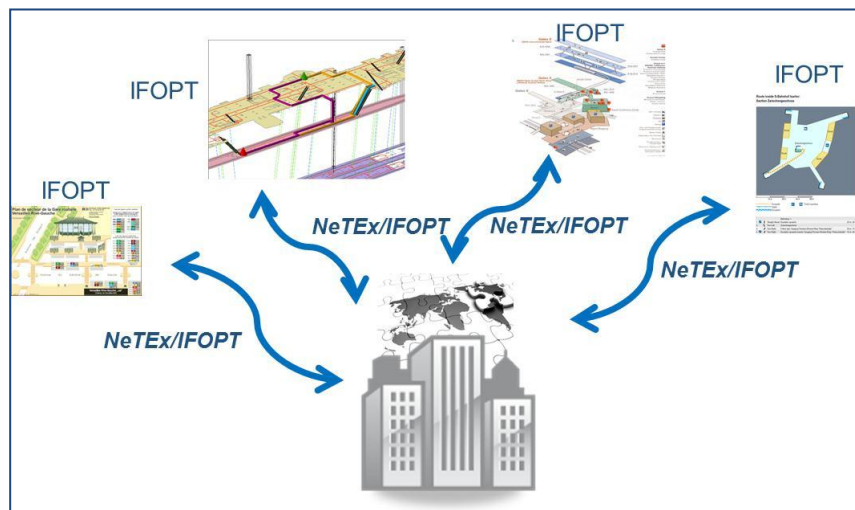


Figure 10. Use Case "Editing and Maintenance of Stop Place Maps"

4. Conclusion

Reference data models (Transmodel & IFOPT) are of particular use in the case when data from different sources have to be aggregated and processed.

In Europe, standard exchanges are elaborated (NeTex), based on standard reference data models for public transport.

More and more, public transport organisations are also implementing data bases, that rely on standards, for instance when renewing their system or developing new applications. In case where the sender and the receiver systems would respect, even only to a certain extent, reference standard data structures being the basis for the exchange messages, the necessity to develop complex converters between proprietary data bases and a standard-based interface allows for simplifications and savings.