



**PUBLIC TRANSPORT
NETWORK TIMETABLE EXCHANGE
(NeTex)**

REUSABLE COMPONENTS

CEN TC278/WG3/SG9 NeTex PT001

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INTRODUCTION

The NeTEx (Network Timetable Exchange) standard is a CEN standard for exchanging public transport data [N1], [N2], [N3]. This white paper gives a short overview of the NeTEx reusable components – a small set of ready-made components provided in the NeTEx kernel along with the NeTEx framework.

The paper is intended to convey a high level view sufficient for a technical manager to appreciate the capabilities of NeTEx, omitting detailed considerations - for a full description please see the full CEN NeTEx specification, in particular Part 1 [N1], from which sections of this paper are taken. As elsewhere, we use UPPER CASE to denote conceptual model elements, each of which will have equivalents in the corresponding NeTEx Physical model and XML schema.

NeTEx REUSABLE COMPONENTS

As well as achieving reusability by specialising abstract framework components (see white paper on frameworks [W4]), NeTEx also provides a number of reusable components to represent common concepts found in various transport data functional models; these may be used as objects without further specialisation.

The elements are used throughout NeTEx Part1, Part2 and Part3; for example transport OPERATORS, transport MODEs, DAY TYPEs, OPERATING DAY, etc. Standardized versions of these common objects are provided, which include a wide range of attributes to support the different functions of NeTEx (and drawn from proven European national standards). NeTEx sub-schemas reuse these existing components rather than introducing separate elements in each different application context. Also, in line with normative CEN standardisation principles, NeTEx references existing underlying standards where appropriate, such as GML for GIS coordinates, or ISO country codes to identify countries.

When included in a NeTEx document, instances of the reusable components will be grouped with a version frame (see “NeTEx Frameworks - White paper”); the RESOURCE FRAME in particular is used to exchange general-purpose components such as ORGANISATIONs and FACILITIES. Frames of different types may be grouped within a COMPOSITE FRAME.

SUMMARY OF REUSABLE COMPONENTS

The NeTEx reusable components can be grouped under several headings:

- **Framework Components:** ready-made components that support framework level functions, such as VERSION.
- **General functional components:** ready-made components of generic applicability, such as NOTICES.
- **Transport functional components:** ready-made components that can be used directly, such as OPERATORS, AVAILABILITY CONDITIONS, FACILITIES, etc

Reusable Component types

The NeTEx framework provides a set of ready made reusable elements that can be used without further specialisation. Some of these are ancillary metadata elements to support framework behaviour (for example for automatic comparison of versions):

- **VERSION:** versions are reified as explicit elements which can be given descriptions and other properties and be used in conditions.
- **VALIDITY CONDITION:** conditions are specified in terms of temporal or other values and can be associated with version frames and other elements to indicate when they apply.
- An **AVAILABILITY CONDITION** is specialisation of **VALIDITY CONDITION** that uses a number of predefined elements to specify a temporal condition, for example as a day of the week or occurrence of a holiday.
- **DATA SOURCE:** sources indicate the origin system from which a data came.
- **RESPONSIBILITY SET:** each NeTEx element can be associated with a Responsibility Set which indicates the owner and other rights and responsibilities. These can be used both to support problem resolution processes and to track IPR rights.

General Reusable Component types

A second group of ready-made components defines useful functional elements that are not specific to transport applications.

- **NOTICE Model** – defines footnotes and other **NOTICES** that can be associated with elements.
- **REUSABLE AVAILABILITY Model** – defines standardised temporal **VALIDITY CONDITIONS** such as day types for specifying when an event or condition is valid, i.e. in effect.
- **TOPOGRAPHIC Model** – defines named **TOPOGRAPHIC PLACES** that provide a context for **SITES**, **STATIONS**, **STOPS** etc, that may be served by public transport, with an ISO based Country definition.

Transport Reusable Component types

The organisational reusable components describe the basic operator mode and topography context for the various transport data elements.

- TRANSPORT MODE Model – defines standard Transport modes & submodes.
- TRANSPORT ORGANISATION Model – defines OPERATORS, AUTHORITIES and other Transport ORGANISATIONS.
- OTHER ORGANISATION Model – defines SERVICED ORGANISATIONS and other non-operator ORGANISATIONS.

The equipment reusable components describe the generic equipment properties, and classifications of servers and facilities that can be associated with services and sites.

- GENERIC EQUIPMENT Model – defines general EQUIPMENT properties for EQUIPMENT elements that can be associated with VEHICLES and SITES. EQUIPMENT can be specialised to create specific types of equipment, for example WAITING ROOM EQUIPMENT, STAIR EQUIPMENT, WHEELCHAIR EQUIPMENT etc with complex attributes.
- FACILITY Model – defines simple named service and facility categories that can be associated with stops, timetables and other NeTEx elements. Facilities have a name and code but no attributes.
- CLASSES OF USE (First class, second class, etc), ticket types etc – define classifiers.
- The vehicle related components define types of vehicles and vehicle equipment.
- VEHICLE TYPE Model – defines VEHICLE TYPES, VEHICLE MODELS and VEHICLES.
- TRAIN model – defines train composition (COMPOUND TRAIN) and the facilities of the carriages (VEHICLE EQUIPMENT PROFILE).
- VEHICLE EQUIPMENT Model – defines specific VEHICLE EQUIPMENT Types and actual EQUIPMENT usage on a VEHICLE TYPES, VEHICLE MODELS and VEHICLES.
- SERVICE REQUIREMENTS Model – defines requirements for VEHICLE TYPES to go on specific services.
- Finally the following miscellaneous element provides a general purpose mechanism for creating “smart” maps that link to NeTEx model elements.
- SCHEMATIC MAP Model – defines general purpose SCHEMATIC MAP contents that can be used to link data elements to visualisations such as network maps and interactive displays.

SUMMARY OF REUSABLE DATA TYPES

NeTEx uses a small set of XML data types to specify the attributes of the different NeTEx elements, facilitating validation and type checking of data in implementations. Where possible these are based on existing XML, CEN or W3C standards.

- XML built in data types are used to set specific types for data elements wherever possible, allowing the efficient validation of NeTEx documents by normal XML validators to detect type and grammar (Schema) errors. Examples are, date, time, number, boolean, duration, etc. Timestamps are generally given in 24 hour format with a time zone suffix to avoid ambiguity. Periods (e.g. 20 days 3 months 1 year, etc.) are defined using the XML duration type.
- NeTEx text elements are designed to support international use; the language of all descriptive strings can be specified through the **MultilingualString** type and alternative translations in different languages can be associated with key text names. Language defaults can be set at the frame level when exchanging sets of data in a given language.
- To specify spatial coordinates NeTEx uses a core subset of the GML schema, allowing a different alternative well-defined systems of spatial coordinates to be used, including WGS84 as a widely used default.
- Common quantitative unit dimensions such as height, distance and weight are specifically typed using added XML types that can be validated. SI units are generally used by default.
- Common reusable base types such as an email format, time zone, etc, are provided to assist XML validation, and a LOCALE mechanism is provided to set a time zone and other locality specific properties.
- Enumerated types are used to restrict the set of allowed values for data elements that take a fixed set of values, again allowing validation by the XML parser. Where an open ended set of values is needed a TYPE OF VALUE is used (see NeTEx Framework – White Paper).

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FURTHER READING

THE NeTEx STANDARD

- [N1] NeTEx-Part 1: *Public Transport Network Topology exchange format, CEN/TS 16614-1:2014*
 - [N2] NeTEx-Part 2: *Public Transport Scheduled Timetables exchange format, CEN/TS 16614-2:2014*
 - [N3] NeTEx-Part 3: *Fare Information exchange format, CEN/TS 16614-3:2014*
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OTHER NeTEx WHITE PAPERS

- [W1] NeTEx *Introduction* - White Paper
- [W2] NeTEx *Getting Started* - White Paper
- [W3] NeTEx *Design Methodology* - White Paper
- [W4] NeTEx *Framework* - White Paper
- [W5] NeTEx *Network* - White Paper
- [W6] NeTEx *Flexible Networks and Multimodality* - White Paper
- [W7] NeTEx *Accessibility* - White Paper
- [W8] NeTEx *Timetables* - White Paper
- [W9] NeTEx *Fares* - White Paper

OTHER REFERENCES

- [T1] *Public Transport Reference Data Model – Part 1: Common Concepts (Transmodel)*, EN12896-1
- [T2] *Public Transport Reference Data Model – Part 2: Public Transport Network (Transmodel)*, EN12896-2
- [T3] *Public Transport Reference Data Model – Part 3: Timing Information and Vehicle Scheduling (Transmodel)*, EN12896-3
- [T4] *Identification of Fixed Objects for Public Transport*, EN28701
- [U1] *Unified Modeling Language* www.omg.org/spec/UML/2.5/

The World Geodetic System (WGS) is a standard for use in cartography, geodesy, and navigation including by GPS. It comprises a standard coordinate system for the Earth, a standard spheroidal reference surface (the datum or reference ellipsoid) for raw altitude data, and a gravitational equipotential surface (the geoid) that defines the nominal sea level. The latest revision is WGS 84 (aka WGS 1984, EPSG:4326).

FURTHER INFORMATION

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