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DELEGATED REGULATION (EU) 2024/490 amending DELEGATED REGULATION (EU) 2017/1926 supplementing the ITS Directive (2010/40/EU)

Assumptions and introductory remarks

1. Transmodel uses the term 'modes of operation' and the following categorization:
 - Conventional modes (of operation):
 - o Scheduled
 - o Flexible
 - Alternative modes (of operation):
 - o Vehicle pooling
 - o Vehicle rental
 - o Vehicle sharing
 - o Taxi
 - o Personal modes (of operation)
2. Demand-responsive transport modes according to the terminology of DR (EU) 2017/1926 (or on demand as appear on amendment DR (EU) 2024/490) are associated in this document with flexible and alternative modes (of operation) according to the terminology of Transmodel.

Abbreviations

Abbreviation Meaning

OJP	Open Journey Planner
OSM	OpenStreetMap
OTP	OpenTripPlanner
POI	Point of Interest
TSC	Transport Service Carrier
TSP	Transport Service Provider
WGS84	World Geodetic System 1984



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Types of Static, Historical, and Observed Travel and Traffic Data

Level of Service 1 (data regarded as essential for the basic functioning of multimodal travel information services)

Location search (origin/destination) – addresses (building number, street name, postcode): the minimum information required for matching specific locations (mainly properties) as trip origins and destinations based on their address.

The following data needs to be provided for an address:

- Identifier (must be globally unique)
- Name
- Coordinates (Centroid)
- Topographic or address identifiers
- Category of classification

The following data is optional for an address:

- External identifiers (e.g., for OpenStreetMap (KeyList))
- Additional coordinates (access)
- Area
- Validity

Correspondence with Transmodel/NeTEx Concepts

ROAD ADDRESS	Specialization of ADDRESS using conventional characteristics such as road number and name for identification of a location along a road.
NeTEx POSTAL ADDRESS	A specification of ADDRESS refining it by using the attributes used for conventional identification for mail. Comprises variously a building Identifier, Street name, Post code, and other descriptors.

BEST PRACTICES

- Addresses that appear in this data type are mostly relevant to the postal address.
- Examples of this are: building numbers, street numbers, postcodes linked with coordinates or other location references (coordinates will be supplied according to WGS84).
- When talking of the origin and destination of a trip, it should be made clear if the reference for origin and destination is the physical location of the departure or arrival of the customer's trip (e.g. from home and to a shopping mall), or the public transport point of origin and destination. In the latter case you need to add information about an access and egress trip leg which is most often not done by public transport (except if you order a taxi or an Uber-like service or some on-demand shuttles).
- Based on INSPIRE data specification, the postal address constitutes a hierarchy consisting of components with an increasing level of detail, e.g., town, street name, and house number or house name. It may also include a post code or other postal descriptors.

Both types of addresses may be used:



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- o The reference for postal address format is INSPIRE.
- o The reference for road address is NeTEx.

References/additional info: EN12896-1 (see <https://www.transmodel-cen.eu>); CEN/TS 16614-1 (see <https://netex-cen.eu>); <https://publications.jrc.ec.europa.eu/repository/handle/JRC118744>

Location search (origin/destination) – topographic places (city, town, village, suburb, administrative unit): the minimum information required for matching wider locations (e.g., areas, regions, localities, cities, suburbs, towns, administrative units, or settlements) as trip origins and destinations based on their name.

The names of settlements, counties, etc., are of importance for locating trip endpoints, namely for the distinction of place names that are not globally unique.

The following data needs to be provided for topographic places:

- Identifier (must be globally unique)
- Name
- Coordinates (Centroid)
- Topographic or address identifiers
- Category or classification

The following data is optional for an address:

- External identifiers (e.g., for OSM) (KeyList)
- Area
- Validity

Correspondence with Transmodel/NeTEx Concepts

TOPOGRAPHIC PLACE	A type of PLACE providing the topographical context when searching for or presenting travel information, for example as the origin or destination of a trip. It may be of any size (e.g., County, City, Town, Village) and of different specificity (e.g., Greater London, London, West End, Westminster, St James's). Based on the Transmodel/NeTEx data specification, TOPOGRAPHIC PLACES may be located within one single country, may intersect one or more countries, and may be contained inside other topographic places. TOPOGRAPHIC PLACES can include disambiguation information to ensure that different places with the same name can be distinguished when searching for place names.
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References/additional info: EN12896-1 (see <https://www.transmodel-cen.eu>); CEN/TS 16614-1 (see <https://netex-cen.eu>); <https://publications.jrc.ec.europa.eu/repository/handle/JRC118744>

Location search (origin/destination) – points of interest (related to transport information) to which people may wish to travel: the minimum information required for matching specific locations of interest (e.g., amenities, landmarks, tourist attractions) as trip origins and destinations (covers DR(EU)1926/2017 1.b.c).

The coordinates and/or address identifiers of any point of interest (POI) that are relevant to travellers. For example, a museum, a theatre, or a shopping mall. The following POI should be (at least) provided:



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- Administrative buildings
- Airports
- Amenities (such as shopping mall, restaurants)
- Hospitals
- Museums, tourist attractions
- Pharmacies
- Police stations
- Ports
- Protected sites
- Rental stations
- Universities, schools

BEST PRACTICES

Be aware that there might exist temporary POI as well (e.g. a circus).

Be aware that some locations are considered as input to trip planners but are not POI in the narrower sense. They are also not modelled as POI, but should still contain the relevant information in their respective data types (e.g. stations, charging stations, parking):

- Parking (see section on parking)
- Park & Ride (all vehicles), kiss & ride: covered under “location search – for transport on demand and personal transport: Park & Ride stops”
- Heavy vehicle parking: covered under DR EU 885/2013 “provision of information services for safe and secure parking places for trucks and commercial vehicles”
- Charging stations, gas stations (personal operated vehicles): covered under DR EU 2022/670 “provision of EU-wide real-time traffic information services”
- Public transport stops (see section on stops)

PROCEDURES

- The data must follow NeTEx Part 4 (EN 12896-4, European Passenger Information Profile, EPIP) in the structure for the data export.
- An export as Open Journey Planner (OJP) Location Information is also possible (TS17118, version 2).
- The data must be actualized at least once a year. In the ideal case any update to a POI (content, existence, coordinates) should be available on the following day.
- The POI are synchronized with the ones in readily available geobases (e.g. OpenStreetMap) and the national geobases.

DATA STRUCTURE

The following data define a point of Interest:

- Mandatory:
 - Identifier (must be globally unique): The identifier that is used afterwards in all other data.
 - Name
 - Coordinates (Centroids): A version in WGS84 is mandatory. A local projection can be added.
 - Category or classification: There can be multiple classification systems used. It is recommended that at least the OSM map feature classification¹ is supported.
- Recommended:
 - External references (e.g., for OSM or a national GeoBase): This helps in using the POI in the diverse



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world we have.

- o Source: A reference to the source of the data.
- o Topographic or address identifiers: If such id exist, they should be provided.
- o Access and egress points to the road network (doors and gates) – with coordinates: For bigger structures they are needed.

- Optional:

- o Area: Some POIs are big and the area covered is of importance.
- o Validity: If a POI is valid only for a given period. This data can be provided.
- o Opening hours

[1] https://wiki.openstreetmap.org/wiki/Map_features ↩

EXAMPLE: NeTEx - tour d'Eiffel²:

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<?xml version="1.0" encoding="UTF-8"?>
<PublicationDelivery xmlns="http://www.netex.org.uk/netex"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.netex.org.uk/netex
file:///C:/Users/ue71603/MG_Daten/github/NeTEx1/xsd/netex_publication.xsd">
  <PublicationTimestamp>2024-05-18T18:12:00</PublicationTimestamp>
  <ParticipantRef>MMTIS-Test</ParticipantRef>
  <dataObjects>
    <CompositeFrame id="cf" version="1.0">
      <frames>
        <SiteFrame id="sf" version="1.0">
          <pointsOfInterest>
            <PointOfInterest id="fr:PointOfInterest:1881-12-122-9"
version="1.0">
              <keyList>
                <KeyValue>
                  <Key>OSM</Key>
                  <Value>5013364</Value>
                </KeyValue>
              </keyList>
              <privateCodes>
                <PrivateCode>fr:monuments:1831812</PrivateCode> <!--main
identifier -->
              </privateCodes>
              <Name>Tour d'Eiffel</Name>
              <Centroid>
                <Location>
                  <Longitude>48.85822</Longitude>
                  <Latitude>2.2945</Latitude>
                </Location>
              </Centroid>
              <AccessibilityAssessment id="fr:AccessibilityAssessment:181-31-
31-221" version="1.0">
                <MobilityImpairedAccess>true</MobilityImpairedAccess>
              </AccessibilityAssessment>
              <Landmark>true</Landmark>
              <PublicUse>all</PublicUse>
            </PointOfInterest>
          </pointsOfInterest>
        </SiteFrame>
      </frames>
    </CompositeFrame>
  </dataObjects>
</PublicationDelivery>
```



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<AllAreasWheelchairAccessible>true</AllAreasWheelchairAccessible>
  <TopographicPlaceRef ref="fr:TP:183819-1231"/>
  <AuthorityRef ref="CityOfParis"/>
  <entrances>
    <EntranceRef ref="fr:Entrance:12312319871"/>
  </entrances>
  <localServices>
    <AssistanceServiceRef ref="fr:AssistanceService:18381923191-
123"/>
  </localServices>
  <classifications>
    <PointOfInterestClassificationRef ref="fr:PoIC:monument"
version="1.0"/>
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</PointOfInterest>
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<pointOfInterestClassifications>
  <PointOfInterestClassification id="fr:PoIC:monument"
version="1.0">
    <privateCodes>
      <PrivateCode type="OSM">historic:monument</PrivateCode>
    </privateCodes>
    <Name>National Monument</Name>
    <Description>National monument</Description>
  </PointOfInterestClassification>
</pointOfInterestClassifications>
</SiteFrame>
</frames>
</CompositeFrame>
</dataObjects>
</PublicationDelivery>
```

[2] <https://www.openstreetmap.org/way/5013364#map=19/48.85826/2.29451> ↩

IMPLEMENTING SERVICES

- Journey Planners
- Geocoders

RELEVANT STANDARDS & LEGISLATION

- EU/1926/2017
- EU/885/2013
- EU/40/2010

Correspondence with Transmodel/NeTEx Concepts

POINT OF INTEREST	A type of PLACE to or through which passengers may wish to navigate as part of their journey and which is modelled in detail by journey planners.
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Transmodel/NeTEx provides a model for a generalized classification system that allows a point of



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interested to be assigned to one or more categories (POINT OF INTEREST CLASSIFICATIONS) and the categories themselves to be organized into hierarchies (POINT OF INTEREST CLASSIFICATION HIERARCHY).

References/additional info: EN12896-2 (see www.transmodel-cen.eu); CEN/TS 16614-1 (see <https://netex-cen.eu>); <https://publications.jrc.ec.europa.eu/repository/handle/JRC118744>³

[3] This report clarifies that INSPIRE can be considered as reference standard only for a limited set of POI categories (Utilities and Governmental Services (US), Buildings (BU), and Protected Sites (PS)), each of which has its own specific data model. [↩](#)

Trip plans – operational calendar, mapping day types to calendar dates: the minimum information required to indicate the days or periods when transportation services are operational.

The operational calendar describes the specific days of operation for public transport services (days, period, day types). For example, it can describe that a specific line operates on all weekdays (Monday to Friday) except for specific public holidays (e.g., December 25).

Correspondence with Transmodel/NeTEx Concepts

SERVICE CALENDAR	A collection of assignments of operational characteristics (expressed by DAY TYPES characterised by different properties of days, for example weekday in school holidays) to particular OPERATING DAYS.
NeTEx POSTAL ADDRESS	A day of public transport operation of which the characteristics are defined within a specific SERVICE CALENDAR. An OPERATING DAY may last more than 24 hours. A DAY TYPE ASSIGNMENT relates an OPERATING DAY to a DAY TYPE.

References/additional info: EN12896-1 (see <https://www.transmodel-cen.eu>); CEN/TS 16614-1 (see <https://netex-cen.eu>)

Location search (access nodes) – for scheduled transport and transport on demand where relevant - identified access nodes: the minimum information required to identify the location of stop or other specific places from which travellers can access scheduled or on-demand transport modes.

Correspondence with Transmodel/NeTEx Concepts

SCHEDULED STOP POINT	A POINT where passengers can board or alight from vehicles.
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STOP PLACE	A place comprising one or more locations where vehicles may stop and where passengers may board or leave vehicles (QUAYS) or prepare for their trip. The STOP PLACE is entered through designated ENTRANCES and may also contain ACCESS SPACES (locations passed through to reach the QUAYS). A STOP PLACE will usually have one or more well-known names.
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BEST PRACTICES

- From a topological point of view, access nodes for public transport are zero-dimensional nodes of the transport networks (road, rail, etc.), that may be located by coordinates in a particular Coordinate Reference System, used for the spatial description of the network, where passengers may board or alight from vehicles.
- From a geographical point of view, access nodes are places that appear in the timetable as locations where vehicles may stop, and passengers may board or alight from vehicles.

References/additional info: EN12896-2 (see <https://www.transmodel-cen.eu>); CEN/TS 16614-1 (see <https://netex-cen.eu>); <https://publications.jrc.ec.europa.eu/repository/handle/JRC118744>

Location search (access nodes) – for *scheduled transport and transport on demand where relevant - geometry/map layout structure of access nodes*: the minimum information required for identifying the location of specific facilities within access nodes considering the topographical structure of access nodes.

Correspondence with Transmodel/NeTEx Concepts

EQUIPMENT PLACE	A SITE (e.g., a STOP PLACE) COMPONENT containing EQUIPMENT.
EQUIPMENT POSITION	The precise position within an EQUIPMENT PLACE where particular equipment is placed.

It is also possible to relate equipment to PATH LINKs; PATH LINKs within a STOP PLACE are connecting between components. (e.g., a STOP PLACE ENTRANCE, ACCESS SPACE, QUAY, BOARDING POSITIONS, etc.), or PATH JUNCTIONs (i.e., points at which two or more PATH LINKs may connect or branch).

Equipment may be represented on a SCHEMATIC MAP: A map representing schematically the layout of the topographic structure of PLACES (e.g., a set of SITES) or the public transport network (a set of LINES), or other entity with a geometric projection (e.g., DECK PLAN for a train, vessel or aircraft). It can include a pixel projection of a set of ENTITIES onto a bitmap image so as to support hyperlinked interactions.

The nature of amenities available at an access node can be specified as FACILITIES and LOCAL SERVICES. Further detailed information can be provided using EQUIPMENT of different types (e.g., LIFT EQUIPMENT, TICKET EQUIPMENT, ENTRANCE EQUIPMENT, etc.). Within an access node EQUIPMENT can be exactly located using an EQUIPMENT POSITION.



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The topographical structure of an access node can be described through the spatial layout of its subcomponents and by explicit links between them, over which a trip planner may compute a route through a site. The plan of a STOP PLACE and the paths through it can be visualized on a digital map.

References/additional info: EN12896-2 (see <https://www.transmodel-cen.eu>); CEN/TS 16614-1 (see <https://netex-cen.eu>); <https://publications.jrc.ec.europa.eu/repository/handle/JRC118744>

Trip plan computation – *for scheduled transport and transport on demand where relevant - connection where interchanges may be made*: the minimum information required for indicating the attributes of connection links (enabling the transfer of travellers from one vehicle to another), essential for trip plan computation purposes.

Correspondence with Transmodel/NeTEx Concepts

TRANSFER and its specializations CONNECTION, SITE CONNECTION, and DEFAULT CONNECTION	
TRANSFER	A couple of POINTs located sufficiently near that it may represent for a passenger a possibility to reach one of these POINTs when starting at the other one in a timescale which is realistic when carrying out a trip.
CONNECTION	The physical (spatial) possibility for a passenger to change from one public transport vehicle to another to continue the trip, determined by a pair of points which may be either SCHEDULED STOP POINTs or VEHICLE MEETING POINTs. Different times may be necessary to cover the link between these points, depending on the kind of passenger.
SITE CONNECTION	The physical (spatial) possibility for a passenger to change from one public transport vehicle to another to continue the trip, determined by physical locations, such as SITES and/or its components and/or ENTRANCES, in particular STOP PLACEs and/or its components. Different times may be necessary to cover the resulting distance, depending on the kind of passenger.
DEFAULT CONNECTION	The physical (spatial) possibility for a passenger to change from one public transport vehicle to another to continue the trip. It specifies default times to be used to change from one mode of transport to another at an area or national level as specified by a TOPOGRAPHIC PLACE, STOP AREA or SITE ELEMENT. It may be restricted to a specific MODE or OPERATOR or only apply in a particular direction of transfer, e.g., bus to rail may have a different time for rail to bus.

BEST PRACTICES

- From a topological perspective, connection links serve as a means of explicitly connecting two or more places that are located sufficiently near to each other to make a transfer between the points within a reasonable timeframe.



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- From a geographical perspective, connection links can be addressed as designated paths between two places, which may be made up of ordered sequences of links within a place or between two places representing a step in a possible route for pedestrians, cyclists, or other out-of-vehicle passengers. A common point in both perspectives is that a passenger transfer shall be time- and distance-feasible to be considered valid. In this respect, the attributes of connection links encompassed by this data category should at least include the distance and time duration of each connection link, also allowing for alternative durations for different types of impaired mobility. Moreover, connection links should be mode-specific including at least (and as applies) walking and cycling modes.

References/additional info: EN12896-2 (see <https://www.transmodel-cen.eu>); CEN/TS 16614-1 (see <https://netex-cen.eu>); <https://publications.jrc.ec.europa.eu/repository/handle/JRC118744>

Trip plan computation – for scheduled transport and transport on demand where relevant - default transfer times at interchanges: the minimum information required for indicating the amount of time allocated for passengers to switch between different vehicles at interchanges, essential for trip plan computation purposes.

Correspondence with Transmodel/NeTEx Concepts

Time-related attributes of TRANSFER and its specialisations (CONNECTION, SITE CONNECTION, DEFAULT CONNECTION):

- o FrequentTravellerDuration
- o MobilityRestrictedTravellerDuration
- o OccasionalTravellerDuration

BEST PRACTICES

- When you order a flight or a long-distance train, you need to be sure that the interchange time proposed in your trip planner allows you to transfer from one PT vehicle to another in normal conditions of operations. The minimum interchange time proposed in the booking phase and accepted when purchasing the tickets must be accepted by the operators.
- In case your first PT leg arrival time is delayed, you should be informed when you plan your trip and of course when you perform your trip what shall happen in case of incident: e.g. if your next PT vehicle shall wait for you, or what options are proposed if your next PT vehicle is no longer there.

References/additional info: EN12896-1 (see <https://www.transmodel-cen.eu>); CEN/TS 16614-1 (see <https://netex-cen.eu>)

Trip plan computation – for scheduled transport and transport on demand where relevant - network topology and routes/lines (topology): the minimum information required for indicating the topology of the service network of scheduled transport or transport on demand modes, essential for trip plan computation purposes.

This data category assists the indication of the pattern of stops that makes up the timetables.



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Correspondence with Transmodel/NeTEx Concepts

ROUTE	An ordered list of located POINTs defining one single path through the road (or rail) network. A ROUTE may pass through the same POINT more than once.
FLEXIBLE ROUTE	Specialisation of ROUTE for flexible services.
LINE	A group of ROUTEs which is generally known to the public by a similar name or number.
FLEXIBLE LINE	Specialisation of LINE for flexible service.
SERVICE PATTERN	An ordered list of SCHEDULED STOP POINTs on a single ROUTE, sequentially connected by SERVICE LINKs, describing the pattern of working for public transport vehicles.
FLEXIBLE STOP PLACE	A specialisation of the STOP PLACE describing a stop of a FLEXIBLE SERVICE. It may be composed of FLEXIBLE AREAs or HAIL AND RIDE AREAs identifying the catchment areas for flexible services (when they use areas or flexible quays). Some FLEXIBLE SERVICE also uses regular STOP PLACEs for their stops.

BEST PRACTICES

The topology of service networks is defined by routes, lines, and service patterns.

References/additional info: EN12896-2 (see <https://www.transmodel-cen.eu>); CEN/TS 16614-1 (see <https://netex-cen.eu>); <https://publications.jrc.ec.europa.eu/repository/handle/JRC118744>

Trip plan computation – for scheduled transport and transport on demand where relevant - transport operators: the minimum information about the public transport companies providing scheduled transport or transport on demand services necessary to provide correct contact information to the travellers.

Such information may encompass the name and identification code of transport operators.

Correspondence with Transmodel/NeTEx Concepts

OPERATOR	A company providing public transport services. An OPERATOR may be associated with each scheduled SERVICE JOURNEY to indicate the organization advertised as responsible for its operation.
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BEST PRACTICES

A distinction should be made between two types of OPERATORS:



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- the Transport Service Provider (TSP) responsible for the contract with the customer;
- the Transport Service Carrier (TSC) responsible for running the vehicle.

Take the typical case of code-sharing for flights. A customer purchases a ticket from a given Airline (the TSP), and the flight is operated by another one (the TSC).

In case of incident prior to the travel (e.g. flight cancelled or delayed), the contact point for the customer is the TSP. In case of incident during the travel (e.g. missed connection due to a delay in the arrival of the first flight or due to a cancellation of the connecting flight) the contact point for the customer is first the relevant TSC, but if no alternative is found the customer the liable company is the TSP.

References/additional info: EN12896-1 (see <https://www.transmodel-cen.eu>); CEN/TS 16614-1 (see <https://netex-cen.eu>)

Trip plan computation – for scheduled transport and transport on demand where relevant - timetables: (*scheduled transport modes*) the minimum information required for indicating the planned passing times of scheduled transport services' vehicles, essential for trip plan computation purposes; (*on-demand transport*)⁴ the minimum information required for indicating the operation times, hours of operation, geographical extend (zones, flexible stops), and further limitations of "dial-a-ride services"; (*vehicle pooling*) the minimum information required for indicating the scheduled transportation times, routes/lines (topology), and further limitations of vehicle-pooling.

For scheduled transport modes: It is an aggregation of vehicle journeys (defined for specific day types) and passing times at stops for the concerned vehicle journeys.

[4] The data category "demand-responsive"/ "transport on-demand" as per DR (EU) 2017/1926 (p. 11)/ DR (EU) 2024/490 (p. 10) covers more modes of transportation than Transmodel would address as demand responsive. E.g. vehicle-pooling (not only car) is not addressed as a part of demand responsive modes, but a separate category. ↩

Correspondence with Transmodel/NeTEx Concepts

TIMETABLED PASSING TIME	Long-term planned time data concerning public transport vehicles passing a particular POINT IN JOURNEY PATTERN ⁵ on a specified VEHICLE JOURNEY ⁶ for a certain DAY TYPE.
DATED PASSING TIME	Time data concerning public transport vehicles passing a particular POINT, e.g., arrival time, departure time, waiting time on a particular OPERATING DAY and for a DATED VEHICLE JOURNEY ⁷ .

⁵ A SCHEDULED STOP POINT or TIMING POINT in a JOURNEY PATTERN (pattern of working for public transport vehicles) with its order in that JOURNEY PATTERN.

⁶ The planned movement of a public transport vehicle on a DAY TYPE from the start point to the end point of a



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JOURNEY PATTERN on a specified ROUTE.

⁷ A particular journey of a vehicle on a particular OPERATING DAY including all modifications possibly decided by the control staff.

BEST PRACTICES

For scheduled transport modes, timetables must be provided in NeTEx format (part 1 and 2). To allow for European interoperability, they must adhere to the European Passenger Information Profile (EPIP; part 4) and/or to the European Passenger Information Accessibility Profile (EPIAP; part 6, under definition).

In addition, to facilitate international/worldwide adoption, timetables should be provided in an aggregated form in GTFS format as well by the national access point. The main reason is that GTFS covers many use cases and is a lot simpler to consume than NeTEx.

- In the context of this data category, vehicles are assumed to carry out specified vehicle journeys conforming to the schedule of availability conditions (specified as bitfields), including modifications possibly decided by the control staff of a transport operator. Based on the public transport reference data model (Transmodel), passing time information encompasses expected departure times, expected waiting times, and in some cases (partially on demand) earliest departure times, and latest arrival times.
- The time horizon of the timetable is of importance. In some cases, booking occurs up to 120 days in advance. So having a prospective time horizon of timetables of those 120 days would be ideal and should be aspired to. However, the information must also be known in advance. The time horizon can be different according to the mode. For long distance trips information can be obtained up to 3 months in advance, but other local-operated services can provide only 1 month in advance.
- Coverage: timetable datasets should be as complete as possible for a given country or region. The degree of coverage/completeness should be declared per geographical region (e.g. country) in terms of percentages/fractions (e.g. "100 % of trains in country A are covered" and a description which modes, operators are missing).
- Partitioning of files: if necessary (for data size or operational reasons), timetables of a country/region may be partitioned onto several files. It must be pointed out, that full XSD validation can't be done in some of the following cases (reference-id checks). It is also very important, that merging the files is not necessarily easy (e.g. mixed lines, service journeys that exist in more than one file). The following divisions have been seen and ordered in the simplicity of parsing. Usually this creates redundancy or size problems. As the redundancy can't always be avoided, importers must be able to identify identical copies (e.g. replicated stop place information when dealing with a line-oriented approach):
 - o One file (network approach)
 - o Complete lines
 - o Complete operators (and sometimes regions, but this might cause integration problems)
 - o Complete groups based on modes or mode groups
 - o Site frame and lines without site in separate files
 - o Files per (NeTEx) frame and multiple timetable frames.
- File organization: within datasets, the data (XML files) should be organized in a simple and practicable way, with a moderate file size if feasible, allowing for handling in standard XML or text editors.
- Datasets should be published in compressed form (ZIP archives).
- File sizes: ZIP archives and files contained therein should have sizes smaller than 2 GB each.
- Datasets should be provided via HTTPS (TLS) under permalinks, so that they may be retrieved easily



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and securely by automated scripts.

- Cross-border services (e.g. international trains) may be included in datasets end-to-end but using whenever possible internationally harmonized/aligned identifiers.
- Quality checks: datasets should be checked for well-formedness and validity (schema conformance) by the national access points. In the future, specific tools (converters/adaptors/validators) need to be available.
- In addition to NeTEx (EPIP and/or EPIAP profiles), GTFS versions of the timetables may be provided as well. IDs in GTFS are equal to IDs in NeTEx, so data consumers can use the data best suited to the purpose of need.
- Interchanges shall be used and supported. Remain seated must be supported. Transregional travel should use interchanges when multiple control systems are involved.
- The data of each national access point should support the collating of transregional travel by interchanges, id for lines/journeys. Either artificial border points can be introduced, or the data should cover the first commercial stop abroad for outgoing journeys and last commercial stop for incoming journeys. It is better to be able to reference the other parts of the journey than to have to map it with timing information on stops.
- Splitting, joining of trains should be supported. The splitting can be based on operational information (where there is always only one train on a block) or from the passengers' point of view. One journey for each composition they can remain in it which is coupled on some blocks.
- Direct carriages should be supported as well.
- Equipment and equipment places are modelled. Facilities are shown.
- Accessibility assessments are provided.
- Leaving out the physical sites (STOP PLACE/QUAY) is possible, but not recommended. SCHEDULED STOP POINTs should refer to the physical model. Modelling should be done on the Quay or sector level and not on the STOP PLACE level. Only then foot paths can be modelled correctly.
- The data should support transfers based on time and paths.
- The transport operators and their contact data should be up to date.
- Notices and FacilitySets must be available for stops, parts of a service journey and a service journey.

For transport on demand, offers must be provided in NeTEx format (part 1+2). Unfortunately, neither EPIP nor EPIAP currently deal with demand responsive traffic yet. An indication of how to implement can be found in the technical description used in Switzerland⁸ (unfortunately currently only available in German).

From a business perspective we point to the recent work in Switzerland referenced in further reading, which extends the previous work done in the VDV 462 standard.

- For area services the areas should be clearly defined, and stops should be within those areas.
- Booking conditions should be clearly defined.
- No overlapping areas should exist. For complex spatial layouts multi-polygons should be used.
- Simple, and clear offers from a user perspective that can be easily combined with other modes of transportation should be preferred.

For vehicle pooling, offers must be provided in NeTEx format (part 5). Unfortunately, neither EPIP nor EPIAP deal with vehicle pooling. A possible indication on how to do it (especially in GTFS) could be the analysis done in Switzerland⁹.

- The mode of operation of operators should be clear.



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- Offers and demands should be provided to allow open matchmaking and thus an improved spatio-temporal coverage.\

[8] See https://www.oev-info.ch/sites/default/files/2023-04/technisches_konzept_on-demand_v2.0.pdf
[↩](#)

[9] See https://www.xn--v-info-vxa.ch/sites/default/files/2024-01/vehicle_pooling_switzerland_v1.0.pdf
[↩](#)

PROCEDURES

For all:

- Timetable datasets (ZIP archives) should be generated on a regular periodic basis, at least weekly.
- Datasets must be quality-controlled (see best practices above).
- The data is aggregated.
- The id has to match the id in the real-time data.
- The interchanges in the real-time data should match the interchanges in the timetable data.

DATA STRUCTURE

For scheduled transport:

Usually in this section the core data elements are listed. Timetables are a complex structure and EPIP/EPIAP as profiles cover most of it. But still EPIP and EPIAP have some flexibility in their implementation. Therefore, the following implementation restrictions should apply (the list is intended for readers that already studied EPIP and EPIAP):

- Use AvailabilityCondition with Bitfields.
- Use ResponsibilitySet for Authority and Operator at least.
- LineRef should be filled.
- Don't rely on Route.

As far as possible the concepts should be copied over to GTFS.

For on-demand transport:

The data structure for on demand can be taken from the NeTEx standard (part 5), which is no reiterated here. The same holds true for the GTFS-Flex and the VDV 462 standards.

The previous work on business aspects of on demand done in Switzerland (see further reading) extends on the VDV 462 standard and content-wise constitutes a superset of GTFS Flex.

For vehicle-pooling:

As for on demand we do not reiterate the work in the NeTEx standard. Note the previous work in Switzerland which summarizes the unsuccessful approaches to modelling pooling, as well as the suggested extension to GTFS named GTFS pool to accommodate particularly for the smaller companies wanting exchange their offers and demands in a standardized manner.

EXAMPLES

For scheduled transport:

- As valid examples use the EPIP and EPIAP examples on github: <https://github.com/NeTEx-CEN/NeTEx/tree/master/examples/standards>

For on-demand transport:

- As valid examples use the NeTEx examples on github: <https://github.com/NeTEx-CEN/NeTEx/tree/master/examples/functions/timetable> (e.g., zones)



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- Further examples can be found in the Swiss technical guide: https://www.öv-info.ch/sites/default/files/2023-04/technisches_konzept_on-demand_v2.0.pdf
- For vehicle-pooling:
- As valid examples use the NeTEx examples on github: <https://github.com/NeTEx-CEN/NeTEx/tree/master/examples/functions/newModes>
- Swiss concept for vehicle pooling: https://www.öv-info.ch/sites/default/files/2024-01/vehicle_pooling_switzerland_v1.0.pdf

IMPLEMENTING SERVICES

For all:

- Trip planners
- Ticket sales systems
- Station boards

RELEVANT STANDARDS & LEGISLATION

For all:

- EU/1926/2017
- NeTEx Parts 2 and 5

For scheduled transport:

- GTFS Schedule: <https://gtfs.org/de/schedule/>

For on-demand transport:

- GTFS Flex: <https://gtfs.org/extensions/flex/>

References/additional info: (for scheduled transport) EN12896-3 (see <https://www.transmodel-cen.eu>); CEN/TS 16614-2 (see <https://netex-cen.eu>); (for on-demand transport) CEN/TS 16614-5 (see <https://netex-cen.eu>); VDV 462 (see <https://www.vdv.de/vdv-462-netex-schrift-v00-26d.pdf?forced=true>); Swiss business concept for On-Demand (see https://www.öv-info.ch/sites/default/files/2024-02/fachkonzept_on-demand_v2.0_en.pdf); (for vehicle-pooling) CEN/TS 16614-5, page 10 ff (see <https://netex-cen.eu>); Swiss concept for vehicle pooling: https://www.öv-info.ch/sites/default/files/2024-01/vehicle_pooling_switzerland_v1.0.pdf)

Trip plan computation – for scheduled transport and transport on demand where relevant - planned interchanges between guaranteed scheduled services: the minimum information required for indicating the possibility for transfer of passengers from one planned transport service to another securely interconnected, essential for trip plan computation purposes.

The planned transport services involved can be either scheduled transport or on demand transport.

Correspondence with Transmodel/NeTEx Concepts

INTERCHANGE	The scheduled possibility for transfer of passengers between two SERVICE JOURNEYS at the same or different STOP POINTS. This can be: o SERVICE JOURNEY INTERCHANGE: the scheduled possibility for transfer of passengers
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	between two SERVICE JOURNEYS at the same or different SCHEDULED STOP POINTs, or o SERVICE JOURNEY PATTERN INTERCHANGE: a recognised/organised possibility for passengers to change public transport vehicles using two SCHEDULED STOP POINTs (which may be identical) on two particular SERVICE JOURNEY PATTERNs, including the maximum wait duration allowed and the standard to be aimed at. Or provided by an: o INTERCHANGE RULE: Conditions for considering JOURNEYS¹⁰ to meet or not to meet, specified indirectly: by a particular MODE, DIRECTION or LINE.
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The INTERCHANGE has the characteristic of being guaranteed (or not): i.e. the OPERATOR of the distributor service is in charge of ensuring the connection.

¹⁰ VEHICLE JOURNEYS (or SPECIAL SERVICES: work of a vehicle that is not planned in a classical way, i.e. that is generally not based on VEHICLE JOURNEYS using JOURNEY PATTERNs).

BEST PRACTICES

- For example, a guarantee is that a departing vehicle waits for a minimum amount of time for an arriving vehicle, guaranteeing an interchange for the passengers.
- It may also describe the prioritized place of interchange between two journey legs.
- It may also be used to describe that two journeys with different identifiers are in fact operated by the same vehicle, allowing the passenger to stay seated in the vehicle at the interchange point.
- Interchanges connect two specific journeys at specific proximate stops, or at a single stop.
- What is “guaranteed” must be clarified, and by whom. The interchange time provided in the booking phase by the trip planner is the responsibility of the trip planner, but the customer should know who is responsible for what in case of missed interchange, and it should be specified if the minimum interchange time is accepted by the operator(s) providing services before and after the interchange.
- The “guaranteed” interchange time may differ according to the category of traveller (passenger with only hand luggage, passenger with registered luggage, passengers with reduced mobility, children travelling alone, etc.).

References/additional info: EN12896-3 (see <https://www.transmodel-cen.eu>); CEN/TS 16614-2 (see <https://netex-cen.eu>); <http://naptan.dft.gov.uk/transmodel/schema/doc/GoogleTransit/TransmodelForGoogle-07.pdf>

Trip plan computation – *for scheduled transport and transport on demand where relevant - hours of operation*: the minimum information required for indicating the time validity – hours of operation of scheduled or on demand transport services, essential for trip plan computation purposes.

Correspondence with Transmodel/NeTEx Concepts

AVAILABILITY CONDITION	A VALIDITY CONDITION expressed in terms of temporal parameters and referring to DAY TYPEs.
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The use of DAY TYPEs (which may include TIMEBANDs) allows the time validity to be characterized precisely. This can be resolved in a precise calendar date and time by means of a DAY TYPE ASSIGNMENT.

BEST PRACTICES

- Each scheduled journey has a precise date and time of operation.
- Hours of operations may refer to:
 - The time of starting services and time of closing services (e.g. for local public transport which may propose timetables, but also only headways per period of the day).
 - They may refer to DAY TYPEs for long distance bus and rail services.
 - They may refer to long periods in case of air travel (low-cost airlines may operate only part of the year).
- For on-demand transport it is necessary to provide information on the time between ordering a trip and the time of actual start of the trip, and the trip time computation in itself is a two steps process.

References/additional info: EN12896-1 (see <https://www.transmodel-cen.eu>); CEN/TS 16614-1 (see <https://netex-cen.eu>)

Trip plan computation – for scheduled transport and transport on demand where relevant - facilities of access nodes (including platform information, help desk/information points, ticket booths, lifts/stairs, entrances and exit locations): the minimum information required for describing the fixed equipment/facilities of the access nodes of scheduled or on demand transport services, essential for trip plan computation purposes.

Correspondence with Transmodel/NeTEx Concepts

Transmodel explicitly represents ENTRANCES, platforms (QUAYS) of a STOP PLACE, as well as designated positions within platforms (BOARDING POINTS) so that precise directions can be given as to where to access a service journey, and/or from where to exit the access node. Intermediate places where facilities may also be located, such as ticket halls, waiting rooms, restaurants are described as ACCESS SPACES. Any of the specific places may further be assigned EQUIPMENT to describe detailed characteristics such as the nature and dimensions of entrance barriers, lifts, ramps, and FACILITIES to summarize available amenities and services such as boarding assistance.

NOTE: The above information may be used for providing guidance to travellers planning or making a trip, e.g., where to request for information, where to validate tickets, from where to access a service journey, and/or from where to exit the access node. Transmodel describes amenities and support services at two different levels of detail.

FACILITY	A named amenity available to the public at a SITE or on a SERVICE.
EQUIPMENT	An item of equipment installed either at a fixed point (PLACE EQUIPMENT) or on-board vehicles (VEHICLE EQUIPMENT).



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A service (LOCAL SERVICE such as LEFT LUGGAGE, TICKETING SERVICE) available at a SITE is considered immaterial EQUIPMENT. EQUIPMENT and LOCAL SERVICE are specialised to create many different types of equipment and services with detailed properties, for example LIFT EQUIPMENT, STAIR EQUIPMENT, WAITING EQUIPMENT, SIGN EQUIPMENT, RETAIL SERVICE, CATERING SERVICE, ASSISTANCE SERVICE, etc., etc.

Information about the location of entrances and exits is provided by the STOP PLACE ENTRANCE components of a STOP PLACE and their relationship to the boarding and alighting points (QUAYS) is given by PATH LINKs. These can be used by a trip planner to create trip specific directions. The location of signage to direct the passenger (and that the passenger will see if following a particular route) can be described using SIGN EQUIPMENT.

References/additional info: EN12896-2 (see <https://www.transmodel-cen.eu>); CEN/TS 16614-1 (see <https://netex-cen.eu>) <https://publications.jrc.ec.europa.eu/repository/handle/JRC118744>

Trip plan computation – for scheduled transport and transport on demand where relevant - vehicles, including their accessibility (such as low floor, wheelchair accessible, pram accessible) and accessibility of on-board services (such as toilets): the minimum information required for indicating the accessibility conditions of scheduled or on demand transport services' vehicles (incl. their on-board amenities), essential for trip plan computation purposes.

EXAMPLES

- A specific train has a lower floor option for people traveling in wheelchairs.
- A bus has guidance amenities for visually impaired travellers (e.g., handrail to board a bus and reach a seat, tactile and high contrast design).
- A tramway has a screen with a continuous display of the next stop name for hearing-impaired travellers.\

Correspondence with Transmodel/NeTEx Concepts

ACTUAL VEHICLE EQUIPMENT	An item of equipment of a particular type in an individual VEHICLE.
PASSENGER EQUIPMENT	An item of equipment of a particular type actually available at a location within a PLACE or a VEHICLE
Both equipment types are characterised by accessibility-related features.	
ACCESSIBILITY ASSESSMENT	The accessibility characteristics of an entity used by passengers such as a STOP PLACE, STOP PLACE COMPONENT, EQUIPMENT or DECK COMPONENT -to indicate its usability by passengers with specific needs, for example, those needing wheelchair access, step-free access or wanting to avoid confined spaces such as lifts. An ACCESSIBILITY



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	ASSESSMENT comprises one or more ACCESSIBILITY LIMITATIONS.
ACCESSIBILITY LIMITATION provides the following characteristics (some of them may be used to characterise accessibility of a vehicle as well): - o Wheelchair access - o Step-free access - o Escalator-free access - o Lift-free access - o Audible signs available - o Virtual signs available	
Accessibility features can be described in summary using FACILITIES, or in detail using an appropriate specialisation of EQUIPMENT. For instance, ASSISTANCE FACILITY names support services such as boarding assistance, while ACCESSIBILITY INFO FACILITY names the available facilities for the visually and hearing impaired. WHEELCHAIR VEHICLE EQUIPMENT describes physical properties of wheelchair spaces, ACCESS EQUIPMENT Describes ramps, hoists etc. LIFT EQUIPMENT describes lifts.	

BEST PRACTICES

- The above information can be used to find suitable routes and guide travellers with impaired mobility by assessing the suitability of the vehicles used on each service.
- An important note: the classification of the accessibility services to describe the vehicles uses the same data model as the stations/stop facilities.
- The number of places available for wheelchair, prams, bicycle, e-scooters... may be limited on-board a vehicle, and/or subject to allowed periods of the days (peak or off-peak periods).
- The characteristics of the traveller may depend on specific categories according to the age, physical conditions, etc.
- The traveller may have to cope with some technical requirements like: size and weight of wheelchairs, of prams, of luggage, conditions of travel for accompanying pets, conditions of travel for children, etc.

References/additional info: EN12896-1&2 (see <https://www.transmodel-cen.eu>); CEN/TS 16614-1 (see <https://netex-cen.eu>)

Trip plan computation – for scheduled transport and transport on demand where relevant - accessibility of access nodes, and paths within an interchange (such as existence of lifts, escalators): the minimum information required for indicating the accessibility conditions of access nodes as well as the conditions for transferring between vehicles, essential for trip plan computation purposes.

Correspondence with Transmodel/NeTEx Concepts

Transmodel explicitly represents ENTRANCES, platforms (QUAYS) of a STOP PLACE, as well as and designated positions within platforms (BOARDING POINTS) so that precise directions can be given as to



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where to access a service journey, and/or from where to exit the access node. Intermediate places where facilities may also be located, such as ticket halls, waiting rooms, restaurants are described as ACCESS SPACES. Any of the specific places may further be assigned EQUIPMENT to describe detailed characteristics such as the nature and dimensions of entrance barriers, lifts, ramps, and FACILITIES to summarise available amenities and services such as boarding assistance.

The components of a STOP PLACE including PATH LINKs, QUAYs, ENTRANCES, etc., may be assigned ACCESSIBILITY LIMITATIONS with the following characteristics:

- Wheelchair access
- Step-free access
- Escalator-free access
- Lift-free access
- Audible signs available
- Virtual signs available

Accessibility may be further described in detail with different types of ACCESS EQUIPMENT: an item of equipment of a particular type actually available at a location within a PLACE and dedicated to access (e.g., lifts, entrances, stairs, ramps, etc.). This can include physical dimensions and usability restrictions (e.g., ENTRANCE EQUIPMENT gives door dimensions and opening mechanisms).

BEST PRACTICES

The above conditions may encompass access through lifts, escalators, or navigations stairs.

References/additional info: EN12896-2 (see <https://www.transmodel-cen.eu>); CEN/TS 16614-1 (see <https://netex-cen.eu>) ; CEN/TS 16614-6 (EPIAP)

Trip plan computation – for scheduled transport and transport on demand where relevant - existence of assistance services (such as existence of on-site assistance): the minimum information required for describing assistance services, essential for trip plan computation purposes.

Assistance services can be proposed prior to the travel (in case of normal conditions of operation), during the travel (in case of an incident), and/or after the travel. Some services - e.g., those for a customer travelling with physical or digital impairment, or compensations in case of delay - are made mandatory by several modal - and even multimodal - European legislation.

Correspondence with Transmodel/NeTEx Concepts

FACILITY	Simple names of the difference assistance facilities available at a SITE, for example disabled parking, boarding assistance, portage, etc. Transmodel describes the general concept of a named facility. NeTEx explicitly enumerates standardised
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	names for a range of facilities, including for accessibility.
LOCAL SERVICES	providing specific details about the named service relating to the use of the SITE or transport services at a particular location, for example, ASSISTANCE SERVICE describes the available services; ASSISTANCE BOOKING SERVICE how to summons assistance for disabled users, opening hours of booking offices, etc.
It includes several subtypes such as Left Luggage service, Meeting Point service, Complaints Service, Lost property service, and Ticketing service.	
SERVICE BOOKING ARRANGEMENTS	Information on booking rules and additional data allowing the user to take the decision to book a service and to undertake the booking of a LOCAL SERVICE.

References/additional info: EN12896-1 (see www.transmodel-cen.eu); CEN/TS 16614-1 (see <https://netex-cen.eu/>)

Trip plan computation – road network (including segregated lanes for bus/taxi): the minimum information required for describing the link and node structure of a (linear) road network used for the transportation of vehicles.

Correspondence with Transmodel/NeTEx Concepts

The road network is represented by ROAD (RAILWAY) ELEMENTs and ROAD (RAILWAY) JUNCTIONs. Such elements are part of the physical transport infrastructure. Transmodel/NeTEx describe in detail the service infrastructure using for example ROUTEs: ordered lists of located POINTs defining one single path through the road (or rail) network). ROUTEs (defined through ROUTE LINKs and ROUTE POINTs) are schematic representations of vehicle paths. In order to integrate/link the road network data with transport service data sets, the elements of the service network (e.g., ROUTEs) may be projected on the infrastructure network. The Transmodel/NeTEx PROJECTION mechanism allows this association.	
PROJECTION	An oriented correspondence from an element in one layer, onto an entity in a target layer.

BEST PRACTICES

The primary dimensions modelled for road network elements include (INSPIRE – reference):

- Spatial dimension: Geometric (point, line, and area (topographic)) representation of various elements that are parts of a road network. Typically, the road network is handled as a network of connected linear elements (links) with points (nodes) at the ends of the lines (at junctions, road ends, etc.). Real objects with a function in a network may also be represented in a dataset. Network connectivity within the roads network is essential but between elements in the other networks is an optional spatial aspect.
- Temporal dimension: All elements in a network may have a temporal validity (i.e., description of when a network element exists or is available in the real world). Optional meta-information on when



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information about a network element was entered, modified, or deleted may also be included in a dataset.

- Thematic dimension: The road schema can be thematically displayed via several of the attributes defined within the specification.

The three dimensions mentioned above are relevant to the physical infrastructure representing the road network.

References/additional info: EN12896-1 (see www.transmodel-cen.eu); CEN/TS 16614-1 (see <https://netex-cen.eu/>); <https://publications.jrc.ec.europa.eu/repository/handle/JRC118744>

Trip plan computation – *cycle network (cycle tracks, cycle lanes, bus-and-cycle lanes, on-road shared with vehicles, on-path shared with pedestrians)*: the minimum information required for describing the topological structure and attributes of cycle networks, essential for trip plan computation purposes.

There is no dedicated-reference European data standard for this data category. Cycling Network is standardised by ISO TC204 (GDF standard) and as mentioned here only partially by INSPIRE. The classes/attributes of the INSPIRE data specification can to a certain extent be used for segregated cycle streets that are parts of/adjacent to road networks, i.e., road segments the FormOfWayValue of which is bicycleRoad.

BEST PRACTICES

Three sub-categories of bikes should be considered:

- private bikes (used privately), which can be used - for moving or for parking - on roads or streets or dedicated infrastructure (or even shared with pedestrian areas or pedestrian crossings at traffic lights).
- bike-sharing, which requires specific organisation of services and fare/ticketing (with sub-categories of e-bikes), but which are used for moving in the same conditions as private bikes.
- bikes boarded in collective public transport modes, which are no longer used as a transport mode.

In addition to cycling, the category of “e-scooters” should also be analysed separately with the same three sub-categories.

References/additional info: <https://publications.jrc.ec.europa.eu/repository/handle/JRC118744>;
https://inspire.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_US_v3.0.pdf

Trip plan computation – *pedestrian network and accessibility facilities*: the minimum information required for describing the topological structure of pedestrian networks (physical and logical arrangements of nodes and links), essential for trip plan computation purposes.

Correspondence with Transmodel/NeTEx Concepts

NAVIGATION PATHs, PATH LINKs and PATH JUNCTIONs can be used to provide the topology of some aspects of the pedestrian network. Such NAVIGATION PATHs (either between SITEs or within SITEs) may be projected (see Transmodel/NeTEx PROJECTION mechanism) on the road infrastructure to provide the



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physical layout of the pedestrian network.	
PROJECTION	An oriented correspondence from an element in one layer, onto an entity in a target layer.

BEST PRACTICES

In line with the previous data category, the scope of the current one is limited to personal modes. There is a gap in INSPIRE, namely the classes/attributes of the INSPIRE data specification can to a certain extent be used for walkways and pedestrian zones that are adjacent to/interface with the remaining road network, i.e., road segments the FormOfWayValue of which is walkway or pedestrianZone. Pedestrian zones represent segments of road networks reserved for pedestrian use and closed for regular vehicular use by means of physical barriers (INSPIRE-reference).

References/additional info: EN12896-1 (see www.transmodel-cen.eu); CEN/TS 16614-1 (see <https://netex-cen.eu/>); <https://publications.jrc.ec.europa.eu/repository/handle/JRC118744>; https://inspire.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_US_v3.0.pdf

Level of service 2

Location search – for transport on demand and personal transport - location of parking places (on and off-street), including accessible parking places for persons with disabilities and persons with reduced mobility: the minimum information required for identifying the location of on-street or off-street places designated for parking vehicles.

Correspondence with Transmodel/NeTEx Concepts

PARKING	Designated locations for leaving vehicles such as cars, motorcycles and bicycles.
PARKING is an ADDRESSABLE PLACE, i.e. a type of PLACE to which passengers may refer to indicate the origin or a destination of a trip and that is so specific that it has an ADDRESS. PARKINGs may be subdivided into specific PARKING AREAs and PARKING BAYs ¹¹ , a POSTAL ADDRESS ¹² or both. The relation of PARKINGs to STOP PLACES and other sites can be represented with PATH LINKs.	
A PARKING as a ZONE may also be located by its coordinates in a specific location referencing system. It may also be explicitly designated as suitable for a specific transport interchange, point of interest, or topographic place.	

¹¹ A place to park an individual vehicle.

¹² A specification of ADDRESS refining it by using the attributes used for conventional identification for mail. Comprises variously a building Identifier, Street name, Post code and other descriptors (INSPIRE – reference format)



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References/additional info: EN 12896-2 (see www.transmodel-cen.eu); CEN/TS 16614-1 (see <https://netex-cen.eu/>); <https://publications.jrc.ec.europa.eu/repository/handle/JRC118744>

Location search – for transport on demand and personal transport - Park & Ride stops: the minimum information required for identifying the location of park & ride stops (i.e., places where road users can park their private vehicle and transfer to another public transport mode).

Park & ride stops constitute facilities located nearby public transport access nodes that hold an appropriate capacity for motorized and non-motorized vehicle parking, thus enabling travellers to leave/pick up their vehicles before/after a public transport trip.

Correspondence with Transmodel/NeTEx Concepts

"Park & ride" is defined as the activity allowing travellers to transfer between personal/alternative mode and conventional mode.
Park & ride facility is a location dedicated to travellers allowing them a modal transfer, in particular to leave/pick up their personal vehicles before/after a trip on public transport.
In order to describe the park & ride activity, a particular TYPE OF PARKING characterises the PARKING that a SITE CONNECTION associates with a STOP PLACE.
The data category refers to a type of PARKING which and may be associated with a STOP PLACE from which transport can be accessed.

References/additional info: EN12896-2 (see www.transmodel-cen.eu); CEN/TS 16614-1 (see <https://netex-cen.eu/>); EN12896-10 (see www.transmodel-cen.eu)

Location search – for transport on demand and personal transport - Park & Drive stops: the minimum information required for identifying the location of park & drive stops (i.e., places where road users can park their vehicle and transfer to carpooling mode).

A type of PARKING that is dedicated as a vehicle meeting point in order to facilitate carpooling. Park & Drive stops are often located in the vicinity of exit roads of towns and near highway ramps. They are mostly free of charge. They can accommodate public transport stops (i.e., buses or demand responsive transit) but their main function is to facilitate carpooling.

Location search – for transport on demand and personal transport - bike-sharing stations: the minimum information required for identifying the location of bike sharing stations.

Bike sharing stations constitute facilities wherein travellers can pick up or return a short-term cycle rental.



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Correspondence with Transmodel/NeTEx Concepts

VEHICLE SHARING PARKING AREA (for cycle sharing)	A dedicated part of the PARKING AREA (a marked zone within a PARKING containing PARKING BAYS) for cycle sharing, which is composed of one or more VEHICLE SHARING PARKING BAYS (spots in the PARKING AREA dedicated to vehicle sharing or rental).
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References/additional info: EN 12896-1, 2 & 10 (see www.transmodel-cen.eu); CEN/TS 16614-1 & 5 (see <https://netex-cen.eu/>)

Location search – *for transport on demand and personal transport - car-sharing stations*: the minimum information required for identifying the location of car sharing stations.

Car sharing stations constitute facilities wherein travellers can pick up or return a short-term car rental.

Correspondence with Transmodel/NeTEx Concepts

VEHICLE SHARING PARKING AREA (for car sharing)	A dedicated part of the PARKING AREA for car sharing which is composed of one or more VEHICLE SHARING PARKING BAYS.
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References/additional info: EN 12896-1, 2 & 10 (see www.transmodel-cen.eu); CEN/TS 16614-1 & 5 (see <https://netex-cen.eu/>); <https://greenbestpractice.jrc.ec.europa.eu/node/390>

Location search – *for transport on demand and personal transport - secure bike parking (such as locked bike garage)*: the minimum information required for identifying the location of secure bike parking facilities.

A bike parking facility can be addressed as secure when it provides the necessary equipment for locking a bicycle on the available bike racks and protecting it from prevailing climatic conditions and other hazards.

Correspondence with Transmodel/NeTEx Concepts

The location of CYCLE STORAGE EQUIPMENT the latter defined as (a specialization of) an item of EQUIPMENT actually available on a location describing cycle parking equipment., classified by TYPE OF CYCLE STORAGE EQUIPMENT (e.g., racks, bars, railings, etc.).

BEST PRACTICES

The location of the (e-)bike/e-scooter is not sufficient: the conditions of access and use are provided in other locations than the cycle storage equipment.



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References/additional info: EN12896-2 (see www.transmodel-cen.eu); CEN/TS 16614-1 (see <https://netex-cen.eu/>)

Location search – for transport on demand and personal transport - scooter parking zones: the minimum information required for identifying the location of scooter parking zones (guarded and unguarded).

Correspondence with Transmodel/NeTEx Concepts

VEHICLE SHARING PARKING AREA (for scooter sharing)	A dedicated part of the PARKING AREA for scooter sharing which is composed of one or more VEHICLE SHARING PARKING BAYS.
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Information service – where and how to buy tickets for scheduled transport, including retail channels, fulfilment methods, payment methods: the minimum set of information required for describing the way of purchasing a ticket for scheduled transport modes, demand responsive modes, including the location as well as the supported payment and fulfilment methods.

This data category encompasses information about different retail channels where tickets can be purchased (e.g., online, ticket desks), different fulfilment methods (e.g., pick up from a designated location) and accepted payment methods for purchasing a ticket (e.g., credit/debit cards, cash).

Correspondence with Transmodel/NeTEx Concepts

Information on how to purchase a ticket is needed both at a high level such as for a line or whole service and a detailed level when it is specific to a product. High level information about payment means can be specified on BOOKING ARRANGEMENTs associated with a LINE, MOBILITY SERVICE (such as cycle hire, taxi, etc.) or specific journeys.	
Specific product offers may be given one or more DISTRIBUTION CHANNELs: A type of outlet for selling of a FARE PRODUCT. It may also be given a FULFILMENT METHOD - how the ticket will be collected.	
More detailed information specific to individual products (SALES OFFER PACKAGES) – for example that a ticket is only available on a specific channel or using an ONLINE SERVICE. A DISTRIBUTION ASSIGNMENT relates a SALES OFFER PACKAGE to a DISTRIBUTION CHANNEL, FULFILMENT METHOD etc.	
The locational and physical characteristics of ticketing equipment available at stops and within interchanges can also be covered using TICKETING EQUIPMENT and RETAIL DEVICES.	
RETAIL DEVICE	A retail device used to sell fare products. Its identity can be used to record fulfilment and support security processes.
This device may be either fixed or on-board vehicles. Fixed equipment is located (cf. EQUIPMENT PLACE,	



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EQUIPMENT POSITION (e.g., by coordinates).
TTICKETING EQUIPMENT is characterized by: • TYPE OF TICKETING: A classification for ticketing services available at a TICKETING EQUIPMENT (e.g., purchase, collection, card top up, reservations). • TYPE OF PAYMENT METHOD: A classification for payment method (e.g., cash, credit card, debit card, travel card, contactless travel card, mobile phone, token, etc.). • VEHICLE MODE: A characterization of the public transport operation according to the means of transport (bus, tram, metro, train, ferry, ship). • TICKET SCOPE: whether the equipment is for long distance, urban, regional, etc.
Such equipment can be placed either in a fixed location or on board. When it is fixed, information about its location (cf. EQUIPMENT PLACE, EQUIPMENT POSITION) should be provided (e.g., by using coordinates).

Information service – *where and how to pay for parking, including retail channels, fulfilment methods, payment methods*: the minimum set of information required for describing the way to pay for parking, including the location as well as the supported payment and fulfilment methods.

Correspondence with Transmodel/NeTEx Concepts

How to buy/pay for access rights to mobility services (including parking services) is described above.
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Auxiliary information – *for scheduled transport and transport on demand where relevant*: basic common standard fares: fare network data (fare zones/stops and fare stages): the minimum information required for describing the layout of a fare network, such as the zones of which it is comprised.

Fare or tariff zones are used to group different sections of a public transport journey for which a set charge is made. They constitute two-dimensional elements within the service area of a public transport operator. The individual one-dimensional elements within the service area of a public transport operator. The individual one-dimensional sections of a fare network are defined as the consecutive fare or border points of a public transport journey that fall within the same fare or tariff zone. For fare structures that are based on the number of fare stages passed, the fare stages passed, the fare stages can be demarcated.

Correspondence with Transmodel/NeTEx Concepts

TARIFF	A ZONE used to define a zonal fare structure in a zone-counting or zone-matrix system.
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ZONE	
FARE ZONE	A specialization of TARIFF ZONE to include FARE SECTIONS.
FARE SECTION	A subdivision of a JOURNEY PATTERN ¹³ consisting of consecutive POINTS IN JOURNEY PATTERN, used to define an element of the fare structure. FARE SECTIONS can be used to indicate fare stages.
ZONE	A two-dimensional location. NOTE: may have global coordinates or relative to an encompassing space.

¹³ An ordered list of SCHEDULED STOP POINTS and TIMING POINTS on a single ROUTE, describing the pattern of working for public transport vehicles.

References/additional info: EN 12896-1, 2 & 10 (see www.transmodel-cen.eu); CEN/TS 16614-1 & 5 (see <https://netex-cen.eu/>)

Auxiliary information – for scheduled transport and transport on demand where relevant:
 basic common standard fares: standard fare structures (point to point including daily and weekly fares, zonal fares, flat fares): the minimum information required to describe how users of public transport services are charged (i.e., data objects and elements needed to support the definition of fare products and their parameters).

Fare structures can be broadly discerned into:

- Space-based structures: flat or progressive, zonal- or interval-based, point-to-point, etc. Interval-based fares may be based on simple distances, numbers of zones, border points, etc.
- Time-based structures: flat or progressive depending upon time intervals.
- Combination of the two (e.g., fare products based on both zones and time intervals).

Correspondence with Transmodel/NeTEx Concepts

Point to point fares may be described with DISTANCE MATRIX ELEMENTs
Zonal fares may be described with DISTANCE MATRIX ELEMENTs
Fares based on unit counts, such as number of zones or number of stops may be described using GEOGRAPHIC INTERVALs
Fares that are progressive on distance may be described using GEOGRAPHIC INTERVALs
Fares that are progressive on time may be described using TIME INTERVALs
Other pricing factors can be represented using QUALITY STRUCTURE FACTORs (factors influencing access rights definition or calculation of prices, based on the quality: traffic congestion threshold, early/late



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reservation etc.
Complex combinations of all the above (such as distance and time combinations) can be specified using GENERIC PARAMETER assignments

References/additional info: https://www.transmodel-cen.eu/wp-content/uploads/2019/10/TUTORIAL_Part5_v2.3-1.pdf; EN 12896-1,5 & 10 (see www.transmodel-cen.eu); CEN/TS 16614-1, 3 & 5 (see <https://netex-cen.eu/>)

Auxiliary information – for scheduled transport and transport on demand where relevant - vehicle facilities, including classes of carriage, on-board Wi-Fi, capacity and access conditions for bicycles: the minimum information required to describe the available facilities/amenities offered by a public transport mode.

The above-mentioned facilities/amenities may involve an indication of whether a) on-board Wi-Fi, b) equipment supporting bicycle or scooter boarding, c) monitors providing vehicle tracking or declaring the next stop is/are available. They may also involve information about the available classes of carriage and the included facilities/amenities. For instance, in rail transport services there are various types of wagons, such as luxury class, first class, second class, third class, economy class. Each of these classes offer different amenities/facilities ranging from private compartments, including private beds, showers, and toilets, to shared compartments, including their own backs, lights, tables, and luggage spaces.

Correspondence with Transmodel/NeTEx Concepts

CLASS OF USE	A classification of fare and other service classes by category of user entitled to use them. It can be used both to classify onboard accommodation and to designate the access rights of a given fare product
FACILITIES	Provide a high-level summary of named amenities available to the public at a SITE or on a SERVICE (e.g., bar, restaurant, Wi-Fi, toilets, quiet carriage). A facility has no further properties other than a named amenity.
ACCOMMODATION	A combination of accommodation characteristics available on a service, e.g., "First Class Couchette with shower and 2 bunks" (specialisation of SERVICE FACILITY SET).
SERVICE FACILITY SET	Set of FACILITIES available for a specific VEHICLE TYPE (e.g., carriage equipped with low floor) possibly only for a service (or for a SERVICE JOURNEY or a JOURNEY).
An EQUIPMENT or LOCAL SERVICE is used to describe the further properties provided as part of particular facility. For example, plug types for seat power, dimensions with a wheelchair space etc.	
DECK PLANS	Provide information about the specific onboard layout of buses, coaches, trains,



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	buses, ferries etc., including seating, luggage, cycle and vehicle storage locations etc. Onboard locations such as PASSENGER SPACES, may be assigned ACTUAL VEHICLE EQUIPMENT as for example PASSENGER INFORMATION EQUIPMENT.
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References/additional info: EN12896-1&2 (see www.transmodel-cen.eu); CEN/TS 16614-1 (see <https://netex-cen.eu/>)

Level of service 3

Detailed common standard and special fare query – for scheduled transport and transport on demand where relevant - passenger classes (classes of passenger such as adult, child, senior, student, military/veteran, passenger with disability and passenger with reduced mobility, and qualifying conditions, and classes of travel): the minimum information about passenger classes required for supporting fare queries.

Provided information may be classified based on fare classes (e.g., first class, second class, business class, etc.) and/or based on user profiles (e.g., adults, children, students, veterans, impaired people). The information provided may also encompass the qualification conditions applying in each user class.

Correspondence with Transmodel/NeTEx Concepts

USER PROFILE	Eligibility requirements to be met by the social profile of a passenger, based on age group, residence, employment status, sex, mobility requirements etc., used for allowing discounts: 18-40 years old, graduates, preferences, unemployed, women, etc.
COMMERCIAL PROFILE	Eligibility requirements may also include membership of frequent traveller schemes, company schemes and other.
FARE CLASS with attributes	first class, second class, third class, economy class, business class.

References/additional info: EN12896-5 (see www.transmodel-cen.eu); CEN/TS 16614-3 (see <https://netex-cen.eu/>)

Detailed common standard and special fare query – for scheduled transport and transport on demand where relevant - 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



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fare prices): the minimum set information about common fare products required for supporting fare queries.

Provided information may be classified based on tariff offers and access rights (e.g., zone/point-to-point weekly/single/roundtrip tickets) as well as the eligibility of access and basic usage conditions (e.g., valid period/operator/time of travel interchanging, standard point-to-point fare prices for different point-to-point pairs including daily and weekly fares/zonal fare/flat fare). The prices may be absolute or derived from other prices.

Correspondence with Transmodel/NeTEx Concepts

Parameters determining the sales offer, i.e., the set of main FARE PRODUCTS and their parameters.	
FARE PRODUCT	An immaterial marketable element (access rights to travel or use other services, discount rights to buy products at a discount, etc.), specific to a CHARGING MOMENT ¹⁴ .
Types of FARE PRODUCTS	Transmodel/NeTEx distinguishes different types of products: - o PRE-ASSIGNED FARE PRODUCT: Specific access rights to travel either on a specific trip or repeatedly on a pass. - o AMOUNT OF PRICE UNIT: Stored value to travel a certain amount. - o SALE DISCOUNT RIGHT: A product that gives the right to buy or consume travel at a discount.
ENTITLEMENT PRODUCT	A precondition to access a service or to purchase a FARE PRODUCT expressed as another product. Issued by an organisation that may not be a PT operator (e.g., military card, travel discount card).
The FARE PRODUCTS are characterised by a range of validity and usage limitation parameters.	
TEMPORAL VALIDITY PARAMETERS	Grouping of time-related parameters defining the validity of access rights. - o VALIDITY CONDITION - o SERVICE CALENDAR - o DAY TYPE - o OPERATING DAY - o TIME BAND
SCOPING VALIDITY PARAMETERS (ORGANISATIONAL/NETWORK/ROUTING/FARE/SERVICE VALIDITY PARAMETERS)	Space- and organisation-related parameters defining the validity of access rights



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USAGE PARAMETERS	Parameters used to specify/limit the use of a SALES OFFER PACKAGE or a FARE PRODUCT: - o travel usage parameters, such as MINIMUM STAY, ROUND TRIP, etc; - o eligibility parameters, such as USER PROFILE, GROUP TICKET, etc; - o entitlement parameters, such as ENTITLEMENT REQUIRED); - o luggage usage parameters, such as LUGGAGE ALLOWANCE; - o booking usage parameters, such as PURCHASE WINDOW, RESERVING, CANCELLING; - o after sales usage parameters, such as REFUNDING, REPLACING, EXCHANGING, TRANSFERABILITY, etc; - o charging usage parameters, such as PENALTY POLICY, CHARGING POLICY, SUSCRIBING.
Some FARE PRODUCTS may be characterised by a possibility to change the normal access rights given to a passenger because of a disruption (possibility of a FARE EASEMENT).	
The elements of a fare offer are PRICEABLE OBJECTs (element which may have a FARE PRICE i.e. price features).	
The Price MODEL provides the necessary parameters (pricing parameters) for the calculation of the exact price of an access right (FARE PRODUCT) based on the atomic FARE PRICES of the different parameters determining a FARE PODUCT.	
PRICING RULE	A rule used for the calculation of FARE PRICE, determined either by a set of parameters to be applied to a reference price or by a more complex algorithm. PRICING RULEs may be chained together.

¹⁴ A classification of FARE PRODUCTS according to the payment method and the account location: pre-payment with cancellation (throw-away), pre-payment with debit on a value card, pre-payment without consumption registration (pass), post-payment etc.

References/additional info: EN12896-5 (see www.transmodel-cen.eu); CEN/TS 16614-3 (see <https://netex-cen.eu/>)

Detailed common standard and special fare query – for scheduled transport and transport on demand where relevant - 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): the minimum set of information about special fare products required for supporting fare queries.



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Special fare products are based on offers with additional special conditions, such as promotional fares, group fares, season passes, aggregated products combining different products and add on products (e.g., parking and travel, minimum stay).

Correspondence with Transmodel/NeTEx Concepts

Special fare products	
The different validity and usage limitation parameters are presented above. In particular, the usage limiting parameters (USAGE PARAMETERS) express specificities of certain access rights (FARE PRODUCTS).	
USAGE PARAMETERS	Allow detailed limitations on use to be specified: - o RESIDENTIAL QUALIFICATION: A parameter providing an authorisation to consider a user as being characterised by a USER PROFILE. - o COMPANION PROFILE: The number and characteristics of the persons entitled to travel in a group or as companions to another USER PROFILE. - o GROUP TICKET: The number and characteristics of persons entitled to travel in addition to the holder of an access right.
Combined products	
Combined access rights: several different access rights may be combined into a single access right, for example a smartcard that providing the right to travel in a specific zone and a discounted travel using value stored on the card for other zones. Another typical example is the access to a parking for a certain time followed by the access to a transport network. Such combined FARE PRODUCTS are considered a FARE PRODUCTS in their own right. Transmodel/NeTEx expresses the combination of the parameters determining the validity of such combined FARE PRODUCTS. Such combinations are often resulting from contracts between product owners/operators and allow for a special price (when used as combinations and not separately). The combined access rights are considered as FARE PRODUCTS in their own right and have to be validated in one go (as one single access right).	
VALIDABLE ELEMENT	A sequence or set of FARE STRUCTURE ELEMENTs, grouped together to be validated in one go.
Offer packages	
SALES OFFER PACKAGES	Combine one or more FARE PRODUCTS with information on the materialisation (as paper ticket, electronic ticket, etc.) and distribution: - o A TYPE OF TRAVEL DOCUMENT specifies the media used (paper, app, smartcard, etc.) - o Where to purchase and collect a product can be specified using DISTRIBUTION CHANNELs, FULFILMENT METHODS



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	- o Means of payment (cash, credit card) can be specified as a TYPE OF PAYMENT METHOD - o FARE PRODUCTS can also be used to define add-on products such as seat reservations, cycle tickets, parking, etc. Such FARE PRODUCTS can be sold separately or bundled into a SALES OFFER PACKAGE with other access rights.
Pricing	
The Price MODEL provides the necessary parameters (pricing parameters) for the calculation of the exact price of an access right (FARE PRODUCT) based on the atomic FARE PRICES of the different parameters determining a FARE PRODUCT.	
PRICE GROUPS	Allow for a grouping of prices, allowing the grouping of numerous possible consumption elements into a limited number of price references, or to apply grouped increase, in value or percentage.
PRICING RULE	A rule used for the calculation of FARE PRICE, determined either by a set of parameters to be applied to a reference price or by a more complex algorithm. PRICING RULES may be chained together.

References/additional info: EN12896-5 (see www.transmodel-cen.eu); CEN/TS 16614-3 (see <https://netex-cen.eu/>)

Detailed common standard and special fare query – for scheduled transport and transport on demand where relevant - basic commercial conditions such as refunding, replacing, exchanging or transferring: the minimum set of information about basic commercial conditions required for supporting fare queries.

This information may refer to the principles of refunding, replacing, exchanging, and transferring a ticket and/or the basic conditions, such as purchase windows, validity periods, fare limitations, and minimum duration.

Correspondence with Transmodel/NeTEx Concepts

When specifying a fare offer with Transmodel/NeTEx different commercial conditions are specified as different of USAGE PARAMETERS, including:	
TRANSFERABILITY	The number and characteristics of persons entitled to use the public transport service instead of the original customer.
RESELLING	Common resale conditions (i.e. for exchange or refund) attached to the product, such as:



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	• REFUNDING: Whether and how the product may be refunded. • EXCHANGING: Whether and how the product may be exchanged for another. • REPLACING: Whether and how the access right may be replaced (e.g., if the user loses their ticket).
BOOKING POLICY	Details of the booking arrangements for a service: • RESERVING: Indicating whether the access right requires reservation. • PURCHASE WINDOW: Period in which the product must be purchased. • CANCELLING: Parameter giving conditions for cancelling of a purchased access right.
Further parameters can describe further commercial aspects, for example: • ELIGIBILITY CHANGE POLICY: What happens if a user's eligibility for a product changes (e.g., they exceed a qualifying age). • REBATING: Rules for compensation for failing to meet minimum guaranteed levels of service. • SUSPENDING: Parameters controlling rules for suspension of a season pass for an allowed period.	
RESERVATION MOMENT	A classification of moment at which a booking or reservation may be made, e.g., in advance, at stop, on boarding, on board, etc.
FARE EASEMENT	A change to the normal access rights given to PASSENGERS because of a disruption to the network, for example permission for metro ticket holders to use local rail and bus services if the metro is suspended.

References/additional info: EN 12896-5 (see www.transmodel-cen.eu); CEN/TS 16614-3 (see <https://netex-cen.eu/>)

Detailed common standard and special fare query – for scheduled transport and transport on demand where relevant - basic booking conditions, such as purchase windows, validity periods, routing restrictions zonal sequence fares, minimum stay: the minimum set of information required for describing basic booking conditions.

Correspondence with Transmodel/NeTEx Concepts

SCOPING VALIDITY PARAMETERS	
ROUTING VALIDITY PARAMETERS	Parameters expressing limitations on routing of an access right (Restricted (Whether only allowed on certain routes or series), CrossBorder (Whether the routing is across a border), ReturnRouteIdentical (Return route must be same as outbound route).
VALIDITY	A time limitation for validity of a FARE PRODUCT or a SALES OFFER PACKAGE. It may be composed of a standard duration (e.g., 3 days, 1 month) and/or fixed start/end



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PARAMETERS	dates and times.
USAGE PARAMETERS	
Parameters used to specify/limit the use of a SALES OFFER PACKAGE or a FARE PRODUCT: o travel usage parameters, such as MINIMUM STAY, ROUND TRIP o booking usage parameters, such as PURCHASE WINDOW, BOOKING POLICY (RESERVING, CANCELLING), RESERVATION MOMENT	

References/additional info: EN 12896-5 (see www.transmodel-cen.eu); CEN/TS 16614-3 (see <https://netex-cen.eu/>)

Information service – for transport on demand - how to book demand-responsive transport services, including retail channels, fulfilment methods, payment methods: the minimum information required to describe the way of booking demand-responsive transport services such as car-sharing, taxi and cycle-hiring services.

Correspondence with Transmodel/NeTEx Concepts

SERVICE BOOKING ARRANGEMENTS	Information on booking rules and additional data allowing the user to take the decision to book a service and to undertake the booking (including car sharing, taxis, cycle rental, etc.).
Included attributes may indicatively refer to a) booking access, b) booking methods, c) booking URL, d) latest booking time, e) booking procedure, f) deposit required, g) cancellation allowed, etc.	

See also above.

References/additional info: EN 12896-10 (see www.transmodel-cen.eu); CEN/TS 16614-5 (see <https://netex-cen.eu/>)

Trip plans – 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): the minimum set of information required for describing the attributes of a cycle network (physical and logical arrangement of nodes and links).

There is no reference standard for this data category.

References/additional info: <https://publications.jrc.ec.europa.eu/repository/handle/JRC118744>



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Trip plans – parameters needed to calculate an environmental factor such as greenhouse gas emissions per vehicle type or passenger mile or per distance walked: the minimum set of information required for enabling the estimation of the environmental footprint of a trip.

As mentioned within the Delegated Regulations (EU) 2017/1926 and (EU) 2024/490, this information encompasses parameters, such as carbon dioxide emissions per vehicle type (i.e., average rate per vehicle type per mile travelled), passenger mile (i.e., average rate per vehicle type per mile travelled per passenger), and distance walked (i.e., average rate per mile of walking).

Correspondence with Transmodel/NeTEx Concepts

LOGGABLE OBJECTS	Entities for which LOG ENTRIES may be made.
LOG ENTRY	A time-stamped record of an event or change of state.

References/additional info: EN 12896–8 (Management Information and Statistics - see www.transmodel-cen.eu)

Trip plans – parameters needed to calculate fuel consumption of conventional and alternative fuels: the minimum set of information required for estimating costs related to fuel consumption.

Correspondence with Transmodel/NeTEx Concepts

LOGGABLE OBJECTS	Entities for which LOG ENTRIES may be made.
LOG ENTRY	A time-stamped record of an event or change of state.

References/additional info: EN 12896–8 (Management Information and Statistics - see www.transmodel-cen.eu)

Trip plan computation – estimated travel times by day type and time-band by transport mode/combination of transport modes: the minimum set of information required for calculating the estimated travel times by transport mode or even combination of transport modes considering recurring conditions at/in specific time bands and day types.

Correspondence with Transmodel/NeTEx Concepts

Estimated travel times may be calculated out of the different types of PASSING TIMES and the LOG ENTRIES of the DATED PASSING TIMES.
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DATED PASSING TIME	A PASSING TIME on a particular OPERATING DAY, in particular: - o OBSERVED PASSING TIME: The actual passing of a public transport vehicle at a pre-defined POINT during a MONITORED VEHICLE JOURNEY. - o ESTIMATED PASSING TIME: A time data, calculated from the latest available input, about when a public transport vehicle will pass a particular POINT IN JOURNEY PATTERN on a specified DATED VEHICLE JOURNEY. These are mainly used to inform passengers about expected times of arrival and/or departure but may also be used for monitoring and re-planning. - o TARGET PASSING TIME: Time data about when a public transport vehicle should pass a particular POINT IN JOURNEY PATTERN on a particular DATED VEHICLE JOURNEY, in order to match the latest valid plan.
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Level of Service 4

NOTE ON HISTORIC AND OBSERVED DATA ON DELAYS

During the preparation of the first edition of the MMTIS DR data dictionary, OpRa (Operating raw data and statics exchange) is under development. OpRa standard will be based on Transmodel (EN12896) and NeTEx (CEN/TS 16614). As a result, OpRa will provide more tools for the data types and services presented in the following lines. Until then, the Article 4. 1. B. iv should be observed: "Transmodel EN 12896 [should be used] where there is no reference exchange protocol".

Historic travel and traffic data on delays – *for scheduled transport and transport on demand where relevant*

Delay: A description of deviations from the public transport timetable.

Correspondence with Transmodel/OpRa

DATED JOURNEY INFORMATION RECORDING	Indicator designed for recording DATED VEHICLE JOURNEY information referencing DATED VEHICLE JOURNEY, DATED PASSING TIME and the PT SITUATION, PT SITUATION CONSEQUENCE and SITUATION CAUSE explaining the reason for the delay.
DELAYS may be caused by OPERATIONAL EVENTS.	
OPERATIONAL EVENT	Any event affecting the public transport operation (production follow-up, management of information or the technical functioning), occurring on an OPERATING DAY and recorded in the system. An OPERATIONAL EVENT is generally causing a CONTROL ACTION.



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Observed data on delays and passing time – for scheduled transport: length of, and when possible the reason for, flight delays at departure of at least 120 minutes, and flight delays at arrival of at least 180 minutes (in accordance with Articles 5 and 6 of Regulation (EC) No 261/2004)

See Correspondence Transmodel/OpRa in “Historic travel and traffic data on delays – for scheduled transport and transport on demand where relevant”.

Observed data on delays and passing time – for scheduled transport: length of, and when possible the reason for, delays in departure of more than 90 minutes for sea and inland waterways passenger services (in accordance with Article 18 of Regulation (EU) No 1177/2010)

See Correspondence Transmodel/OpRa in “Historic travel and traffic data on delays – for scheduled transport and transport on demand where relevant”.

Observed data on delays and passing time – for scheduled transport: length of, and when possible the reason for, delays in departure from a terminal of more than 120 minutes for regular bus and coach passenger services with a scheduled distance of 250 km or more (in accordance with Article 19 of Regulation (EU) No 181/2011)

See Correspondence Transmodel/OpRa in “Historic travel and traffic data on delays – for scheduled transport and transport on demand where relevant”.

Observed data on delays and passing time – for scheduled transport: length of, and when possible the reason for, flight delays at departure of at least 120 minutes; and flight delays at arrival of at least 180 minutes (in accordance with Articles 5 and 6 of Regulation (EC) No 261/2004)

See Correspondence Transmodel/OpRa in “Historic travel and traffic data on delays – for scheduled transport and transport on demand where relevant”.

Observed data on cancellations – for scheduled transport: cancellations, and when possible the reason, of rail passenger services

Correspondence with Transmodel/SIRI

The Transmodel CONTROL ACTION MODEL represents cancellations and delays in the operation of services and the reasons for them. For instance, the VEHICLE CONTROL ACTION, JOURNEY CANCELLATION, CHANGE OF JOURNEY TIMING.
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CONTROL ACTIONs are LOGGABLE OBJECTs data that can be logged and subsequently analysed to construct performance indicators.

References/additional info: EN12896-4 (see www.transmodel-cen.eu); CEN/TS 15531-6

Observed data on cancellations – for scheduled transport: cancellations, and when possible the reason, of sea and inland waterways passenger services

See Correspondence Transmodel/SIRI in “Observed data on cancellations – for scheduled transport: cancellations, and when possible the reason, of rail passenger services”.



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Observed data on cancellations – for scheduled transport: cancellations, and when possible the reason, of regular bus and coach services with a scheduled distance of 250 km or more

See Correspondence Transmodel/SIRI in “Observed data on cancellations – for scheduled transport: cancellations, and when possible the reason, of rail passenger services”.

Observed data on cancellations – for scheduled transport: cancellations, and when possible the reason, of flights

See Correspondence Transmodel/SIRI in “Observed data on cancellations – for scheduled transport: cancellations, and when possible the reason, of rail passenger services”.

Information on parking tariffs: the minimum information required for describing parking tariffs

Correspondence with Transmodel/NeTEx

PARKING TARIFF	A set of parking CHARGE BANDs (Parking charges that describe the cost of using a PARKING or PARKING AREA for a given period, vehicle type and type of stay, for example long term car parking for over 48 hours).
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References/additional info: EN12896-5 (see www.transmodel-cen.eu); CEN/TS 16614-3 (see <https://netex-cen.eu/>)

Types of the Dynamic Travel and Traffic Data

Level of service 1

Passing times, trip plans and auxiliary information – disruptions, such as network closures and/or diversions, and when possible, the reason: the minimum dynamic information required for disseminating the existence of changes in the normal operation of transport services.

SIRI can exchange estimated real-time changes to the planned timetable and continuously keep track of minor deviations, cancellations and other disruptions, prior to- or during the service operation.

NeTEx can be used to exchange alterations to the planned timetable including last-minute changes to the passing times.

Correspondence with Transmodel/SIRI

OPERATIONAL EVENT	Any event affecting the public transport operation occurring on an OPERATING DAY and recorded in the system.
An OPERATIONAL EVENT is generally causing a CONTROL ACTION.	



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OPERATIONAL EVENTS may concern a SITE, a FACILITY, or may be related to a DRIVER or a VEHICLE.
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References/additional info: EN12896-4 (see www.transmodel-cen.eu); SIRI 16631 (Estimated Timetable Service)

Passing times, trip plans and auxiliary information – *real-time status information, such as estimated departure and arrival times of services, delays, cancellations, guaranteed connections monitoring*: the minimum dynamic information required for providing further details about the operational status of transport services.

This information may provide further details about delays, cancellations, and guaranteed connections among different modes (e.g., foreseen delay duration, cancellation timeframe). It shall be dynamically updated as soon as it becomes available to reflect the latest operational status of transport services.

Correspondence with Transmodel/SIRI

PT SITUATION CONSEQUENCE	A description of the consequences of the PT SITUATION generally or in relation to involved or indirectly impacted public transport elements.
May provide information such as:	
DELAYS	Description of deviations from the public transport timetable.
PT SITUATION GENERAL CONSEQUENCE	A parameter describing a general consequence of a PT SITUATION.
EASEMENT	A description of temporary (fare) exceptions allowed because of disruptions.

References/additional info: EN12896-4 (see www.transmodel-cen.eu); CEN/TS 16631-5 (Situation Exchange Service)

Passing times, trip plans and auxiliary information – *status of access node features (including dynamic platform information, operational lifts/escalators, closed entrances and exit locations)* – for scheduled transport: the minimum dynamic information providing insight into the operational status of access nodes features.

The operational status of access nodes features (e.g., platform information systems, lift/escalators, entrances, and exits) may be affected by technical issues and malfunctions.

Correspondence with Transmodel/SIRI



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MONITORED PLACE EQUIPMENT FACILITY	A monitored named amenity or capability related to a PLACE EQUIPMENT.
MONITORED FACILITY CONDITION	Describes a changed state of availability for a MONITORED FACILITY.
FACILITY STATUS	Categorizes the change to availability of the facility, such as being removed, unavailable or only partially available.

References/additional info: EN12896-4 (see www.transmodel-cen.eu); CEN/TS 16631-4 (Facility Monitoring Service)

Level of service 2

Information service on parking tariffs – *for transport on demand and personal transport*: the minimum dynamic information on parking tariffs.

Correspondence with Transmodel/NeTEx

PARKING TARIFF	A set of PARKING CHARGE BANDS that describe the cost of using a PARKING or PARKING AREA.
PARKING CHARGE BAND	Parking charges that describe the cost of using a PARKING or PARKING AREA for a given period (PARKING PRICES).

References/additional info: EN12896-5 (see www.transmodel-cen.eu); CEN/TS 15514-3

Availability check and location – *for transport on demand and personal transport where relevant - car-sharing availability and location, bike-sharing availability and location, scooter-sharing availability and location, and other vehicle-sharing availability and location*: information disseminating the availability of shared vehicles (e.g., car, bike, scooter) at a specific location (dedicated to vehicle sharing).

It may derive from the capacity of a given area and vehicle location information at a specific time.

Correspondence with Transmodel/NeTEx

PARKING CAPACITY of the VEHICLE SHARING PARKING AREA (i.e., a dedicated part of the PARKING AREA for vehicle sharing or rental which is composed of one or more VEHICLE SHARING PARKING BAYS).	
VEHICLE	An activity consisting in the identification of a vehicle at a certain time by a detection



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DETECTING	device and of collecting crude data such as an absolute location of the vehicle.
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References/additional info: EN12896-2 & 4 (see www.transmodel-cen.eu)

Availability check and location – for transport on demand and personal transport where relevant - car parking spaces available (on and off-street): the minimum dynamic information required for disseminating the availability of on-street and off-street car parking space.

BEST PRACTICES

Information of the availability of parking space should ideally specify the accessibility of parking places for wheelchair users (as they require more space for accessing and leaving the vehicle).

More details on the content and structure of on-street or off-street parking availability data can be found on the data dictionary of the DATEX II Parking Publication light.

References/additional info: <https://docs.datex2.eu/v3.2/downloads/parkinglight.html>

Level of service 3

Occupancy information of the vehicle – for scheduled transport and transport on demand where relevant: dynamic information indicating the occupancy of vehicles of scheduled and on-demand mobility services.

Correspondence with Transmodel

VEHICLE LOAD ENTRY	The observed or estimated load levels for a VEHICLE on a journey, at a specified stop.
VEHICLE OCCUPANCY COUNT	A record (or estimate) of occupancy of a given VEHICLE and type of occupant, in a given context.

References/additional info: EN12896-4 (see www.transmodel-cen.eu)