Interface with National Access Point Italy – development plan for planned and real-time data sharing of South Tyrol

Indice dei contenuti

1.   Introduction and status quo

This technical document aims to describe how the South Tyrolean Regional Access Point (ST-RAP) will provide mobility services data to the National Access Point (NAP).

The ST-RAP is formed by the combination of two system architectures: the (i) digital architecture for public transport in South Tyrol, which can be seen as its digital backbone; and (ii) the Open Data Hub platform, where real-time data from all other mobility services are centrally collected and distributed.

1.1.   The digital architecture for public transport in South Tyrol

The digital architecture for public transport in South Tyrol is graphically presented in Figure 1. Differently from other regions, in which public transport services are mainly organized, managed and carried out by public transport operators (PTOs), including in relation to topics like passenger information and ticketing (so called "net costs" model), keeping the income from the reselling of tickets sold to passengers, in South Tyrol a gross cost model is implemented. The main difference is related to the fact that all these main competences are kept by the public transport authority (PTA), while PTOs are just paid for the actual transportation service carried out. The main reference organization in South Tyrol, apart from the Mobility Department of the Province of Bolzano, which manages all the contracts with the PTOs, is STA, who has designed and implemented such architecture, thanks also to the strict cooperation of NOI Techpark. STA has of course also the responsibility to manage and maintain the components under its responsibilities, including those that externalized to its suppliers.

Figure 1: The digital architecture for public transport in South Tyrol.

As a consequence, the ST-RAP is not a regional collection system of planned data (e.g. network, timetables, etc.) provided by regional PTOs. All data is centrally defined and managed by the PTAs in the "Timetable & Network Topology Planning Tool" and from there distributed to all other system components. Please note that the digital architecture implements all standard EU protocols in the public transport domain, including NeTEx and SIRI. For NeTEx, the German profile (VDV-462 specification) for the sharing of data is implemented.

1.1.1. NeTEx Level 1 interface with NAP

Thanks to this so conceived digital architecture, the implementation with the NAP as far as the Level 1 is concerned has been quite sample. Together with the other export in the VDV-462, the "Timetable & Network Topology Planning Tool" has also implemented the EU-Profile, which is the profile chosen by Italy for its national profile. All these exports are managed in the Datawarehouse, where all data are stored and saved in order to create a historical database to be used for different applications, e.g., analysis of the efficiency of transportation services and accounting of the PTOs. The interface with the NAP is actually implemented at the level of the Datawarehouse, which has implemented the API for the automatic exchange of the data with the NAP, which takes place once a day. In this way it is possible to feed the NAP with fresh actual planned data, which take in consideration all the changes that are introduced on a daily basis in the services offered. This is the same level of "refresh rate" which is implemented also with the other PTOs and that is used on all regional passenger information channels.

1.2. The Open Data Hub platform for the sharing of additional mobility services data

The other relevant platform for the sharing of mobility services data is Open Data Hub, managed by NOI Techpark. Open Data Hub is an open source platform which centrally collects static and real-time data in different domains from different data sources and providers, including mobility. In the last years it has been possible to open and let publicly available data related to e.g. off-street / on-street parking, e-charging stations, car / bike sharing mobility services. The architecture is basically structured as follows:

- Provision of a custom API from the back-end of a data provider
- Micro-service for the automatic ingestion of the available data and mapping with a common data model applied to all different mobility data types
- Provision of the data to 3rd parties through a unique (non standard but documented) API. Through its data it's possible, for example, get all parking data shared with the Open Data Hub through one API call.

At present, no standard interfaces for the sharing of the data through the Open Data Hub has been implemented, since the objective has always been to provide a simple and easy-to-use API for data consumers. However, depending on the uses cases, the development of standard interfaces will be considered in the short period. Within this specific activity, the Open Data Hub will in particular be extended so to provide available real-time data to the NAP through the SIRI protocol.

2.   NeTEx export enhancement

The current NeTEx interface with NAP, as described in paragraph 1.1.1 has to be extended according to the additional "levels" that have been introduced in the latest version of the Italian NeTEx profile, i.e. v4.0. The following developments are foreseen:

- **Level 2**:
  - o   Information related to the contracts between PTA and PTOs
  - o   Information of the vehicles used for the public transportation services
  - o   Information of available (off-street) parking infrastructure
- **Level 3**:
  - o   Information related to the ticketing products and rules
- **Level 4:**
  - o   Information related to sharing mobility services

2.1.   Level 2 development

2.1.1.   Contracts

At present, this information is not available in a digital format. The plan is to integrate this data in the Datawarehouse based on information provided by the Province of Bolzano. This could take place through the completion of an online form within the PTO's portal for the accounting operations, or simply through e.g., a CSV file, as in the simplified graphical representation of Figure 2.
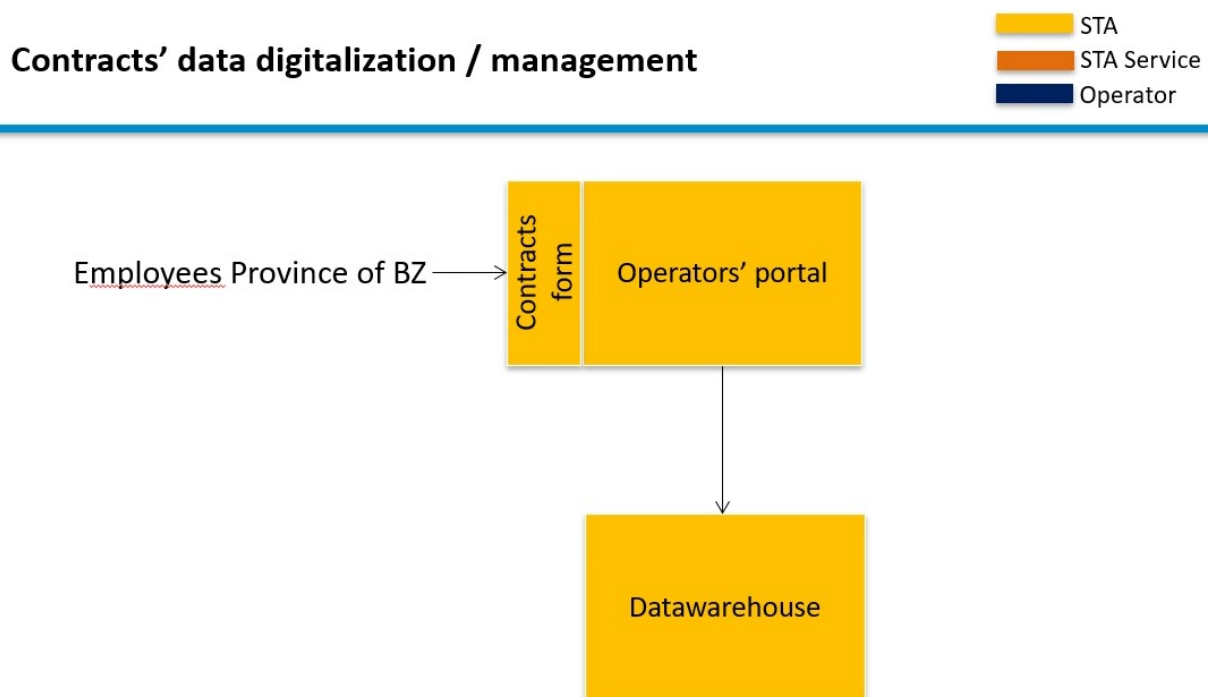
The reference contracts' data have to exported through the structure "**members**" within the **GeneralFrame** of NeTEx. The reference specification is contained in [1], paragraph 5.2.1.1. Table 1 contains a mapping between the fields to be foreseen in the contracts form and the fields to be made available through the NeTEx interface.

Contracts form	NeTEx	Notes
-	**id**	Global ID of the contract. To be automatically generated by the Datawarehouse according to the South Tyrolean specifications related to the IDs [2] - paragraph 2.4. Example: IT:ITC1:JourneyAccounting:busATS:1A
-	**version**	Version of the contract. Each change through the contracts form generates a new version of the data record (versioning support).
-	**ValidityConditionRef**	Not provided in the export, general validity conditions of NeTEx export provided in the composite frame apply
Nome / Name	**Name**	Name of the contract
Descrizione / Beschreibung	**Description**	Additional info to the contract
Operatore / Betreiber	**OrganisationRef**	Global ID of the PTO. In the contracts form, to be selected through a drop-down menu.
Codice / Code	**AccountingCode**	Code associated to the contract by the PTA (Province of Bolzano)
-	**AccountingType**	Type of contract. Default value to be set: "**contract**".

Table 1: Mapping between contracts' data to be made available in the Datawarehouse and the fields to be considered in the NeTEx export.

2.1.2. Vehicles

Vehicles' data is currently managed within the Datawarehouse, according to the actual information provided by the different PTOs. Currently, only data related to the **buses** are available; in future it is not excluded to be extend this at least to trains. The particular application related to funicular services (considered as one of the vehicle types in reference NeTEx structure in ResourceFrame) is not relevant here.

The reference vehicles' data have to exported through the structure "**vehicles**" within the **ResourceFrame** of NeTEx. The reference specification is contained in [1], paragraph 5.2.3.6. Table 2Table 1 contains a mapping between the available vehicles' data (in one of the tables of the

Datawarehouse) and the fields to be made available through the NeTEx interface. For simplicity sake, only the requested NeTEx fields are considered.

Vehicles' data (Data-wareh.)	NeTEx	Notes
(id)	**id**	Global ID of the vehicle. To be automatically generated in the export based on the current vehicle ID (currently a 4 digit number) according to the South Tyrolean specifications related to the IDs [2] - paragraph 2.4. Example: IT:ITC1:Vehicle:busATS:ZZ998ZZ
-	**version**	Version of the vehicle. Standard value: "any"
-	**ValidBetween** • **FromDate** • **ToDate**	Not provided in the export, general validity conditions of NeTEx export provided in the composite frame apply
modell	**Name**	Vehicle name (not multilingual)
hersteller	**ShortName**	Short vehicle name. In our implementation, takes as value the OEM name (not multilingual), in part already in the name.
kennzeichen	**RegistrationNumber**	Number plate of the vehicle
rahmennummer	**VehicleIdNumber**	Number of chassis of the vehicle
id	**PrivateCode**	Number of vehicle as in the (PTO) management system.
betreiber_id	**OperatorRef**	Reference to the PTO owning the vehicle (Global ID)
vehicle_type_id	**VehicleTypeRef/ TrainRef**	Reference to the vehicle type (Global ID)

Table 2: Mapping between contracts' data to be made available in the Datawarehouse and the fields to be considered in the NeTEx export.

2.1.3. Parkings

Parking data is currently managed within the Open Data Hub. Not all parking data is currently available, only the ones for which real-time information is also provided.

The reference parking data have to exported through the structure "**parkings**" within the **Site-Frame** of NeTEx. The reference specification is contained in [1], paragraph 5.2.4.3. Table 3 contains a mapping between the available static parking and the fields to be made available through the NeTEx interface. For simplicity sake, only the requested NeTEx fields are considered. Please note that the reference static parking data can be requested via API to the API call https://mobility.api.opendatahub.com/v2/flat,node/ParkingStation

Also bike parking stations should be included in the export. The reference Open Data Hub API is in this case: -https://mobility.api.opendatahub.com/v2/flat,node/BikeParking

Note: at present the on-street parking data are not exported, even if available through the Open Data Hub (https://mobility.api.opendatahub.com/v2/flat,node/ParkingSensor).

Parking data – Open Data Hub	NeTEx	Notes
(sorigin,scode)	**id**	Global ID of the parking. To be automatically generated in the export based on the current parking ID (structured differently for the different Parking Data Providers) according to the South Tyrolean specifications related to the IDs [2] - paragraph 2.4. Example: IT:ITH10:Parking:parcheggiComuneBolzano:p:105
-	**version**	Version of the parking. Standard value: "any"
smetadata -> standard_name sname	**Name**	Name of the parking area. Matched with the "harmonized" parking name (additional value from the Open Data Hub) For bike parking stations the field „sname" can be considered instead of standard_name
sname	**ShortName**	Short name of the parking area. Matched with the parking name as provided by the Parking Data Provider.
scoordinate	**Centroid**	Position of the parking area. Provided as lat / long (only).
-	**gml:Polygon**	Not provided in the NeTEx export
sorigin	**OperatorRef**	Reference to the parking area operator. Please note that there is the need to enrich the structure "organizations" in the ResourceFrame with an additional record related to this new operator. Following fields have to be considered: • **id** (Global ID of parking operator, to be generated from its name) • **Name** • **ShortName** (same value as name) • **OrganisationType** (default value: "facilityOperator")
-	**entrances**	Not provided in the NeTEx export
smetadata -> parkingtype	**ParkingType**	Parking type (enumerated value)
smetadata -> parkingvehicletypes	**ParkingVehicleTypes**	Admitted vehicle types that can park (enumerated value)
smetadata -> parkinglayout	**ParkingLayout**	Indicates the type of infrastructure associated to the parking (enumerated value)
-	**PrincipalCapacity**	Not provided in the NeTEx export
smetadata -> capacity smetadata -> totalPlaces	**TotalCapacity**	Total capacity of the parking area For bike parking stations the reference field is "to-

Parking data – Open Data Hub	NeTEx	Notes
	talPlaces"	
smetadata -> parkingprohi-bitions	**ProhibitedForHazar-dous-Materials**	Indicates if limitations are available for vehicles transporting dangerous goods (boolean)
smetadata -> parkingcharging	**RechargingAvailable**	Indicates if charging services for EVs are available (boolean)
smetadata -> parking-surveillance	**Secure**	Indicates if a surveillance system is present (boolean)
smetadata -> parkingreservation	**ParkingReservation**	Indicates if reservation is possible (enumerated value)
-	**parkingProperties**	Not provided in the NeTEx export

Table 3: Mapping between the static parking data in the Open Data Hub and the fields to be considered in the NeTEx export.

2.2. Level 3 development (fare data)

In the South Tyrolean architecture, fare data are currently managed in two different back-end systems:

- **Tariff zones and related information** (e.g. fare kilometers between two tariff zones, association of each stop point to a tariff zones): this information is managed in the Timetable & Network Topology Planning Tool directly by the PTA.
- **Fare products and related limitations / usage conditions**: this information is managed in the Ticketing Back-End.

The data managed in the in the Timetable & Network Topology Planning Tool are provided on a daily basis to the Ticketing Back-End through an extension of the VDV-462 export (NeTEx German profile), using the FareFrame structure, as detailed in the following paragraph. The purpose of this analysis is to understand what could be immediately available in terms of data and information in the NeTEx export towards the Italian NAP by considering the available interfaces that are already in use (e.g. mobile ticketing API exposed by the Ticketing Back-End, see Annex 1). Please note that additional fare information could be available in the Ticketing Back-End, but in order to exchange it an additional effort in terms of API implementation by the company managing this system (i.e. Scheidt & Bachmann) would be needed. All this could be considered in a second implementation phase.

2.2.1. Tariff zones

As already mentioned, part of this information is already part of the NeTEx interface (VDV-462 / German profile extension) used in the communication between the Timetable & Network Topology Planning Tool and all other systems importing the planned data defined by the PTA. In Table

4 it is possible to highlight which fields are currently considered in the VDV-462 compared to the fields specified in the Italian profile. In South Tyrol a simple fare system based on geographical origin / destination tariff zones is considered, therefore only the corresponding data structures are considered in the export. Please note that in the Italian profile an essential field is not present, i.e. the field "Distance" containing the fare kilometers between two tariff zones. This is an essential information for the correct calculation of the tariffs, so it is important that the Italian profile is amended in order to accept this field.

VDV-462 export (South Tyrol)	NeTEx (Italian NAP)	Notes
id	**id**	ID of the tariff structure of South Tyrol. Currently takes the following value: it:apb:Tariff:apb
version	**version**	Version of the tariff. Standard value: "any"
-	**GeographicalInterval - id**	
-	**GeographicalInterval - version**	In South Tyrol, there are no specific access rights associated to particular geographical intervals, they apply in the entire region always in the same way. Therefore, no geographicalUnits are also provided.
-	**StartGeographicalValue**	
-	**EndGeographicalValue**	
-	**GeographicalUnitRef**	
-	**TimeInterval-id**	
-	**TimeInterval-version**	In South Tyrol, there are no specific access rights associated to particular time intervals, they apply in all timing intervals of the day / year in the same way.
-	**Description**	
-	**Duration**	
-	**FareStructureElement-id**	To be added in the export towards the NAP, by considering the information provided the mobile ticketing API of the Ticketing Back-End. See Table 5 for more details.
-	**FareStructureElement-version**	
-	**FareStructureElementInSequence-id**	
-	**FareStructureElementInSequence-version**	
-	**FareStructureElementInSequence-order**	
-	**GenericParameterAssignment-id**	
-	**GenericParameterAssignment-version**	
-	**GenericParameterAssignment-order**	
-	**Limitations- UserProfileRef**	

VDV-462 export (South Tyrol)	NeTEx (Italian NAP)	Notes
-	**Limitations- UsageValidityPeriodRef**	
-	**validityParameters-OperatorRef**	
-	**DistanceMatrixElementRef**	
-	**GeographicalIntervalRef**	
DistanceMatrixElement-id	**DistanceMatrixElement-id**	ID of the distance matrix element. Currently the IDs are structured according to the following logic: it:apb:DistanceMatrixElement:A_B where A and B are a max 4-digit number representing the code of the start and end tariff zone, respectively. Examples: it:apb:DistanceMatrixElement:9215_75 it:apb:DistanceMatrixElement:9253_9252
DistanceMatrixElement-version	**DistanceMatrixElement-version**	Version of the distance matrix element. Standard value: "any"
Distance	**-**	Represents the fare distance between the two tariff zones. Expressed in [meters].
StartTariffZoneRef	**StartTariffZoneRef**	Reference to the starting tariff zone, provided through its GlobalID, according to the South Tyrolean specifications related to the IDs [2] - paragraph 2.4. Example: it:ITH10:TariffZone:9215
EndTariffZoneRef	**EndTariffZoneRef**	Reference to the end tariff zone, provided through its GlobalID, according to the South Tyrolean specifications related to the IDs [2] - paragraph 2.4. Example: it:ITH10:TariffZone:9215

Table 4: Mapping between the tariff zones fields currently available in the VDV-462 export and to be delivered in the NeTEx export towards the NAP.

Mobile Ticketing API	NeTEx (Italian NAP)	Notes
-	**FareStructureElement-id**	ID of the FareStructureElement, to be formatted as follows: IT:ITH10:FareStructureElement:code where 'code' is an integer univocally identifying the FareStructureElement. This field should take the same value of the field 'order' below.
-	**FareStructureElement-version**	Version of the FareStructureElement. Standard value: "any"
-	**FareStructureElementInSequence-**	ID of the FareStructureElementInSequence,

Mobile Ticketing API	NeTEx (Italian NAP)	Notes
	id	to be formatted as follows: IT:ITH10:Fare-StructureElementInSequence:code where 'code' is an integer univocally identifying the FareStructureElementInSequence. This field should take the same value of the field 'order' below.
-	**FareStructureElementInSequence-version**	Version of the FareStructureElementInSequence. Standard value: "any"
-	**FareStructureElementInSequence-order**	Sequential number associated to the different products provided by the mobile ticketing API, based on the order they are returned back by the API.
-	**GenericParameterAssignment-id**	Not provided since not foreseen
-	**GenericParameterAssignment-version**	Not provided since not foreseen
-	**GenericParameterAssignment-order**	Not provided since not foreseen
-	**Limitations- UserProfileRef**	Not provided since not foreseen
-	**Limitations- UsageValidityPeriodRef**	Not provided since not foreseen
-	**validityParameters-OperatorRef**	Not provided since not foreseen
-	**DistanceMatrixElementRef**	There is no specific association between a FareStructureElement and a specific couple of origin-destination tariff zones, therefore not provided
-	**GeographicalIntervalRef**	Not provided since not foreseen

Table 5: Mapping between the mobile ticketing API of the Ticketing Back-End and the tariffs data structure in the NeTEx export (FareStructureElement).

2.2.2. Products

In the Italian NeTEx profile, products are described mainly through the structure fareProducts, which is related to the structure validableElements which is related in its turn to the structure tariffs (FareStructureElements). In the following tables the proposed mapping with the information provided by the mobile ticketing API is presented.

Mobile Ticketing API	NeTEx (Italian NAP)	Notes
-	**id**	ID of the ValidableElement, to be formatted as follows: IT:ITH10:ValidableElement:code where 'code' is an integer univocally identify-

Mobile Ticketing API	NeTEx (Italian NAP)	Notes
		ing the ValidableElement. This field should take the same value of the code associated to the FareStructureElement, since the mapping is 1:1.
-	**version**	Version of the ValidableElement. Standard value: "any"
/routesNew/outward/name	**Name**	Name of the ValidableElement. Provided in Italian and German languages.
-	**FareStructureElementRef-Ref**	Reference to the associated FareStructureElement.
-	**FareStructureElementRef-version**	Not supported

Table 6: Mapping between the mobile ticketing API of the Ticketing Back-End and the validableElements data structure in the NeTEx export.

Mobile Ticketing API	NeTEx (Italian NAP)	Notes
-	**UsageValidityPeriod -id**	ID of the UsageValidityPeriod, to be formatted as follows: IT:ITH10:UsageValidityPeriod:code where 'code' is an integer univocally identifying the UsageValidityPeriod. This field should take the same value of the code associated to the FareStructureElement, since the mapping is 1:1.
-	**UsageValidityPeriod -version**	Version of the UsageValidityPeriod. Standard value: "any"
/routesNew/outward/product_validation/product_duration_type	**ValidityPeriodType**	Type of validity associated (enumeration). A proper mapping function has to be foreseen between the enumeration implemented in the mobile ticketing API and the enumeration specified.
/routesNew/outward/product_validation/product_duration	**StandardDuration**	Duration of validity. Proper mapping in the time format foreseen in NeTEx to be foreseen.
-	**UserProfile-id**	Not supported
-	**UserProfile- version**	Not supported
-	**UserType**	Not supported
-	**MinimumAge**	Not supported
-	**MaximumAge**	Not supported

Table 7: Mapping between the mobile ticketing API of the Ticketing Back-End and the usageParameters data structure in the NeTEx export.

Mobile Ticketing API	NeTEx (Italian NAP)	Notes
-	**id**	ID of the FareProduct, to be formatted as follows: IT:ITH10:PreassignedFareProduct:code where 'code' is an integer univocally identifying the FareProduct. This field should take the same value of the code associated to the ValidableElement, since the mapping is 1:1.
	version	Version of the FareProduct. Standard value: "any"
/routesNew/outward/product_validation/ product_schedule_start_date	**ValidBetween-FromDate**	Start of associated validity period
/routesNew/outward/product_validation/ product_schedule_end_date	**ValidBetween-ToDate**	End of associated validity period
/routesNew/outward/name	**Name**	Name of the FareProduct. Provided in Italian and German languages.
/routesNew/outward/description	**Description**	Description of the FareProduct. Provided in Italian and German languages.
-	**ChargingMomentType**	Indicates when charging is applied (enumeration). Default vaue: 'beforeTravel'
-	**GenericParameterAssignment-id**	ID of the GenericParameterAssignment, to be formatted as follows: IT:ITH10:GenericParameterAssignment:code where 'code' is an integer univocally identifying the GenericParameterAssignment. This field should take the same value of the code associated to the FareProduct, since the mapping is 1:1.
-	**GenericParameterAssignment-order**	Order of the GenericParameterAssignment. Increasing number starting from '1'
-	**GenericParameterAssignment-version**	Version of the GenericParameterAssignment. Standard value: "any"
-	**UsageValidityPeriodRef**	Not supported
-	**UserProfileRef**	Not supported
-	**OperatorRef**	Not provided since not foreseen
-	**TariffZoneRef**	There are specific fareProducts for the "urban" tariff zones. For these fareProducts ("urban" ticket), such reference should be provided (to be hardcoded in the mapping, since this information is not provided by any available source).
-	**TrainRef**	Not provided since not foreseen

Mobile Ticketing API	NeTEx (Italian NAP)	Notes
-	**TimeIntervalRef**	Not provided since not foreseen
-	**validableElements-validableElementRef**	Reference to the validableElement
-	**tariffs- ParkingTariffRef**	Not provided since at present not covered.

Table 8: Mapping between the mobile ticketing API of the Ticketing Back-End and the FareProducts data structure in the NeTEx export.

2.2.3. Prices

In the Italian NeTEx profile, prices are described mainly through the structure fareTables, In the following tables the proposed mapping with the information provided by the mobile ticketing API is presented. Please note that in a first implementation stage prices will be limited to the simplest fare products.

Mobile Ticketing API	NeTEx (Italian NAP)	Notes
-	**id**	ID of the FareTable, to be formatted as follows: IT:ITH10:FareTable:code where 'code' is an integer univocally identifying the FareTable. This field should take the same value of the code associated to the ValidableElement, since the mapping is 1:1.
-	**version**	Version of the FareTable. Standard value: "any"
	FareStructureElementPrice-id	ID of the FareStructureElementPrice, to be formatted as follows: IT:ITH10: FareStructureElementPrice:code where 'code' is an integer univocally identifying the FareStructureElementPrice. This field should take the same value of the code associated to the FareTable, since the mapping is 1:1.
-	**FareStructureElementPrice-version**	Version of the FareStructureElementPrice. Standard value: "any"
-	**FareStructureElementPrice-Name**	To be formatted as "Tariffa –" fareProductName
-	**FareStructureElementPrice-Description**	To be formatted as "Tariffa –" fareProductDescription
/routesNew/outward/value	**FareStructureElementPrice-Amount**	Associated price
-	**FareStructureElementPrice-CanBeCumulative**	If discounts could be cumulative. Standard value: 'false'.
-	**FareStructureElementPrice-FareStructureElementRef**	Reference to the FareStructureElement
-	**DistanceMatrixElementPrice-**	Not supported in a first implementation

Mobile Ticketing API	NeTEx (Italian NAP)	Notes
	id	
-	**DistanceMatrixElementPrice-version**	Not supported in a first implementation
-	**DistanceMatrixElementPrice-Name**	Not supported in a first implementation
-	**DistanceMatrixElementPrice-Description**	Not supported in a first implementation
-	**DistanceMatrixElementPrice-Amount**	Not supported in a first implementation
-	**DistanceMatrixElementPrice-CanBeCumulative**	Not supported in a first implementation
-	**DistanceMatrixElementPrice-DistanceMatrixElementRef**	Not supported in a first implementation
-	**GeographicalIntervalPrice-id**	Not supported since not foreseen
-	**GeographicalIntervalPrice-version**	Not supported since not foreseen
-	**GeographicalIntervalPrice-Name**	Not supported since not foreseen
-	**GeographicalIntervalPrice-Description**	Not supported since not foreseen
-	**GeographicalIntervalPrice-Amount**	Not supported since not foreseen
-	**GeographicalIntervalPrice-CanBeCumulative**	Not supported since not foreseen
-	**GeographicalIntervalPrice-GeographicalIntervalPriceRef**	Not supported since not foreseen

Table 9: Mapping between the mobile ticketing API of the Ticketing Back-End and the FareTables data structure in the NeTEx export.

2.2.4. Distribution Channels

At present this information is not available in digital form but could be provided with reasonable effort. It should be a list of all distribution channels characterized by:

- Name
- Description
- DistributionChannelType (enumeration, e.g. onBoard, online, etc.)
- PaymentMethods (enumeration, e.g. cash, creditCard, etc.)

2.2.5.   Sales Offer Packages

The new integrated ticketing system of South Tyrol is going to be an Account-Based Ticketing (ABT). This means that the logic is not in the support media of the traveler, which could contain multiple fare tariff products, but in the back-end, which considers the association between users ("accounts") and related support media, which could be various (smart card, smartphone, etc.). The vision is that more and more all travelers have a type of abo, so that they can travel in a seamless way among all public transportation means without taking care about the different fare products that are available. Therefore, in South Tyrol the concept of "sales offer package" is not present and won't be implemented as foreseen in NeTEx. Based on these considerations, this structure won't be made available in the interface towards the NAP.

2.3.   Level 4 development (sharing mobility data)

In the South Tyrolean architecture, sharing mobility data are managed within the Open Data Hub. Static and dynamic data are jointly received from the sharing mobility service providers, harmonized according to the Open Data Hub and further jointly distributed to interested 3rd parties. The proposal is therefore to read the relevant data from the Open Data Hub API so to populate the different structures of the MobilityServiceFrame, as specified by the Italian NeTEx profile. The following paragraphs explain in detail how such mapping should be implemented.

Important note: for each specific mobility service, a different CompositeFrame with its Mobility-ServiceFrame (and other relevant frames, where necessary) is to be foreseen. The following services are going to be exported:

- Bike sharing service of the city of Bolzano (reference Open Data Hub end-point: https://mobility.api.opendatahub.com/v2/flat/BikesharingStation?where=sorigin.eq.BIKE_SHARING_BOLZANO)
- Bike sharing service of the city of Merano (reference Open Data Hub end-point: https://mobility.api.opendatahub.com/v2/flat/Bicycle?where=sorigin.eq.BIKE_SHARING_MERANO)
- Bike rental service offered by the private company Papin Sport (reference Open Data Hub end-point: https://mobility.api.opendatahub.com/v2/flat/BikesharingStation?where=sorigin.eq.BIKE_SHARING_PAPIN)
- Car sharing service of the entire Province of Bolzano (reference Open Data Hub end-point: https://mobility.api.opendatahub.com/v2/flat/CarsharingStation?where=sorigin.eq.HAL-API)

2.3.1. Fleets

This structure contains the information of the fleet of vehicles (bikes / cars) that belong to the sharing mobility service. This information is currently not available for the bike rental service offered by the private company Papin Sport.

Open Data Hub API	NeTEx (Italian NAP)	Notes
sorigin **smetadata → company → shortName**	**id**	Global ID of the fleet. To be automatically generated in the export according to the following specification: (epd):it:ITH10:Fleet:[DataProvider] where: [DataProvider] is the name of the Data Provider, provided by the following Open Data Hub API fields: Bike sharing service of the city of Bolzano: sorigin Bike sharing service of the city of Merano: sorigin Car sharing service of the entire Province of Bolzano: smetadata → company → shortName
-	**version**	Version of the fleet. Standard value: "any"
-	**validBetween** • **FromDate** • **ToDate**	Not provided in the export, general validity conditions of NeTEx export provided in the composite frame apply
	members/vehicleRef	Reference to the vehicle, as defined in the ResourceFrame (see Table 11)
	operatorRef	Reference to the operator, as defined in the ResourceFrame

Table 10: Mapping between the Open Data Hub API and the fleets data structure in the NeTEx export.

The information related to the single vehicles (bikes or cars) can be retrieved from the Open Data Hub from the following end-points:

- Bike sharing service of the city of Bolzano (reference Open Data Hub end-point: https://mobility.api.opendatahub.com/v2/flat/Bicycle?where=sorigin.eq.BIKE_SHARING_BOLZANO)
- Bike sharing service of the city of Merano (reference Open Data Hub end-point: https://mobility.api.opendatahub.com/v2/flat/Bicycle?where=sorigin.eq.BIKE_SHARING_MERANO)
- Car sharing service of the entire Province of Bolzano (reference Open Data Hub end-point: https://mobility.api.opendatahub.com/v2/flat,node/CarsharingCar/?where=porigin.eq.HAL-API)

Open Data Hub API	NeTEx (Italian NAP)	Notes
sorigin	**id**	Global ID of the vehicle. To be automatically generated in the

Open Data Hub API	NeTEx (Italian NAP)	Notes
		export according to the following specification:
		(epd):it:ITH10:Vehicle:[DataProvider]:[VehicleCode]
		where: [DataProvider] is the name of the Data Provider, provided by the following Open Data Hub API fields:
smetadata → company → shortName **scode** **sname**		Bike sharing service of the city of Bolzano: sorigin Bike sharing service of the city of Merano: sorigin Car sharing service of the entire Province of Bolzano: smetadata → company → shortName and [VehicleCode] is a number univocally assigned to each vehicle, provided by the following Open Data Hub API fields: Bike sharing service of the city of Bolzano: scode Bike sharing service of the city of Merano: sname Car sharing service of the entire Province of Bolzano: scode
-	**version**	Version of the vehicle. Standard value: "any"
-	**validBetween** • **FromDate** • **ToDate**	Not provided in the export, general validity conditions of NeTEx export provided in the composite frame apply
sname	**Name**	Name of the vehicle
sname	**ShortName**	Short name of the vehicle
smetadata → licensePlate	**RegistrationNumber**	Vehicle plate number of the vehicle. Available for car sharing cars only
-	**VehicleIdNumber**	Not available
scode	**PrivateCode**	Company code of the vehicle
-	**OperatorRef**	Reference to the operator, as defined in the ResourceFrame (see Table 12)
-	**VehicleTypeRef**	Reference to the vehicleModelProfile, as defined in the ResourceFrame (see Table 13 and Table 14).

Table 11: Mapping between the Open Data Hub API and the vehicles data structure in the NeTEx export.

Open Data Hub API	NeTEx (Italian NAP)	Notes
sorigin **smetadata → company → shortName**	**id**	Global ID of the operator. To be automatically generated in the export according to the following specification: (epd):it:ITH10:Operator:[DataProvider] where: [DataProvider] is the name of the Data Provider, provided by the following Open Data Hub API fields:

Open Data Hub API	NeTEx (Italian NAP)	Notes
		Bike sharing service of the city of Bolzano: sorigin
		Bike sharing service of the city of Merano: sorigin
		Car sharing service of the entire Province of Bolzano: smetadata → company → shortName Car sharing service of the entire Province of Bolzano: scode
-	**version**	Version of the vehicle. Standard value: "any"
	PrivateCode	Company code of the operator. To be set as [DataProvider] in the ID.
sorigin	**Name**	Name of the operator. To be set as [DataProvider] in the ID.
smetadata → company → shortName	**ShortName**	Short name of the operator. To be set as [DataProvider] in the ID.
	LegalName	Legal name of the operator. To be set as [DataProvider] in the ID.
-	**TradingName**	Not provided
smetadata	**ContactDetails/Email** **ContactDetails/Phone** **ContactDetails/URL**	Contact details of the operator
-	**OrganisationType**	Type of operator (enumerated value). Default value 'operator'
smetadata	**Address/Country- Name** **Address/Street** **Address/Town** **Address/PostCode**	Address details of the operator
-	**Departments**	Not provided since this kind of detail is not applicable for the currently available mobility services.

Table 12: Mapping between the Open Data Hub API and the operators data structure in the NeTEx export.

For bike sharing services, the CycleModelProfile applies. On the other side, for car sharing services the CarModelProfile applies.

Open Data Hub API	NeTEx (Italian NAP)	Notes
sorigin **smetadata**	**id**	Global ID of the type of cycle. To be automatically generated in the export according to the following specification: (epd):it:ITH10: CycleModelProfile:[DataProvider]:[type] where: [DataProvider] is the name of the Data Provider, provided by the following Open Data Hub API fields: Bike sharing service of the city of Bolzano: sorigin

Open Data Hub API	NeTEx (Italian NAP)	Notes
		Bike sharing service of the city of Merano: sorigin
		And [type] is the name of the type of cycle, provided as additional metadata field
-	**version**	Version of the type of cycle. Standard value: "any"
-	**ChildSeat**	Enumerated value indicating the type of child seat. Available bike sharing services do not have this, therefore the default value is "none".
smetadata-> electric smetadata	**Battery**	Boolean value indicating if the bicycle has a pedal assistance system. This information is available as follows: Bike sharing service of the city of Bolzano: smetadata -> electric Bike sharing service of the city of Merano: smetadata
smetadata	**Lamps**	Boolean value indicating if the bicycle has an illumination system.
-	**Pump**	Boolean value indicating if the bicycle has a pump system. Available bike sharing services do not have this, therefore the default value is "false".
smetadata	**Basket**	Boolean value indicating if the bicycle has a basket.
smetadata	**Lock**	Boolean value indicating if the bicycle has a locking system. For the bike sharing service of the city of Merano, the default value is "true".

Table 13: Mapping between the Open Data Hub API and the vehicle model profile data structure in the NeTEx export (CycleModelProfile).

Open Data Hub API	NeTEx (Italian NAP)	Notes
smetadata → company → shortName **smetadata ->brand**	**id**	Global ID of the type of car. To be automatically generated in the export according to the following specification: (epd):it:ITH10: CarModelProfile:[DataProvider]:[type] where: [DataProvider] is the name of the Data Provider, provided by the following Open Data Hub API fields: Car sharing service of the entire Province of Bolzano: smetadata → company → shortName ~~Car sharing service of the entire Province of Bolzano: scode)~~ And [type] is the name of the type of car, provided through the field smetadata ->brand
-	**version**	Version of the type of car. Standard value: "any"
smetadata	**ChildSeat**	Enumerated value indicating the type of child seat.
smetadata	**Seats**	Number of available seats

Open Data Hub API	NeTEx (Italian NAP)	Notes
smetadata	**Doors**	Number of available doors
smetadata	**Transmission**	Enumerated value indicating the type of gearbox available. Relevant fields: "automatic" / "manual"
smetadata	**CruiseControl**	Boolean indicating if a cruise control system is available
smetadata	**SatNav**	Boolean indicating if a satellite navigation system is available
-	**AirConditioning**	Boolean indicating if an air conditioning system is available. Default value: "true".
-	**Convertible**	Boolean indicating if the vehicle is convertible (cabrio). Default value: "false".
smetadata	**UsbPowerSockets**	Boolean indicating if USB power sockets are available
smetadata	**WinterTyres**	Boolean indicating if the vehicle has winter tyres
smetadata	**Chains**	Boolean indicating if the vehicle has chains
smetadata	**TrailerHitch**	Boolean indicating if the vehicle has a trailer hitch
smetadata	**RoofRack**	Boolean indicating if the vehicle has a roof rack
smetadata	**CycleRack**	Boolean indicating if the vehicle has a cycle rack
smetadata	**SkiRack**	Boolean indicating if the vehicle has a ski rack

Table 14: Mapping between the Open Data Hub API and the vehicle model profile data structure in the NeTEx export (CarModelProfile).

2.3.2. Modes of operation

This structure contains a structure called vehicleSharing describing the type of sharing service.

Open Data Hub API	NeTEx (Italian NAP)	Notes
sorigin **smetadata → company → shortName**	**id**	Global ID of the type of sharing service. To be automatically generated in the export according to the following specification: (epd):it:ITH10:VehicleSharing:[DataProvider] where: [DataProvider] is the name of the Data Provider, provided by the following Open Data Hub API fields: Bike sharing service of the city of Bolzano: sorigin Bike sharing service of the city of Merano: sorigin Bike rental of Papin Sport: sorigin Car sharing service of the entire Province of Bolzano: smetadata → company → shortName
-	**version**	Version of the type of sharing service. Standard value: "any"
sorigin	**SubMode->id**	Global ID of the submode of type of sharing service. To be automatically generated in the export like id, but a different prefix:

Open Data Hub API	NeTEx (Italian NAP)	Notes
smetadata → company → shortName		(epd):it:ITH10:Submode:[DataProvider]
-	**SubMode->version**	Version of the submode of the type of sharing service. Standard value: "any"
-	**Submode->Transport-Mode**	Enumerated field indicating the type of vehicle that is possible to rent. Default vehicles: "bicycle" for bike sharing services and "car" for car sharing services.
-	**Submode->Self-DriveSubmode**	Enumerated field indicating the property of the vehicle that can be rent. Default vehicles: "hireCycle" for bike sharing services and "hireCar" for car sharing services.

Table 15: Mapping between the Open Data Hub API and the modes of operation data structure in the NeTEx export.

2.3.3. Mobility services

This structure contains the details of the associations between fleets and modes of operation.

Open Data Hub API	NeTEx (Italian NAP)	Notes
sorigin **smetadata → company → shortName**	**id**	Global ID of the sharing service. To be automatically generated in the export according to the following specification: (epd):it:ITH10:VehicleSharingService:[DataProvider] where: [DataProvider] is the name of the Data Provider, provided by the following Open Data Hub API fields: Bike sharing service of the city of Bolzano: sorigin Bike sharing service of the city of Merano: sorigin Bike rental of Papin Sport: sorigin Car sharing service of the entire Province of Bolzano: smetadata → company → shortName
-	**version**	Version of the sharing service. Standard value: "any"
-	**VehicleSharingRef**	Reference to the associated modes of operation
-	**FloatingVehicles**	Boolean indicating if the vehicles are available in a "free floating" mode or not. Default value = "false" for all services, except for the bike sharing of Merano, in which the value = "true" has to be considered.
-	**FleetRef**	Reference to the associated fleet

Table 16: Mapping between the Open Data Hub API and the mobility services data structure in the NeTEx export.

2.3.4. Mobility service constraint zone

This structure contains a geographical reference of the area in which the sharing mobility services is made available. This structure is not supported for the service provided by Papin Sport, since it is not specifically limited to a specific zone.

Open Data Hub API	NeTEx (Italian NAP)	Notes
sorigin **smetadata → company → shortName**	**id**	Global ID of the mobility service constraint zone. To be automatically generated in the export according to the following specification: (epd):it:ITH10:MobilityServiceConstraintZone:[DataProvider] where: [DataProvider] is the name of the Data Provider, provided by the following Open Data Hub API fields: Bike sharing service of the city of Bolzano: sorigin Bike sharing service of the city of Merano: sorigin Car sharing service of the entire Province of Bolzano: smetadata → company → shortName
-	**version**	Version of the mobility service constraint zone. Standard value: "any"
smetadata	**Gml:polygon**	Geometry of the area in which the sharing service is available. Following geometries have to be available: Bike sharing service of the city of Bolzano: border of the municipality of Bolzano Bike sharing service of the city of Merano: border of the municipality f Bolzano Car sharing service of the entire Province of Bolzano: border of the Province of Bolzano
-	**VehicleSharingRef**	Reference to the associated modes of operation

Table 17: Mapping between the Open Data Hub API and the mobility services constraint zone data structure in the NeTEx export.

3.   SIRI interface implementation

3.1.   Interface with the PT Real-Time Data Hub

The Real-Time Data Hub is able to distribute real-time information about public transport services according to the standard SIRI interfaces. This component supports the following SIRI interfaces: SIRI ET / PT, SIRI ST / SM, SIRI VM, SIRI CM, SIRI SX (Swiss profile VDV-736).

Also the corresponding VDV-453/4 interfaces, from which SIRI is derived, are also supported. At present, in a first implementation phase, these German interfaces are used for the exchange of real-time traffic information. Connected systems are in particular:

- the new **Automatic Vehicle Monitoring (AVM)** system that is under installation on all urban and regional **buses**, which provides:
    - o planned daily timetables and real-time travel times at the bus stops (**VDV-454 REF-AUS and VDV-454 AUS**, corresponding to SIRI ET /PT)
    - o real-time positions of the vehicles (**VDV-453 VIS**, corresponding to SIRI VM)
    - o real-time information about disruption events (**VDV-736**, corresponding to SIRI SX) [still to be released].
- the **Automatic Vehicle Monitoring (AVM)** system of the railway **Val Venosta**, directly controlled by STA which provides planned daily timetables and real-time travel times at the bus stops (**VDV-454 REF-AUS and VDV-454 AUS**, corresponding to SIRI ET /PT);
- the **Automatic Vehicle Monitoring (AVM)** system of the railway infrastructure controlled by **RFI** which provides thanks to a converter to the proprietary interface that has been shared planned daily timetables and real-time travel times at the bus stops (**VDV-454 REF-AUS and VDV-454 AUS**, corresponding to SIRI ET /PT).

One of the most interesting features of the Real-Time Data Hub is the possibility to **convert** data from one standardized interface to another one. In other words, the Real-Time Data Hub can receive data in the VDV-454 AUS format from one satellite system and distribute it to another satellite system in its equivalent SIRI interface, i.e. SIRI ET. Not only: the Real-Time Data Hub can also "**bundle**" different data streams in input and organize them as one single data stream in output. An example for this is the real-time passenger information system at the bus stops, which is implemented by a system supplied by Solari, in which the different VDV-454 AUS data streams are merged in one single SIRI SM data stream to feed this system.

For the South Tyrolean implementation, it is in plan to exactly specify the VDV / SIRI fields that are going to be supported by the Real-Time Data Hub. While the work related to the VDV interfaces is nearly completed, the **implementation specification** for the SIRI interfaces is still ongoing. The proposed Italian specifications for the SIRI services SIRI VM, SIRI ET and SIRI SX are

going to be followed and taken as implementation reference. Specific deviations from what reported in the national specification are provided in the following paragraphs.

3.1.1. SIRI VM

[Contribution by Mentz -> list of not supported fields that are requested in the Italian SIRI specification or indication of additional fields that are made available that are not covered by this national specification]

3.1.2. SIRI ET (SIRI PT)

[Contribution by Mentz -> list of not supported fields that are requested in the Italian SIRI specification or indication of additional fields that are made available that are not covered by this national specification]

3.1.3. SIRI SX (VDV-736)

[Contribution by Mentz -> list of not supported fields that are requested in the Italian SIRI specification or indication of additional fields that are made available that are not covered by this national specification]

3.2. Interface with the Open Data Hub

It is however to be noted that the Real-Time Data Hub does not support, at least at present, the SIRI FM interface. In the public transportation scenario, this interface is thought to be used for the exchange of real-time information related to the status of the public transport infrastructure, e.g. temporarily unavailable lift at a train station. In the Italian SIRI specification, the SIRI FM is proposed to be used for the exchange of real-time information related to parking and sharing mobility services. Since this kind of data is made available through the Open Data Hub, this kind of interface will be directly implemented and made available in connection to this platform.

3.2.1. SIRI common data fields

SIRI messages are characterized by a certain number of standard fields, used mainly to univocally identify them.

Open Data Hub API	NeTEx (Italian NAP)	Notes
-	**ResponseTimeStamp**	Timestamp of the generated SIRI message. To be automatically generated by the interface implementation tool
-	**ProducerRef**	Identifier of the source. Standard value: "RAP Alto Adige – Open Data Hub"
-	**ResponseMessageIdentifier**	Integer describing the content of the file. To be automatically generated by the interface implementation tool, according to the following rule: each message receives an incremental value. First message has default value "1".

Open Data Hub API	NeTEx (Italian NAP)	Notes
-	**SubscriberRef**	Identifier of the receiver, i.e. the NAP. Standard value to be agreed with the counterpart, i.e. the NAP:
-	**SubscriptionRef**	Identifier of the abonnement of the receiver, i.e. a number identifying the data stream with which the NAP gets the data from the Open Data Hub according to this interface. Standard value to be agreed with the counterpart, i.e. the NAP:

Table 18: Mapping between the Open Data Hub API and the common data fields in the SIRI interface.

3.2.2. SIRI FM (parking data)

In case of parking data, the SIRI messages looks like as follows.

Parking data – Open Data Hub	NeTEx (Italian NAP)	Notes
(scode)	**FacilityRef**	Global ID of the parking, as defined in 2.1.3.
(tname=free, mvalue)	**FacilityStatus/Status**	Enumerated value describing the real-time state of the parking. Possible values: • "available" • "notAvailable" • "partiallyAvailable" The value is automatically set based on the real-time status of the parking facility, according to this rule: • "available": if mvalue > 10 • "notAvailable": if mvalue = 0 • "partiallyAvailable": if mvalue $\leq$ 10
-	**MonitoredCounting /CountingType**	Enumerated value describing the type of available counting. Default value: "presentCount".
-	**MonitoredCounting / countedFeatureUnit**	Enumerated value describing the type of object for which the countingType is made available. Default values: • "~~vehicles~~bays" (in case of vehicles) • "otherSpaces" (in case of bikes)~~"~~.
-	~~MonitoredCounting /TypeOfCountedFeatures / TypeOfValueCode~~	~~String identifying the type of value provided. Default value: "car".~~
-	~~MonitoredCounting /TypeOfCountedFeatures / NameOfClass~~	~~String identifying the category of value provided. Default value: "car".~~
tname=occupied, mvalue	**MonitoredCounting /Count**	Real-time number of vehicles / byclces present in the parking area

Table 19: Mapping between the Open Data Hub API and the SIRI FM interface (parking).

3.2.3. SIRI FM (bike sharing station-based data)

In case of bike sharing data related to a station-based system (e.g. bike sharing of Bolzano), the SIRI messages looks like as follows.

Open Data Hub API	NeTEx (Italian NAP)	Notes
(sorigin, sname)	FacilityRef	Global ID of the bike sharing station. To be automatically generated in the export based on the current bike sharing station ID according to the South Tyrolean specifications related to the IDs [2] - paragraph 2.4. Spaces in the string values of the Open Data Hub are substitude with a "_". Example: IT:ITH10:parcheggiBikeSharingBolzano:p:Palasport_Stadthalle
(tname=free-bays, mvalue)	FacilityStatus/Status	Enumerated value describing the real-time state of the bike sharing station. Possible values: • "available" • "notAvailable" • "partiallyAvailable" The value is automatically set based on the real-time status of the parking facility, according to this rule: • "available": if mvalue > 1 • "notAvailable": if mvalue = 0 • "partiallyAvailable": if mvalue $\leq$ 1
-	MonitoredCounting /CountingType	Enumerated value describing the type of available counting. Default value: "availabilityCount".
-	MonitoredCounting / countedFeatureUnit	Enumerated value describing the type of object for which the countingType is made available. Default value: "other spaces" vehicles".
-	~~MonitoredCounting /TypeOfCountedFeatures / TypeOfValueCode~~	~~String identifying the type of value provided. Default value: "bike".~~
-	~~MonitoredCounting /TypeOfCountedFeatures / NameOfClass~~	~~String identifying the category of value provided. Default value: "bike".~~
tname=number-available, mvalue	MonitoredCounting /Count	Real-time number of available bikes present in the bike sharing station.

Table 20: Mapping between the Open Data Hub API and the SIRI FM interface (bike sharing station-based).

3.2.4. SIRI FM (bike sharing free-floating data)

Open Data Hub API	NeTEx (Italian NAP)	Notes
sorigin	FacilityRef	Global ID of the bike sharing bike. It is the corresponding value defined in Table 11.
(tname=available, mvalue)	FacilityStatus/Status	Enumerated value describing the real-time state of the bike

Open Data Hub API	NeTEx (Italian NAP)	Notes
		sharing bike. Possible values: • "available" • "notAvailable" • "partiallyAvailable" The value is automatically set based on the real-time status of the bike facility, according to this rule: • "available": if mvalue = 1 • "notAvailable": if mvalue = 0
scoordinate	**FacilityUpdatedPosition/Longitude,Latitude**	Real-time position of the bike, expressed as lat/long

Table 21: Mapping between the Open Data Hub API and the SIRI FM interface (bike sharing free floating).

3.2.5. SIRI FM (car sharing data)

In case of car sharing data, the SIRI messages looks like as follows, similarly to bike sharing station-based data.

Open Data Hub API	NeTEx (Italian NAP)	Notes
(sorigin, sname)	**FacilityRef**	Global ID of the car sharing station. To be automatically generated in the export based on the current car sharing station ID according to the South Tyrolean specifications related to the IDs [2] - paragraph 2.4. Spaces in the string values of the Open Data Hub are substitude with a "_". Example: IT:ITH10:parcheggiCarSharing:p: Bozen_süd_Bolzano sud
(tname=number-available, mvalue)	**FacilityStatus/Status**	Enumerated value describing the real-time state of the car sharing station. Possible values: • "available" • "notAvailable" • "partiallyAvailable" The value is automatically set based on the real-time status of the parking facility, according to this rule: • "available": if mvalue > 1 • "notAvailable": if mvalue = 0 • "partiallyAvailable": if mvalue $\leq$ 1
-	**MonitoredCounting /CountingType**	Enumerated value describing the type of available counting. Default value: "availabilityCount".
-	**MonitoredCounting / countedFeatureUnit**	Enumerated value describing the type of object for which the countingType is made available. Default value: "~~vehicles~~bays".
-	**~~MonitoredCounting /TypeOfCountedFeatures / TypeOfValueCode~~**	~~String identifying the type of value provided. Default value: "bike".~~

Open Data Hub API	NeTEx (Italian NAP)	Notes
-	MonitoredCounting /TypeOfCountedFeatures / NameOfClass	String identifying the category of value provided. Default value: "bike".
tname=number-available, mvalue	MonitoredCounting /Count	Real-time number of available ~~bikes~~ cars present in the ~~bike~~ car sharing station.

Table 22: Mapping between the Open Data Hub API and the SIRI FM interface (car sharing).

4.   Final implementation details

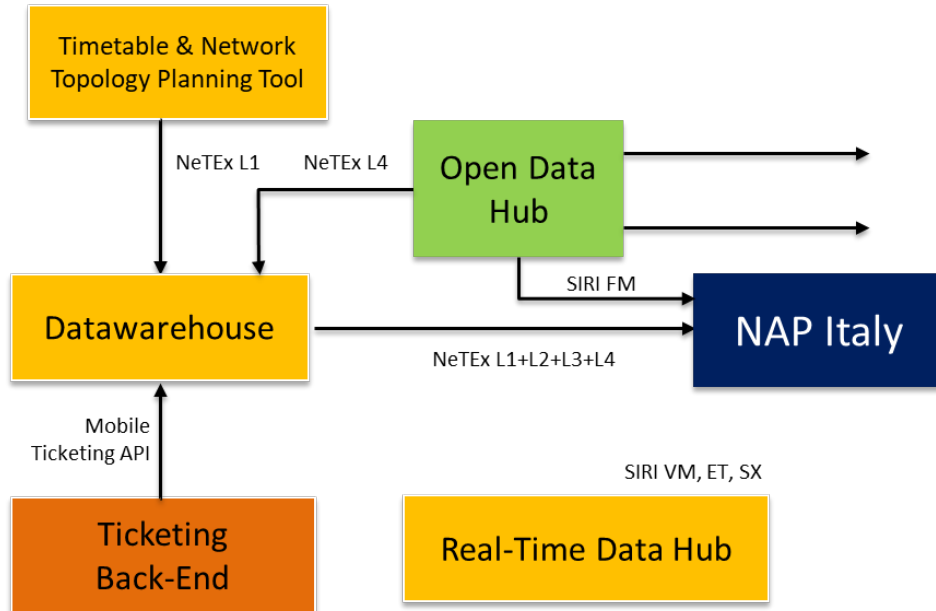The implementation is going to be carried out as graphically illustrated in Figure 3.

Figure 3: Graphical illustration of the implementation modalities of the different parts / services of the NeTEx and SIRI interfaces.

In details:

- **NeTEx L1** is automatically generated with a script applied to Timetable & Network Topology Planning Tool (DIVA) [already implemented]
- the **Datawarehouse** implements an automatic process for generating the necessary structures of **NeTEx L2**, based on the data that are already stored within this tool; these are added to the NeTex L1 export.
- the **Datawarehouse** implements an automatic process for generating the necessary structures of **NeTEx L3**, based on the information provided by the mobile ticketing API; these are added to the NeTex L1+L2 export.
- the **Open Data Hub** generates an additional **NeTEx** export related to **L4**, based on the data already stored in this platform; the **Datawarehouse merges this** additional export to the one containing the L1, L2, L3 parts.
- the **Datawarehouse** provides the final **complete export to the NAP through their specified interface**; this interface is already implemented for NeTEx L1 and should be simply "upgraded" in order to provide the complete NeTEx export;
- the **SIRI VM, ET, SX** services are provided by the **Real-Time Data Hub**, while the **SIRI FM** service is provided by the **Open Data Hub**.

- Last but not least, **all exports / end-points are made publicly available** for all interested 3rd parties on the **Open Data Hub**.

4.1. Composition of the final NeTEx export

The Datawarehouse has the task to "merge" all NeTEx contributions, related to the different levels of the Italian profile. In reality, this task is quite simple since the different parts can be contained in different composite frames. The final NeTEx export is going to be organized as follows:

5.　Bibliography

[1] Dipartimento per la trasformazione digitale e Ministero delle Infrastrutture e dei Trasporti: "Linee guida per la compilazione del profilo italiano del NeTEx (Network Timetable Exchange)" (version 3.0), 30.06.2023.

[2] STA, NOI Techpark: "South Tyrolean implementation of NeTEx standard (German profile)" 06/2023.

[3] Dipartimento per la trasformazione digitale e Ministero delle Infrastrutture e dei Trasporti: "Linee guida per la compilazione del profilo italiano del NeTEx (Network Timetable Exchange)" (version 3.0), 30.06.2023.

[4]

6.   Annex 1: Description of mobile ticketing API

The reference information of the ticketing products that are available in order to access the public transport can be automatically retrieved from the mobile ticketing API, which can be used by 3rd parties to purchase tickets.

The starting API to be considered is the following one:

curl -H 'Content-Language: it-IT' -L
https://preproervice/transportStations/incoming_webhook/getProducts?
websites=suedtirol (in order to have ticket names in Italian, in German please use de-DE)

The response is structured in this way:

{"results":

     [{"optionsData":

          [{"id":1569913,"name":"Startpunkt"},{"id":1559911,"name":"Mobilecard"}],

          "name":"Mobilcard",

          "image":"….",

          "description":"….",

          "short_description":"…,

          "url_path"

          "sorting":10

       }

By putting as input the IDs of "Startpunkt" and the ticket type (e.g. Mobilcard) it is possible to have through a second API call all relevant information for this ticket type, including price. This second call has to be made several times, once for each id "combination" as received in the first API call.

The end-point for the second call is:
https://preprod.bmt.innokrea.com/mongo/api/client/v2.0/app/jbmproducts-xsmnn/service/transportStations/incoming_webhook/routesNew A separate Postman collection is made available to understand which other input parameters are necessary:

The response is structured in this way:

{

   "stations": [

     {

```json
      "id": 1559911,

      "name": "mobilcard"

    },

    {

      "id": 1569913,

      "name": "startpoint"

    }

  ],

  "outward": [

    {

      "id": "...",

      "departureStationId": 1569913,

      "arrivalStationId": 1559911,

      "via": "1 day",

      "price": {

        "value": 20,

        "priceNet": 18.18,

        "currency": "EUR",

        "taxClass": "10%",

        "tax_class_code": 1

      },

      "segmentsId": "f019f1d64d6e75abbf2145a742122e22",

      "segments": [

        {

          "id": "1",

          "departureStationId": 1569913,

          "arrivalStationId": 1559911,

          "travelClass": "second",
```

```json
            "mode": "train",

            "reservation": "unavailable"

        }

    ],

    "name": "Mobilcard 1 day",

    "sku": "BERGBAHN.TICKET.MOBILCARD.1TAG.SENIOR",

    "image": ...",

    "description": "... ",

    "short_description": "...",

    "validity_text": "....",

    "sold_text": "....",

    "product_validation": {

        "product_schedule_start_date": "2022-01-01T00:00:00.000Z",

        "product_schedule_end_date": "2025-12-31T23:59:00.000Z",

        "product_validity_type": "month",

        "product_validity": "12",

        "product_duration_type": "day",

        "product_duration": "1"

    },

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