



Using SIRI

June 2021

Christophe Duquesne – Ulf Bjersing





Standards for realtime data exchange



What are the available formats

SIRI: European standard CEN (European Committee for Standardization)

Service Interface for Real-time Information: EN 15531-1 to 5

Set of real-time information services: at stop, for a line, vehicle centric, information messages, incidents and disruption, connections, facility status, etc.

<https://www.siri-cen.eu/>

<https://github.com/SIRI-CEN/SIRI>

GTFS-RT: de facto standard now managed by MobilityData

General Transit Feed Specification RealTime

Global update of transit times initially provided in GTFS and provision of information messages

<https://gtfs.mobilitydata.org/spec/gtfs-realtime>



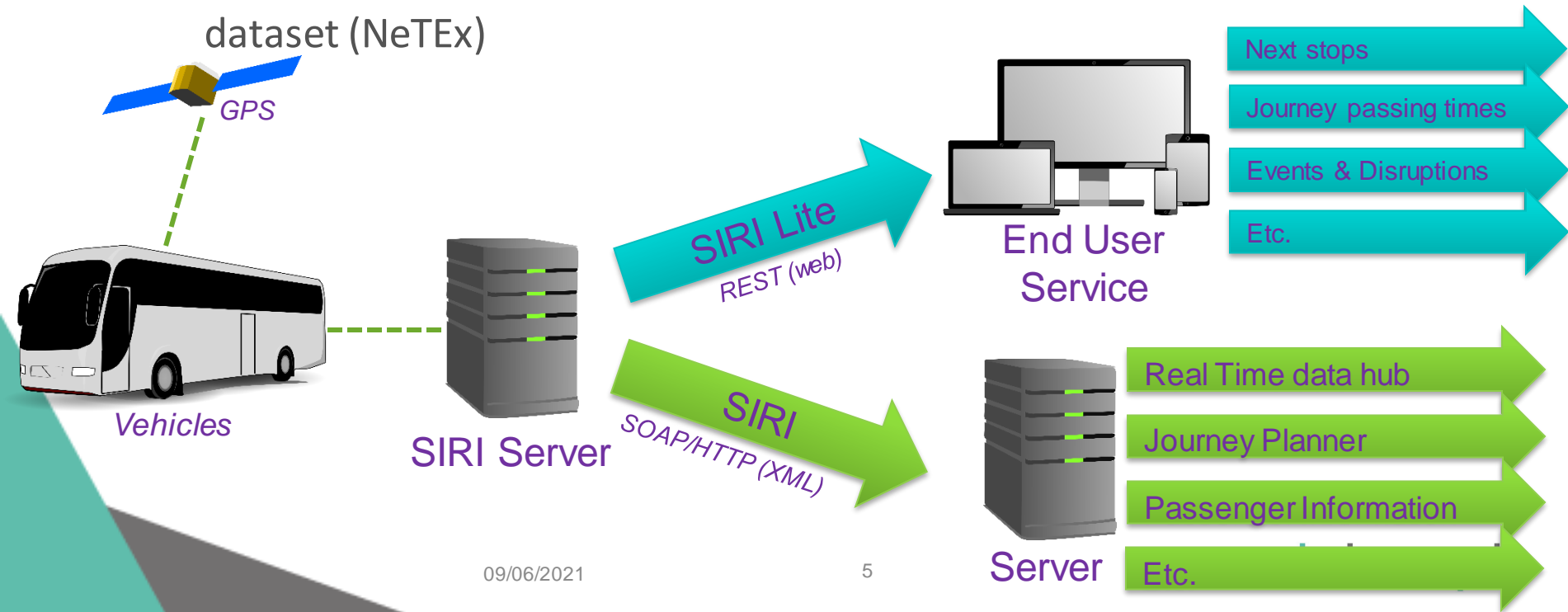
SIRI and SIRI-Lite

- SIRI offers a set of web-services, the most used of which are:
 - Real-time passing times at the stop (with possible reminder of the planned one)
 - Real-time passing times for a line (set of lines or network)
 - Information messages and description of disruptions
 - Status of equipment (escalators, elevators, vehicle pallets,..)
 - Vehicles status and position
- SIRI offers a classic query system, as well as a subscription mechanism
- If the network is not previously known, SIRI can provide the list of stops and lines
- Like most European standards for transport, SIRI is relatively large and requires the definition of a **profile (subset conforming to the standard and meeting a set of identified use cases)**
 - There are already quite a lot of national SIRI Profile (France, Switzerland, Nordic, etc.) and also local ones (Ile de France Mobilité, Transport for London, etc.)
 - A simple European profile (to conform the regulation) is currently under definition



SIRI and SIRI-Lite

- Offers several access protocols
 - Simple HTTP or SOAP for interchange between servers (XML format)
 - REST (web protocol), so called SIRI Lite, for exchanges with the end user application (mainly in an open data context) (JSON or XML format)
 - The information remains the same, but the exchange protocol is adapted to the use
 - **SIRI** can be used standalone or in addition to a scheduled information dataset (NeTEx)

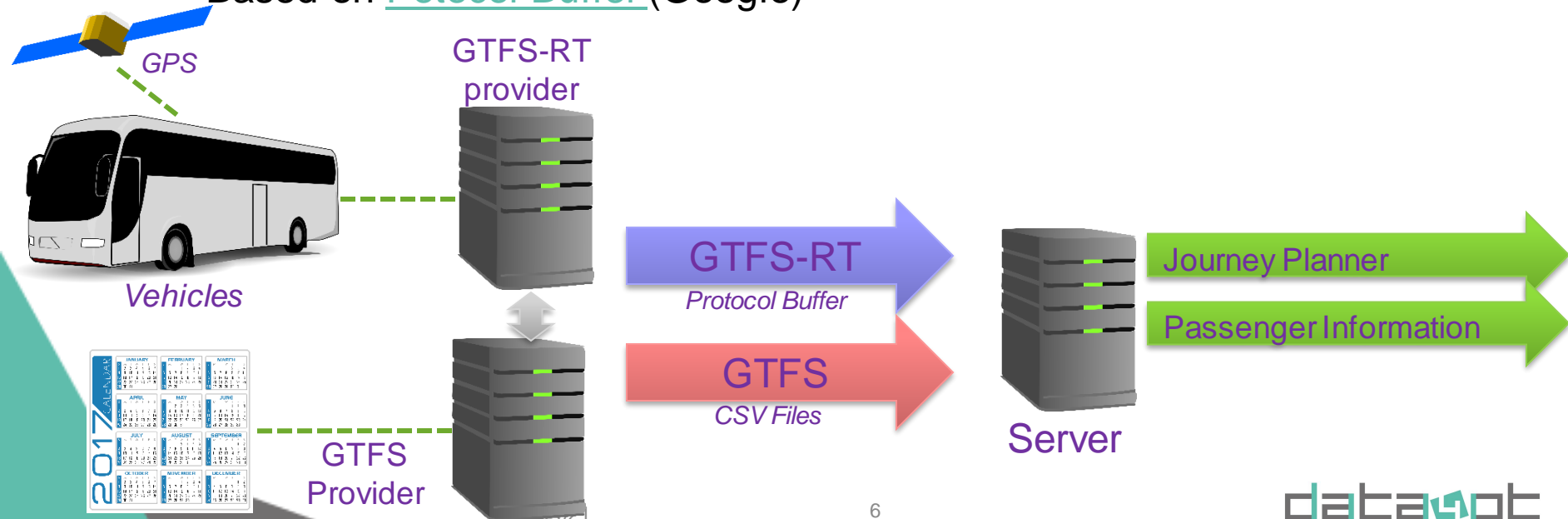




GTFS-RT

GTFS-Realtime (*GTFS-RT*)

- It is a complement to GTFS (which only manages scheduled data) to update, in real time, the information previously exchanged
- As GTFS it mainly focuses the Journey Planner use case
 - Requires a prior GTFS exchange (and consistency between planned and real-time data)
- Based on [Protocol Buffer](#) (Google)





GTFS-RT

GTFS-Realtime

- GTFS-Realtime allows you to exchange:
 - Passing Times updates
 - Information messages (text)
 - Vehicle positions
- It provides a global information on the entire network (not stop centric or line information)
- Optimized to be as compact as possible



Why standards are important ?

Reusable solutions

- Avoids the need for users to develop a vendor-specific solution, potentially different for each data source
 - As a result, as long as the formats are not harmonized, the vast majority of reuses remain local and not very sustainable
 - Another consequence is that only large players have the ability to spread out their solutions

This also allows the development of packaged offers and therefore a reduction in acquisition costs for authorities

- Otherwise, each opening of real-time data is a specific development entirely financially carried out by the authority
- This partly explains why today real-time information dissemination systems have the image of expensive systems !

This ensures consistency with business needs and constraints

- Some made available of real-time data had to be redone several times due to design errors in the definition of the specific solution !



SIRI or GTFS-RT

Both are fully relevant for their use cases

GTFS-RT was not designed for open-data broadcasting

- It was essentially defined to feed journey planners as a complement to GTFS
- It does not offer classic functions such as "the next ones to a stop"
- It is very efficient and compact for its use case

All the services offered by GTFS-RT can be carried out with SIRI

- The reverse is not true
- SIRI provides a proper answer to all open-data needs

GTFS-RT and SIRI are quite similar as regard to the implementation complexity

SIRI (and NeTEX) are mandatory at NAP level by the European Regulation. However, these elements do not take anything away from the specific qualities of GTFS-RT, in particular to feed a journey planner, and while a mixed SIRI/GTFS-RT system would be ideal, a GTFS-RT-only interface, will always remain preferable to a specific interface.



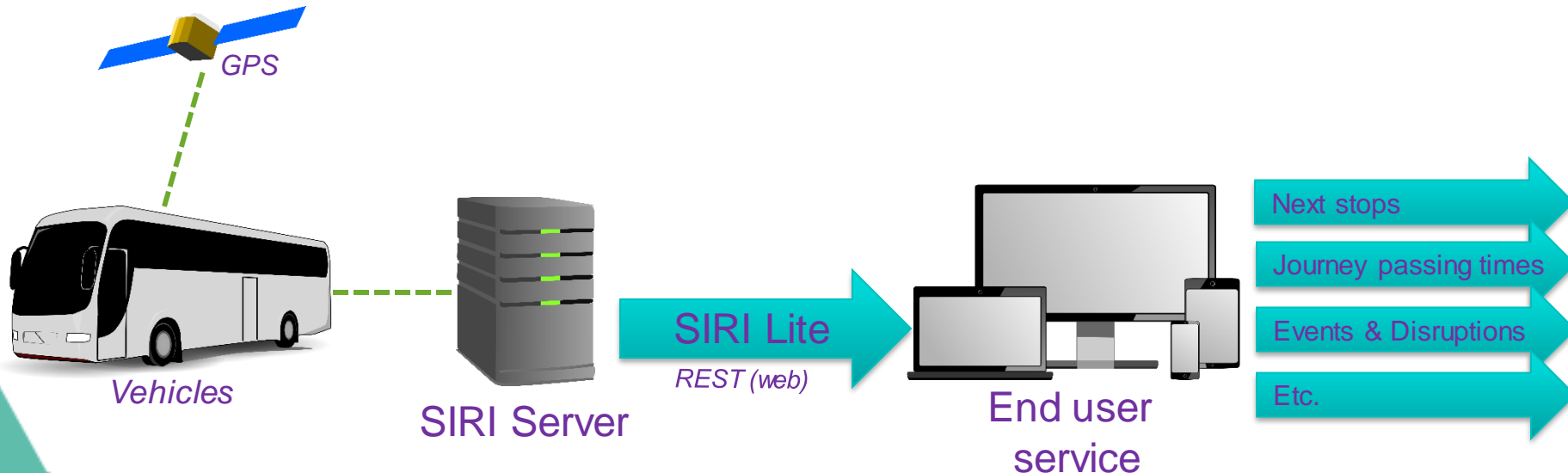
Use cases



Open data for direct use by the end user/service

SIRI Lite

- The French profile is here [ici](#) (*only SIRI Lite profile at national level for now*)
- Offer, at a minimum, Stop Monitoring (passing time at the stop) and General Message (information messages)
- You can set up an identification key system to secure and/or track the users





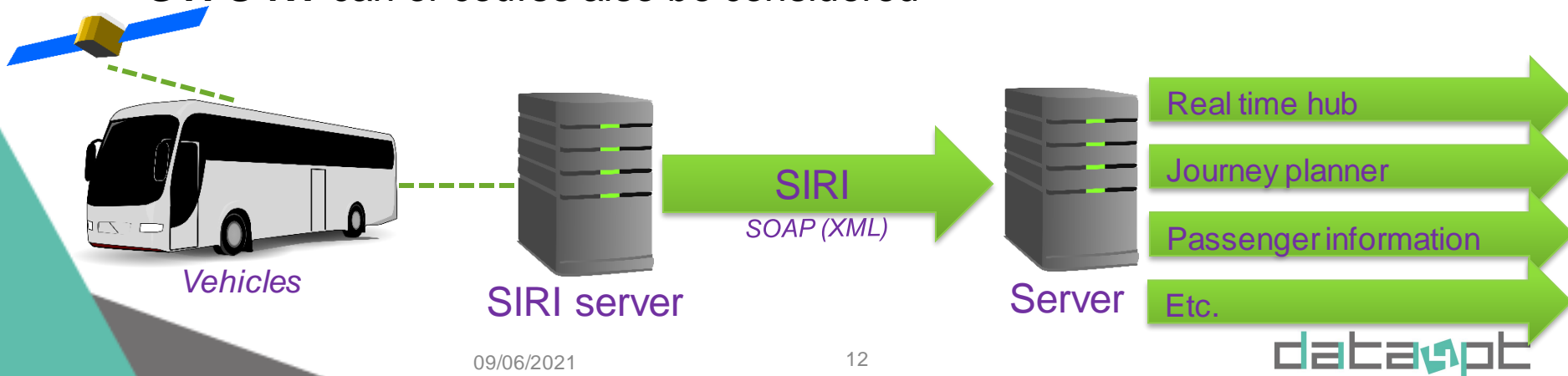
Open data to feed third parties of service

SIRI *(national profile or EU Profile)*

- The **XML** (possibly with SOAP) version of SIRI is here well adapted (and already largely implemented in Europe)
- The use of the subscription is recommended to manage possible data size issues
- The entire exchange can be managed with only the **Estimated Timetable** service (timetables per line); **Situation Exchange** can be a nice complement.

Alternatively or complementarily, using the Estimated Timetable service (schedule per line) in its **SIRI Lite** version may be an option

GTFS-RT can of course also be considered





Paying services above a certain usage threshold

SIRI Lite or XML

According to the use case, the recommendations of the two previous use cases are taken up

SIRI includes an authentication mechanism that will be necessary to control the usage thresholds

- In France the use of authentication is only retained in the SIRI Lite profile, so this one that will be preferred... but other countries may have different choices
- All management messages, including authentication-related deadlocks, shall be described in the profile

Once the authentication is set up, you can cumulate the uses and verify that the corresponding user has sufficient permissions for the measured level of use.

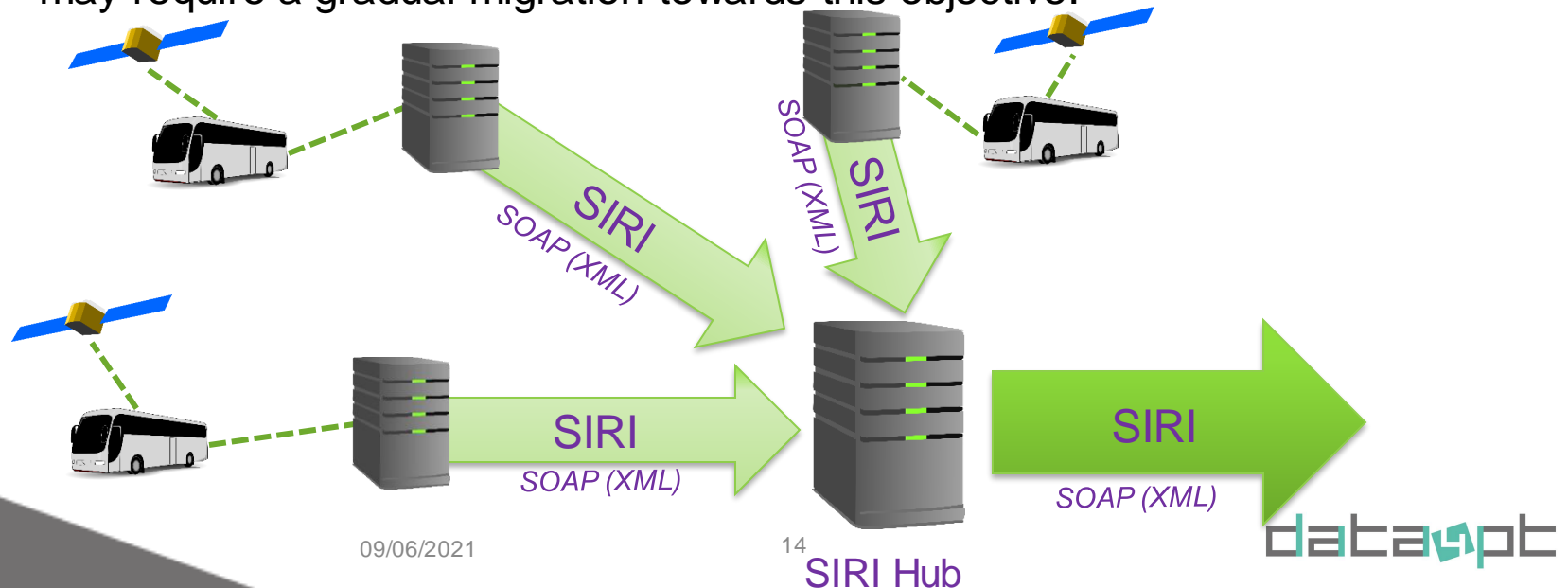




Multi-Operator repository

SIRI XML

- This use case is likely to raise data volume issues, therefore it is recommended to use the Estimated Timetable service (to exchange data per line rather than by stop) in subscription mode (to be notified only of modified information). The General Message (informational messages) or preferably the Situation Exchange (information disruptions) service can also be used
- However, constraints of pre-existing and limited operator systems (AVMS) may require a gradual migration towards this objective.

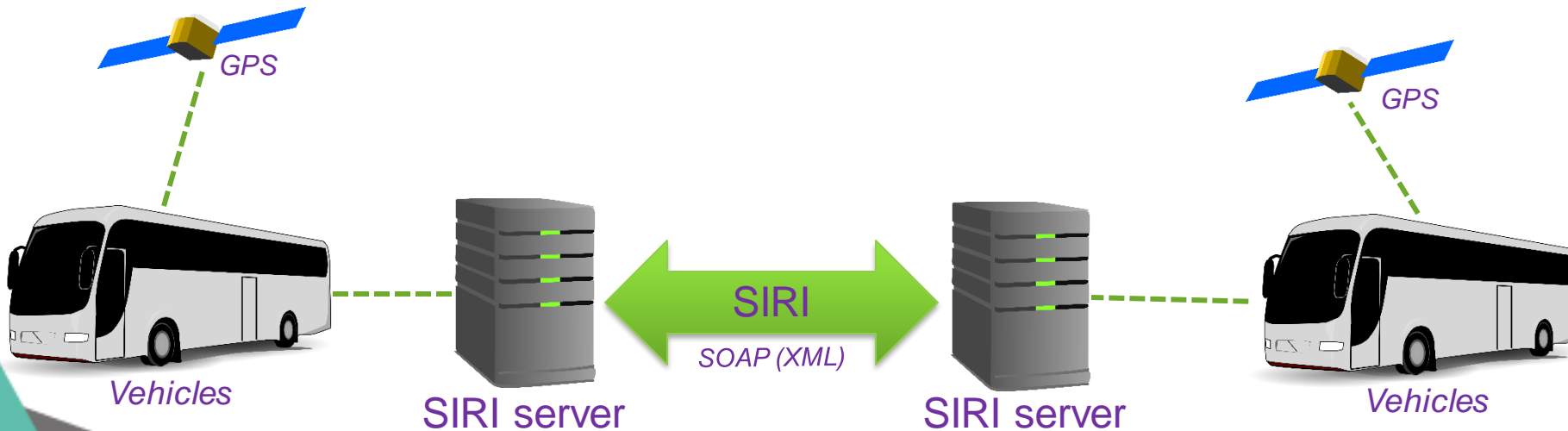




Co-Operating

SIRI XML

- The services to use are usually Vehicle Monitoring and Estimated Timetable
- The Connection Monitoring service can be used in this case to manage the guarantee of connection between operators





Other use cases

The use cases presented above are not intended to be comprehensive: the choice of services shall be adapted according to the details of the needs

Stop Monitoring: Passing times at stop



Estimated Timetable: Passing times for all journeys of a line (or network)



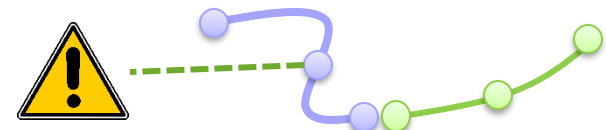
Vehicle Monitoring: Vehicle centric



General Message: simple text information



Situation Exchange: detailed information on disruptions and event (causes/consequences)



Facility Monitoring: Equipment an service status (specially well suited for accessibility)



Connection Monitoring: real-time information and management of connections





Checking and validating SIRI compliance



How to check compliance?

Verifying conformance to a standard or a profile format is important to ensure interoperability and effective use by service and end-users.

Need for a tool

- Experience shows that non-compliance generates significant additional integration costs: a compliance verification tool makes it possible to greatly limit these difficulties.
 - It's one of the roles of Data4PT to develop such tools (*but it's not done yet...*)

Need for a third party

- It is recommended that compliance be verified by a third party and not by the system developer
- Many actors now have SIRI skills and finding a competent third party should not be a difficulty ... and Data4PT may help !

Need for inclusion in the specifications

- The conformity check must be included in the specifications so that it is properly taken into account in the tasks and project development plan
- Compliance checks should also be considered in non-regression testing and maintenance in operational conditions



Some frequent technical questions



Request or subscription ?

- The **classic query** provides an immediate response whose contents cancel and replace what has already been obtained. The answer may contain information that has already been obtained beforehand (if the estimated passing times have not changed, for example)
- In **subscription mode**, one is automatically and immediately notified of any change concerning the information already obtained, and only the modified information is provided
- The subscription mode therefore ensures smaller messages, does not require regular requests and allows to identify the changes more quickly
- but the subscription mode is also more complex and more expensive to set up, for the client and for the server !
- In general, the implementation of the subscription mode will therefore be reserved for situations where the planned exchanges are very large (typically, as soon as it is necessary to disseminate all the real-time information of a network)

 [Subscribe](#)



ET or SM ?

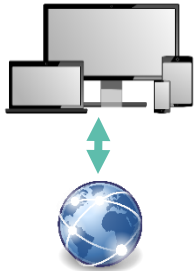
- Stop Monitoring, or SM, provides passing times at stop
- Estimated Timetable, or ET, provides all the passing times (and journey status) of a line in one go
- If one wishes to provide passing information for only a few stops, ET will not be relevant because a lot of unnecessary data will be exchanged and the customer will have to do a lot of sorting work.
- If on the other hand it is necessary to provide information on all the stops (for a journey planer for example) then ET will limit the number of exchanges and processing time and consequently the volumes and speed of the exchange (also avoiding a work of assembly of all the SM answers).





REST, SOAP or simple HTTP ?

- SIRI offers a SOAP implementation and a simple HTTP mechanism (these two being the “classic” SIRI) as well as a REST implementation (SIRI Lite)
 - The data exchanged is 100% identical, only the exchange protocol differs
- Simple Object Access Protocol (**SOAP**) is an XML protocol that allows to make a functional call on a remote computer
 - The service are described by a WSDL file that can be used in most computer languages
 - It allows you to manage complex queries and large data sets
 - It is particularly suitable for server to server exchanges
- **REST** (REpresentational State Transfer) is a Web protocol that allows to call the services of a Web server
 - It is more targeted to simple queries
 - It is particularly suitable for exchanges with a user terminal (browser, smartphone), but can also be used in a machine-to-machine context
- REST will be used almost systematically in open data context
- SIRI “classic” is preferred for exchanges between operators, service provider and Authorities.





What about data size ?

- Data size is often considered as one of the hard points of real-time data exchange
- However, two very distinct concepts must be considered.:
 - The **size of public transport data** itself (directly related to the size of the transport network)
 - The **number of requests** and solicitations, especially in open data context
- Regarding the volume of public transport data
 - It should first be remembered that, while vehicles may require very frequent updates of their position, the passing times are much more stable and generally do not change by more than one minute per minute !
 - The subscription mechanism, coupled with the ET (Estimated Timetable) service, make it possible to control these volumes
 - In addition, further substantial data volume reductions are possible using incremental updates.





What about data size ?

- Regarding the number of requests
 - Typical of the Open-Data context where the number of requests cannot be limited
 - This is a technical problem very similar to that of the load of traditional web page servers, and the solutions are of the same nature:
 - Server replication and query distribution
 - Cache management
 - Etc.
 - This is practically the only case where there is, above a certain threshold, actually a direct link between the number of requests (or subscribers) and the infrastructure costs for the provider.
 - The EU regulation opens a little door for paying services here





API or files ?

- SIRI is an API: you submit a request and receive a response
- But this is only a choice of technical protocol
 - One could very well put exactly the same answer in a file and indicate where the file is located... and it would just be much longer (but without any impact at the functional level)
 - In addition, the exchange of files would require the use of a protocol like FTP, which is also an API !





Business standard vs technical standard

- **SIRI** and **GTFS-RT** are specific norm and standard of the public transport **business** and the real-time information
 - and they are based on other technical norms and standards...
- **REST** and **SOAP** are technical protocols for the solicitation of remote services and are neither specific to the transport business nor to the field of real-time
- **XML**, **JSON** and **Protocol Buffer** are purely technical exchange data formats



Why set up a stop repository ?

There are more and more implementations of stop repositories

- In England at the national level with NaPTAN, in Norway, Switzerland, locally like in Ile-de-France, etc. etc.
- This makes it possible to share stops (their names, identifiers and main attributes) between all actors and service
 - Between planned information and real-time information
 - Between operators when multiple operators use the same stop
 - For exchanges with other information services (ticketing, mapping, etc.)
 - To set up exchanges with other modes (in particular new modes of transport: carpooling, car sharing, bike sharing, etc.)
 - Etc.
- This also makes it possible to group the stops within mono-/multi-modal stop places
- And it is a very good tool to improve data quality





Repository for other data ? (1/2)

A repository is quite fundamental for stops ... but is also recommended for lines

Furthermore, even if not fully structured as a repository other concepts identifier's stability is also a very important

- That's specially true for journeys (DATED VEHICLE JOURNEY as defined by Transmodel)
- If not you will face strong difficulties when trying to relate scheduled information and the corresponding real time one
 - It's quite often that the AVMS use different identifiers than the one provided by the scheduling system
 - Furthermore, scheduling systems mostly don't provide DATED VEHICLE JOURNEY (journey on a specific calendar date) but only VEHICLE JOURNEY associated to a calendar... but the AVMS manages DATED VEHICLE JOURNEY: defining a way to associate them is therefore important (can be a simple trick on the identifier codification);





Main concepts and Reference Data



SIRI concepts

STOP / MONITORING POINT– SIRI

A point at which real-time status is reported on a display or other visualisation. Normally corresponds to a SCHEDULED STOP POINT (Transmodel / NeTEx).

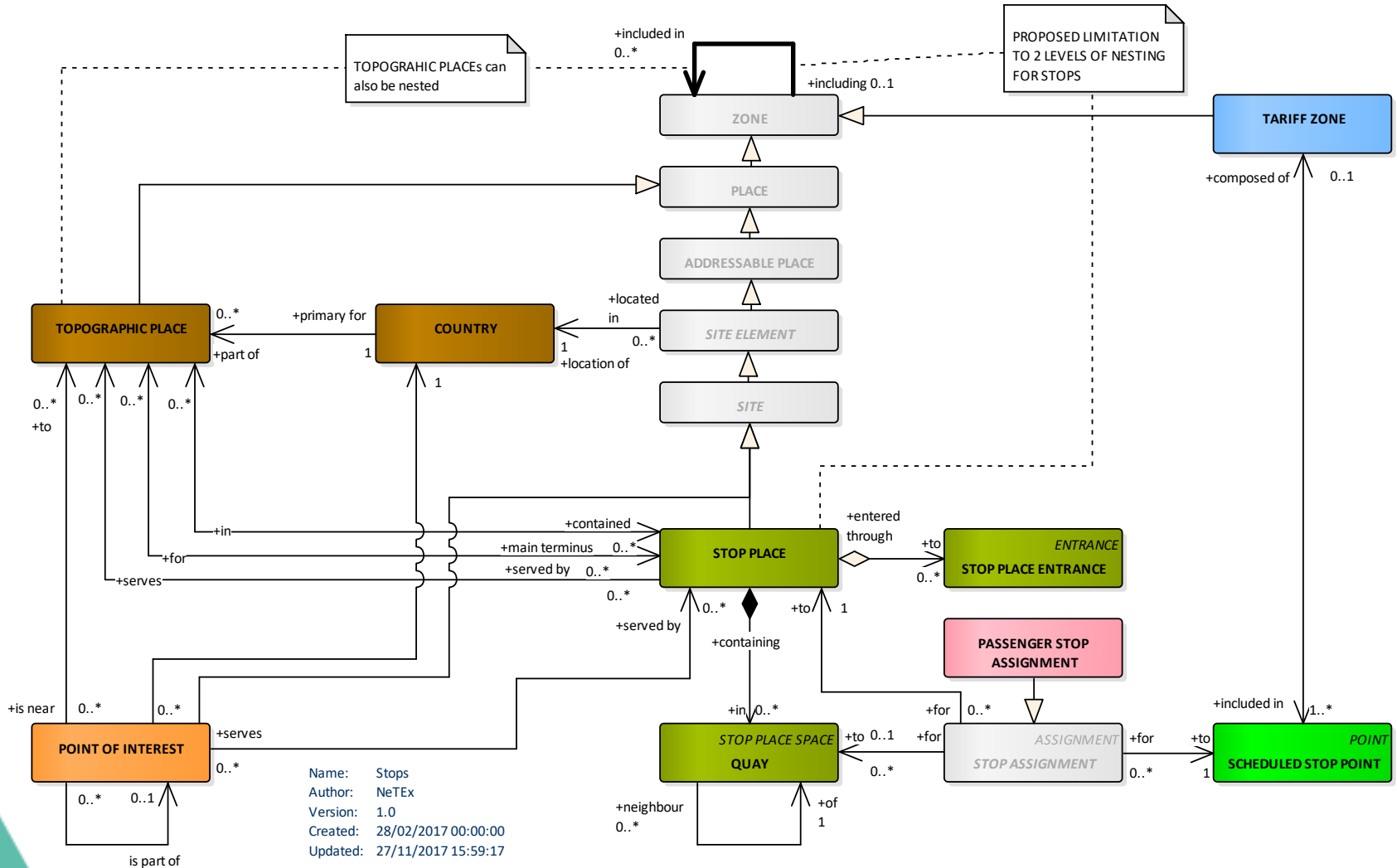
CALL

A visit by a VEHICLE to a specific SCHEDULED STOP POINT as it follows the JOURNEY PATTERN of its VEHICLE JOURNEY to achieve a set of planned and estimated PASSING TIMES. The CALL may have real time data associated with it.

Note: A SIRI CALL may be regarded as a useful optimisation of a more normalised set of structures that are articulated separately in Transmodel. CALL combines the Transmodel elements of POINT IN JOURNEY PATTERN in with ESTIMATED PASSING TIME, OBSERVED PASSING TIME, & TARGET PASSING TIME, along with real time elements and other stop properties pertaining to the visit. Note that SIRI segregates all elements pertaining to arrival from those pertaining to departure, again facilitating the validation and implementation of actual systems.



Transmodel/NeTEx Stops





Transmodel/NeTEx Stops

STOP PLACE

(« level » 2)

STOP PLACE

(« level » 1)

Bus Stop

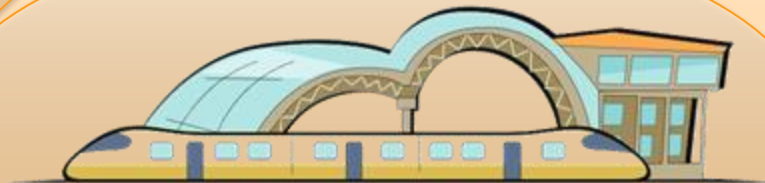


Bus Stop



QUAYS

Gare TGV



STOP PLACE

(« level » 1)

STOP PLACE

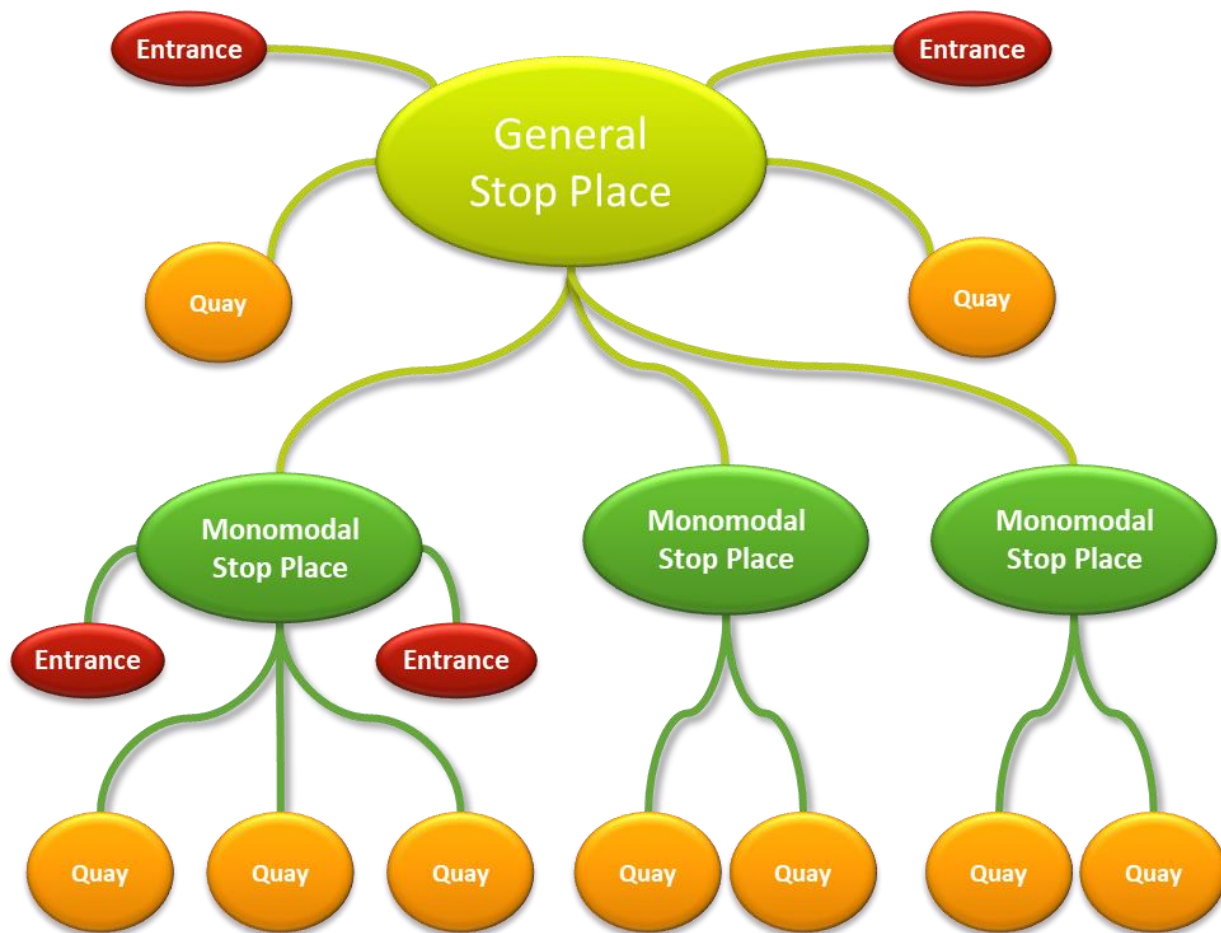
(« level » 1)



TRAM Station

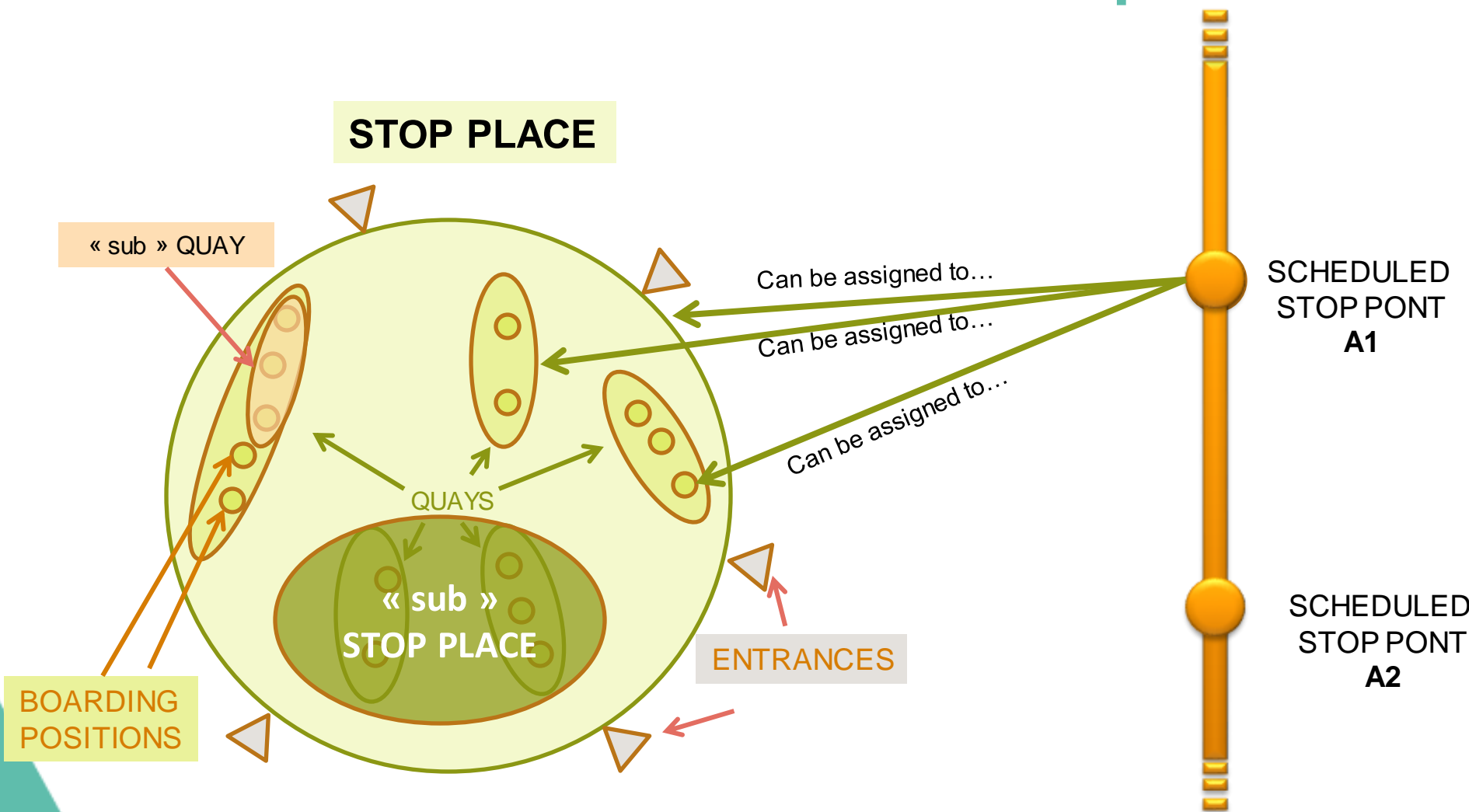


Transmodel/NeTEx Stops (EPIP)





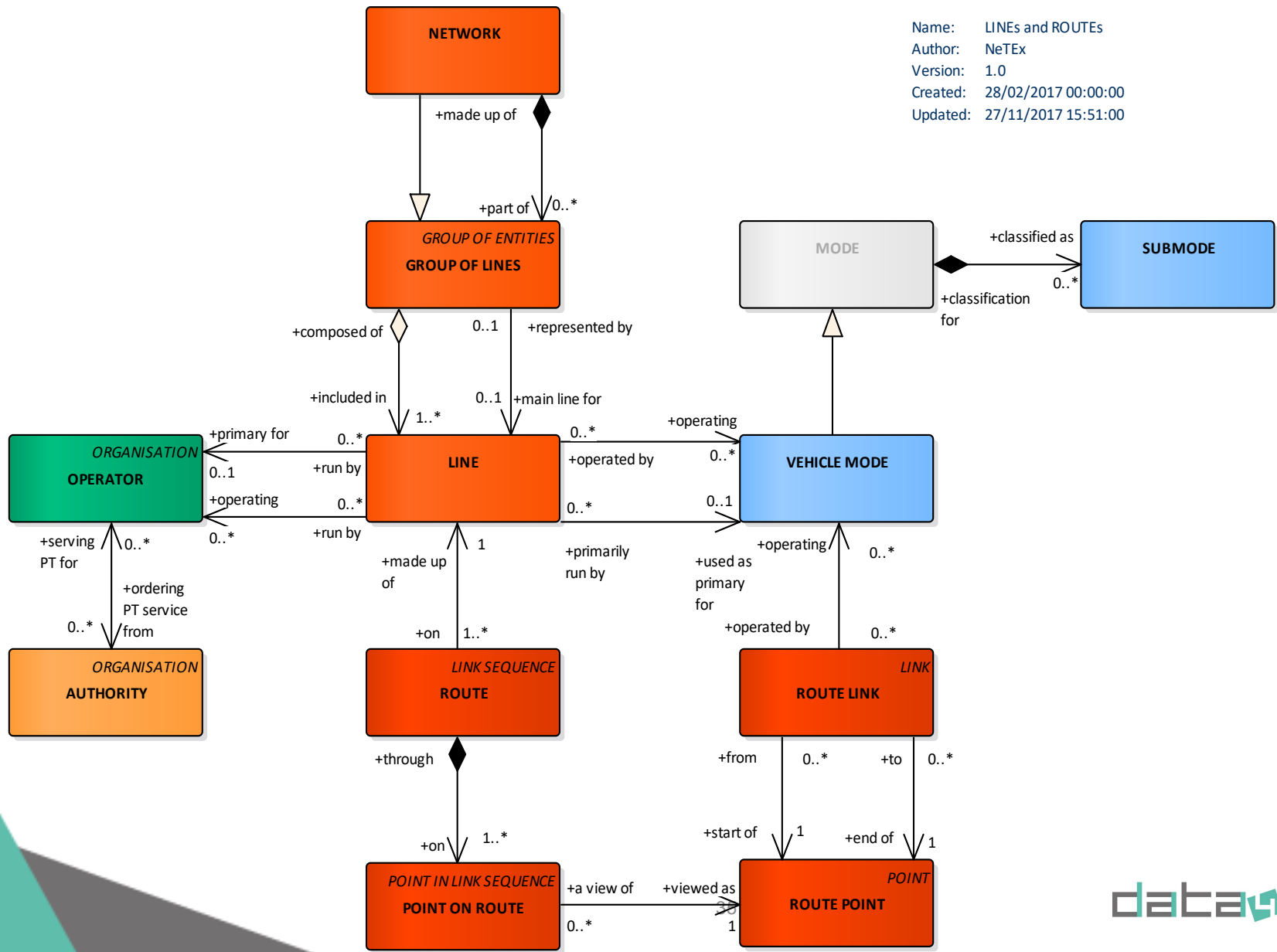
Transmodel/NeTEx Stops





Transmodel/NeTEx LINES

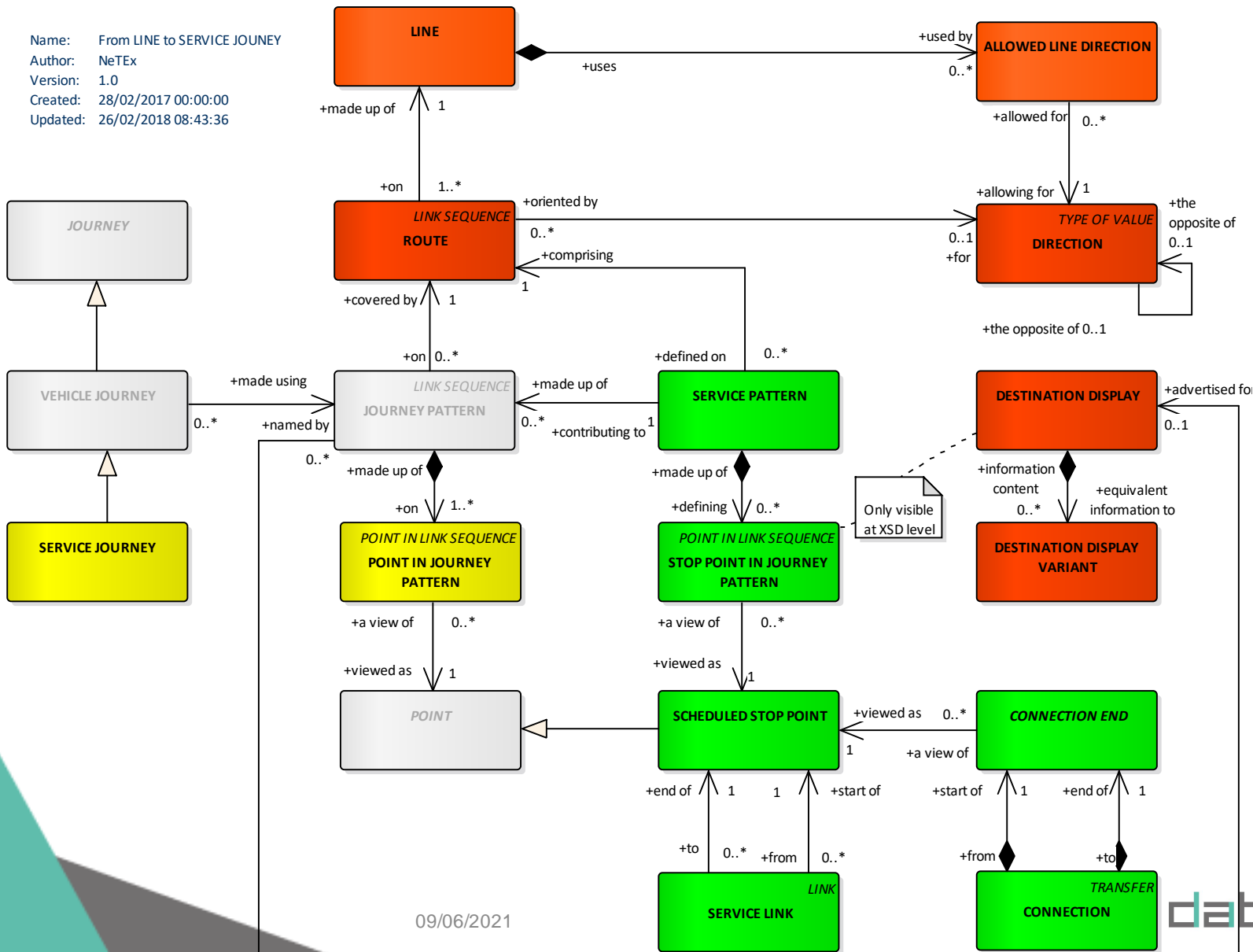
Name: LINES and ROUTES
Author: NeTEx
Version: 1.0
Created: 28/02/2017 00:00:00
Updated: 27/11/2017 15:51:00





Transmodel/NeTeX JOURNEY

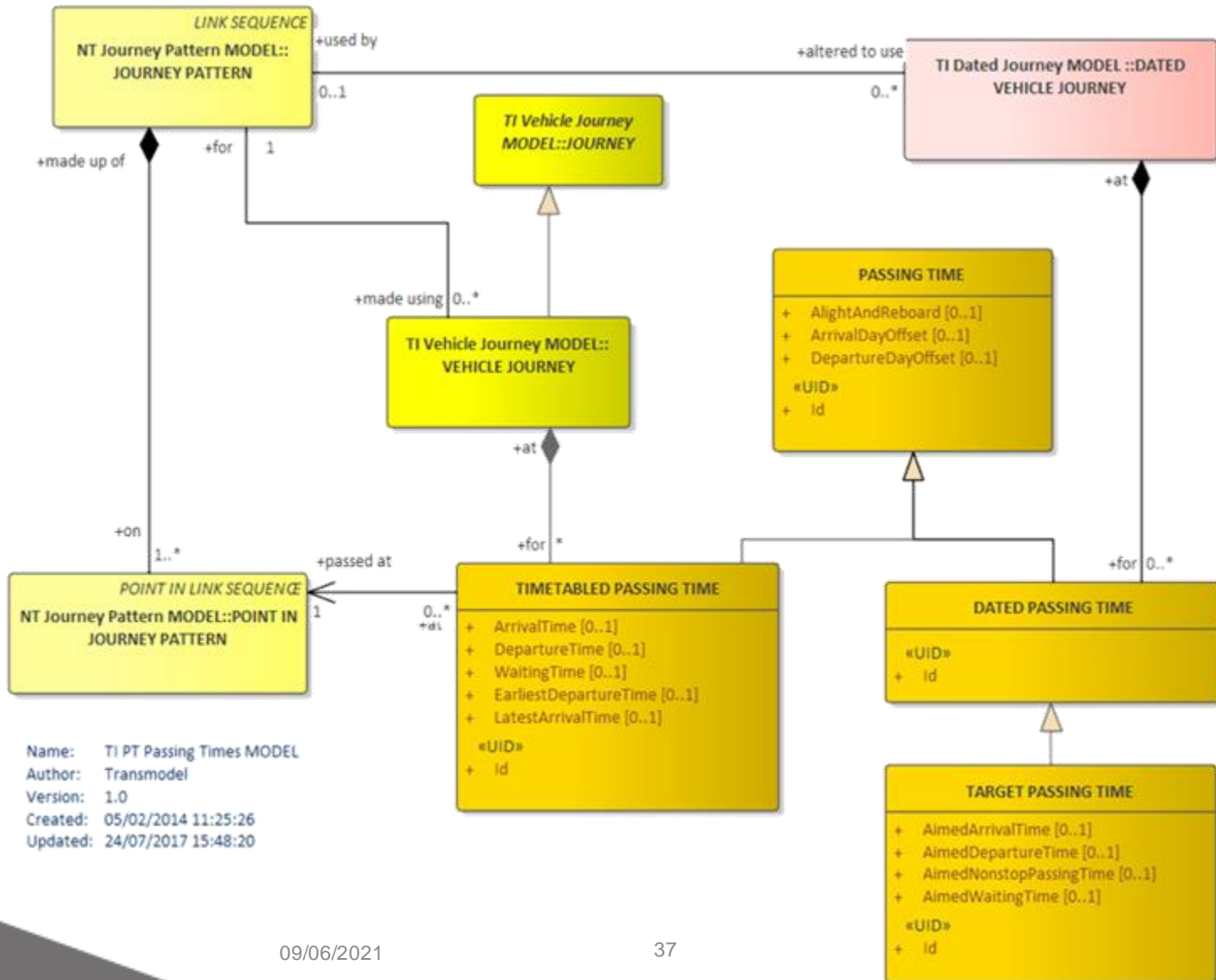
Name: From LINE to SERVICE JOUNEY
 Author: NeTeX
 Version: 1.0
 Created: 28/02/2017 00:00:00
 Updated: 26/02/2018 08:43:36



09/06/2021



Transmodel/NeTex JOURNEY



Name: TI PT Passing Times MODEL
 Author: Transmodel
 Version: 1.0
 Created: 05/02/2014 11:25:26
 Updated: 24/07/2017 15:48:20



Thank you for your attention

Data4PT has received funding from the European Union's DG for Mobility and Transport under grant agreement No MOVE/B4/SUB/2019-104/CEF/PSA/SI2.821136