UIRR
INTERNATIONAL UNION
FOR ROAD-RAIL
COMBINED TRANSPORT

ELETA

Co-financed by the European Union
Connecting Europe Facility

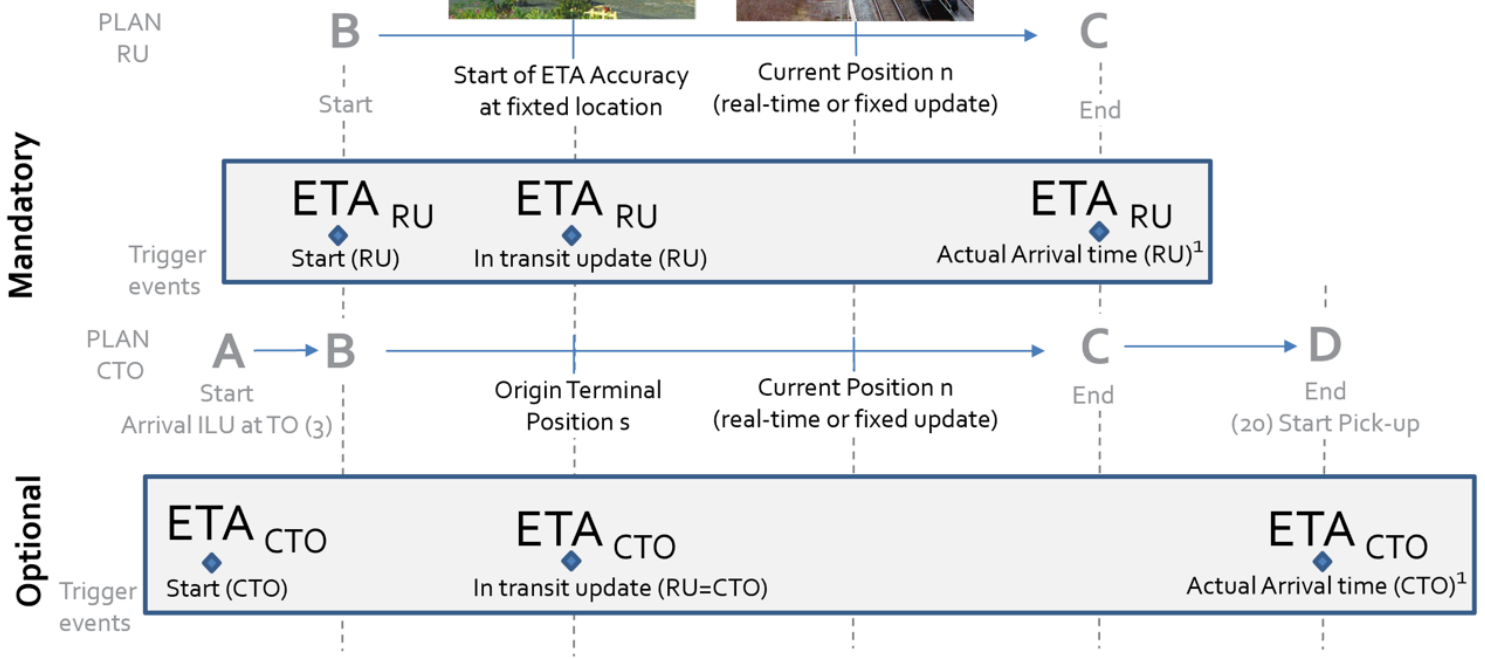
ELETA FINAL CONFERENCE – BRUSSELS - 5.11.2019

Introduction on the main functional requirements

SPECIFICATIONS OF THE CTOs REQUIREMENTS

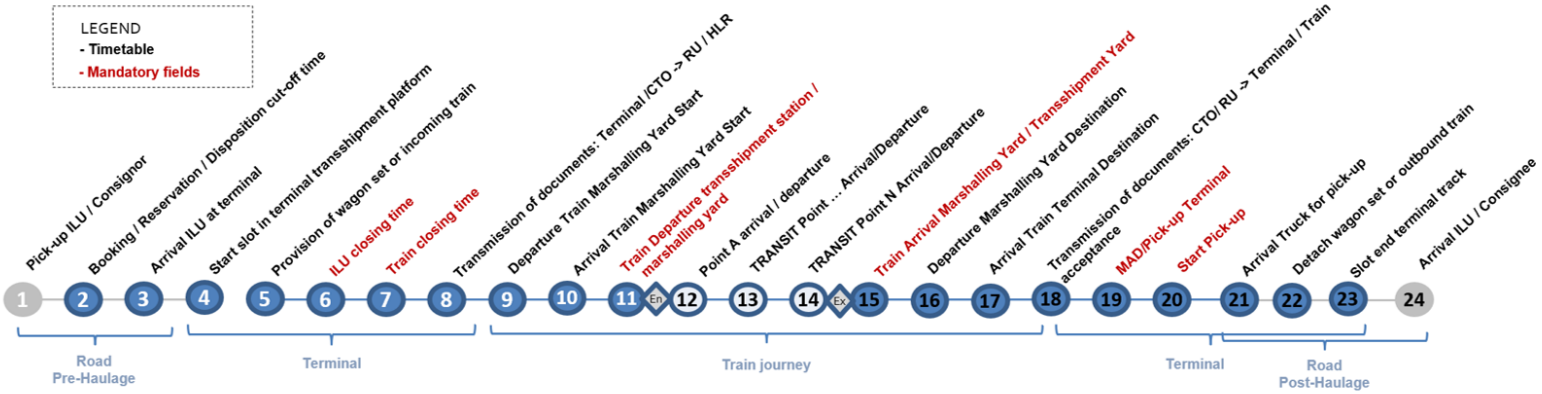
Scope	Definition of the **business and IT-related requirements** for the calculation of a ETA in Road-Rail Combined Transport
Types	1) **Functional requirements: system components** (design area scope, system functionality, data definitions, user classes, user Interfaces, information needs, business processes/activities, business rules) 2) **Non-functional requirements: system operations** (performance, security, reliability, compatibility, maintainability, transferability, usability, metrics and measurements)
Request for proposal	Basis for the **selection and evaluation of the ETA service providers** (in coordination with the European Commission)

GENERAL REQUIREMENTS – PROJECT SCOPE



- Electronic interface to RNE TIS (train information system)
- Calculation of an ETA (as role of a Lead RU - line dependent)
- Display of the actual train position
- Interface to send 'train run' and 'ETA' information to the CTO and TO electronically

GENERAL REQUIREMENTS – TIMESTAMPS



Key output of the project

#	Timestamp name	Timestamp description
3	Arrival ILU at terminal	ETA of truck provided by LSP
En	IM Entry Point (first)	
13	Transit Point… arrival/departure	ETA from RU at a handover point
Ex	*IM Exit Point (final)*	*ETA option for Lead RU*
15	*Train Arrival Marshalling Yard*	*ETA option for Lead RU (line configuration*
17	*Arrival Train Terminal Destination*	*ETA option for Lead RU (line configuration)*
20	Start pick-up	ETA for CTO (information to LSP)

FUNCTIONAL REQUIREMENTS – ETA DATA SOURCES

POSSIBLE DATA SOURCES	• IMs (national, TIS) • (L)RUs • Terminals • CTOs • Shunting Operators (optional) • LSPs (optional) • Wagon keepers (optional)
DATA TYPES	• Timetables • Train running information • Near-to-real time updates • Historical data • Weather data • Operational incident and works data • GPS or general telematics information
DATA CONSITENCY CHALLENGES	1) Trains change their numbers during international transports. 2) Possibility for the CTOs to overwrite a computed ETA in case of more up-to-date information from other sources

FUNCTIONAL REQUIREMENTS – ETA COMPUTATION

1) Real-time predictive: based on real-time data updates

$ETA1 = position_n + t_{n\ to\ B}$

2) History-based stochastic predictions

$ETA2 = position_s\ t_{actual} + t_{s\ to\ B} + \Delta t_{historic}$

3) Machine Learning based prediction:

Supervised learning algorithm integrating multiple sources, e.g.

1) Based on past data
2) Based on timetables
3) Based on real-time updates
4) Based on current influencing factors from external sources (congestion, weather, terminal waiting time, etc.)

$ETA3 = position_n + multiple\text{-}source\ t_{n\ to\ B}$

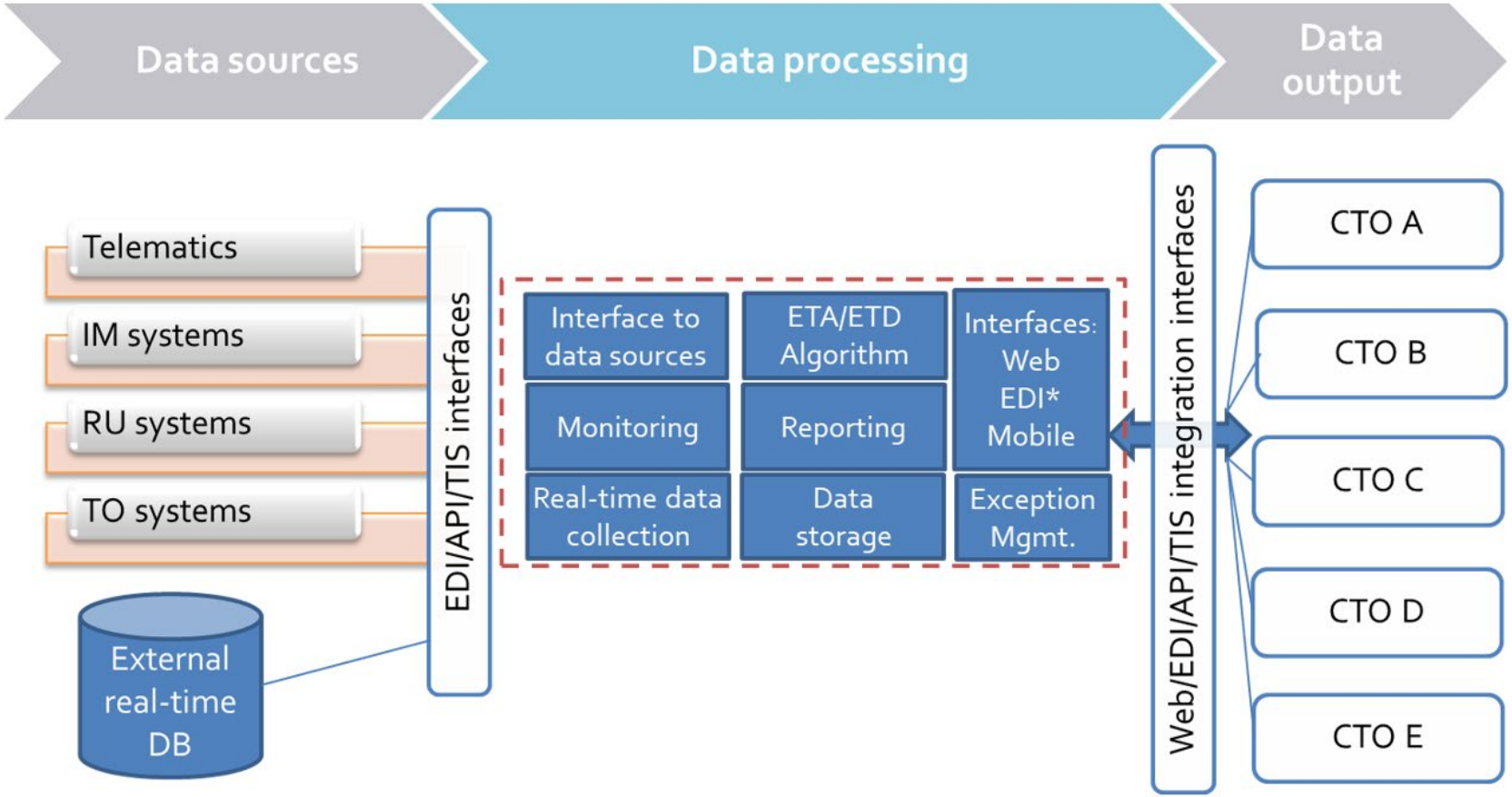
'Computed Smart ETA' better than 'time shifting'

- Line-specific approach (with or without fixed location)
- Train run dependent percentage (e.g. 30% of the train run achieved)

FUNCTIONAL REQUIREMENTS – ETA ACCURACY

Definition	ETA calculation compared to the effective actual time of arrival (ATAs)
Minimum requirement	ETA – Delivery (ATA) at defined location = Deviation incidence (if tolerance level is surpassed)
Tolerance levels	1) 30' for national trains 2) 60' for international trains
Target	>95% computed as number of deviations / number of total trains
ETA accuracy types	1) Single ETA accuracy (per train, per line) 2) Total ETA accuracy (all trains per line)

FUNCTIONAL REQUIREMENTS – IT ARCHITECTURE



ELETA – THE MAIN SERVICE PROVIDERS

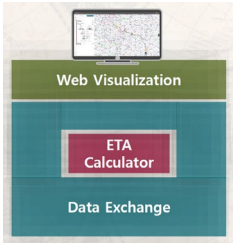
Main Data Provider

RNE
RailNetEurope

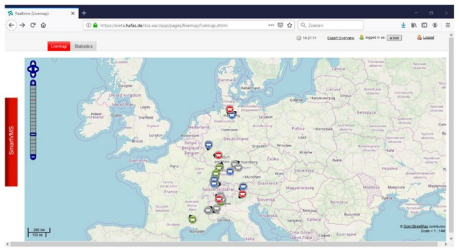
RNE TIS
Train Information System

Two selected ESPs

SYNFIOO



HaCon
Traffic • Software • Service



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THANK YOU FOR YOUR ATTENTION !