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Capacity for Rail

WP22 NOVEL RAIL FREIGHT VEHICLES

FFE (Madrid, Spain) – 21 September 2017

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UIC

New OPERA

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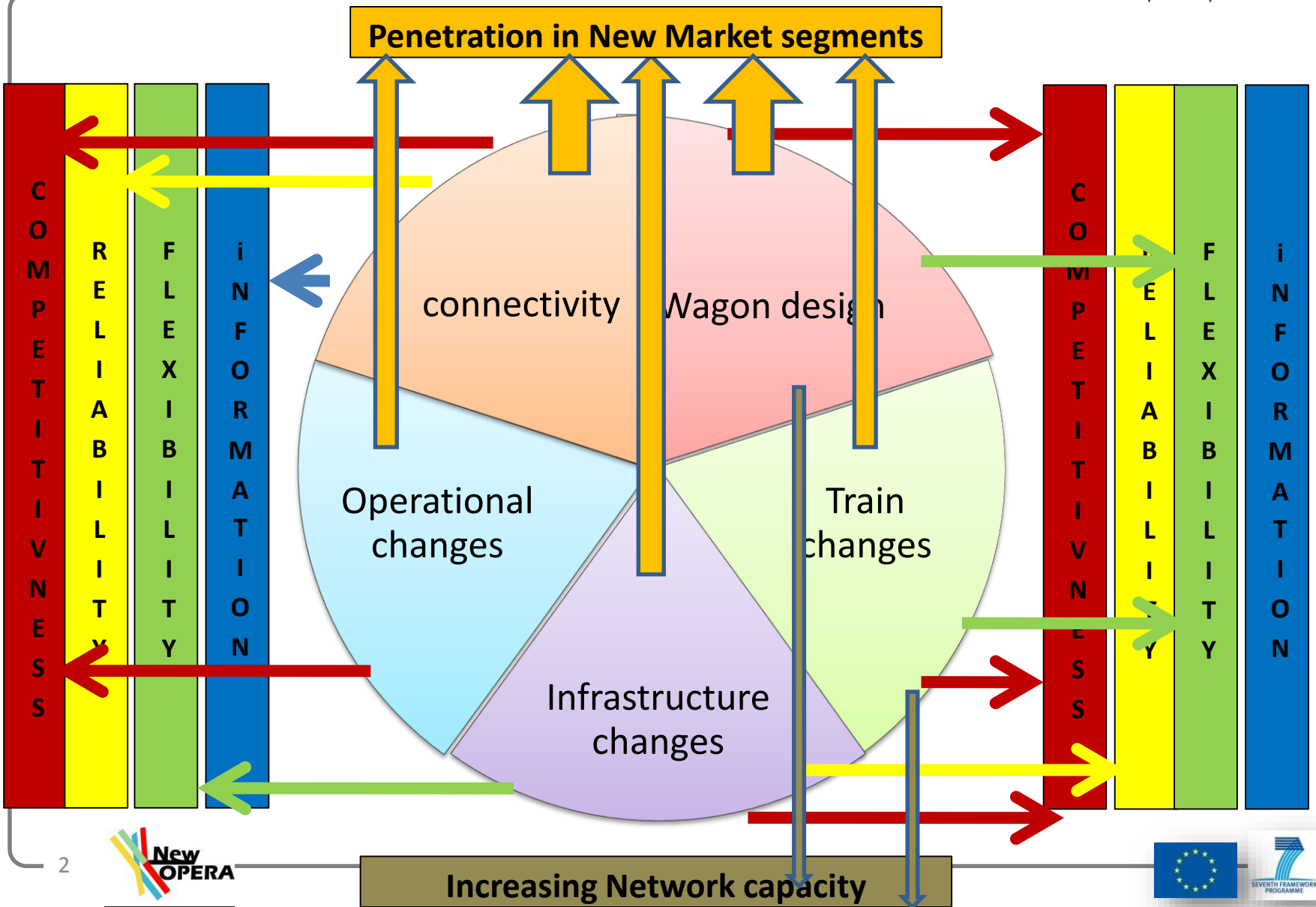
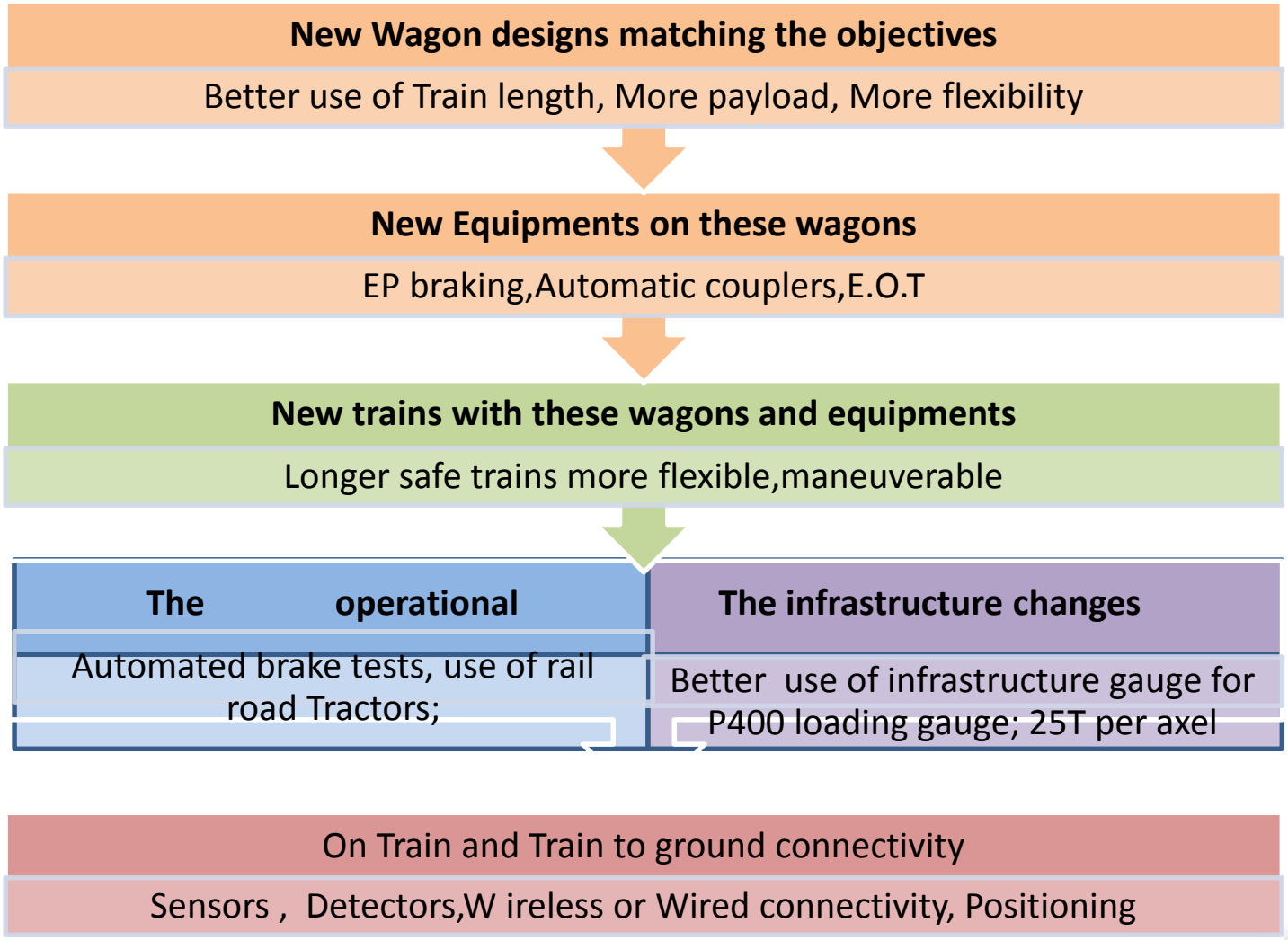
General map of WP22 activity



WP 2.2 Conceptual achievements



Design and Equipment innovations

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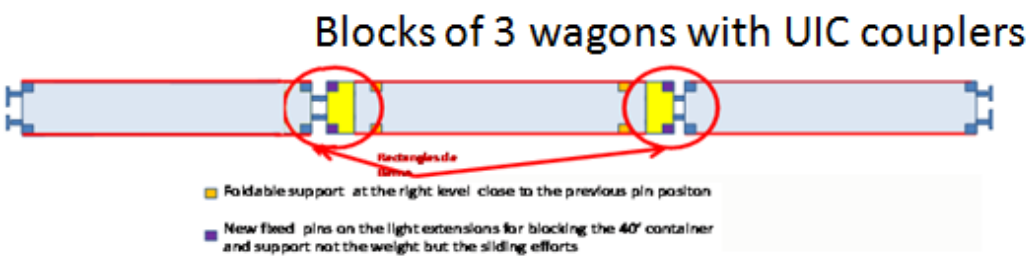
Multi-body wagons connected by Jacobs bogies and/or draw bars instead of UIC couplers

Wagon Lohr UIC

Automatic couplers

End of Train device: EOT

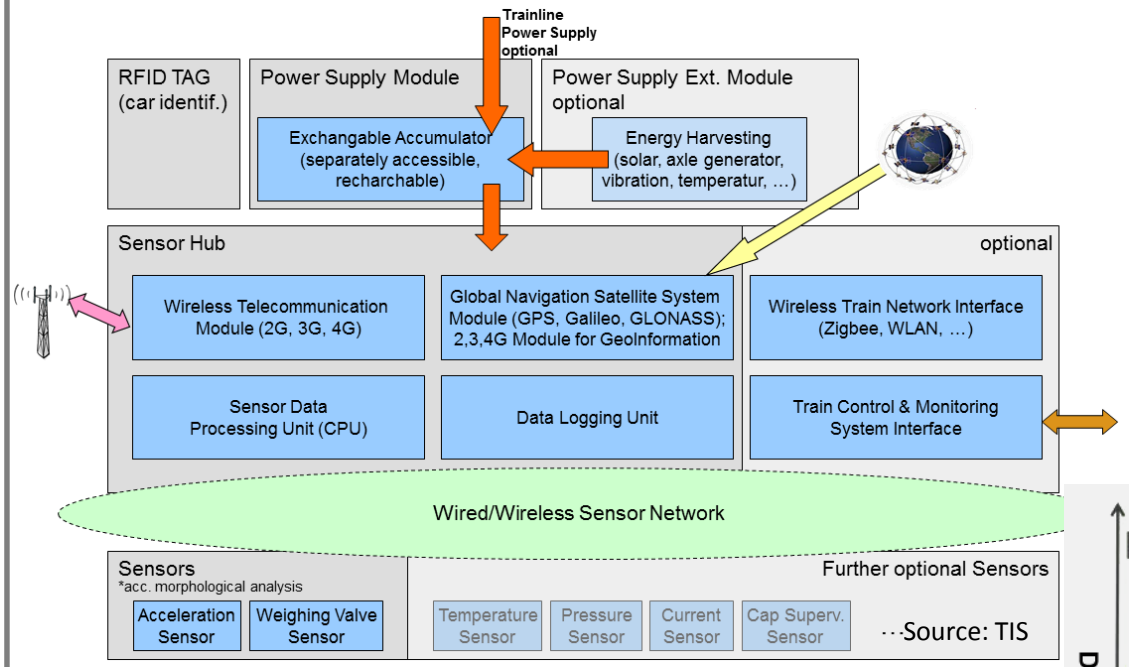
Extension over buffers



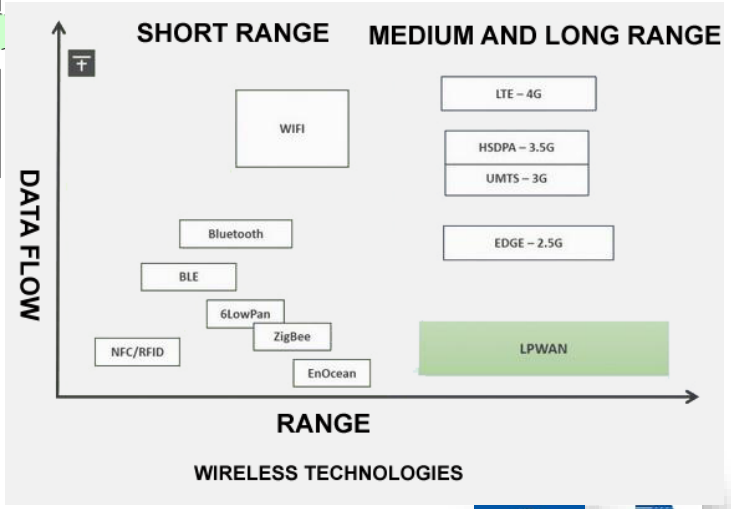
Rail-road tractor

Connectivity solutions: innovations

- **How to win the challenge of saving energy but communicate**



Less Data but long range and low energy
Concentration in a smart box before sending informations to the locomotive by a mesh communication
Keep GPS positioning for sensitive points



Assessment of the impact:KPIs

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- Each innovation or integrated innovation developed in WP22 has impacted the Reliability, the Flexibility, the Competitiveness, the transport capacity, the quality of the service and the attractiveness of the rail freight transport.

- Defining KPIs appeared the next essential step to measure the impacts on the efficiency:

  The percentage of usable length to place cargo
  The ratio between the payload and the gross weight of the train measured in percentage
  The average number of loaded kilometers per year of the wagons
  The average number of empty kilometers per year of the wagons
  The average commercial speed of the train divided by the maximum speed allowed of the train
  The cost of wagon maintenance per kilometer and the cost of maintenance per ton-km transported
  The Reliability is measured by the average delay per train

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Methodology of selection of Innovations

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- For each new design or each new equipment, in a cost-benefit analysis, the impact on competitiveness has been compared with the increase of the wagon cost of utilization taking into account the possible increased availability , but also the cost of a standard new built wagon for the comparison.

- At the same time, short term implementation of a design increasing the efficiency more than the cost of utilization as explained here above are not decided because of availability of fleets of largely amortized wagons.

- Innovations have also been examined in light of the potential need of a TSI modification for its introduction on the network.

- According to the various market segments the priorities are different.

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Innovations selected for further analysis

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- The main interesting topics resulting from the criteria quoted above are:
  - Sensors enabling the brake test done from drivers cabin
  - Wireless connectivity for in-wagon and on-train connectivity
  - Lengthening the train with an EOT or by coupling two trains
  - EP brakes
  - Automated couplers
  - 25T per wagonaxel
  - Multi-body Wagons
  - Extension over buffers
- A Table shows according the segment of the market the possible timing of introduction in the market if a positive business case may be set up:

POSSIBLE TIMING FOR MARKET UPTAKE

Type of traffic→ / Innovations ↓	Block trains: bulk	Wagon load	Combined-transport	Car carriers
connectivity	X	X	X	X
EP Braking	X wheel protect	X	X	
Multi-Body	X		X	X
EOT		X For inter-hub trains	X	
25T	X Heavy Stuff			
Automatic couplers		X		
Extension over buffers			X	

Short term | medium term | long term

Relation with the market needs

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KEY FACTOR-> Market Segment	Competitiveness	Reliability	Transit Time	Connectivity	Automation	Other
Mass Transport by block trains	++	++	N	+	At loading / unloading points	Flexibility in Volumes
Combined transport	+++	+++	Equivalent to road or better	+++	+++	
Wagon load transport	+++	+++ Punctuality +++	++	+++	++++	Flexibility in Volumes
Rolling Motorway	+++	+++	Better than road	++	+++	Capacity to transport P400 SemiTrailers

Key Factors by Market segment defined by type of Transport

Real business case for a car carrier transport

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- Assumptions: 3 flows of finished car traffics on 900km across 3 countries by trains of 500m to 600m and weight from 600T to 900T . Some segments are single track lines with sometimes short by-pass loops.
- New buildings has been excluded as large fleets of amortized wagons are available. Trains are relatively light but steep gradients (up to 26‰) on the route in both directions justify an EOT device. Limited length of tracks at both ends impose a very flexible road rail tractor remote controlled to enable quick maneuvers. For a longer trains an upgraded positioning will help acceptance of some derogations. Gaining time at departure with devices for a brake test from the drivers cabin is compulsory.
- The major potential obstacle is the capacity to be overtaken by quicker trains on a double track line or crossing a long train on a single track section.
- Newopera has conducted this feasibility study only with the public documents analyzing the path schedule of STVA trains with all passenger trains on all critical points. At terminals Newopera has explained the train movements to insure the effctive possibility of operating such two trains both ways.

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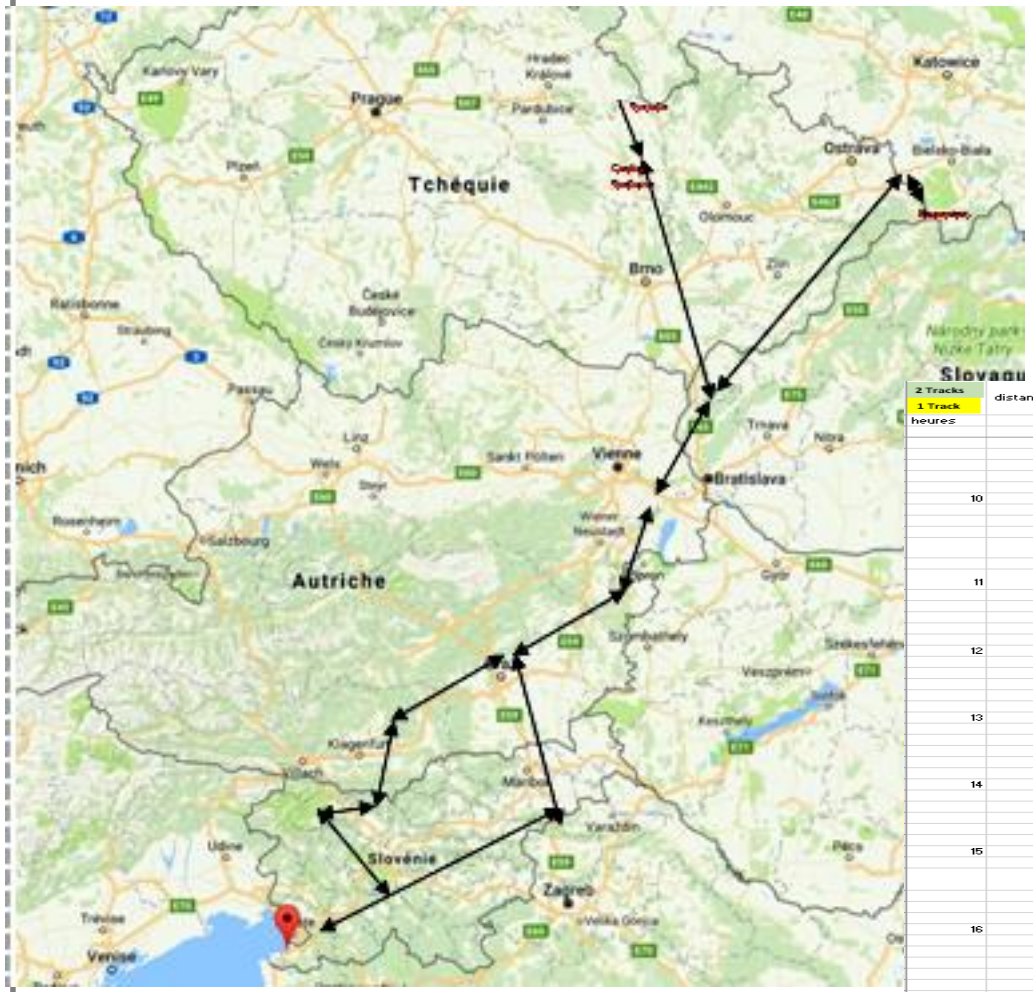
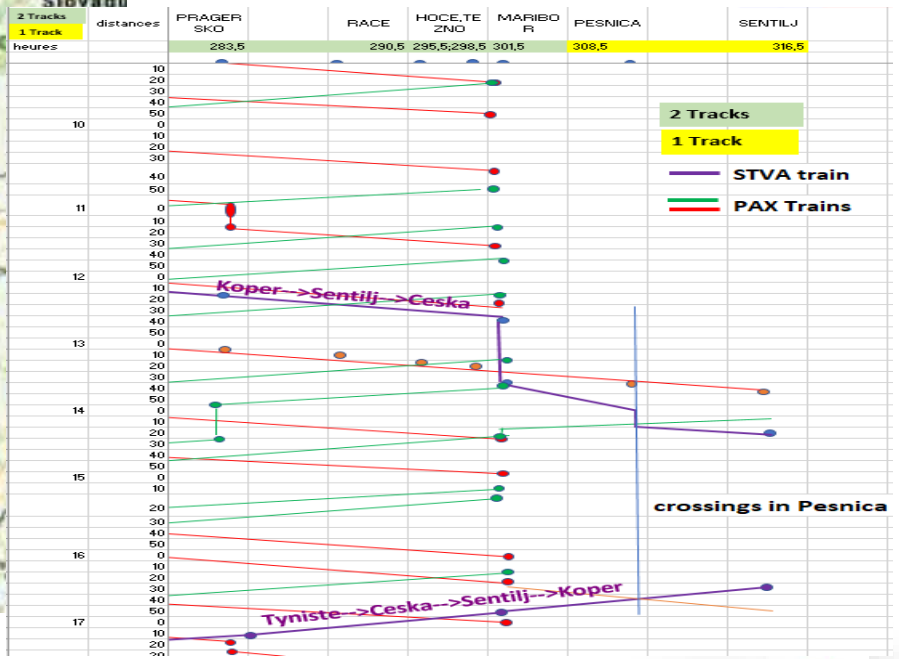
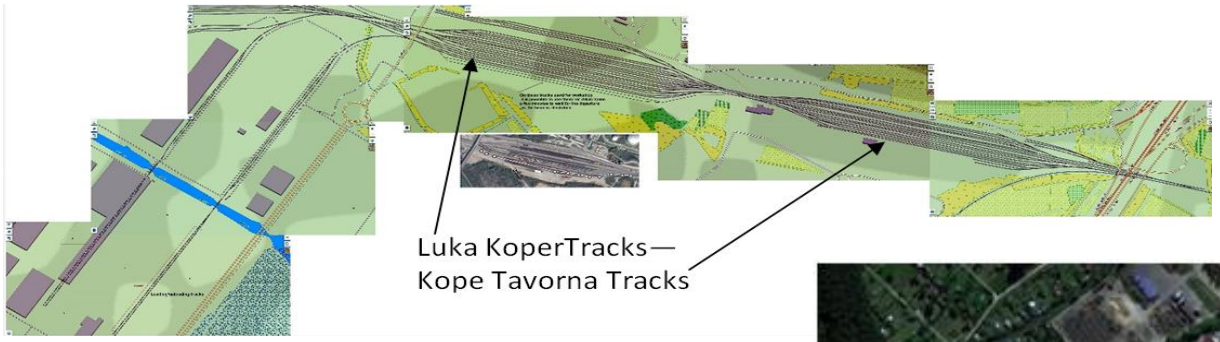
STVA business case: the itinerary



Example of a critical section study from Maribor to Sentilj (single track line)



Terminal Analysis



Koper

Tyniste

Nosovice

Business case: financial study

- The feasibility study showing that for these flows , according to the nature of the traffic the path drawn could support with only one light modification the extension of the train up to 700m and the terminals study showing also such a possibility, the business case analysis should be set up.
- No major investments are involved 4 EOT and a 130 equipment of wagons in sensors and radio as well as the ten locomotives used for all STVA traffic flows.
- The cost increase for a 20% lengthening the train with EOT are in proportion of the full present traction cost of the existing train :

--Traction cost +1,5%
--Cost of wagons +2,4%
--Cost of EOT +4%
--Cost of the Toll+2,2%

} 10,1% of the present traction cost including wagons

- The road rail tractors are not an extra cost compared to shunting locomotives but produce immediately an improvement. Their positive contribution has not been counted to remain on the safe side.
- The increase of the length without any impact on the asset rotation but increase the number of wagons taken into consideration already in keeping the ratio of the global cost.
- The increase of the revenue is 20% leaving and added value of 10% to be shared between the investors, the operator and the customers.

Evolutions and Further work

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Beyond the previous investments quoted:

- Heavier investments are essential for wagon load activity like:
  - Automated couplers
  - Automated trains
  - Automatic couplers and un-couplers

- For Heavy bulk traffics and in general heavy stuff:
  - Increasing axel load to 25T per axel
  - Coupling two trains with distributed traction

- For combined transport
  - EOT for longer trains
  - Devices for a high reliability
  - Develop wagons for P400 transport and rolling motorways

- S2R has already started to work on some of these topics

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Thank you for your kind attention

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