
Connecting EU insights
Circle Group
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Ingenuity for life
The **Digital Freight Train** enhances operational efficiency and safety of train operations
Automated driving for an optimized operation to safe energy and lower maintenance efforts
Increased productivity by **Automated Shunting and Train Formation**
Increase infrastructure capacity by an **Effective Timetable & Network Capacity Management** for network providers and operators
Innovative Service solutions cover maintenance, technical support and spare parts **and other digital services**
System Approach
Selected insights from digitalising rail
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Lars Deiterding / Executive Director Hacon
www.hacon.de

Hacon is part of the most diversified and vertically integrated mobility company – and a reliable partner in rail freight

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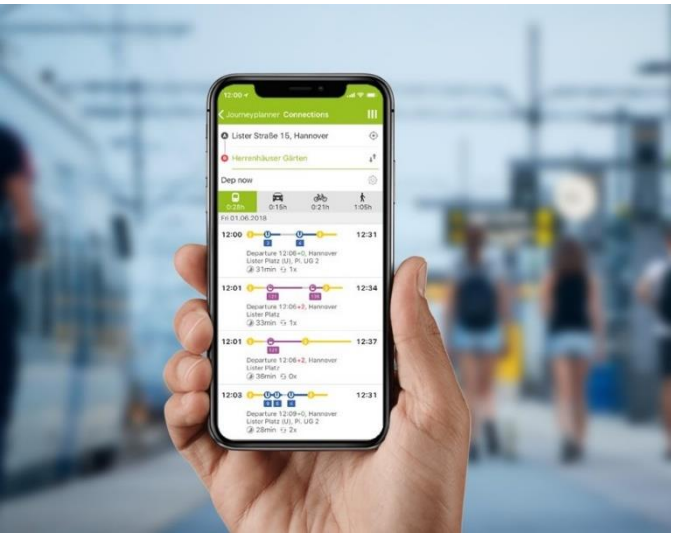

Intermodal Solutions

Apps and backend systems for customer information, transport planning, booking, payment and real-time management of data, infrastructure and fleets.

Rail Infrastructure

Products and solutions for Rail Automation and Electrification. Integrated network management from planning to operation.

Rolling Stock

Short-distance, regional and long-distance rolling stock, product and system solutions for passenger and freight transport

Customer Services

Services for Rolling Stock and Rail Infrastructure, throughout the entire lifecycle

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Continued innovation leadership secured by growing R&D investment

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Larger R&D investment than the next

2 competitors

in the market together

36,800

employees worldwide[1)]

81%

Coworkers, that are proud to work for Siemens Mobility[2)]

1,420

patent applications since 2015/2016[3)]

17,600

employees for more than 10 years with Siemens Mobility

2,600

R&D employees[1)]

1,000

apprentices[1)]

14

MindSphere application centers (MACs) worldwide

1) As of Sept 30, 2019 | **2)** Source: Siemens Global Employee Survey, June 2019 | **3** From Oct 1, 2015 to Sept 30, 2019

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Shift2Rail

Development steps – Flat / Hump Yards

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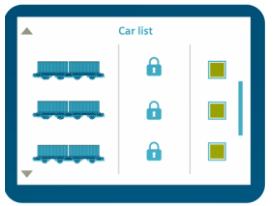
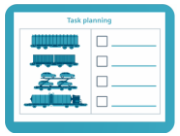
Evolution





Assisted Shunting	Low automation	Partial automation	Full automation
• Assisted driving (obstacle visualization) • Remote route selection / switch operation • Basic diagnostics	• Real-time information of carriage location • Automatic calculation of required shunting movements • Automatic route setting • Grip retarder instead of drag shoes • Process planning	• Autonomous shunters • Improved processes: Data exchange with external facilities	• Automatic coupling and decoupling • Easy train preparation (e.g. automatic brake test, partial tests of technical status)

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Shift2Rail

Full automated hump yard

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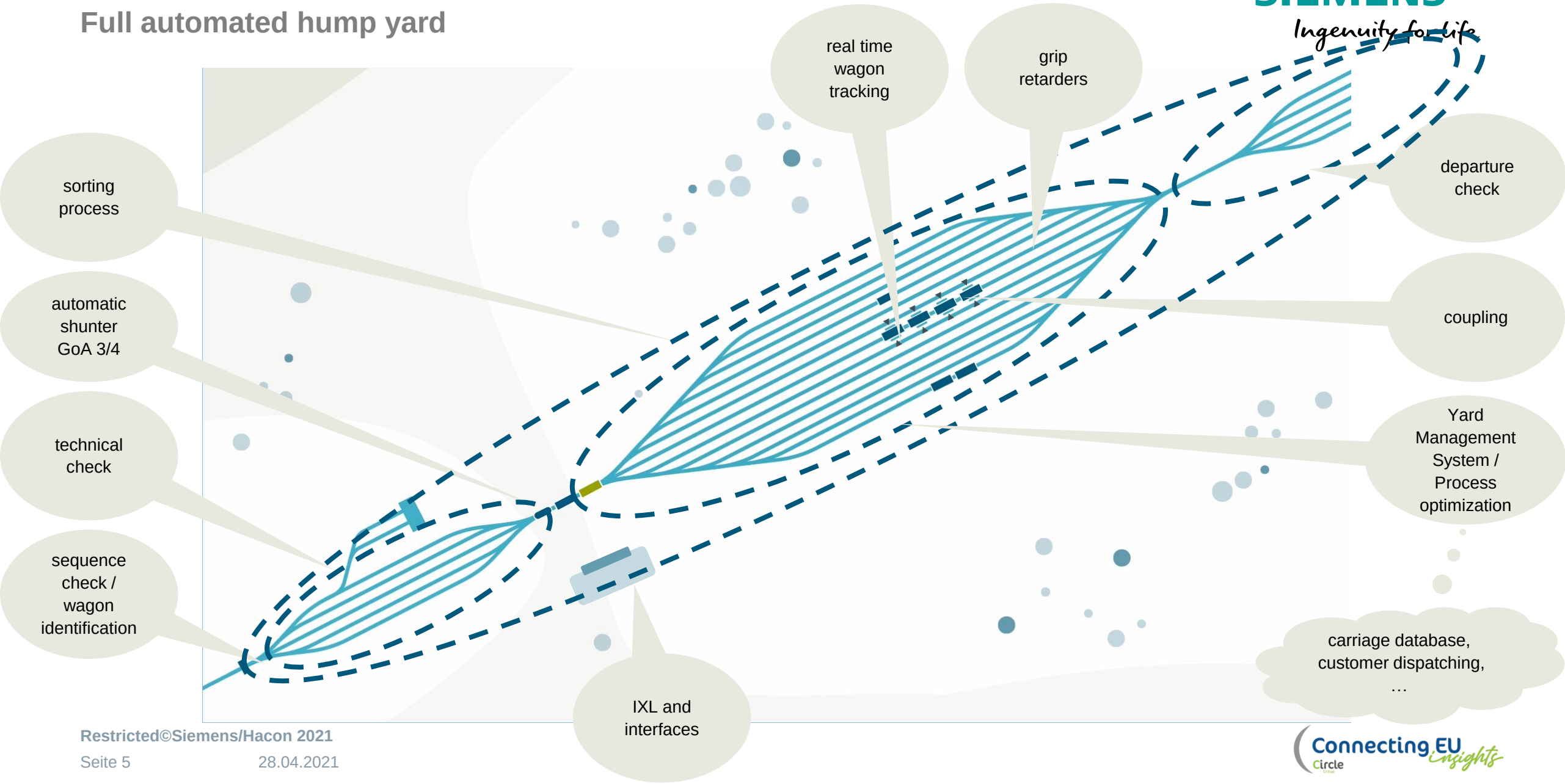

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TPS.yard

Efficient management of capacity in yards and stations

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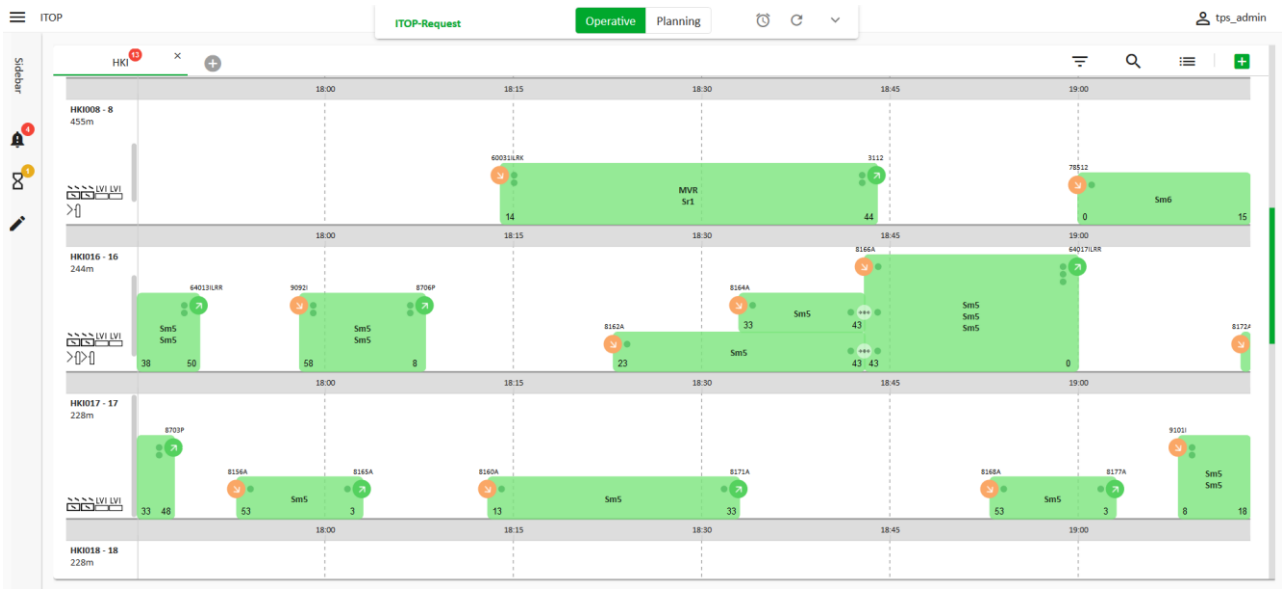
- Planning of all track and facility capacity inside the yard or station
- Planning and live operation view
- Management of train consists and relations to incoming and outgoing trains
- Workflow and capacity request support
- Browser application for capacity requester and planner



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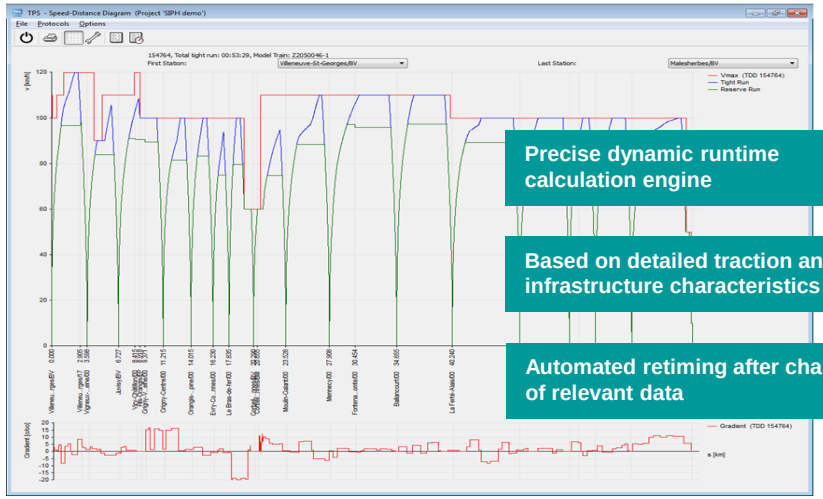
TPS Features – microscopic topology model

A detailed model of the entire network enables capacity management on operational level

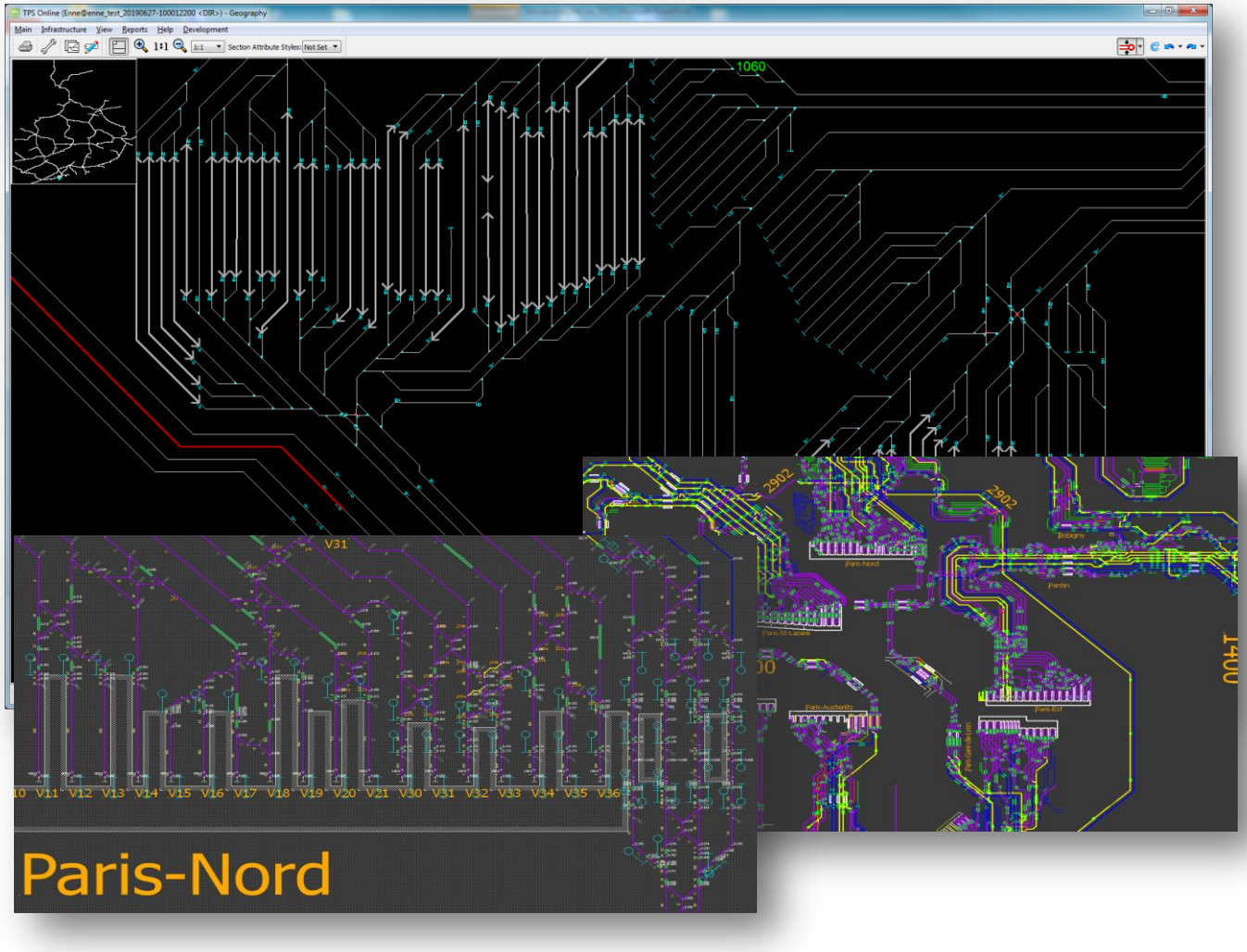
- Microscopic modelling of the infrastructure
- Detailed modelling of control and safety technology
- Data versioning and infrastructure restrictions as overlays
- Integrated infrastructure model with TPS, TPS Online and TPS Track Works



Precise dynamic runtime calculation engine

Based on detailed traction and infrastructure characteristics

Automated retiming after changes of relevant data



TPS.live

From planing to traffic management

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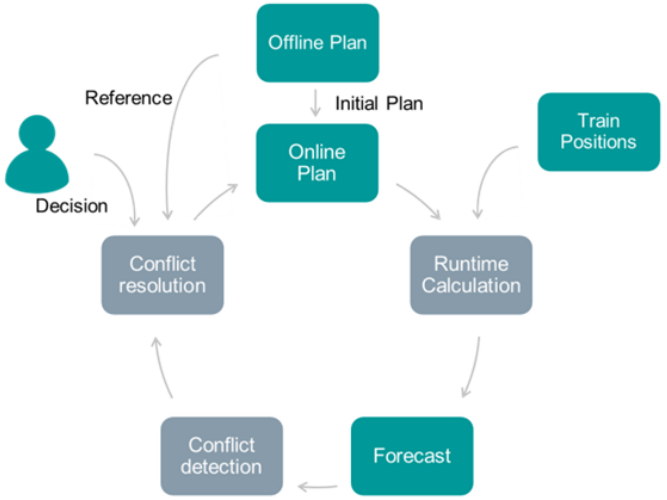
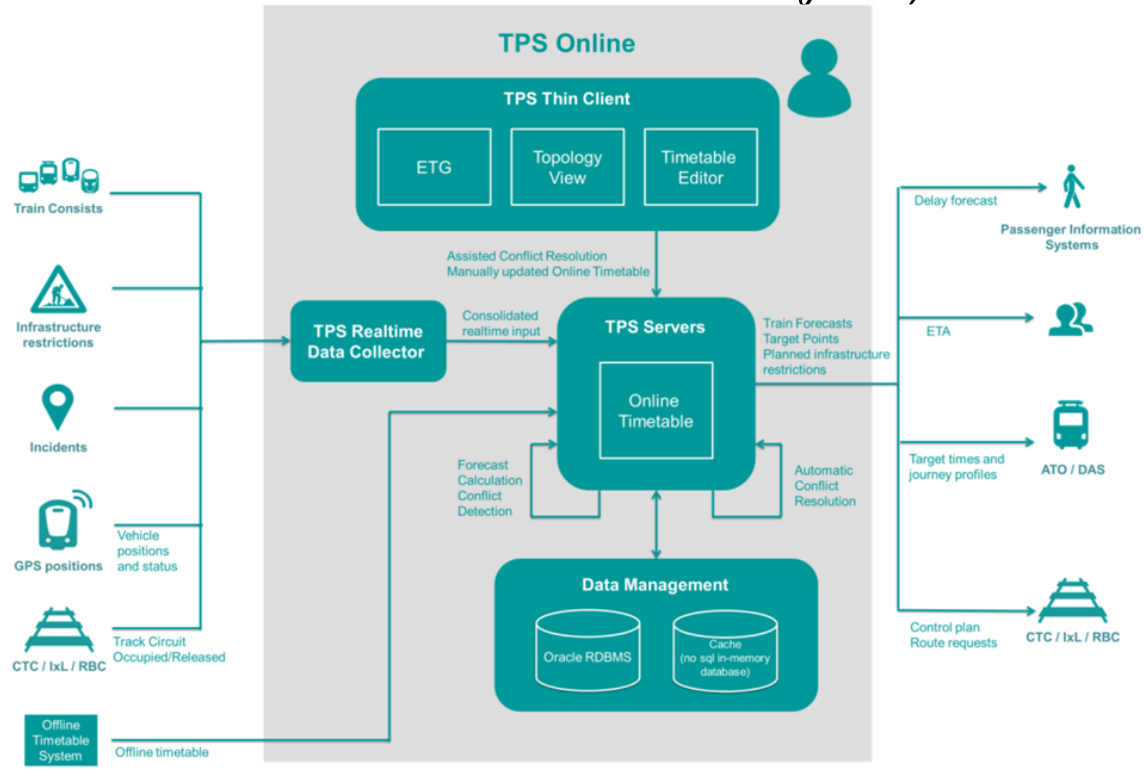
TPS provides a controlled timetable process

- Import of offline timetable from planning systems
- Regular updates possible
- Editing of the online timetable
- Indication of real-time information + forecast as basis of update of the online timetable
- Delay can be measured against on Online or Offline timetable
- ETA is a side product
- Extension in S2R (integration layer, …)





- Precise dynamic runtime calculation engine
- Based on detailed traction and infrastructure characteristics
- Automated retiming after changes of relevant data occur
- Full modelling of control and safety technology

- Calculation of detailed track occupation forecast based on UIC 406 for free-floating conflict detection
- Train/train dependencies, e.g. turn arounds are taken into account
- Delay propagation on single track and by headway conflicts are taken into account

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ELETA

Accuracy assessment enabling operational decisions

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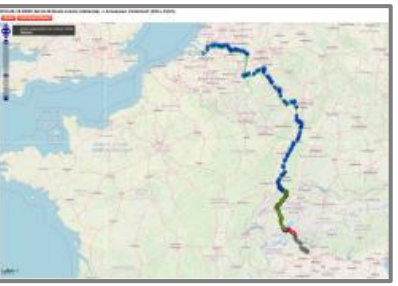
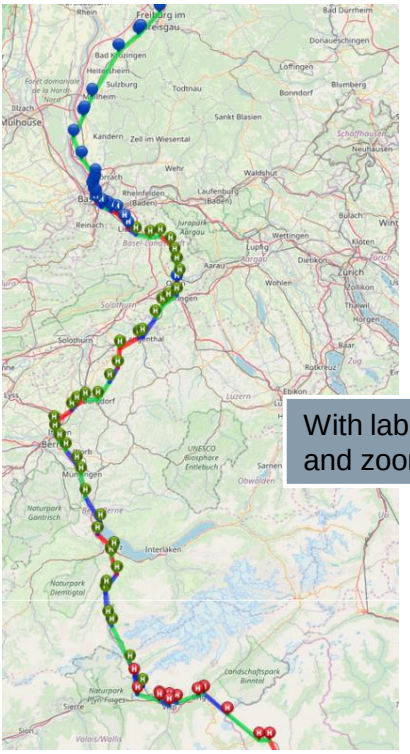
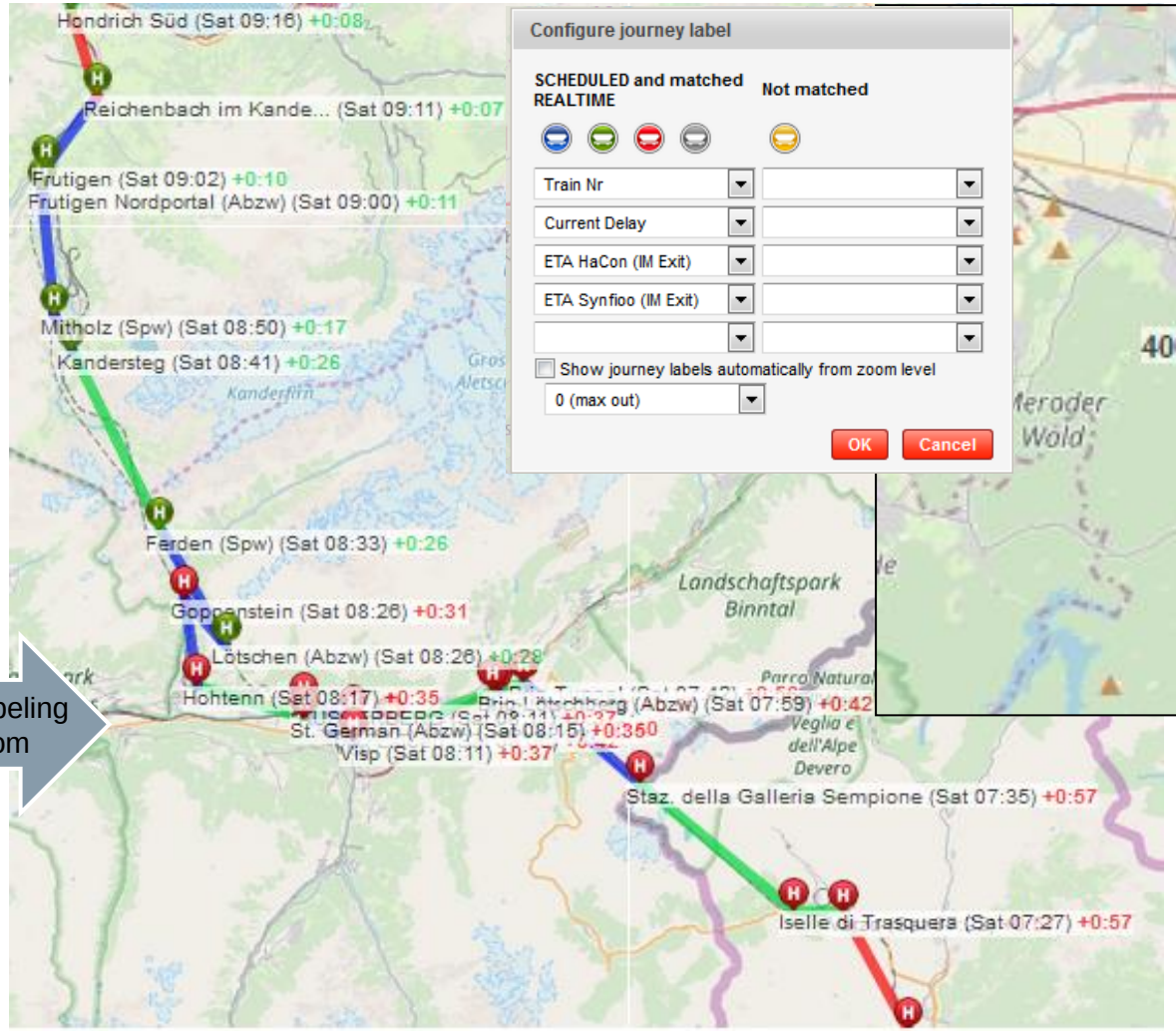
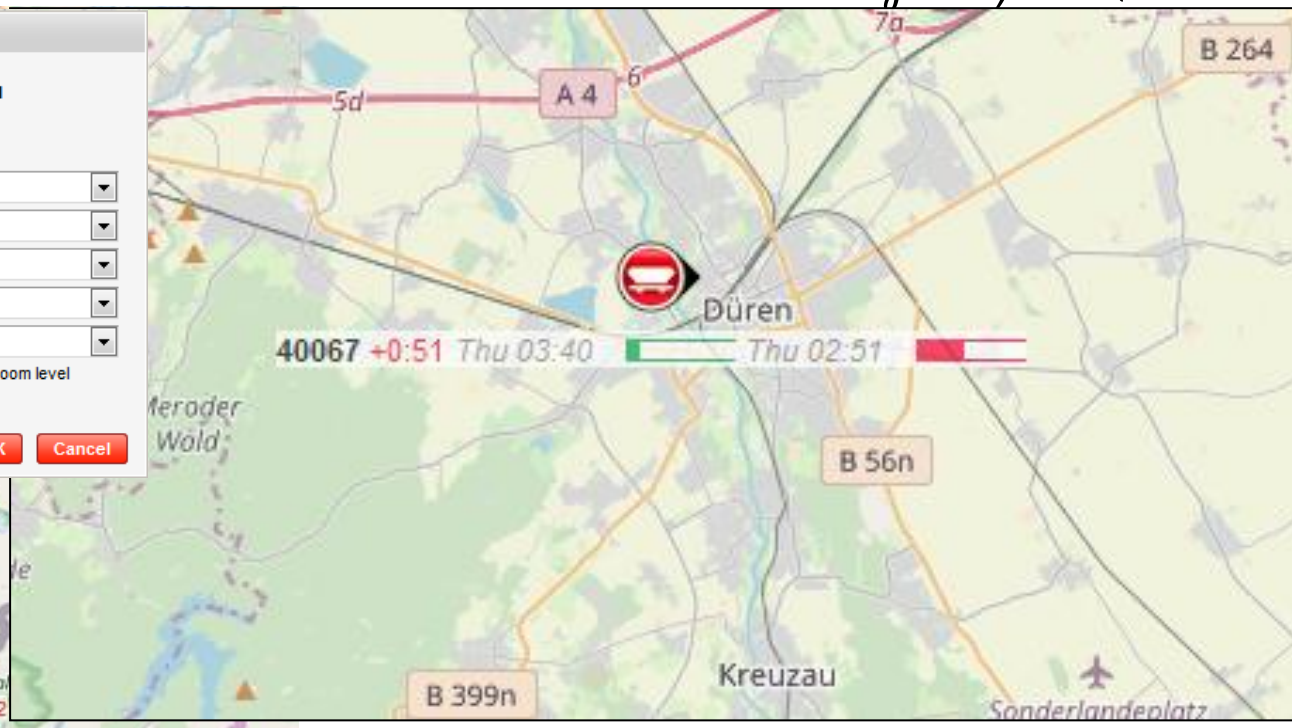




With labeling and zoom





Explanation for coloured sections on Map:

- Red line: Additional delay
- Green line: Constant travel time
- Blue line: Decreasing delay

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Let's work together on a digitalised and automated railway system of the future

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Thanks for your attention !

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