Siemens Planning Solutions

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Jamie Boychuck

CSX Executive Vice President of Operations

“It will help improve fuel efficiency and network fluidity. It’s another way to leverage data.”

Progressive Rail Oct 2019 – Quote tied to Siemens Meet/Pass Planner Tool

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Who is HaCon?

HaCon is a company that has a background of **over 35 years** that specializes in the creation and development of high-quality software solutions for traffic, transport and logistics planning and optimizations.

HaCon was **purchased by Siemens in 2017** and has a US location based in Jacksonville, Florida with their Global HQ being based out of Hannover, Germany.

HaCon employs **400 IT and transport planning specialists.**

With their rich history in development and project execution, HaCon has established **itself as a leader in the industry** for planning, scheduling and information solutions.

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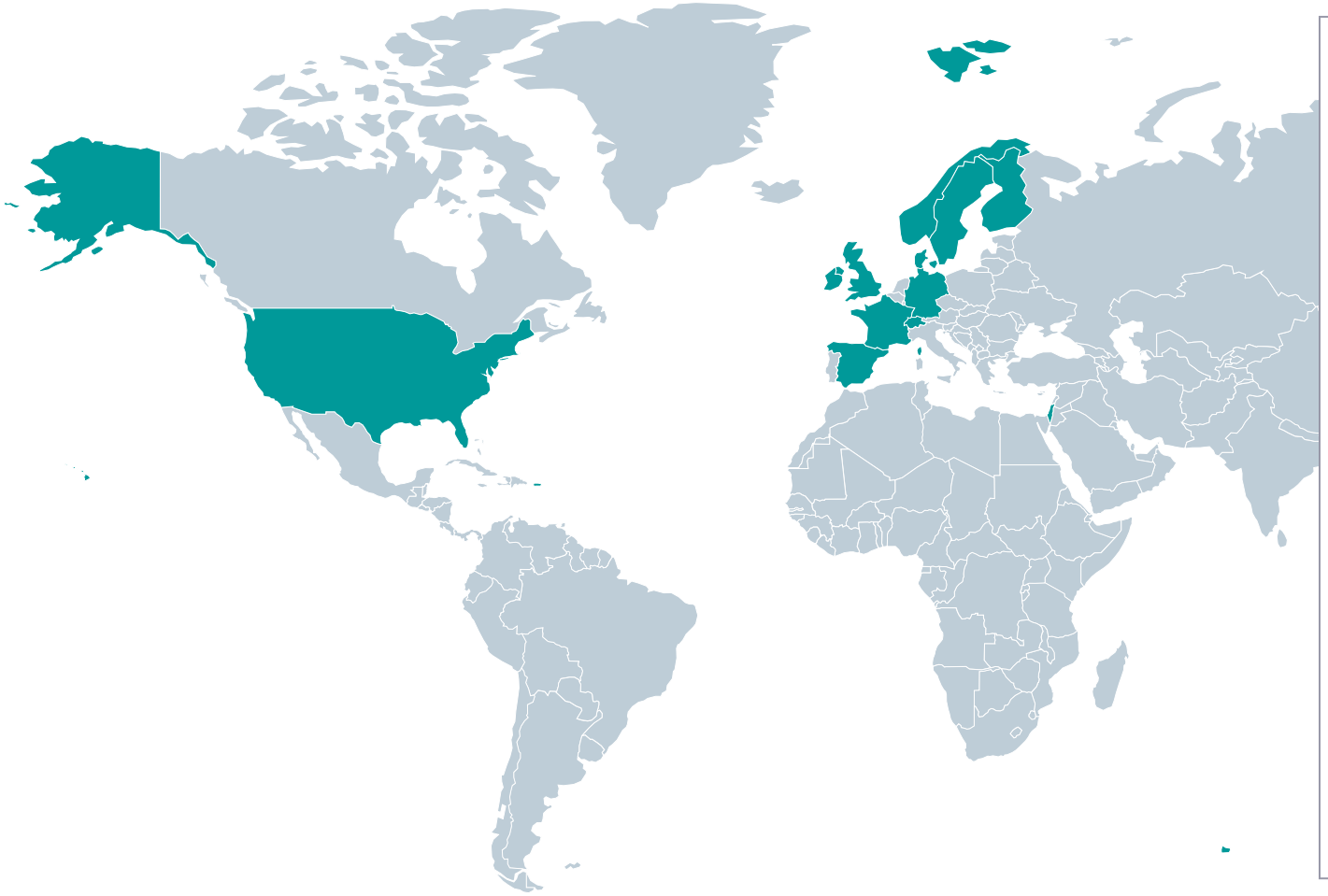
TPS
A large community of Railroads sharing features and experience



Our current customer base (TPS live and plan)

CSX How tomorrow moves · SNCF RÉSEAU · SNCF VOYAGEURS · banedanmark · DSB

Iarnród Éireann Irish Rail · DB NETZE · DB Cargo · FINRAIL

TP Ferro · abellio · BANE NOR · TRAFIKVERKET

RhB Rhätische Bahn · ISRAEL RAILWAYS ENJOY THE RIDE · GHD

NetworkRail · COLAS RAIL · Trafikstyrelsen Danish Transport Authority · MTR

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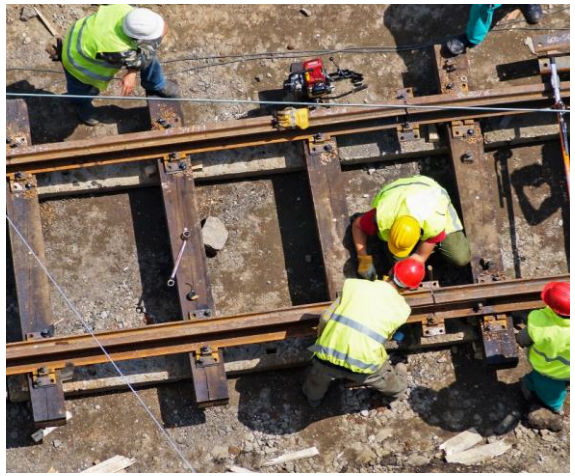
TPS
Available products for Planning and Dispatching

TPS.live

Real-time network optimization system to improve on-time performance & rail utilization

TPS.trackworks



One solution for request, planning, coordination, validation and publication of **track works and maintenance possessions**

TPS.plan

Multi-user system focused on **train and capacity planning for railway networks**

TPS.yard

Efficient planning and dispatching of all **track and facility capacity** inside **yards, depots and stations**

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Future additions to the product suite

TPS.fleet

TPS.fleet allows the management of **Rolling stock rosters**, their **assignment to running trains and train profiles**, and maintenance constraints

TPS.crew

Planning **shifts** and assigning **crew members** according to **HR rules**

AI based analytics

Learning from data with **statistics**, and taking better decisions with **AI**

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TPS.live

Real-time network optimization system
to improve on-time performance and rail utilization

Features
- Highly accurate runtime calculation, conflict detection and delay propagation engine provides reliable train and delay forecasts
- Fast recovery to planned rail operation in case of disruptions
- Highly precise and automated data fed to passenger information and internal stakeholder
- Up-to-date and fully scalable architecture – A major step towards the digital railway

Runtime Calculation | Online Runtime | Forecast

ROI
1. Fuel efficiency savings
2. Velocity improvement
3. Improve ETA
4. Decrease dwell time
5. Crew planning efficiency
6. Efficiency with personnel improvements
7. Forecast simulation tools to support decision making

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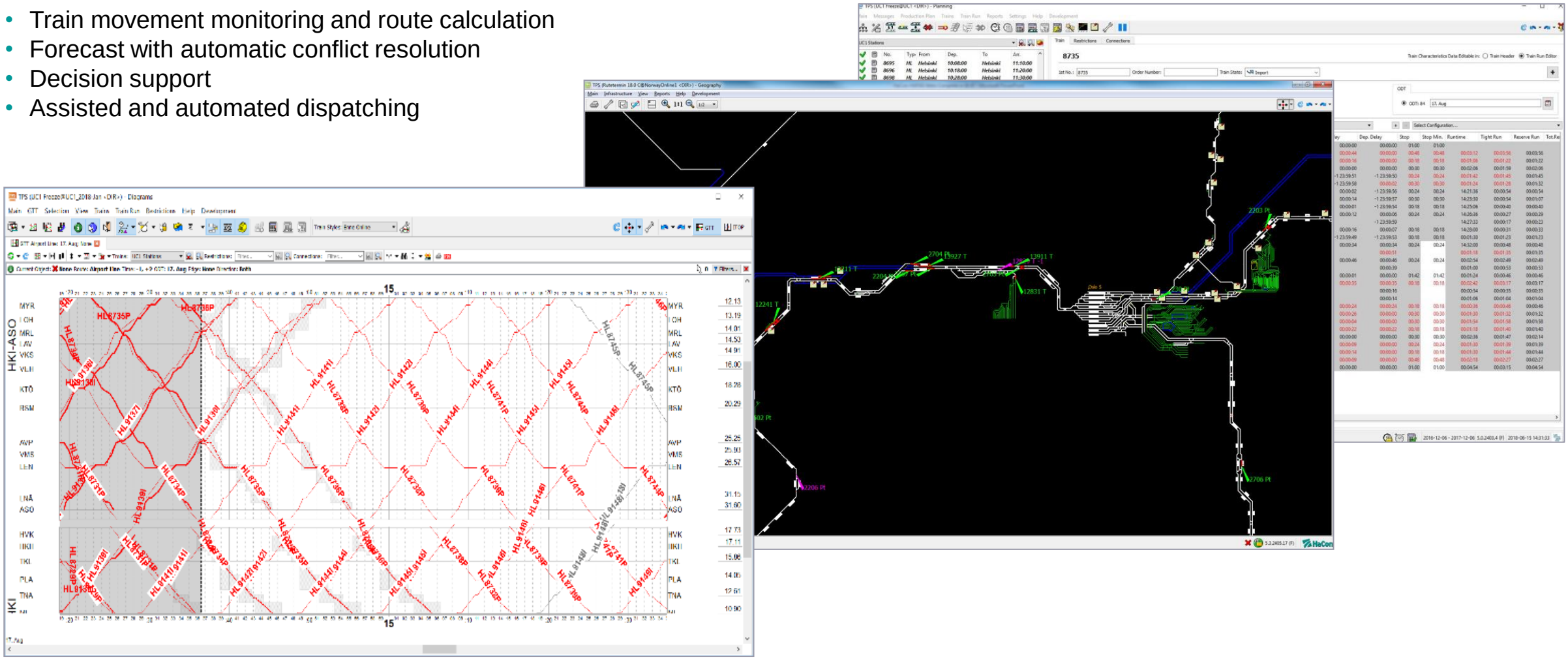
TPS.live

Network wide assisted and automated real-time train dispatching

- Train movement monitoring and route calculation
- Forecast with automatic conflict resolution
- Decision support
- Assisted and automated dispatching



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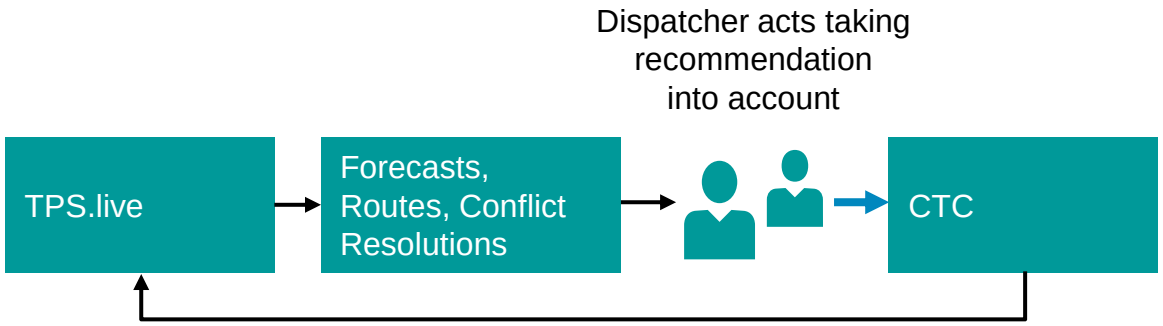
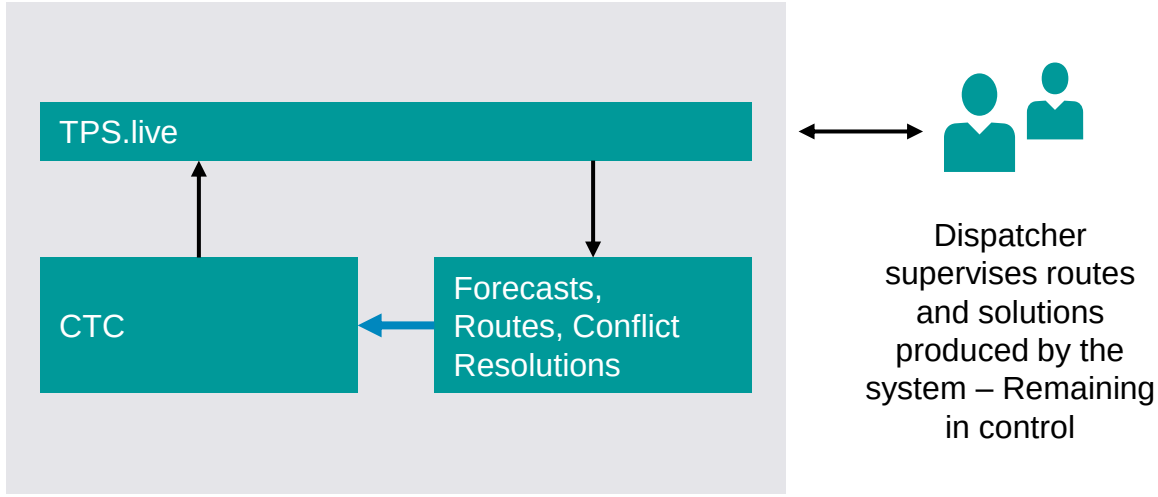
TPS.live
Supports Both Assisted and Automated Dispatching

Assisted dispatching



Automated dispatching



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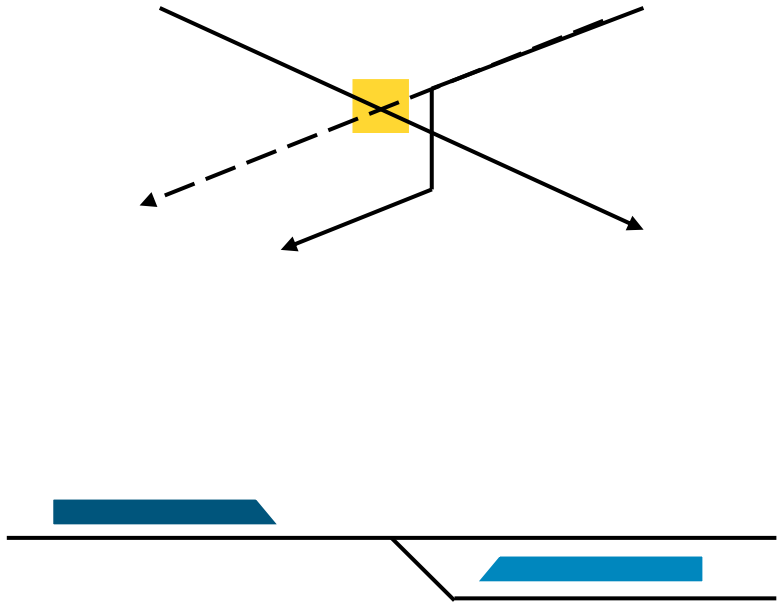
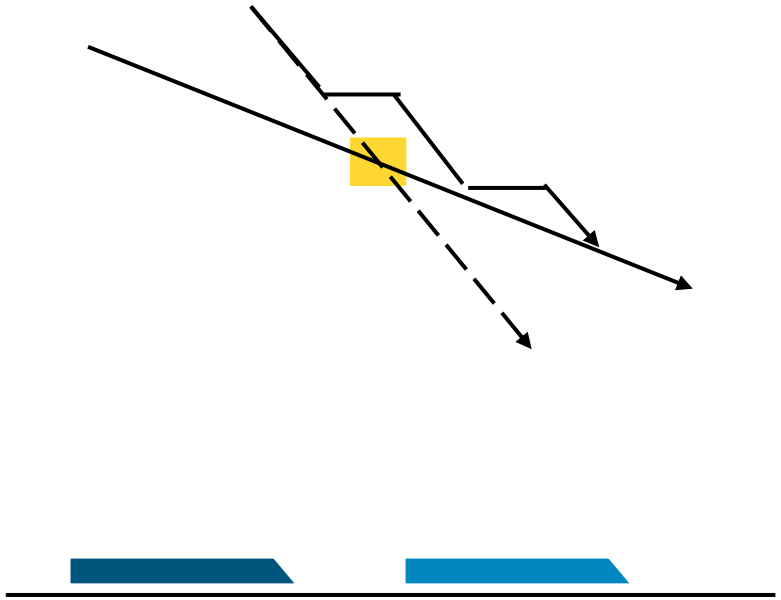
Forecast calculation

Resolves an occupation conflict by stopping one of the involved trains in a multi-track station before the occupation conflict occurs. Here are two examples.

Meet



Pass



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Occupation conflict types

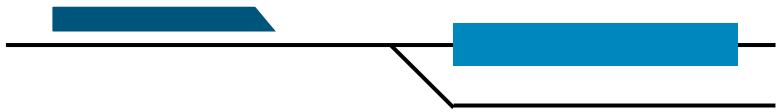
Two trains want to occupy the same part of the network at the same time.

Meet

Pass

Merge

Infrastructure



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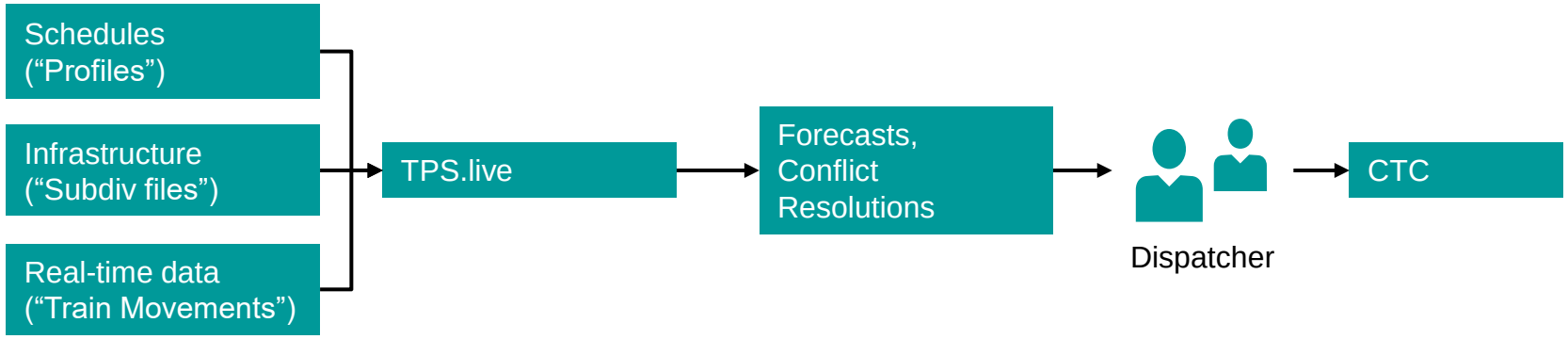
Movement Planning features of TPS

- Across network meet/pass planning
- Continuous automatic re-planning of meet and pass operations
- Creation of a detailed train schedule based on rough planning & for unplanned trains
- Integration: Subdivision files, Train profiles, live Train positions, Dispatcher messages, …



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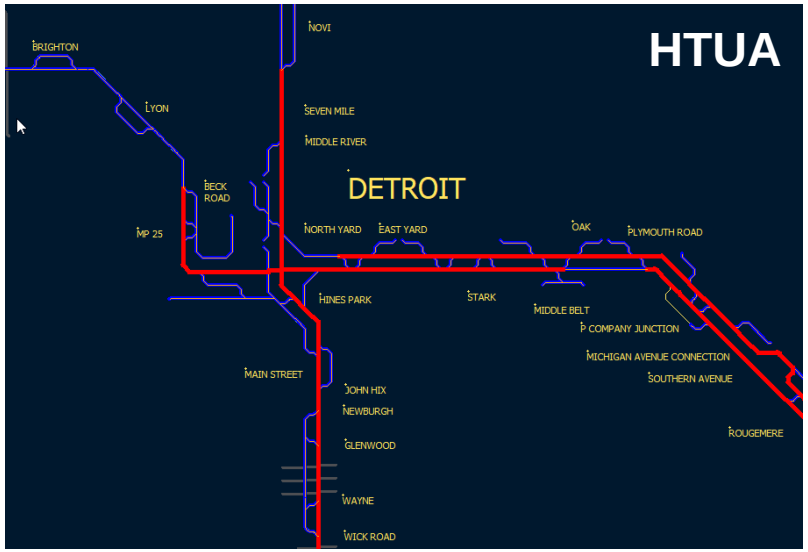
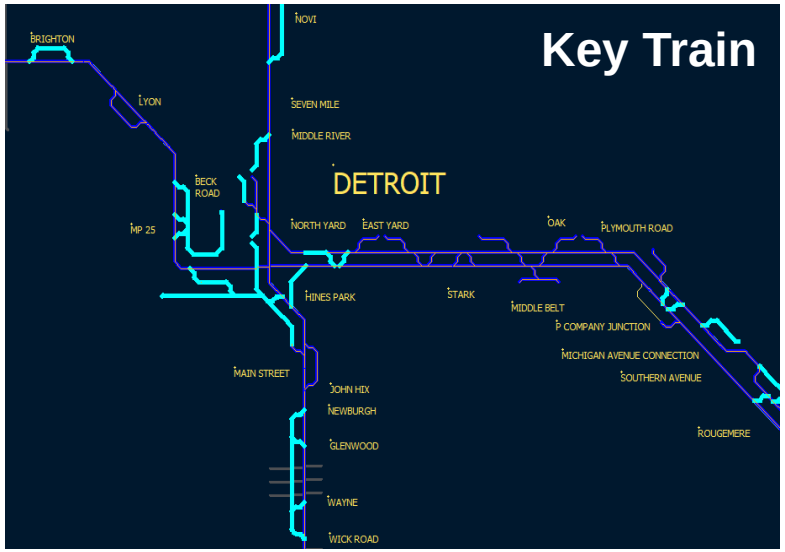
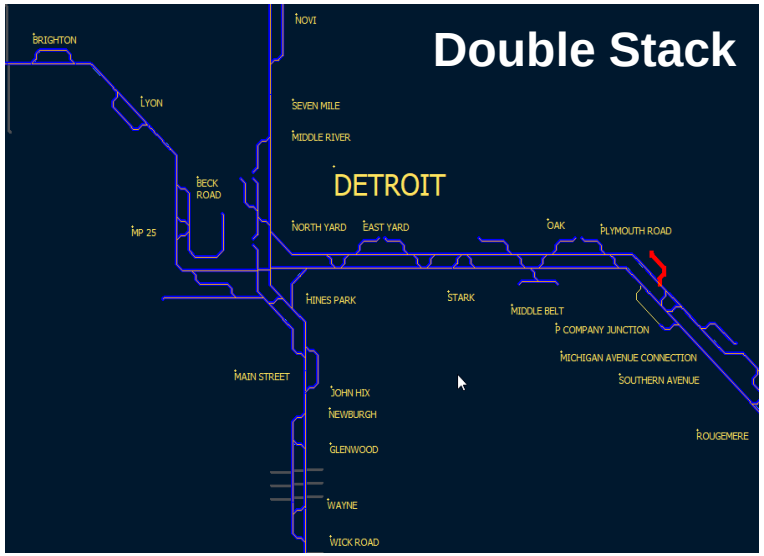
Functionality TPS.live Infrastructure

- Seamless subdivision activation
- Properties of the infrastructure like **HTUA, Key Train** prohibited sidings and **Double Stack** prohibited sidings are persistent infrastructure properties







- Temporary infrastructure restrictions (e.g. weather restrictions, blocking restrictions put out by Dispatcher)

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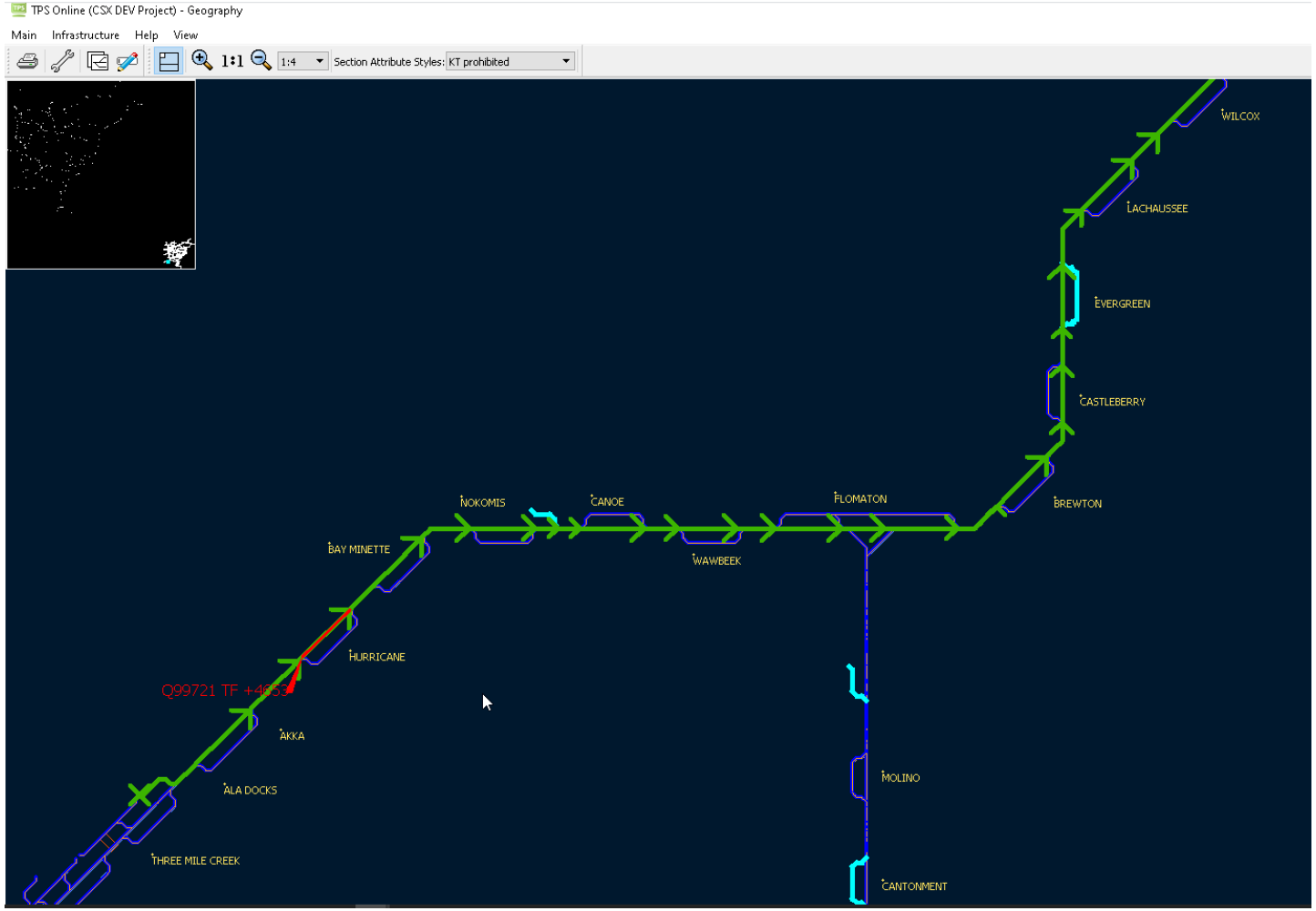
Functionality TPS.live Routing and runtime calculation

For routing a profile is routed by TPS.live from start to end taking all infrastructure and train properties into account

Routing works in Signaled as well as Dark Territory



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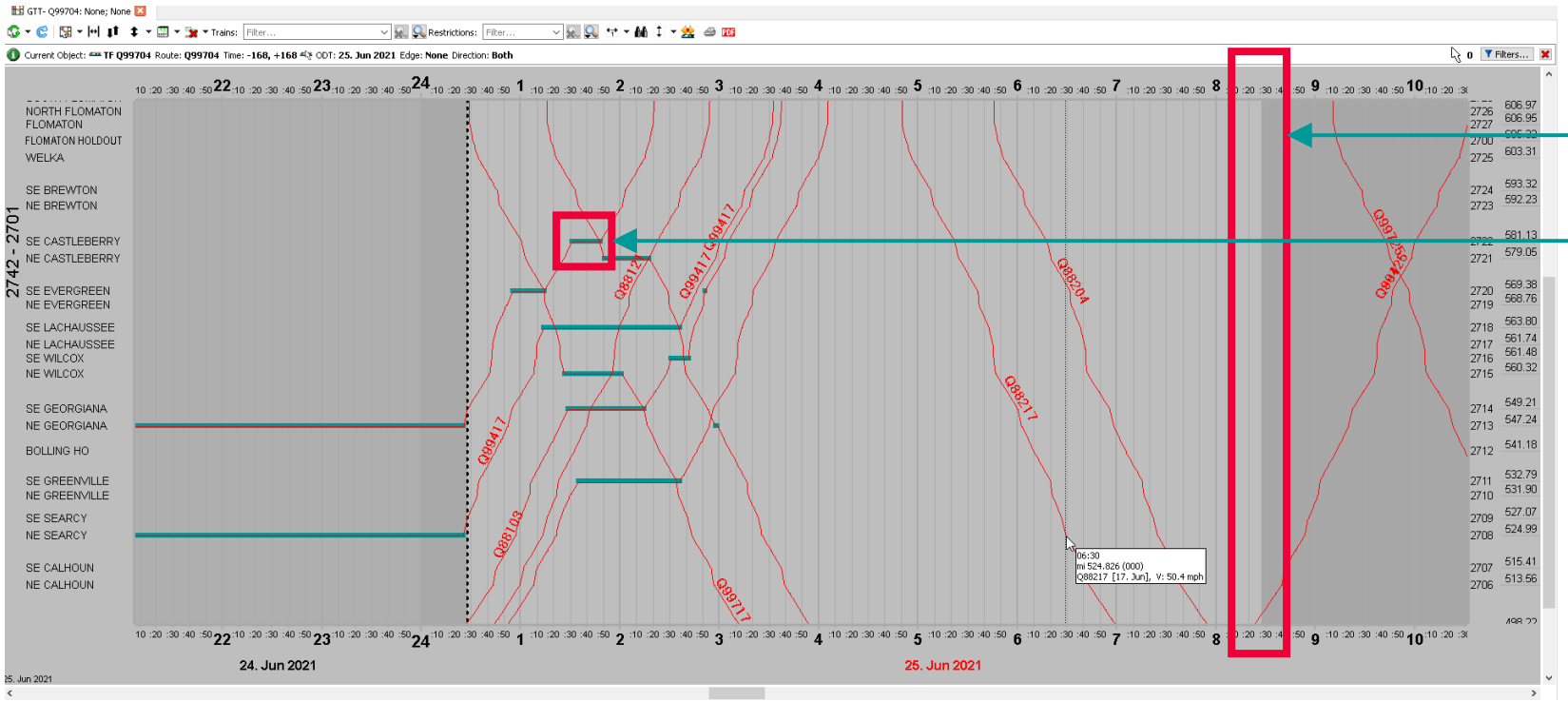
Functionality
Automatic Conflict Resolution



Forecast window in which conflicts are solved is 8 h (setting)

Additional Stop added by TPS.live to resolve a train/train conflict (dispatch event)

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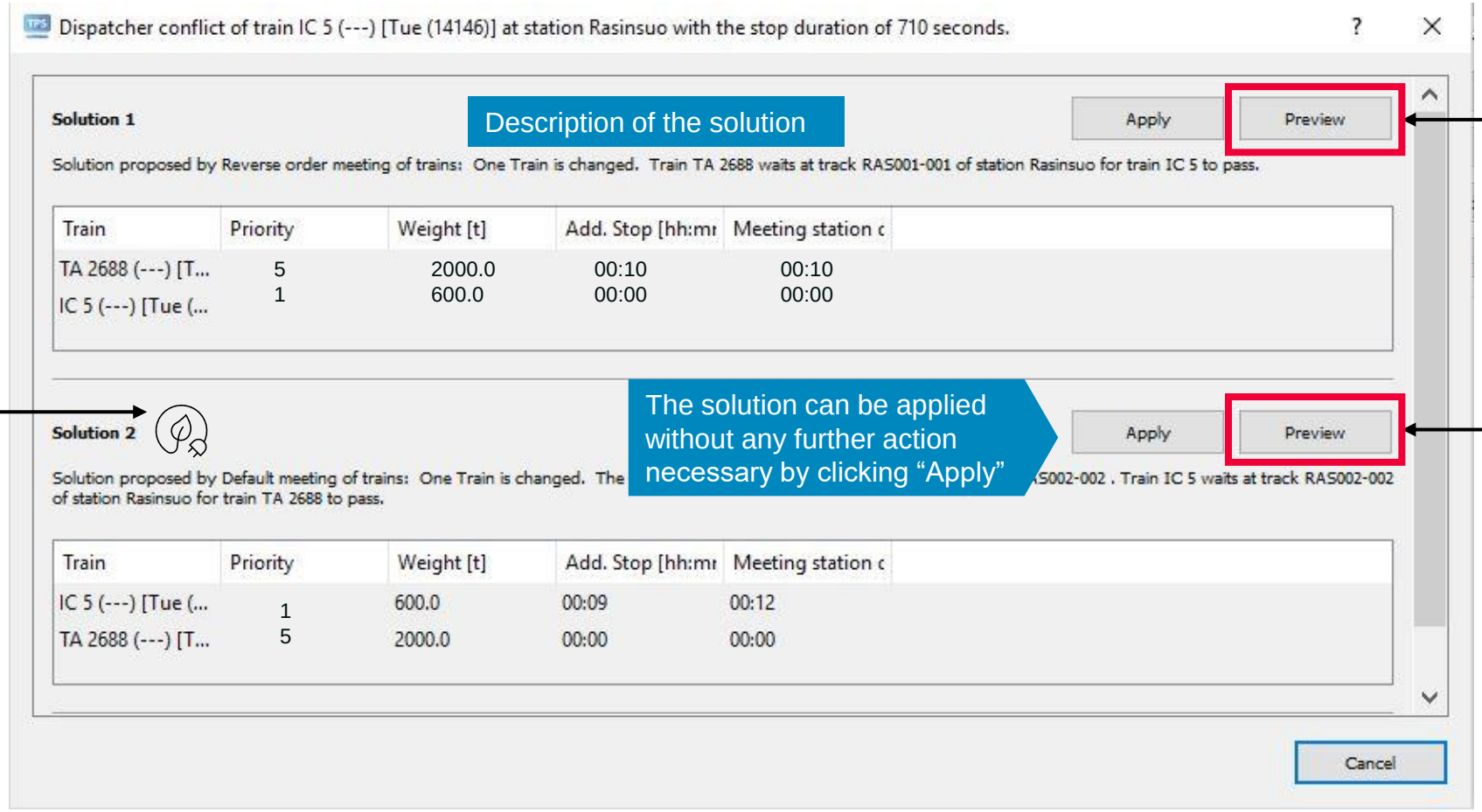
Functionality
Solution proposal dialog



Marks the energy efficient solution

Preview the solution in the graph before you select it

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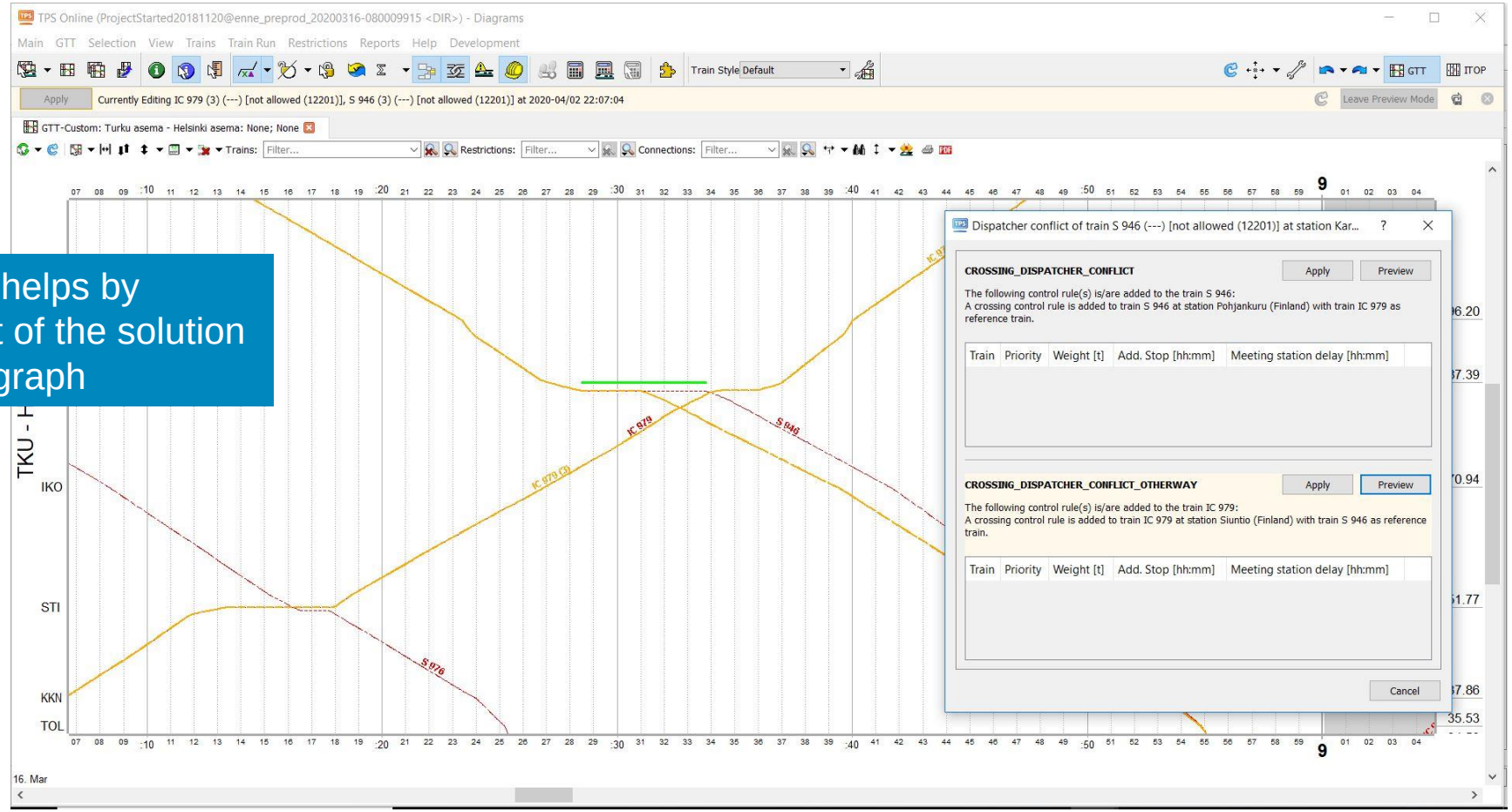
Graphically preview of solutions

The preview mode helps by showing the impact of the solution to the traffic in the graph



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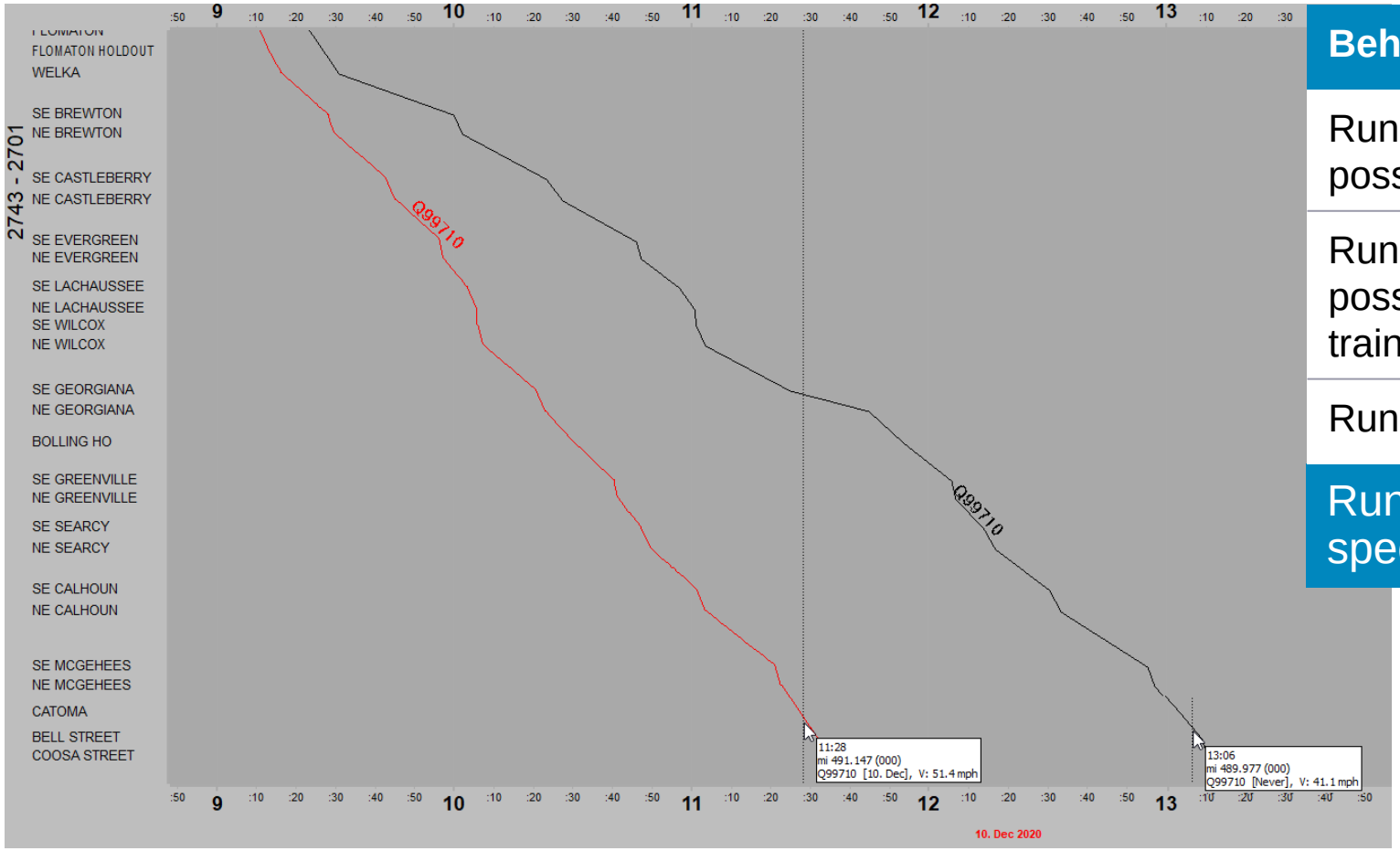
Functionality Energy efficient in runtime calculation



Behind schedule	Ahead of schedule
Run as fast as possible	Run as fast as possible
Run as fast as possible, as long as train is delayed	Run energy efficient, as long as train is not delayed
Run energy efficient	Run energy efficient

Runtime calculation allows for different speed profiles that are tunable

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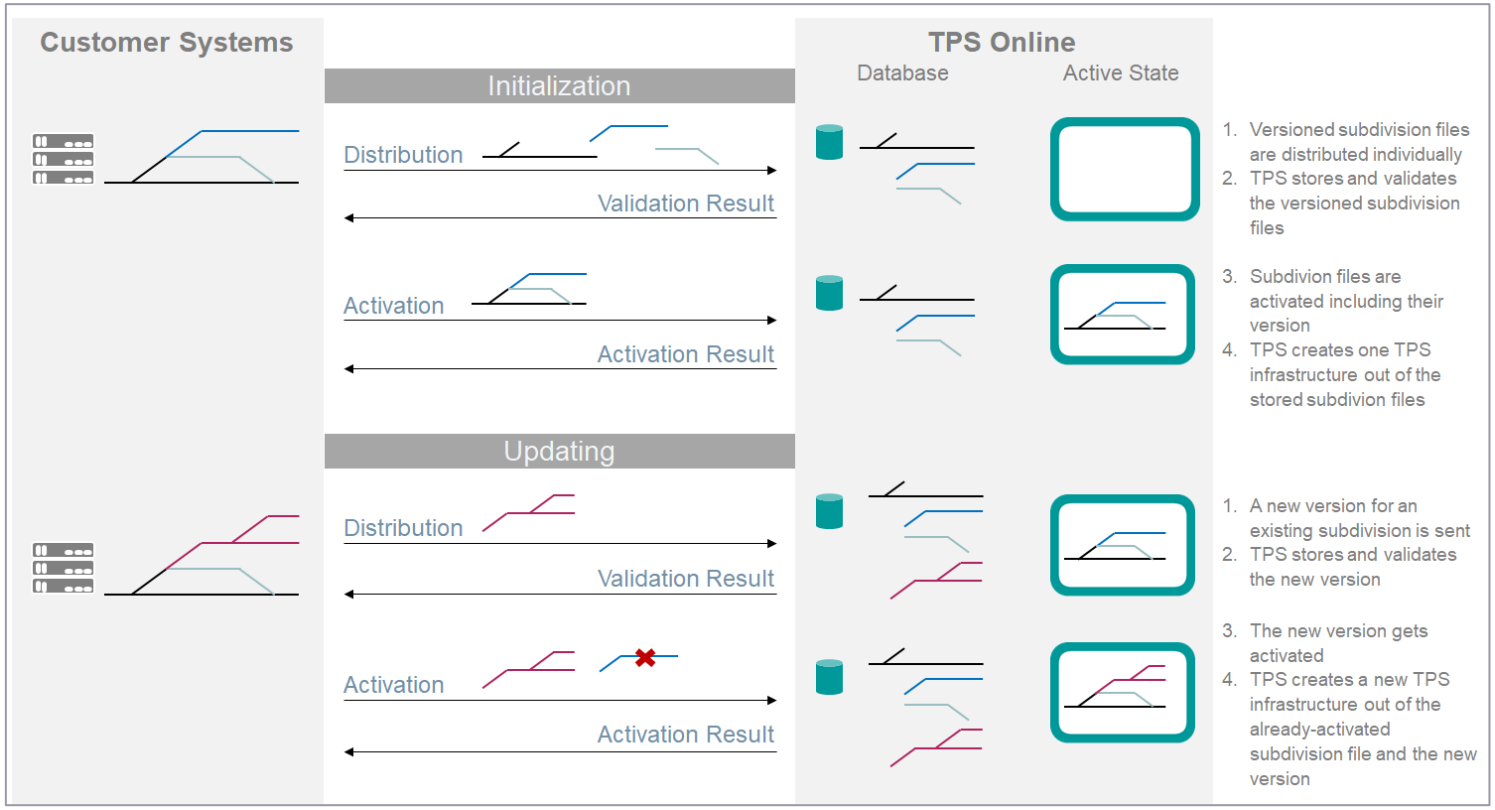
TPS.live
Infrastructure Data Import and Activation

An automated import and activation process without downtime keeps TPS.live always aligned with the ever-changing railway infrastructure

- Integrated with the central infrastructure data management systems
- Separation of import and validation from the activation
- Import of sub sections of the network
- Activation on the fly without any down time



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TPS.trackworks

One system for request, planning, coordination, validation and publication of **track work and maintenance**

Features

- Long-term and short-term planning in one system
- TPS Track Works provides comprehensive overviews of the track work to find synergies/Work plans and calendars help to coordinate
- Integrated view for different stakeholders – Every involved party can see what is planned
- Separation of work location and operational impact

On the roadmap

- Generation of the legal documentation of maintenance works
- Calculation of the remaining capacity and optimization tool to suggest maintenance slots automatically

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Challenge

Running trains

RUs need to run trains

Customer demands

- High punctuality
- Short travel times
- High network connectivity

Conducting track work

Contractors need to conduct track works

Business aims

- Economical building
- Safe work sites
- Technical constraints

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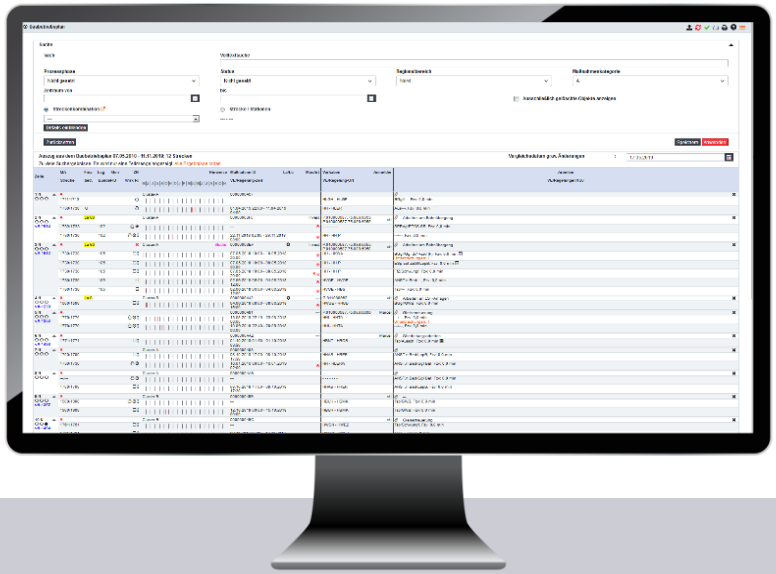
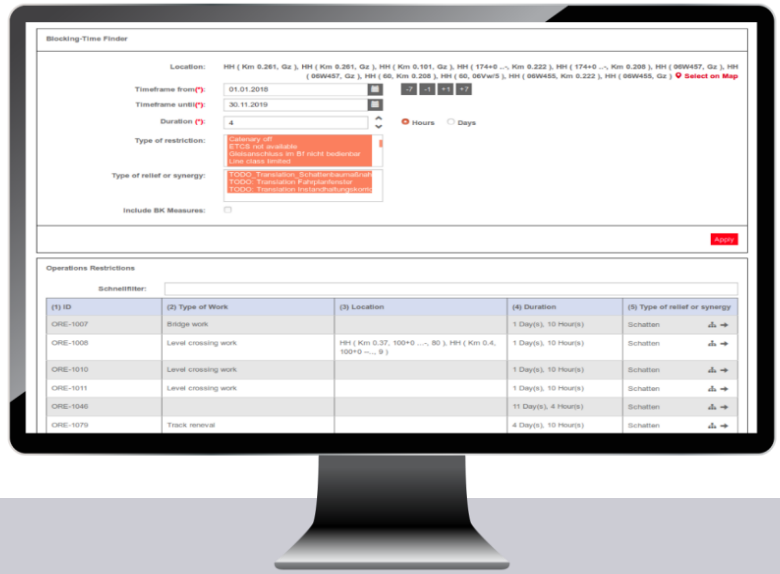
TPS.trackworks

Define how trains operate during the **track restriction**

Overview the work status on a certain line
(Track Work Operation Plan)



Find train-free times and **optimize possession times**
(Blocking Time Finder)



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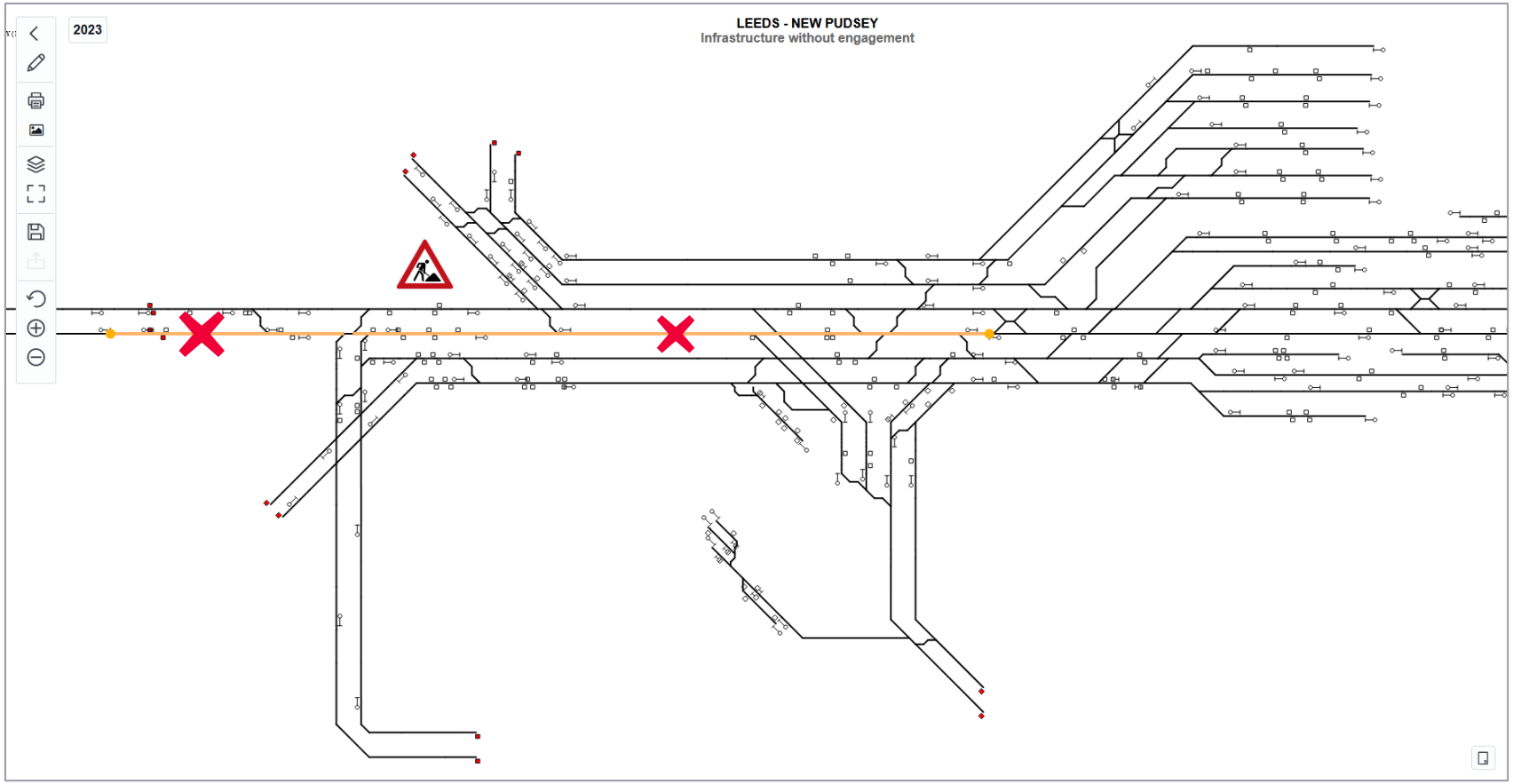
TPS.trackworks

Microscopic route band

- Technical restriction for a line closure in Leeds



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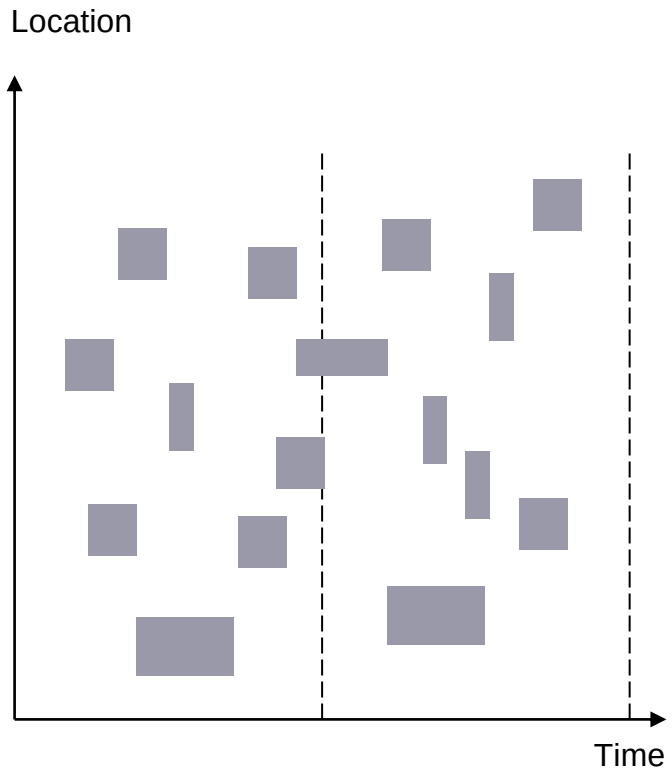
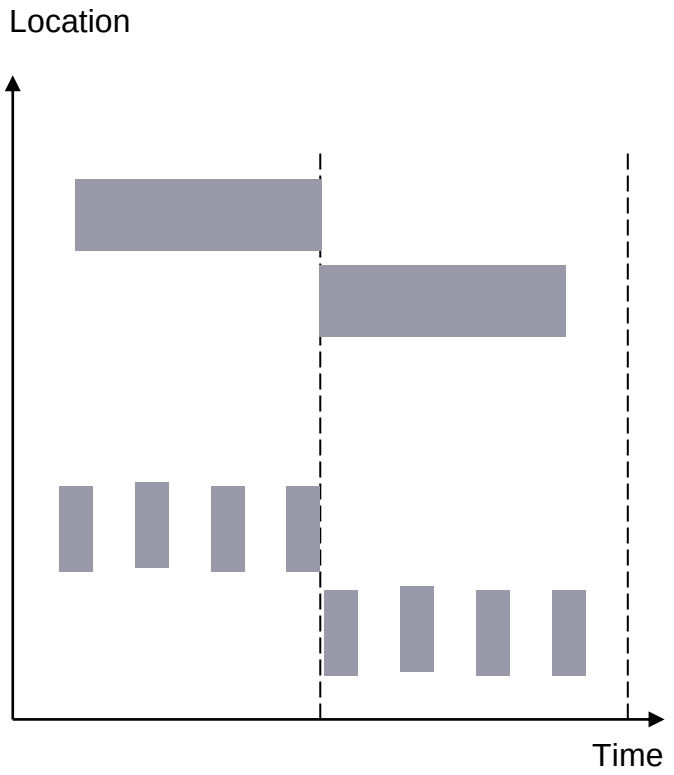
Approach
Coordination

- Planned maintenance activities
- Regular maintenance activities
- Urgent work
- Maintenance corridors

Requests



Maintenance activities



- Less impact on running times
- Less delay minutes
- Higher schedule reliability
- Earlier information for RUs and IMs

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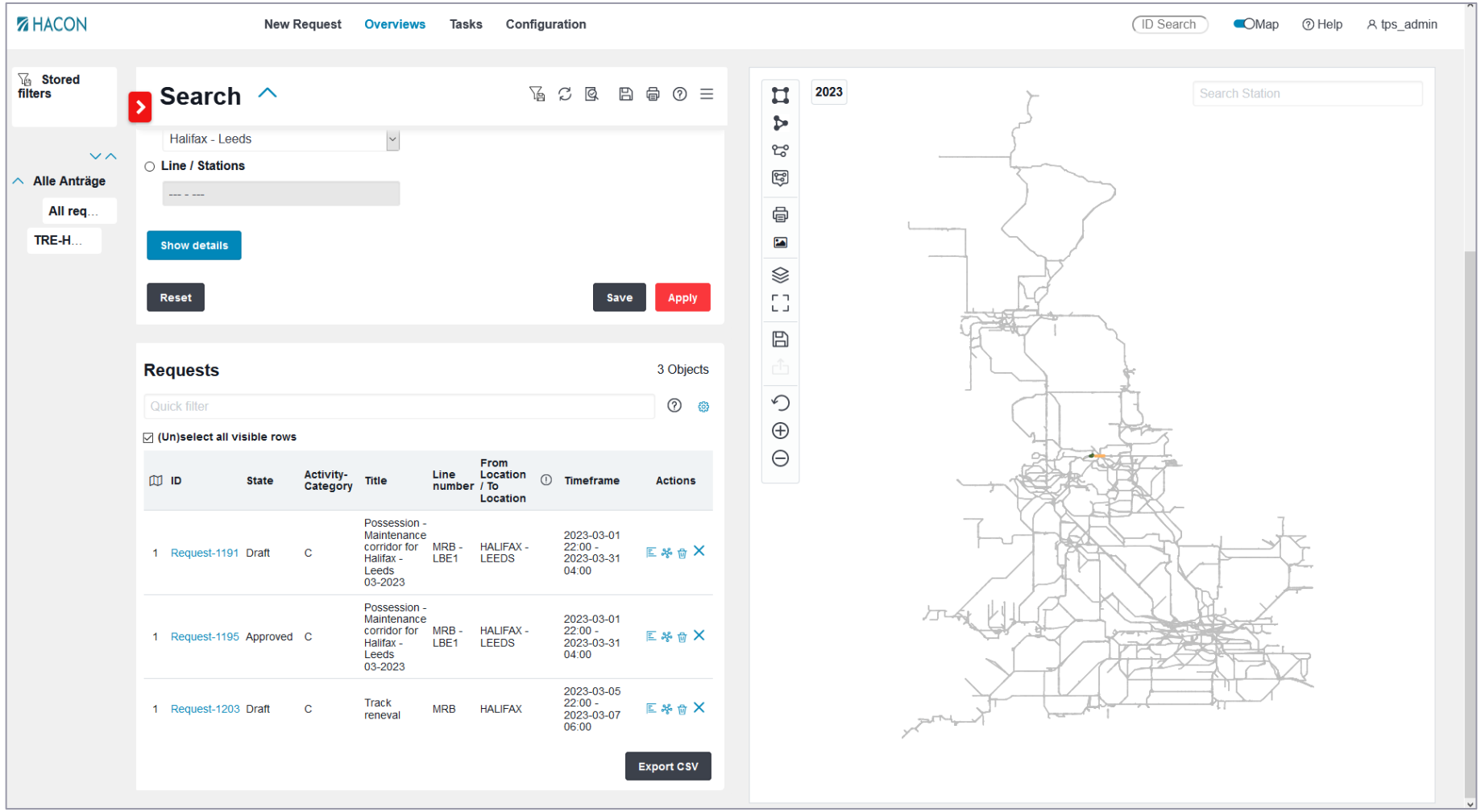
TPS.trackworks



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TPS.plan

Multi-user system focused on
train and capacity planning for railway networks

Features

- Track occupation plan and various output options
- Automated search for conflict-free train paths
- Runtime calculation/conflict detection
- Sophisticated data integration via multiple interfaces
- End-to-end bid-offer process for infrastructure managers and train operation companies
- Graphical, infrastructure and timetable editor
- European Communication Standard TAF TSI

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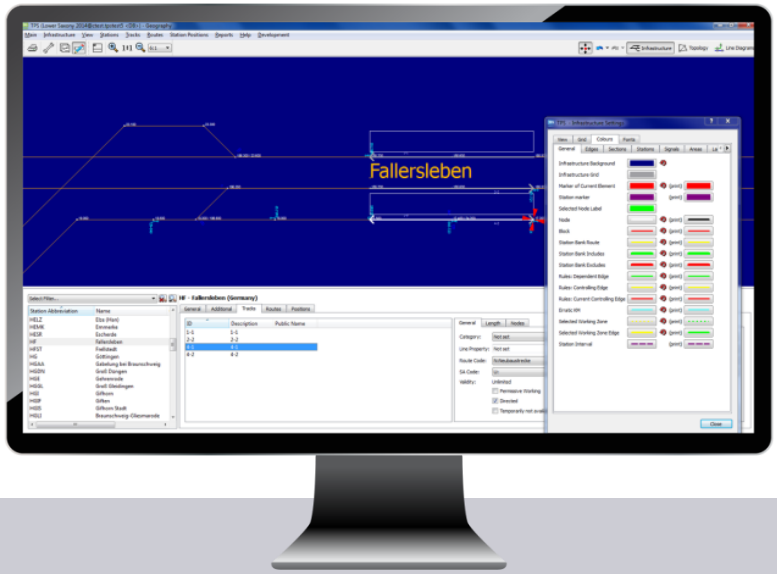
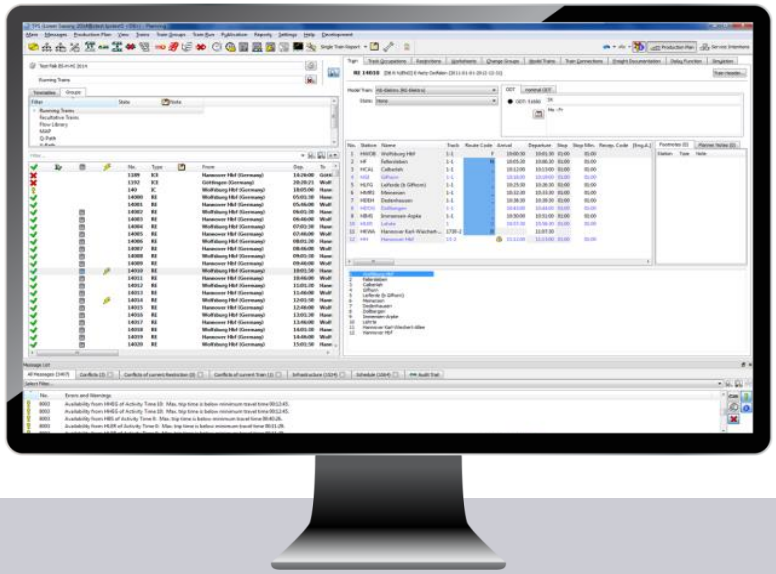
TPS.plan

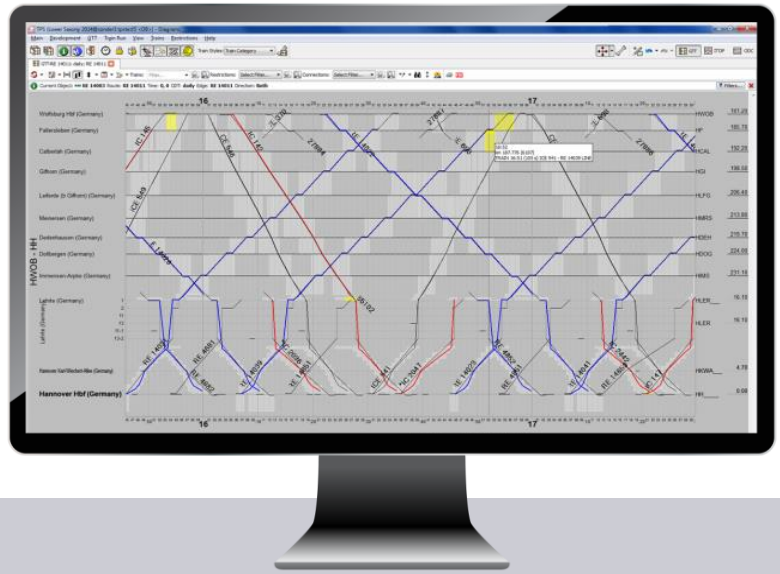
View the track infrastructure along routes and in the train stations in microscopic detail



Edit train paths and show **calculation, validation** and **publication status**



Visualize information on **track occupations** and possible **train path conflicts**



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TPS.yard

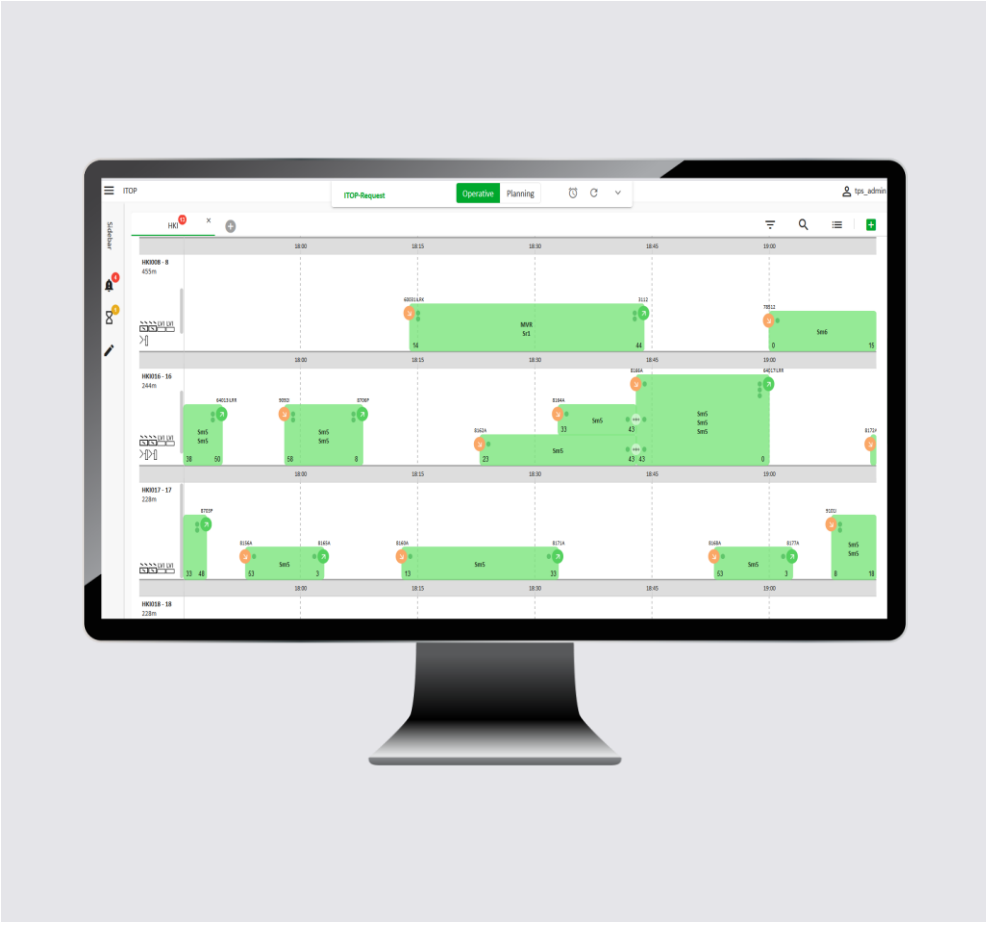
Web-based application focused on **capacity planning for railway yards and stations**

Features

- Planning of all track and facility capacity inside the yard or station
- Planning and live operation view
- Management of train consists and relations to inbound and outbound trains

On the roadmap

- Full control of movements into and out of the track with train roster relations



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TPS.yard

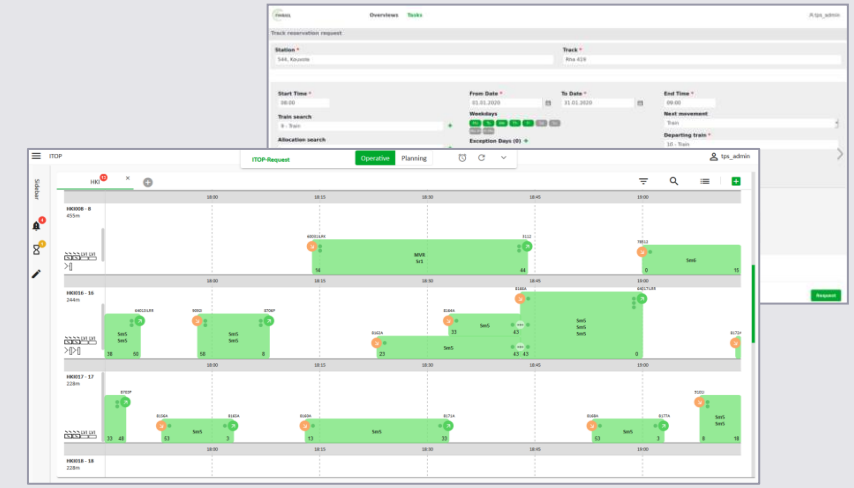
Efficient management of capacity in yards and stations

Features

- 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

On the roadmap

- Full control of movements into and out of the track with train roster relations



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