



Cross Border Operation – Poster Session 26-05-13

Check out our poster series with a cavalcade of innovative solutions for improved interoperability and increased performance in international cross-border rail transport for increased attractiveness and competitiveness.

Making Europe's railways truly European!

The posters showcase our demonstrations highlighting cross-border operations and how the results will transform and improve rail operations. Each poster briefly presents concrete results from collaborations across Europe and collectively illustrates how interoperable solutions can strengthen resilience, efficiency and coordination across the entire network.

1. Cross-Border Path Scheduling, Demo 5.1
2. Coordination of residual capacity for ad hoc cross-border traffic, Demo 5.2
3. Cross Border Planning, TPS Suite, Demo 5.3 & 5.5
4. Cross Border Operations, TPS Suite, Demo 12.6 & 14.3
5. Coordinated Yard Planning with YSC, Demo 5.4 & 12.8

Cros-Border Path Scheduling

Demo 5.1

Federico Santamaria
Mermec, Mermec STE

Angelo Naselli

Mirko Gherzi

Abstract

Objective:

Cross-border path requests lack direct automated integration between PCS and local CMS systems. Today this gap is bridged manually, making ad-hoc path negotiation slow and error-prone. This work automates the full exchange using the TAF TSI data and message model.

Research and Methods:

A PCS simulator was built to forward Path requests. The CMS was extended to implement the new path models, their lifecycle, and return structured responses. Validated on the Albacina-Civitanova Marche line with real timetable and infrastructure data across 5 test cases.

Results: reduced path negotiation time. Path status updates were propagated instantly across systems. Conflict detection managed at Short Term Timetable Planning.

Conclusion

Efficiency, responsiveness and consistency of cross-border path coordination were improved. laying the groundwork for scalable, standards-based capacity management across European networks

Additional Information

Mermec, Mermec STE

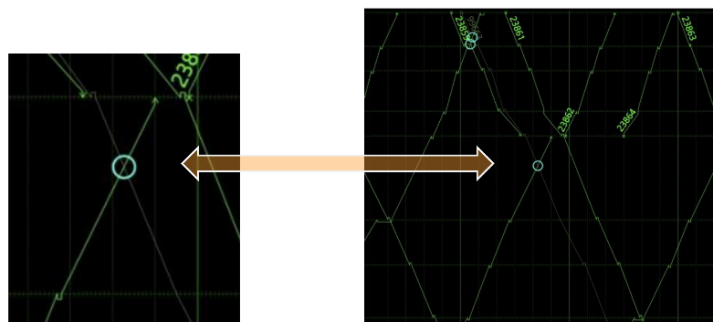
1 PCS Client Simulator

Forward Path Requests to interested CMSs and enable their management.

Train	Station	Planned Arrival	Actual Arrival	Arrival Difference (mins)	Planned Departure	Actual Departure	Departure Difference (mins)
7206	N/D	N/D	N/D	N/D	3/17/2026 3:01:00 PM	N/D	N/D
7310	3/17/2026 3:09:00 PM	N/D	N/D	N/D	3/17/2026 3:10:00 PM	N/D	N/D
7309	3/17/2026 3:16:00 PM	N/D	N/D	N/D	3/17/2026 3:17:00 PM	N/D	N/D
7312	3/17/2026 3:20:00 PM	N/D	N/D	N/D	3/17/2026 3:20:00 PM	N/D	N/D
7308	3/17/2026 3:24:00 PM	N/D	N/D	N/D	3/17/2026 3:25:00 PM	N/D	N/D
7314	3/17/2026 3:30:00 PM	N/D	N/D	N/D	3/17/2026 3:30:00 PM	N/D	N/D
7307	3/17/2026 3:35:00 PM	N/D	N/D	N/D	3/17/2026 3:36:00 PM	N/D	N/D
7313	3/17/2026 3:38:00 PM	N/D	N/D	N/D	3/17/2026 3:38:00 PM	N/D	N/D
7306	3/17/2026 3:44:00 PM	N/D	N/D	N/D	3/17/2026 3:44:00 PM	N/D	N/D
7305	3/17/2026 3:49:00 PM	N/D	N/D	N/D	3/17/2026 3:49:00 PM	N/D	N/D
7304	3/17/2026 3:55:00 PM	N/D	N/D	N/D	3/17/2026 3:55:00 PM	N/D	N/D
7303	3/17/2026 4:00:00 PM	N/D	N/D	N/D	3/17/2026 4:00:00 PM	N/D	N/D
7311	3/17/2026 4:16:00 PM	N/D	N/D	N/D	3/17/2026 4:17:00 PM	N/D	N/D
7302	3/17/2026 4:20:00 PM	N/D	N/D	N/D	3/17/2026 4:20:00 PM	N/D	N/D
7301	3/17/2026 4:29:00 PM	N/D	N/D	N/D	3/17/2026 4:30:00 PM	N/D	N/D
7300	3/17/2026 4:39:00 PM	N/D	N/D	N/D	3/17/2026 4:40:00 PM	N/D	N/D
7207	3/17/2026 4:45:00 PM	N/D	N/D	N/D	N/D	N/D	N/D

2 Short Term Timetable Management

Temporary path implemented with instant conflict detection



3 Short Term Timetable Management

Full path request lifecycle between CMS and a centralized system from request, modification, acceptance or rejection

Train	Station	Planned Arrival	Actual Arrival	Arrival Difference (mins)	Planned Departure	Actual Departure	Departure Difference (mins)
7206	N/D	N/D	N/D	N/D	3/17/2026 3:01:00 PM	3/17/2026 3:01:00 PM	0
7310	3/17/2026 3:09:00 PM	3/17/2026 3:09:00 PM	0	3/17/2026 3:10:00 PM	3/17/2026 3:10:00 PM	0	
7309	3/17/2026 3:16:00 PM	3/17/2026 3:16:00 PM	0	3/17/2026 3:17:00 PM	3/17/2026 3:17:00 PM	0	
7312	3/17/2026 3:20:00 PM	3/17/2026 3:20:00 PM	0	3/17/2026 3:20:00 PM	3/17/2026 3:20:00 PM	0	
7308	3/17/2026 3:24:00 PM	3/17/2026 3:24:00 PM	0	3/17/2026 3:25:00 PM	3/17/2026 3:25:00 PM	0	
7314	3/17/2026 3:30:00 PM	3/17/2026 3:30:00 PM	0	3/17/2026 3:30:00 PM	3/17/2026 3:30:00 PM	0	
7307	3/17/2026 3:35:00 PM	3/17/2026 3:35:00 PM	0	3/17/2026 3:36:00 PM	3/17/2026 3:36:00 PM	0	
7313	3/17/2026 3:38:00 PM	3/17/2026 3:38:00 PM	0	3/17/2026 3:38:00 PM	3/17/2026 3:38:00 PM	0	
7306	3/17/2026 3:44:00 PM	3/17/2026 3:44:00 PM	0	3/17/2026 3:44:00 PM	3/17/2026 3:44:00 PM	0	
7305	3/17/2026 3:49:00 PM	3/17/2026 3:49:00 PM	0	3/17/2026 3:49:00 PM	3/17/2026 3:49:00 PM	0	
7304	3/17/2026 3:55:00 PM	3/17/2026 3:55:00 PM	0	3/17/2026 3:55:00 PM	3/17/2026 3:55:00 PM	0	
7303	3/17/2026 4:00:00 PM	3/17/2026 4:00:00 PM	0	3/17/2026 4:00:00 PM	3/17/2026 4:00:00 PM	0	
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7301	3/17/2026 4:29:00 PM	3/17/2026 4:29:00 PM	0	3/17/2026 4:30:00 PM	3/17/2026 4:30:00 PM	0	
7300	3/17/2026 4:39:00 PM	3/17/2026 4:39:00 PM	0	3/17/2026 4:40:00 PM	3/17/2026 4:40:00 PM	0	
7207	3/17/2026 4:45:00 PM	3/17/2026 4:45:00 PM	0	N/D	N/D	N/D	

Coordination of residual capacity for ad hoc cross-border traffic

Johan Högdahl (1)

Hans Sipilä (2)

(1) RISE Research Institutes of Sweden, (2) KTH Royal Institute of Technology

Abstract

Objective:

To support timetable planners in the early ad hoc planning stage by:

- Visualising remaining capacity for in the timetable
- Reducing manual trial-and-error when constructing train paths
- Evaluating train path alternatives using simulation

Research and Methods:

- Search based on pushing time windows through the timetable.
- Conflict resolution to reschedule conflicting trains
- Robustness evaluation with macroscopic simulation

Results:

- The demonstrator identifies feasible capacity segments for complex cross-border corridors.
- Train path can be generated directly from the capacity segments.
- Realistic train path requests can be solved in minutes rather than hours.

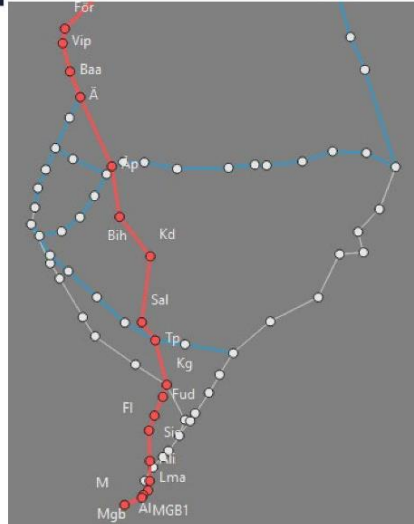
Conclusion

By combining capacity search, and simulation-based robustness evaluation, the tool provides decision support for planners while preserving human control.

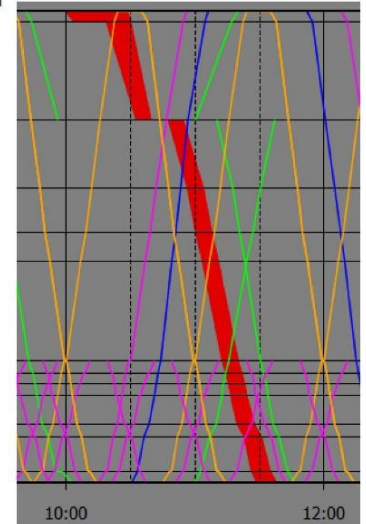
Additional Information

RISE Research Institutes of Sweden, KTH Royal Institute of Technology participated in demonstration 5.2.

1 Station selection



2 Capacity segment



2 Dialog for specifying train path request

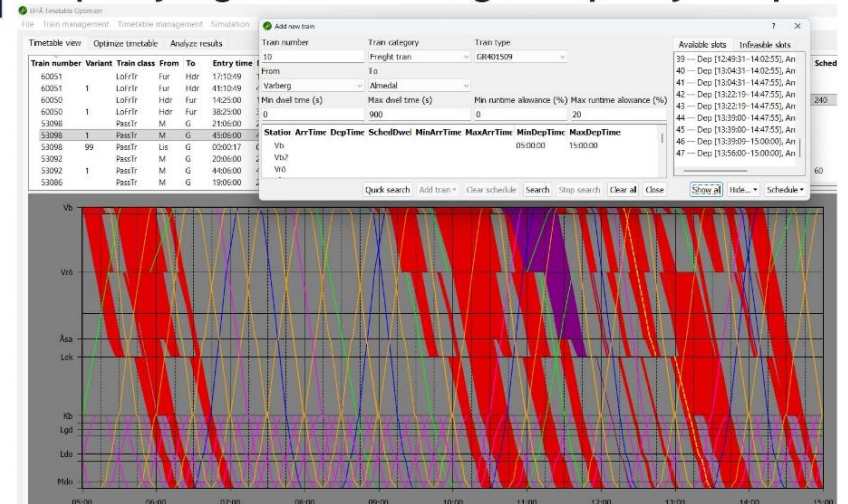
Add new train

Train number	Train category	Train type
10	Freight train	GR401509
From	To	
Malmö Godsbangård	Kornsjö St	
Min dwell time (s)	Max dwell time (s)	Min runtime allowance (%)
0	900	0
		Max runtime allowance (%)
		20

Station	ArrTime	DepTime	SchedDwel	MinArrTime	MaxArrTime	MinDepTime	MaxDepTime
Mgb						05:00:00	12:00:00
MGB1							
Al							
Ali							
Lma							
Fi							
Si							
Fud							
Kg							
Tp							

Quick search Add train Clear schedule Search Stop search Clear all Close Show all Hide... Schedule

4 Capacity segments and a single temporary train path



Capacity segments (red/purple), requires rescheduling (purple), temporary train path (dashed yellow line)

CROSS BORDER PLANNING

TPS SUITE

DEMO 5.3 & 5.5

Lars Deiterding

Mario Höcker

Marika Potgieter

Hacon – Siemens Mobility Software

Abstract

Objective:

The objective is to transcend traditional and fragmented national planning.

Research and Methods:

TPS.plan is a sophisticated timetable planning tool significantly enhanced with several purpose-built innovations to manage cross-border timetable updates with unprecedented automation and intelligence.

- Automated Data Exchange using Telematics TSI
- Proactive Conflict Resolution
- Intelligent Timetable Optimization
- Robust What-If Scenario Analysis
- Comprehensive Planning Horizon Support

Results:

TPS.plan enables international rail planning that is proactive, adaptive, and conflict-free. TPS.plan offers an unparalleled level of automation and intelligence in cross-border timetable management. TPS.plan transforms a challenging, time consuming, and error-prone process into a seamless and adaptive digital workflow.

Conclusion

TPS.plan delivers transformative results and enables a more integrated and resilient European rail network capable of responding dynamically to change across all planning horizons.

Additional Information

Hacon, Siemens Mobility

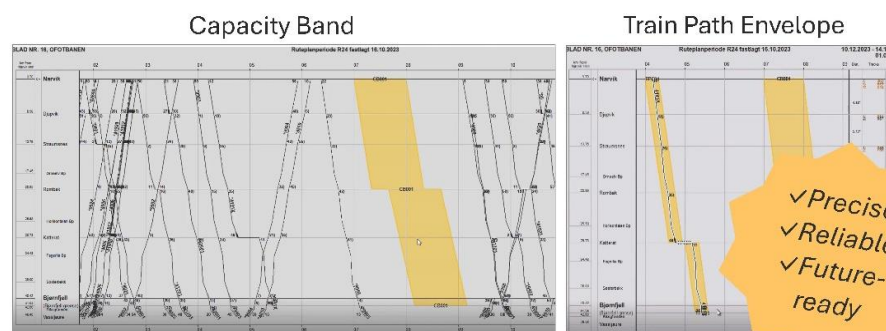


TPS.plan integrates several purpose-built innovations to manage national timetable planning with consideration for the cross-border impact of changes into a single, cohesive system.

1 Seamless import and export of train path data using standard **Telematics TSI messages**

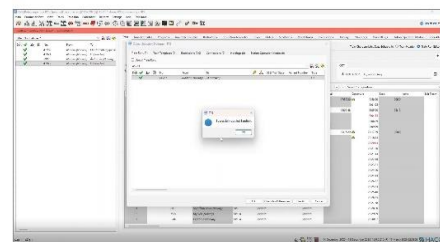
- ✓ Sophisticated ordering processes
- ✓ Exchange with central data exchange platforms like PCS and neighbouring IM planning systems

2 Tools for Strategic Capacity Allocation and Dynamic Train Path Planning



3 What-If Scenario Planning

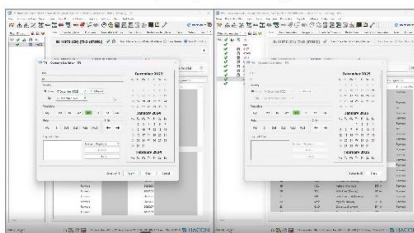
The user can analyse expected impacts of the timetable updates and decide on solution strategies in a closed environment before applying the changes to the working timetable.



4 Comprehensive Planning Horizon Support - from strategic planning to very short-term planning

Intelligently manage timetables across multiple planning horizons.

Apply versioning and validity to manage infrastructure changes.



CROSS BORDER OPERATIONS

TPS SUITE

DEMO 12.6 & 14.3

Lars Deiterding

Mario Höcker

Marika Potgieter

Hacon – Siemens Mobility Software

Abstract

Objective:

Effective cross-border railway operations are hindered by fragmented systems, limited visibility at national borders, and a lack of real-time data exchange and processing.

Research and Methods:

This initiative aims to overcome these challenges by enabling seamless operational continuity, shared situational awareness, and coordinated decision-making for international rail services.

Our solution, TPS.live, is a Traffic Management System designed for real-time monitoring and control, enhanced with specific innovations for cross-border contexts.

Results:

TPS.live provides traffic managers with a unified operational picture across borders. It eliminates blind spots, enables early conflict detection, and facilitates informed handover decisions.

Conclusion

TPS.live delivers distinct benefits in efficiency, responsiveness, and reliability, ensuring full situational awareness and highly coordinated responses for cross-border services, ultimately improving overall network performance.

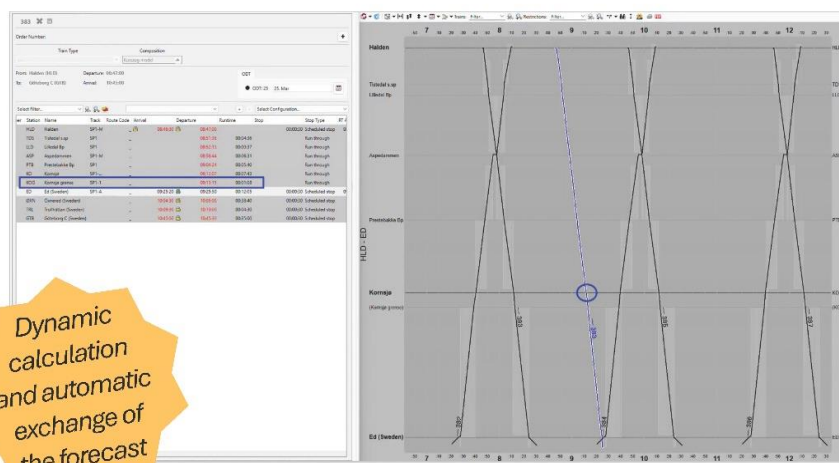
Additional Information

Hacon, Siemens Mobility



1 Forecast Export/Import

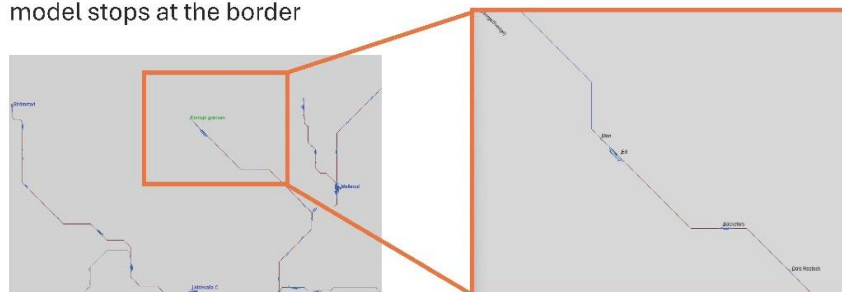
Accurate forecast-based information enables a seamless handover of the train entering the network.



2 Cross-border visibility for seamless handover

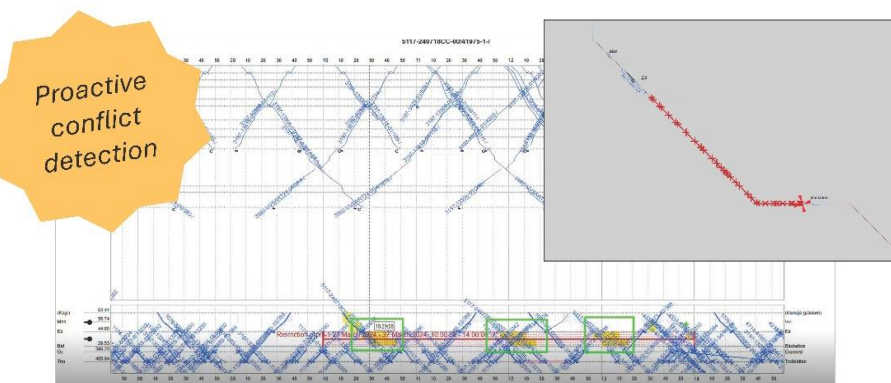
Old approach: Infrastructure model stops at the border

New approach: entire cross border section is visible



3 Cross Border Disruption Management

Conflict detection on extended cross border sections taking into consideration imported data from the neighbouring system creates immediate awareness of the restriction and the impact.



Funded by the European Union. Views and opinion expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Europe's Rail Joint Undertaking. Neither the European Union nor the granting authority can be held responsible for them. The project FP1 MOTIONAL is supported by the Europe's Rail Joint Undertaking and its members.



Coordinated Yard Planning with YCS

Demonstration 5.4 and 12.8

Sara Gestrelius

Martin Joborn

Martin Kjellin

Henrik Teinlund

RISE Research Institutes of Sweden

Abstract

Objective:

Operative planning of track utilisation for the arrival and departure yard of Swedish marshalling yards is made by line managers at Trafikverket based on track demands indicated by the companies operating in the yard. The coordination of these demands is currently done using telephone (Figure 1). The objective of the work presented here is to develop a prototype for a system, called Yard Coordination System (YCS) 2.0, that supports planning and coordination.

Research and Methods:

YCS is based on requirements collected from real-world users and has been evaluated in a demonstration workshop.

Results:

The evaluation indicates that YCS can help improve coordination in the yard by making current plans visible to everyone.

Conclusion

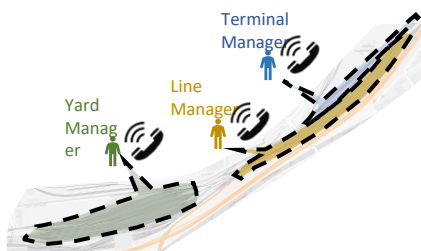
The use of YCS might lead to increased transparency and efficiency in the yard. There are plans for a pilot study, where the system will be tested further.

Additional Information

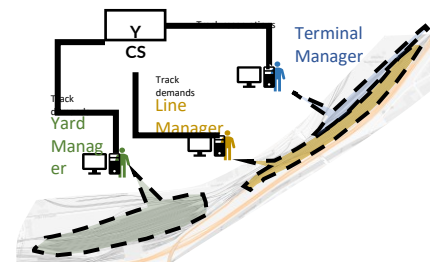
Participating partners:



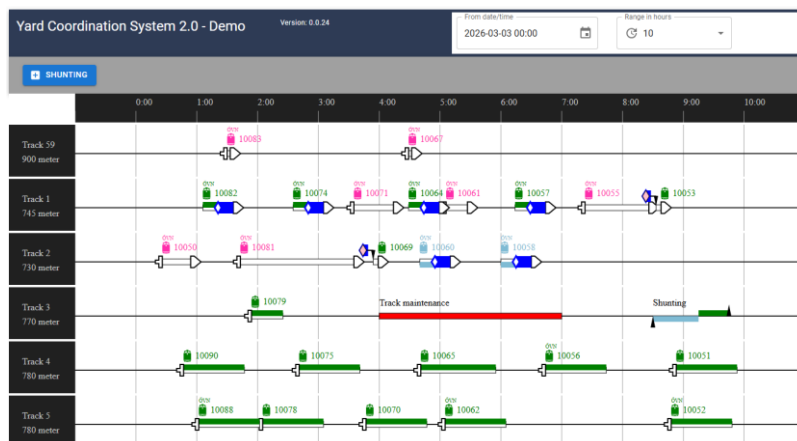
1 Without YCS



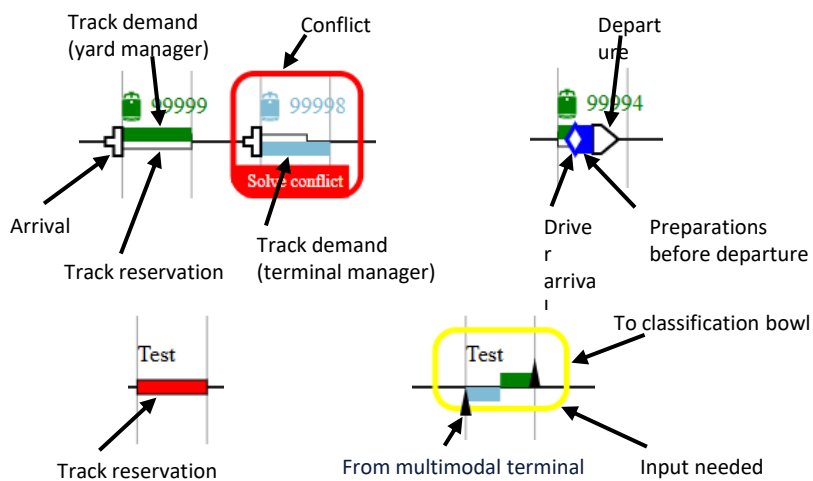
2 With YCS



3 User Interface



4 Symbols in the User Interface



Arriving trains (upper left), departing trains (upper right), track reservations (lower left) and shunting movements (lower right).



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