Flagship Area 1:

Network management planning and control & Mobility Management in a multimodal environment

EU-Rail FP1 Info session

Teams meeting 04.12.2025

14:00-16:00 (CET)

AGENDA

Time	Topic	Responsibility
5 min	Welcome	HACON
15 min	Project Overview and Structure	HACON
15 min	Workstream 1.1 - Planning	HACON
15 min	Workstream 1.2 - Operations	HACON
15 min	Workstream 1.3 - Multimodal integration	HACON
15 min	Workstream 2 – Digital enablers	HACON
10 min	Dissemination and Communication	
	Q&A	

FP1 Project Overview and Structure

Europe's Rail

FP1 MOTIONAL
European Rail Network and Mobility Management

VISION

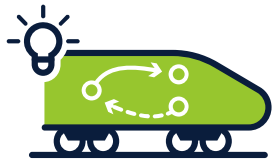
To deliver a fully integrated European railway network for citizens and cargo

OBJECTIVES

- Single European Railway Area
- Transition to integrate European rail system into the wider mobility system
- Strong European rail industry

→

- Integrated, sustainable and resilient European railway system
- Unified operational concept and a functional, safe, and secure system architecture
- Competitive green rail freight
- Strong and globally competitive European rail industry
- Synergies with other EU policies, programmes, initiatives, instruments, or funds



A strong, competitive European rail industry enabling a green and digital Europe.

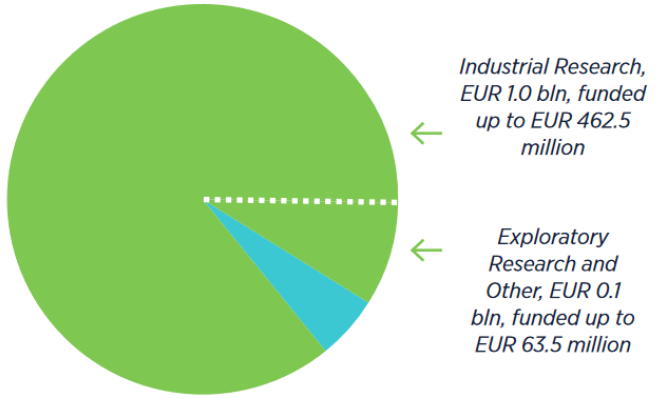
FP1 MOTIONAL

Total Value of the EU-Rail Program is estimated at EUR 1.2 bln

Innovation Pillar	2021 – 2031 (in EUR million)	Multi Annual Call 2022 (in EUR million)
Flagship Area 1: Network management planning and control & Mobility Management in a multimodal environment & Transversal Topics: Digital Enablers	173.7	87.4
Flagship Area 2: Digital & Automated up to Autonomous Train Operations	251.9	121.5
Flagship Area 3: Intelligent & Integrated asset management	217.4	104.2
Flagship Area 4: A sustainable and green rail system	169.2	89.7
Flagship Area 5: Sustainable Competitive Digital Green Rail Freight Services	136.3	95.5
Flagship Area 6: Regional rail services / Innovative rail services to revitalise capillary lines	82.3	37.7
Flagship Area 7: Innovation on new approaches for guided transport modes	15.7	7.3
Total	1046,5	543,3

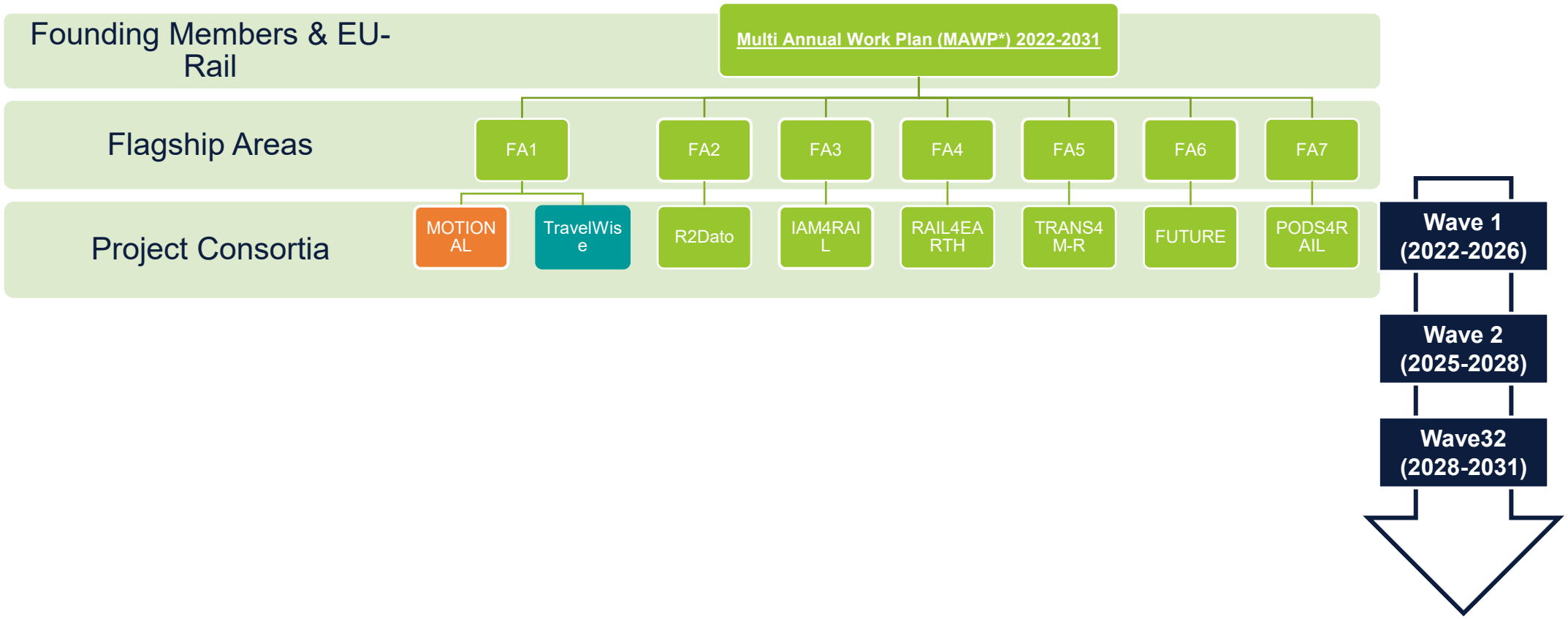
System Pillar: EUR 58.8 million, funded up to EUR 50.0 million

Innovation Pillar: EUR 1.1 bln



Source: https://rail-research.europa.eu/wp-content/uploads/2022/09/Europes-Rail-Factsheet-v5.pdf
Status 2022/2023

Structure of EU Calls



* MAWP Link: https://rail-research.europa.eu/wp-content/uploads/2022/03/EURAIL_MAWP_final.pdf

FP1 MOTIONAL - Why? How? What?

FP1 MOTIONAL
European Rail Network and Mobility Management

Objective

Make rail the preferred mode of transport in Europe through improved railway planning and operational management

Current Challenges

Network Complexity
National/regional management with legacy systems
Poor digitalization and weak integration (between rail systems and with other modes)
Demand for international trains

Vision of the future European Railway System

Interoperable and resilient
Adaptive capacity
Integration of services, including first/last mile operations
Exploitation of digitalization opportunities

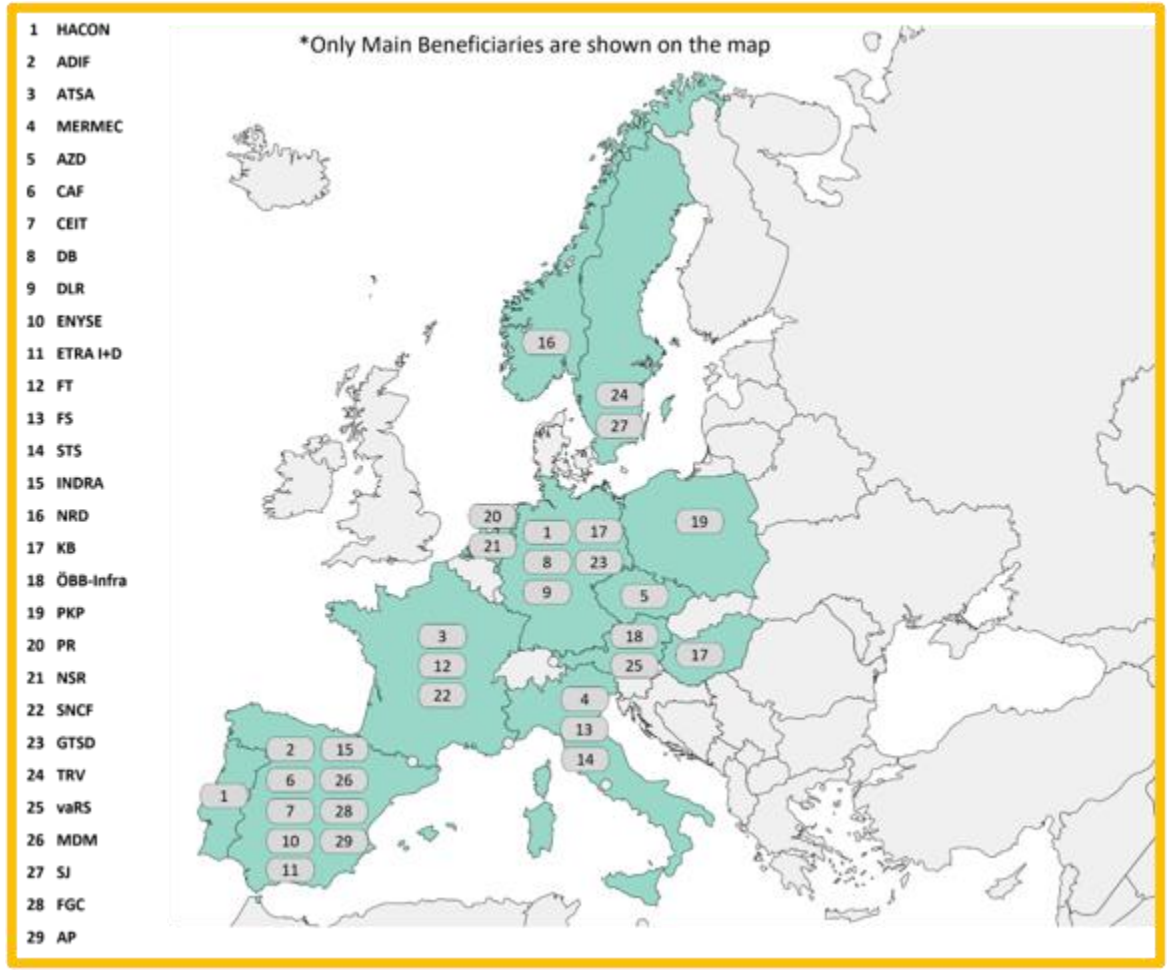
Project Goals

Develop functional requirements, specifications, and solutions
Transform capacity planning and traffic management systems (increase automation)
Make rail the backbone of a multimodal transport system
Deliver Digital enablers

FP1 MOTIONAL

Project Partners and Details

HACON	adif	ALSTOM	mermec	AZD	HITACHI
CAF	ceit	DB	DLR	ÖBB INFRA	PKP
enyse	etra	Faiveley Transport	FERROVIE DELLO STATO ITALIANE	SNCF	indra
Jernbane-direktoratet	KNORR-BREMSE	Metro	ProRail		FGC Ferrocarrils de la Generalitat de Catalunya
TRAFIKVERKET	voestalpine	SJ			



Call	HORIZON-ER-JU-2022-01	**Max Grant Amount**	37.875.973,46 €
Topics	HORIZON-ER-JU-2022-FA1-TT-01 Network management planning and control & Mobility Management in a multimodal environment and Digital Enables	**Total Project Costs**	92.600.000 €
		Project Duration	46 months
Linked Actions	FP2, FP3, FP4, FP5, FP6	**Number of partners**	94

https://rail-research.europa.eu/rail-projects/fp1-motional/

FP1 MOTIONAL

Europe's Rail

FP1 MOTIONAL
European Rail Network and Mobility Management

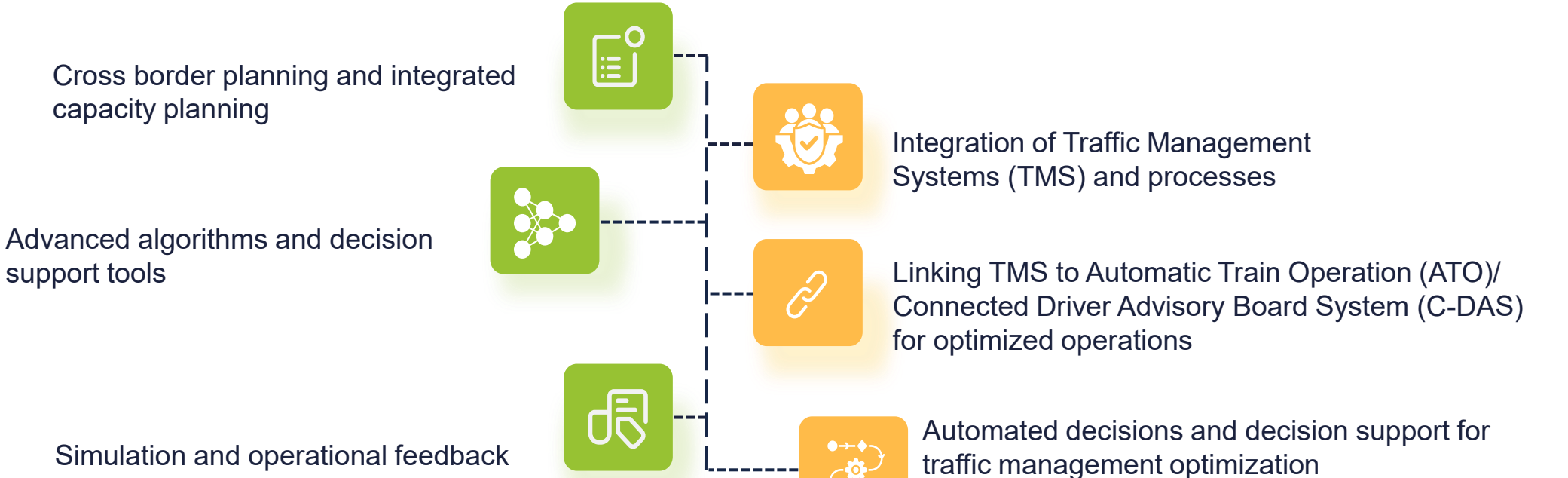
Railway Planning

Objective: Improve strategic and tactical planning of the networks *(Capacity Management)*

Railway Operation

Objective: Taking advantage of the potential of digitalization, operational and technological solutions are developed for different business areas, paving the way to the future European Rail Traffic Management Systems *(Network Management)*

Expected results:



Improved resilience and efficiency in disruption management

Digitalisation – Automation – Connectivity

FP1 MOTIONAL

Europe's Rail

FP1 MOTIONAL
European Rail Network and Mobility Management

Multimodal Integration

Objective: Make Rail the backbone of Multimodality

B2B INTEGRATION

B2B

- ✓ **B2B Platforms & Services**
- ✓ **Standardized Interfaces**

INCLUSIVE MOBILITY

- ✓ **Travel Assistance Across Modes**
- ✓ **Hands-free Solutions**
- ✓ **Platform-based Guidance**

ANTICIPATE DEMAND

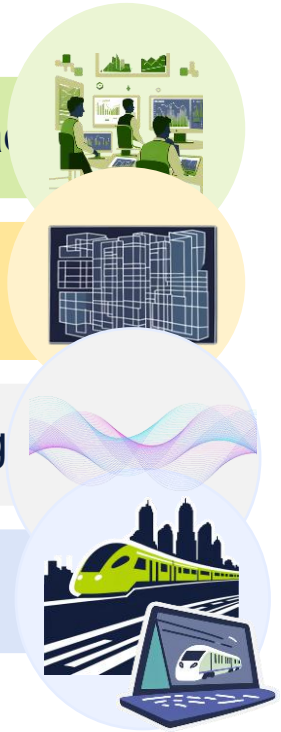
- ✓ **Short Term Demand**
- ✓ **Long Term Demand**
- ✓ **Digital Twins**
- ✓ **Optimized Capacity**
- ✓ **Disruption Handling**

Transforming the European rail system, making it more interoperable, resilient, capacity strong, intermodal

Digital Enablers

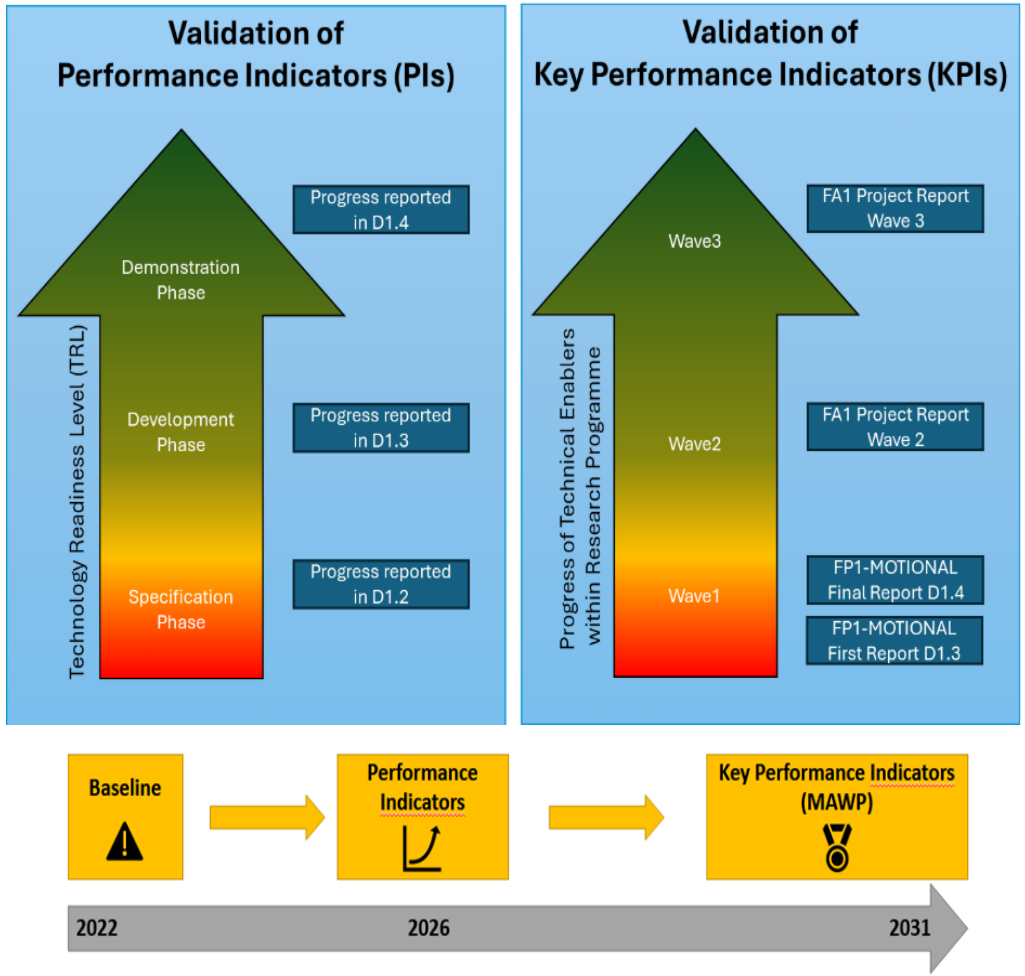
Objective: Digitally transform the European Rail System by implementing specialized applications and common enablers

- Rail Federated Data Spa
- Conceptual Data Model
- Digital Asset Engineering
- Digital Twins



FP1 MOTIONAL

KPIs towards EU impact



FP1 Project Interactions

FP1 MOTIONAL
European Rail Network and Mobility Management

FP1 MOTIONAL
European Rail Network and Mobility Management

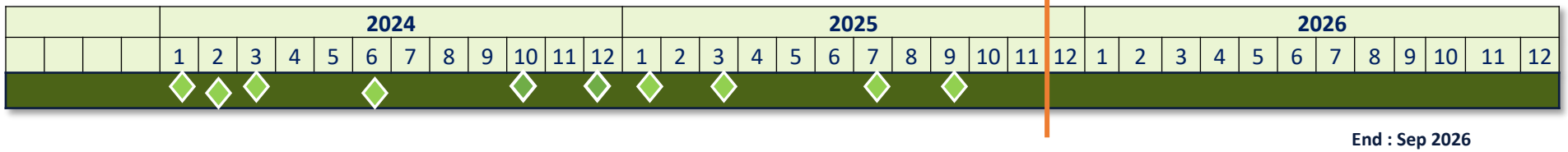
Ongoing interactions and alignment discussions with other FP projects for knowledge exchange, advisory board participation, sharing updates and best practices within each project (e.g., data sharing topic,TMS interface, automated decision support for traffic at regional level, and many other topics).

Flagship Project 1 - *MOTIONAL*

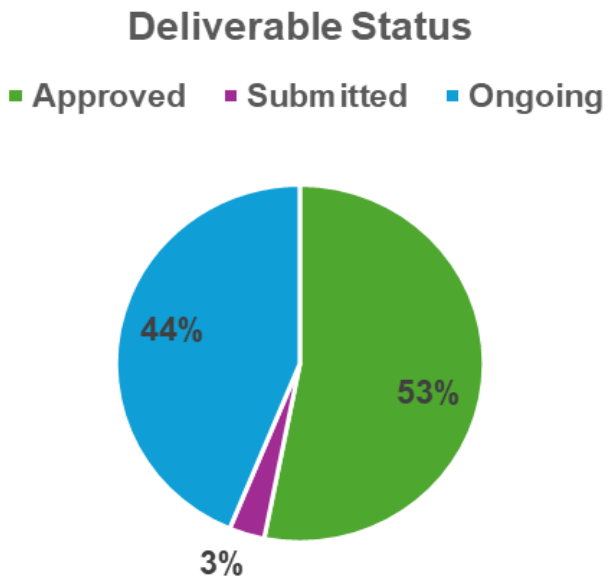
Europe's Rail

FP1 MOTIONAL
European Rail Network and Mobility Management

Overall Status

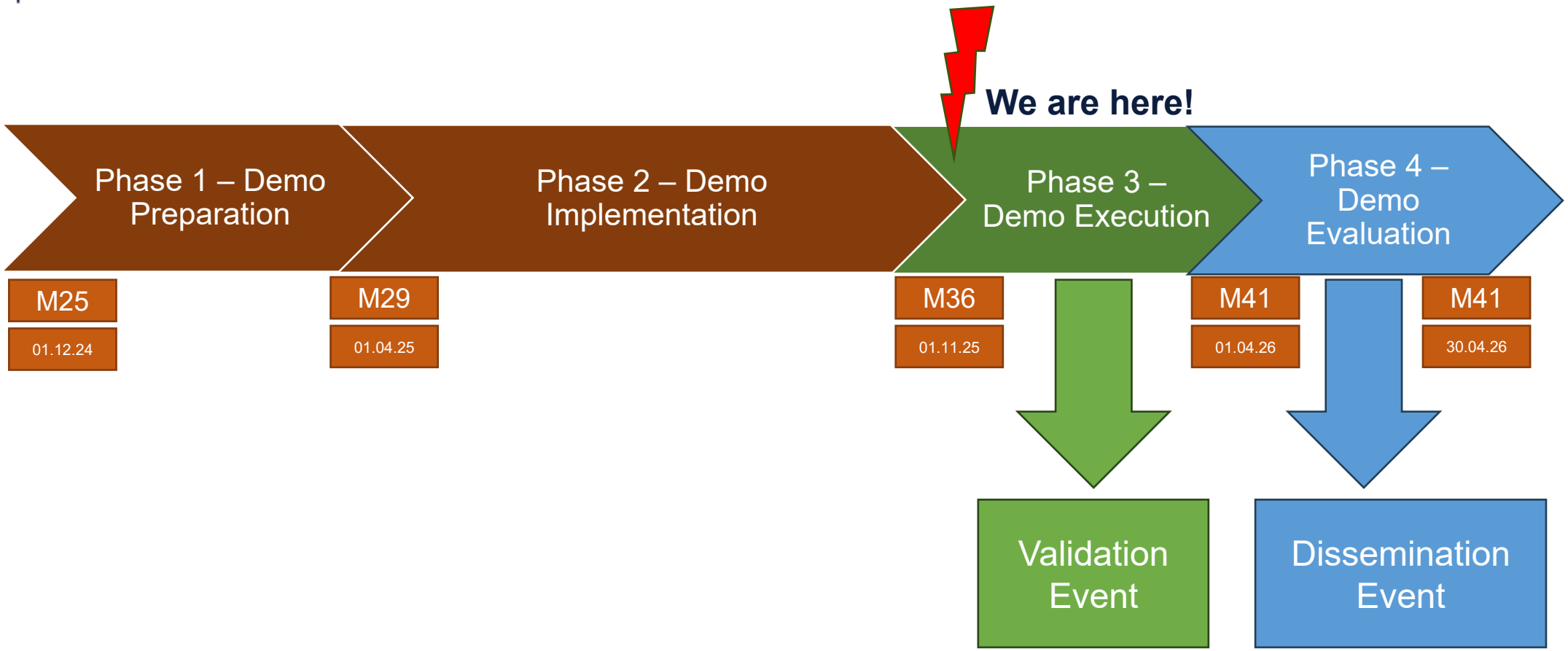


End : Sep 2026



No	MCP	Milestone name	Status
12	MCP6	Maturity check point – Prototype validation 1 (Development) – TRL 4-5	Done
13	MCP7	Maturity check point – Update 2 CDM, Additional DT and Connector specification TRL 1-3	Ongoing
14		KPIs testbed and benchmark methodology	Done
15		Alignment and identification of dependencies between all demonstrations of the project	Done
16	~~MCP8~~	~~Maturity check point~~ – WS 1 input delivery 4 to WS2 – TRL 1-3	Done
17	MCP9	Maturity check point – WS 1 input delivery 5 to WS2 – TRL 1-3, TRL5 demonstrators to FP3, FP5, FP6	Ongoing
18	MCP10	Maturity check point – Update 3 CDM, Additional Connector specification – TRL 1-3	Ongoing
19		FP1 to FP2 delivery 1	Not started
20		FP1 to FP2 delivery 2	Not started
27		Intermediate report on KPI and impact delivered to the JU	Ongoing

FP1 Demonstration phase



FP1 Demonstration timeline

FP1 MOTIONAL
European Rail Network and Mobility Management

Europe's Rail

		2025	Q1 2026	Q2 2026
WS 1.1 Planning	WP5		D5.2, D5.4, D5.7	D5.1, D5.3, D5.5, D5.6
	WP7			D7.1, D7.2, D7.3, D7.4, D7.5, D7.6, D7.7, D7.8, D7.9, D7.10,
	WP9	D9.5, D9.11	D9.1, D9.4, D9.5, D9.7, D9.8, D9.9, D9.10	D9.2, D9.3, D9.6
WS1.2 Operations	WP12		D12.1, D12.2, D12.3, D12.4, D12.8 D12.9	D12.5, D12.6, D12.7
	WP14			D14.1, D14.3, D14.4
	WP16			D16.1, D16.2, D16.3, D16.4, D16.5, D16.6, D16.7, D16.8, D16.9
	WP18		D18.1, D18.5	D18.2, D18.3, D18.4, D18.6, D18.7, D18.8, D18.9
WS1.3 Multimodal integration	WP21		D21.3, D21.4 (Lux), D21.5	D21.2, D21.4 (Sweden), D21.6
	WP23	D23.2, D23.4	D23.1, D23.3, D23.5	
	WP25	D25.5	D25.1, D25.2, D25.3, D25.4, D25.5	D25.2
WS2 Digital Enablers	WP27			D27.5
	WP29		D29.1, D29.2, D29.3, D29.4	
	WP31		D31.2+D31.3, D31.4	

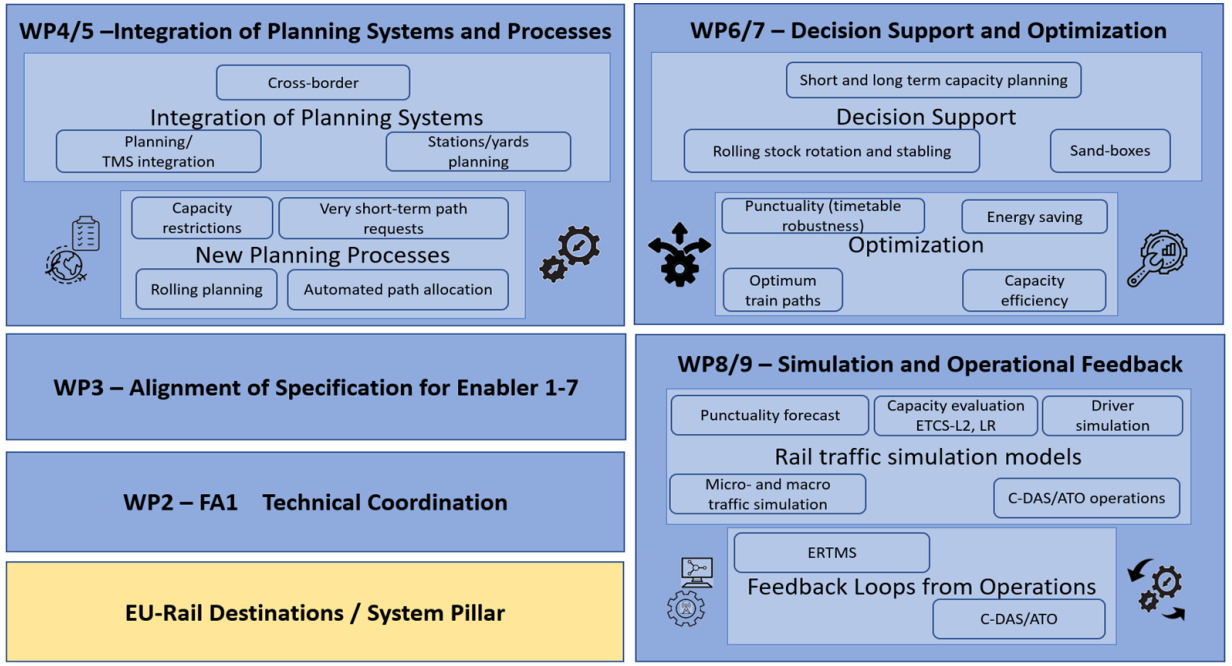
FP1 MOTIONAL

Workstream 1.1 - Planning
Progress and achievements

WS 1.1 Planning Achievements

- **Planned intermediate maturity achieved:** Finalized development of the design, requirements and use cases for capacity management developments in scope of WP 5, 7 and 9 to achieve their targeted TRL.

- **Demo preparation finalized, demo execution started:** 28 demonstrations to be performed in workstream 1.1.
  - Prepare and process demonstration data and demonstration environments
  - Define demonstration tests and define demonstrations outcomes and how to measure
  - preparing validation event, end-user interaction
  - Running of first test cases in the environments.



WS 1.1 Planning - Achievements

- **Validation events:** Ongoing planning of validation events with involved stakeholders and end-users.
- **Dissemination events:** Initial planning and preparation of dissemination events including sales pitches.
- **System Pillar and RNE alignment:** Regular interaction meetings with System Pillar Task 3 about capacity management and traffic management, topics to mention FP1 cross border demons and federated European traffic management. Railway Co-operative Decision making (sharing real time data with time stamps between actors), FP1 demo Malmö and handbook RNE.

		2025	Q1 2026	Q2 2026
WS 1.1 Planning	WP5		D5.2, D5.4, D5.7	D5.1, D5.3, D5.5, D5.6
	WP7			D7.1, D7.2, D7.3, D7.4, D7.5, D7.6, D7.7, D7.8, D7.9, D7.10,
	WP9	D9.5, D9.11	D9.1, D9.4, D9.5, D9.7, D9.8, D9.9, D9.10	D9.2, D9.3, D9.6

Event 4 – Intelligent Planning
"When algorithms create better plans than humans"
May-June TBC
SG1-SG3, 28 demos Paris TBC

Event 3 – Cross Border Integration
"Making Europe's railways truly European"
13th of May
SG1-SG2, 8 demos Stockholm / Hybrid

Joint demo of MOTIONAL WP9 and FP2-R2DATO

Timetable and capacity simulation of new DATO-technologies in signalling and train operation

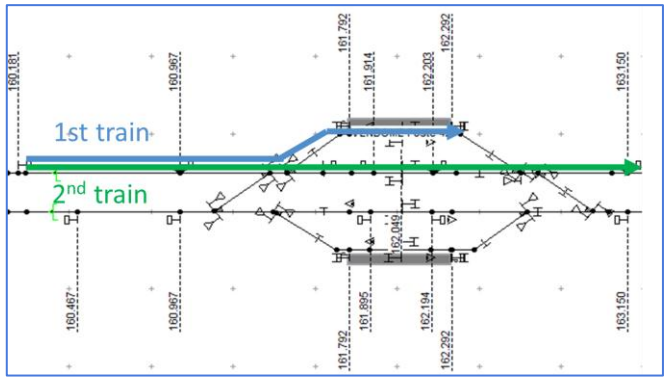
EXAMPLE

Development of new DATO-technologies for signalling and train operation. Their impact is maximised when effects are understood and integrated in timetable planning and capacity simulation tools. The technologies are:

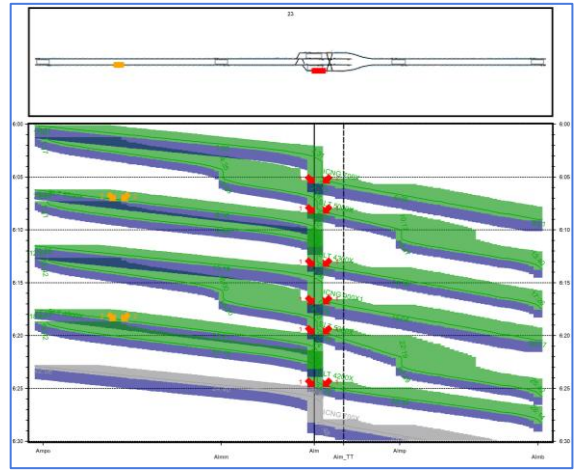
- ERTMS HTD (Hybrid Train Detection, former HL3)
- ATO (Automatic Train Operation)
- NG Brake (Next Generation Brake)
- C-DAS (Connected Driver Advisory Systems)

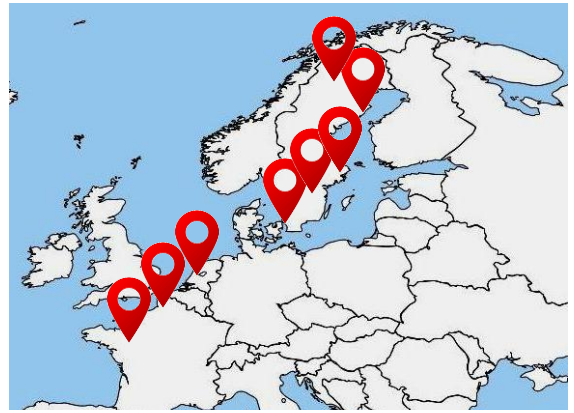
All partners perform their studies with the same simulation tool. Our combined research leads to methods that don't have to be developed by each partner gaining in efficiency and quality.

The results of these studies are input for other FPs to further develop the technologies and analyse their cost-benefit ratios. In such way the most effective and efficient applications can be chosen.



FP1-MOTIONAL Demos
9.5, 9.6 and 9.10





8 scenarios spread over Europe

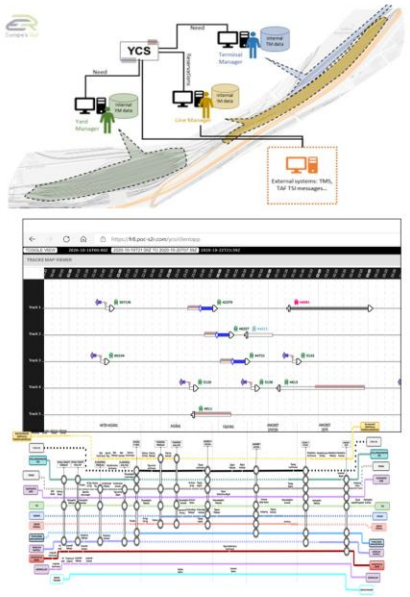
Joint demo by: France (SNCF RÉSEAU), Sweden (TRAFIKVERKET, KTH VETENSKAP OCH KONST, vti), The Netherlands (ProRail, (NS))

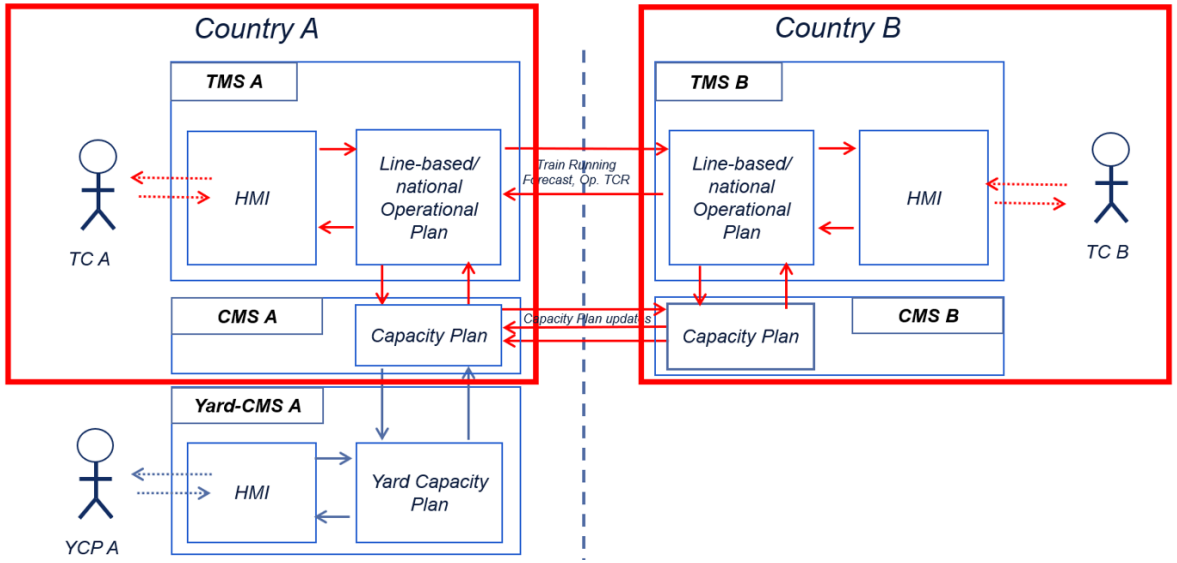
Cross-border

WS	Topic	Partner	Demo number	EU Motivation
1.1 & 1.2	Demo YCS Malmö Co-operative planning node corridor	TRV	5.4, 12.8	Solution support cross border operations, sharing information to handle disturbances
1.1 & 1.2	Integrated demo: Demo Cross-border TMS/CMS	HACON, TRV, and NRW/ Bane-NOR	5.3,5.5, 5.6, 12.6	Harmonizing EU-wide capacity planning and TMS/CMS interfaces

YCS – Yard Coordination System Collaborative Decision Making

- Demonstrator Malmö Marshalling Yard TRL 6
- Co-operation between
  - Trafikverket line manager
  - Green Cargo, Marshalling Yard
  - Mertz, Combiterminal
- YCS – Active planning of track allocation and optimisation functionality
- Connected to Digital graph and Deplide datasharing platform real time information – not logner a black hole
- Collaborative Decision Making – sharing timestamps between actors according to a "metro map"



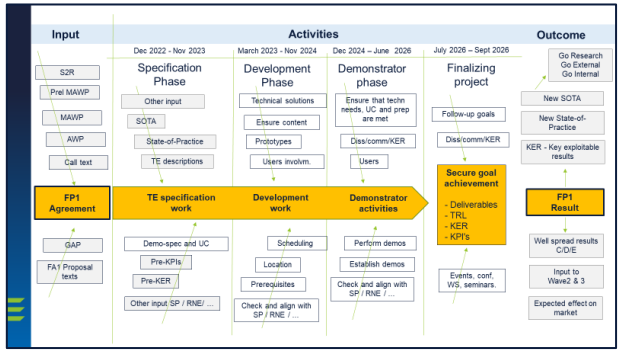


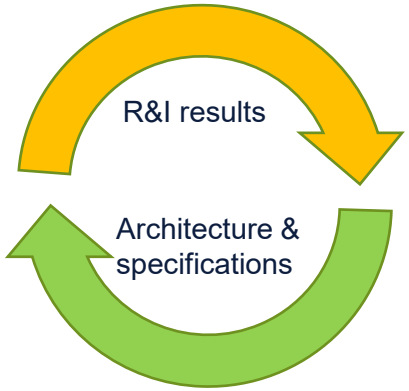
Demo Cross-border TMS/CMS

FP1 – SP / RNE interaction

FP1 and SP/RNE interaction for improving the European rail system
to **agree** and establish **working arrangement** and address **critical issues**

FP1 Logic





System Pillar Task 3 CMS/TMS

- Overall system Architecture
- System requirement
- Standardisation and regulation

Respect for each other's interests and roles

FP1 Motional

- Secure demonstration quality
- To give input to necessary harmonisation activities
- Alignment for visions, timing, specifications
- Unified ambition, communication and glossary

SystemPillar CMS-TMS

- Design principles and architecture of the target system
- Harmonisation and standardization supporting SERA
- Providing technical specifications to feed into standards or TSI
- Alignment with and between flagship projects

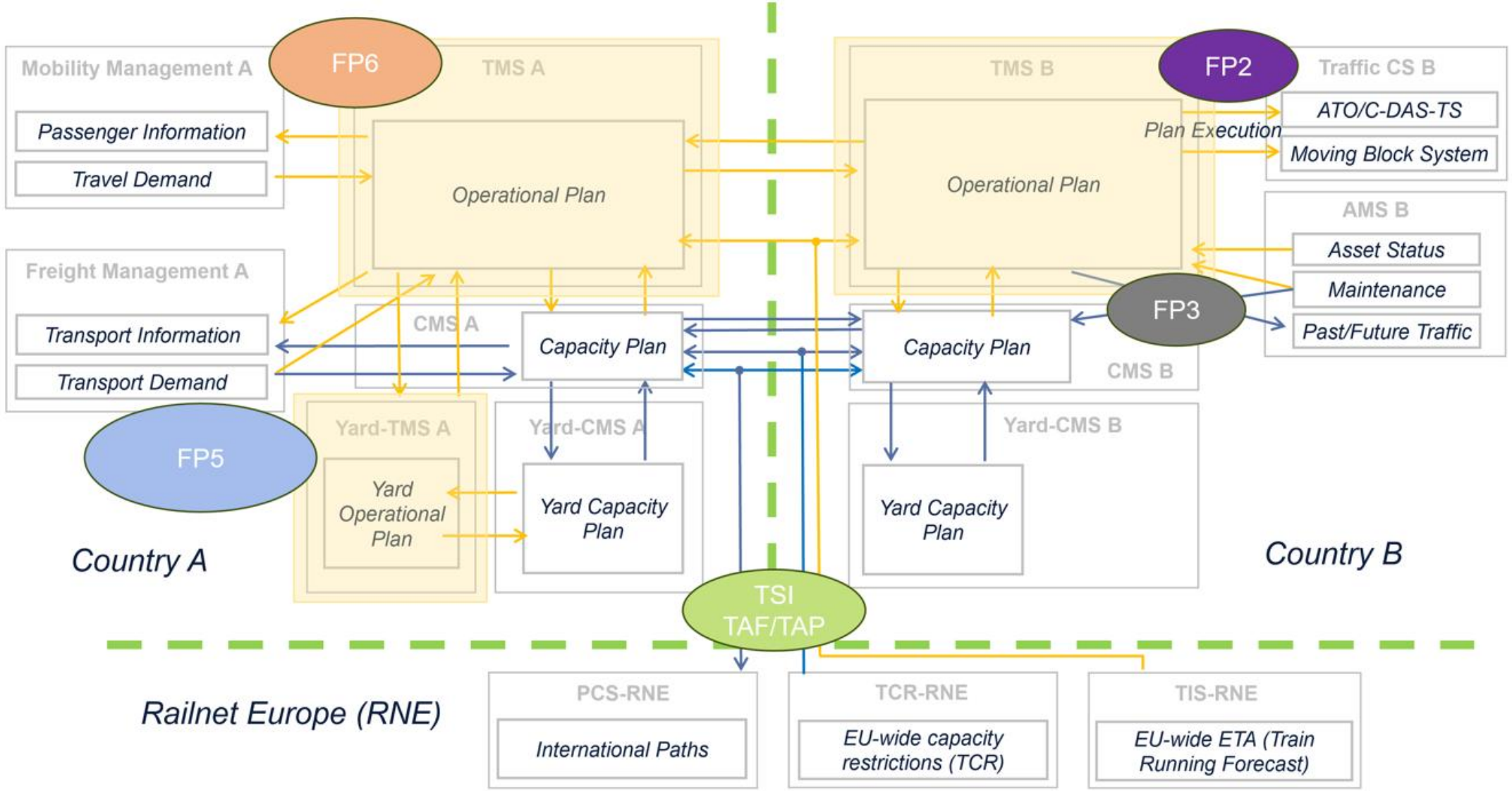
RNE

- Assure integration of RNE/sector initiati ves/project in the SystemPillar
- Avoid scope overlaps with FP1 projects
- Ensure aligment with a IMs requests in CM and TM
- Give recommendations on demonstrations

Secure goal achievement by results

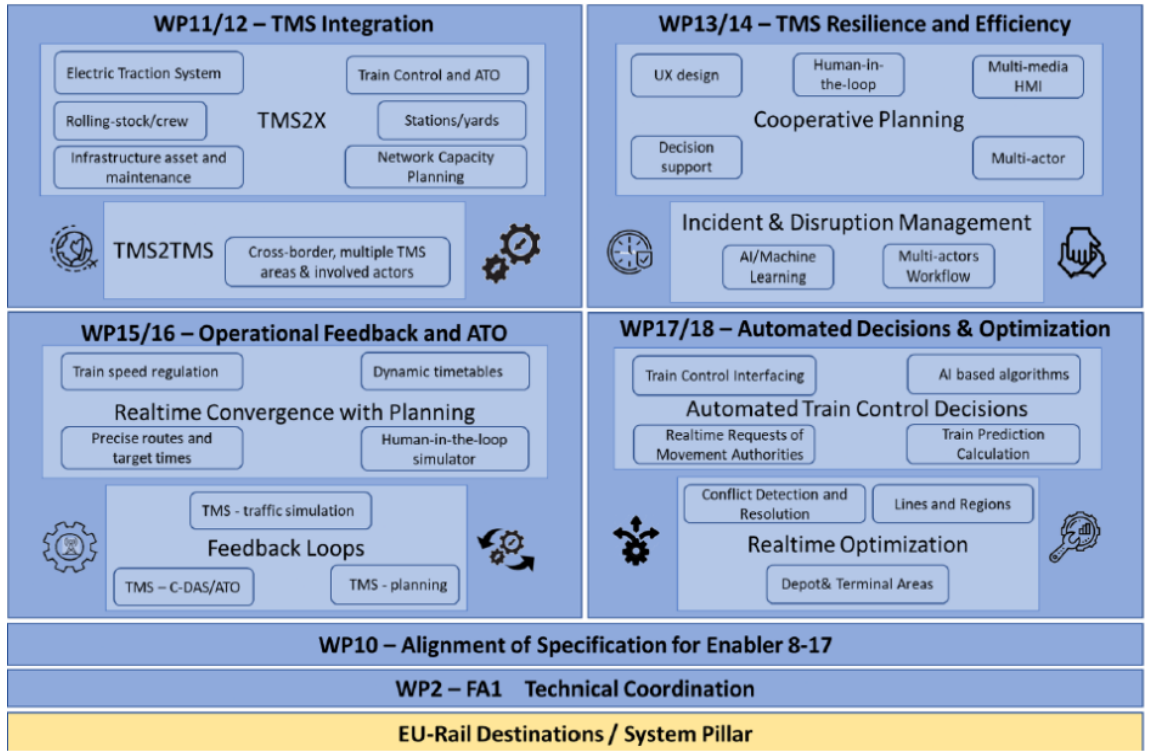
Workstream 1.2 - Operation
Progress and achievements

MOTIONAL System Approach in WS 1.2 (TMS)



WS Operations 1.2 - Achievements

- **Planned intermediate maturity achieved:** Finalized development of the design, requirements and use cases for the TMS developments in scope of WP12, 14, 16 and 18 to achieve their targeted TRL.
- **Demo preparation finalized:** 31 demonstrations to be performed in workstream 1.2.
  - Data identification, acquisition and preparation for feeding the demonstration environments.
  - Set-up of technical demonstration environments for performing the demonstration cases based on the identified Use Cases and requirements. Running of first test cases in the environments.



WS Operations 1.2 - Achievements

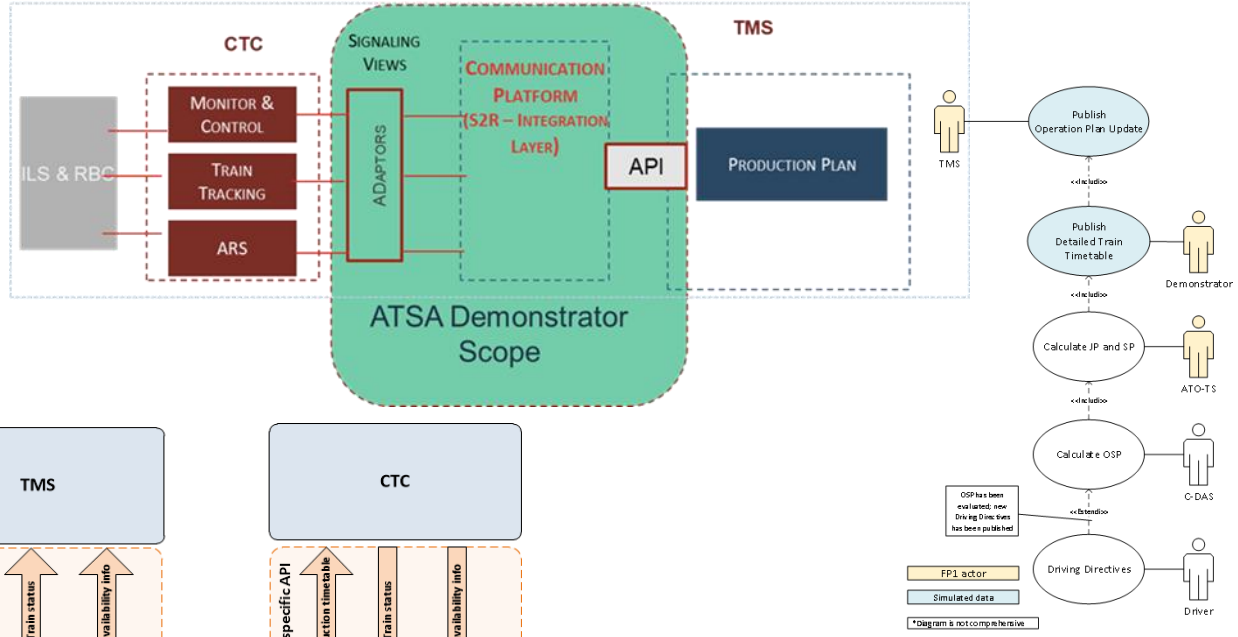
- **Validation events:** Initial planning of validation events with involved stakeholders and end-users.
- **Dissemination events:** Initial planning and preparation of dissemination events including sales pitches.
- **System Pillar alignment:** Bi-weekly interaction meetings with System Pillar Task 3 (CMS/TMS)

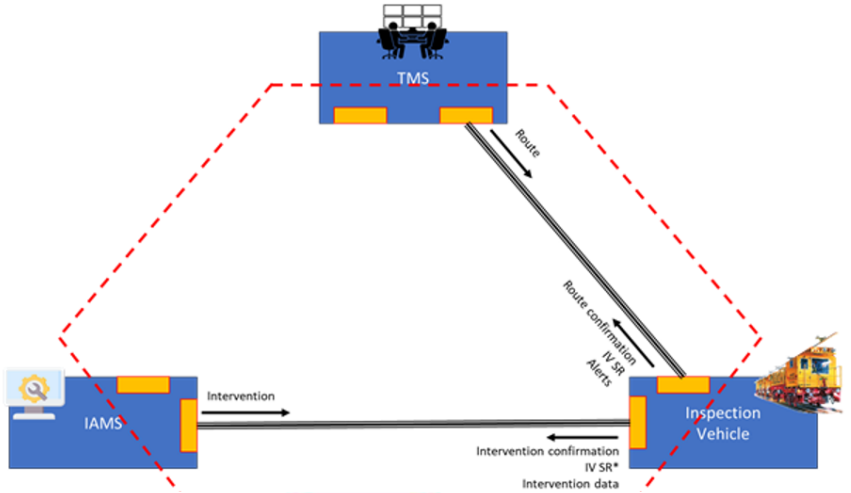
		2025	Q1 2026	Q2 2026
WS1.2 Operations	WP12		D12.1, D12.2, D12.3, D12.4, D12.8 D12.9	D12.5, D12.6, D12.7
	WP14			D14.1, D14.3, D14.4
	WP16			D16.1, D16.2, D16.3, D16.4, D16.5, D16.6, D16.7, D16.8, D16.9
	WP18		D18.1, D18.5	D18.2, D18.3, D18.4, D18.6, D18.7, D18.8, D18.9

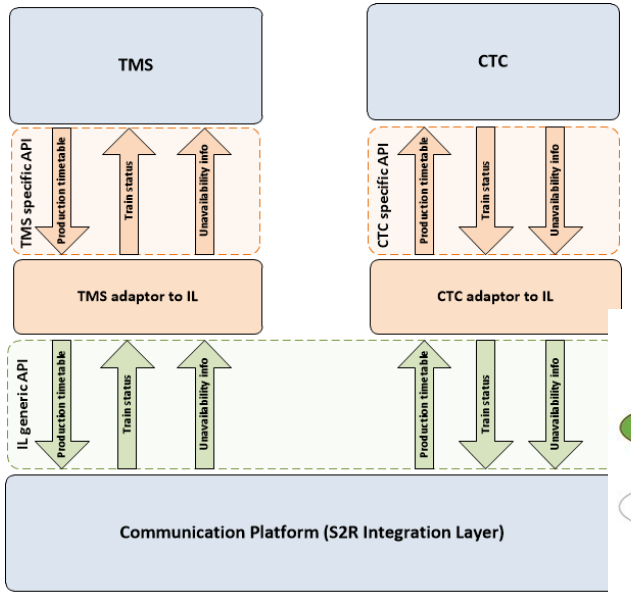
Event 5 – Real-Time Intelligence
"The thinking railway responds faster than problems can spread"
17th or 24th of June 2026
Utrecht / Hybrid
SG2-SG3, 25 demos

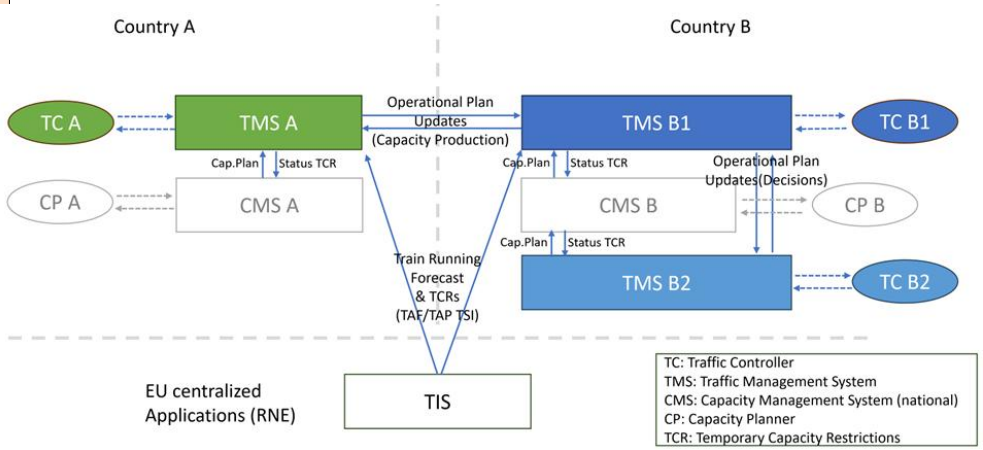
Event 4 – Intelligent Planning
"When algorithms create better plans than humans"
May-June TBC
Paris TBC
SG1-SG3, 28 demos

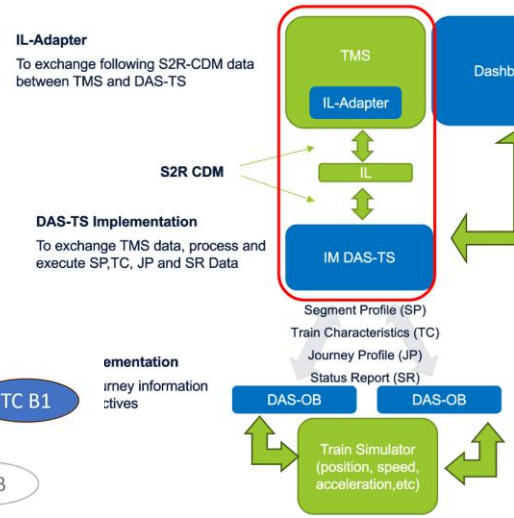
WP11/12 demonstrations

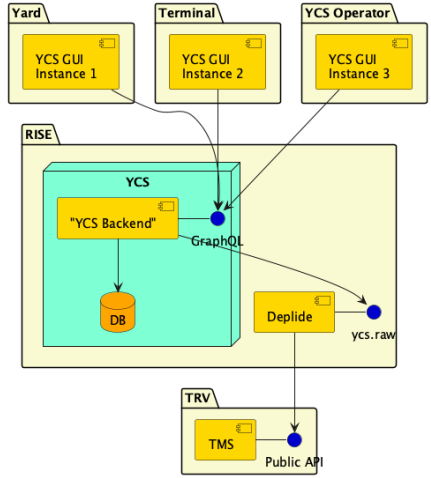




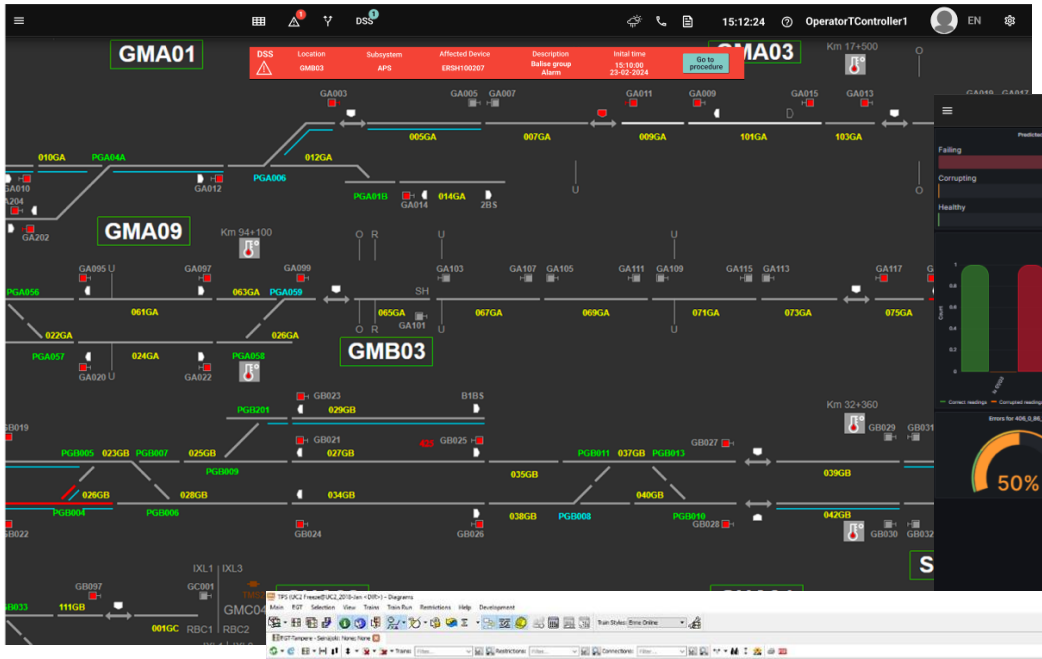


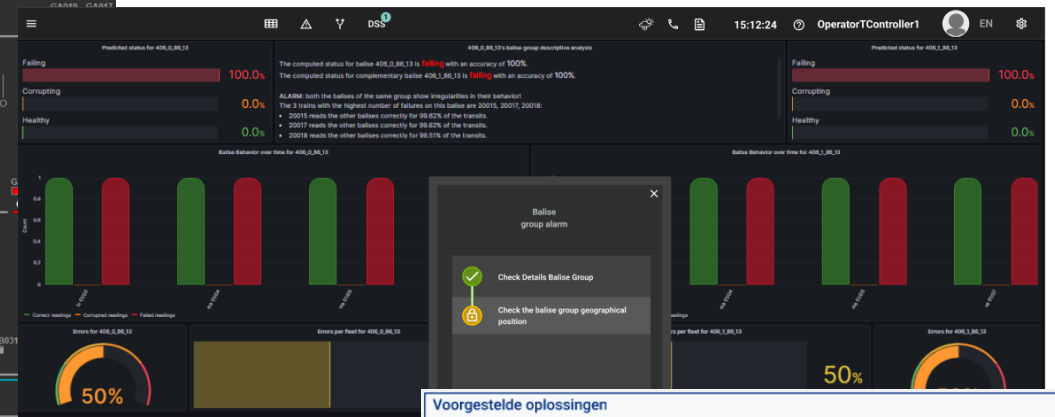


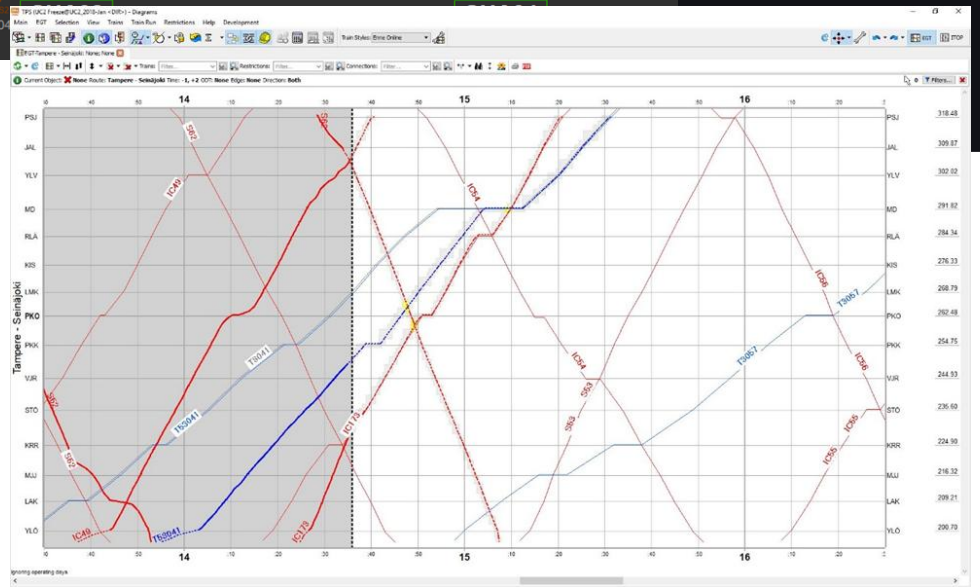


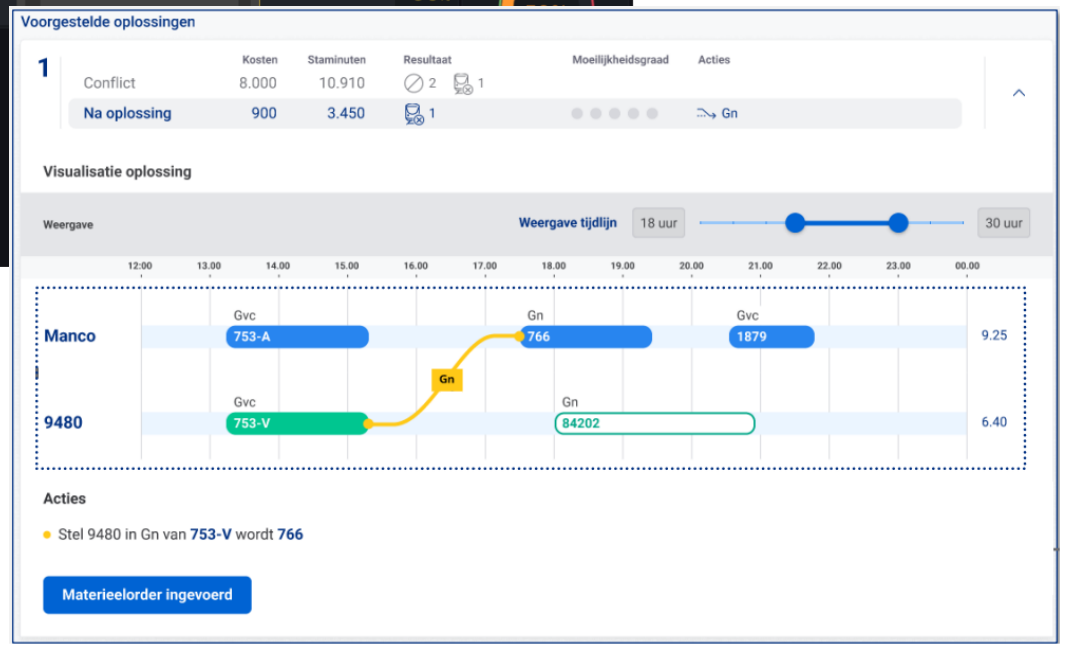


WP13/14 demonstrations

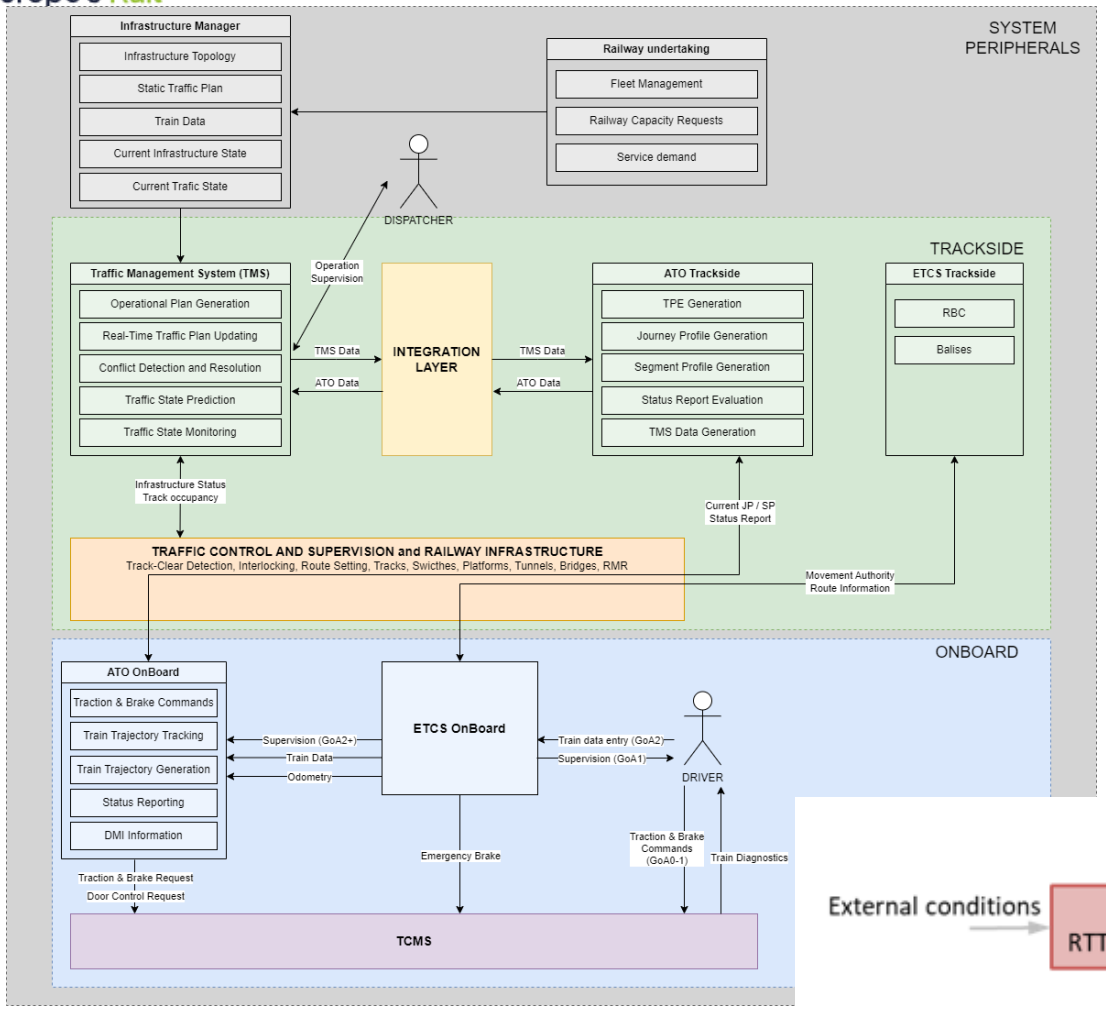


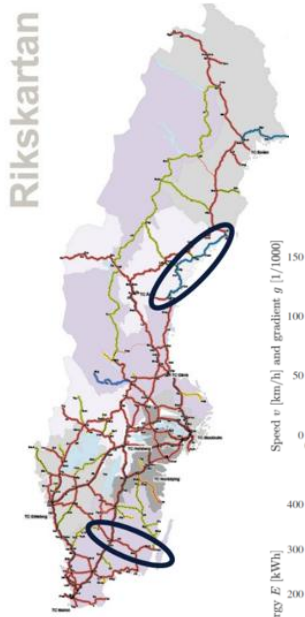


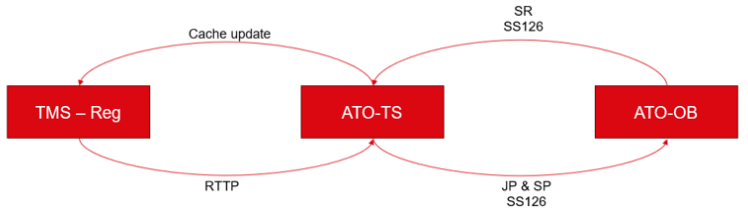


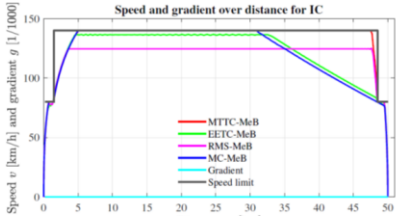


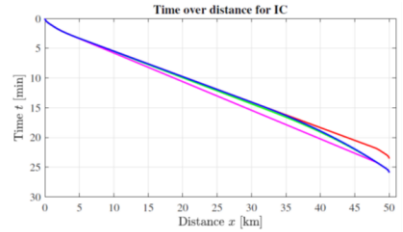
WP15/16 demonstrations

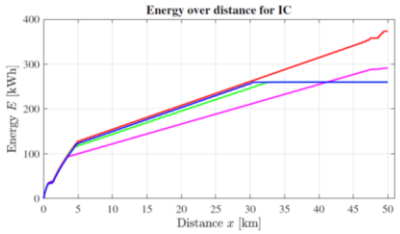


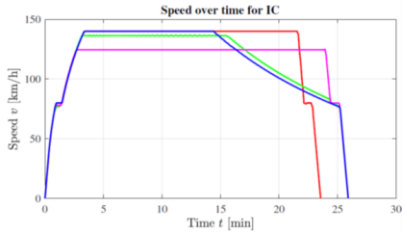












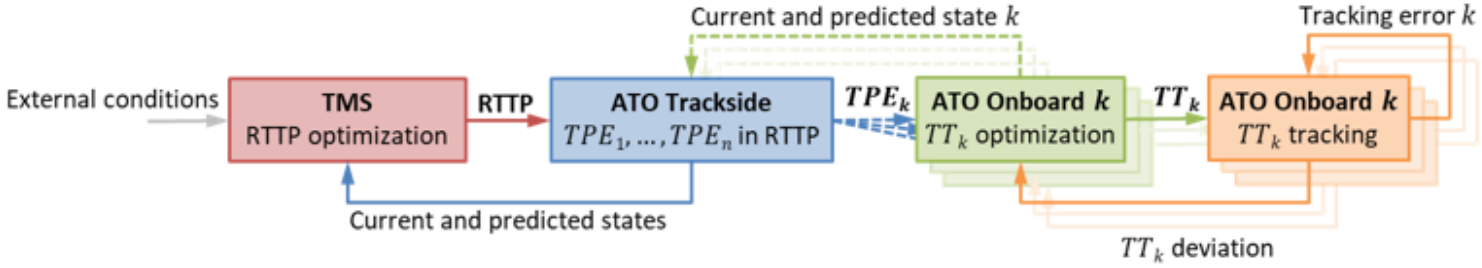
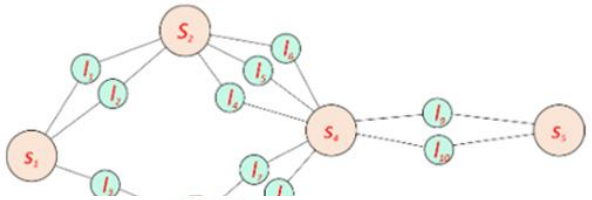
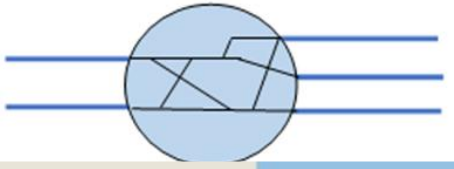
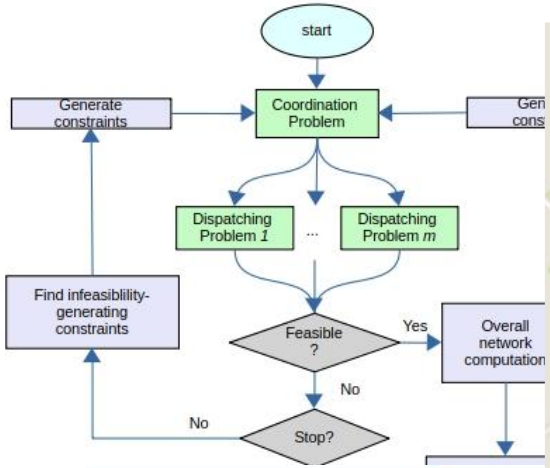


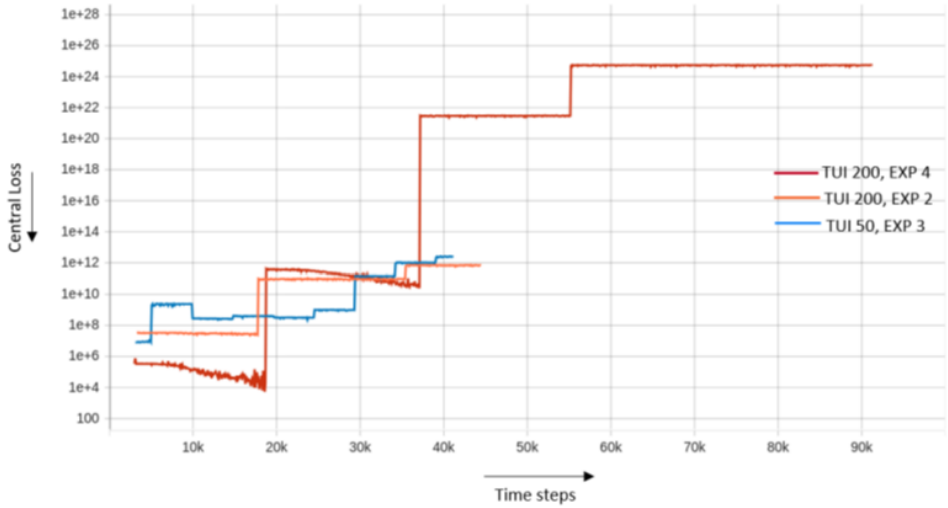
Figure 5-2 TMS-ATO feedback control-loops with passive TS and active OB

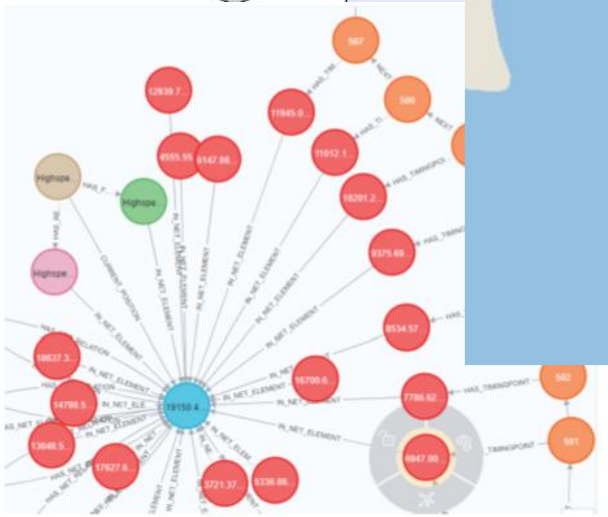
WP17/18 demonstrations

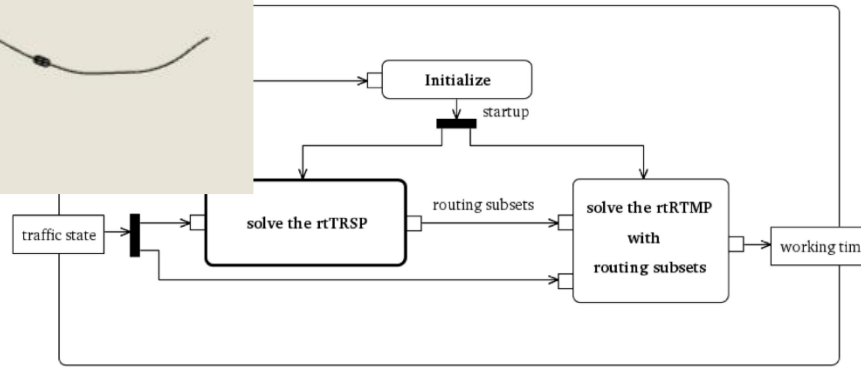






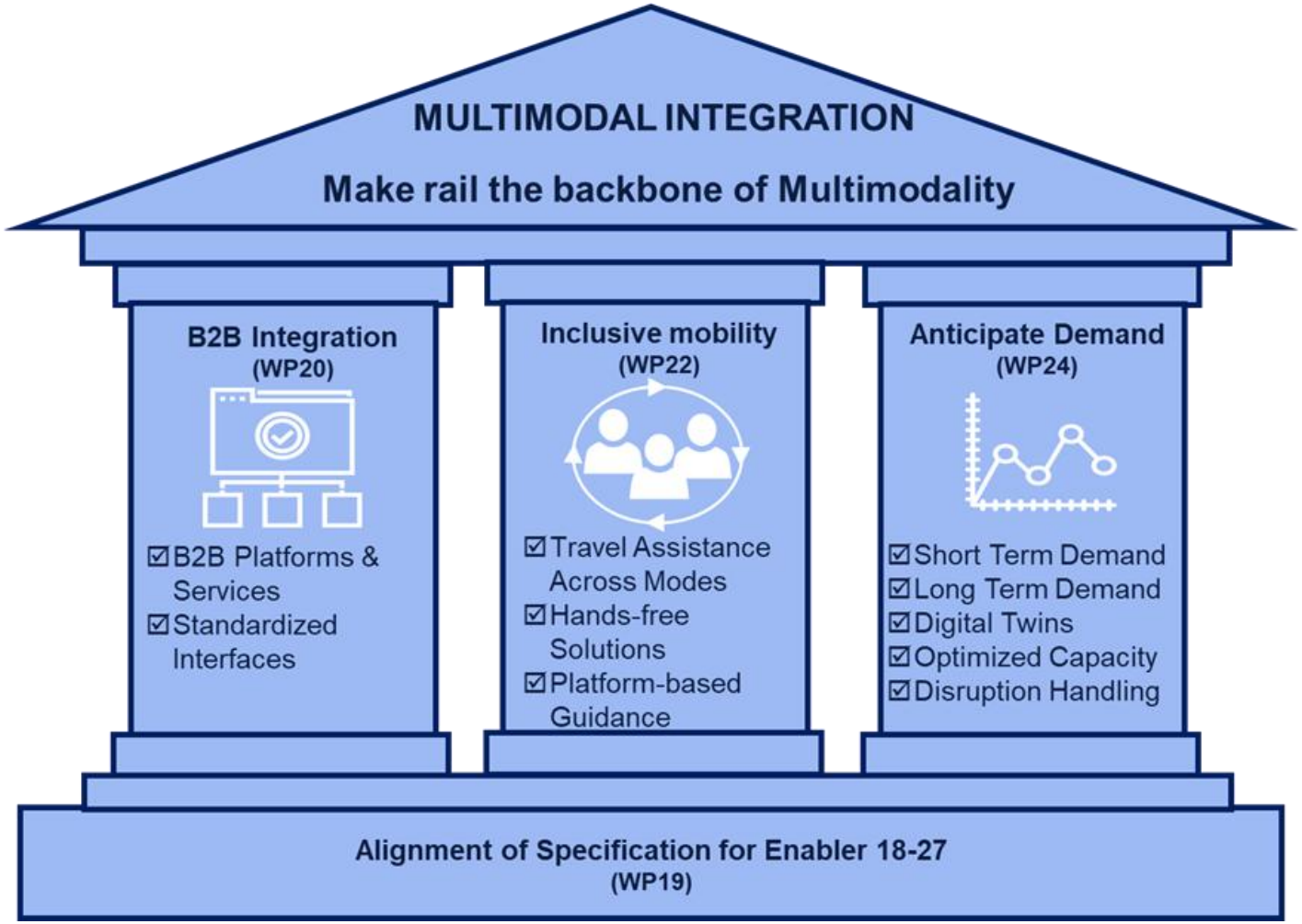






Workstream 1.3 - Multimodal integration
Progress and achievements

Multimodal Integration

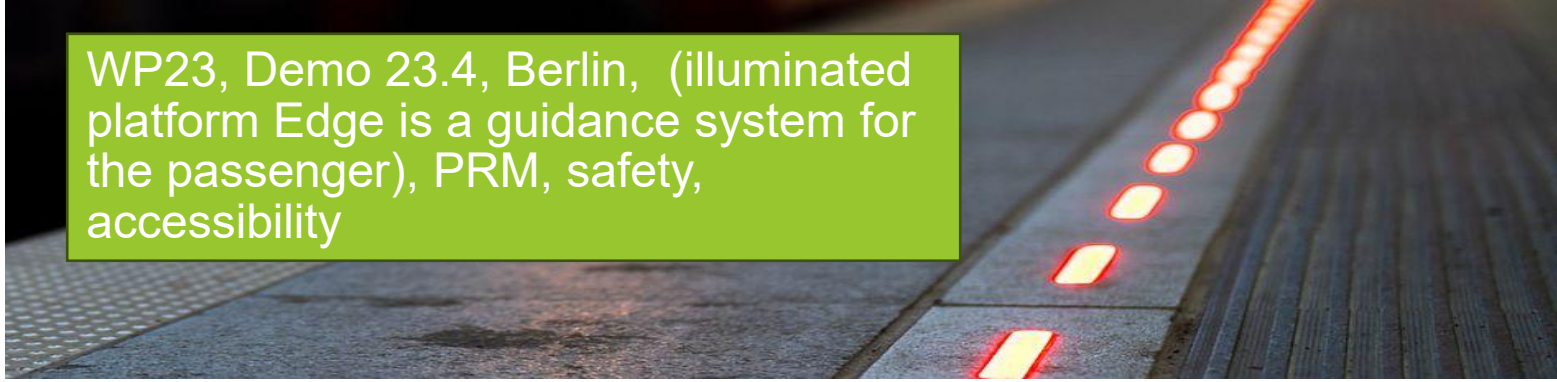


WS1.3 – Multimodal Integration

		2025	Q1 2026	Q2 2026
WS1.3 Multimodal integration	WP21		D21.3, D21.4 (Lux), D21.5	D21.2, D21.4 (Sweden), D21.6
	WP23	D23.2, D23.4	D23.1, D23.3, D23.5	
	WP25	D25.5	D25.1, D25.2, D25.3, D25.4, D25.5	D25.2

Event 2 – Seamless & Inclusive Mobility
"One Europe, one journey, zero barriers"
7th of May 2026
Madrid / Hybrid
SG3, 15 demos

FP1 successful first outcomes!



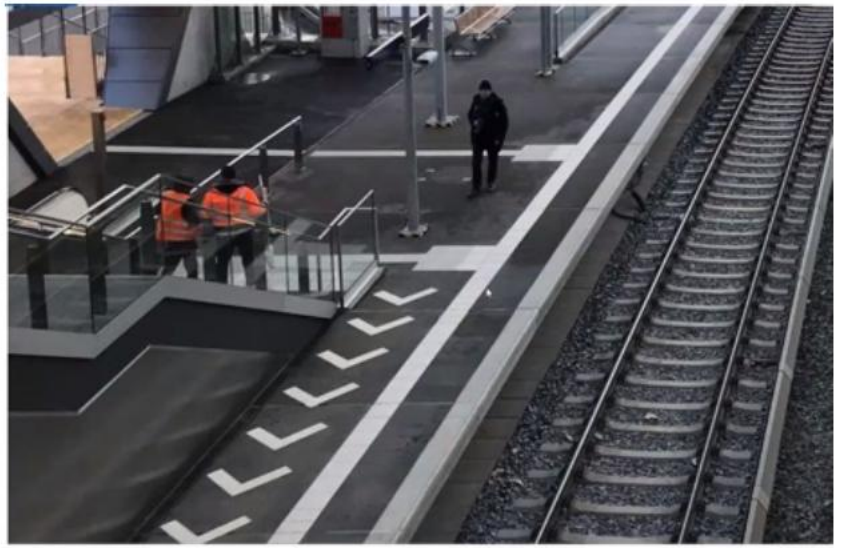
WP23, Demo 23.4, Berlin, (illuminated platform Edge is a guidance system for the passenger), PRM, safety, accessibility

Berlin, Südkreuz, Q2/2024

[Leuchtende Bahnsteigkante Bahnhof Berlin Südkreuz - YouTube]

Brochure: broschuere_doppelseitig_v1

WP23 Demos – Illuminated Platform Edge
Initial situation: Rising number of passengers



WP23 Demos – Illuminated Platform Edge
Target: Evaluation in terms of:

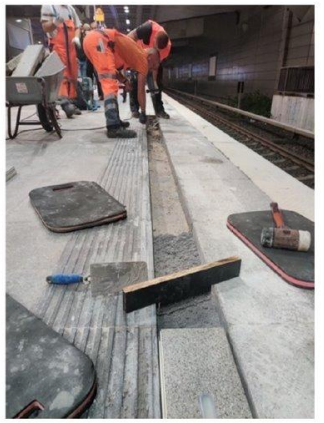
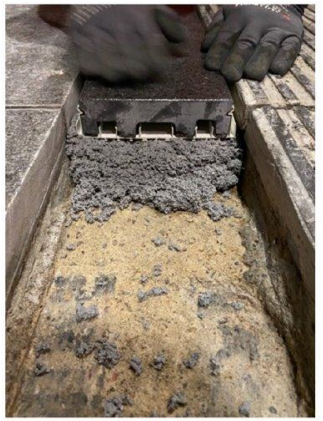
Security: Increasing attention on the platform

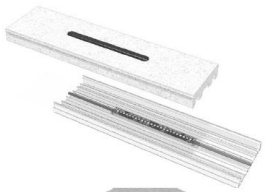
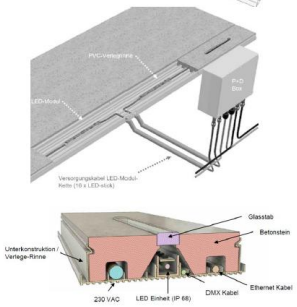
Punctuality: Optimization of stopping times and handling

Capacity: Improving the distribution of travellers

Customer satisfaction: Improving the orientation

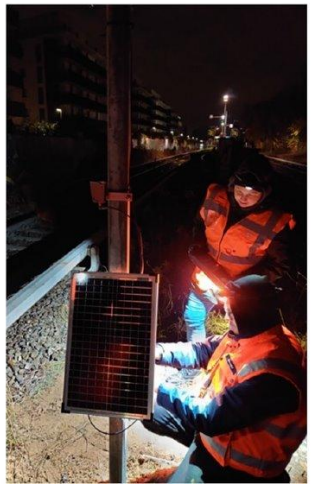
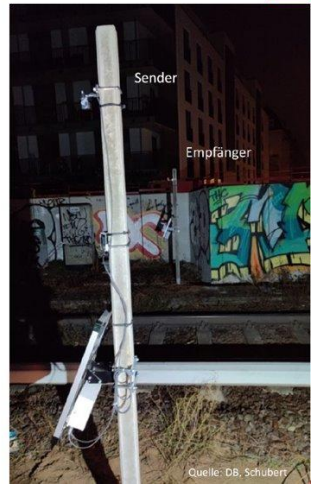
Construction Site


Technical Solution: Smart concrete LED-floor tiles



Sensor Installation

FP1 successful first outcomes!

sqills

S3 Passenger From Sqills Now Powers Swedish Rail Operator SJ | Knowledge H

S3 Passenger from Sqills now powers Swedish rail operator SJ

Content type
News

Published
21 May 2024

Share
Copy URL

Simplifying the booking process for public transport through common standards and procedures: a very simple and yet very ambitious goal. That is what OSDM (Open Sales and Distribution Model) is about.

Sqills.

Press release

Brussels, 23 April 2024

CER The Voice of European Railways · OSDM Open Sales and Distribution Model · UIC International Union of Railways · Samtrafiken

The future of European rail ticketing - Sweden launches Open Sales and Distribution Model

A new era of seamless and efficient rail travel was ushered in on 16 April with the official rollout in Sweden of the Open Sales and Distribution Model (OSDM) sector specification. OSDM represents a significant leap forward in rail distribution and the enabling of multi-modal, multi-carrier ecosystems. OSDM, a free and open sector specification, is set to transform the way travellers navigate and book their journeys. By enabling cross-border sales with unprecedented ease, the OSDM-based booking system opens up a world of possibilities for travellers and operators alike. Its implementation is one of the key commitments by members of the International Union of Railways (UIC) and the Community of European Railway and Infrastructure Companies (CER) in the CER Ticketing Roadmap.

Sweden, which has one of the most competitive and open rail markets in the European Union, has adopted OSDM as the standard for its national ticket distribution, for rail and other transport modes, both for retail and distributors. The use case in Sweden also shows that OSDM can be used in addition to other standards. From the rail perspective, OSDM represents both a vision and now a reality of rail ticketing, that is more future-proof than the current situation and will benefit both operators and passengers. Moreover, OSDM is - by design – open source, so that OSDM is available for every player in mobility. OSDM implementation is ongoing, with six European Railway Undertakings to implement it by the end of this year and many more planning to deploy in 2025.

It is crucial that the information available to both the retailer and passenger is not unduly limited by the technical and functional requirements set out in any specification. For this reason, OSDM has been developed together with ticket vendors in full transparency with the European Union Agency for Railways (ERA). It is also important to note that the technical and commercial aspects of ticket distribution should be discussed separately. Technical specifications are designed to facilitate seamless data exchange for ticket distribution, while commercial agreements handle pricing, revenue sharing, and service-level agreements. Addressing these points separately is the most efficient way to achieve seamless international rail ticketing.

sqills

Sqills
4,399 followers
1yr •

Hej Sverige!

We are extremely excited to announce that SJ AB is now officially powered by S3 Passenger.

This modern solution by Sqills ensures SJ can improve on their customer experience while allowing them to introduce new customer offerings more easily.

The go live is only the beginning of what has already proven to be a successful partnership.

Find out why this go live is such an important step going forward, not only for Swedish rail travel, but also for the OSDM standard. Click the link below to read more.

https://lnkd.in/e_StdHtx

232 · 4 comments · 8 reposts

"Within a few years, it will be much easier for train travellers to plan and book journeys throughout Europe, and it will be much easier for the companies that sell the tickets to offer travel across all of Europe."

WP21, Sweden Demo 21.4 (MaaS platform for B2B intermodality - new booking system)

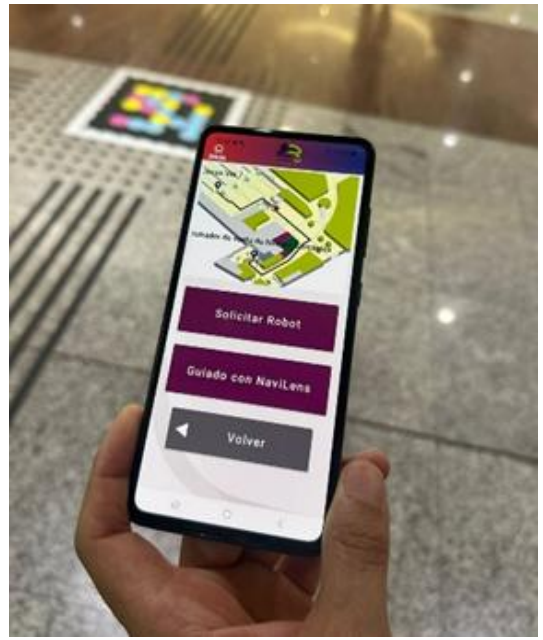
WP23 Demos – Services for inclusive rail-based mobility

Accessibility improvement demonstration in Málaga - Elements

Platform projections showing where the accessible carriage of the arriving train will stop.

An interactive totem that provides accessible information, suggested routes and support.

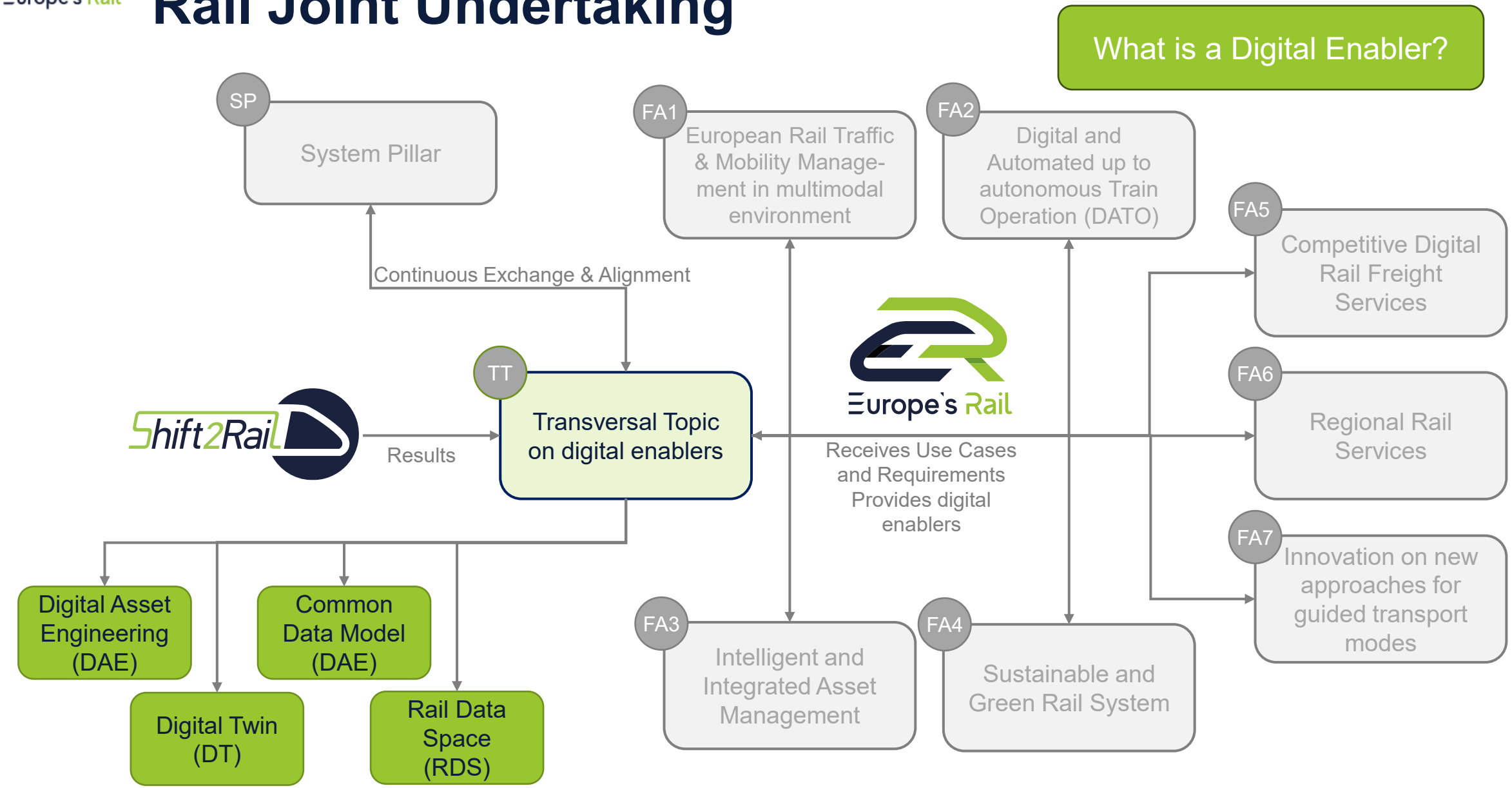
A guidance robot that accompanies travellers to their destination inside the station.



Integrated software that connects all the elements and generates tailored accessibility solutions.

Workstream 2 - Digital enablers
Progress and achievements

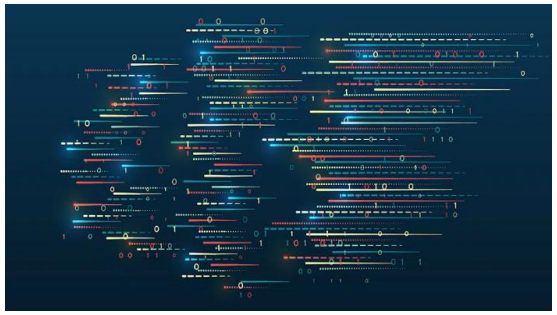
Digital Enablers Landscape in the EU-Rail Joint Undertaking



Addressing digital challenges of the Rail industry

Disruptions

- Disruptions in Rail operations
- Disconnected from other transport modes
- Supply Chain disruptions



Fragmentation of data

- Silos within and in companies
- Data storage and analysis based on individual use cases

Reluctance to share

- Security concerns
- Liability concerns
- Competitive concerns

Lack of interoperability

- Between data types
- Between standards
- Between data storages

Challenges result in underutilization of innovation potential
New approach needed!

2.Digital enablers

		2025	Q1 2026	Q2 2026
WS2 Digital Enablers	WP27			D27.5
	WP29		D29.1, D29.2, D29.3, D29.4	
	WP31		D31.2+D31.3, D31.4	

Event 1 – Digital Foundation
"Before smart trains, we need smart data"
29th of April 2026
Online

Digital Asset Engineering (DAE)

OBJECTIVE: The Goal of DAE is to fully digitalize the Engineering process of railway assets (CCS, Stations, etc.) to ease engineering work, reduce costs of development and testing, and reduce time to deployment.

Benefits

- Increases economic benefits by reducing entrance barriers to new markets
- Increased operation efficiency(predictive maintenance/Monitoring through DT)
- Optimize rail operation and reduce energy consumption and emission
- Automation saves time in design and construction phases.

Highlights 2025

•Data requirements for detection and data acquisition is complete with two datasets. The algorithm development successfully achieved.

•The data requirements document for ETCS level 2 with signals has been completed, and four datasets have been acquired. The development of the Automatic Planning Tool, including engineering rules is approximately complete.

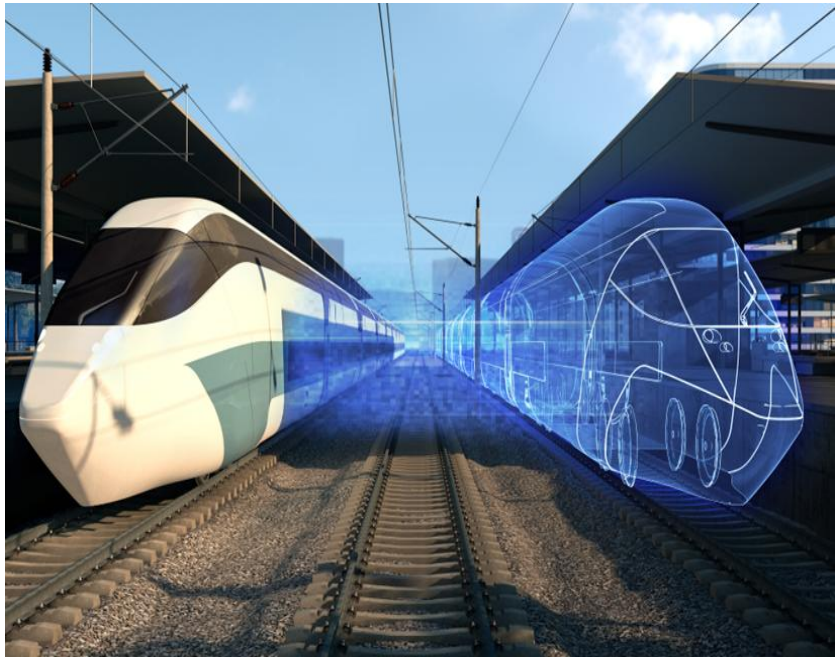
•Guidelines and standard document for acquiring, updating, and developing BIM/AIM data and models is about 80% complete,

Digital Twin (DT)

OBJECTIVE: The DT enabler aims to organise and support the assembly, verification, validation, testing and co-simulation of complex high-order Digital Twins. Modularity, interoperability and composability of the digital representation of the physical railway system are particularly in focus.

Benefits

- Increases Assets utilization and Sustainability
- Enables exchange of digital artefacts of railway assets
- Reduces operational cost through predictive maintenance
- New opportunities with AI



Highlights 2025

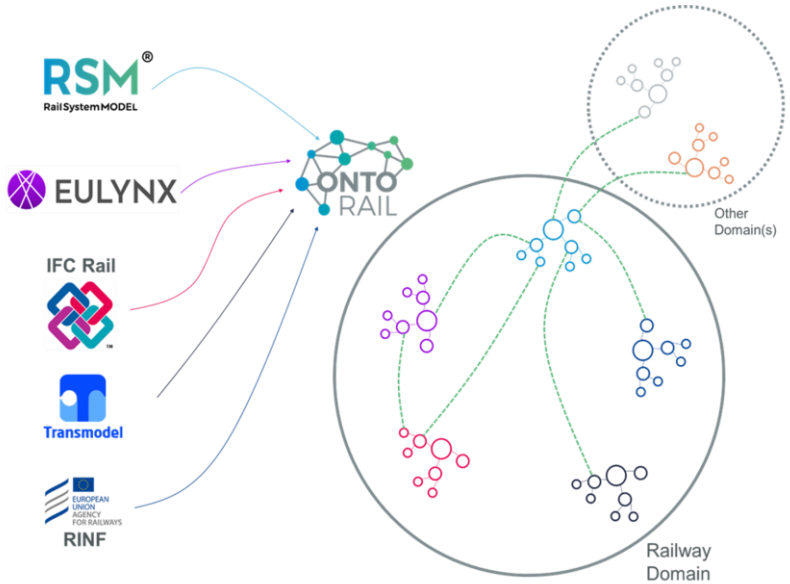
- Three use cases presented at the Modelica & FMI Conference https://doi.org/10.3384/ecp218. .
- Validated at TRL 5
- The created GitLab repository contains the Digital Twin support and design-time environment, and generic versions of proprietary use cases or the associated component models and assembly architectures, respectively,
- So far, use of off-the-shell simulation tools for the Digital Twin run-time environment. Co-simulation investigated as an alternative. (https://dcp-standard.org)

Conceptual Data Model (CDM)

OBJECTIVE: The Conceptual Data Model aims at creating a common standardised ontology based machine-readable model of the rail system domain, formally describing syntactic and semantic data structures.

Benefits

- Enables interoperability among source models
- Source of Knowledge for domain users
- Fosters reuse and maintainability of the information systems



Highlights 2025

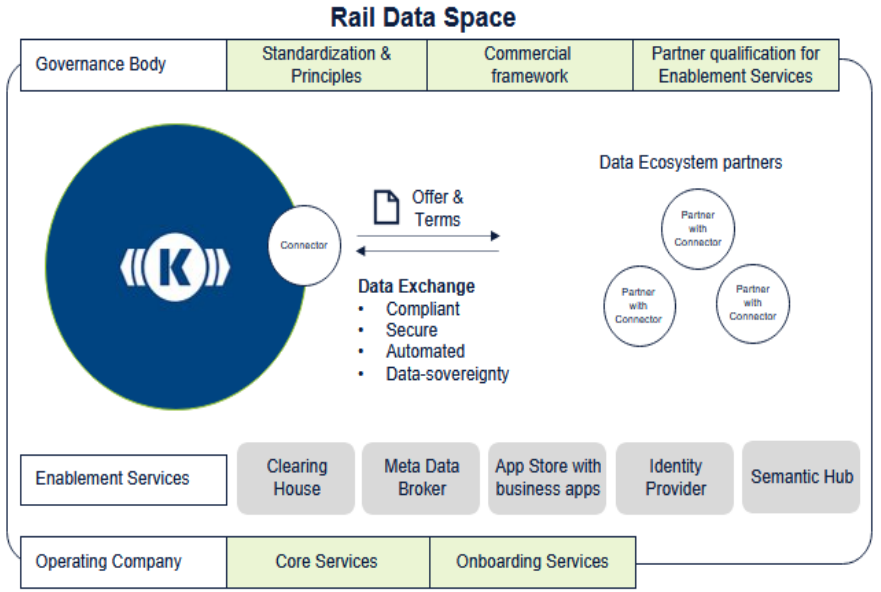
- **Ontologies:** localization, ports, rolling stock (typology, composition), telematics (domain-oriented)
- **Adapters:** GeoSPARQL update, ifcOwl (2024 continuation), SOSA/SSN (2024 continuation)
- Demonstrated solutions for automated or assisted ontology; Quality Assurance and JSON schema generation from a set of ontologies
- Development/publication of reference datasets; Successfully demonstrated the RDF serialization for topology representations and feedback to System Pillar on shortcomings of the SP CCS/TMS Scheibenberg dataset.
- **Collaboration with FP5** on the Intelligent Video Gate (identifying possible extensions to the ERA ontology through telematics domain-oriented ontology). Exploring collaboration with FP3 around asset management
- Ongoing work on maintenance-related use cases (lindometer, on-foot patrolling semantics)

Decentralized, open and secure Rail Data Space (RDS) to drive Rail Innovations

OBJECTIVE: The ERJU Rail Data Space aims to **create a trusted, reliable, and cybersecure ecosystem for data exchange within the European rail sector**, enabling interoperability and innovation across operators, infrastructure managers, and suppliers

Benefits

- Compliant with EU legislation including EU Data Act
- Maintain data ownership by defining who can access data and under what terms
- Full transparency and verification of data transactions
- Most efficient way to share data with multiple parties
- Shared costs of scalable data space infrastructure



Highlights 2025

- Finalization of Development Phase within Wave 1; Implementation of the extended data exchange methods to be used by the Federated Rail Data Space
- Development of first App-Store based on the user requirements.
- Onboarding of additional Participants to the sandbox environment
- Demonstration (Q2/2026) Use Cases selected. Held a public townhall meeting 01.07.25.

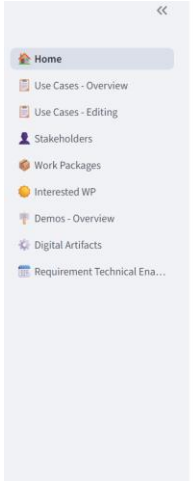
Common developments for the digital enablers

Database for the repository of use cases, designed to drive the development of digital enablers based on actual requirements, constraints, and timelines indicated by the different domains across Europe's Rail flagships.

The use cases will be more visible than in individual deliverables and make the railway and public transport community at large aware of the sheer number and variety of those cases.

Dissemination material and preparation for 2026, in particular

- Townhall meetings
- TRA papers,
- demos at the "Digital foundation event" encompassing all WPs of the digital enablers and beyond,
- Innotrans 2026 preparations.



Communication and Dissemination

Scientific Publications

MOTIONAL: Advancing the future of European railway systems through digitalization and integration

Marco Ferreira [1][0000-1111-2222-3333], Magnus Wahlborg [2][1111-2222-3333-4444], Lars Deiterding [3][2222-3333-4444-5555] and Anders Johnson [4][3333-4444-5555-6666]

[1,3] Hacon Ingenieurgesellschaft mbH, Lister Str. 15, 30163 Hannover, Germany
[2,4] Trafikverket, Röda vägen 1, 781 70 Borlänge, Sweden
marco.ferreira.smo@hacon.de

Abstract.
The Flagship Project "MOTIONAL", supported by Europe's Rail initiative, paves the way for implementation of the future European Capacity Planning and Traffic Management System, built on digitalization, automation, connectivity and multimodal integra

Proyecto FP1 Motional, vía libre hacia la digitalización

El proyecto de EU-Rail, FP1 Motional. "Gestión de l
dales y facilitadores digitales", tie
operativa de los

On the Fragility of a Train Timetable

25 Pages • Posted: 4 Jun 2024

Marta Leonina Tessitore
Università degli Studi Roma Tre

Giorgio Sartor
affiliation not provided to SSRN

Marcella Samà
Roma Tre University

Carlo Mannino
affiliation not provided to SSRN

Dario Pacciarelli
Roma Tre University

Vehicle System Dynamics ›
International Journal of Vehicle Mechanics and Mobility
Latest Articles
Submit an article | Journal homepage
146 Views | 0 CrossRef citations to date | 0 Altmetric
Review Article

A systematic review of acceleration-based estimation railway track quality

Adrián Sansiñena, Borja Rodríguez-Arana & Saioa Arrizabalaga
Received 26 Sep 2024, Accepted 19 Mar 2025, Published online: 26 Mar 2025
Cite this article | https://doi.org/10.1080/00423114.2025.2483972
Full Article | Figures & data | References | Citations | Metrics | Reprints & Permissions

Abstract

Track quality is crucial for the safety and comfort of train passengers, traditionally its quantification is made through rigorous track geometry measurements using expensive inspection systems. The adoption of on-board inertial sensors for track condition monitoring presents a cost-effective alternative, potentiall reducing maintenance and inspection expenses while enhancing passenger safety and comfort. Supporte

ELSEVIER
Transportation Research Interdisciplinary Perspectives
Volume 30, March 2025, 101350

Charting the landscape of rail human factors and automation: A systematic scoping review

Sarah A. Kusumastuti [a], Tom H.J. Kolkman [a], Julia C. Lo [b], Simone Borsci

[a] Faculty of Behavioural, Management and Social Sciences, Dep. Learning, Data and Technology, Human Factors Team of the CoDE Group, University of Twente, 15, Enschede 7521 PL the Netherlands
[b] ProRail, Department of Innovation and Development, Moreelsepark 3 3511 Netherlands
[c] Faculty of Medicine, Dep. Surgery and Cancer, NIHR UK HealthTech Research In Vitro Diagnostics, Imperial College of London, St Mary's Hospital, Praed S 1NY United Kingdom

Received 9 October 2024, Revised 31 January 2025, Accepted 31 January 2025, Available February 2025, Version of Record 12 February 2025.

Robust Routing in Railway Stations – Gen Assessing Robustness Concepts Using Ab

29 Pages • Posted: 27 Oct 2024

Philipp Widmann
affiliation not provided to SSRN

Norman Weik
affiliation not provided to SSRN

Abstract

Ensuring the feasibility and robustness of train operations in station phases is receiving more and more attention given the trend towar and network planning in railway systems. Existing approaches for robust stati either the maximization of buffer times between consecutive trains or the optimization of wo ths. In this work we develop a new exact robust routing approach that allows to minimize the ted primary delays, generalizing delay absorption concepts in timetable stability thodology is based on a MILP approach modelling delay dencies into account. We test our approach in a luated together with existing method can reduce

TRANSPORTATION SCIENCE
JOURNAL HOME | ARTICLES IN ADVANCE | CURRENT ISSUE | ARCHIVES | ABOUT | SUBMIT
Request Access | Tools | Share
Home › Transportation Science › Vol. 59, No. 1 ›

A 0,1 Linear Programming Approach to Deadlock Detection and Management in Railways

Veronica Dal Sasso, Leonardo Lamorgese, Carlo Mannino, Andrea Onofri, Paolo Ventura
Published Online: 13 Dec 2024 | https://doi.org/10.1287/trsc.2024.0521

Go to Section
Abstract

Abstract

In railway systems, a deadlock occurs when trains accidentally occupy positions that prevent each other from moving forward. Although deadlocks are rare events, they do occur from time to time, requiring costly recourse actions and generating significant knock-on delays. In this paper, we present a noncompact 0,1 linear programming formulation and a methodology for discovering (possibly future) deadlocks and the subsequent implementation of optimal recovery measures. The approach is implemented in a tool to dispatch trains in real time developed in cooperation with Union Pacific (UP) and currently in operations on the entire UP network.

Funding: This work was partially funded by Europe's Rail, Flagship Project MOTIONAL [Action Horizon JU Innovation, Project 101101973].

Supplemental Material

FP1 website news

Europe's Rail

FP1 MOTIONAL
European Rail Network and Mobility Management

Latest News & Events

WP21 Kick-off Meeting: Paving the Way for Multi-Modal Transport Integration

March 27, 2025

READ MORE →

WP9 Kick-off Meeting on Simulation and Operational Feedback for Enhanced Rail Planning

March 11, 2025

READ MORE →

Successful Kick-Off Meeting for WP7 in FP1 Motional

January 17, 2025

READ MORE →

Kick off Meeting of WP16

December 6, 2024

FP1-Motional project's Work Packages 15 and 16, with the scope of 'Linking TMS to ATO/C-DAS for optimised operations', held their 5th physical meeting on the 3rd and 4th of December 2024. Hosted by AŽD Praha at their headquarter in Prague, this meeting was attended by 29 participants from all ...

READ MORE →

FP 1 MOTIONAL, Plenary meeting - year 2 in Borlänge, Sweden.

10-02-2024

FP1 MOTIONAL
European Rail Network and Mobility Management

FP 1 MOTIONAL, Plenary meeting - year 2 in Borlänge, Sweden.

Flagship 1 team of experts from infrastructure managers, Railway undertakings and System suppliers met in Borlänge, Sweden, 7-8 February. Other collegue's joined online. The team discussed organisational and technical topics, plans, requirements and duties for the second project phase – the development phase year 2. All in order to improve planning and operational management of rail services and offers to meet the European goal of making rail the preferred mode of transport.

FP1 MOTIONAL at the Nordic region's largest fair for sustainable rail transport.

May 23, 2025

Magnus Wahlborg from Trafikverket represented Europe's Rail JU's Flagship Project 1 (FP1) -MOTIONAL at Train & Rail, the Nordic region's largest fair for sustainable rail transport. In his presentation, Magnus explained that the project will contribute to an interoperable, integrated ...

READ MORE →

FP1 MOTIONAL
European Rail Network and Mobility Management

Europe's Rail

Newsletter 11/2024

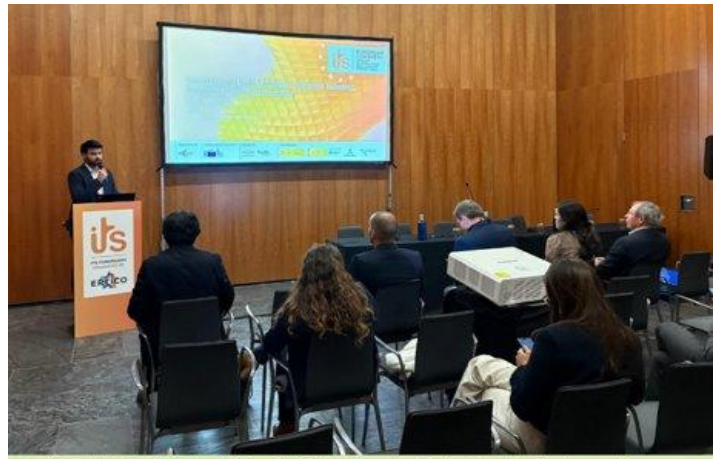
Welcome to the latest edition of our newsletter, where we share updates and insights from the Flagship Project 1 (FP1) MOTIONAL. In this edition, we highlight key milestones and provide a closer look at the progress we have made so far.

We hope you enjoy this edition!

Europe's Rail Flagship Project 1 - Mobility management multimodal environment and digital enabler

MOTIONAL Project: Transforming Europe's Rail Network

The FP1 MOTIONAL, a key initiative within Europe's Rail Joint Undertaking (EU-Rail), is an EU-funded collaboration led by Hacon and Trafikverket with 89 partners. FP1 MOTIONAL aims to modernise Europe's rail network through digitalisation, automation, and integration, establishing rail as a vital part of sustainable European transport for both passengers and freight.



Motional is Transforming Urban Mobility: Seamless Ticketing, Navigation and Sustainability

May 26, 2025

As part of the FP1- MOTIONAL project under Europe's Rail, Enrique Jiménez from Indra gave a presentation at the ITS Congress in Seville on the development of innovative solutions to enhance ticketing, navigation and payment systems within the scope of the project. These solutions use

FP1 MOTIONAL

FP1 conferences

FP1 MOTIONAL

Last gathering? - Plenary meeting in October 2025

Europe's Rail Joint Undertaking
16.396 seguidores
2 h •

The #FP1MOTIONAL Plenary Meeting took place in Munich DE on 29–30 October, bringing project partners together to advance European rail research and innovation toward a digitalised, interoperable and resilient rail system.

As MOTIONAL approaches its final year in 2026, discussions focused on the upcoming demonstration phases and and on how to best showcase the project's achievements across Europe.

✨ Key outcome: five Demo Dissemination Events will take place in spring 2026, presenting 80+ demonstrations and promoting knowledge exchange across the European rail community. ...mais

Exibir tradução

Você e mais 13 pessoas 1 compartilhamento

Dissemination Series

Event 1 – Digital Foundation
"Before smart trains, we need smart data"
29th of April 2026
Online

Event 2 – Seamless & Inclusive Mobility
"One Europe, one journey, zero barriers"
6 or 7th of May 2026
Madrid / Hybrid

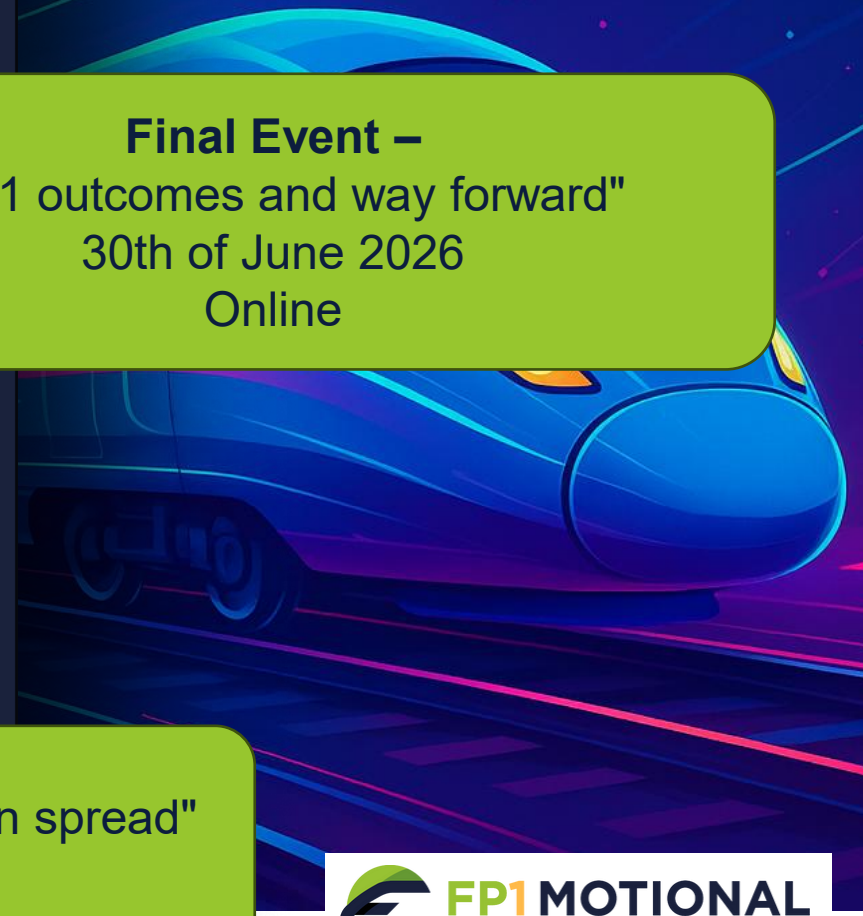
Event 3 – Cross Border Integration
"Making Europe's railways truly European"
May-June TBC
Stockholm / Hybrid

Event 4 – Intelligent Planning
"When algorithms create better plans than humans"
May-June TBC
Paris TBC

Event 5 – Real-Time Intelligence
"The thinking railway responds faster than problems can spread"
17th or 24th of June 2026
Utrecht / Hybrid

Stay Tuned!

Final Event –
"FP1 outcomes and way forward"
30th of June 2026
Online



Europe's Rail

FP1 MOTIONAL
European Rail Network and Mobility Management

Q&A session

FP1 MOTIONAL

FP1 MOTIONAL

Europe's Rail

Founding Members

Thank You !!!