



# Final Event





# Welcome !



**Giorgio Travaini**

Executive Director,  
Europe's Rail  
Joint Undertaking



**Cédric Gallais**

European Research  
Project Coordinator, SNCF





## Vision

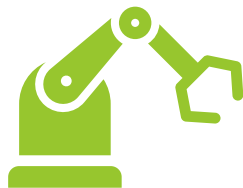
To deliver a **fully integrated  
European railway network  
for citizens and cargo.**

*Rail Research and Innovation  
to Make Rail the Everyday  
Mobility*

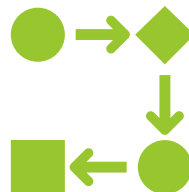




# Digitalisation and Automation in the rail industry



**SCALABLE**



**INTEROPERABLE**

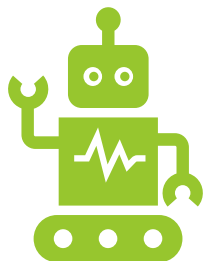


**COST**



**DIGITAL & FUTURE  
PROOF**





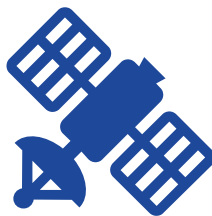
### Automation process

ATO up to GoA4

Perception

Remote driving

Automating functions



### Optimised headway

Moving Block, HTD

Train Positioning

Train integrity/length

NG brake

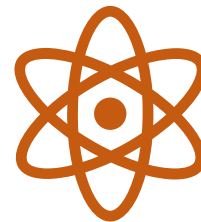


### Enabling digital technologies

Connectivity

Modular Platform

Digital register



### Innovative operational solutions

Self driving wagon

Virtual Coupling

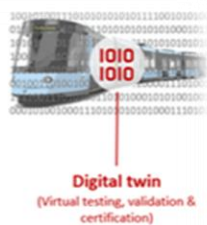
Autonomous route setting



# Flagship Area 2 | (some of the) key demonstrations in Phase 1



Short range / Train-to-Train Communications



Demo #1



The yard and track to Groningen Central Station



Remote Operating Center Utrecht



FP2 R2 DATO Europe's Rail



**FP6-FutuRe**  
Cost effective regional lines  
Development of Train for frugal lines





FA2 Phase 2 (2026→2029) & Phase 3 (2028→2029)

More demonstrations in **operational environment**  
Increased **maturity** of solutions

Input to architecture, regulation and standardization

Contribution to SP architecture and **STIP**  
Update of relevant standards and focus on providing  
key input for future CCS TSI updates



- Traditional Fragmented Approach:
  - ✓ Research delivers technical solutions (TRL 6-7/8 achieved)
  - +/- But implementation fails due to misaligned actors and processes
  - ✗ "Valley of Death": alignment R&I, standardisation, regulation, and pre-deployment
- A possible future Rail JU as Integrated Solution





# Future Directions: System Simplification Mission

A mission that centers on **simplifying the rail systems** and operations while enhancing its fundamental capabilities and **reducing its costs**.

Aiming to strengthen the Single Market and deliver a harmonised **Single European Rail Area (SERA)**

## FOCUS ON:

Agility

Resilience

Competitiveness

**Enhanced PPP framework** building on EU-Rail foundation:

- Expanded scope including **pre-deployment** activities
- Coordinate pre-deployment to **bridge innovation to market impact**
- **Greater inclusiveness**



Coordinated EU-level partnership

**€3 billion in R&I innovation** addressing the need for costly yet essential one-time developments of innovative solutions aiming to transition the diverse existing legacy systems into a new, simplified European rail system.

**€15 billion in pre-deployment** from the participation of diverse stakeholders across different countries to upgrade their systems and make investments in their network. Procurement activities to enable a first implementation at system level.



# Flagship Initiative 1 - European simplified and integrated rail system (ESIRS)

**Simplifying the system architecture** – based on but beyond ERTMS and deployment/update processes - ESIRS promises to **reduce** both **capital** and **operational expenditures** across the European rail system enabling the system competitiveness of densely operated as well as **low density lines**.

## SCOPE

- Full trackside CCS system solutions for ETCS only operations based on harmonised operational rules
- Automated operations and modular onboard in both urban and non-urban areas
- Future rail radio communication
- Future rail traffic and capacity management
- Common rail ontology and federated rail data space

## MATURITY

Builds directly on outcomes of Europe's Rail Joint Undertaking in the domain of **CCS**, **TMS** and **digital spaces** – carrying out the necessary pre-deployment activities to test and validate a simplified and more performant operation based on harmonised operational rules



# Flagship Initiative 2 - The Next-Generation Rail Freight Operations with European Digital solutions

Transforming European freight operations into a **unified, automated, and data-driven logistics ecosystem**.

By **automating processes** across the entire freight chain—from digital yard operations and intermodal transfers to on-train coupling and energy management—the initiative will deliver **faster transshipment, higher line capacity, and significantly lower lifecycle and logistics costs**.

## SCOPE

- It integrates **automation, digital coupling, intelligent capacity management, and multi-modal synchronisation** to boost rail's market share, operational efficiency, and environmental performance.
- It eliminates bespoke, nationally isolated freight solutions through harmonised specifications and corridor-level deployment, **ensuring true cross-border interoperability and efficiency**.

## MATURITY

This project builds directly on outcomes of Europe's Rail Joint Undertaking work on enabling the **DAC technologies** and **digital platforms** plus the Pioneer DAC train project. Advanced concept level with ongoing pilots, demonstrations, commercial testing and standardisation activities



# Flagship Initiative 3 - Resilient and Recoverable Railway System

An integrated approach to **physical, digital, and operational resilience**, interlinking **climate adaptation, cybersecurity, and civil-military interoperability**. To ensure that **Europe's rail backbone** remains **reliable, secure, and sustainable under any operational condition**—delivering continuity of essential transport functions for both citizens and strategic logistics.

## SCOPE

- Climate-resilient infrastructure
- Integrated cyber-physical protection systems and active surveillance
- Intelligent asset and health monitoring systems using digital twins, predictive analytics, and IoT
- Minimum viable operations including self-standing operation under massively disturbed conditions in adjacent networks
- Real-time operational resilience management supported by AI, interoperable with Crisis Management Systems

## MATURITY

This project builds on outcomes of Europe's Rail Joint Undertaking, having provided the core technologies but not yet the adaptation and focus to resilience



# Flagship Initiative 4 - Innovative EU High-Speed Rail Corridors

Developing a **harmonised, fully digital and climate-resilient high-speed system** that ensures efficient, zero-emission operations across national borders.

Evolve beyond today's fragmented architecture by integrating next-generation digital and clean technologies within a **single European framework**.

## SCOPE

- By unifying traffic management, enhancing traction technologies, digital twins, materials innovation, and predictive maintenance, it enables dramatic improvements in reliability, cost efficiency, and energy performance.
- Through corridors implemented as early pre-deployment pilots, the initiative will reduce travel times between major EU capitals, create seamless multimodal links, and strengthen Europe's industrial and technological sovereignty in high-speed mobility.

## MATURITY

The flagship builds on outcomes of Europe's Rail Joint Undertaking, notably on **ERTMS**, traffic management systems (**TMS**), **asset management** and **cybersecurity**.



# Agenda





## Back to the beginning

*Our initial challenges and vision*

## People, Technologies, Processes : the FP2-R2DATO collaboration journey

*Working together across partners*

## Technical convergence

*Bringing technologies together*



## From DATO to better rail services

*What will passengers actually gain?*

## Key Performance Indicators

## Business Cases



## What we delivered

*Demonstrators introduction*

## Rotation 1

## Rotation 2



## Rotation 3

## Rotation 4

## Celebrating R2DATO wave 1

*Awards & quizz*

## Conclusion



# 1. Back to the beginning

*Our initial challenges & vision*



**Jean-Baptiste Simonnet**  
System Architect  
SNCF



**Philippe Prieels**  
Former X2Rail-4  
coordinator  
Alstom



**Michael Meyer zu Hörste**  
Former X2Rail-5  
coordinator  
DLR



## Back to beginnings

### Learning from collaboration on ERTMS...



SERA and ERTMS context

→ needs for collaboration with demanding expectations



Technology challenge

→ enablers for high performance



Maturity challenge

→ ITD to support coherent design and implementation



Boosting innovation and industrialization

→ integrating design communities on a continental scale



# ERTMS is a necessary brick for SERA

ETCS is a **hard rail system transformation started in the 90's**

Need harmonization across the sector but also collaborative research & innovation

## Report on ERTMS Longer Term Perspective (2015)

### Game changer

ETCS L3

ATO

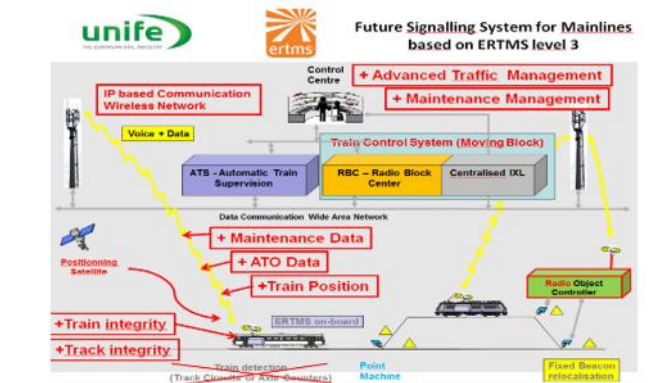
Braking curves

NG Com

Satellite positioning

**Secure stability while  
preparing evolution**

← 5 game changers  
Larger system challenges →





## Back to beginnings

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→ enablers for high performance

X2RAIL

Maturity challenge

→ ITD to support coherent design and implementation

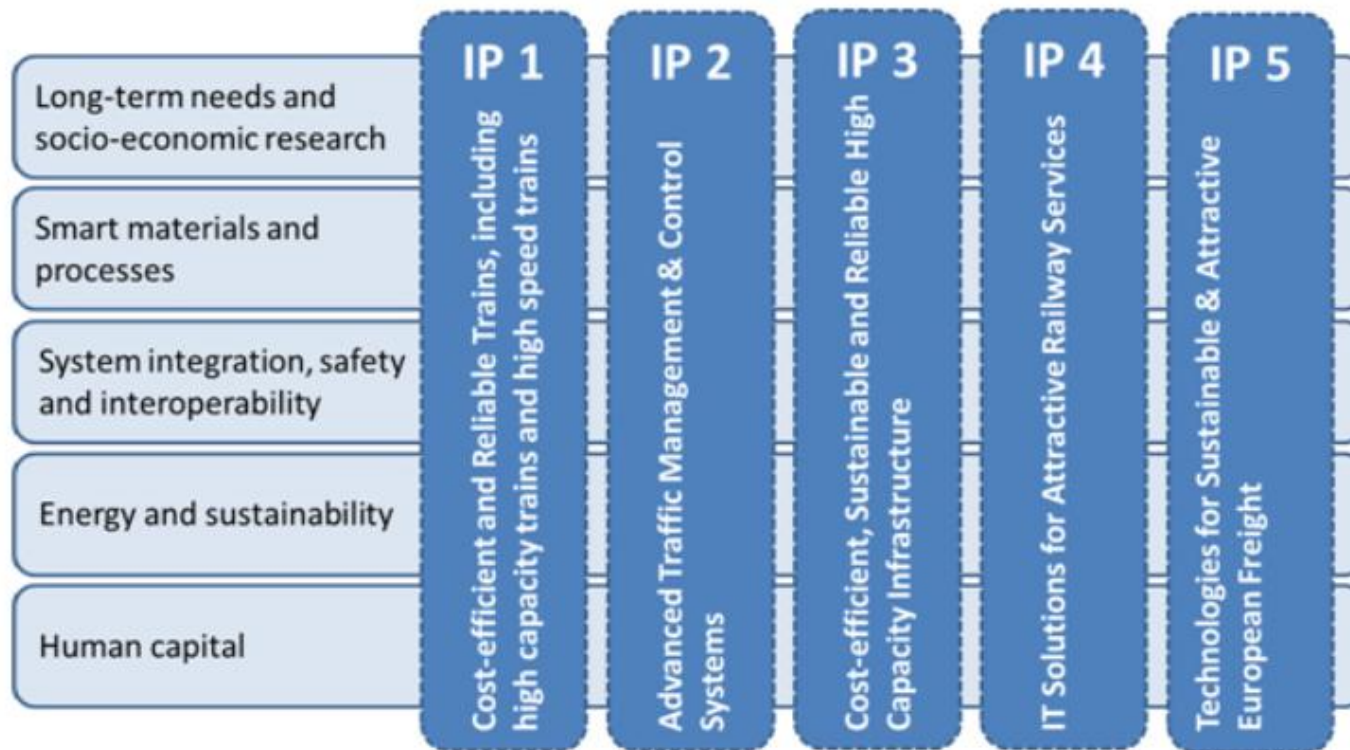


Boosting innovation and industrialization

→ integrating design communities on a continental scale



## Shift2Rail structure





## Shift2Rail IP2: 11 Technological Demonstrators (TDs) becomes TE

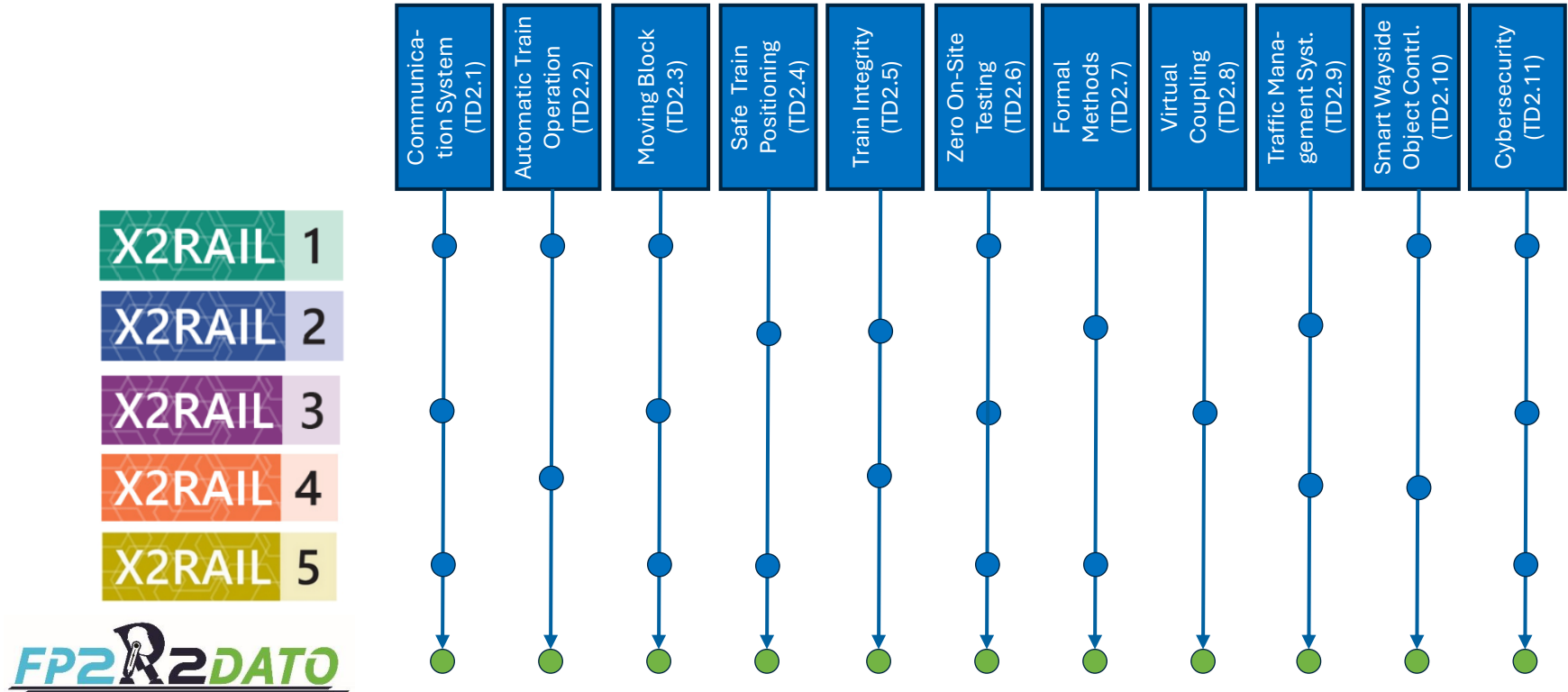
### IP 2

#### Advanced Traffic Management & Control Systems

<b>Communication System (TD2.1)</b>	<b>Connectivity solutions (FA2 TE5)</b>
Automatic Train Operation (TD2.2)	ATO up to GoA4 (FA2 TE01)
Moving Block (TD2.3)	ETCS Hybrid Train Detection and Moving block systems (FA2 TE10)
Safe Train Positioning (TD2.4)	Absolute safe train positioning (FA2 TE02)
Train Integrity (TD2.5)	Train Integrity (FA2 TE03)
Zero On-Site Testing (TD2.6)	Platform and facilities for testing, validation and (virtual) certification (FA2 TE14)
Formal Methods (TD2.7)	Platform and facilities for testing, validation and (virtual) certification (FA2 TE14)
Virtual Coupling (TD2.8)	Virtual Coupling (FA2 TE11)
TMS (TD2.9)	FA1
SWOC (TD2.10)	FA6, FA3
Cybersecurity (TD2.11)	FA1 TT



## IP2: 5 X2Rail-x Projects addressing the 11 TDs

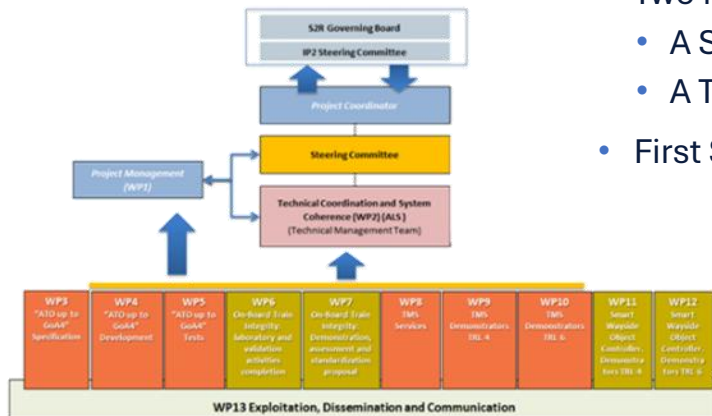




## What did Shift2Rail IP2 bring? An organisational structure

Organizational structure with:

- Split of the work into Work Packages → decentralised management
- Two management committees:
  - A Steering Committee (Non-technical decision making body)
  - A Technical Management (Technical decision making body)
- First System Coherence activities with a dedicated transverse WP





## What did Shift2Rail IP2 bring? X2Rail-4 reference logical architecture

### X2RAIL 4

#### Foundation for System architecture

made of logical components with logical interfaces (FIS level)

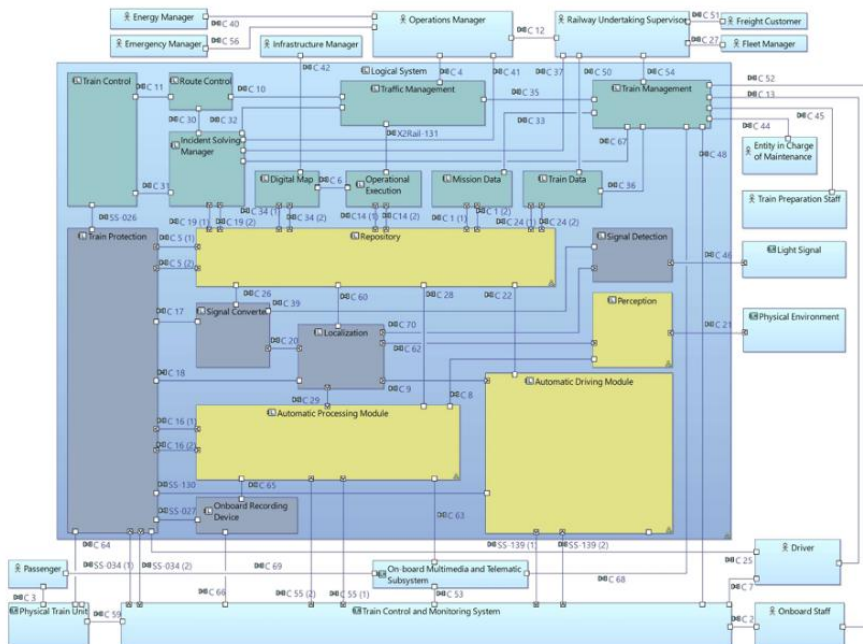
#### ATO up to GoA4 on-board logical components:

- Automatic Driving
- Automatic Processing
- Repository
- Perception

Other on-board logical components

Trackside Logical components

Railway system actors



Start to integrate feedback from CONNECTA, OCORA, RCA, SFERA, TAURO...

MBSE approach based on Arcadia method and using Capella tool

Interoperability and / or interchangeability



## Back to beginnings

### Learning from collaboration on ERTMS...



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→ needs for collaboration with demanding expectations



Technology challenge

→ enablers for high performance

**X2RAIL**

Maturity challenge

→ ITD to support coherent design and implementation



Boosting innovation and industrialization

→ integrating design communities on a continental scale



## Maturity challenge: ITD to support coherent design and implementation

- The pathway to demonstrate maturity is:
  - Design and implement the Technical Demonstrators (TD in Shift2Rail) / Technical Enablers (Europe's Rail)
  - Demonstrate them individually in Lab and on-site
  - Integrate them and demonstrate as Integrated Technical Demonstrator (ITD) on-site coherency and maturity
- Integrated Technical Demonstration (ITD) in X2Rail-5:
  - Technical Demonstrators integrated:
    - Train Integrity Monitoring System (TIMS) (coordination with X2Rail-4)
    - Adaptable Communication System (ACS)
    - Moving Block (MB)
  - On-Site, in an operational railway environment:  
ERTMS National Integration Facility (ENIF) UK, Summer 2022





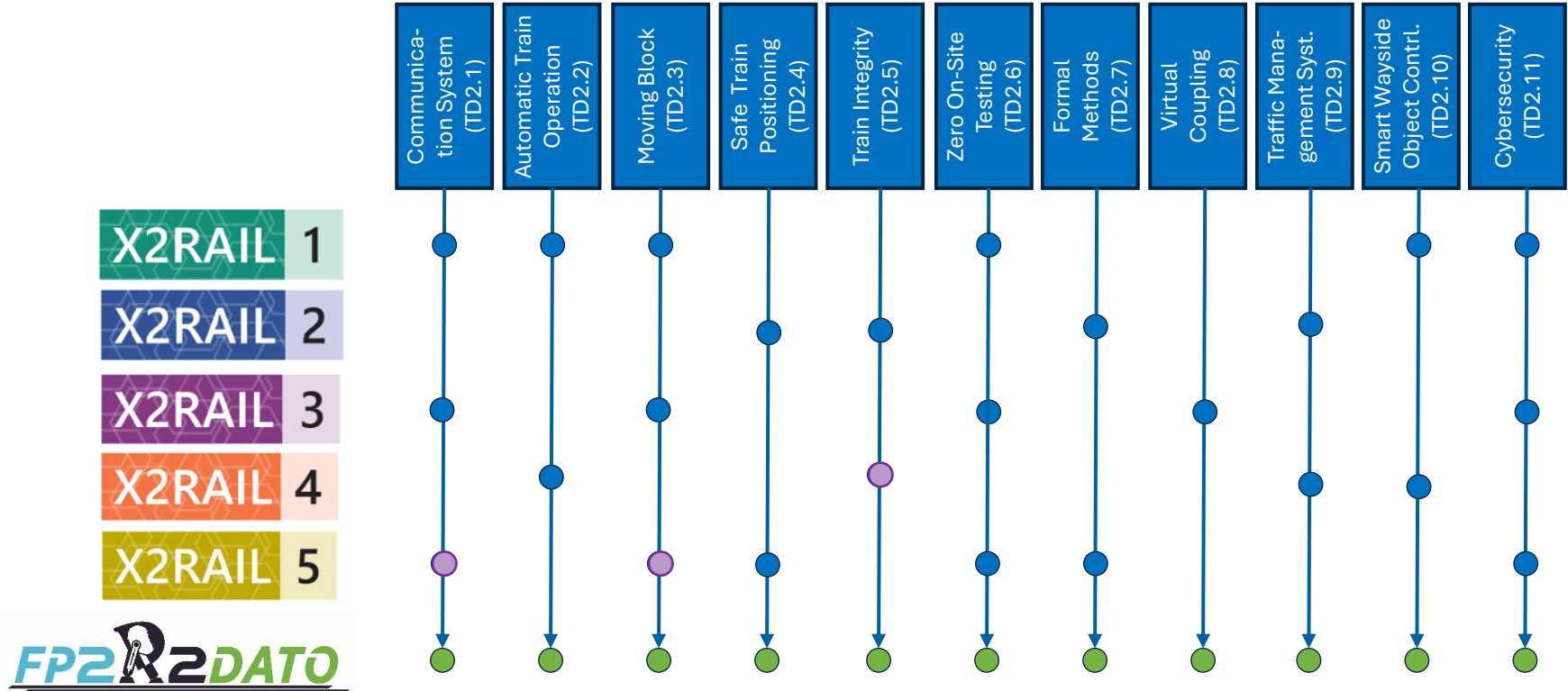
## Maturity challenge: ITD to support coherent design and implementation



Source: Network Rail X2Rail-5 ITD Video: (845) [X2Rail-5 Project - Integrated Technical Demonstrator - YouTube](#)



## IP2: 5 X2Rail-x Projects addressing the 11 TDs





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Technology challenge

→ enablers for high performance

X2RAIL

Maturity challenge

→ ITD to support coherent design and implementation



Boosting innovation and industrialization

→ integrating design communities on a continental scale



# Boosting innovation and industrialization

## Europe's rail challenges



Reconcile interoperability experts



Integrate ERTMS game changers



Build design communities



Integrate technologies in a system of system

EU-Rail program is a path in complexity.



# EU-Rail leverage learning communities



## Infuse new technology in a complex system

- A multi-layered challenge: from science to operations.
- Address diverse industrial and operational expectations and cultures.



## Develop common understanding and coherence

- Specification to consolidate existing knowledge and open issues
- System coherence needs a framework and stepwise baseline releases



## Anticipate and simplify system migration

- Reconcile needs and solutions, and perspectives from users and suppliers
- Converge data and standardize key interfaces to enable new innovations

**FP2-R2DATO project builds on a path integrating rail diversity,  
a new step to develop rail performance and resilience ?**





## 2. People, Technologies, Processes - The FP2-R2DATO collaboration journey

*Working together across partners*



**Bettina Doetsch**  
FP2-R2DATO Flagship  
Project Manager





Insert video Q1 here





# FP2 R2DATO project ´s complexity



## TECHNOLOGIES

- high complexity due to many interconnected technologies
- integration across different systems and domains
- differences in terminology and technical understanding
- balancing high-level design with detailed implementation



## PROCESSES

- ensuring consistency in a large, complex organization
- managing interdependencies across projects & systems
- fragmentation across work packages and deliverables
- time pressure and delivery constraints



## PEOPLE

- diverse & numerous stakeholders with different interests
- managing cultural & skill diversity
- misaligned expectations, priorities & ways of working
- communication gaps across disciplines & organizations







Insert video Q2 here



# FP2 R2DATO mastering complexity – collaboration approach



## TECHNOLOGIES

- shared system understanding & architectural alignment
- integration frameworks & baseline management
- feedback from testing & validation into development
- start of cross-disciplinary technical coherence



## PROCESSES

- clear governance, structure & defined responsibilities
- regular, structured exchange across all project levels
- iterative alignment mechanisms & feedback loops
- shared goal-setting to align diverse stakeholders



## PEOPLE

- open, trust-based communication & active listening
- strong collaboration mindset with willingness to go beyond roles
- facilitation through key roles [e.g. integrators, coordinators]
- motivation & enthusiasm fostering a positive working culture



## FP2 R2DATO summary

people enable collaboration through **trust, openness & active facilitation**, creating the cultural foundation for effective teamwork and innovation



technology supports collaboration by enabling **system-wide coherence, integration & evidence-based improvement** through technical feedback loops

processes ensure collaboration works in practice by providing **structure, alignment mechanisms & continuous coordination** across teams and stakeholders





THANK  
YOU





# 3. Technical Convergence

*Bringing technologies together*



**Bastian Simoni**

Railway Automation  
Senior Expert

Alstom



**Andreas Steingröver**

Senior Principal Key Expert  
Rail Automation Solutions

Siemens



**Ana Cuervo**

Railway Technology &  
Innovation Engineer

INECO-ADIF



**Jean-Baptiste Simonnet**

System Architect

SNCF



**Pieter Vreeswijk**

Lead Architect

NS



# It all starts with Technical Enablers

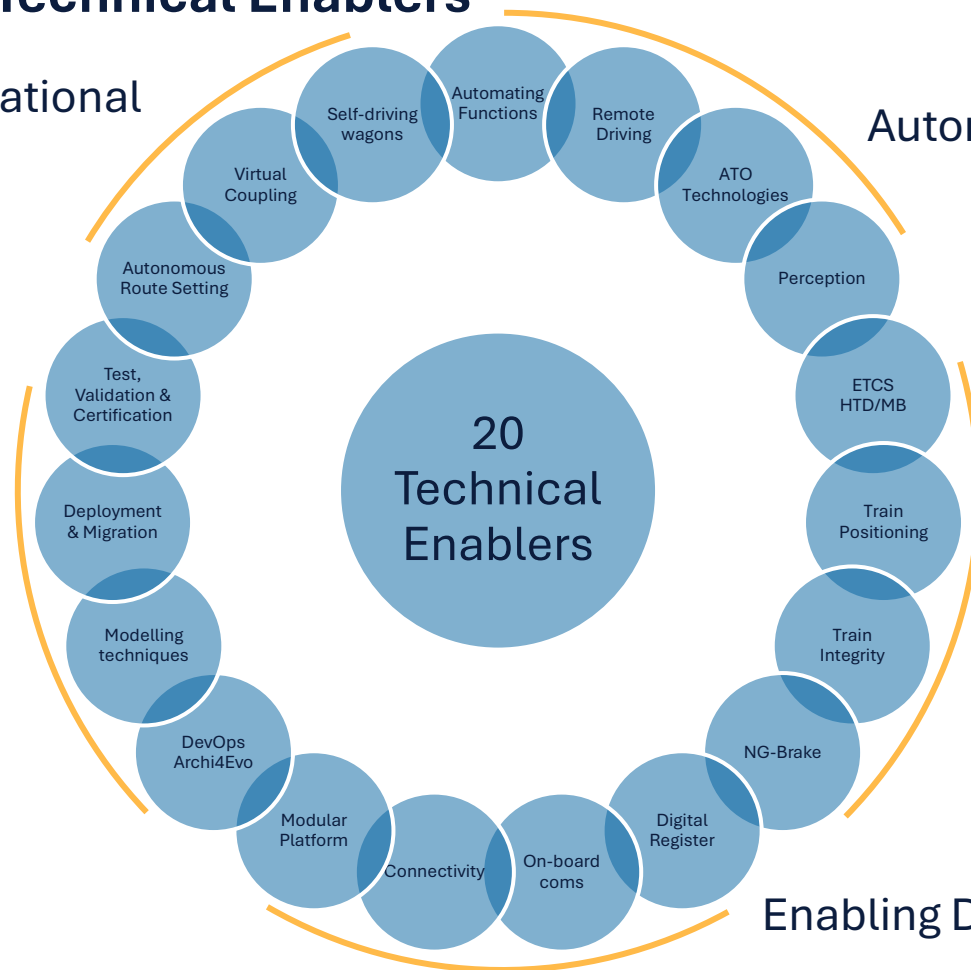
Innovative Operational  
Solutions

Automation Processes

Optimized  
Headway

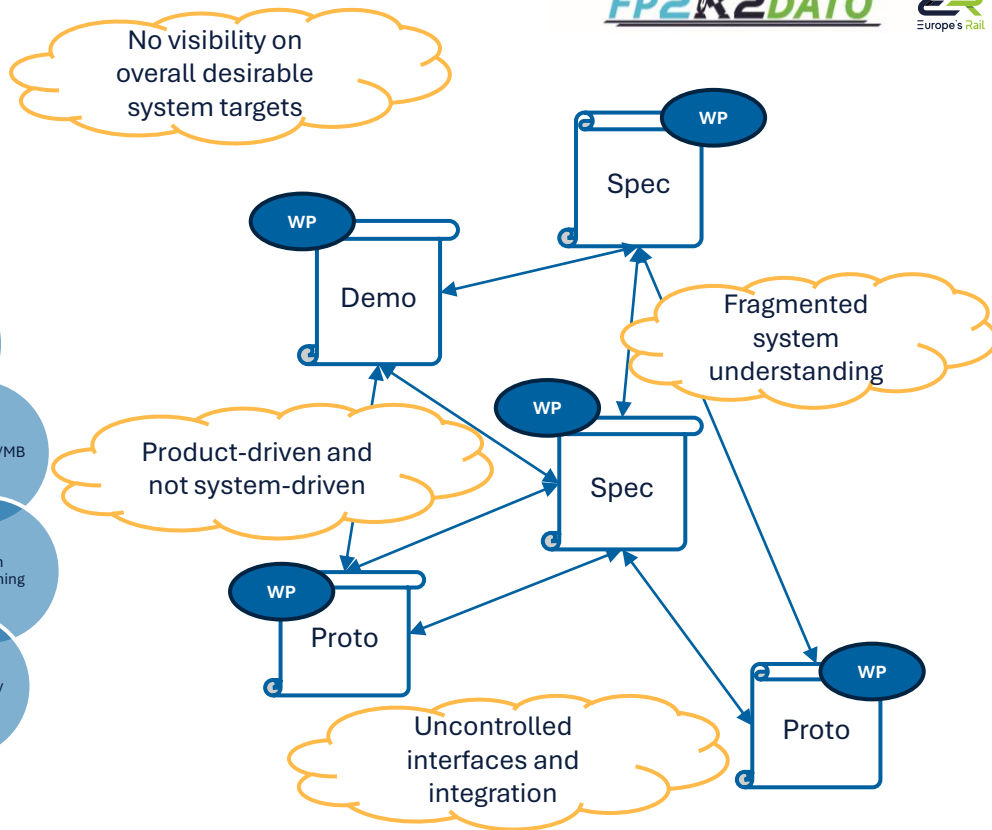
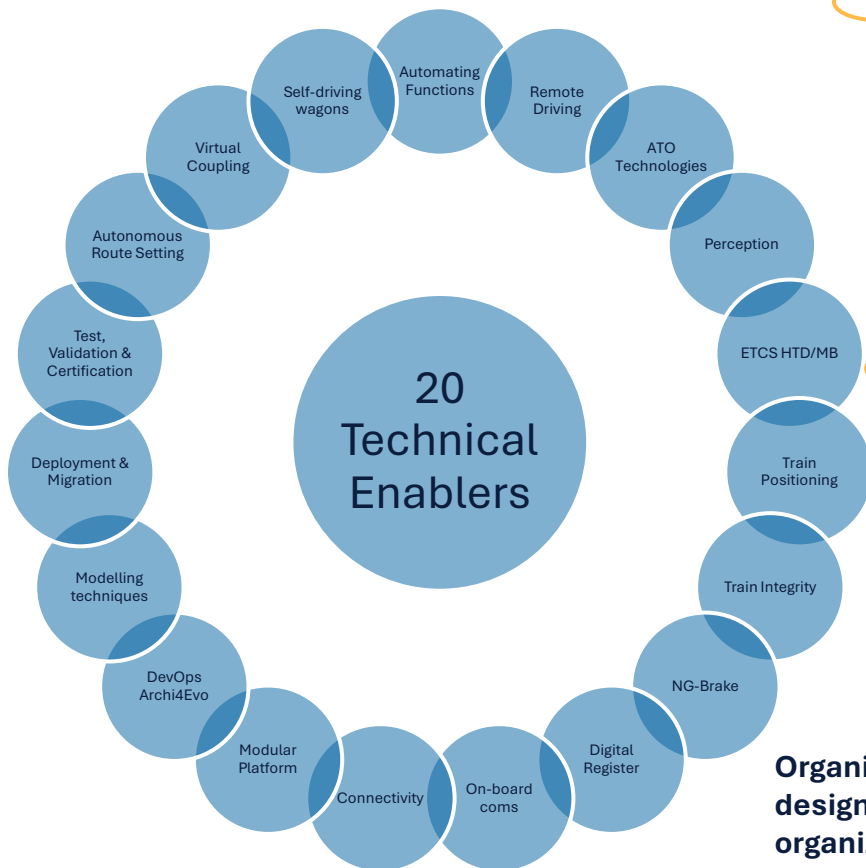
Fast & Effective  
Deployment

Enabling Digital Technologies





## Why convergence is key

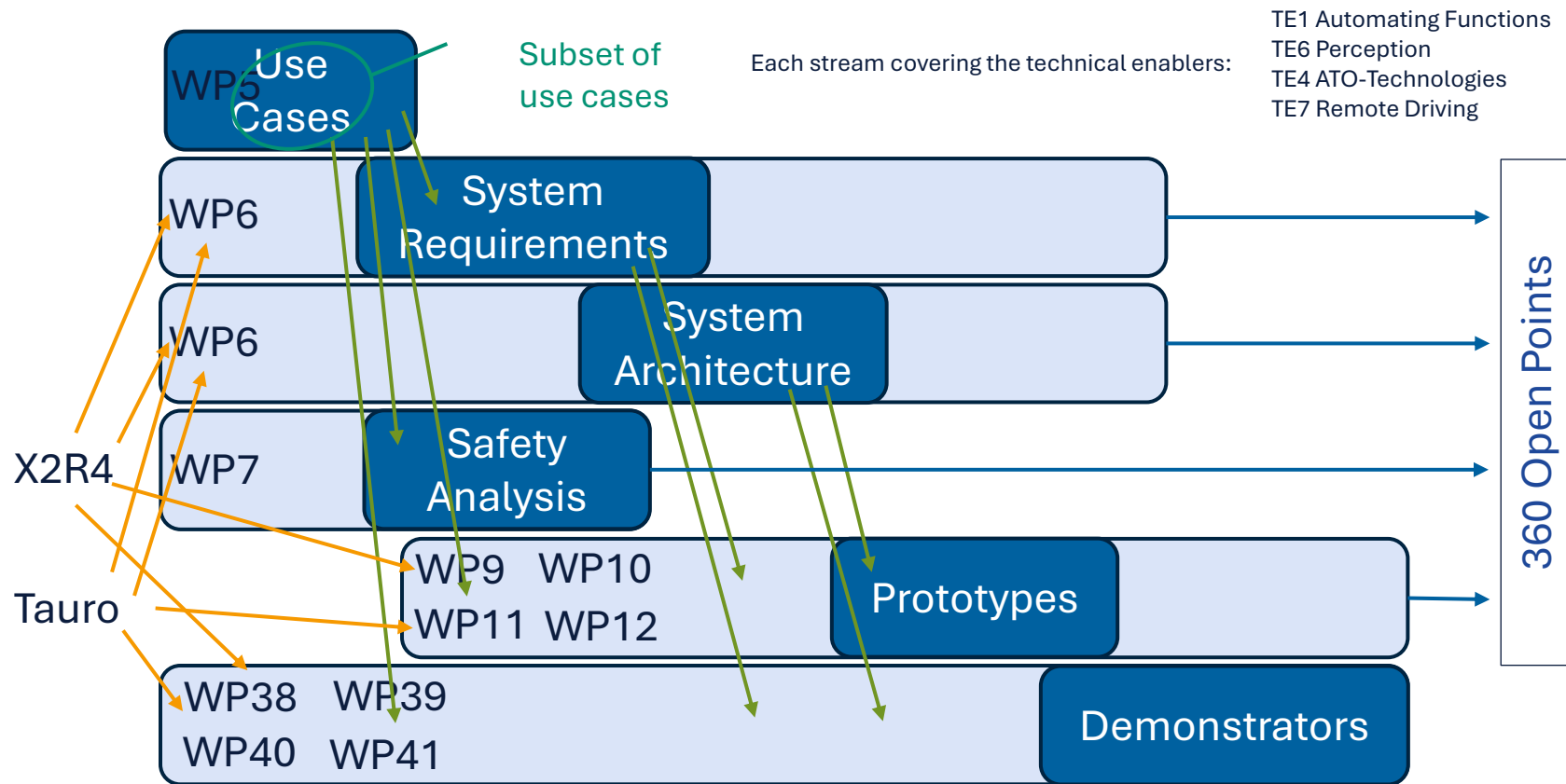


**Organizations which design systems are constrained to produce designs which are copies of the communication structures of these organizations.**

—Melvin E. Conway, How Do Committees Invent?



## Technology integration at cluster level: example Automation Processes



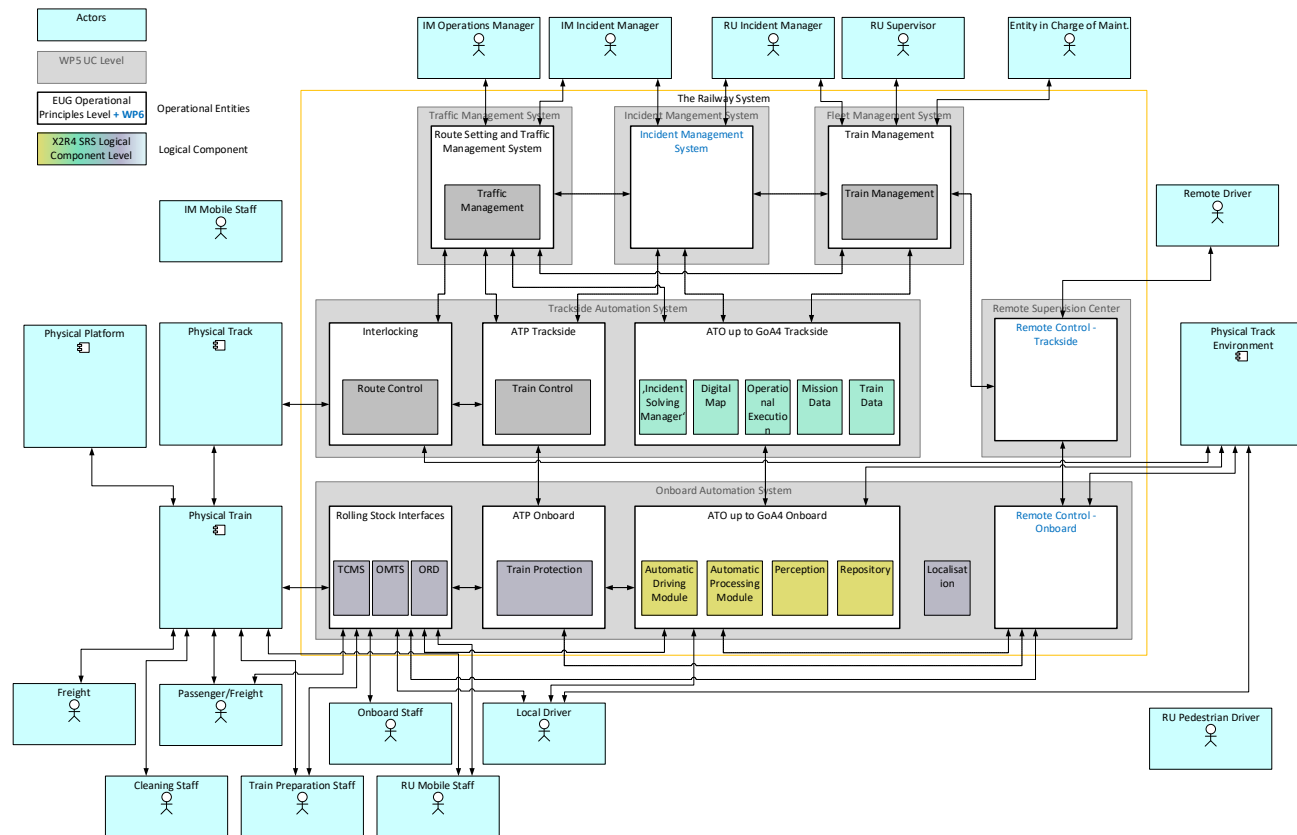


# Technology integration at cluster level: example Automation Processes

## High Level System Architecture and Actors

### ,Technical Core Team‘:

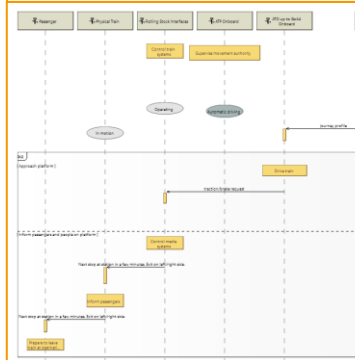
- experts from the major contributors
- to prepare technical topics
- to propose solutions
- to define a ,High Level System Architecture‘
- to align between different tasks
- to determine modelling methodology with Capella tool





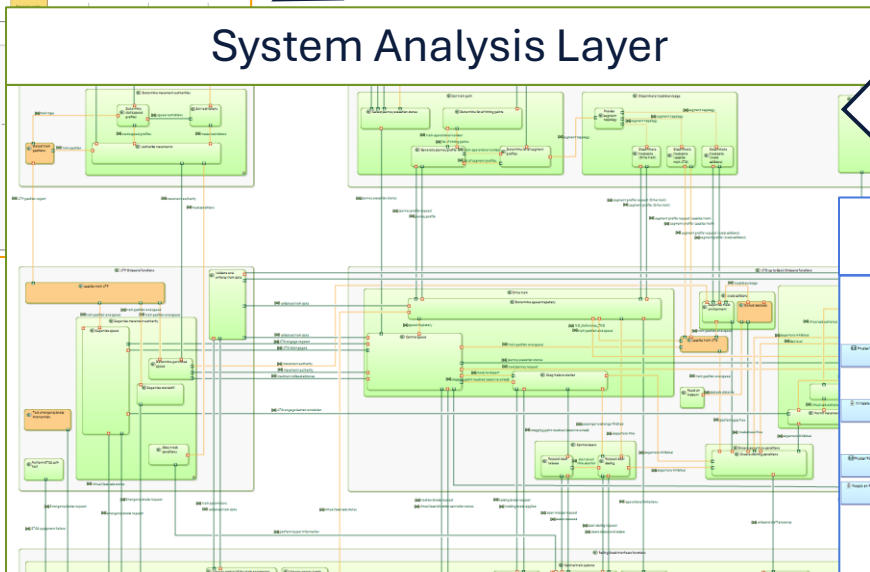
# Technology integration at cluster level: example Automation Processes

## Operational Analysis Layer

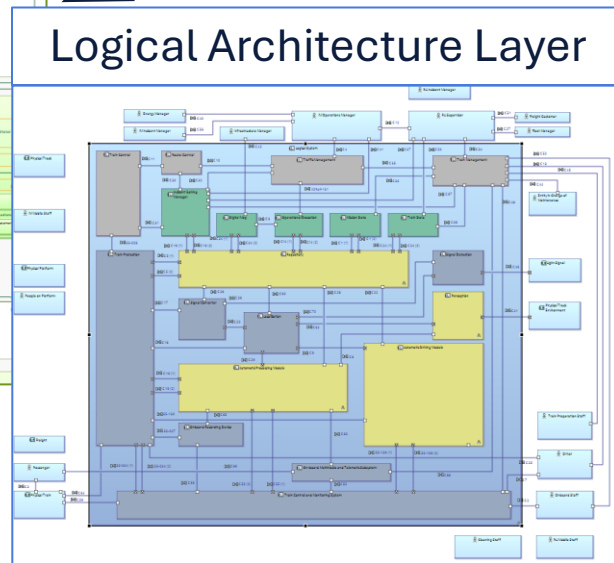


ATO up to GoA4 Capella Model

## System Analysis Layer

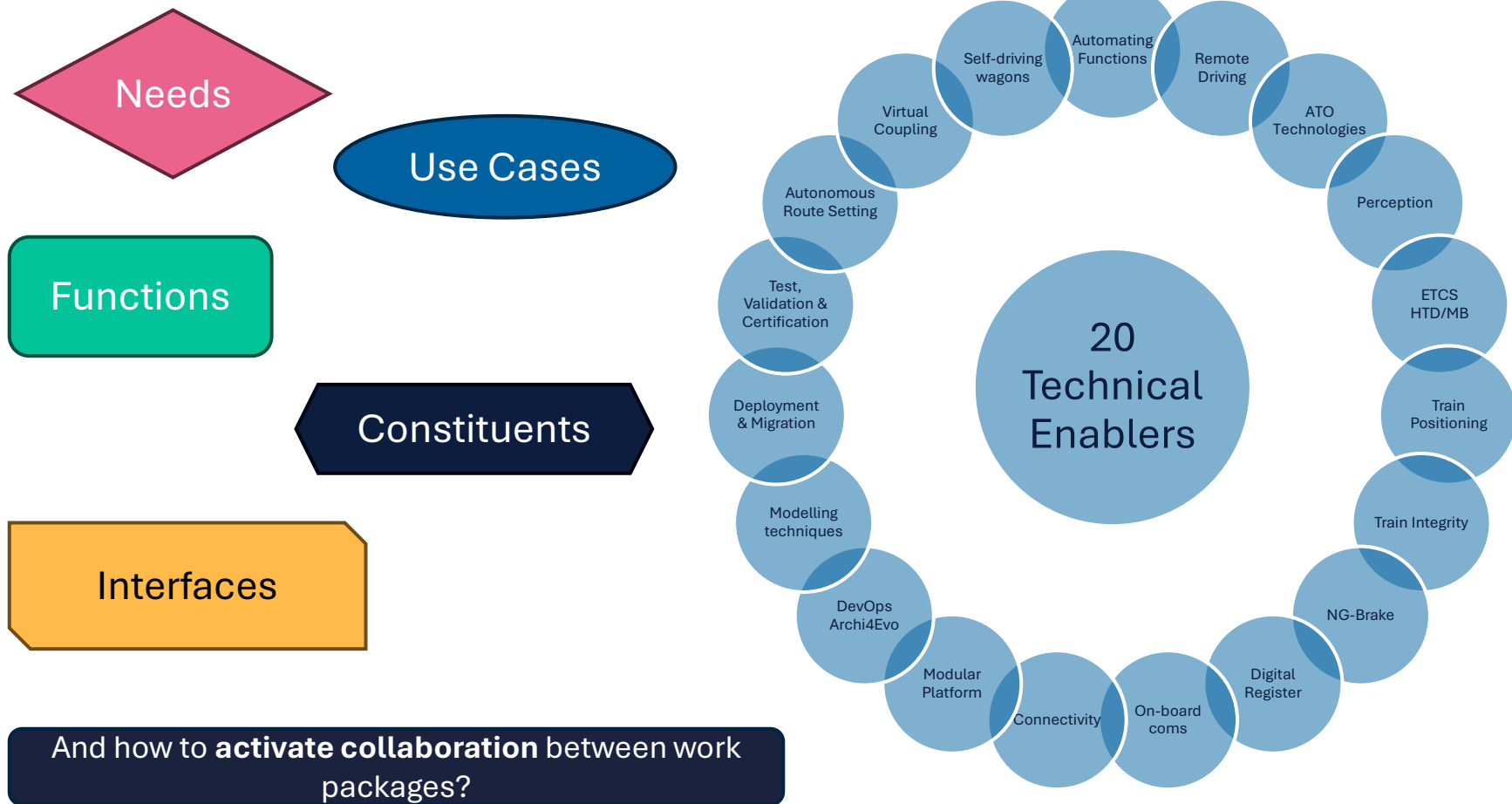


## Logical Architecture Layer





# How to qualify Technical Enablers ?





## Technology integration at project level: catalogue of artefacts

### Why a Catalogue of Artefacts?

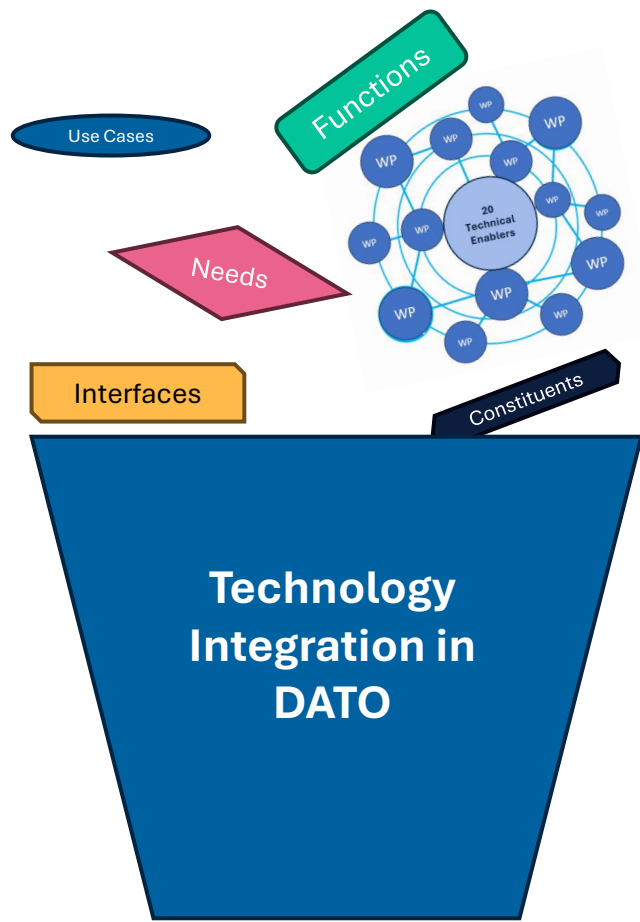
What **needs** does the WP address?

What **use cases** does the WP cover?

Which **function** belongs to which WP?

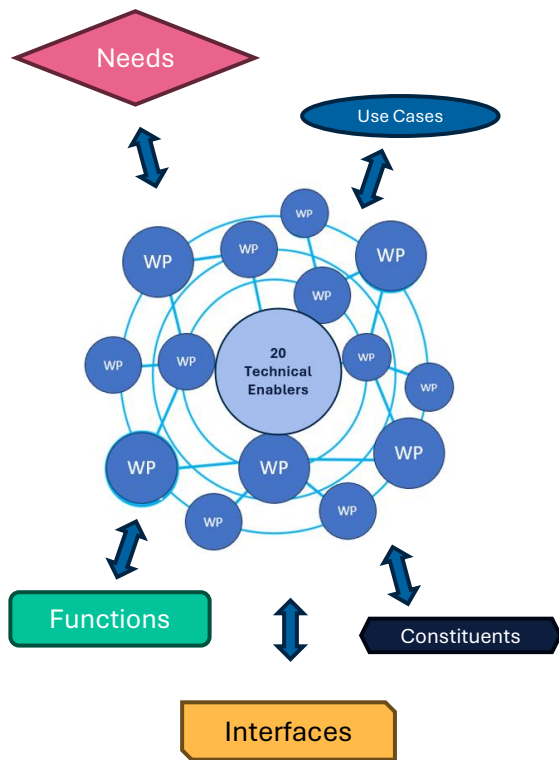
Which **constituents** are addressed in each WP?

Which **interfaces** impact other WPs?





## Technology integration at project level: catalogue of artefacts



### Catalogue of Artefacts

Catalogue of Stakeholders

Stakeholders iteration

Catalogue of Use Cases

Relevant **DATO Use Cases** characterized

Catalogue of Functions

**Functions** and **Technical Capabilities**

Catalogue of Constituents

Logical and physical **constituents** and **interfaces**

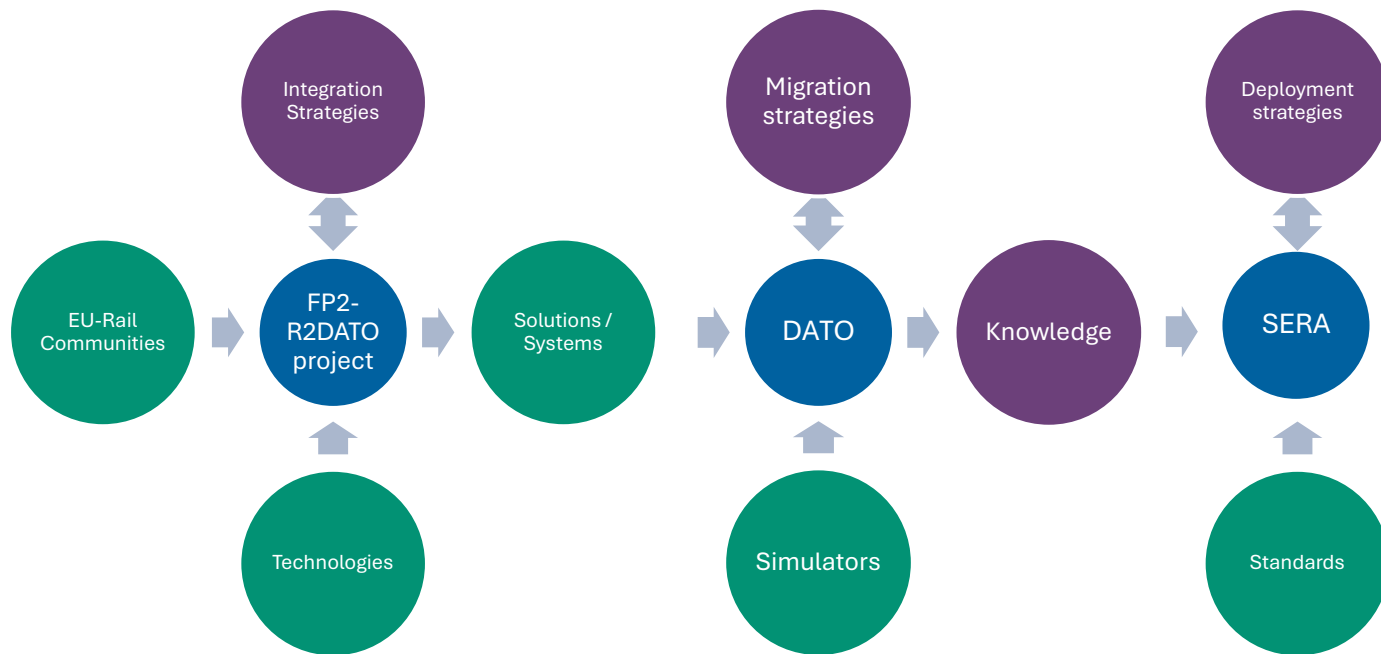


# Different demos, and a same system ?





## DATO System of Systems integrates FP2-R2DATO knowledge to facilitate SERA deployment



FP2-R2DATO contributes to **DATO System of Systems** design to support System Pillar in consolidating the **Single European Railway Area**



# Integration within the eco-system

## DEPLOYMENT GROUP

### System Pillar

Harmonized  
Operational Concept

Support Single  
European Railway  
Area

Functional system  
architecture

Single  
gouvernance &  
coordination body

Common  
EU railway system view

CONTINUOUS  
EXCHANGE

### Innovation Pillar

Flagship Projects



User-focused  
Research &  
Innovation

Exploratory,  
fundamental R&I

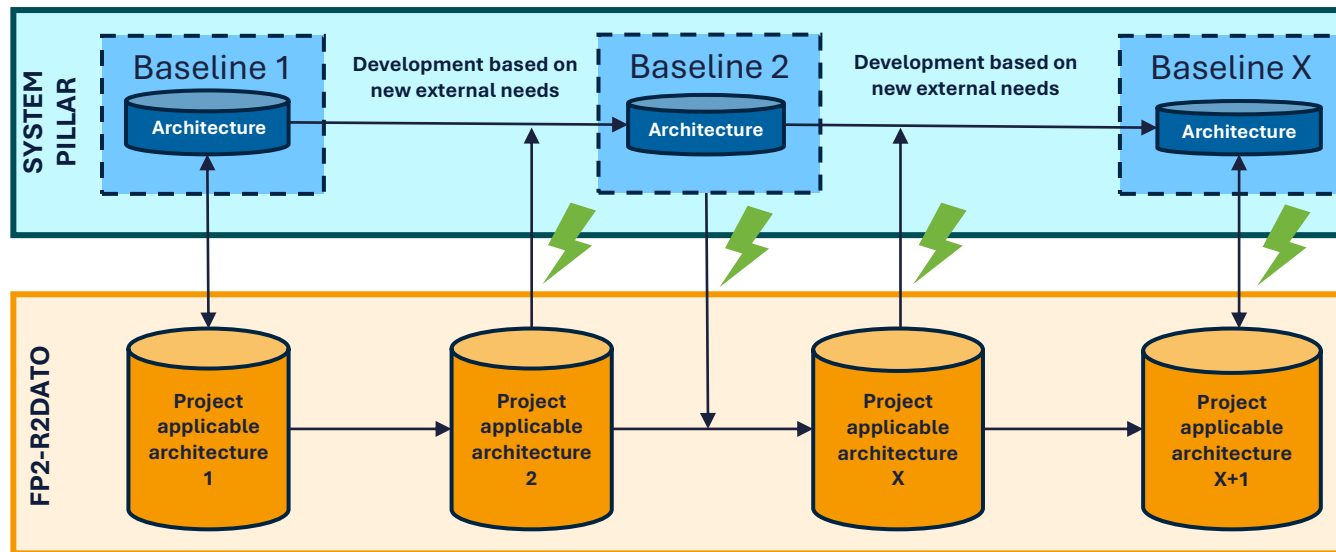
Large-scale  
demonstrations.


Technological and operational  
solutions



# System Pillar target release as a basis

System pillar will translate **new goals** within its target architecture. Based on the target architecture **any affected innovation pillar project should be determined**



 Updates on architecture and requirements

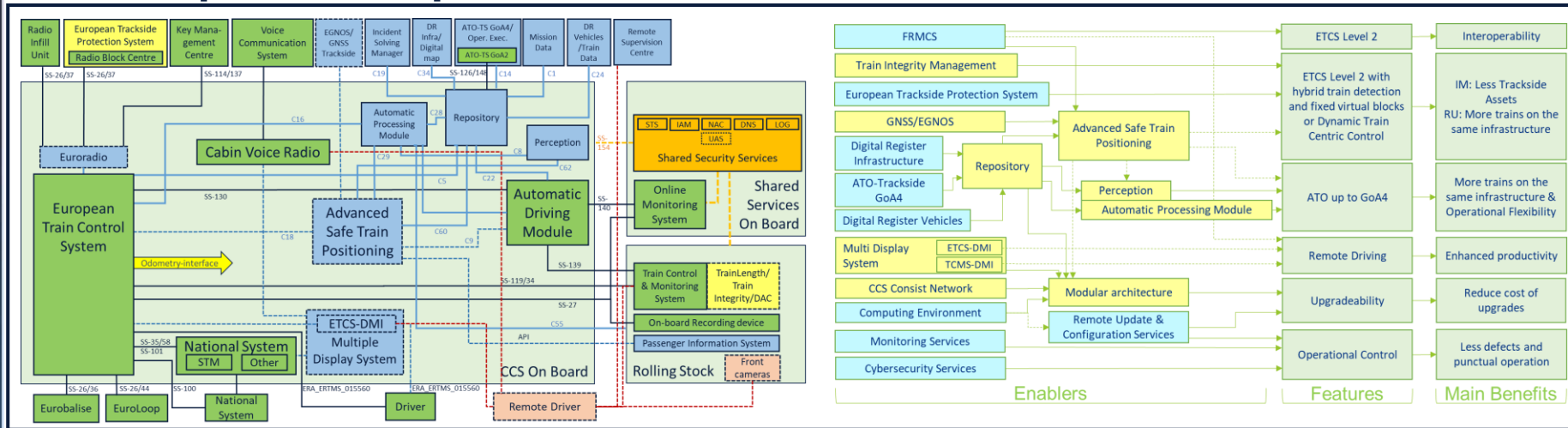
The system and innovation pillar should be able to develop **uncoupled** from each other.

The **interface** to align developments and decide on potential inconsistencies **can be done with architecture**.

For the innovation pillar the applied architecture should be kept up to date with the state of play of the innovation pillar. Using the architecture to consise relation with the evolving system pillar can be managed.



# The Adapter concept

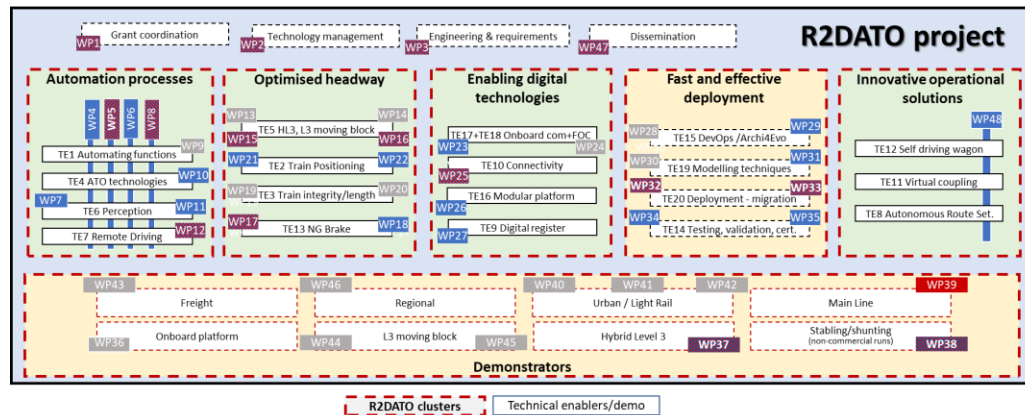


## System Pillar outputs



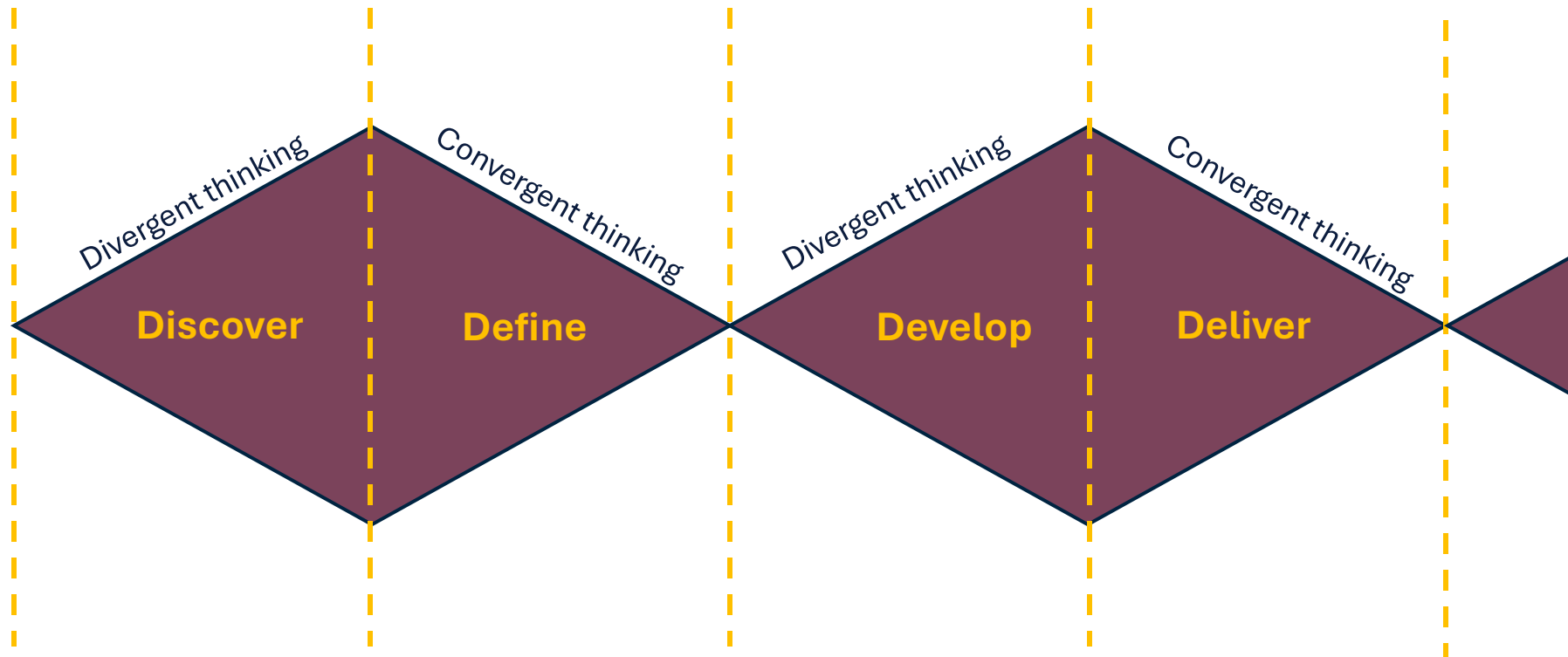
ADAPTER

## FP2-R2DATO outputs





## Beyond FP2-R2DATO



Technical Convergence is enabled by **technical coordination bodies** and **system architecture** to deliver integrated outputs for SERA







## 4. From DATO to better rail services

*What will passengers actually gain?*



**Daria Kuzmina**  
Head of Rail Unit,  
Knowledge & Innovation  
UITP



# Round table: From DATO to better rail services : What will passengers actually gain?



**Dusan Klago**  
Head of the Project Office  
Sporveien Trikken



**Monique de Wit**  
Senior Project Manager  
PRORAIL



**Itziar Villaro**  
SW Design Manager  
CAF Signalling



**Michael Meyer zu Hörste**  
Chief Engineer  
DLR



**Delphine Grandsart**  
Senior Researcher  
EPF





## Audience Q&A







**From your professional perspective, what improvement from the DATO perspective would deliver the most value to rail passengers today?**





# Round table: From DATO to better rail services : What will passengers actually gain?



**Dusan Klago**  
Head of the Project Office  
Sporveien Trikken



**Monique de Wit**  
Senior Project Manager  
PRORAIL



**Itziar Villaro**  
SW Design Manager  
CAF Signalling



**Michael Meyer zu Hörste**  
Chief Engineer  
DLR



**Delphine Grandsart**  
Senior Researcher  
EPF





## Round 1

### Passengers' expectations

**What frustrates passengers most today, and what might operators be underestimating?**

**How are passenger expectations linked to the operational challenges faced by operators?**





## Round 2

### R2DATO Value & Use Cases

**Which R2DATO use cases deliver the most visible benefits for passengers?**

**What are the technical enablers that help these use cases to become a reality?**

**What will passengers notice as a result of these developments?**





## Round 3

Future Impact

**If DATO is deployed, what will  
concretely change for passengers in  
5, 10, and 15 years?**

**What will remain unchanged  
despite automation?**





## Round 4

Barriers / Biggest Challenges

**What is the ONE barrier: e.g.,  
technology, regulation, investment, or  
organisational change that most  
challenges fast deployment of DATO  
technologies?**

**Which barrier is hardest to solve today?**

**Which single change would create the  
biggest immediate benefit for  
passengers?**





## Round 4

Barriers / Biggest Challenges

**What policy changes and shifts in passenger perception are needed to accelerate the deployment of DATO across the EU?**

**What is already happening at EU policy level, and how can R2DATO contribute?**





**From your professional perspective, what improvement from the DATO perspective would deliver the most value to rail passengers today?**



## Round table: From DATO to better rail services – what will passengers actually gain?

# Q&A





# TAKEAWAYS





# Key performance indicators



**Michael Meyer zu Hörste**  
Cluster IOS leader  
DLR



# Definition and Methods for KPI

- Impact KPI as defined by the Multi-Annual Work Programme (MAWP):

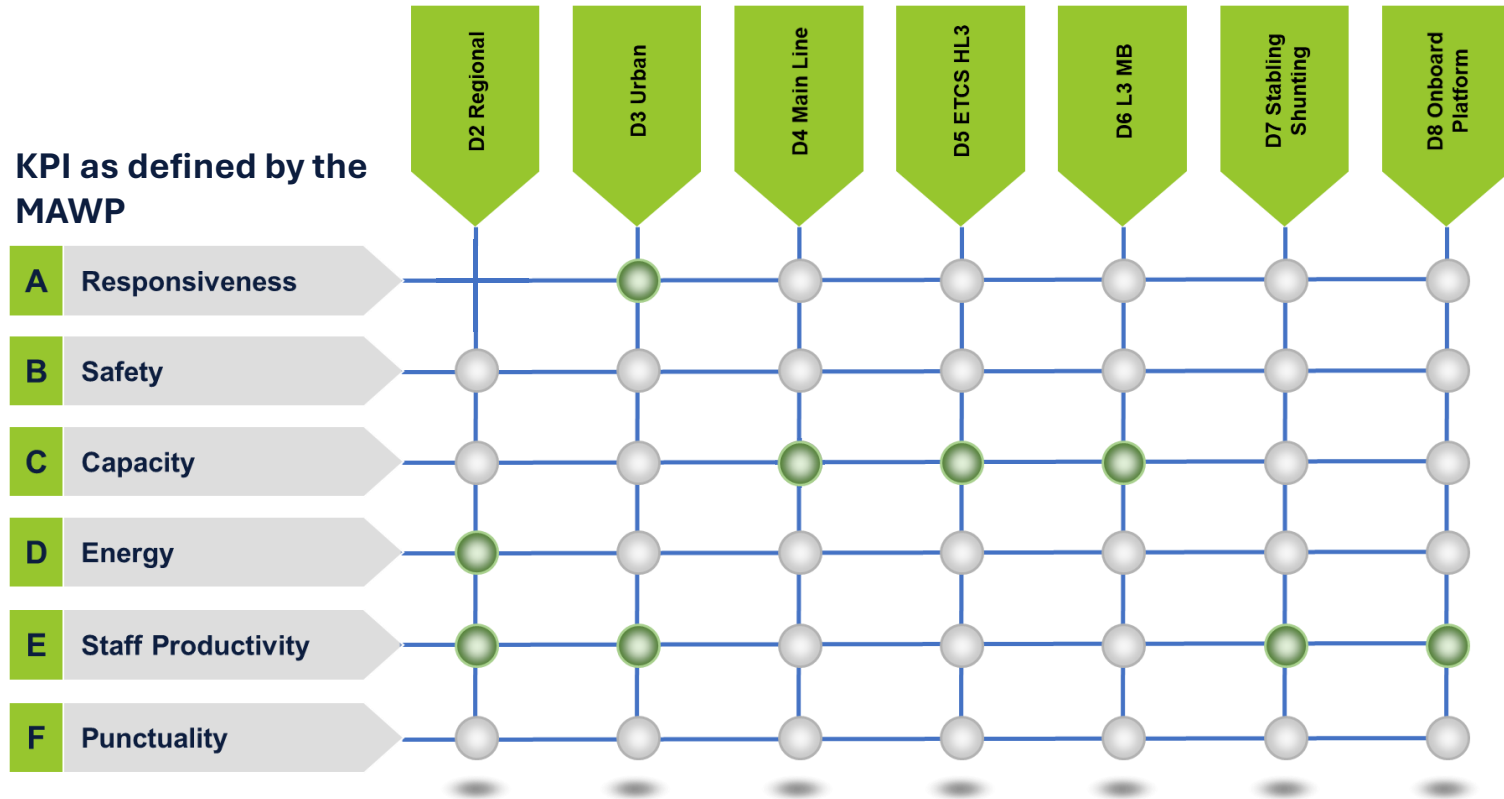
<p>1</p> <p><b>KPI</b></p> <p>Responsiveness</p> <p>Reduction from 2 hours to 2 min as reaction time to a request from FA1</p>	<p>2</p> <p><b>KPI</b></p> <p>Safety</p> <p>50% decrease of no. of collisions (ca. from 0.2 to 0.1) with 3<sup>rd</sup> parties per 10.000 km travelled</p>	<p>3</p> <p><b>KPI</b></p> <p>Capacity</p> <p>10% increase of no. of trains on line per hour and direction</p>	<p>4</p> <p><b>KPI</b></p> <p>Energy</p> <p>10% decrease in kWh consumption compared to human driver average</p>	<p>5</p> <p><b>KPI</b></p> <p>Staff Productivity</p> <p>30% increase of productive hours</p>	<p>6</p> <p><b>KPI</b></p> <p>Punctuality</p> <p>50% decrease in delay minutes</p>
--	---	--	--	--	--

- Method:

<p><b>DEMO</b></p> <p>Individual KPI definition and use case description</p>	<p><b>BASELINE</b></p> <ul style="list-style-type: none"> <li>Raw Data: source, timeline, ...</li> <li>Data Transformation: source, timeline, ...</li> <li>Data for comparison</li> </ul>	<p><b>&lt;&lt; IMPROVED &gt;&gt;</b></p> <ul style="list-style-type: none"> <li>Raw Data: source, timeline, ...</li> <li>Data Transformation: source, timeline, ...</li> <li>Data for comparison</li> </ul>	<p><b>&lt;&lt; Expert Estimation &gt;&gt;</b></p> <ul style="list-style-type: none"> <li>As of Date</li> <li>Comments</li> <li>Assumptions</li> <li>Conditions</li> <li>Frame</li> </ul>
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# Mapping of KPI to Demonstrators



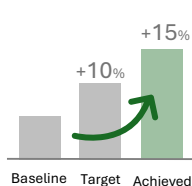


# Impact KPI Results



## CAPACITY

Trains on line per hour and direction

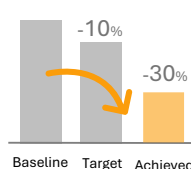


Up to  
**+15%**  
Increase in  
capacity



## ENERGY

kWh consumption compared to human driver average

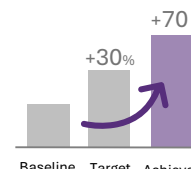


Up to  
**-30%**  
Decrease in energy  
consumption



## STAFF PRODUCTIVITY

Productive hours

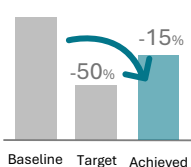


Up to  
**+70%**  
Increase in  
productive hours



## PUNCTUALITY

Delay minutes

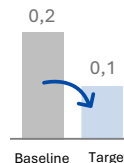


Up to  
**-15%**  
Decrease in  
delay minutes



## SAFETY

Collisions with third parties per 10.000 km travelled



**-50%**  
Decrease in number  
of collisions



## RESPONSIVENESS

Reaction time to are request from Flagship Area 1

**2**  
HOURS  
Baseline



**2**  
MINUTES  
Target

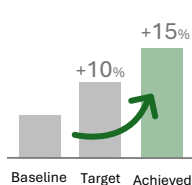


# Impact KPI Results



## CAPACITY

Trains on line per hour and direction



Up to  
**+15%**  
Increase in capacity



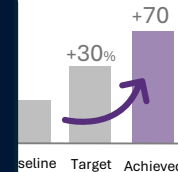
## ENERGY

kWh consumption compared to human driver average



## STAFF PRODUCTIVITY

Productive hours

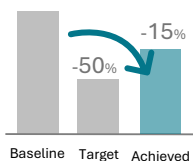


Up to  
**+70%**  
Increase in productive hours



## PUNCTUALITY

Delay minutes



Up to  
**-15%**  
Decrease in delay minutes



## ENERGY

**-30%**  
Decrease in energy consumption



## RESPONSIVENESS

Reaction time to are request from Flagship Area 1

**2**  
HOURS  
Baseline



**2**  
MINUTES  
Target

### IF YOU REMEMBER 3 THINGS...



## CAPACITY

**+15%**  
Increase in capacity



## STAFF PRODUCTIVITY

**+70%**  
Increase in productive hours

FP2-R2DATO is delivering a **measurable impact** for the future of rail in Europe.

Baseline Target

Covered in R2DATO qualitatively to prepare the demo in subsequent projects



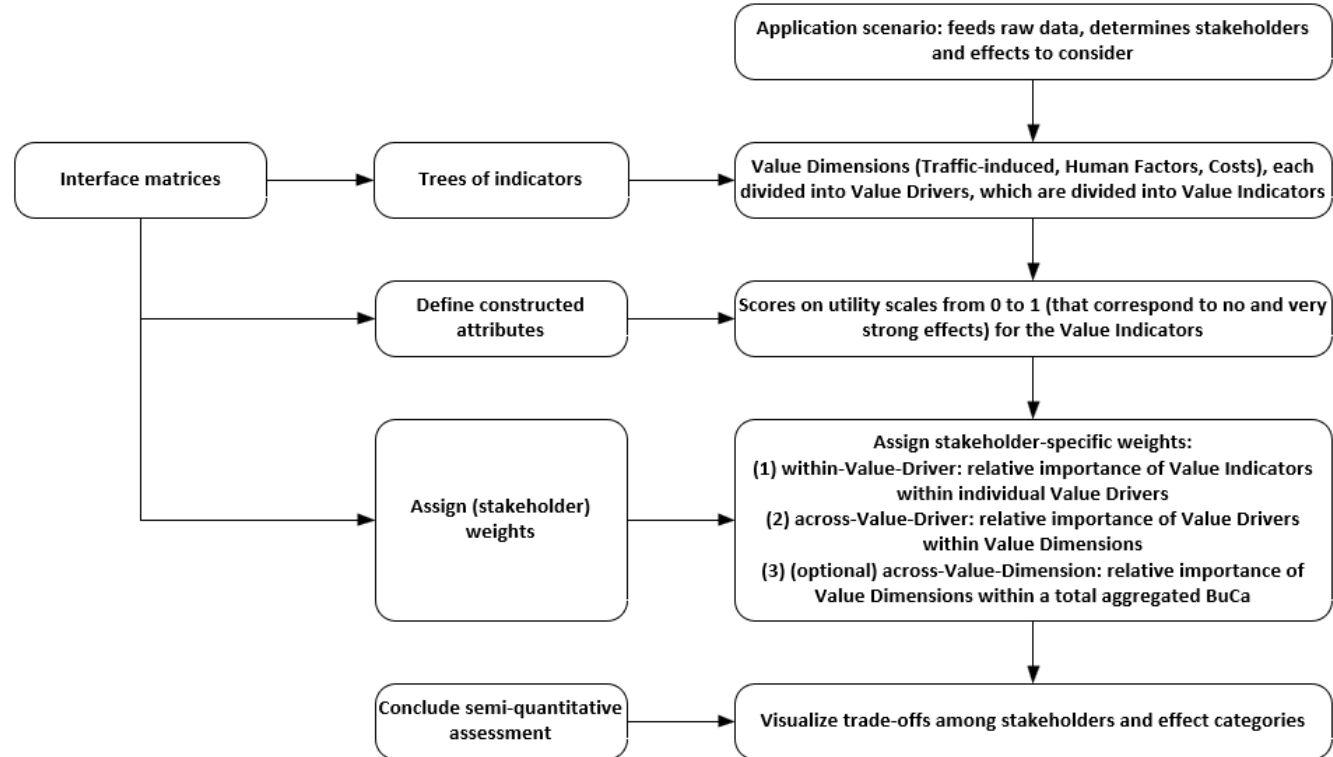
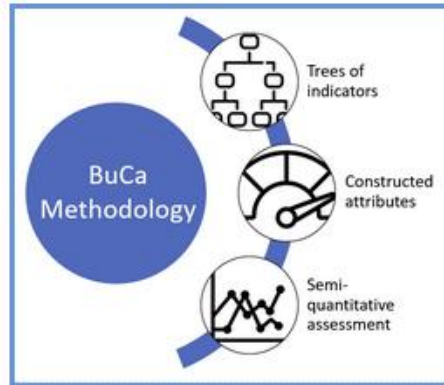
# The DATO Business Case



**Thomas van den Berg**  
Advisor Railway  
PRORAIL



# Business Case Methodology

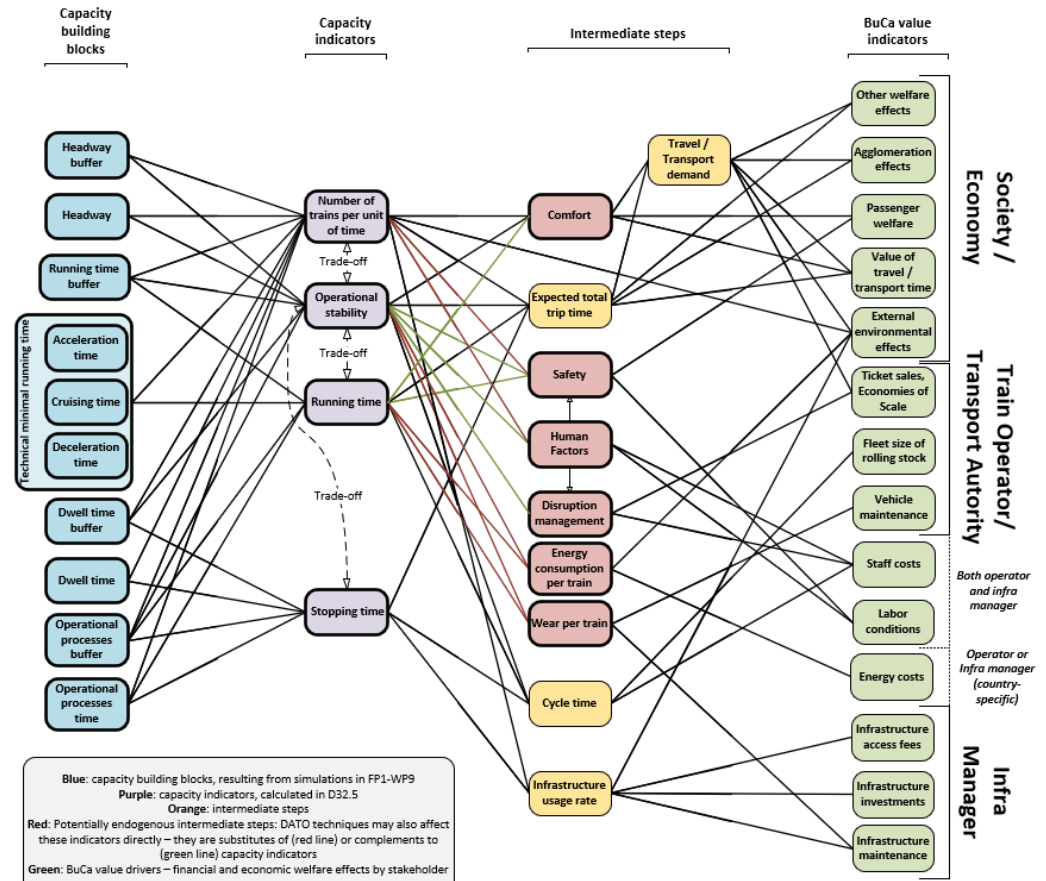




# Interface matrices - Indicators to economic effects

## Capacity indicators

- Defining an interface model that links capacity constructs with economic and financial effects





## Summary of capacity effects (based on simulations)

### Dutch results

Concept	Adhesion	Capacity increase	Running time decrease	Capacity benefit
HTD		3.6 %	N/A	EUR 6.3M/y
ATO GoA 2		7.2 %	- 2.0 s/km	EUR 26.3M/y
ATO GoA 4		9.9 %	- 3.0 s/km	EUR 32.7M/y
NG Brake	Dry	0.1 %	- 0.3 s/km	EUR 6.6 – 8M/y
	Low	10.7 - 13.2 %	- 3.8 s/km	
	Very low	14.2 - 15.7 %	- 4.2 s/km	

### Swedish results

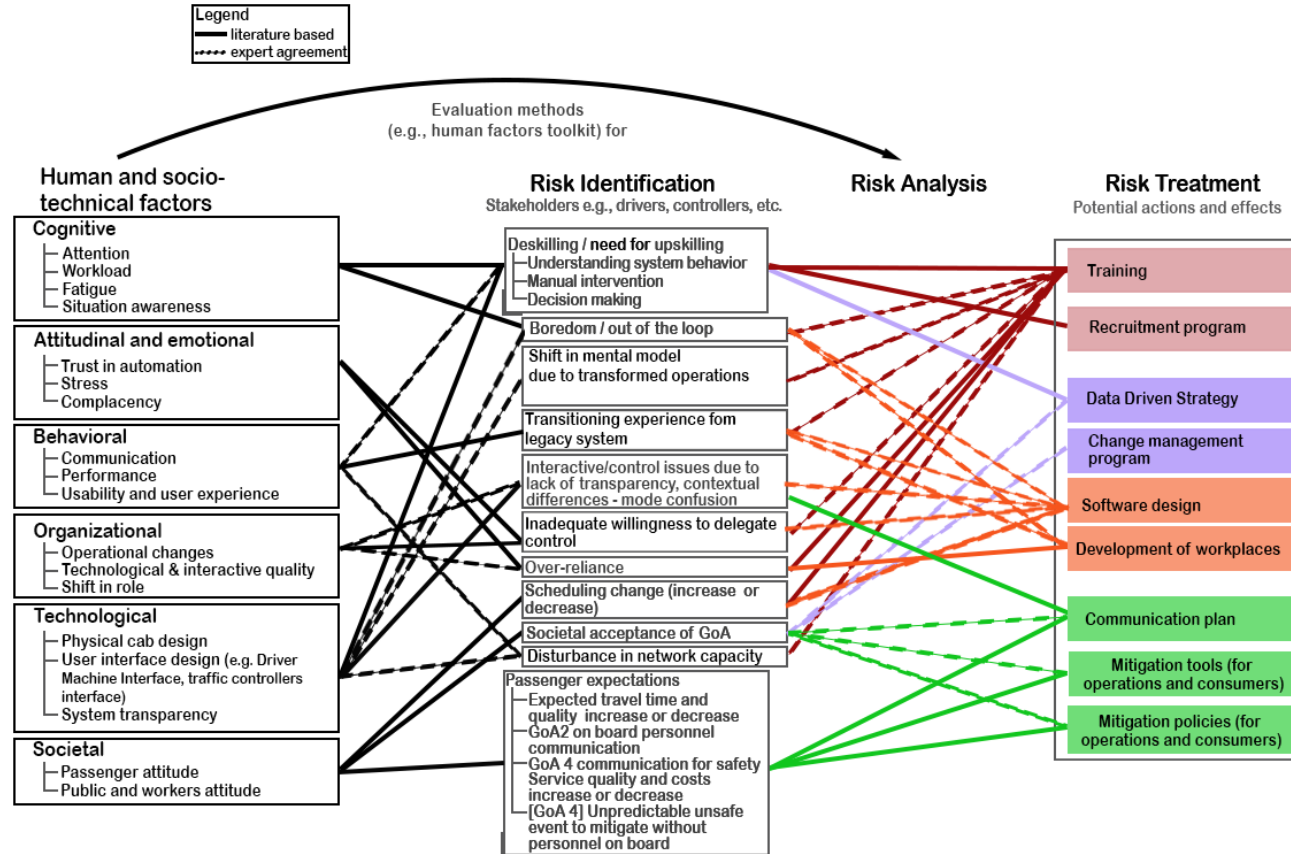
Concept	Average delay	Running time decrease	Capacity benefit*
ATO GoA 2	-9 to -21 s	- 0.6 to 2.4 s/km	EUR 0,9 to 4.6M/y
NG Brake	-12 to -27 s	-0.1 to -1.3 km/s	EUR 1.4 to 5.9M/y



# Interface matrices - Indicators to (economic) effects

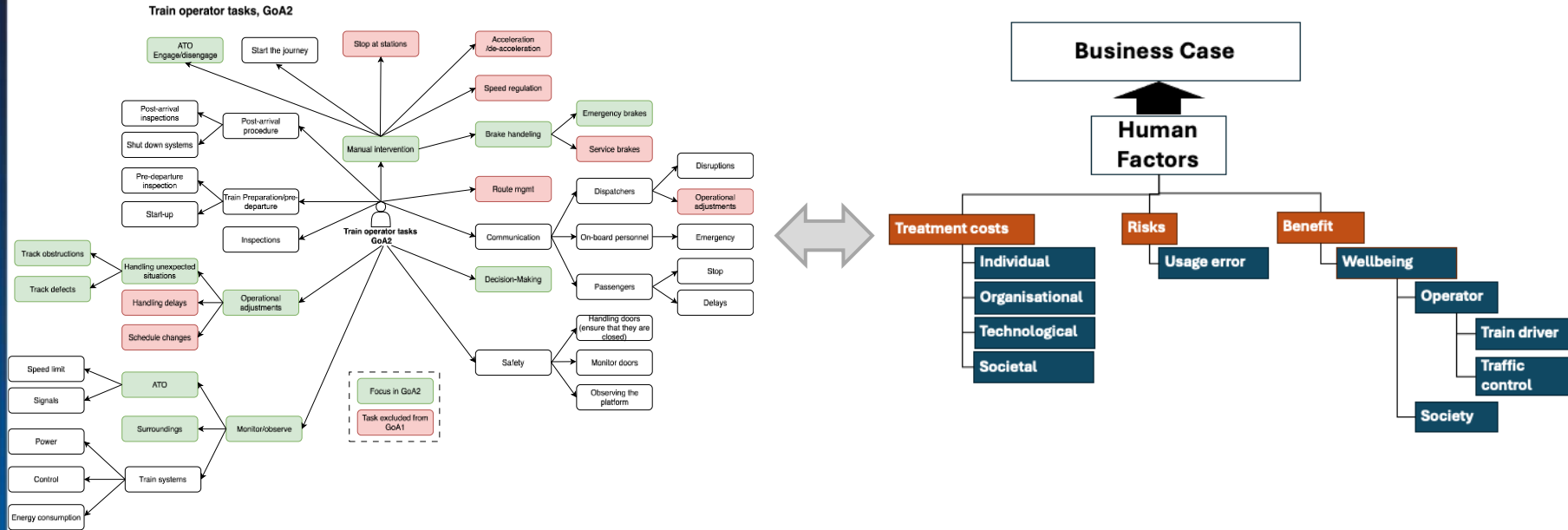
## HF-BuCa model

- Model developed to outline human factors issues as an input to the business case



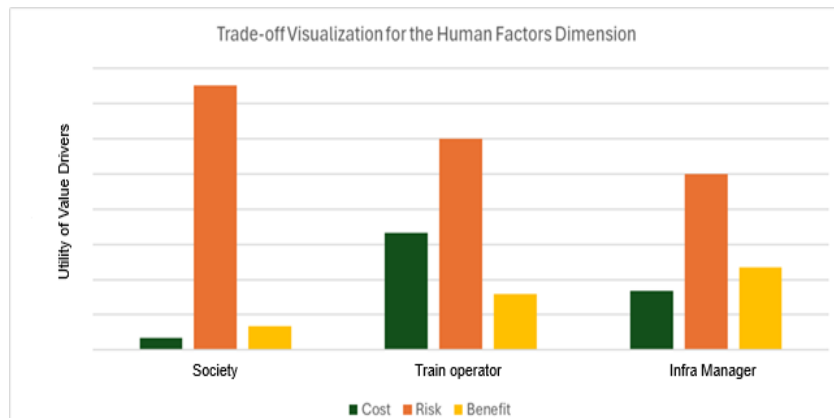
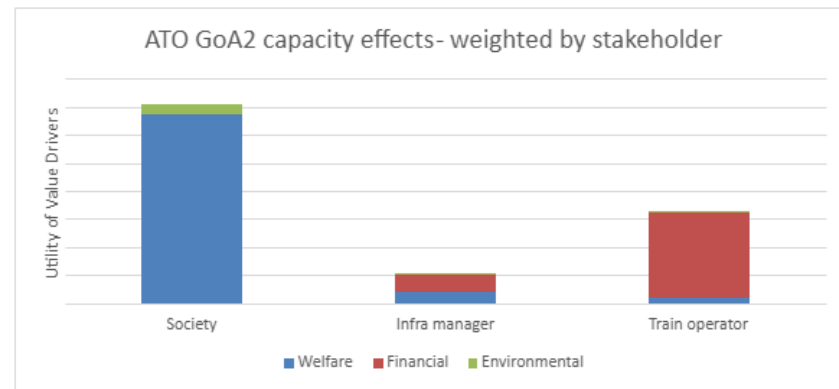
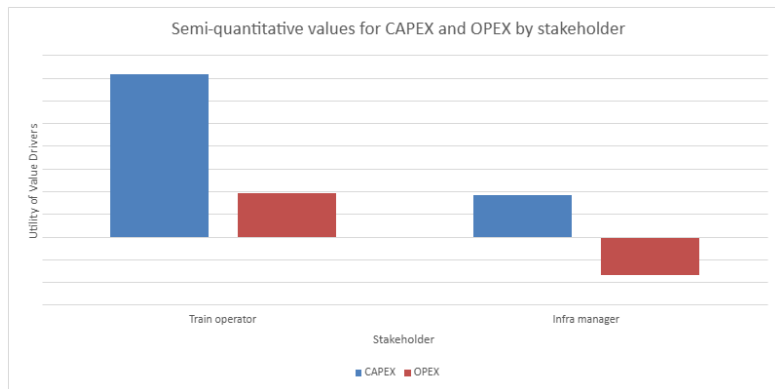


# HF input to the BuCa as risks, costs and benefits





## Economic results – examples of all effects together





# Conclusion & future steps

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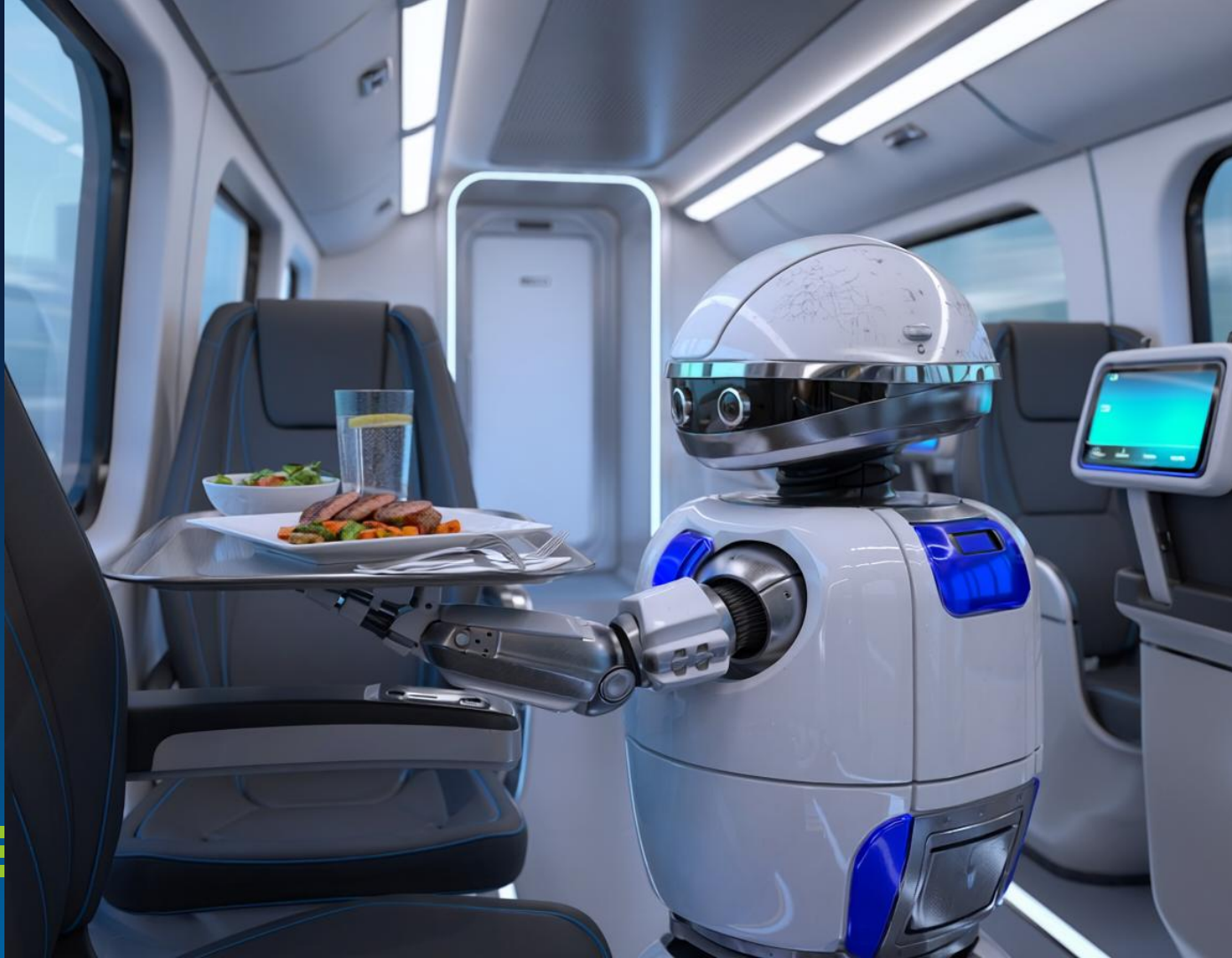
## Conclusion:

- Developed a generalizable BuCa methodology for DATO, linking technical effects to financial, economic and societal value
- Clarified where and how specific DATO techniques create value across capacity, HF, and cost dimensions
- Explicitly revealed stakeholder trade-offs and misalignment, which are key inhibitors of fast and effective deployment
- Application of the methodology demonstrated the advantages of the methodology; stakeholder trade-offs, ability to include qualitative data across multiple dimensions of value

## Limitations & future steps

- Data gaps, subjective weighting, lack of time/uncertainty modelling (migration and technological dependencies)
- Integration with existing, often mandatory, CBA methodologies to measure certain effects was either missing (HF) or based on limited expertise









# Welcome back !





# 5. What we delivered

## *Demonstrators introduction*



**Martijn Lanenga**  
Cluster DEMO leader  
NS





D2 Regional



D3 Urban



D4 Mainline



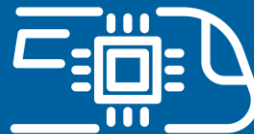
D5 ETCS Hybrid  
Train detection



D6 Moving block



D7 Stabling /  
Shunting



D8 Onboard  
Platform



## Demonstrators : rotation 1

*Please go to the first demonstrator  
you have chosen this morning  
(check your ticket !)*

*Each rotation will last 30 minutes*





# 6. Celebrating R2DATO wave 1

Quizz & Awards



**Lionel Turci**  
SiaXperience

Please give one last vote  
(Demonstrator Impact)





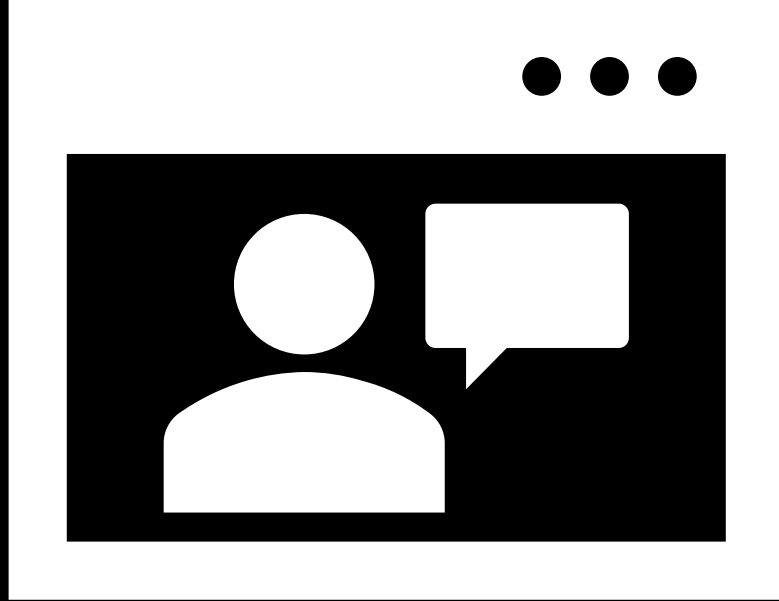
# QUIZZ





































# 7. Closing words



**Giorgio Travaini**

Executive Director, Europe's Rail  
Joint Undertaking



**Cédric Gallais**

European Research Project  
Coordinator, SNCF

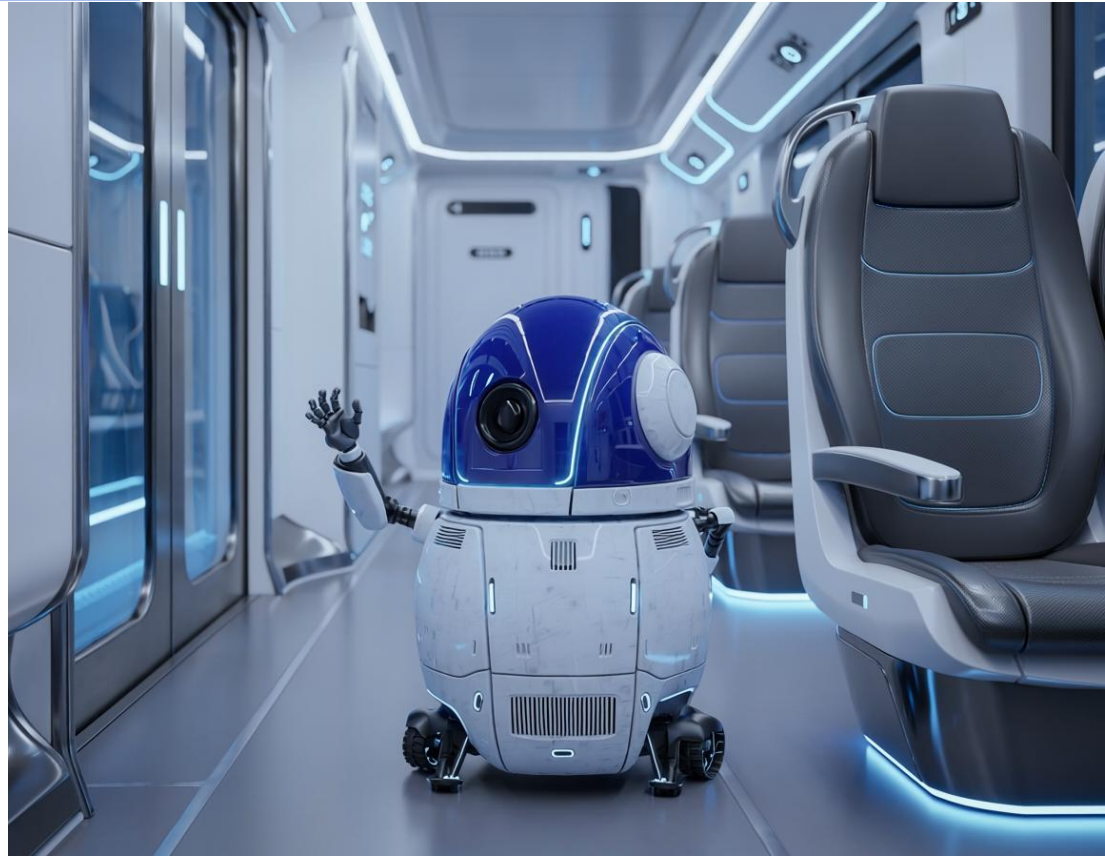




Thank you !

Let's meet tonight  
at 7 o'clock 🍴

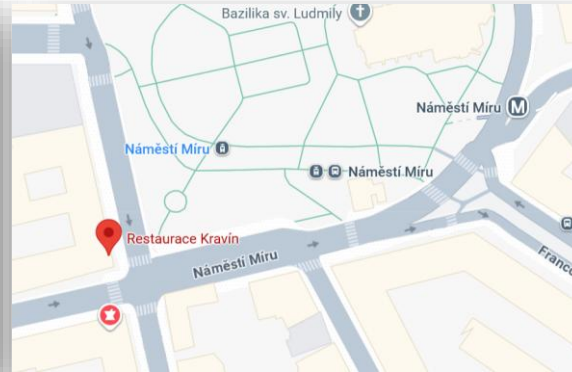
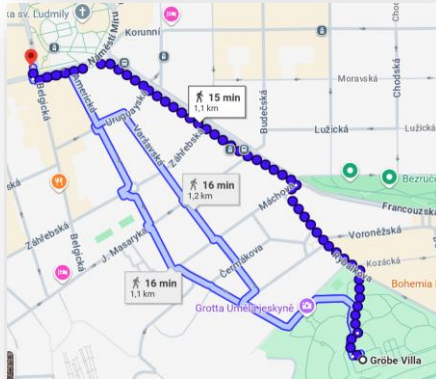
... And tomorrow  
for the demonstration 🚅





# Social Dinner 7 pm « Restaurace Kravin »

**Address :** Náměstí Míru 109/18



***Náměstí Míru metro station***

## Recommendations:

- Indicate your menu 1,2 or 3
- Please have a seat
- Kindly pay directly

***Enjoy your meal and night in Prague !***





## Day 2

### D2 – Demonstration – logistics & planning

## Train tickets – 2 options

### 1 At the station at the ticket office/ticket machines

- Please **arrive earlier** to avoid possible delays caused by queues
- Buy **return** ticket to Nymburk hl. n. (so you can travel there and back)

### 2. The **app Můj Vlak** or on the **website** <https://www.cd.cz/en/>

Buy ticket from Praha hl. n. to Nymburk hl. n.

**Group A – R 923 Krakonoš; 8:14; „Flexi“ ticket**

**Group B – R 925 Krakonoš; 10:14; „Flexi“ ticket**

Buy ticket from Nymburk hl. n. to Praha hl. n.

**Group A – R 946 Hradečan; 14:02; „Flexi“ ticket**

**Group B – R 944 Hradečan; 16:02; „Flexi“ ticket**

- A '**Flexi**' ticket means that you can also use it if you travel on a different train that day in case the program runs longer
- Add your **email** and you will receive the ticket electronically





## Day 2 D2 – Demonstration – Logistics & Planning

### Demonstration Site - DETENICE

Kopidlanka Line Location Detenice - 80 kms from Prague

**Transportation** : Train from Prague Main Station to Nymburk + AZD Bus to Detenice

**Meeting point** at the station in front of the Burger King

Group A – **7:30** – Jiří Hájek - Christophe Cochelin

Group B – **9:30** – Lukáš Kacar - Laura Bidault





## 2 last things, for tomorrow :

Please read  
the **safety**  
**instructions**  
from AZD



Please bring  
your  
**nametags**  
back

