ERTMS Conference 2022

Workshop 8: CCS Beyond 2022: introducing Europe's Rail Programme

The Innovation Pillar

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Europe's Rail JU

- DELIVER AN **INTEGRATED EUROPEAN RAILWAY NETWORK** BY DESIGN

- DEVELOP A **UNIFIED OPERATIONAL CONCEPT AND A FUNCTIONAL SYSTEM ARCHITECTURE** FOR INTEGRATED EUROPEAN RAIL TRAFFIC AND CCS/AUTOMATION

- DELIVER A **SUSTAINABLE AND RESILIENT RAIL SYSTEM**

- DELIVER A **COMPETITIVE, GREEN RAIL FREIGHT** FULLY INTEGRATED INTO THE LOGISTICS VALUE CHAIN

- DEVELOP A **STRONG AND GLOBALLY COMPETITIVE EUROPEAN RAIL INDUSTRY**

EUROPE'S RAIL:
ONE INTEGRATED R&I PROGRAMME

SYSTEM PILLAR

OPERATIONAL CONCEPTS

FUNCTIONAL SYSTEM ARCHITECTURE

A SINGLE COORDINATING BODY FOR THE WHOLE SECTOR EVOLUTION

OPEN INTERFACES TO OTHER TRANSPORT MODES AND BUSINESSES

SYSTEM REQUIREMENT SPECIFICATIONS

INNOVATION PILLAR

TECHNOLOGICAL AND OPERATIONAL SOLUTIONS FOR SERVICES OF FUTURE

FLAGSHIP PROJECTS

LARGE-SCALE DEMONSTRATIONS

EXPLORATORY AND FUNDAMENTAL R&I

1 EUROPEAN RAIL TRAFFIC AND MOBILITY MANAGEMENT
- Manage and improve rail traffic at EU level
- Adjust rail traffic management in function of the mobility demand

2 DIGITALISATION & AUTOMATION IN TRAIN OPERATIONS
- ATO implementation
- Digital train operations

3 SUSTAINABLE AND DIGITAL ASSETS
- Integrated assets testing & life-cycle framework
- Zero-emmission, silent rail system

4 COMPETITIVE, DIGITAL, GREEN RAIL FREIGHT
- New digital customer interaction & innovative rail freight services
- Multimodal and rail freight innovation integration

5 REGIONAL RAIL SERVICES IN LOW DENSITY AREAS
- New system approach to regional rail services in low density areas

DEPLOYMENT GROUP

FUTURE SOLUTIONS DEPLOYED IN A COORDINATED AND CONSISTENT WAY AT EUROPEAN LEVEL, TAKING INTO ACCOUNT ALTERNATIVE ROLLOUT SCENARIOS, BEHAVIOURAL AND ORGANISATIONAL CHANGES, SYNERGIES WITH OTHER MODES OF TRANSPORT

EU-Rail JU Members

Logo	Member	Country
	European Union	EU
	Administrador de Infraestructuras Ferroviarias (ADIF), Entidad Pública Empresarial	ES
	Alstom Transport SA	FR
	ANGELRAIL consortium led by MER MEC S.p.A	IT
	AŽD Praha s.r.o	CZ
	Construcciones y Auxiliar de Ferrocarriles, S.A. (CAF)	ES
	Asociación Centro Tecnológico CEIT	ES
	České dráhy, a.s.	CZ
	Deutsche Bahn AG	DE

Logo	Member	Country
	Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)	DE
	European Smart Green Rail Joint Venture (eSGR JV), represented by Centro de Estudios de Materiales y Control de Obra S.A (CEMOSA)	ES
	Faiveley Transport SAS	FR
	Ferrovie dello Stato Italiane S.p.A. (FS)	IT
	Hitachi Rail STS S.p.A.	IT
	INDRA SISTEMAS S.A & PATENTES TALGO S.L.U.	ES
	Jernbanedirektorate (Norwegian Rail Directorate)	NO
	Knorr-Bremse Systems für Schienenfahrzeuge GmbH	DE
	Österreichische Bundesbahnen-Holding Aktiengesellschaft (ÖBB-Holding AG)	AT

Logo	Member	Country
	Polskie Koleje Państwowe Spółka Akcyjna (PKP)	PL
	ProRail B.V. & NS Groep N.V.	NL
	Siemens Mobility GmbH	DE
	Société nationale SNCF, société anonyme	FR
	Strukton Rail Nederland B.V.	NL
	THALES SIX GTS France SAS	FR
	Trafikverket	SE
	voestalpine Railway Systems GmbH	AT

What EU-Rail is built upon

Shift2Rail R&I programme

28 MEMBERS

412 PARTICIPANTS

29 COUNTRIES

109 SMEs

113 RESEARCH CENTRES AND UNIVERSITIES

Europe's Rail
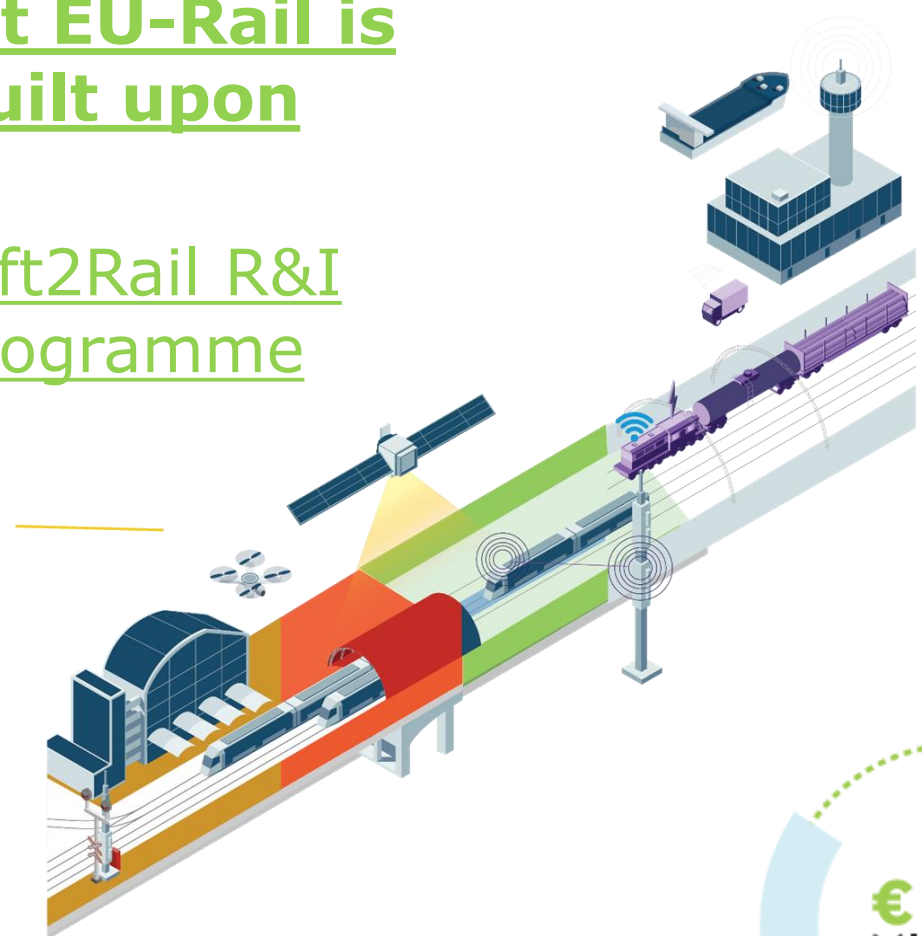
IP1 Cost-efficient and Reliable Trains, including high-capacity trains and high speed trains

IP2 Advanced Traffic Management and Control System

IP3 Cost-efficient, Sustainable and Reliable High Capacity Infrastructure

IP4 IT Solutions for Attractive Railways Services

CCA Cross Cutting Activities

€ 920 MILLION

2015 - € 52 M
SHIFT2RAIL INITIATIVE LIGHTHOUSE PROJECTS

2016 – € 168 M
27 PROJECTS

2017 – € 112 M
17 PROJECTS

2018 - € 153 M
19 PROJECTS & 3 TENDERS

2019 - € 150 M
17 PROJECTS & 4 TENDERS

2020 - € 152 M (yet to be awarded)
19 TOPICS, 3 TENDERS & 1 PRIZE

Navigating the EU-Rail key documents of a Programme approach

EU-Rail Regulation

EU-Rail Master Plan

EU-Rail Multi-annual Work Programme

EU-Rail Annual work programmes
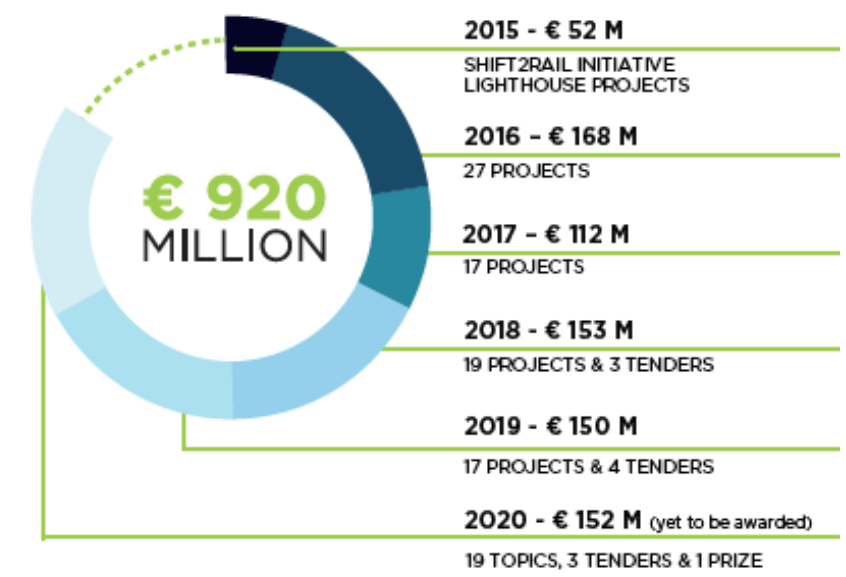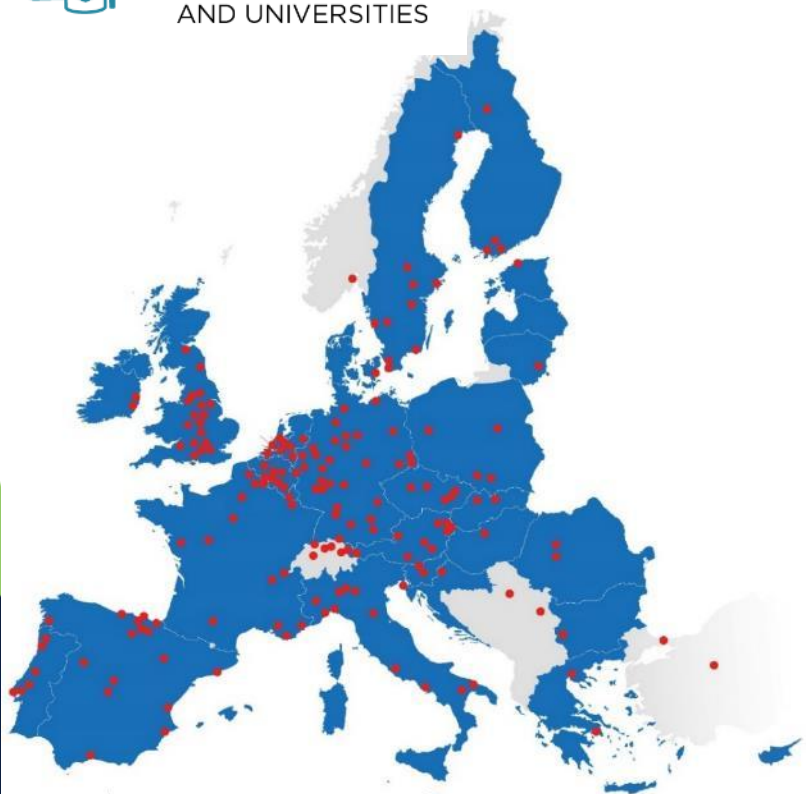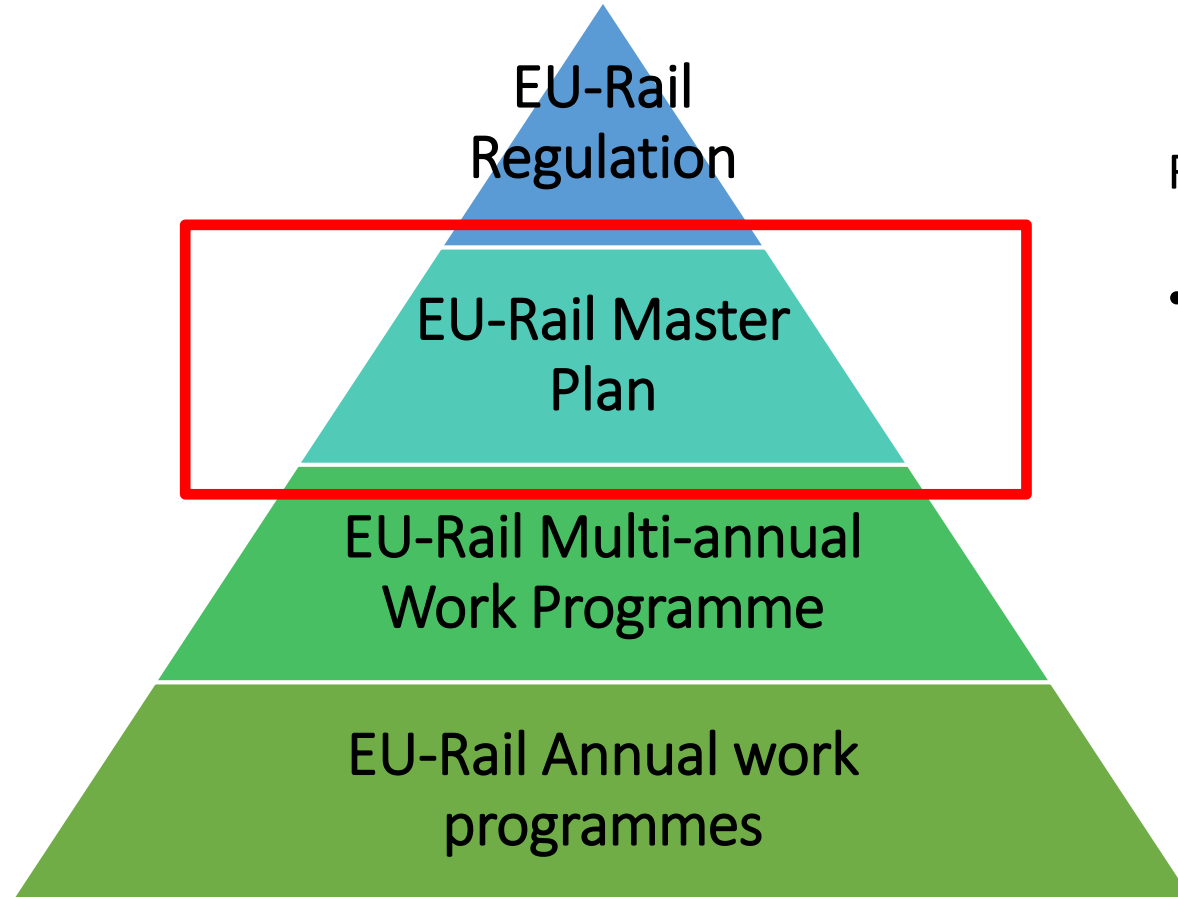
Focus on the

- **MP:** A common, forward-looking roadmap based on a system view, presenting the areas of intervention within the scope of the Joint undertaking; Give guidance on how to invest the €1,2 billion (EU funding 50%); Based on two integrated pillars, System and Innovation Pillars, complemented by the Deployment Group

EU-Rail expected system impacts from the Programme

- Meeting evolving customer requirements

- Improved performance and capacity

- Reduced costs

- More sustainable and resilient transport

- Harmonised approach to evolution and greater adaptability

- Reinforced role for rail in European transport and mobility

- Improved EU rail supply industry competitiveness

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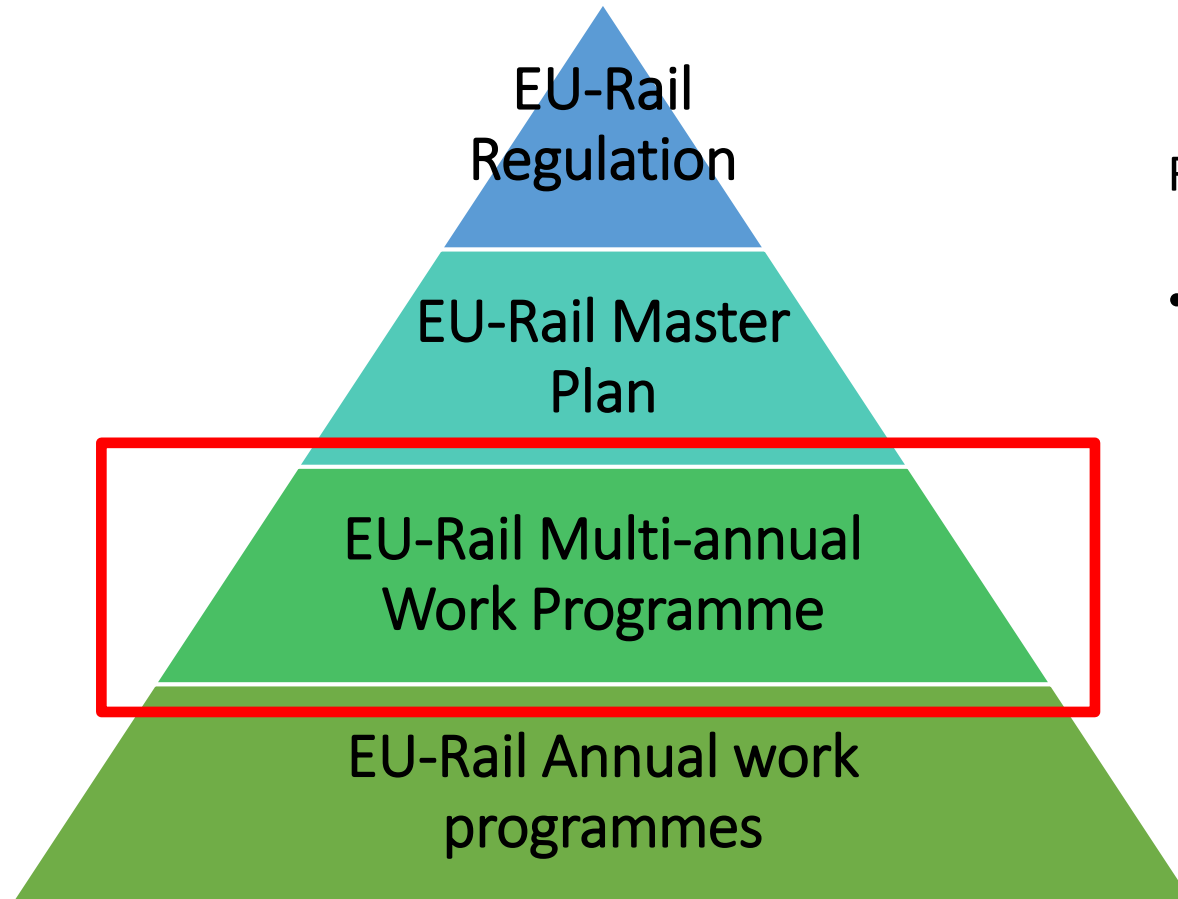
Focus on the

- **MAWP:** It defines how the EU-Rail JU has designed its R&I activities to achieve the general and specific objectives set out in the SBA through an Integrated Programme:
  - *System Pillar (tasks)*
  - *Innovation Pillar*
    - *7 Flagship Areas + TT*
    - *Exploratory and Other activities*
  - *Deployment group*

EU-Rail Multi-Annual Work Programme

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

Network management planning and control (new processes and automation for decision support) & rail management in a multimodal environment (real-time demand-driven operations, including demand from other transport modes)

Digital & Automated up to Autonomous Train Operations

Digital "Automated & Autonomous" Train Operations building upon the next gen Automatic Train Control based on ERTMS + enhancements on TCMS for integration at the on-board level

Intelligent & Integrated asset management

Knowledge from the digital transformation will feed back into the design, construction, manufacturing as well as into operation and maintenance processes.

A sustainable and green rail system

Innovative solutions and services based on leading edge technologies to minimize the overall energy consumption and environmental impact of the railway system

Digital Enablers

Provide Digital Twins Design toolbox for design as well as for validation, verification and test + a Federated dataspace where all digital elements of the system can play together in a coherent and interoperable way

Innovation on new approaches for guided transport modes

Explore non-traditional and emerging flexible and/or high-speed guided transport systems, as well as to create opportunities for innovators to bring forward ideas for shaping those future systems

Regional rail services / Innovative rail services to revitalise capillary lines

Decreasing cost while offering a high quality of service and operational safety + increase customer satisfaction and attractiveness

Sustainable Competitive Digital Green Rail Freight Services

Digitalization and automation of operational functions (e.g. DAC) and processes as well as increasing the efficiency of the immaterial (information/data) layer of transport in logistic

FA1 - TMS+

Transversal Topic

FA7- new approaches

FA2 - ATO+

FA6 - Regional services

FA3 - Assets Mngt

+ Exploratory Research and other activities

FA4 - Green Solutions

FA5 - Freight

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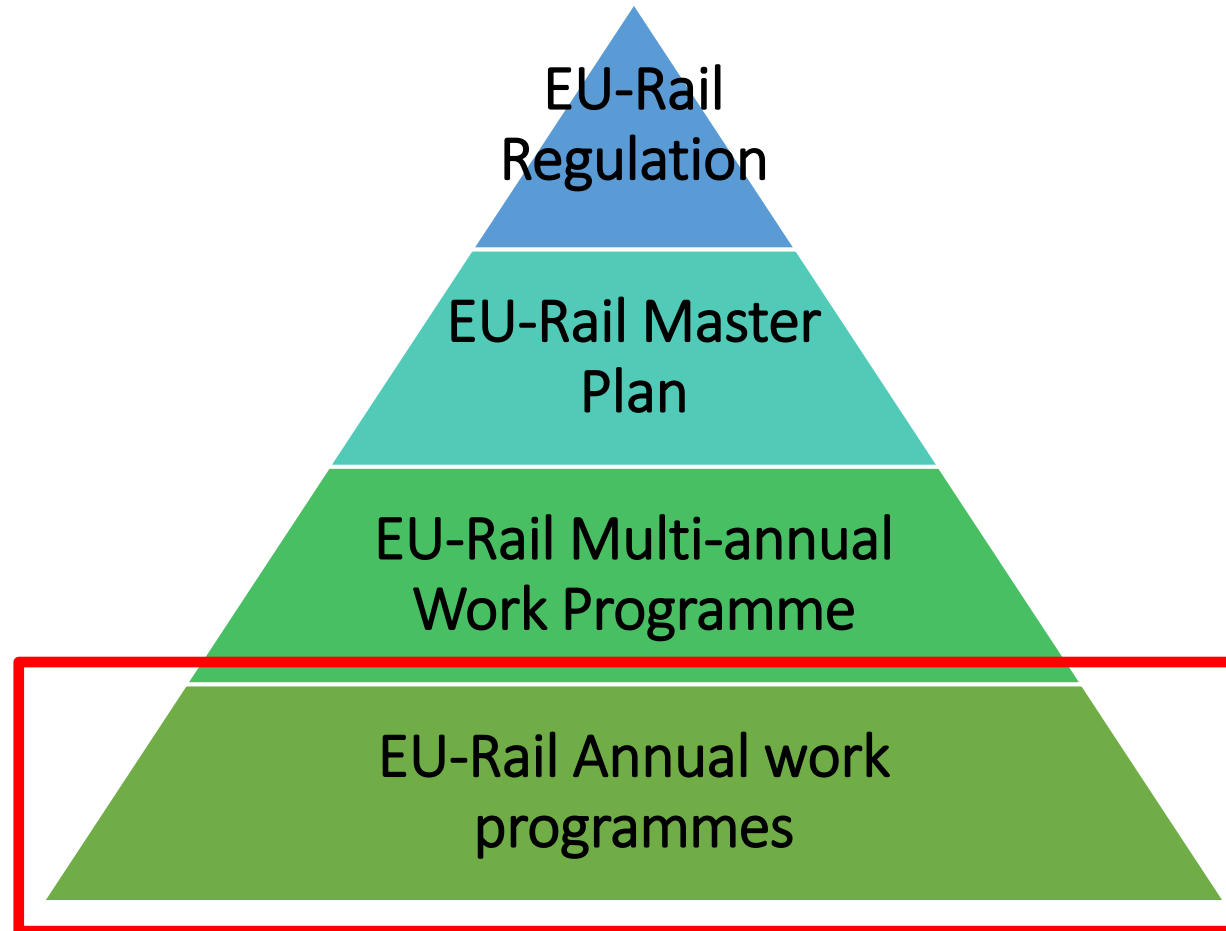
Focus on the

- **[Annual] work programme:** the set of [annual] activities that the JU undertake to implement the Programme; it includes the calls for proposals and tender.

Multi-Annual Programme Implementation

- **System Pillar activities:** the implementation via framework contract (procurement). The first call for tenders is expected to be launched by the end of the first quarter 2022.

- **Innovation Pillar activities:** This constitutes the core of the Programme, where the private Members are expected to provide their contribution up to EUR 576 million.
  1. **Published and open for submission: Call 2022-1**, to cover up to 50% of the research and innovation activities value of 6 Flagship Areas
  2. Call 2025/2026, expected to cover around 30% of the research and innovation activities of 6 Flagship Areas+TT
  3. Call 2027 expected to cover the remaining part of 6 Flagship Areas activities to be performed until 2031
  - In addition, EU-Rail will launch on a regular basis calls for proposals to explore new areas of rail research and innovation or perform studies and any other relevant activities that would contribute to the achievement of its Programme → **next call 2022-2 to be published Q3 this year**

- **Deployment Group activities**: to bridge research and innovation to the future coordinated deployment and they will be defined in line with the evolution of the Programme.

EU-Rail moving the ladder up

Network management, planning, and control & mobility management in a multimodal environment

- Dynamic real time traffic management

- Managing traffic on demand supporting door-to-door services

- Connecting TMS to relevant subsystems that influence traffic

- Capacity optimization and automatic management of cross-border traffic

European capabilities to develop

Improve strategic and tactical planning

1.   Cross-border Planning
2.   Decision support and optimization
3.   Simulation
4.   Improved integration
5.   Operational feedback for planning

Develop resilience for a connected real-time rail network

6.   Cross-border operation
7.   Improved integration
8.   Improved resilience and efficiency
9.   Decision support and optimization

Integrate rail traffic within door-to-door mobility

10.   Integrate rail with other transport modes
11.   Services for inclusive rail-based mobility, including PRM needs
12.   Anticipate demand leading to improved resource utilisation

EU-Rail moving the ladder up

Digital & Automated up to Autonomous Train Operations

- Next <u>European</u> Generation Automatic Train Control, building on harmonised, adaptable and scalable trackside and onboard CCS+ system architecture.
    - building upon radio-based ERTMS or above
    - incorporating the latest technological advances
    - enabling full optimisation of performance in line with the Traffic Management improvements

- Delivering scalable automation in train operations, up to GoA 4
    - rail system is ready for fully unattended train operations including setting a train in motion, driving and stopping the train, opening and closing the doors, remote train control and recovery operations in the event of disruptions.

EU-Rail moving the ladder up

Digital & Automated up to Autonomous Train Operations

| Capabilities enabling **operational objectives**	Capabilities for **offering more capacity to customers**	Capabilities for **supporting cost-effective deployment**
✛ Connectivity (FRMCS, V2X, etc…) ✛ ATO ✛ Absolute safe train positioning ✛ Digital register (central data source) ✛ Automating functions ✛ Safe environment perception ✛ Remote driving and command ✛ Autonomous route setting	✛ Mixed Level 2, Hybrid Level 3, Moving Block ✛ Virtual Coupling including self-driving freight wagons ✛ Next generation of braking subsystems	✛ Testing, validation and (virtual) certification platform and facilities ✛ Modelling techniques ✛ Architectural software design patterns and methods ✛ Railway industrial DevOps ✛ Modular platform ✛ Evolved on-board communication networks ✛ Functional Open Coupling ✛ Deployment and migration strategic plans
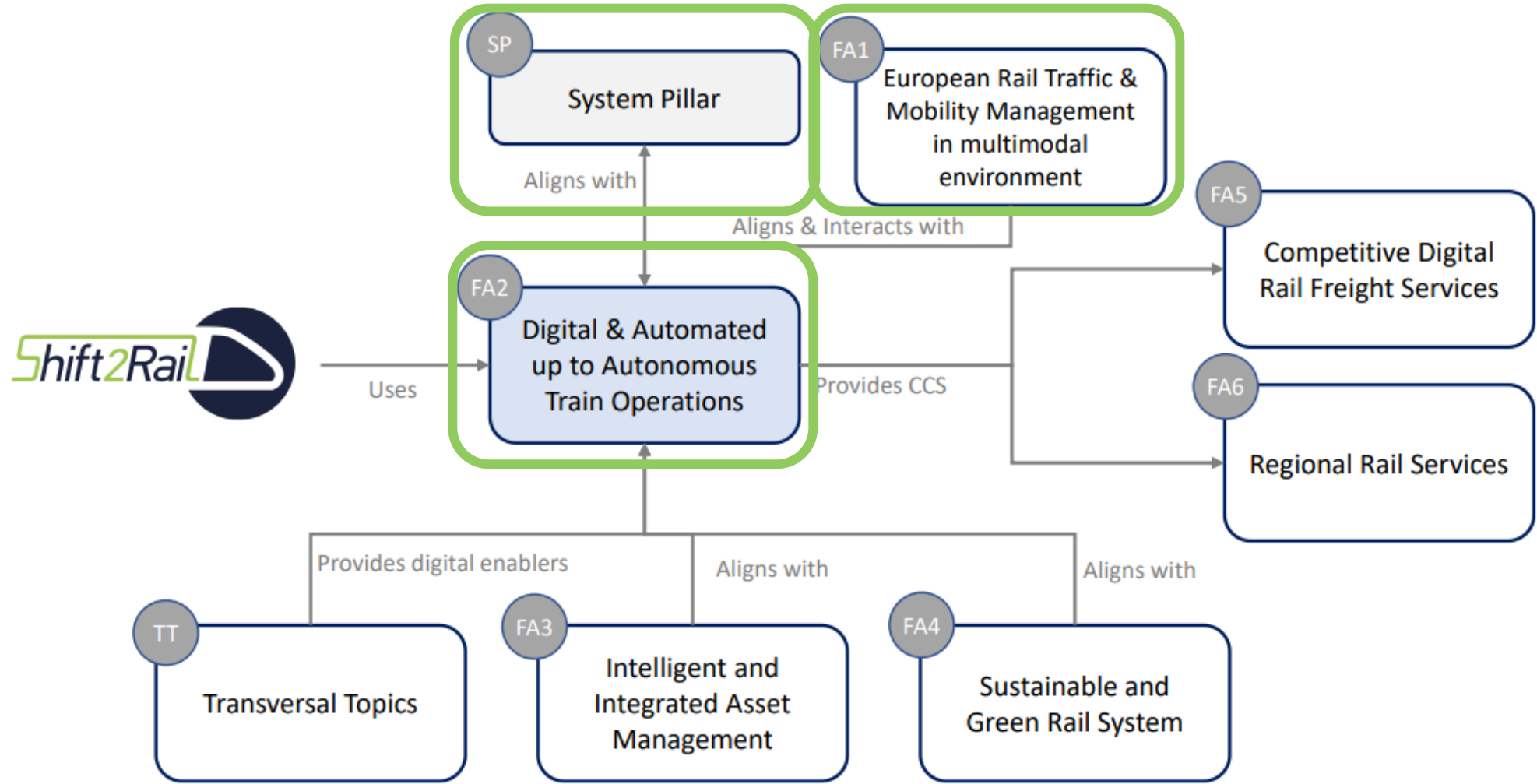
Figure 10 - Overview of the relations within Europe's Rail

https://rail-research.europa.eu