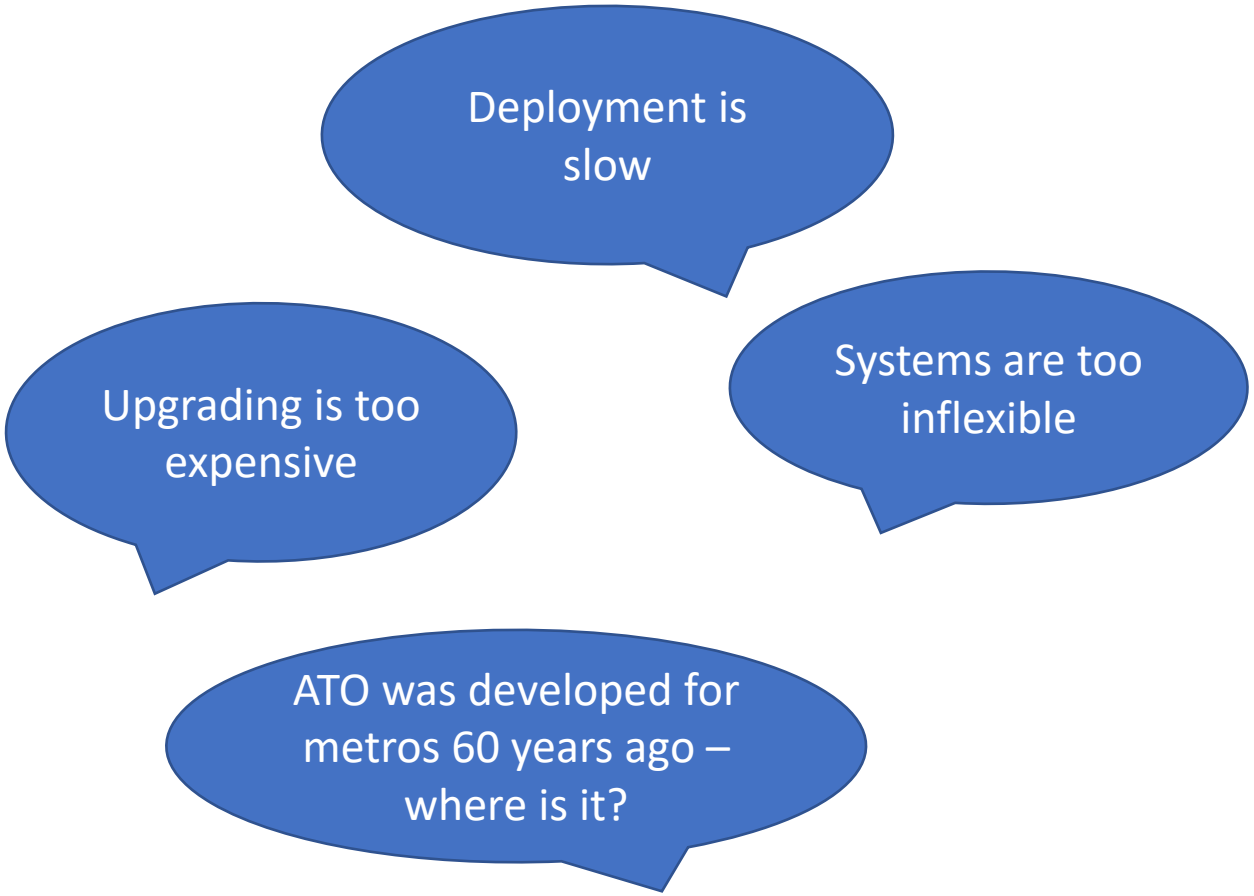
ERA ERTMS conference

Workshop 8 – System Pillar presentation

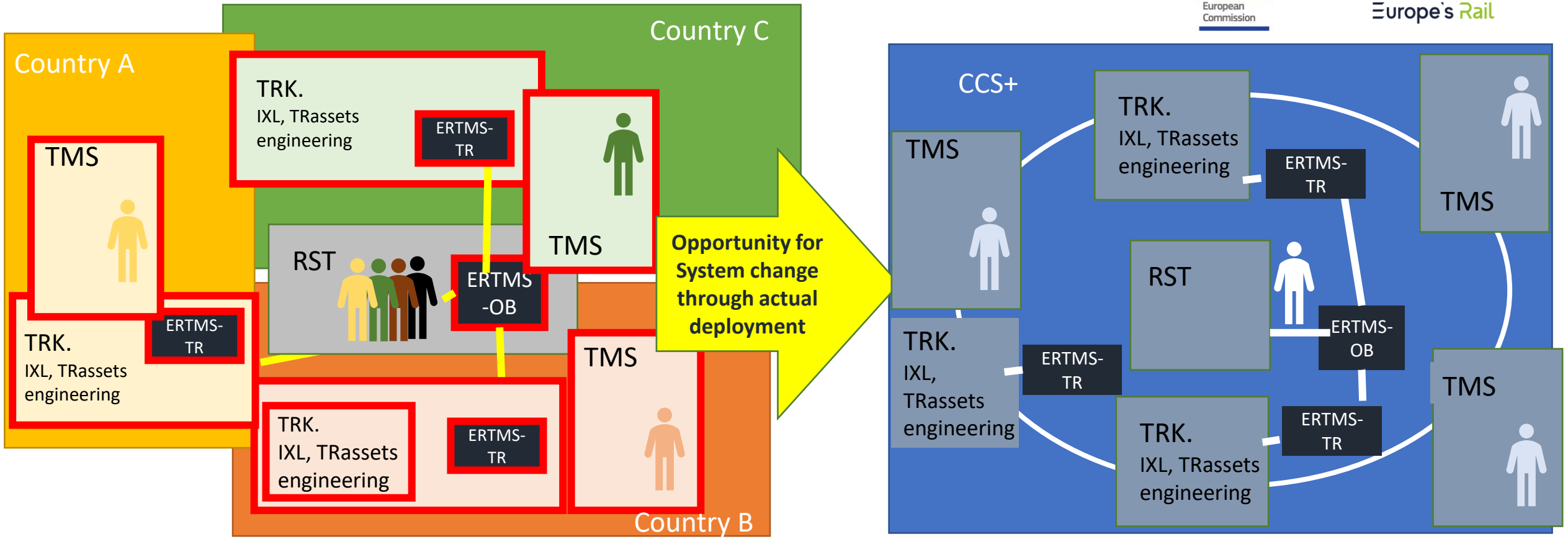
System Pillar: Problem statement

Rail is a complex, safety-critical, system of systems

- Railways across Europe do not operate in the same manner and use a variety of technical systems, which are neither integrated nor, in general, harmonised.
- Innovations to the European rail system are often bespoke and country or system specific; thus slow to deploy and costly.
- At the same time, the market potential and the return on investment are limited.
- Ultimately, this fragmentation of the rail sector undermines the performance and competitiveness of the European rail system as well as of the European railway supply industry in global markets.



System Pillar: The opportunity



System view:

- Harmonized operations and engineering – beyond strict interoperability
- Best practice architecture approaches supporting adaptable systems
- Specifications and standard evolution supporting a strategic view on system change

System Pillar is the opportunity for the sector to converge on the evolution of the Railway system - operational concept and system architecture

System Pillar: Impact

EU-Rail, through the System Pillar, provides governance and resources to allow the sector to coordinate and converge on the evolution of the system to:

- Define the fundamental design principles and a functional architecture for rail as a system
- Harmonise this system architecture approach at European level, including standardisation of interfaces, communications and data exchange.
- Consider the migration path from current systems to the future system.
- Ensure that the long-term system view can be reflected in a predictable regulatory framework, while modularity ensures the necessary flexibility to innovate.

Successful implementation will:

- facilitate rail as integral part of mobility services and intermodal transport
- increase the overall performance of the rail system, and strengthen interoperability
- deliver cost efficiency in integration, maintenance and evolution of the system
- strengthen the market with large scale and faster deployment of leading-edge developments

System Pillar within the SBA

Article 84(5)a

develop in its System Pillar a system view that brings together the rail manufacturing industry, the rail operating community and other rail private and public stakeholders, including bodies representing customers, such as passengers and freight and staff, as well as relevant actors outside the traditional rail sector. The “system view” shall encompass:

- i. the development of the operational concept and system architecture, including the definition of the services, functional blocks, and interfaces which form the basis of rail system operations;
- ii. the development of associated specifications including interfaces, functional requirement specifications and system requirement specifications to feed into Technical Specifications for Interoperability (TSI) established pursuant to Directive (EU) 2016/797 of the European Parliament and of the Council or standardisation processes to lead to higher levels of digitalisation and automation;
- iii. ensuring the system is maintained, error-corrected and able to adapt over time and ensure migration considerations from current architectures;
- iv. ensuring that the necessary interfaces with other modes are assessed and validated, in particular for freight and passenger flows.

Article 86

The Union financial contribution from the Horizon Europe Programme to the Europe’s Rail Joint Undertaking, including EFTA appropriations, to cover administrative costs and operational costs shall be up to EUR 600 000 000, including at least EUR 50 000 000 for the System Pillar , and up to EUR 24 000 000 for administrative costs. The Union contribution may be increased with contributions from third countries if the latter are available.

(*) draft SBA as at 18 Feb 2021

System Pillar within the SBA

Article 93: *The System Pillar Steering Group*

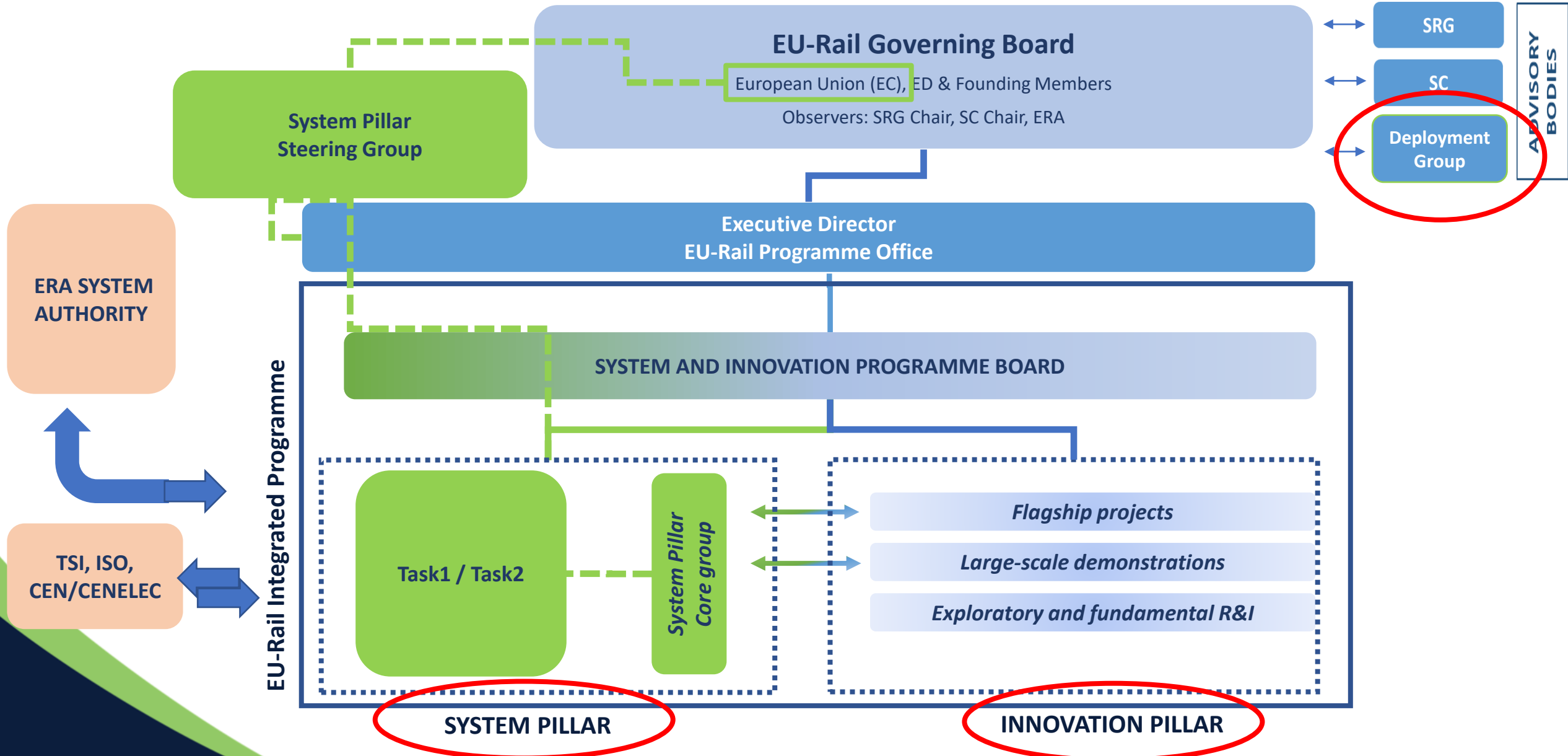
The System Pillar Steering Group shall be composed of representatives of the Commission, representatives of the rail and mobility sector and of relevant organisations, the Executive Director of the Europe's Rail Joint Undertaking and representatives of the European Union Agency for Railways. The Commission shall take the final decision on the composition of the Group. When justified, the Commission may invite additional relevant experts and stakeholders to attend the meetings of the System Pillar Steering Group as observers.

- The System Pillar Steering Group shall be chaired by the Commission.
- The recommendations of the System Pillar Steering Group shall be adopted by consensus. Where no consensus is reached, the Executive Director of the Europe's Rail Joint Undertaking shall prepare a report for the Governing Board, outlining the key common points and diverging views.
- The System Pillar Steering Group shall adopt its own rules of procedure.
- The System Pillar Steering Group shall be responsible, for providing advice to the Executive Director and Governing Board on any of the following:
    - the approach to operational harmonisation and the development of system architecture, including on the relevant part of the Master Plan;
    - delivering on the specific objective set out in point (c) of Article 83(2);
    - carrying out the task set out in point (a) of Article 84(5);
    - the detailed annual implementation plan for the System Pillar in line with the work programmes adopted by the Governing Board in accordance with point (b) of Article 92.

Article 91 (3): Functioning of the governing board

Notwithstanding Article 15(1) with regard to activities to be performed under the System Pillar, a decision shall be deemed adopted by a majority of at least 55% of the votes including the votes of representatives who are absent.

System Pillar: Governance



System Pillar: outcomes in level structure

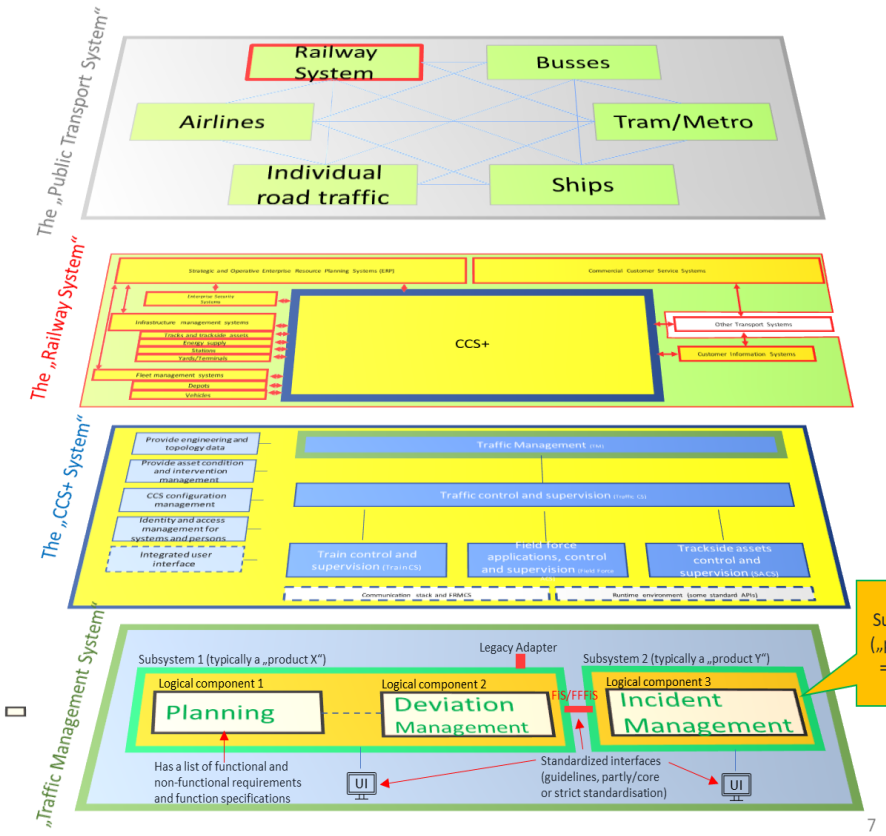
Because of the size of the Railway System, it is necessary to distinguish for the content structure between different level of details (design level). There is a hierarchy of process and system levels

Railway System

Task 1

Specific sub systems

Tasks 2,3,..



Operational concept and Basic requirements

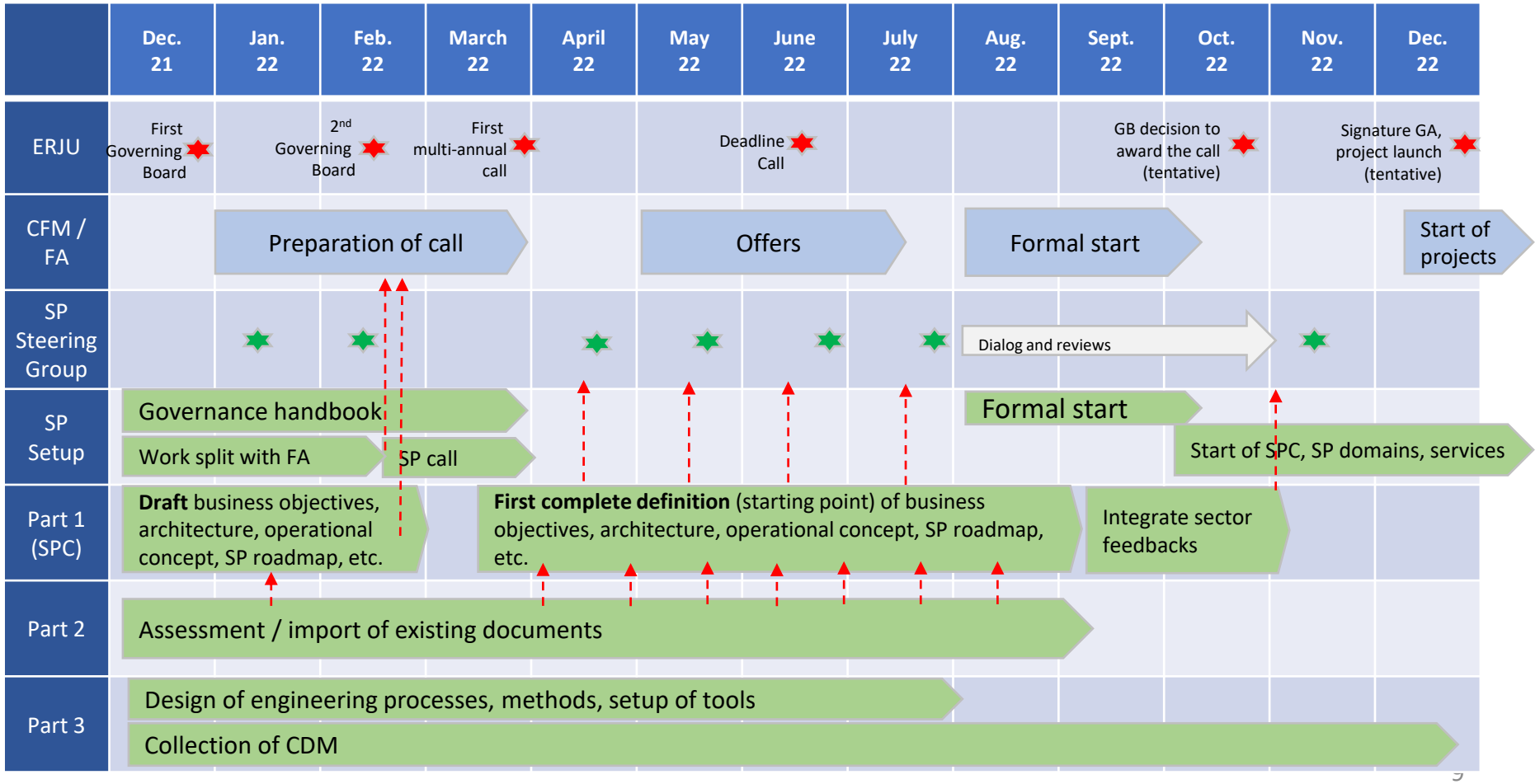
Basic operational processes and requirements

Operational processes and specifications

examples

- ✓ For public transport, how railways and other transport systems shall interact concerning management connections in a station
- ✓ For Railway system, how shall customer information, TMS and CCS interact in general to manage connections for passengers in case of a deviation
- ✓ For CCS, how shall different actors in the production (trains, field forces, ..) be coordinated to execute a changed plan
- ✓ For vehicle control and supervision, what processes shall happen onboard in general when the movement authorisation changes

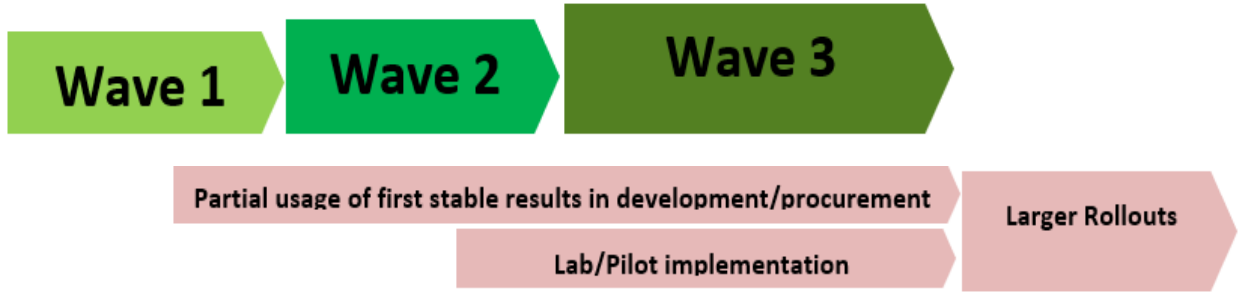
SP. Ramp up plannning



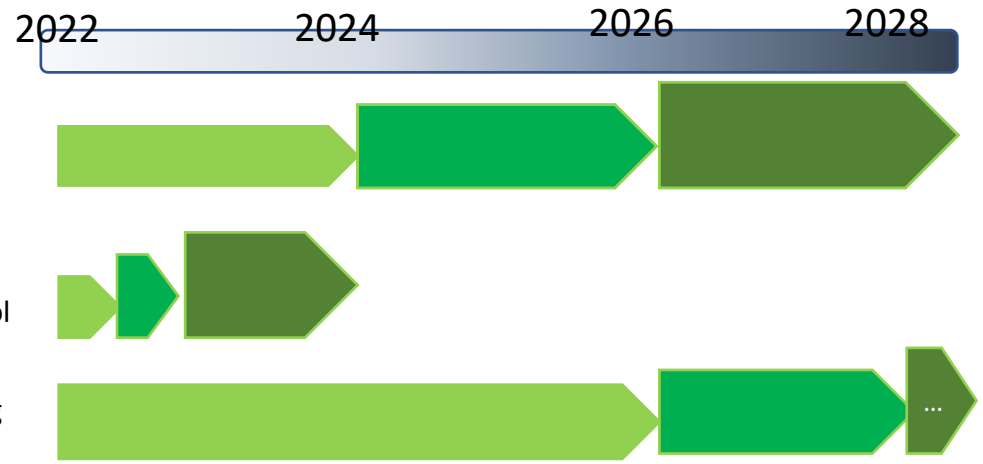
SP. Roadmap

SP outcomes prioritisation is driven by the needs of the sector and the Railway modernisation programmes foreseen in the coming years

- ✓ Outputs from existing initiatives are evaluated during ramp-up to follow SP processes and reach sector agreement in short term
- ✓ Deployment plans and ongoing and tenders will set the priorities for activities to cover their needs through SP deliverables
- ✓ standardisation and TSI input plan will provide strategic planning for specifications
- ✓ Specifications and outputs will be available in different levels of definition and maturity, i.e. waves. Deployment projects can use the outcomes at the different waves to cover different needs

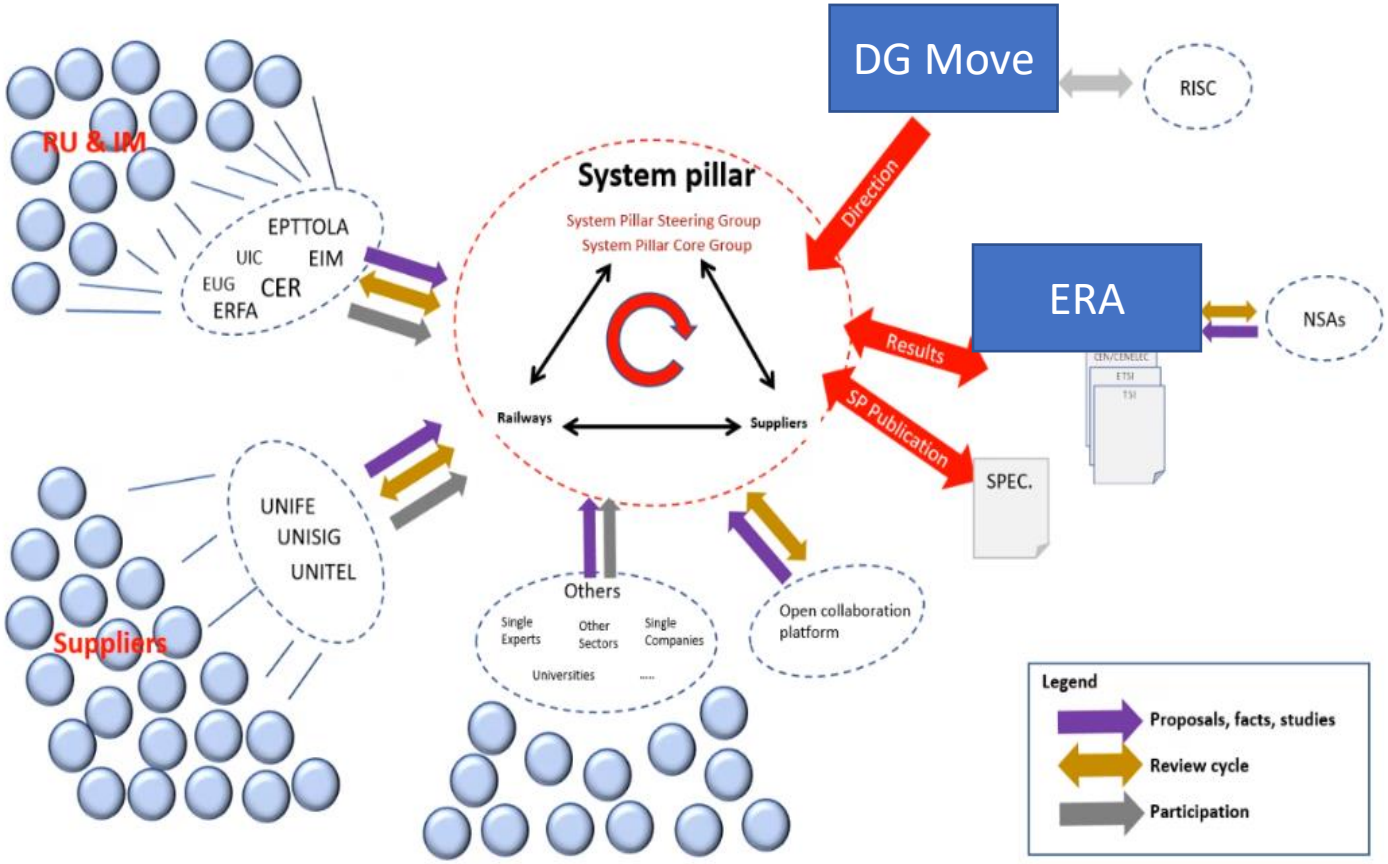


Examples in current draft



Supporting slides

SP. Working arrangements



Should we add the governing board??

The process of determining the level of granularity and whether or not a particular level of standardisation is required are dealt with through the SP processes outlined in the Single Basic Act.

- ✓ Strategic plan for the new railway specifications delivery
- ✓ Harmonised operational concept and common architecture
- ✓ technical specifications and interfaces

SP. From CBO to specific improvements

More flexibility and punctuality for passengers and freight

service quality and improve punctuality	real-time data sharing	On demand/real time and complete operational plan
		Single European Railway Area with end-to-end journeys

Improved performance and capacity

Increase capacity, reduce travel time	Better predict capacity needs	automated extensions of Movement Authority with shorter headway
Optimise capacity	efficient capacity of lower used lines	Unmanned train operation

Reduced costs

Affordable LCC	Economically attractive solutions	35 % reduction LCC including removal of trackside assets
Affordable system updates		system updates of SW and digitalized system. software as a service

More sustainable and resilient transport

efficient energy consumption& smart energy infra	proper security regulations and standards	Digitized maintenance processes interaction
Improve availability/reliability/robustness	integration of transport systems in populated areas	More efficient energy consumption

Harmonised approach to evolution and greater adaptability

Harmonize ope & strengthen interop	Optimize Safety regulations	unique operational, safety and engineering requirements for CCS+
Standardize architecture	Increase systems adaptability	standardisation of interfaces, communications and data exchange

Reinforced role for rail in European transport and mobility

Improve methods and tooling	Reduce regulatory complexity	Simplify planning, engineering, installation, commissioning&maintenance
Enable fast migration and roll out		backwards and forwards compatibility

Improved EU rail supply industry competitiveness

Make future railway system attractive	international design authority	Full" reusability of products and installation nearly on the fly
		Guarantee the compatibility of subsystems and components

SP. Key drivers

Whilst many railways will have views of the future railway architecture, there is no common EU railway system view that is used today.
The railways have traditionally approached systems architecture following a national – even regional –technical approach, leading to a heterogeneous picture at European level. National markets for rail infrastructure and vehicles continue to exist in a way that has been overcome in other modes of transport or sectors. The problem with this is that innovations and changes to the system are very difficult and costly to achieve. Ultimately this undermines the performance and competitiveness of rail.
The purpose of the System Pillar is to improve the European railway system to offer better services for the European citizen, passengers and freight.
For this, the key drivers are the following:

- Cost efficiency for integration,
- Migration and deployment,
- Cost efficiency for maintenance and evolution of the system
- Quicker roll-out of innovations
- Market accessibility (for equipment and service provision)
- Increase overall performance and agility of the railway including time, reliability and safety towards the customer through faster deployment of key new technologies
- Improved train service delivery across the European Union
- Facilitate rail as integral part of the mobility services across the European Union
- Manage diverse rail legacy, bringing interoperability and ease the migration
- Sound, qualified and reliable supply chain.

SP. System view

opportunities

Designs to take full advantage of current innovations and technologies and allow easier evolution and modernisation at later stages

Sustainability, including increased market penetration of rail services, both passenger and freight.

Reduced costs and better amortisation of developments and innovations through economies of scale

removal of operational and administrative borders, Real time Traffic Management across EU and more flexible trains and services

Enable full end-to-end services and intermodality, and freedom for passengers and freight to travel at international level

Improve the competitiveness of the European railway sector.

Take care of investment protection in migration schemes. Minimum requirements for different roadmaps should be defined. taking into account the separation between the operator and the infrastructure manager business cases

The system should be robust, resilient and secure

The system should be agile, available and simple to use and operate.

Need to enable all rail stakeholders to deliver a safe and continuous railway, and take into account rail specificities, including technical and operational aspects.

The continuity of railway services in transition phases has to be achieved

Constraints