Freight Rolling Stock digitalisation at EU level
The intelligent train

carlo m borghini
Shift2Rail Executive Director

Brussels, 6 November 2019

@Shift2Rail_JU
#Horizon2020

SUSTAINABLE DEVELOPMENT GOALS

RAILWAY

A

- Aging

People, Infrastructure, Assets Staff, …

C

- Climate Change

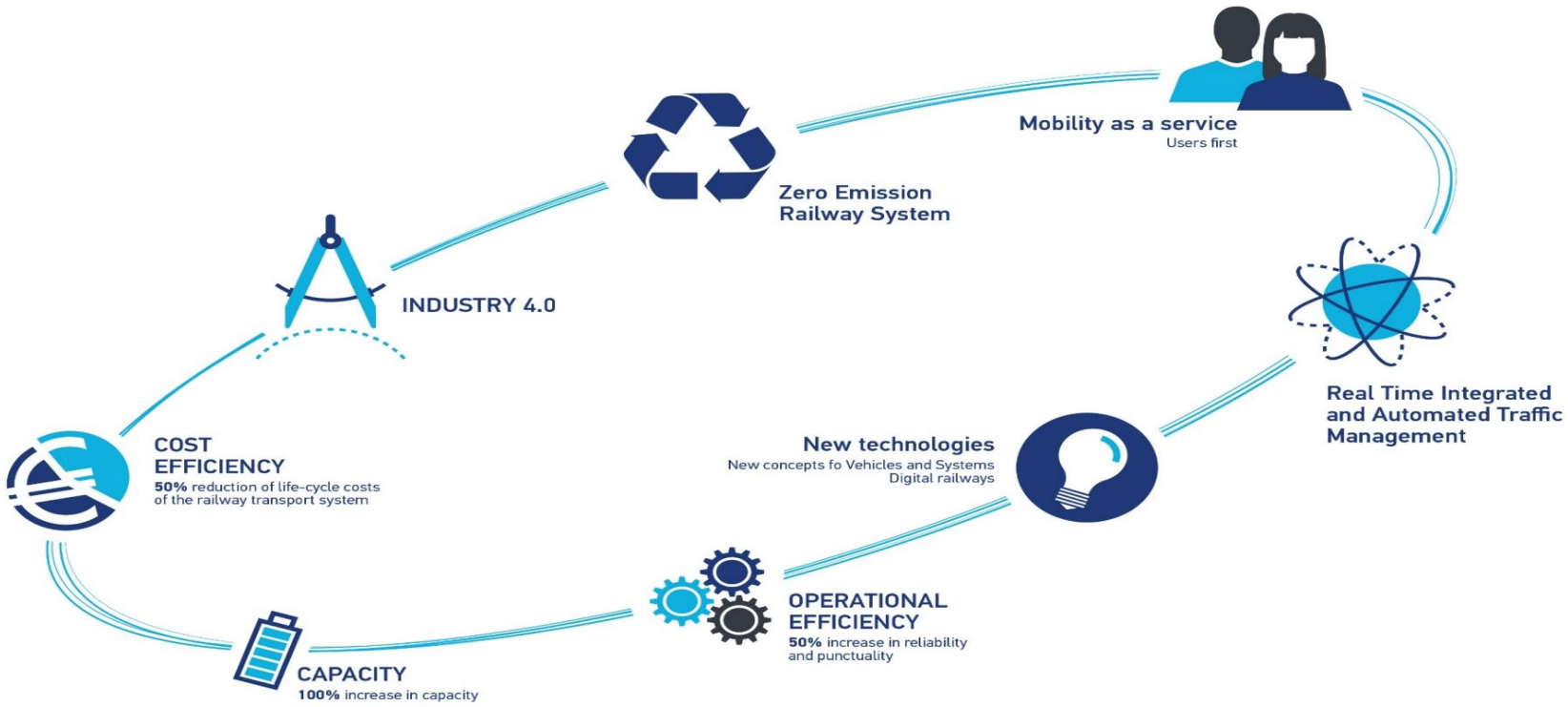
Game changer

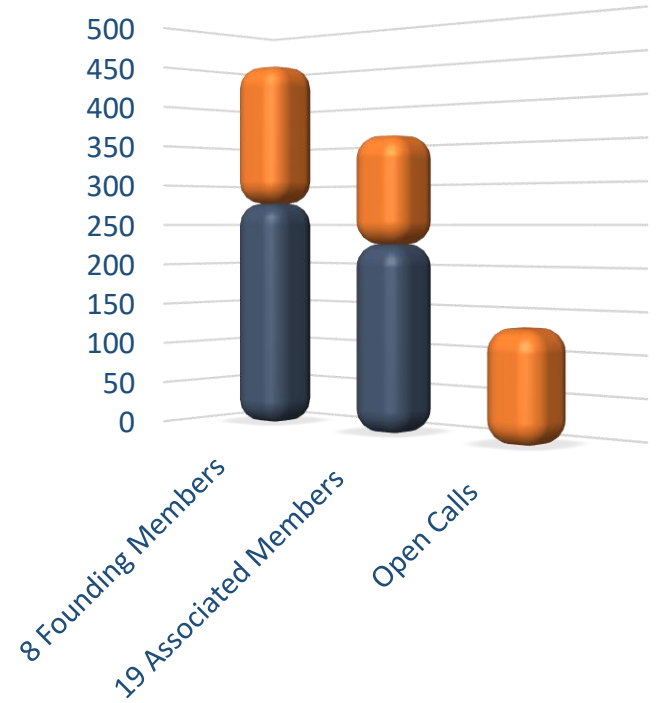
T

- Technology

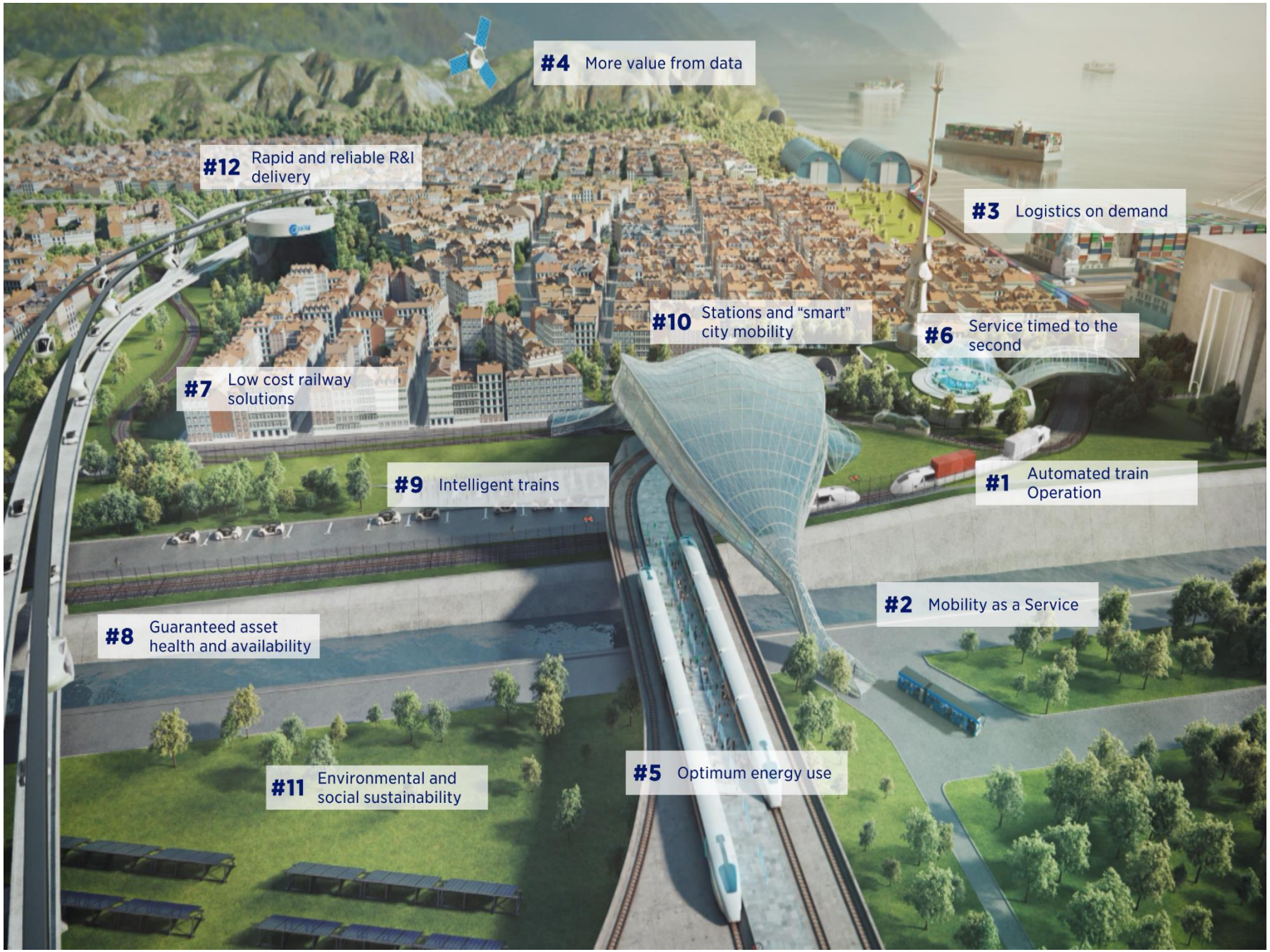
Opportunity & risk

S2R VISION





To **deliver** through railway **research and innovation** the **capabilities** to bring about the most **sustainable**, **cost-efficient**, **high-performing**, **time driven**, **digital** and **competitive, customer-driven** transport **mode** for Europe

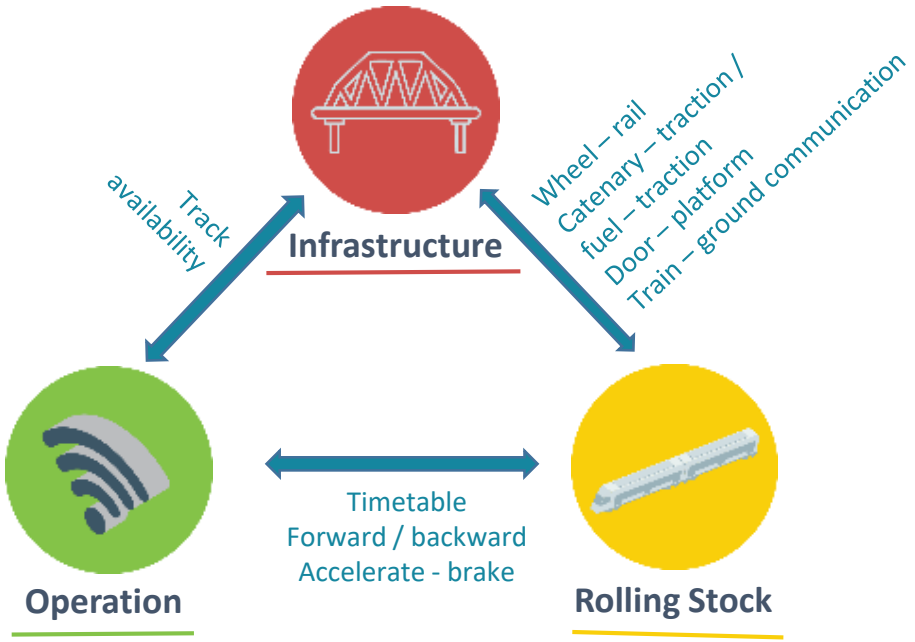


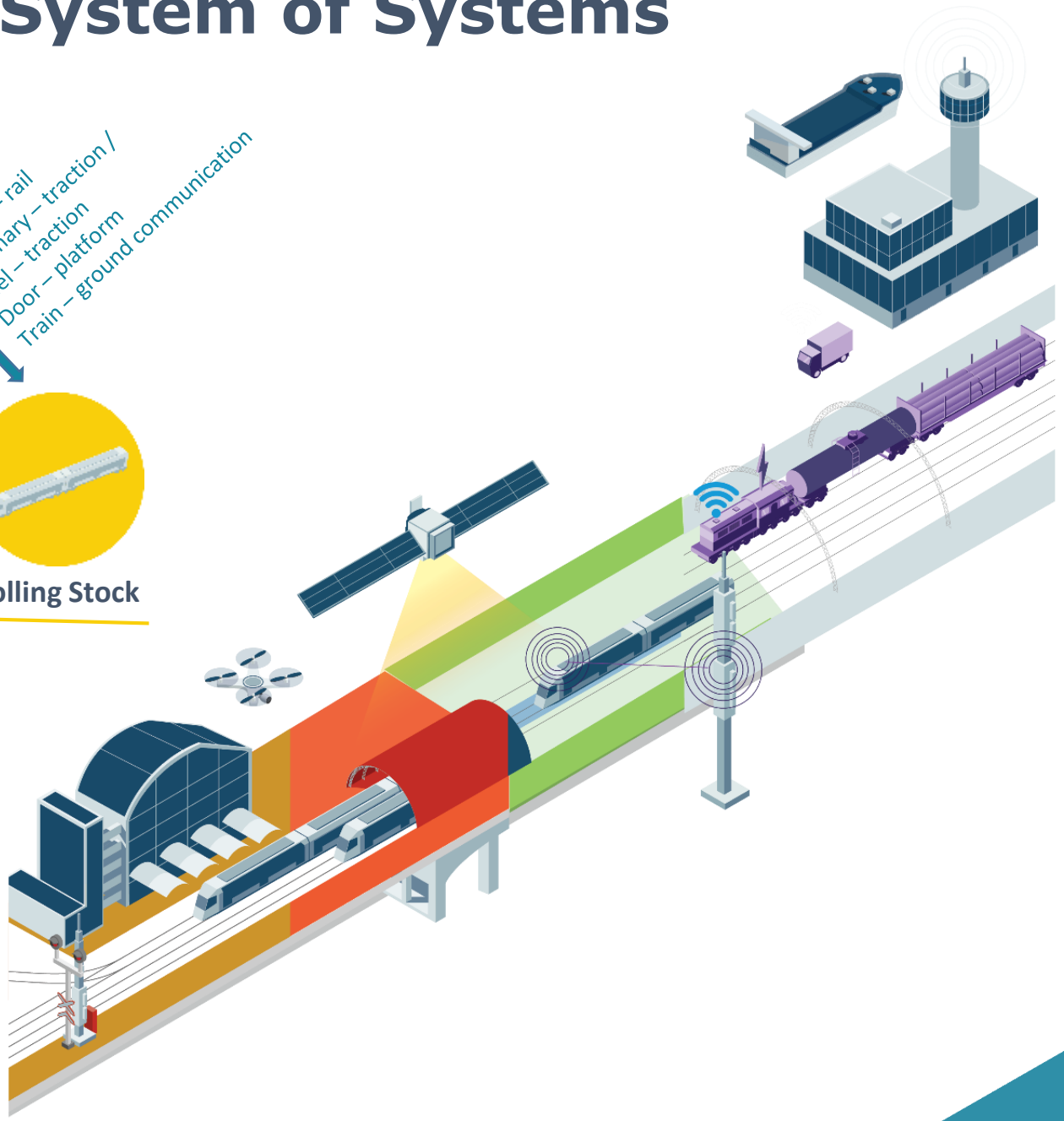
INNOVATION CAPABILITIES

USER FIRST

Shift2Rail

Railway - System of Systems





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

IP5 Technology for Sustainable and Attractive European Rail Freight

CCA Cross Cutting Activities

Railway System Architecture

- ✓ **Innovation:** evolutionary, by steps or disruptive
- ✓ **Time to market**: moving from R&I to deployment => **system approach to decrease fragmentation**
- ✓ **“Do not reinvent the wheel”: Open System Interface (or interconnection) model**
- ✓ **Innovation Skills and Competences :** still the same needs in the Digital Railway?

THE FUTURE RAIL SYSTEM: TRAINS MAXIMIZING THE SYSTEM PERFORMANCE BY A COMBINATION OF DISTRIBUTED INTELLIGENCE AND SUPERVISION

- ✓ **Enablers:** digital technologies, automation, artificial intelligence, data, cloud and supercomputing, **connectivity**, satellite, but also **new regulatory concepts and framework**, traction, braking systems, etc….
- ✓ **Deployment: from zero on site testing through integrated testing to revenue services testing, large real time demos, transition models**

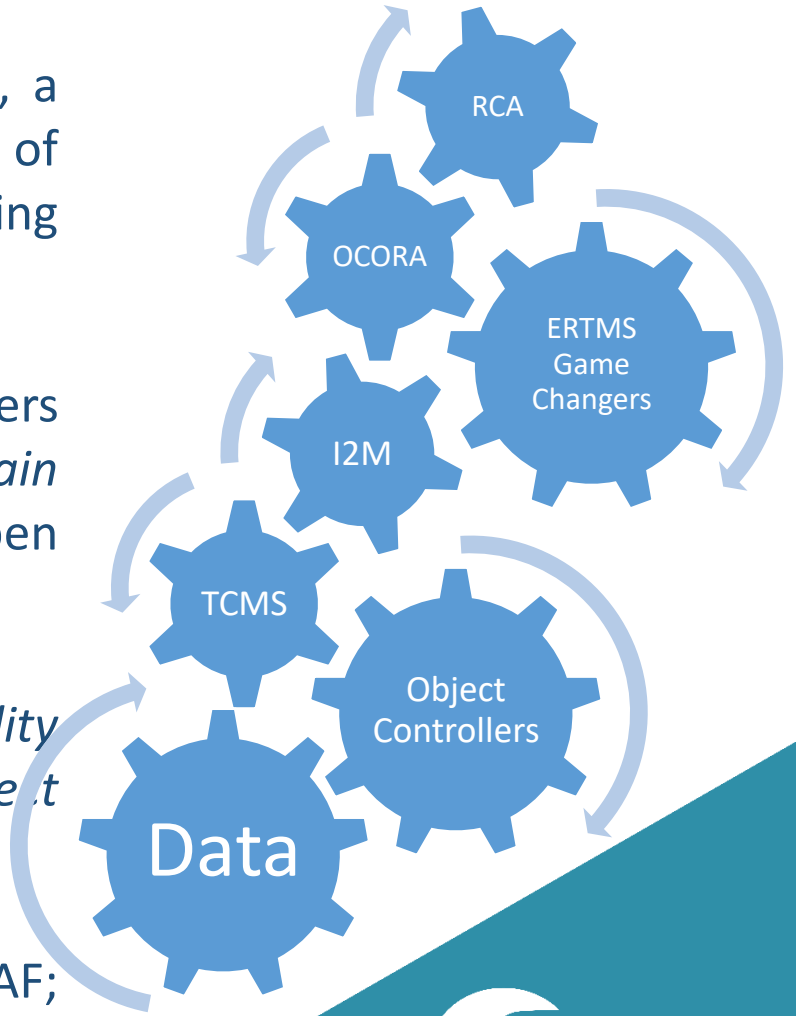
A System of Systems' Architecture: Innovative Solutions for Railway Next Gen Systems

S2R will deliver with the Sector, under DG MOVE and together with ERA, a Comprehensive **Systems of Systems' Architecture**, meaning a structure of components, their relationships, and the principles and guidelines governing their design functional evolution over times:

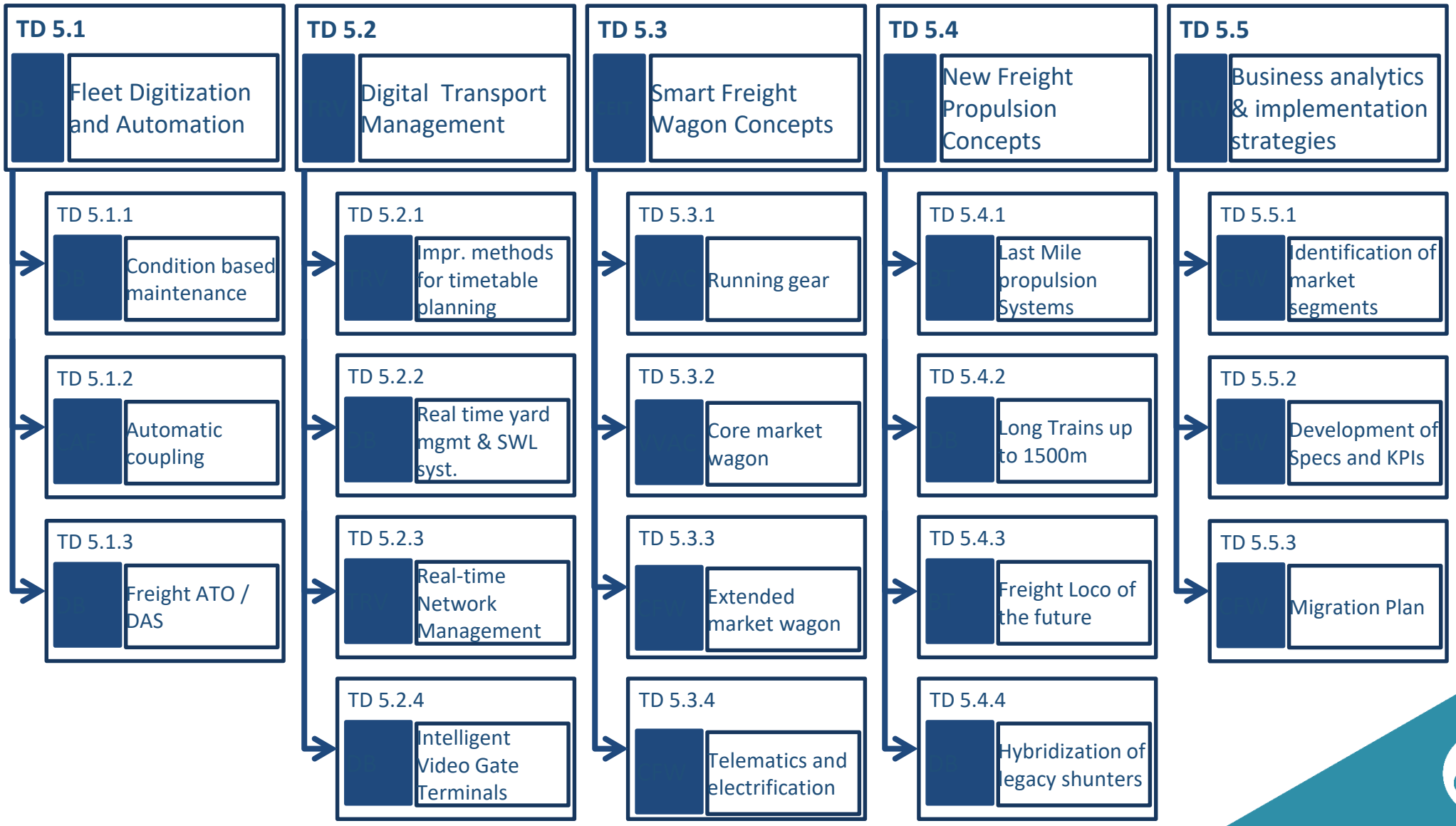
- Integration of the S2R Innovative Solutions for the ERTMS Game Changers (*ATO GoA2, GoA3/4, Adaptable Communication System, Moving Block, Train Positioning*) together with sectorial initiatives (*RCA, OCORA*) for an Open System Interface (or interconnection) model

- Integration of S2R interoperable solutions as *Intelligent Mobility Management (enlarged TMS)*, *next gen TCMS*, *smart connected object controllers*, *condition based maintenance* for all kind of assets, etc

- Aligning all ongoing modelling initiatives (RTM, EULynx, IFC, RailML, TAP/TAF; SensorML etc.) in terms of principles and digital data exchange format with the S2R solution on a EU shared *Conceptual Data Model*

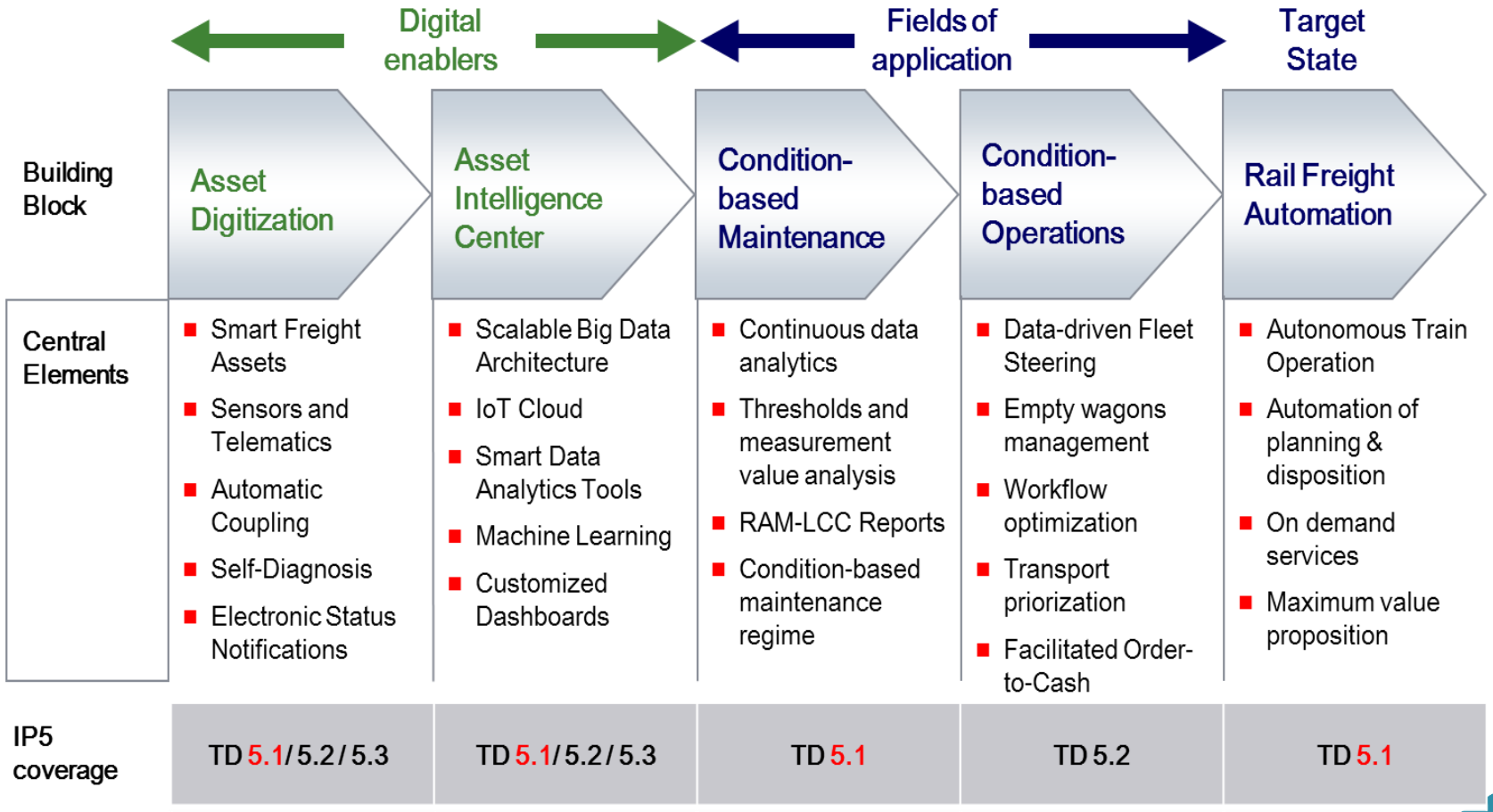


IP5 better focused approach



IP5 interaction between TDs

Simplified digital value chain



IP5 planning

TDs	TASKS	TRL	2016				2017				2018				2019				2020				2021				2022			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
TD 5.1	**Fleet Digitalisation and Automation**																													
5.1.1	High level specification definition, feasibility analysis and preliminary testing CBM and AC	n/a																												
5.1.2	Conceptual / architecture design CBM and AC	3																												
5.1.3	ATO over ETCS - GOA2 freight specification	3																												
5.1.4	Detailed design, implementation and unitary testing CBM and AC	4																												
5.1.5	GOA2 Pilot Line freight demonstration	6																												
5.1.6	Integration of components CBM and AC	5																												
5.1.7	C-DAS/ ATO interface assessment	3																												
5.1.8	ATO over ETCS - GOA4 freight simulation	3																												
5.1.9	Demonstration activities CBM and AC	6																												

milestone

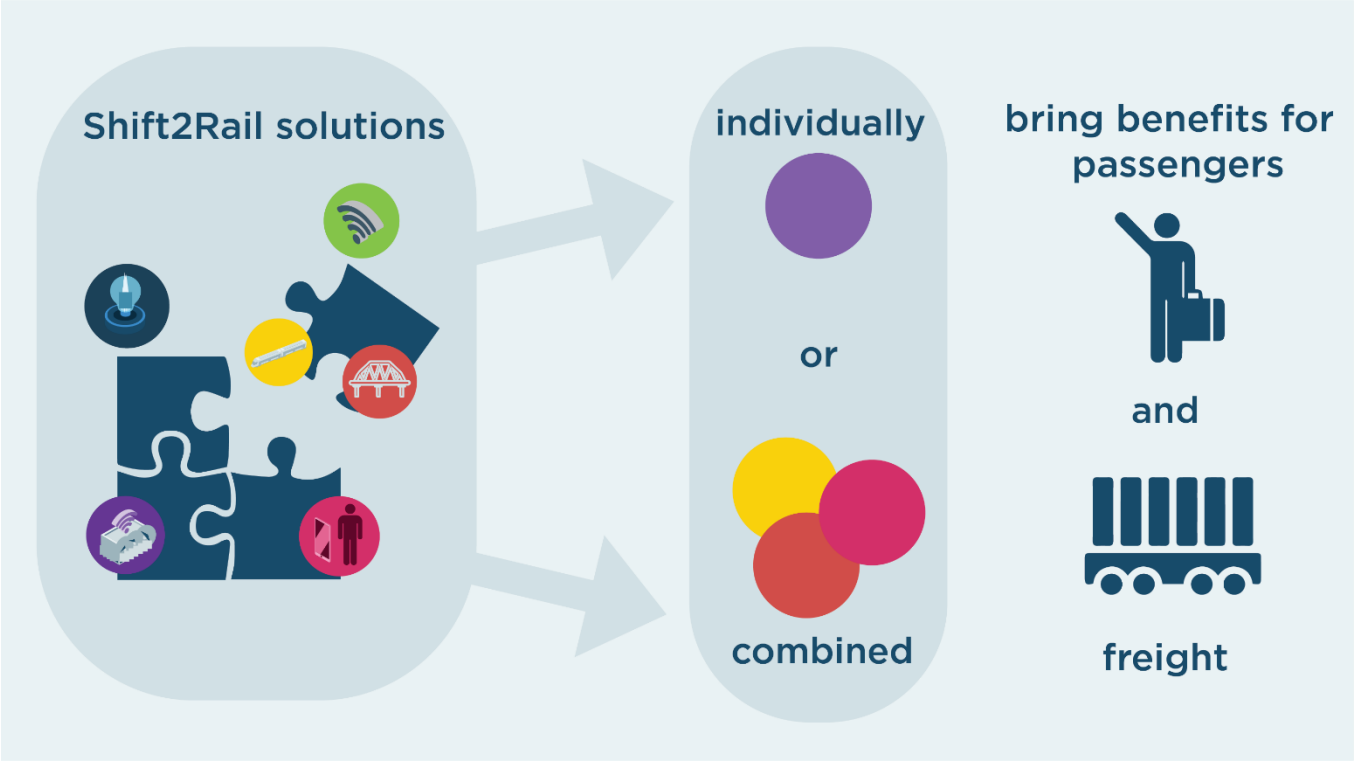
quick win

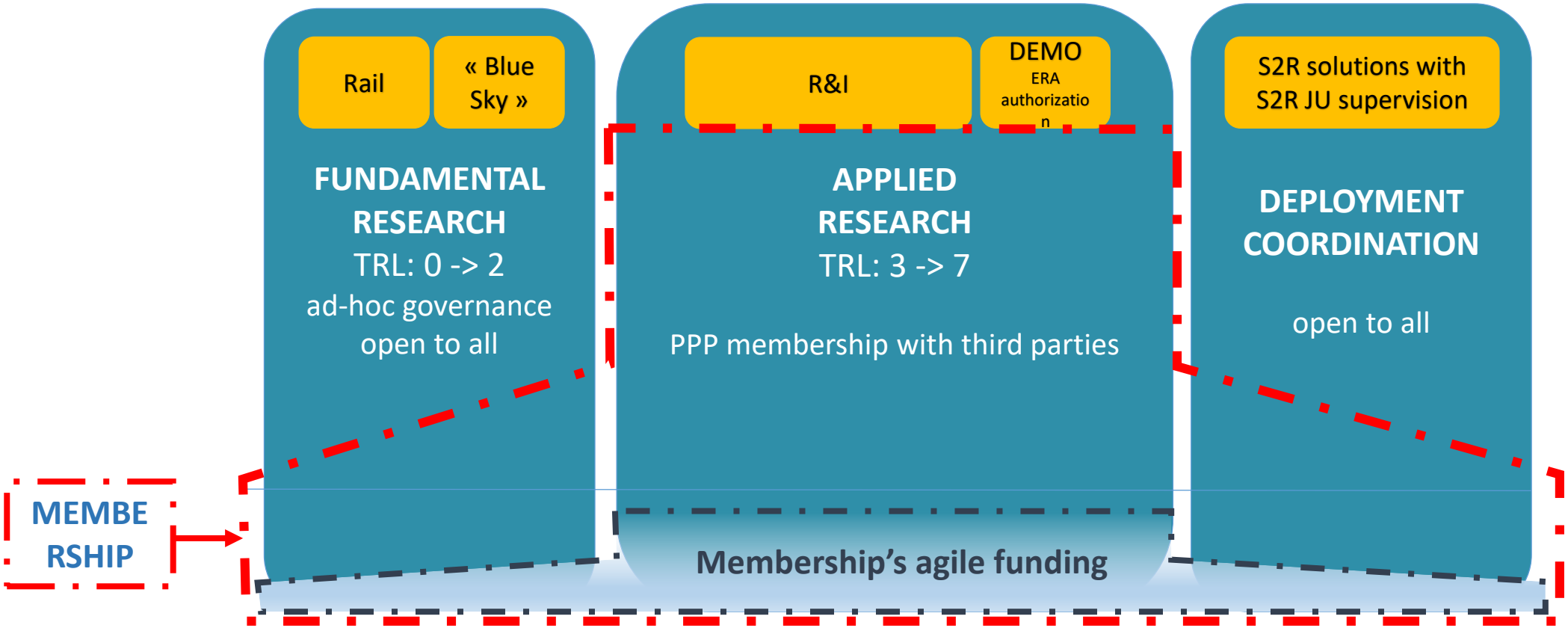
ongoing activities

planned activities

S2R JU Catalogue of solutions

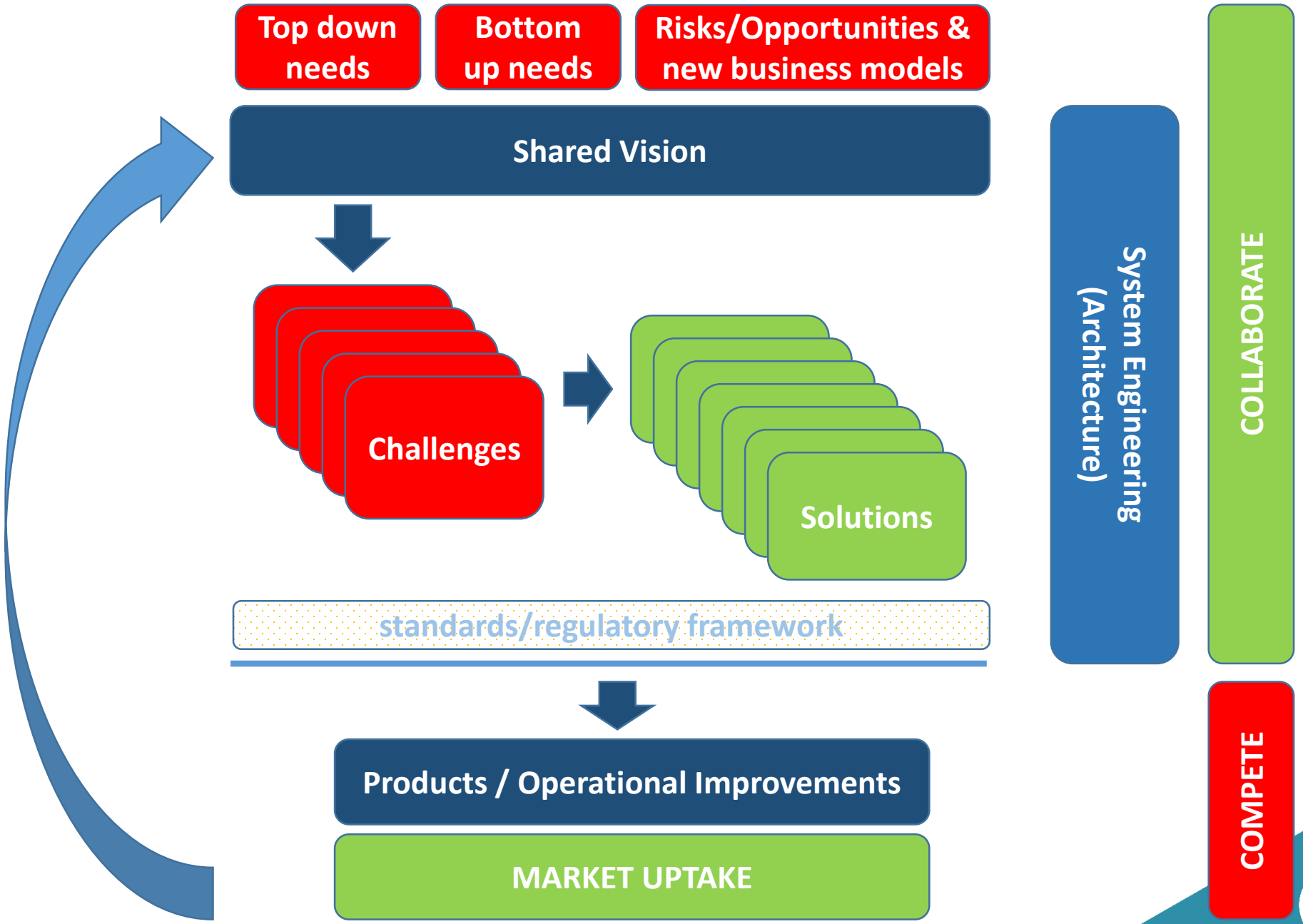
- What R&I investments generate as innovative solutions for market uptake
- To explain **successful results in term of possible products/solutions** with a clear timetable
- **To show Benefits for "customers"**: final users, operators, infrastructure managers and/or suppliers
- To highlight the **advantages** of integrating the demonstrators into **market solutions**
- **To deliver the Innovation Capabilities**
- **28 October publication**





No participation barriers between R&I&D areas
TRL 7 Demos included in Applied Research, Live Large Scale Demos in Deployment Coordination

Research and Innovation beyond 2020


Top down needs
Bottom up needs
Risks/Opportunities & new business models
Shared Vision
Challenges
Solutions
standards/regulatory framework
Products / Operational Improvements
MARKET UPTAKE
System Engineering (Architecture)
COLLABORATE
COMPETE

FOUNDING MEMBERS

ALSTOM

BOMBARDIER

CAF

Hitachi Rail STS

NetworkRail

SIEMENS

THALES

TRAFIKVERKET

ASSOCIATED MEMBERS

amadeus · ČD PRAHA · DB · DIGINEXT be visionary · Faiveley Transport A Wabtec Company · HaCon

indra · KNORR-BREMSE · kontron S&T Group · mermec AN ANGEL COMPANY · SNCF · Talgo

Virtual Vehicle Austria consortium+ (VVAC+)

virtual vehicle · WIENER LINIEN · FCP · TATRAVAGÓNKA POPRAD · getzner engineering a quiet future · ACT · KIRCHDORFER CONCRETE SOLUTIONS · MCL · Plasser&Theurer · PJM · voestalpine ONE STEP AHEAD. · AVL

European Rail Operating community Consortium (EUROC)

ÖBB Immer in Bewegung · bls · COMBOIOS DE PORTUGAL · Lik erne vira sto · PKP POLSKIE KOLEJE PAŃSTWOWE Spółka Akcyjna · SBB CFF FFS · ProRail · Infraestruturas de Portugal · TCDD · Slovenske železnice

Swi'Tracken consortium

RAILENIUM · Universidad del País Vasco Euskal Herriko Unibertsitatea · U.PORTO · TATA STEEL · University of Minho · vossloh · TRONICO · izt · egis · EURO TUNNEL

Smart DeMain (SDM) consortium

Strukton Rail · cemosa · Fraunhofer IVI · acciona · DLR

AERFITEC

AERnnova · FIDAMC · tecnalia Inspiring Business

Competitive Freight Wagon Consortium (CFW)

ConTraffic Consulting Network for Traffic System · DLR · DIE BAHNINDUSTRIE. VDB VERBAND DER BAHNINDUSTRIE IN DEUTSCHLAND E.V. · ceit IK4 Research Alliance · WBN

Smart Rail Control (SmartRaCon) consortium

DLR · RAILENIUM · ceit IK4 Research Alliance · NSL

Shift2Rail