
Shift2Rail

S2R R&I 2016 - 2018

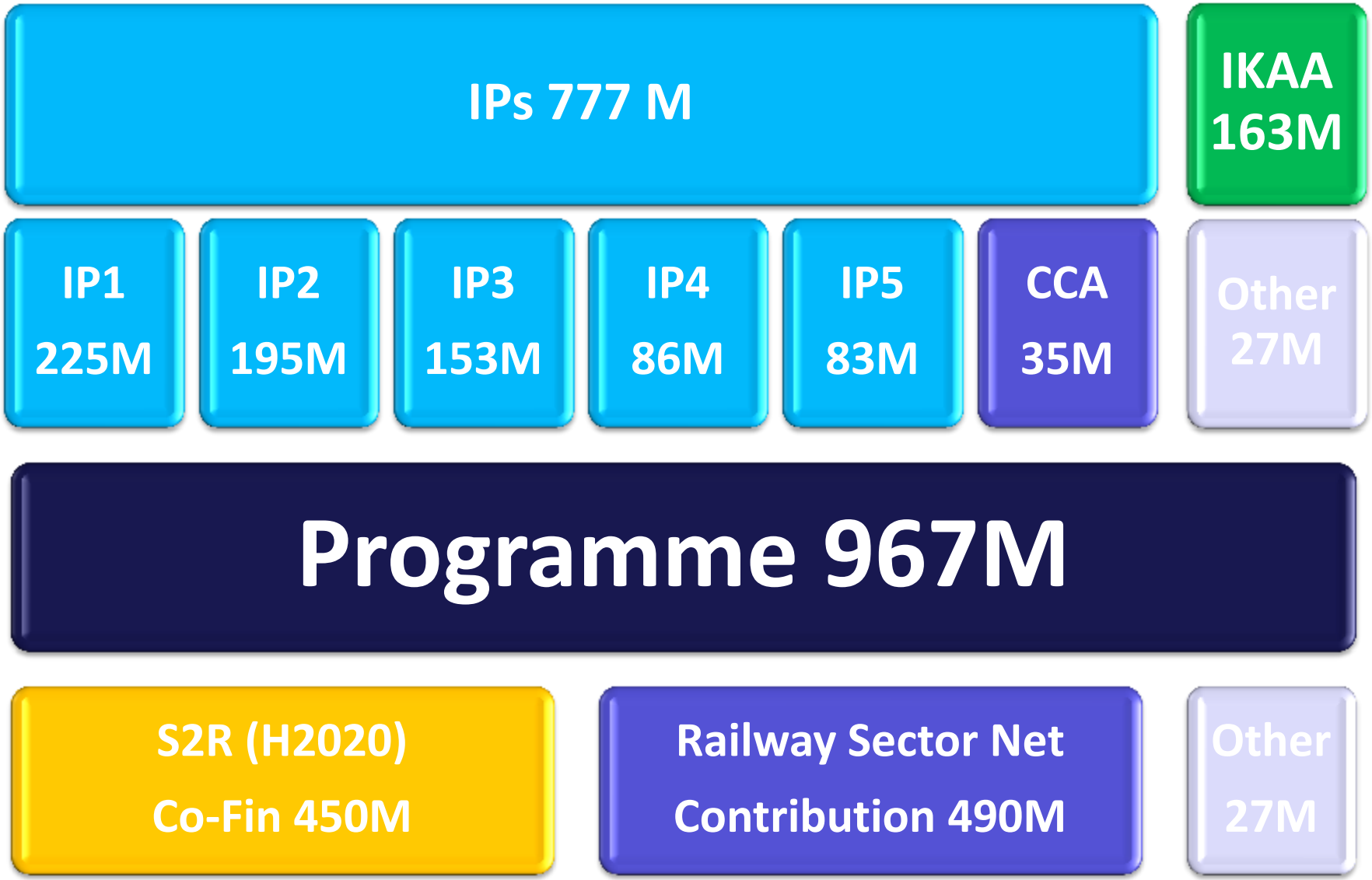
what is S2R

A public-private partnership, a platform for the rail sector as a whole to work together to drive innovation in the years to come … 2024… to achieve

- a **50 % reduction** of the **life-cycle cost of the railway transport system** (i.e. costs of building, operating, maintaining and renewing infrastructure and rolling stock);
- a **100 % increase** in the **capacity of the railway transport system**;
- a **50 % increase** in the **reliability and punctuality** of rail services (measured as a 50 % decrease in unreliability and late arrivals).

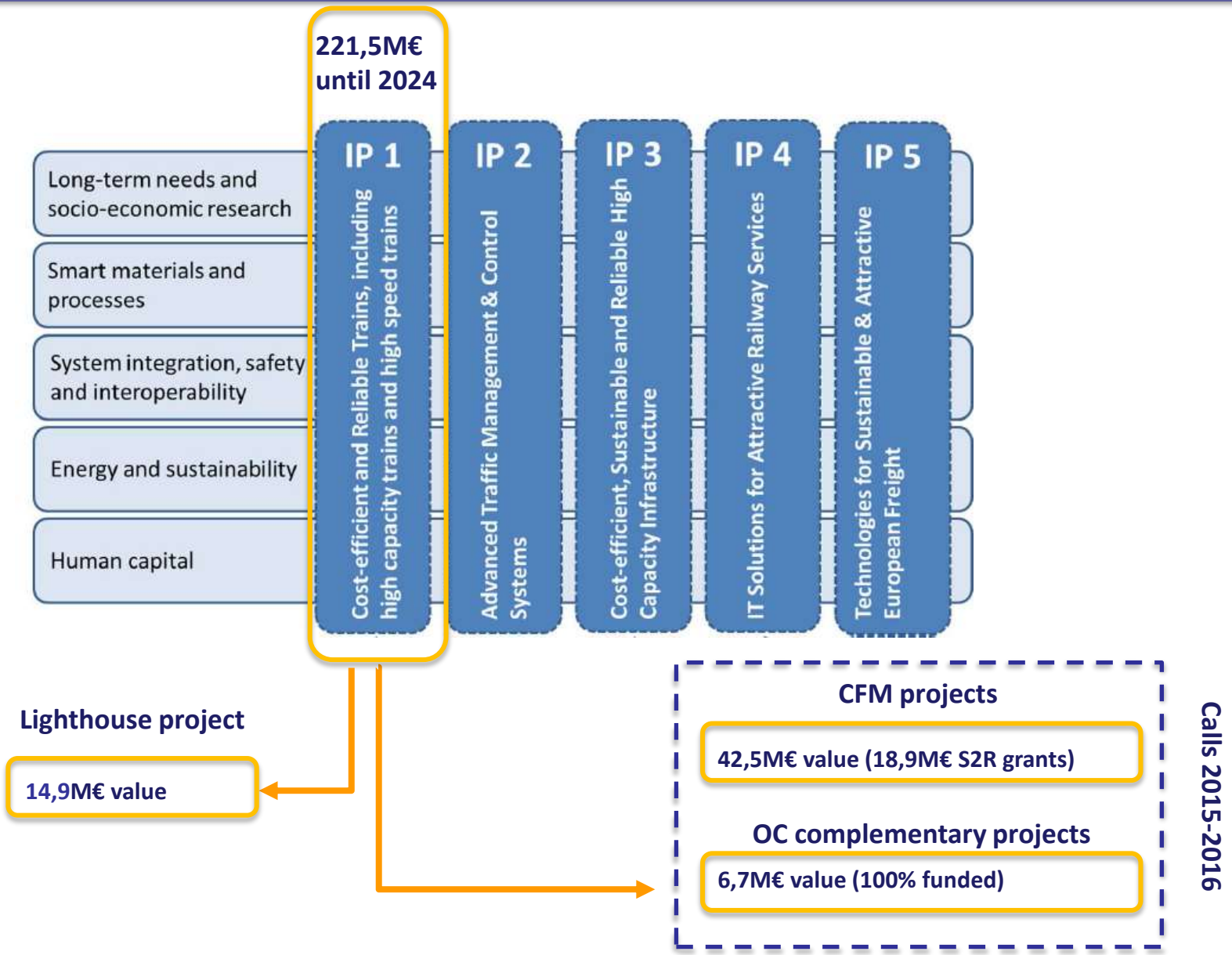
Council Regulation (EU) No 642/2014 of 16 June 2014 (S2R Regulation)

programme financials



Values as at 1 Sept 2016 in Million EUR

S2R IP1 projects status and the MAAP



S2R IP1: Quick Overview

SYSTEM LEVEL

Technical Integration

System level Performance:

- Capacity
- Operational reliability
- Life cycle cost
- Energy efficiency
- Comfort
- ...

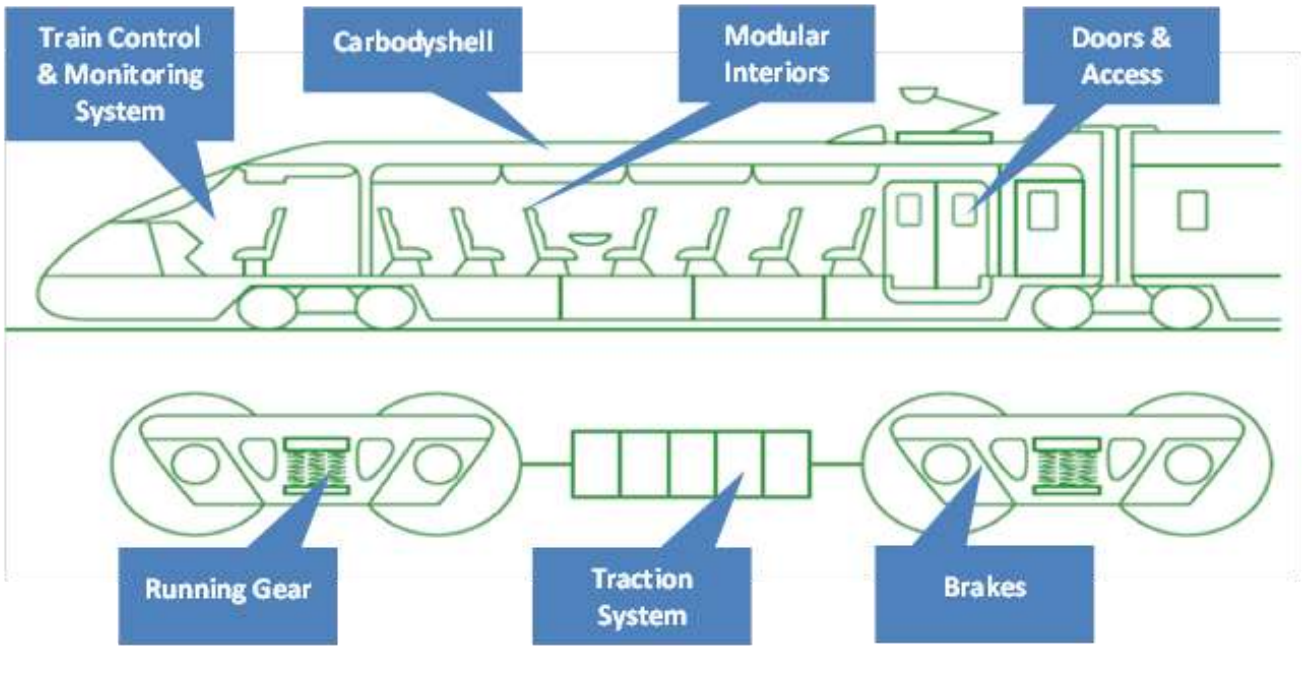
IP2 IP3 IP4 IP5

IP1 ROLLING STOCK

CCAs (Noise, Energy, ...)

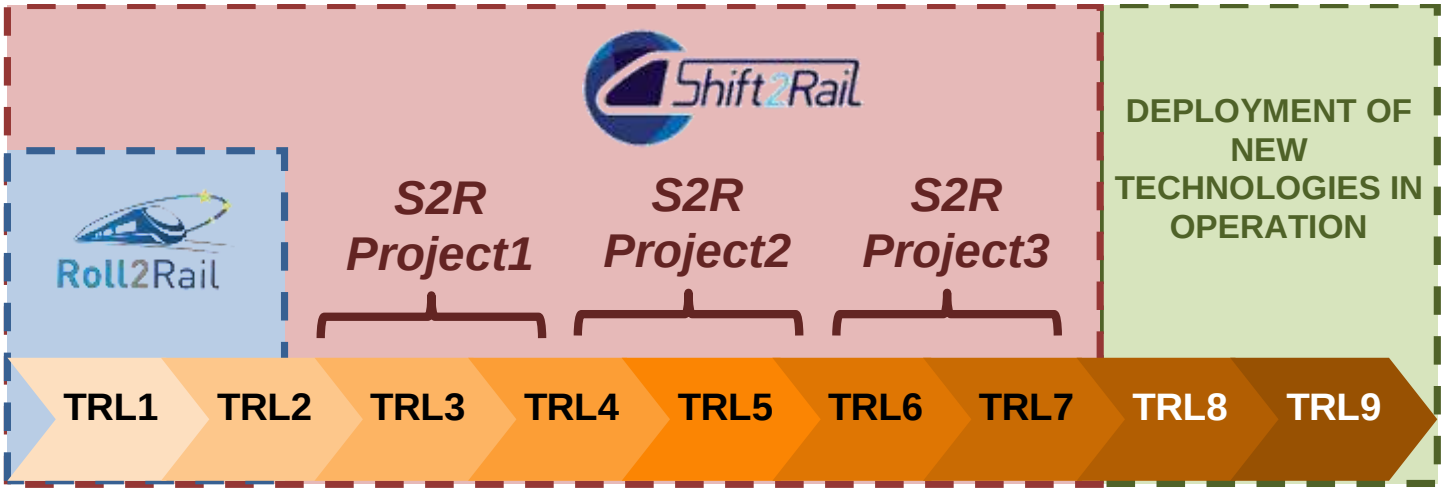
SUB-SYSTEM LEVEL

- New Technological opportunities
- Eliminate existing barriers for implementation of technologies from other fields



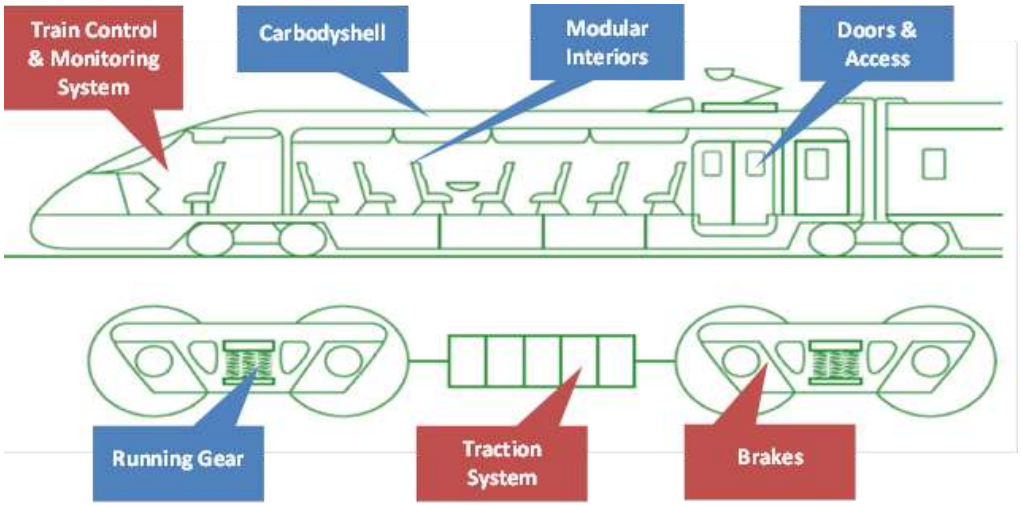
S2R IP1: Development Philosophy

- Technologies developed to reach real application just after S^2R ends
- Each subsequent project increasing Technology Readiness Level compared to the previous one

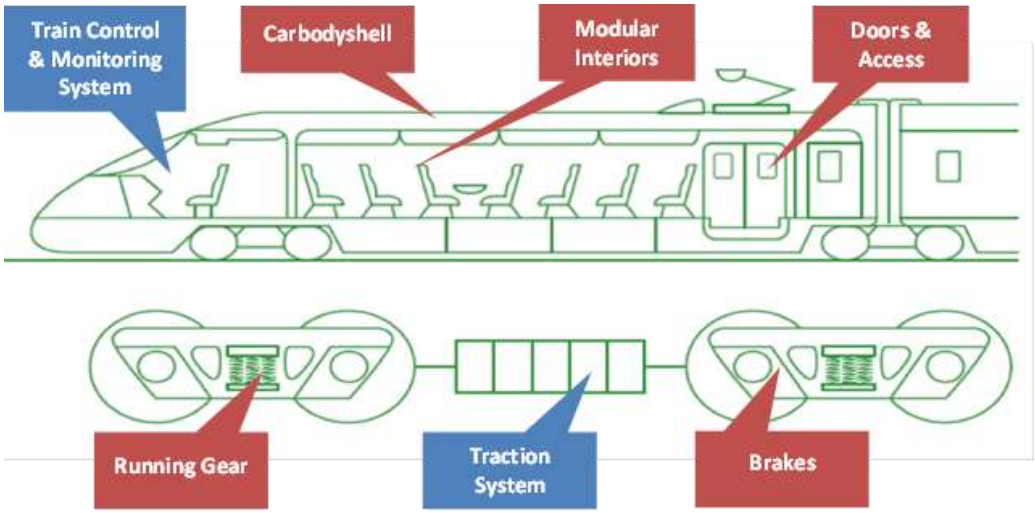


S2R IP1: Starting Up

Starting 2016



Starting 2017



Not all development lines can start on the 1st year

All activities starting within the first 2 years of S2R

IP1 Projects Starting in 2016

AREA	SCOPE	TRL	CONSORTIUM
TRACTION & BRAKING	• New traction components and sub-systems (especially Silicon Carbide based but also independently rotating wheel architecture for HST) customised for different market segments. • Energy saving technologies • Maintenance solutions (Condition Based Monitoring of traction components, remote diagnostic, …) • Methodologies and tools for noise emission prediction • Increase traction system reliability and smart maintenance. • Virtual validation and certification of traction systems • Adhesion management tools and solutions for braking to map different adhesion conditions occurring in rail traffic • Specifications for Adhesion Recovery Systems & improved requirements for Wheel Slide Protection (WSP)	**TRL 2/4**	**PINTA** *(S2R Members)* ALSTOM BOMBARDIER CAF DB Faiveley TRANSPORT KNORR-BREMSE SIEMENS SNCF Talgo

IP1 Projects Starting in 2016

AREA	SCOPE	TRL	CONSORTIUM
TRAIN CONTROL & MONITORING SYSTEM (TCMS) & BRAKING	• Feasibility studies for safety related communications: Technologies and architectures from other sectors • Technology and feasibility studies for functional distribution architectures. Tech. transfer from automotive • Technology and feasibility for virtual certification • Certification aspects for high safety braking electronics	TRL 2	**SAFE4RAIL** *(Open Call)* *Signature Pending*
	• Wireless TCMS for Train-to-train and Train-to-ground communications development • Drive-by-data: SIL4 TCMS for safety critical functions • Functional Distribution architecture • Virtual placing on the market: methodology and architectures • Safe control for brakes: high safety integrity level architectures for brake control	TRL 3/4	**CONNECTA** *(S2R Members)* CAF ALSTOM Ansaldo STS A Hitachi Group Company BOMBARDIER DB Faiveley TRANSPORT KNORR-BREMSE SIEMENS SNCF

Next Activities foreseen to start 2017

AREA	SCOPE	TRL
CARBODY SHELL	• Build on previous projects towards a regulatory framework for composite materials in trains (REFRESCO) and preliminary activities (Roll2Rail) • Progress on material selection and manufacturing alternatives	**Low / mid TRL**
RUNNING GEAR	• Technical specifications of running gear of the future. Development on: ○ Innovative sensors for condition monitoring ○ Noise reduction ○ New materials for bogies ○ Control systems	
BRAKES	• Technologies for efficient force generation: ○ Friction pair solutions ○ Frictionless low noise brake solutions ○ Electromechanical brakes	
DOOR & ACCESS	• Access system for PRM • New technologies for door surveillance • Innovative materials for doors	
INTERIORS MODULARITY	• Analysis of new interior modularity concepts • Studies and developments	

OPEN CALLS

- Specialist technologies / tech. transfer
- Feasibility analyses
- New / blue sky approaches

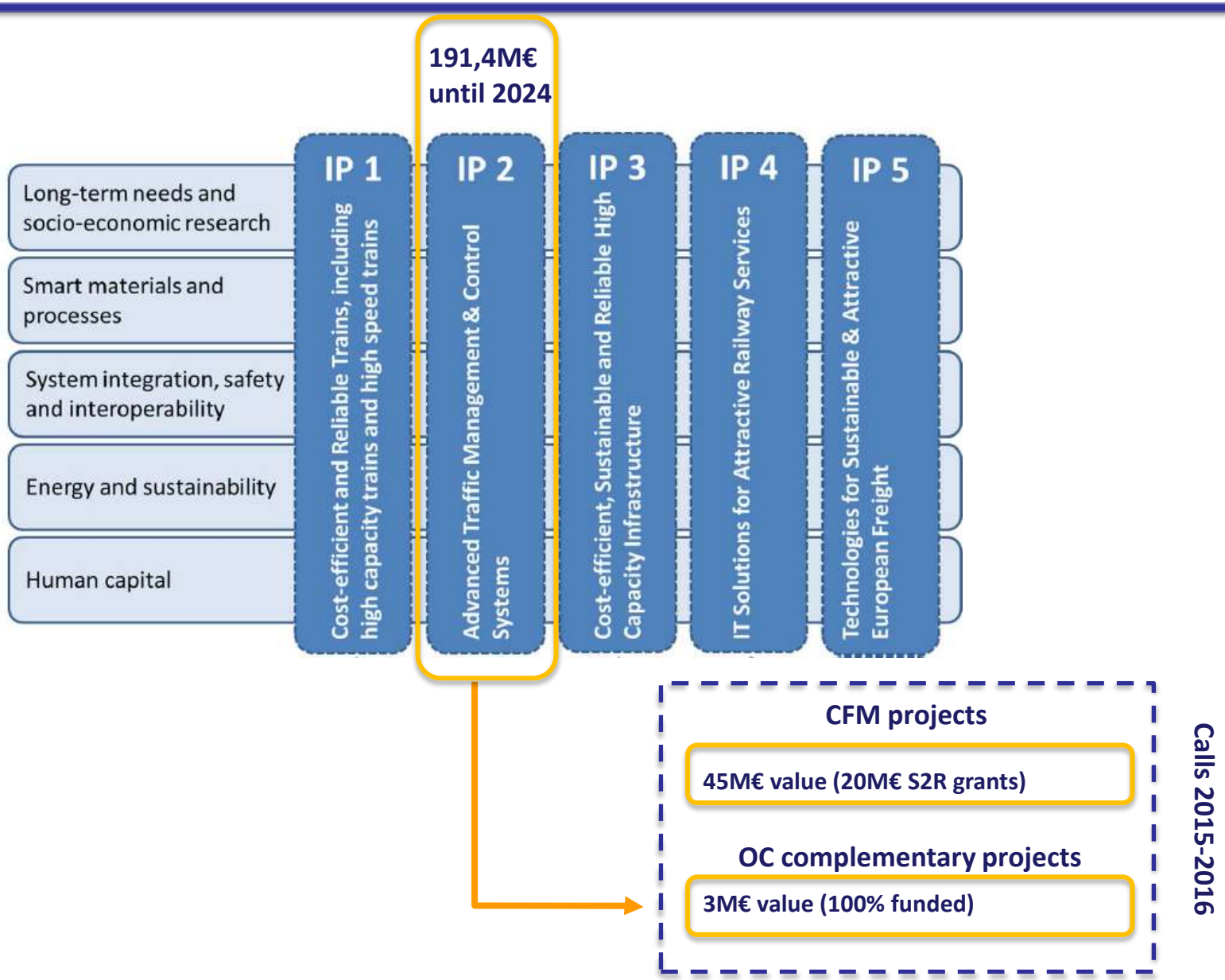
CLOSE COOPERATION

MEMBER CALLS

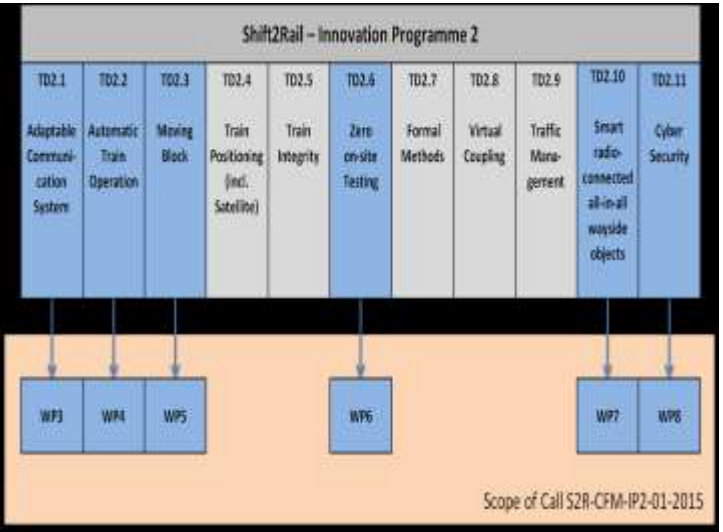
- Architectures
- Technology application
- Demo-oriented activities

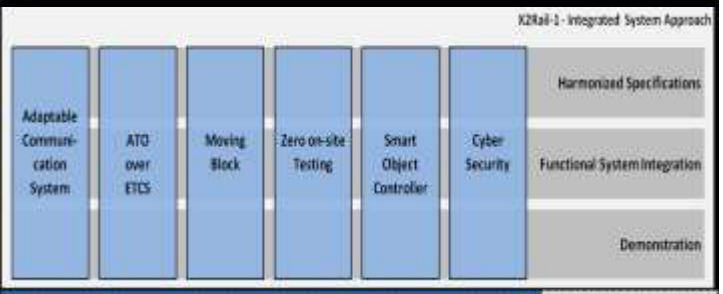
Thank you for your attention

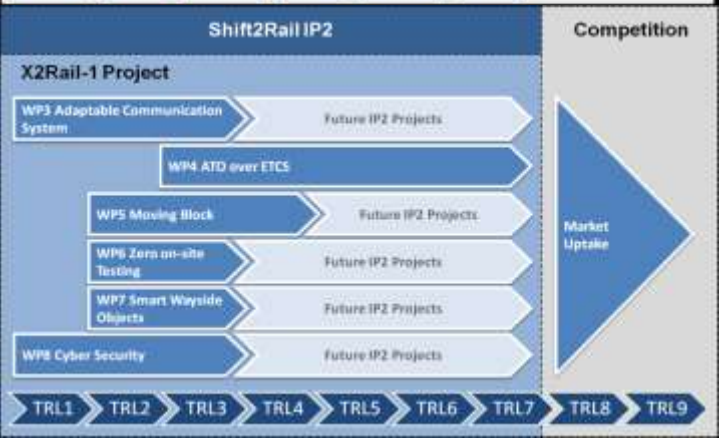
S2R IP2 projects status and the MAAP



IP2 Topics submitted (AWP 2015)







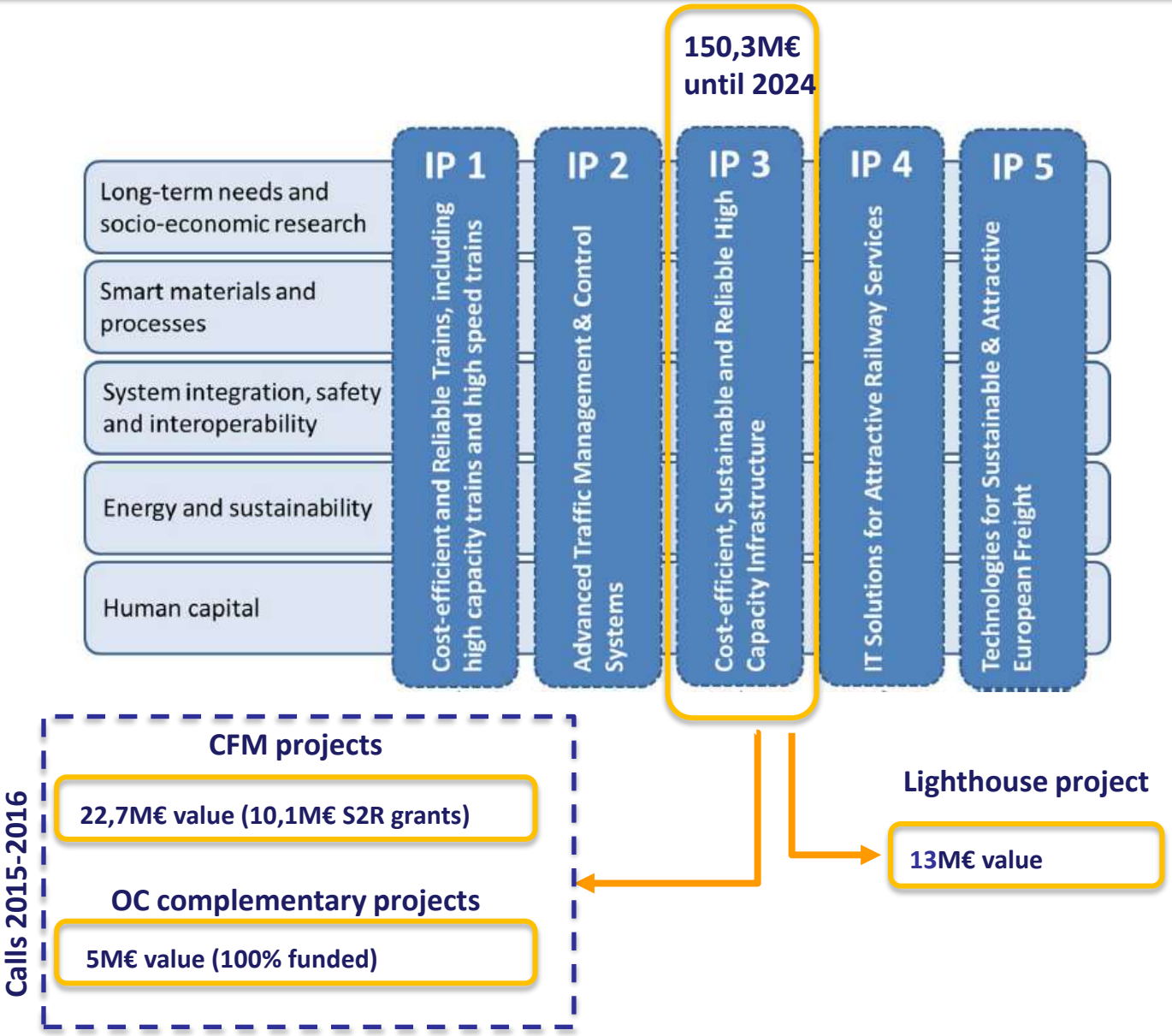
IP2 Topics	Member Consortia
• Provide activities for an adaptable IP communication system based on new technologies with enhanced throughput, safety and security functionalities, supporting the current and future needs of signalling systems and voice services • Provide development and test bench focusing on ATO GoA2 starting from inputs from Ten-T 3rd call (ATO over ETCS - Technical Interoperability Requirement for GoA2), from the results of the European NGTC project and existing standard IEC 62290-2. Perform the feasibility study and preliminary design for GoA3 and GoA4 solutions. • Provide the definition of the Moving Block Work Package for a high capacity, low cost, high reliability signalling system, based on Moving Block principles, which is applicable across all railway market segments. • Definition of a common test process framework to support guidance for improving lab/simulation tests. Definition/implementation of a dedicated system test architecture for lab testing. Standardization of interfaces and test processes. • Define and provide specification for practical demonstration for development of an autonomous, intelligent, maintenance-free smart equipment (“box”) able to connect with any signalling wayside object and communicating device in the area (by radio or satellite) in order to foster overall cost reduction both of installation and maintenance. • Definition of a cyber security system dedicated to railway and the definition of a security-by-design standard.	X2Rail-1

IP2 Topics submitted (AWP 2015)

AREA	SCOPE	CONSORTIUM
Cyber-security	– **Security assessment** of railway systems; – Identification and analysis of the different **cyber-attack threats** applicable to different railway segments (Urban/Mass Transit, Suburban/Commuters and Main Line) and interfaces with other modes; – Selection of the standard framework to be applied for the development of cyber secure railway applications in order to reach "**security by design**".	CYRail (Open Call) Signature pending
– IT virtualisation	– Develop the **concept of virtualisation** for holistic railway testing environments; – Develop an **IT virtualisation** of hardware (HW) and software (SW) **platform**; – Propose different **scenarios** (railway system combinations and configurations) that could be deployed at the same time but running separately (scenario by scenario); – Develop a **demonstrator** with the selected parts of the testing environment.	VITE (Open Call) Signature pending
Adaptable Communication system	– Definition of new **business model scenarios** for the use of the more advanced radio technologies in the railways domain; – **Analysis and definition** of conditions in which the use of **public radio communication network** instead of dedicated networks could be possible.	MISTAL (Open Call) Signature pending

Thank you for your attention

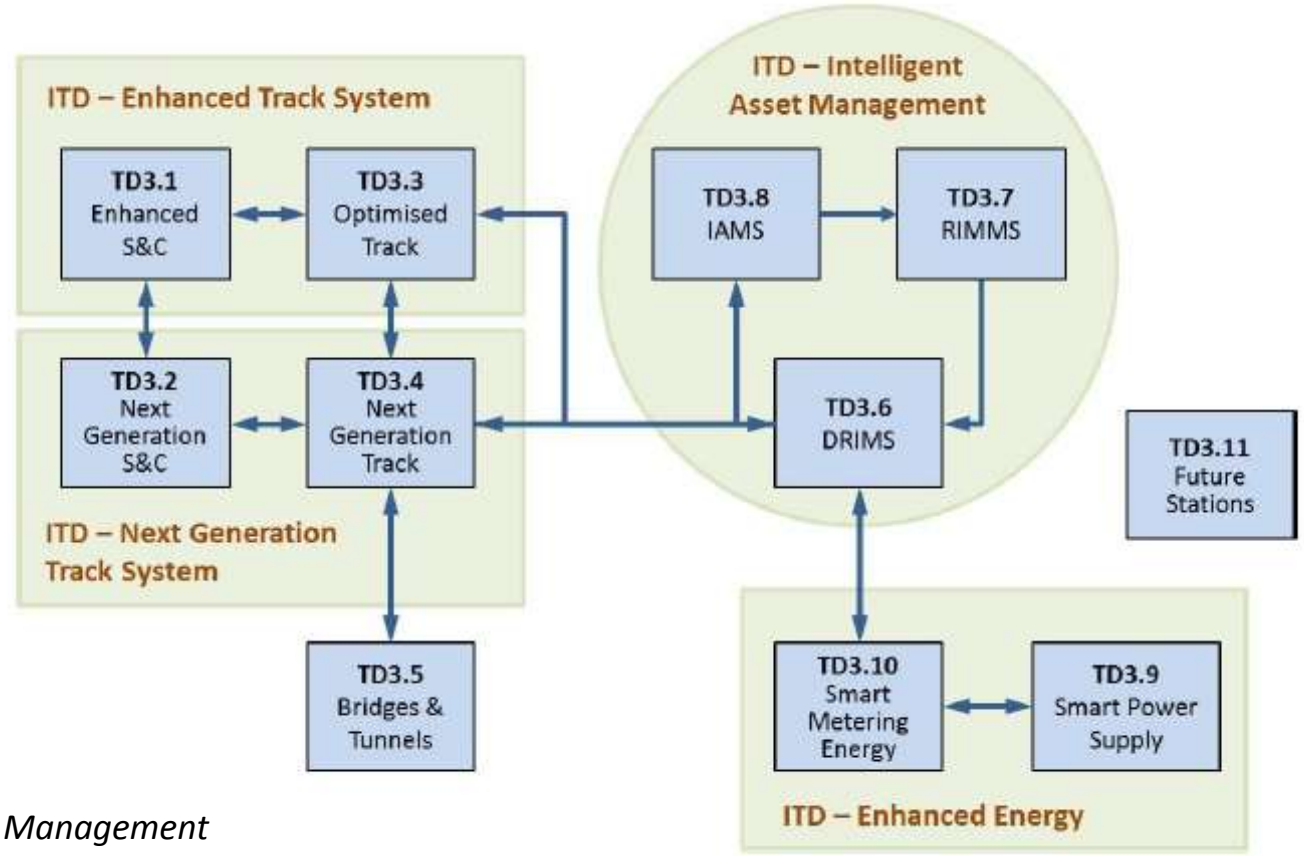
S2R IP3 projects status and the MAAP



Objectives of IP3

- Builds on In2Rail – lighthouse project
- Improved reliability
- Enhanced capacity
- Improved customer experience
- Lower investment costs
- Reduced operating costs
- Respect and adaption of TSIs
- Removal of open-points
- Improved standardisation

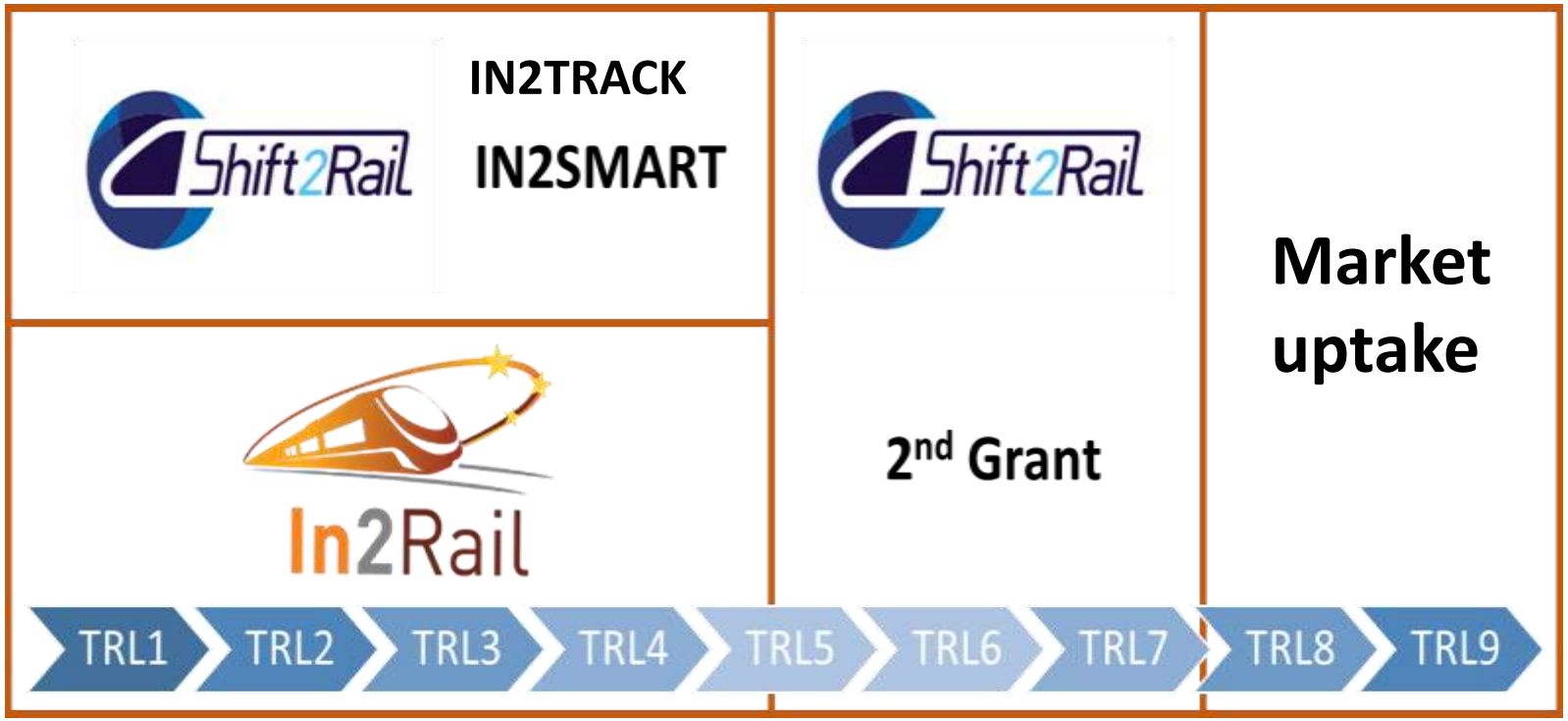
Management of inter-dependencies



IAMS = *Intelligent Asset Management Solutions*
RIMMS = *Railway Integrated Measuring and Monitoring System*
DRIMS = Dynamic Railway Information Management System

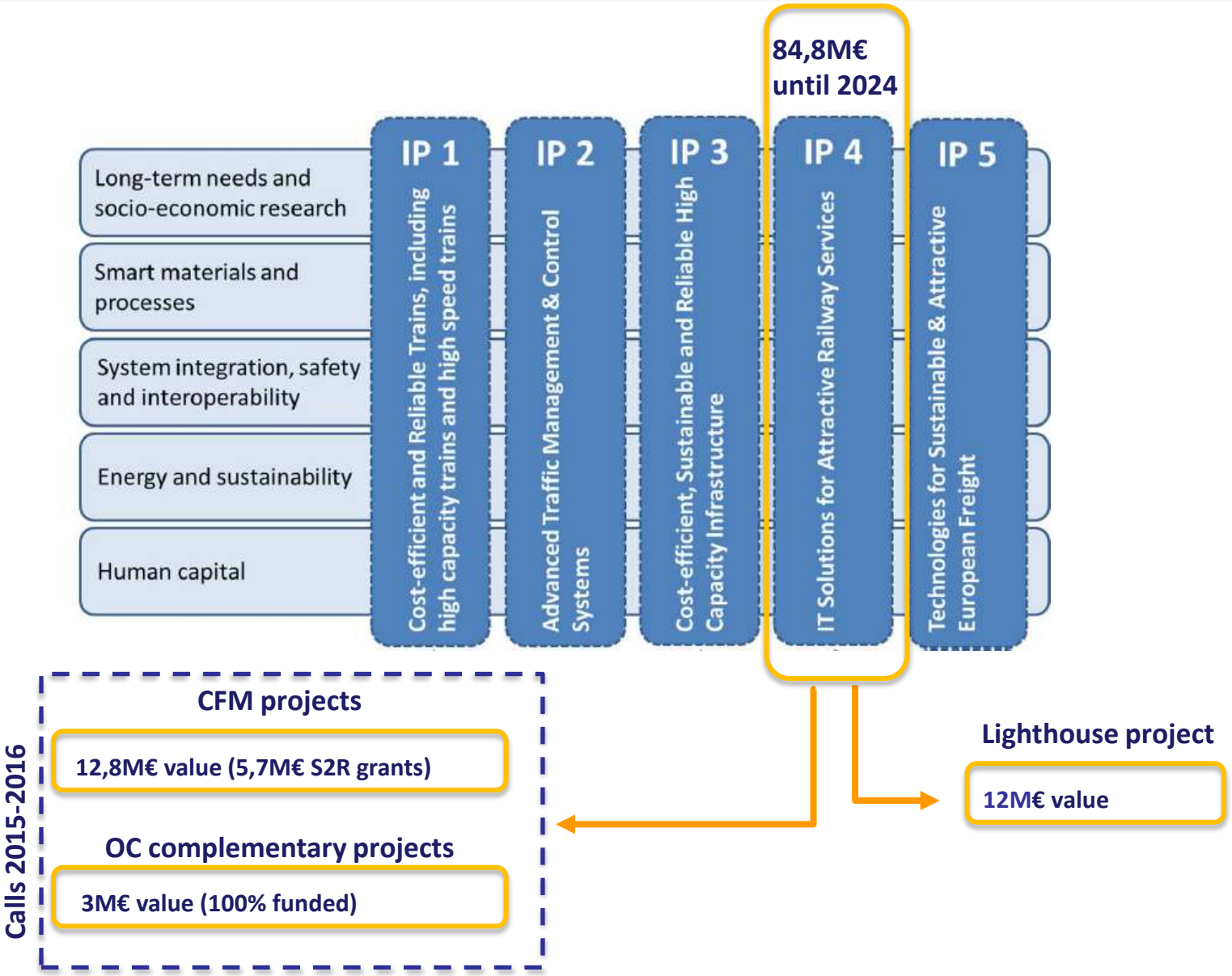
Annual Work Plan 2015

- In2Smart; In2Track; S-Code projects



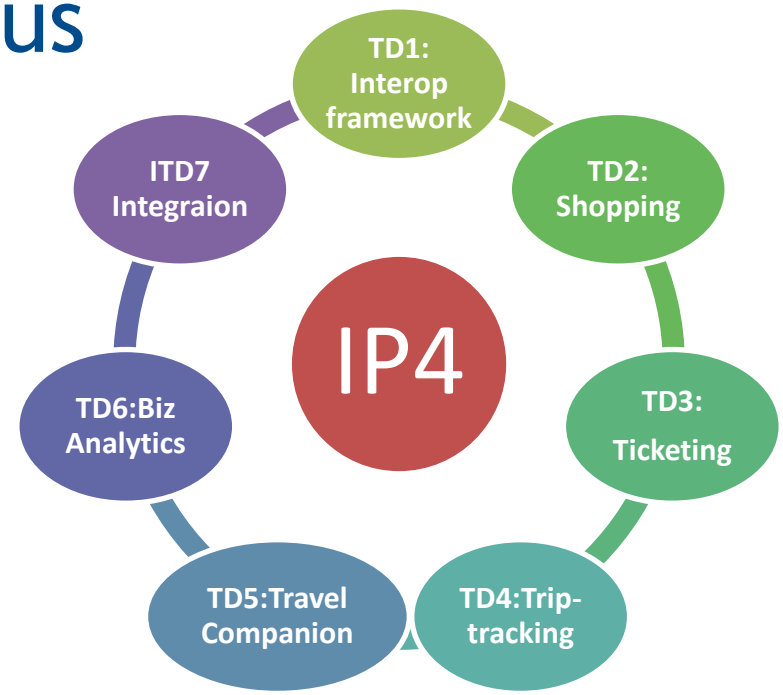
Thank you for your attention

S2R IP4 projects status and the MAAP



IP4 projects: current status

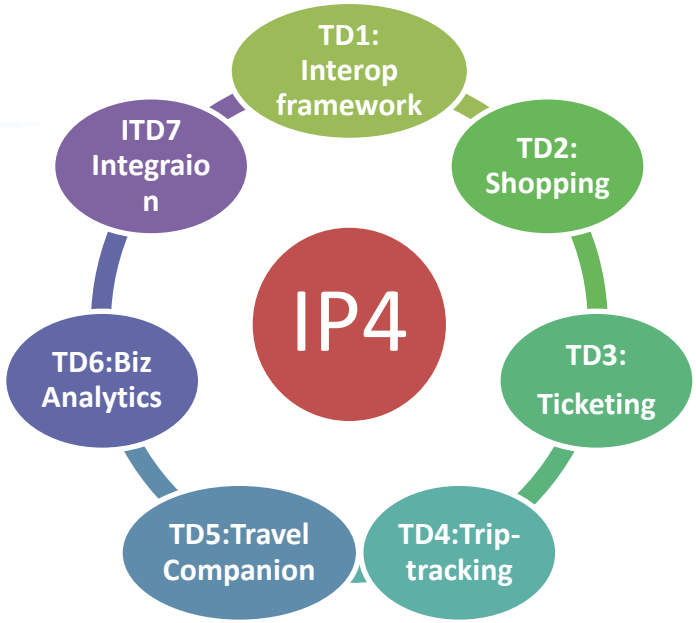
- *IT2RAIL : lighthouse project*
  - *Started in May 2015*
  - *Halfway, presented on 21st Sept at UNIFE stand*
  - *Cover all IP4 TDs, but with a reduced complexity*
- *S2R-CFM-IP4-01-2015 : Co-Active*
  - *Travel Shopping (TD2) and Booking & ticketing (TD3)*
  - *Activities started 1st Sept, official KOM 5th October*
- *S2R-CFM-IP4-02-2015 : ATTRACkTIVE*
  - *Travel Companion (TD4) and Trip Tracking (TD5)*
  - *Activities started 1st Sept, official KOM 5th October*



- *S2R-OC-IP4-01-2016 : GoF4R (Gov. of the Interop. Framework 4 Rail)*
- *S2R-OC-IP4-01-2016 : ST4RT (Semantic Transformation 4 Rail Transport)*

** Open calls should start in November 2016*

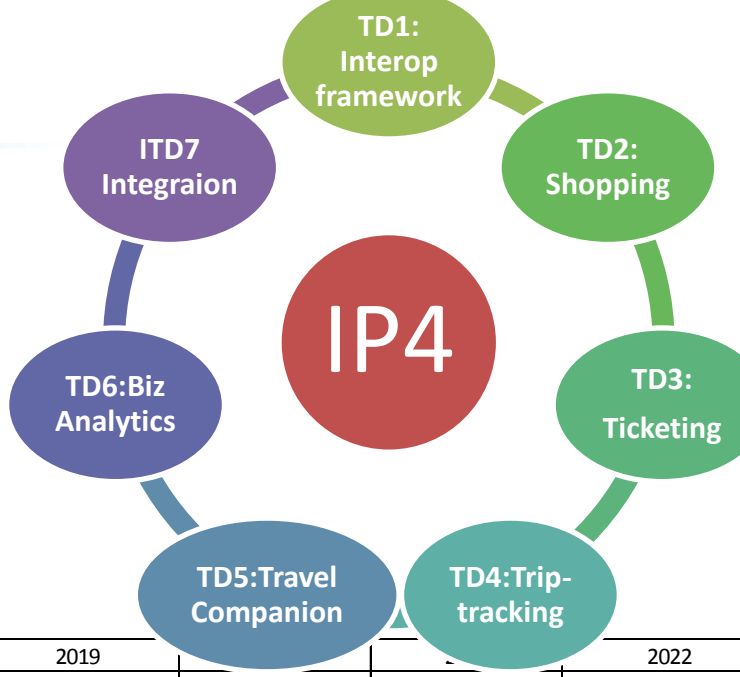
IP4 projects: CFM projects



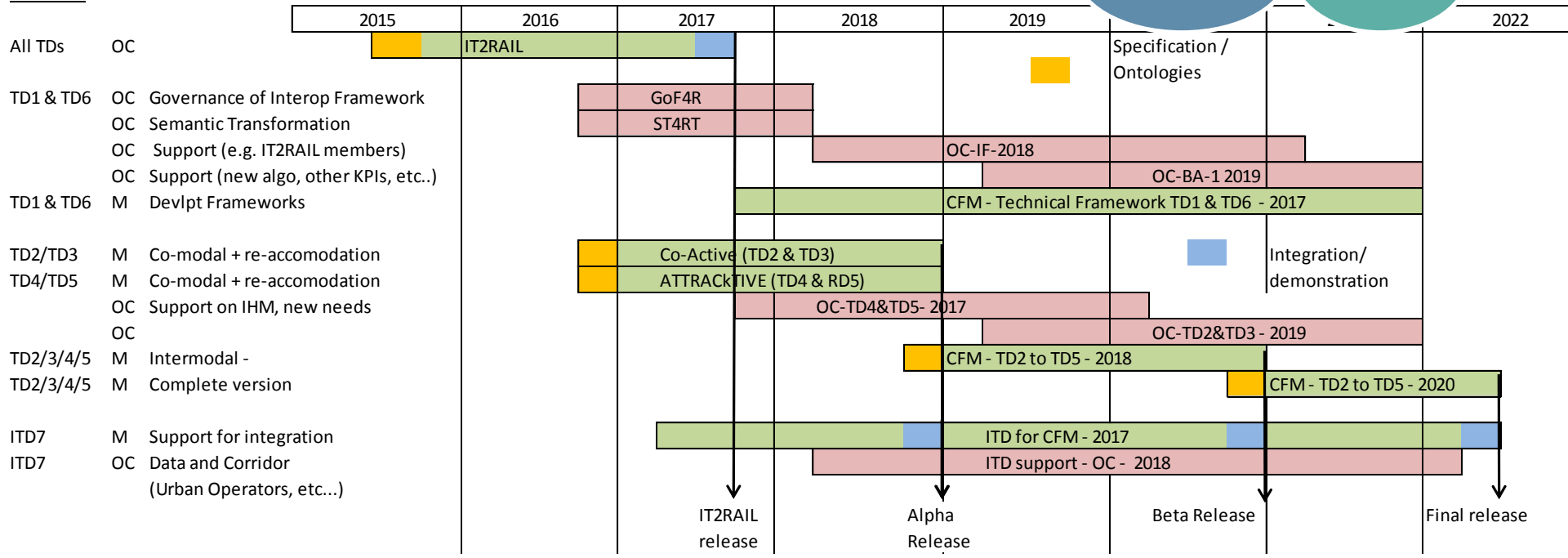
Project	Content	Partners
Co-Active (TD2+TD3)	*'one-stop-shop' capability initiated in IT2Rail completed with post-sale business transactions, and payment-settlement solution for co-modal journey*	Thales, Amadeus, Indra, Hacon, Network-Rail
ATTRACkTIVE (TD4+TD5)	*Travel companion and Trip-tracking activities, including degraded modes, and automatic re-accomodation, clearing and settlement treatments*	Hacon, Diginext, Indra, Thales, Network-Rail, Ansaldo

IP4 Overall plan

- Including an ITD for an overall integration
- 4 releases in 2017, 2018, 2020, and 2022 with increased complexity
- Two non technological Open Calls:
  - Governance of the Interop. Framework (2016)
  - Demo with operators (incl. urban sector) for ITD in 2018



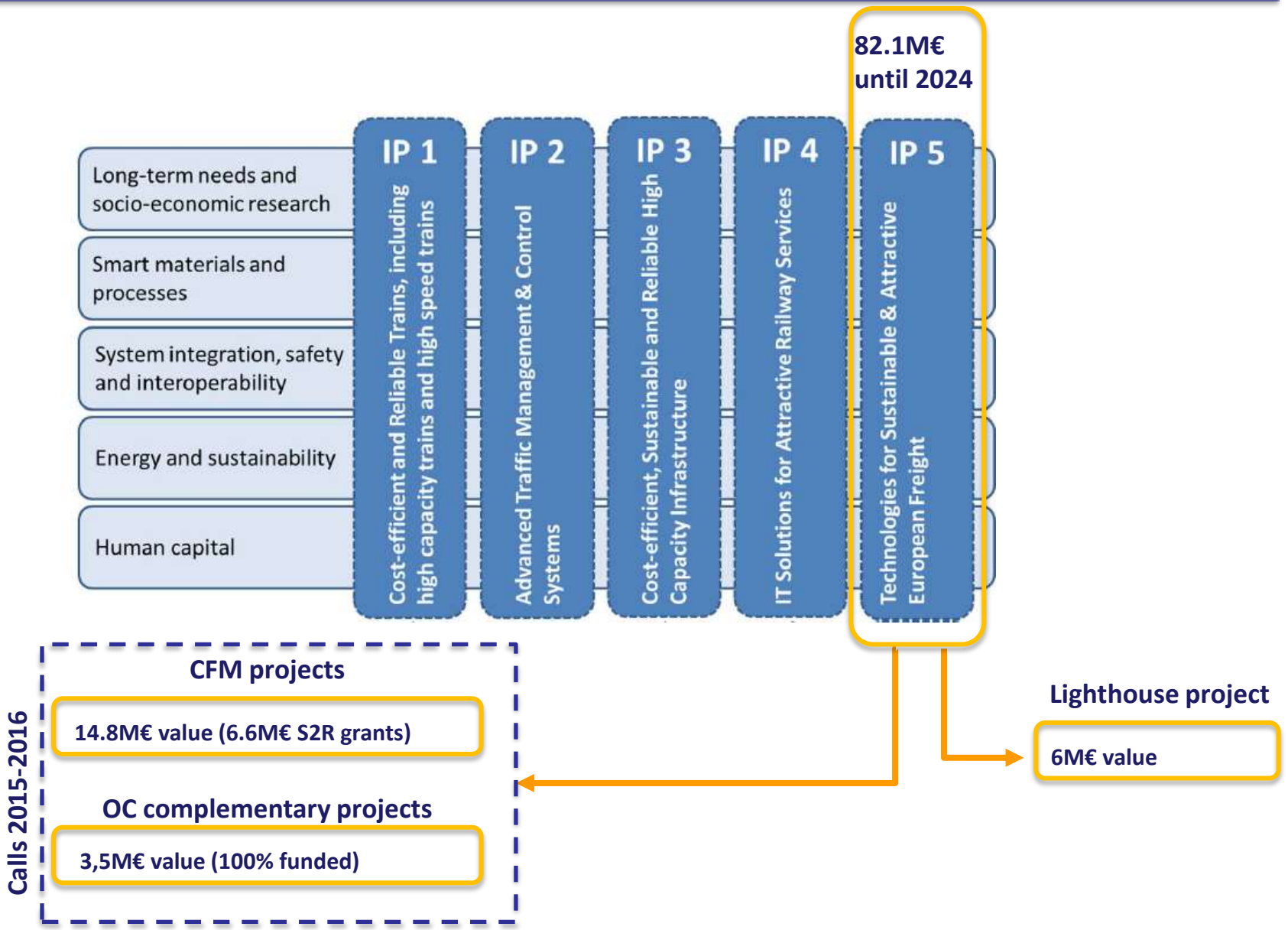
TIMELINE



Shift2Rail

Thank you for your attention

S2R IP5 projects status and the MAAP

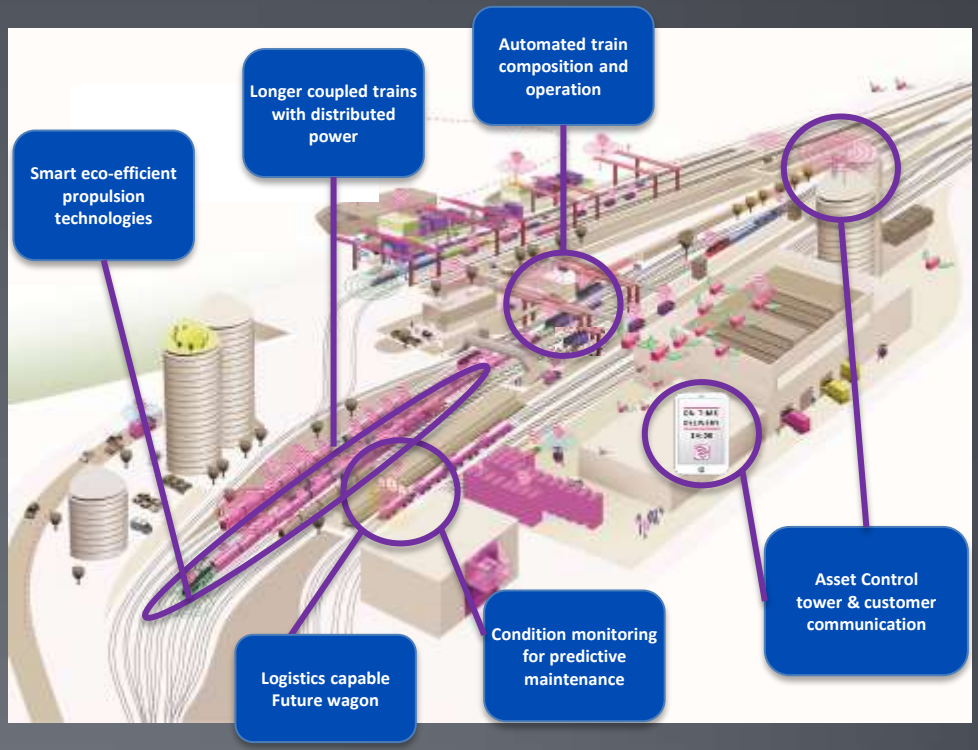


Driving Innovation within Shift2Rail: Innovation Programme IP5 “Technologies for sustainable and attractive European Rail Freight”

Structure IP5

Implementation Strategies and Business Analytics	Identification of requirements in market segments, KPI’s and Migration
Freight, Electrification, Brake and Telematics	Condition-based maintenance, Automatic Coupling, Telematics and electrification
Access and Operations	Time table planning, Real-time yard & network management
Wagon Design	Low-noise, lightweight, track friendly running gear, core and new market wagon 2020
Novel Terminal, Hubs, Marshalling yards, Sidings	Intelligent video gate terminal with new design, Hybridisation of legacy shunting Fleet
New Freight Propulsion Concepts	New power technologies including battery solutions and new mainline operations enabling longer trains
Long-term vision for autonomous rail freight system	Autonomous Train Operation (ATO) and Demonstration on market level

Vision IP5



Targets of Shift 2 Rail

- **Reduction of Green House Gases**
- **Market Growth & Modal Shift**
- **Improved services and customer quality until 2030**
- **Cost reduction**

IP5 Open call Projects

AREA	SCOPE	CONSORTIUM
Freight Automation	– Analysis of the requirements for obstacle detection for targeted autonomous trains with E-locomotive on European mainlines in existing infrastructure; – Analysis of technologies available for transfer and adaptations and interfaces; – Specification of requirements for an integrated obstacle detection system; – Development of the obstacle detection system prototype; – Development of a safety framework, testing and validation in lab. – Analysis of requirements of a real-time simulation towards the modelling of local marshalling yards and the modelling techniques; – Detailed modelling of all assets, resources and processes based on requirements analysis; – Advancement of existing simulations platform to provide optimisation of decisions in real-time; – The preparation of the simulation system for integration in an IT production system and the pilot testing of real-time management of a given large marshaling yard.	SMART (Open Call) Signature pending

IP5 Open call Projects

AREA	SCOPE	CONSORTIUM
Improved vehicle/train dynamics	– Develop and demonstrate new design concepts using lightweight and self-cleaning materials, noise absorbing structures as well as mechatronic systems; – Analyse, specify, integrate and implement various functions, such as braking, cooling, noise reduction, torque transmission, radial steering and advanced monitoring systems in next generation bogies – Developing reasonable solutions for a radio remote controlled traction and braking system; – The work should implement methods to determine, simulate and evaluate longitudinal forces within longer trains; – Trains up to 1500 m will be operated as double trains. For this reason it is necessary to adapt certain infrastructure components, such as stations, where efficient coupling and sharing processes for freight trains can be realized	DYNAFREIGHT (Open Call) Signature pending

AREA	SCOPE	CONSORTIUM
Intelligent freight wagon with predictive maintenance	– Cargo condition monitoring technologies – Wagon design – Predictive maintenance	INNOWAG (Open Call) Signature pending

Thank you for your attention

S2R CCA projects status and the MAAP

Calls 2015-2016

CFM projects

4,5M€ value (2M€ S2R grants)

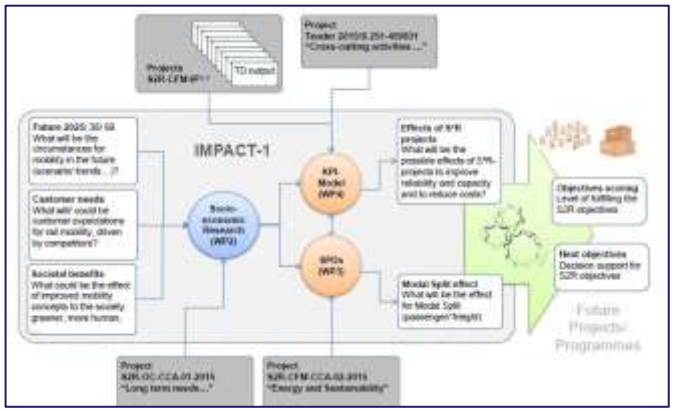
OC complementary projects

3,5M€ value (100% funded)

Lighthouse projects

6,1M€ value

CCA Topics submitted (AWP 2015)



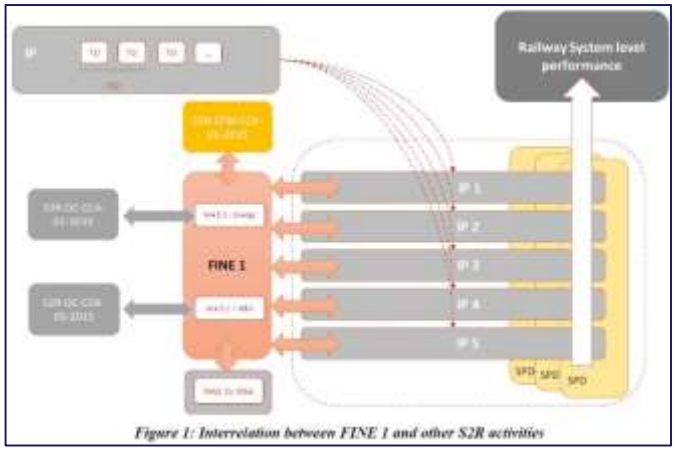


Figure 1: Interrelation between FINE 1 and other S2R activities

CCA Topics	Member Consortia
• Analysis of the Socio-economic impact to identify future trends and liaise with Shift2Rail bringing a perspective leading to 2050 • System platform demonstrators define the 4 System Platform Demonstrators that will be used to demonstrate the effects of the Shift2Rail • KPI Tree Definition show how the expected results of the key Shift2Rail targets are achieved	IMPACT 1
• Develop and use the methodology for assessing the overall energy reduction • Technical assessment and integration on system level of N&V • Traffic noise scenarios and baseline for evaluation and monitoring noise effects of Shift2Rail innovations • Interior Noise modelling Sources and assemblies • New methodologies and technologies to support the development of new tools for auralisation and visualisation for demonstration and selection of the best means and appropriate usage of noise control improvements.	FINE 1
• Development and enhancement of a basic smart planning model to disruptions and elaboration of case studies • Management of the safety of the railway system based on risk assessment	PLASA

AREA	SCOPE	CONSORTIUM
Long-term needs of different actors in the railway sector	• Collect and analyse the long-term changes in future needs of actors and users of the railway sector and customer requirements • Analyse mega-trends, scenarios and disruptions to the "landscape of mobility", changing the circumstances for railway, in 2022, 2030 and 2050 • Analyse the implications for the railway sector in case of car usage reduction, i.e. by 10% or more • Match the outcome of customer requirements, scenarios and society effects of the aforementioned studies with the objectives of S2R Master Plan	NEAR2050 (Open Call) Signature pending
Energy usage, generation and saving approaches	• Analyse the energy requirements for urban rail traffic all over Europe • Develop an energy simulation model and provide a simulation tool allowing the evaluation of energy consumption (high speed, regional, urban and freight) • Develop the optimum drive strategies and energy management for different propulsion systems and traffic segments. • Analyse the losses of energy within the traction chain including their cooling needs for different traction systems • Develop a global vision of energy in railways including smart management of railway networks.	OPEUS (Open Call) Signature pending

AREA	SCOPE	CONSORTIUM
Noise reduction methodologies	• Evaluation and monitoring of impact on traffic noise scenarios of S2R research and innovation activities • Develop interior noise simulation model • New Technologies: auralisation and visualisation • Perform and demonstrate feasibility of active and other new noise control technology on noise proof windows	DESTINATE (Open Call) Signature pending
Safer infrastructure – improved object detection and prevention of safety critical events and integrated mobility	• Safety: Develop a global approach to an integrated management system for the safety of the railway system, based on a global risk assessment model • Integrated mobility (smart planning): improvement of basic micro-level railway network simulation models and test its implementation	GOSAFERAIL (Open Call) Signature pending

Thank you for your attention


Shift2Rail