



INTERNATIONAL UNION
OF RAILWAYS

2017

The Railway Operating Community (ROC) involvement in EU projects

RICG members in action

RICG Common Collaboration Working Group

Foreword from Bo Olsson, RICG Chairman



2017 was a productive year for the European Railway Operating Community (ROC) in terms of research and innovation. The Research and Innovation Coordination Group, which I have the honour to chair, worked hard to produce on behalf of the European region members a comprehensive, clear and appealing ROC R&I vision in the form of the 12 Capabilities.

The 12 Capabilities show in a nutshell how the European ROC expects to operate in 2050 as the backbone of the European transportation system. Although they form twelve identified streams, they are completely intertwined and progressing them in a coordinated manner will in the end lead to the delivery of the Future

European Railway System.

However, innovation is a continuous process that takes place every day: each and every link in the work chain has the power, in its own capacity, to contribute to an ever more system reliable, safe and attractive to both the customers and the railway people. As everybody knows, Rome was not built in a day; the foundational stones for the Capabilities vision to become a reality are deeply rooted in the present and recent past.

The exercise undertaken in the projects book is a part of that necessary introspection the community must undertake in order to understand what it has done, achieved and what are the next steps to make. RICG, through its Working Group Common Collaboration, decided to first have a look on its current and recent involvement in research and innovation projects benefiting from a public funding by the European Commission. Understanding the extent to which these projects and our commitment in these projects serve our vision is crucial in making the best out of our resources and the time constraints upon the sector. Additionally, the target is also to increase information toward the stakeholders that may be less informed of these activities.

I would even add that, beyond paving the way for our upcoming decisions, this project book is also really important in fostering transparency on the railways' action in R&I. First to the other sectors, of which we have to learn and import the right technologies and best practices, but also particularly to the European citizens which are the end-users of the service we provide.

RICG is always looking for a deep cooperation with all interested parties; I hope the reading of this projects book will prove useful to you and potentially trigger an interest in collaborating with us toward the Future European Railway System!

Bo Olsson

RICG Chairman,
Trafikverket

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Published in January 2018

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What is the RICG?

The **Research & Innovation Coordination Group (RICG)** is an International Union of Railways (UIC) European internal body, comprised of willing European members, aimed at ensuring sustainable and efficient support to coordinate European research and innovation activities. The RICG strengthens the UIC members activities in collaborative research and innovative projects through a more efficient use of scarce resources and funding available for rail research and development.

Chaired by Mr. Bo Olsson (Trafikverket) supported by Ms Karin Biffiger (SBB) and Mr Jürgen Maier (BLS) as co-Vice-Chairs, the RICG has focussed its activity around three main themes: vision and strategy, common collaboration and communication.

Firstly, the RICG has the mission of preparing, defining and updating a Railway Operating Community (ROC) European Research & Innovation strategy to carry a common message from European members towards the various R&I stakeholders in Europe (European Commission, authorities, associations, etc) and beyond. This vision emerged in the form of the ROC capabilities which are introduced below and detailed fully in the annex.

The second core task of RICG is to foster efficient collaboration between the members, through a continuous monitoring of what is happening in the R&I field including: what is undertaken beyond rail research, a regular exchange of information on the issues and, last but not least, articulating the R&I identified needs into strong research projects – UIC, member-led or EU-funded. The RICG does not undertake any research projects on its own in order to remain focussed on its coordination role.

These two actions are supported by a liaison activity between the RICG, the wider UIC, the members and other stakeholders in the R&I galaxy in order to ensure the railway system operators needs are properly conveyed and developed for the railways of tomorrow.

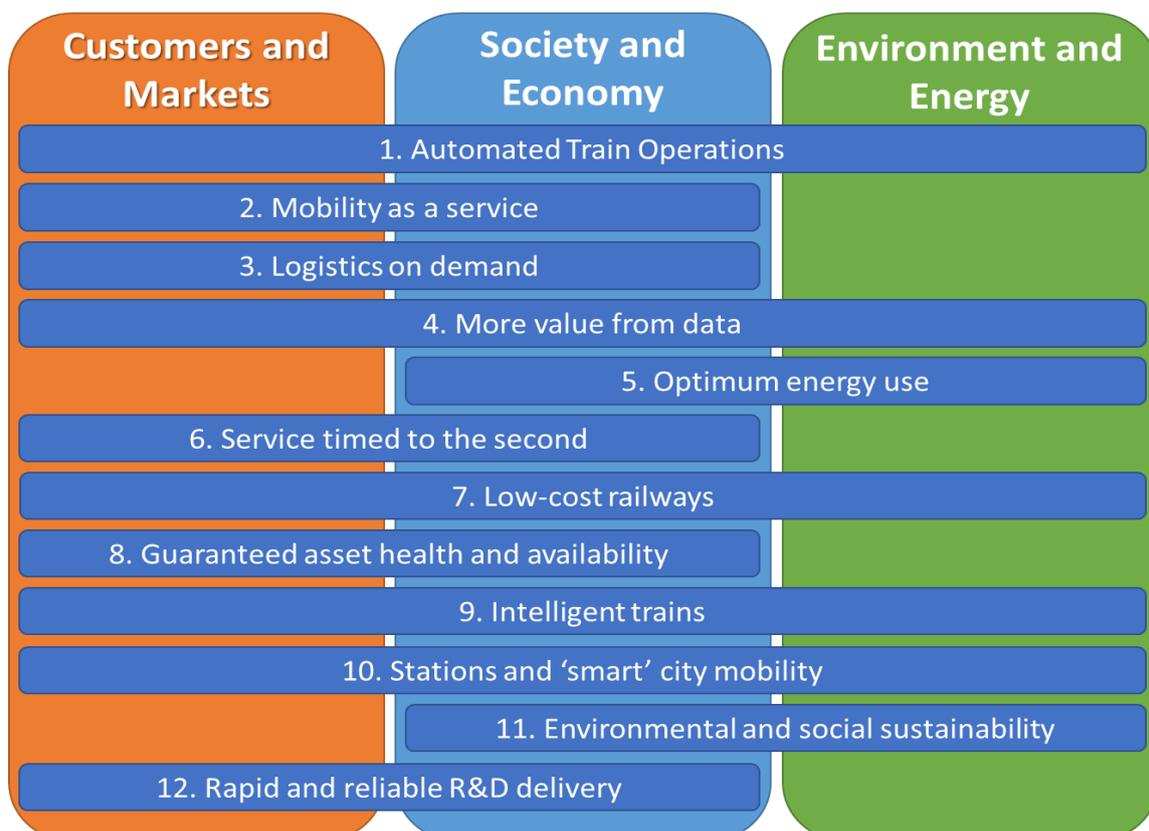
The 12 Railway Operating Community (ROC) Capabilities

RICG was tasked with the preparation of a strategic direction, from the ROC stand point, for future research and innovation. This would then serve as a solid ROC basis for influencing the development of the future European Commission R&D Framework Programme (currently referred to as FP9) and at the same time contribute to a number of strategic initiatives, including supporting the delivery of rail's digital agenda.

The outcome has been the emergence of a structure of 12 "Capabilities", which the railway operators should be developed for delivery of an efficient future railway system that fulfils customers' expectations.

These capabilities are designed to build the necessary links between high-level customer expectations, company strategic objectives and the core principles of the railway sector of customer, carbon, cost, capacity, safety and security. They represent a specific target for future research and innovation so as to develop technologies/methods that, by enabling the aforementioned capabilities, contribute toward achieving the high-level objectives.

The capabilities identified by RICG are each complemented by a number of enabling "sub-elements". The capabilities are clustered under the three pillars set out below.



These clusters highlight, where within the system, the capabilities will have an impact:

- **Customers and Markets:** the capability sets out to achieve customer satisfaction with the railway mode and its services; it allows railway companies to develop existing markets and to evolve new opportunities
- **Society and Economy:** the capability contributes to fostering social and economic integration thanks to the ability of rail to transport people and goods from A to B. Railways are economically sustainable in their operations
- **Environment and Energy:** the capability sets out to support environmental sustainability and encourages the procurement and use of clean energy

Please note that the numbers in front of the capabilities do not imply any ranking in priority but are simply meant for reference purposes.

A more detailed description of the capabilities and their “sub-elements” can be found in the annex to this document.

What is this project book about?

With the Railway Operating Community (ROC) vision having been defined through the Capabilities, the RICG deemed it was a worthy action to identify how its current involvement in research and innovation projects serves their achievement and the enabling of the Future European Railway System that is attractive, affordable and comfortable for its customers.

Reviewing the ROC commitment in various European Commission-funded projects appeared to be an appropriate first step since the information is transparent. This would also help the European citizens to see where the railways are heading with the Commission's support and their taxes.

This projects book references the EC-funded projects, in which the European RICG members and the UIC are involved and identifies which ROC capabilities they seek to enable. It focuses on the year 2017, containing:

- Projects that started in 2017
- Projects that started before 2017 and are still ongoing
- Projects that were completed in 2017

Projects list

Projects

Below are listed some 59 EC-funded projects in which the Railway Operating Community members of RICG are involved in 2017. They are listed here and in the following pages in alphabetical order.

ARCC	InnoWEE
ATTRACKTIVE	IT2RAIL
BODEGA	MASAI
BONVOYAGE	MEACTOS
CIPSEC	NeTIRail-INFRA
CLUSTERS 2.0	OPEUS
Co-Active	OPTIYARD
COHESIVE	PAPERCHAIN
CONNECTA	PINTA
CONNECTIVE	PLASA
CYRail	PORTIS
DESTinationRAIL	Q-Air
DYNAFREIGHT	RAGTIME
ECORoads	REFINET
ERSAT EAV	ROLL2RAIL
EuTravel	SAFE-10-T
FFL4E	SAFER-LC
FINE 1	S-CODE
FINESSE	SETRIS
FOX	SKILLFUL
FR8HUB	Smart-Rail
FR8RAIL	SocialCar
GoF4R	ST4RT
I-ALLOW	SYNCHRO-NET
IMPACT-1	TT
IMPACT-2	VITE
IN2RAIL	WRIST
IN2SMART	X2Rail-1
IN2STEMPO	X2Rail-2
IN2TRACK	

Almost half of these projects are funded within the Shift2Rail¹ Joint Undertaking framework - (S2R): these 27 S2R projects are listed on the next page for an easier traceability. They will be marked with the S2R logo in the following pages: 

¹ www.shift2rail.org

S2R projects	
ARCC	IMPACT-2
ATTRACKTIVE	IN2SMART
Co-Active	IN2STEMPO
COHESIVE	IN2TRACK
CONNECTA	OPEUS
CONNECTIVE	OPTIYARD
CYRail	PINTA
DYNAFREIGHT	PLASA
FFL4E	S-CODE
FINE1	ST4RT
FR8HUB	VITE
FR8RAIL	X2Rail-1
GoF4R	X2Rail-2
IMPACT-1	

Presentation

Each project is presented with similar details, including: acronym, status, EC-funding, start, duration, call, country/region, lead organisation, coordinator, contact details, partners, website and objectives. If available, the project sheet also contains the structure. Further detailed information is available for each project on their website and on the Commission's European project repository CORDIS (<http://cordis.europa.eu>).

Projects involving the RICG ROC members as well as the UIC itself are **highlighted in bold and red**. Each project is also connected with the ROC capability it supports. This connection is shown via a bar-shape colour code which marks the relevant capabilities:



1	Automated Train Operation
2	Mobility as a service
3	Logistics on demand
4	More value from Data
5	Optimum Energy Use
6	Service Operation timed to the second
7	Low Cost Railway
8	Guaranteed asset health and availability
9	Intelligent Trains
10	Stations and 'smart' city mobility
11	Environmental and social sustainability
12	Rapid & reliable R&D delivery

Colours displayed in this bar correspond to the adjacent capabilities table. The bar appears on the top right-hand of the project sheet, just above the project name.

**STATUS**

Underway

BUDGET

€3,600,360

FUNDING

€1,600,000

START

September 2016

DURATION

36 months

CALL

H2020-S2RJU-CFM-2015-01-1

CONTRACT No

730813

LEAD ORGANISATION**Deutsche Bahn AG (DB AG)****COORDINATOR**

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ARCC

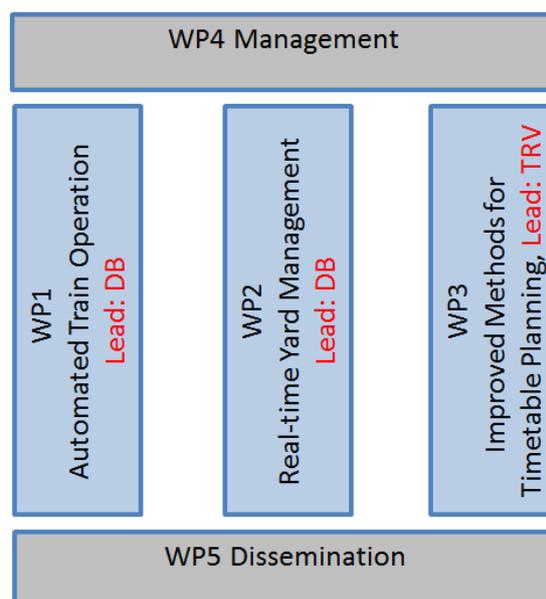
Automated Rail Cargo Consortium: Rail freight automation research activities to boost levels of quality, efficiency and cost effectiveness in all areas of rail freight operations

OBJECTIVES

The overall aim of this specific Automated Rail Cargo Consortium (ARCC) project is to carry out an initial phase of rail freight automation research activities in order to boost levels of quality, efficiency and cost effectiveness in rail freight operations of the European railway sector.

- The three areas of research activities are: Transporting and delivering freight transport via automated trains;
- Developing automated support processes that are carried out at the system's nodes (e.g. terminals, yards and transshipment points);
- Improving yard and railway network management through advanced timetable planning.

The various start-up activities for freight automation have the potential to help tackle the challenges relating to key issues and operational bottlenecks, which will help to reduce lead time, increase reliability and improve the cost-effectiveness of the rail freight sector. Improving the connections between different nodes (e.g. terminals, yards and transshipment points) and improving information flows transferred between different nodes in real-time and network management systems and supporting eco-efficient and energy-efficient driving are key parts of the project activities.

PROJECT STRUCTURE



ATTRACKTIVE

STATUS

Underway

BUDGET

€5,059,579

FUNDING

€2,248,477

START

September 2016

DURATION

28 months

CALL

H2020-S2R-CFM-IP4-02-2015

CONTRACT No

730822

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WEBSITE

<https://shift2rail.org/projects/attracktive/>

ATTRACKTIVE

Advanced Travel Companion and Tracking Services

OBJECTIVES

ATTRACKTIVE aims to provide new concepts, tools, and systems to improve the attractiveness of rail transport by offering more intuitive and engaging travel experiences to customers while shielding them from the complexity and heterogeneity of services for door to door intermodal journeys. This includes disruption handling, navigation and user centric ubiquitous applications as well as the required tooling and modular design to foster adoption and enable future refinements, new concepts and ideas. The journey shall become attractive for travellers and offer a seamless, stress free, and even engaging experience.

Increasing the attractiveness of rail transport requires a novel and integrated solution that will be developed in the IP4 part of the Shift2Rail project. In particular, ATTRACKTIVE proposes new capabilities such as the capacity to create a “one stop shop” that helps customers to easily select and purchase an itinerary and assist her/him throughout her/his whole journey. In this respect the solutions of IT2Rail will be expanded and further developed. It will guide, support, inform, and even entertain users throughout their entire itinerary, adapting to unforeseeable interruptions and events in order to propose alternative routes, including in the first and last miles. A real door-to-door travel solution including all modes of transport will be developed along with new forms of traveller experiences aiming to transform the travel itself into an “ATTRACKTIVE” part of the journey. This proposal aims to implement both the Shift2Rail Trip Tracker (TD4.4) and Travel Companion (TD4.5), two major components to materialise this vision and deliver seamless door-to-door travel support encompassing both public and private transportation portions of a journey. This includes disruption handling, navigation and user centric ubiquitous applications as well as the required tooling and modular design to foster adoption and enable future refinements, new concepts and ideas.

PROJECT STRUCTURE





Proactive Enhancement
of Human Performance in Border Control

STATUS

Underway

BUDGET

€4,999,238

FUNDING

€4,999,238

START

June 2015

DURATION

40 months

CALL

H2020-BES-14-2014

CONTRACT No

653676

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WEBSITE

www.bodega-project.eu

BODEGA

BOrdDERGuArd - Proactive Enhancement of Human Performance in Border Control

OBJECTIVES



Investigate and model Human Factors in border control to provide innovative socio-technical solutions for enhancing border guards' performance in critical tasks, support border management decision-making and optimize travelers' border crossing experience.



Propose an assessment of existing technologies, including video surveillance or document and identity verification, in the light of border guards' daily needs.

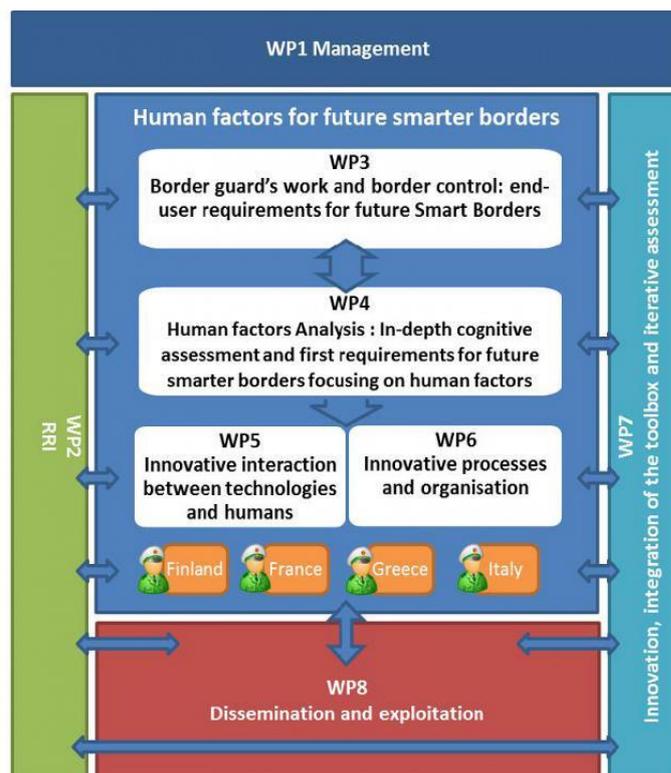


Design and pilot game and e-learning solutions for border control operators and travelers, aiming at mitigating the impact of cognitive biases on their decision making process and usage of new technology.



Provide a toolbox which integrates BODEGA's results adapted for the needs of the end-users in border control. The toolbox will integrate ethical and societal dimensions to enable improved effectiveness and harmonization across border controls in Europe.

PROJECT STRUCTURE





Mobility
People
Goods

STATUS

Underway

BUDGET

€4,000,000

FUNDING

€4,000,000

START

May 2015

DURATION

36 months

CALL

H2020-MG-7.2a-2014

CONTRACT No

635867

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WEBSITE

www.bonvoyage2020.eu

BONVOYAGE

From Bilbao to Oslo, intermodal mobility solutions and interfaces for people and goods, supported by an innovative communication network

OBJECTIVES

BONVOYAGE will design, develop and test a platform optimizing multimodal door-to-door transport of passengers and goods. The platform integrates travel information, planning and ticketing services, by automatically analysing non-real-time data from heterogeneous databases (on road, railway and urban transport systems); real-time measured data (traffic, weather forecasts); user profiles; user feedback.

The platform is supported by an innovative information-centric communication network that collects and distributes all the data required. The highly heterogeneous, distributed and mobile nature of data, coming from data-centers, sensors, vehicles, goods and people on the move, calls for an innovative networking paradigm. Current networks (e.g. Internet) limit themselves to “just” providing communication channels between hosts. Our paradigm, called Internames, allows communications among entities identified by names, without the constraint of a static binding to a particular location.

The request of a “user” (be it a person or a parcel) to travel from source to destination is managed by the platform with several tools: Metadata Handler collects and elaborates data related to the request and generates a corresponding Context; User Profiler creates a personalized profile, conveying requirements including Quality of Experience parameters and special needs; Multi-Objective Optimizer develops personalized travel instructions, optimal for the Context and User Profile. The user may give feedback, before accepting the travel itinerary. If a trip is not available at request time, the user is notified if it becomes available later on. An Actuator triggers the necessary services. A Tariff Scheme Designer exploits platform data to define multi-part tariff schemes.

BONVOYAGE will trial and demonstrate the platform and communication network in integrated, large-scale, real life application scenarios, incorporated into the normal business operations of our transport operator partners.

PROJECT STRUCTURE

WP1 – Project Management

WP2 – System requirements and design

WP3 – Internames communication system

WP4 – Intelligent Transport Functionality

WP5 – Adaptation Functionality

WP6 – Multimodal integrated interfaces and Apps

WP7 – System integration and validation

WP8 – Communication, Dissemination, Standardization and Exploitation



CIPSEC

*Enhancing Critical Infrastructure Protection with innovative
SECurity framework*

STATUS

Underway

BUDGET

€7,017,235

FUNDING

€5,258,316

START

May 2016

DURATION

36 months

CALL

H2020-DS-03-2015-1

CONTRACT No

700378

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OBJECTIVES

In recent years, the majority of the world's Critical Infrastructures CIs evolved to become more flexible, cost efficient and able to offer better services and conditions for business opportunities. Towards this evolution, CIs and companies offering CI services had to adopt many of the recent advances of the Information and Communication Technologies (ICT) field. This adaptation however, was rather hasty and without thorough evaluation of its impact on security. The result was to leave CIs vulnerable to a who the new set of threats and attacks that impose high levels of risk to the public safety, economy and welfare of the population. In so far, the main approach to protect CIs is to handle them as comprehensive entities and offer them a complete solution for their overall infrastructures and systems (IT&OT departments). However Complete CI protection solutions exist in the form of individual products from individual companies. These products integrate only and tools/solutions designed by the same company, thus offering limited technical solutions.

The main aim of CIPSEC is to create a unified security framework that orchestrates state-of-the-art heterogeneous security products to offer high levels of protection in IT (information technology) and OT (operational technology) departments of CIs. As part of this framework CIPSEC will offer a complete security ecosystem of additional services that can support the proposed technical solutions to work reliably and at professional quality. These services include vulnerability tests and recommendations, key personnel training courses, public-private partnerships (PPPs) forensics analysis, standardization and protection against cascading effects. All solutions and services will be validated in three pilots performed in three different CI environments (transportation, health, environment). CIPSEC will also develop a marketing strategy for optimal positioning of its solutions in the CI security market.

PROJECT STRUCTURE

WP1 – Analyzing specific CI security requirements clearly assessing weak points and current limitations

WP2 – Setting the whole CIPSEC solution tailored to CI scenarios

WP3 – Integrating the CIPSEC solution to the three pilot scenarios proposed in the project for validation

WP4 – Final adjustments turning into a close to market solution running on real operational scenarios

WP5 – Starting from the very beginning, capturing and collecting all project contributions for communication, exploitation, and standardization purposes

WP6 – Dealing with overall project management aspects

STATUS

Underway

BUDGET

€6,329,619

FUNDING

€5,998,744

START

May 2017

DURATION

36 months

CALL

H2020-MG-5.1-2016

CONTRACT No

723265

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INNOVATRIN, **UIC**, OTHERS

WEBSITEwww.clusters20.eu**CLUSTERS 2.0**

*Open network of hyper connected logistics clusters towards
Physical Internet*

OBJECTIVES

The Clusters 2.0. project vision is to leverage the full potential of European Logistics Clusters for an efficient and fully integrated transport system in Europe and demonstrate the scaling effects for the companies collaborating within logistics clusters. This project will provide solutions from four development streams:

- Establish CargoStream an open Pan-European community approach of shippers to scale supply chain efficiency through bundling their regular transportation demand with other shippers and to favour intermodal alternatives.
- Develop New Modular Loading Units and innovative handling and transshipment technology to accelerate handling processes within clusters for road and intermodal modes.
- Implementing a first of a kind prototype on a Cluster Community System for standard message and information exchange and asset management within logistics clusters.
- Develop governance models introducing the role of a neutral agent that will form the basis for new collaborative business models building up on the work of the FP7 project CO3.

CLUSTERS 2.0 will provide a toolbox for future logistics including large scale IT applications establishing and facilitating collaboration within and across logistics clusters. Compared to previous approaches CLUSTERS 2.0 will advance by adding elements of horizontal collaboration, modularization and standardization of loading units to the concept of logistics clusters. The project will increase engagement, performance and coordination of terminals and hubs at cluster and network level. An increase of 50% in the intermodal freight managed within clusters is targeted.

PROJECT STRUCTURE

Not available



Co-Active

STATUS

Underway

BUDGET

€7,818,365

FUNDING

€3,474,482

START

September 2016

DURATION

28 months

CALL

H2020- S2R-CFM-IP4-01-2015

CONTRACT No

730846

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CO-ACTIVE

CO-modal journey re-ACcommodation on associated Travel services

OBJECTIVES

The overall objective of CO-ACTIVE is to provide new concepts, tools, and systems to improve the attractiveness of rail transport by offering more intuitive and engaging travel experience to customers while shielding them from the complexity and heterogeneity of services for door-to-door intermodal journeys.

It addresses the general enrichment of the 'one-stop-shop' capability as initiated in the IT2Rail project and further completes the scope of functionality by addressing post-sale business transactions, and an underlying payment-settlement solution for comodally retailed products and services. This provides the opportunity to focus specifically on those aspects whose level of customer-perceived risk discourages the advance purchase of comodal travel entitlements:

- Enhancing the technical facilitation of a one-stop-shop capability,
- Research into the different possibilities for managing retailer-TSP settlement in order to simplify/rationalise integration of today's multiple settlement system infrastructures,
- Analysis of potential automation and orchestration based on the information of previously generated travel entitlements, for enabling the processing of cancellations, ticket exchanges and refunds.

PROJECT STRUCTURE



**STATUS**

Underway

BUDGET

€4,039,419

FUNDING

€1,795,150

START

September 2017

DURATION

58 months

CALL

H2020-S2R-CFM-IP4-02-2017

CONTRACT No

777599

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http://projects.shift2rail.org/s2r_ip4_n.aspx?p=COHESIVE

COHESIVE

COHErent Setup and Demonstration of Integrated Travel Services

OBJECTIVES

The COHESIVE project aims to progressively integrate and demonstrate the various technological innovations developed in the other IP4 projects. This objective will be achieved through specific activities: set up of a common technical approach for all IP4 projects allowing the collection of consistent results, definition of (three) successive releases based on use-cases with increased scope and market value, integration of the building blocks developed in the other IP4 projects, and flagship demonstrations which will pave the way of a solid market uptake.

Main objectives associated to the overall IP4 and its related demonstrations:

- Guarantee a Technical Coordinated Interface amongst the different projects of S2R/IP4;
- Ensure Engineering Consistency throughout the different Technical Demonstrators;
- Promote convergence of all IP4 technical demonstrators;
- Dissemination and Communication of the results and concepts developed in IP4;
- To create a Living Lab approach across the Community to increase the innovation potential generated;
- To coordinate successive releases based on use-cases with increased scope and market value, integrating the building blocks developed in the different IP4 projects.

PROJECT STRUCTURE

WP1 – Technical coordination of ITD4.7 and technical interface with IP4

WP2 – Engineering consistency management

WP3 – End to end Use cases definition

WP4 – Testing and Integration

WP5 – Demonstrations

WP6 – Dissemination and Communication

WP7 – Project Management

**STATUS**

Underway

BUDGET

€13,291,984

FUNDING

€5,906,957

START

September 2016

DURATION

24 months

CALL

H2020-S2RJU-CFM-2016-01-1

CONTRACT No

730539

LEAD ORGANISATION

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WEBSITE

http://projects.shift2rail.org/s2r_ip1_n.aspx?p=CONNECTA

CONNECTA

CONtributing to Shift2Rail's NExt generation of high Capable and safe TCMS and brAkes. Phase 1.

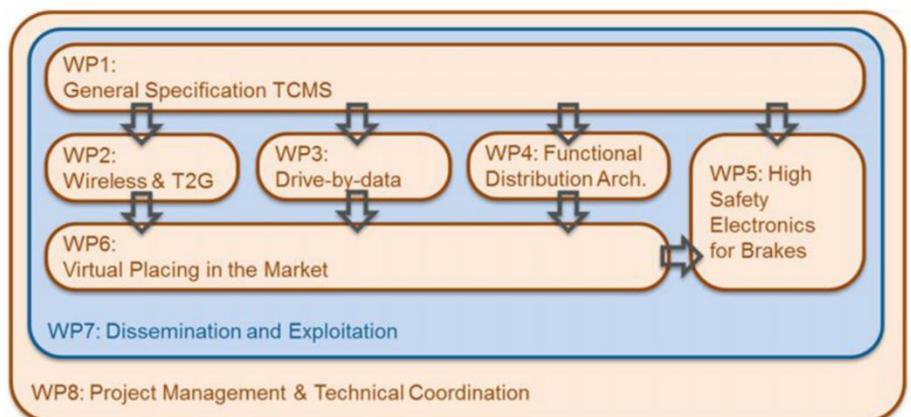
OBJECTIVES

CONNECTA aims at contributing to the Shift2Rail's next generation of TCMS architectures and components with wireless capabilities as well as to the next generation of electronic braking systems.

The project conducts research into new technological concepts, standard specifications and architectures for train control and monitoring, with specific applications in train-to-ground communications and high safety electronic control of brakes.

The project is developed in four phases of work which are reinforcing and extending the early work done in the TCMS part of Roll2Rail as well as start the specific activities of the MAAP of Shift2Rail. The major streams are described below.

1. Define General Specifications for TCMS technologies and high-level architectures to shape the future system with less cabling, increased availability, enhanced performance, easier integration and commissioning of functions and, above it, reduced life cycle costs.
2. Progress and implement new architectures and technologies, tools, norms and standards for the future generation of TCMS as well as for high safety level electronic brakes.
3. Simulate and test virtually all the communication networks and functions of the new generation TCMS subsystems to help to simplify business processes and enhance the interoperability.
4. Evaluate results, disseminate, communicate and exploit as much as possible at this TRL3-4 level of achievements.

PROJECT STRUCTURE



CONNECTIVE

STATUS

Underway

BUDGET

€7,906,243

FUNDING

€3,513,534

START

September 2017

DURATION

58 months

CALL

H2020-S2R-CFM-IP4-01-2017

CONTRACT No

777522

LEAD ORGANISATION

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WEBSITE

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CONNECTIVE

Connecting and Analysing the Digital Transport Ecosystem

OBJECTIVES

CONNECTIVE project (“Connecting and Analysing the Digital Transport Ecosystem”) aims to be the technical backbone of S2R’s Innovation Programme 4 (IP4), which addresses the provision of “IT solutions for attractive Railway services”.

CONNECTIVE will provide other S2R-IP4 projects with a technical framework and a set of tools that will foster the digital transformation of rail and in general all the transport ecosystem, enabling an unprecedented multimodal travel experience and improving the fit between supply and demand. Its outcomes will provide new levels of interoperability and seamless access to all transport data and services in a multimodal and distributed environment, while offering a common business intelligence to extract insights of the ecosystem, valuable for both users and service providers.

The project addresses two of the Technology Demonstrators (TD) identified in the MAAP, namely:

- TD4.1-Interoperability Framework: aims at allowing more efficient interconnection between heterogeneous systems. It will foster the digital transformation the transport ecosystem by enabling the creation of an open “Web of Transportation”, a shared distributed database of transportation data and services provided and consumed by information systems independently from their internal organization and representation.
- TD4.6 - Business Analytics: aims at providing a common business intelligence foundation to monitor, analyse and generate data from the IP4 ecosystem. It will leverage the importance of the data managed and generated in the transport ecosystem, allowing to obtain valuable insights of the ecosystem from a multimodal, door-to-door trans-European Mobility approach.

Framework and tools developed by the project will be used by the other IP4 TDs in the provision of multimodal door-to-door experiences.

PROJECT STRUCTURE

WP1 – Interoperability Framework

WP2 – Business Analytics

WP3 – Technical Coordination and System Coherence

WP4 – Dissemination and Communication

WP5 – Project Management



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STATUS

Underway

BUDGET

€1,498,150

FUNDING

€1,498,150

START

October 2016

DURATION

24 months

CALL

H2020-S2RJU-OC-2015-01-2

CONTRACT No

730843

LEAD ORGANISATION

EVOLEO TECHNOLOGIES

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PARTNERS

FUNDACIÓN EUSKOIKER,
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WEBSITE

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CYRail

Cybersecurity in the RAILway sector

OBJECTIVES

CYRail aims to deliver tailored specifications and recommendations for secure modern rail systems design and operation.

The challenges are multiple: wide and distributed geographical display of rail systems limit the traditional cyber-protection and cyber-defence tools & practices; the heterogeneous nature of rail systems make them vulnerable to blended attacks; the collaboration with other transportation infrastructures increase the number of points for attack; new passenger-centric services may expose rail systems to threats known in the IoT; last but not least, ICT supporting these trends are not necessarily trusted for critical applications.

CYRail will address those challenges through a methodical diagnosis and specification process, enforced at each step of the cyber-security chain: operational context and scenarios will be defined, followed by a security assessments of railway systems. An analysis of threats targeting those infrastructures will be developed as well as innovative, attack detection and alerting techniques. Adapted mitigation plans and countermeasures will be defined, taking into account their potential impact on operations. Protection Profiles for railway control and signalling applications will be delivered to ensure security by design of new rail infrastructures.

The CYRail consortium intends to take advantage of developments in other industries (aeronautics, automotive and energy) and bring them into the railway sector, taking similarities and specificities into account.

PROJECT STRUCTURE

WP1 – Project Management

WP2 – Operational Context and Scenarios

WP3 – Security Assessment

WP4 – Threat Analysis, Attack Detection and Early Warning

WP5 – Mitigation and Countermeasures Specification

WP6 – Protection Profiles

WP7 – Dissemination and Outreach

**STATUS**

Underway

BUDGET

€3,924,800

FUNDING

€2,997,000

START

May 2015

DURATION

36 months

CALL

H2020-MG-2.1- 2014

CONTRACT No

636285

LEAD ORGANISATIONGAVIN AND DOHERTY
GEOSOLUTIONS**COORDINATOR**

Dr. Kenneth Gavin

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GEOTEKNISKE INSTITUTT,
NORGES TEKNISK-
NATURVITENSKAPELIGE
UNIVERSITET NTNU, **SZ**, Others**WEBSITE**www.destinationrail.eu**DESTINATIONRAIL***Decision Support Tool for Rail Infrastructure Managers***OBJECTIVES**

The project provides solutions for common infrastructure problems encountered in diverse regions of Europe, e.g. deterioration and scour damage to bridges, slope instability, damage to switches and crossings and track performance. Whilst similar failure modes are seen around the EU, the triggers (precipitation, earthquake loading etc.) are regional. The DESTINATION RAIL project will develop management tools based on scientific principles for risk assessment using real performance measurements and other vital data stored in an Information Management System. This will allow for a step-change in the management of European rail infrastructure.

The objectives will be achieved through a holistic management tool based on the FACT (Find, Analyse, Classify, Treat) principle.

- Find - Improved techniques for the assessment of existing assets will be developed.
- Analyse - Advanced probabilistic models fed by performance statistics and using databases controlled by an information management system.
- Classify - The performance models will allow a step-change in risk assessment, moving from the current subjective (qualitative) basis to become fundamentally based on quantifiable data.
- Treat - The impact of proposed remediation or reconstruction will be assessed using the probabilistic whole life cycle model which includes financial and environmental costs and the impact of work on traffic flow.

The FACT principles will be implemented in a holistic decision support tool for infrastructure managers.

DESTINATION RAIL will result significant impact in relation to the objectives of the work programme. It will reduce the cost of investment by using the IMS to manage the network, (ii) Monitoring and real-times analyses will prevent unnecessary line restrictions and closures. (iii) Lower maintenance costs by optimising interventions in the life cycle of the asset and (iv) optimise traffic flow in the network.

PROJECT STRUCTURE

WP1 – FIND

WP2 – ANALYSE

WP3 – CLASSIFY

WP4 – TREAT

WP5 - Integration and Dissemination

WP6 – Management

**STATUS**

Underway

BUDGET

€999,822

FUNDING

€999,822

START

November 2016

DURATION

20 months

CALL

H2020-S2R-OC-IP5-02-2015

CONTRACT No

730811

LEAD ORGANISATION

UNIFE

COORDINATOR

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WEBSITEwww.dynafreight-rail.eu**DYNAREIGHT**

Innovative technical solutions for improved train DYNAMics and operation of longer FREIGHT Trains

OBJECTIVES

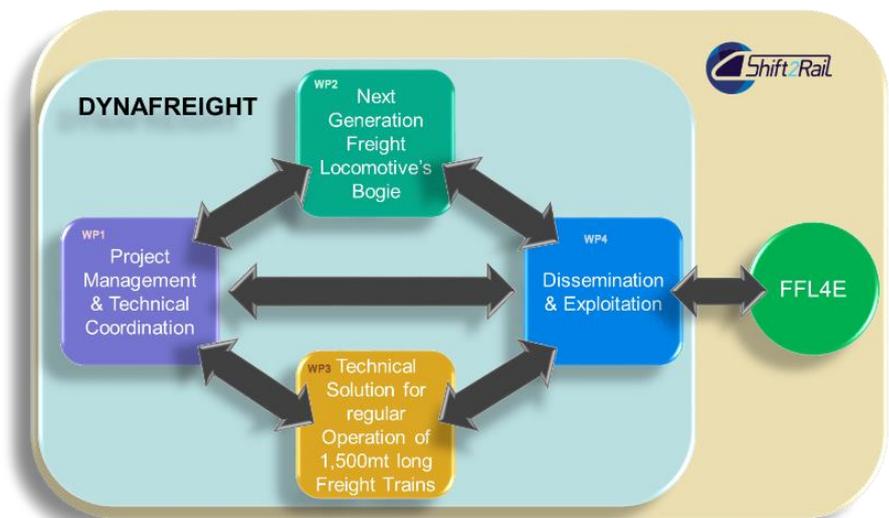
The goal of DYNAREIGHT (Innovative technical solutions for improved train DYNAMics and operation of longer FREIGHT Trains) is to provide the necessary inputs for the development of the next railway freight propulsion concepts within Shift2Rail. The project contributes to overcoming the problems of operational and technical nature that have been negatively affecting the overall capacity, performance and competitiveness of the EU rail freight industry.

The project addresses two main areas:

- 1) Freight running gear for locomotives: DYNAREIGHT designs and develops the necessary concepts that will allow a locomotive freight bogie to reduce wheel and track wear, to have lower noise and lower LCC.
- 2) Operation of long freight trains: following the outcomes of MARATHON, DYNAREIGHT prepares the path for regular operations of long freight trains.

Main planned outcomes:

- Improved performances: traction, speed, running dynamics and wheel/rail efforts
- Reduced rail freight noise at the source
- Enhance capacity/traffic throughput with the operation of longer trains
- Reduction of operation and maintenance costs (reduce wheel and rail wear, smarter maintenance, etc.)

PROJECT STRUCTURE

**STATUS**

Completed

BUDGET

€999,500

FUNDING

€999,500

START

June 2015

DURATION

24 months

CALL

H2020-MG-8.1b-2014

CONTRACT No

652821

LEAD ORGANISATION

FEHRL

COORDINATOR

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CDV, ROMA TRE, CTL, NET
Engineering, ASTRAAL, UNIZA,
NPRA

WEBSITEwww.ecoroadsproject.eu**ECORoads***Effective and COordinated ROAD infrastructure Safety operations***OBJECTIVES**

The general objective of the ECORoads project is to overcome the barrier established by the formal interpretation of the two Directives 2008/96/EC (on road infrastructure safety management) and 2004/54/EC (on tunnels), that in practice do not foresee the same Road Safety Audits/Inspections to be performed on open roads and in tunnels.

The main problem is that, while from the user (driver) point of view a road is a unique linear infrastructure generally in open terrain and sometimes in closed environment (tunnels), the strict application of the two Directives may lead to a non-uniform approach to the infrastructure safety management outside and inside tunnels.

To overcome this barrier, ECORoads projects aims at the establishment of a common enhanced approach to road infrastructure and tunnel safety management by using the concepts and criteria of the Directive 2008/96/CE on road infrastructure safety management and the results of the two related European Commission's (EC) studies on Directive 2008/96/EC, covering the open road safety management and Directive 2004/54/EC, covering the tunnels.

Such an objective will be achieved through the following specific activities:

- Workshops with the stakeholders (European tunnel and road managers);
- Exchange of best practices and experiences between European tunnel experts and road safety professionals
- Pilot joint safety operations in (at least) five European road sections in transition (which feature both open roads and tunnels)
-
- Recommendations and guidelines for the application of the RSA and RSI concepts within the tunnel safety procedures and operations

PROJECT STRUCTURE

WP1 – Project Management

WP2 – Overview of the application of the Two Directives

WP3 – Workshops with Stakeholders

WP4 – Exchange of best practices

WP5 – Joint road safety operations

WP6 – Guidelines and recommendations

WP7 – Dissemination



ERSAT EAV

ERTMS on SATELLITE – Enabling Application Validation

STATUS

Completed

BUDGET

€5,518,704

FUNDING

€4,252,447

START

February 2015

DURATION

27 months

CALL

H2020-Galileo-2014-1

CONTRACT No

640747

LEAD ORGANISATION

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WEBSITE

<http://www.ersat-eav.eu/>

OBJECTIVES

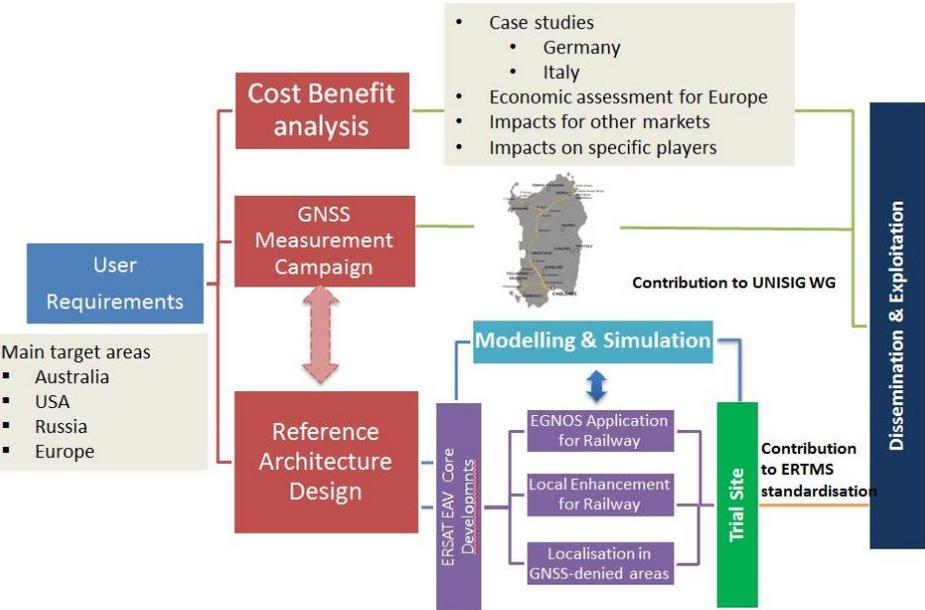
The main ERSAT EAV objective is to verify the suitability of EGNSS (including EGNOS and Galileo early services) for safety railway application, in particular in regional lines scenario, for which a safe localization of the trains, based on satellite technologies, will be defined and developed, leading the way for the harmonization with the European ERTMS standard, by implementing the solution on a pilot line as reference.

The objectives will be achieved, in a first phase by measuring and evaluating the gaps to be filled, in terms of technological criticalities and in relation to railway requirements, performing measurements under real operating conditions, building models and analysis with the help of the simulation, and finally defining and developing a system solution, implementing, testing and validating it on a pilot line, as reference for the future standardisation and certification processes.

The ERSAT EAV proposal is relevant to the work programme for the exploitation of the space infrastructure, in particular prioritising the EGNSS uptake for the rail sector, fostering the competition and the innovation of the European space and rail industry and research community, and enhancing in parallel the strong coordination and synergy with the specific sector of European Railways and the main actors involved, building-up a system centered to the ERTMS platform and able to bring to the ERTMS the “competitiveness-dividend” of the satellite promises, linked with the enormous opportunity of the local and regional lines in Europe that represent about 50% of the total railways length.

The EGNSS-ERTMS based train control/protection system is especially beneficial in terms of operating costs compared to other solutions for upgrading the local/regional infrastructure, considering the forecasted average Benefit/Cost ratios of 2.2 at the European level and a remarkable increase of safety.

PROJECT STRUCTURE



**STATUS**

Completed

BUDGET

€3,873,992

FUNDING

€3,873,992

START

May 2015

DURATION

30 months

CALL

H2020-MG-7.2a-2014

CONTRACT No

636148

LEAD ORGANISATION

INLECOM SYSTEMS

COORDINATOR

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DICKINSON, NCSR
DEMOKRITOS, PHAROS, SRI
INNSBRUCK, SILVERRAIL,
TRAVELPORT, **TRENITALIA**,

WEBSITE

www.eutravelproject.eu

2**4****12**

EuTravel

Optimodal European Travel Ecosystem

OBJECTIVES

EuTravel aims to:

1. Support the EU agenda towards an open and single market for mobility services by enabling travellers to organise a multimodal trip in accordance with their own criteria including environmental performance, providing multimodal travel service providers an effective way to deliver customised services addressing any type of specialised travel needs and facilitating fact-based EU policy making.
2. Promote the creation of content, open and linked data for travellers enriching the travelling experience.
3. Support travel industry players join forces towards realising an EU shared seamless mobility strategy and architecture.

EuTravel will research and demonstrate Inter-modal travel optimised with respect to synchronisation between modes, passenger experience and rights and environmental performance (Optimodal Travel).

The project objectives will be realised by:

1. Developing an open and readily usable Optimodality Framework aimed at integrating processes, data, and systems in a manner that eliminates interoperability barriers to the marketplace emergence of truly Optimodal travel services: from planning through booking and the full range of related travel support solutions.
2. Delivering Optimodality Ecosystem Enablers, offering an open infrastructure that allows organisations to set up cost-effective integration of existing systems and to create value added multimodal travel services.
3. Organising and developing a Living Lab to experiment and evaluate new concepts and prototype solutions in real life multimodal travel scenarios and obtain data to quantify impact.
4. Taking actions towards sustainable development including a Stakeholder Engagement Strategy and wide dissemination.

EuTravel, unlike other projects/initiatives, will deliver an Ecosystem promoting and supporting Optimodal travel that will have higher chances of success as it will be populated with tools that tap into existing mainstream IT travel reservation systems and sources of data.

PROJECT STRUCTURE

Not available



STATUS

Underway

BUDGET

€3,375,017

FUNDING

€1,499,857

START

September 2016

DURATION

33 months

CALL

H2020-S2R-CFM-IP5-03-2015

CONTRACT No

730823

LEAD ORGANISATION

BOMBARDIER

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WEBSITE

http://projects.shift2rail.org/s2r_ip5_n.aspx?p=FFL4E

FFL4E

Future Freight Loco for Europe

OBJECTIVES

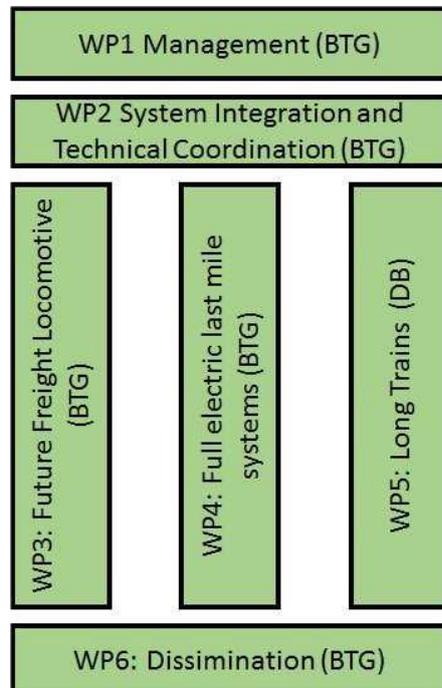
FFL4E (Future Freight Locomotive for Europe) aims at developing key technologies for future energy efficient freight locomotives, allowing highest operational flexibility and providing attractive and competitive rail freight services to the final customer.

The key elements of the project are: digitalisation, automation in train operation, energy-supplied freight wagons, advanced functionalities and increased productivity. The challenge is to take the freight locomotive to the next level by:

- improving the efficiency of propulsion systems with hybrid technologies and energy storage systems
- improving last mile concepts
- reducing LCCs, including wear
- enabling longer trains up to 1500 meters
- reducing emissions, including noise
- introducing driver advisory systems (DAS)
- enabling autonomous driving

To accelerate the development process, the FFL4E looks for additional knowhow to be brought in by Dynafreight project.

PROJECT STRUCTURE



**STATUS**

Underway

BUDGET

€3,017,282

FUNDING

€1,340,880

START

September 2016

DURATION

36 months

CALL

H2020-S2R-CFM-CCA-02-2015

CONTRACT No

730818

LEAD ORGANISATION

BOMBARDIER

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TRAFIKVERKET

WEBSITE

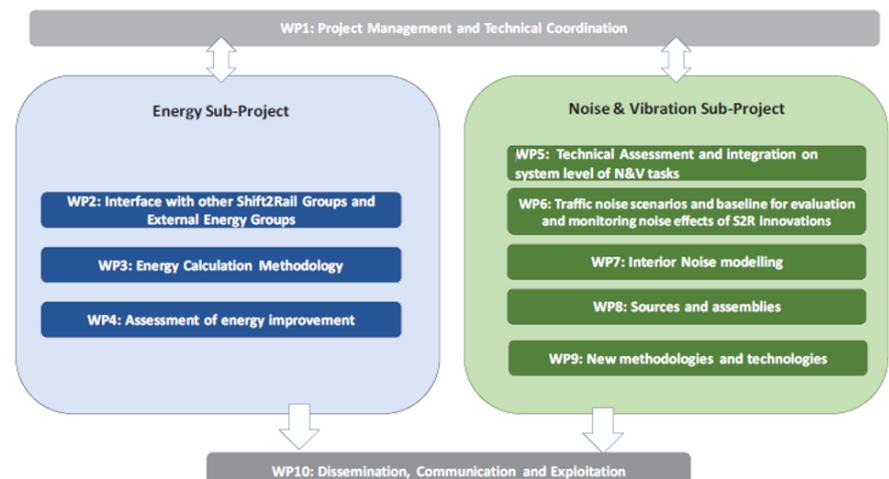
http://projects.shift2rail.org/s2r_ipcc_n.aspx?p=FINE%201

FINE1*Future Improvement for Energy and Noise***OBJECTIVES**

The FINE 1 project aims to reduce operational costs of railways by a reduction of energy use and noise related to rail traffic. The project results are expected to enable an increase of traffic in Europe and to enhance the attractiveness of railway in relation to other modes of transport.

The project activities will support the innovation process within the S2R Technical Demonstrators (TDs) by providing methodology and know-how to enable development of low noise and low energy TDs. The project is fully in line with the EU objectives with eight technical work packages (WPs) addressing technologies to support these objectives. The reduction of energy use for rail vehicles is as addressed in WP 3 and WP4 and will indirectly lead to reduced green-house gas emissions, also with most rail transport powered with electricity. Further, reducing energy use will lower the life cycle cost and the costs of vehicle operation. The project also aims at development of practical methods for predicting noise and vibration performance on system level including both rolling stock, infrastructure and its environment. Prediction of interior vehicle noise is addressed in WP 7 and source modelling for interior and exterior noise in WP 8. With an accurate characterization of each contributing source, it will be possible to optimize cost benefit scenarios, as addressed in WP 6, as well as take exposure and comfort into account. Finally, the auralisation and visualisation techniques of traffic noise scenarios and the noise control techniques developed in WP 9, support the reduction of noise exposure for residents by efficient traffic planning and novel mitigation techniques.

In summary, the expected FINE 1 advances of the state-of-the-art in noise modelling and control as well as in energy management and control methodology, will improve the competitiveness of the European railway system compared to other modes of transportation and thus promoting a modal shift to rail.

PROJECT STRUCTURE

**STATUS**

Underway

BUDGET

€3,880,324

FUNDING

€3,880,324

START

October 2016

DURATION

48 months

CALL

H2020-MSCA-ITN-2016

CONTRACT No

722509

LEAD ORGANISATIONECOLE POLYTECHNIQUE
FEDERALE DE LAUSANNE**COORDINATOR**

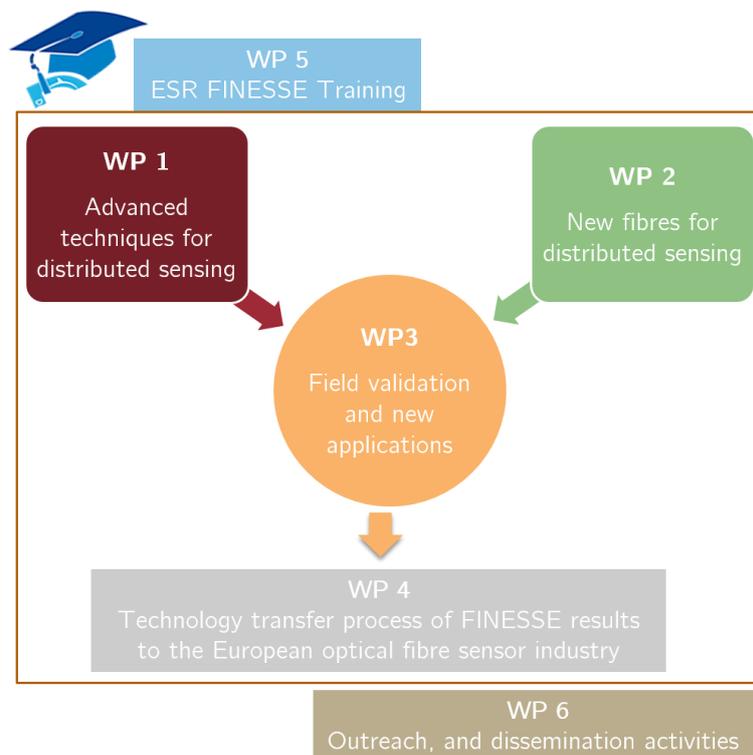
Dr. Kenny Hey Tow

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VALENCIA, UCAM, IPHT, TAU,
FIBERCORE, ACREO SWEDISH
ICT, **ADIF**, OTHERS**WEBSITE**www.itn-finesse.eu**FINESSE***Fibre NErvous Sensing SystEms***OBJECTIVES**

The objective behind FINESSE (Fibre NErvous Sensing SystEms) is to mimic the nervous system of living bodies by turning man-made and natural structures into objects that are sensitive to external stimuli owing to advanced distributed fibre-optic sensor technology, with the objective to either give early warning in case of possible danger or occurrence of damage, or to optimise the operation of the structure to allow for a sustainable use of natural resources and assets. Enabling such functionalities will greatly contribute to realizing a safe, secure and energy efficient Europe, which is an identified societal concern.

To turn this ambitious concept into reality, 26 European universities, research centres and industrial partners have teamed up to set up this Innovative Training Network, with the common objective of educating and training 15 Early Stage Researchers (ESRs) in the development of a set of disruptive new optical 'artificial nervous systems' and to boost the industrial uptake of these sensors by technology transfer from academic research to the European optical fibre sensor industry.

We are also engaged in stimulating awareness of this technology to other scientists and a wider public to encourage research in this field and improve societal acceptance on distributed fibre sensing systems through various training events, opened to other early career researchers, and outreach activities.

PROJECT STRUCTURE

**STATUS**

Completed

BUDGET

€929,753

FUNDING

€929,753

START

May 2015

DURATION

30 months

CALL

H2020-MG-8.1b-2014

CONTRACT No

653631

LEAD ORGANISATION

FEHRL

COORDINATOR

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CONTACTthierry.goger@fehrl.org**PARTNERS**BAST, ZAG, IFSTTAR, TNO,
EURNEX, STAC**WEBSITE**www.useitandfoxprojects.eu**FOX***Forever Open infrastructure across (X) all transport modes***OBJECTIVES**

An efficient and high-quality transport infrastructure is a fundamental requirement for the connectivity of people and goods in Europe and basis for economic growth, competitiveness and territorial cohesion. In general, the transport network in Europe is of a high standard but is still fragmented regarding the geographical distribution and the transport modes.

In recent years, first networking activities and exchange of strategic programmes among the stakeholders of the four transport modes – road, rail, water and air – can be noticed but still a mono-modal, mono-disciplinary culture exists. In the light of the future challenges, e.g. increasing transport demand, ageing infrastructure, scarcity of natural resources, changing climatic conditions, it is inevitable to strengthen the collaboration of the single transport modes in order to create an improved future integrated and functioning transport system for Europe, despite of limited financial resources of the owners of the transport network.

The FOX project aims to develop a highly efficient and effective cross-modal R&D environment and culture which meets the demanding requirements of the transport and connectivity. Based on already existing programmes and agendas related to the aspects of co-modal transport research, the FOX project will identify common needs and innovative techniques in the areas of construction, maintenance, inspection, and recycling & reuse of transport infrastructure. This will be reached by the involvement of all stakeholders (owners, researchers, and industry) of the four transport modes in a phased approach: Starting with the determination of the state-of-the-art in research and practice, in the next step the most promising practices and ideas will be identified. By mapping the common needs, the final aim is to establish a cross-modal Working Group to develop a roadmap for the whole transport sector and set the agenda for further improvement of cross-modal research development innovation.

PROJECT STRUCTURE

WP1 - Project Management

WP2 – Construction

WP3 – Maintenance

WP4 – Inspection

WP5 - Recycling & Reuse

WP6 - Dissemination and exploitation/implementation



STATUS

Underway

BUDGET

€9,900,990

FUNDING

€4,400,000

START

September 2017

DURATION

36 months

CALL

H2020-S2R-CFM-IP5-01-2017

CONTRACT No

777402

LEAD ORGANISATION

TRAFIKVERKET

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WEBSITE

http://projects.shift2rail.org/s2r_ip5_n.aspx?p=FR8HUB

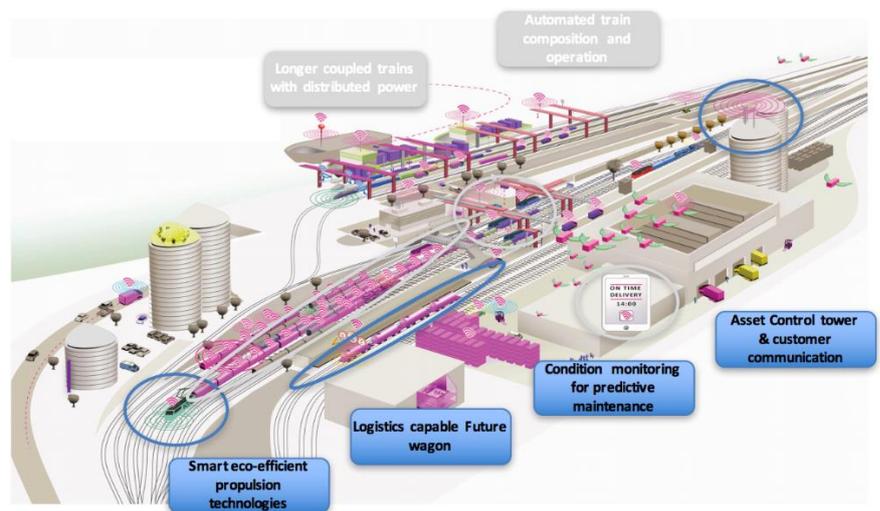
FR8HUB

Real-time information applications and energy efficient solutions for rail freight

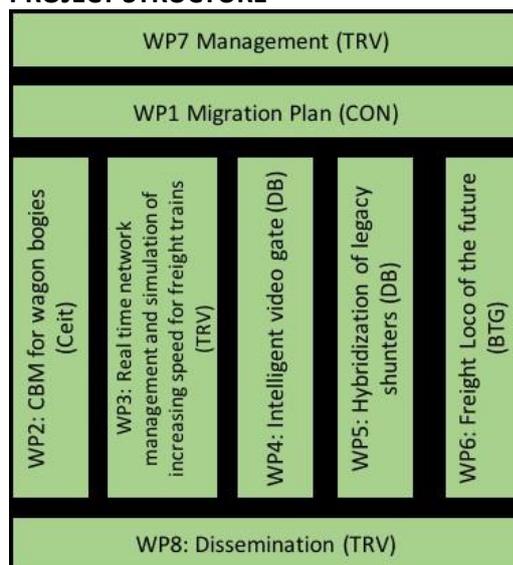
OBJECTIVES

The key aspects for this proposal, FR8HUB, is the emphasis on increasing the efficiency in the nodes, hubs and terminals in the railway system for freight and to continue development in freight locomotives of the future. FR8HUB answers to the member call for Shift2Rail IP5 AWP 17 and thereby propose activities in new development areas together with continuation of progress in Technical Demonstrators (TD) started in AWP 15.

To succeed with implementation of technologies developed within Shift2Rail IP5, FR8HUB will also initiate development of a strategy for implementation of relevant technologies to secure market uptake.



PROJECT STRUCTURE



FR8RAIL

STATUS

Underway

BUDGET

€7,826,783

FUNDING

€3,478,222

START

September 2016

DURATION

36 months

CALL

H2020-S2R-CFM-IP5-01-2015

CONTRACT No

730617

LEAD ORGANISATION

TRAFIKVERKET

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PARTNERS

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BREMSE, **EUROC (SBB)**,
CONTRAFFIC, DLR, WBN, AC2T,
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LEOBEN FORSCHUNG, PJ
MESSTECHNIK

WEBSITE

http://projects.shift2rail.org/s2r_ip5_n.aspx?p=FR8RAIL

FR8RAIL

Development of Functional Requirements for Sustainable and Attractive European Rail Freight

OBJECTIVES

The main aim of the FR8RAIL project is the development of functional requirements for sustainable and attractive European rail freight.

The objectives of the project are:

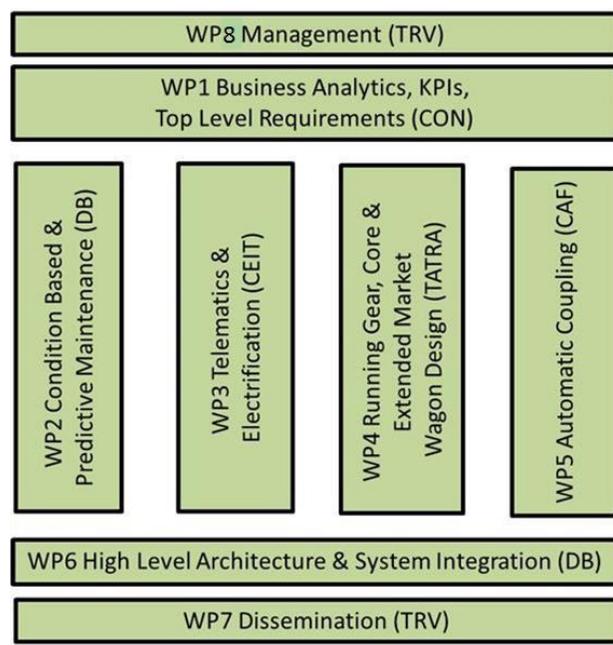
- A 10 % reduction in the cost of freight transport measured by tonnes per Km,
- A 20 % reduction in the time variations during dwelling, and
- increase attractiveness of logistic chains by making available 100 % of the rail freight transport information to logistic chain information sy
- stems.

The objectives of the FR8RAIL project will be achieved by developing a number of vital areas within freight rail.

There are six main areas of work that form the backbone of this project's approach;

1. Business Analytics, KPIs, Top Level Requirements,
2. Condition Based and Predictive Maintenance,
3. Telematics & Electrification,
4. Running Gear, Core and Extended Market Wagon,
5. Automatic Coupling,
6. High level System Architecture and Integration.

PROJECT STRUCTURE





STATUS

Underway

BUDGET

€2,000,000

FUNDING

€2,000,000

START

November 2016

DURATION

24 months

CALL

H2020- S2R-OC-IP4-01-2016

CONTRACT No

730844

LEAD ORGANISATION

UNIFE

COORDINATOR

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POLITECNICO DI MILANO,
RSSB, TELESTE, **TRENITALIA**,
UIC, UITP, ZILINSKA
UNIVERZITA V ZILINES,
UNIVERSIDAD POLITECNICA DE
MADRID, THE UNIVERSITY OF
SHEFFIELD

WEBSITE

www.gof4r.eu

GoF4R

Governance of the Interoperability Framework for Rail and Intermodal Mobility

OBJECTIVES

The establishment of good governance will effectively secure the confidence of the industry to use the Interoperability Framework (IF) semantic technologies that will be established under the IP4 Shift2Rail program. The objective of the Governance of the IF for Rail and Intermodal Mobility (GoF4R) project is to define sustainable governance for the IF that will create the right conditions to introduce seamless mobility services and foster the development of multimodal travel services. GoF4R will help to overcome obstacles currently impeding development of market innovation by fostering a large acceptance of the "semantic Web for transportation".

The objectives will be achieved through a partnership of specialist participants including research institutions, a major European rail operator, industry associations representing the passenger and multimodal transport sectors and public transportation authorities. Participants, who are also involved in the consortium of designers for the IF, will focus on the establishment of sustainable governance that will promote community confidence. The governance structure will create the basis for long term stability and controlled future evolution of the IF, promoting industry confidence so that it is attractive to invest in future products and services.

The project encompasses all current and future stakeholders who will exploit the IF as described in the Shift2Rail Multi Annual Action Plan, contributing to the realisation of a distributed semantic "web of transport" integrating the TAP-TSI specifications as one of its elements. The governance models proposed in GoF4R will assure the interests of European travellers by fostering market uptake by mobility service providers. It will facilitate new business opportunities for improved mobility and travel related services and improve the incorporation of new stakeholders in the European arena by removing technological, administrative and economic boundaries

PROJECT STRUCTURE

WP1 - Project Management
WP2 - User Demand
WP3 - Regulatory Environment for Interoperability Framework components
WP4 - Semantic Interoperability Technology Market
WP5 - Governance and Management Structure for Interoperability Framework
WP6 - Dissemination and Exploitation

**STATUS**

Completed

BUDGET

€2,409,223

FUNDING

€2,409,223

START

January 2015

DURATION

28 months

CALL

H2020-ICT-26-2014-1

CONTRACT No

645262

LEAD ORGANISATION

IMEC

COORDINATOR

Pr. Murali Jayapala

CONTACTmurali.jayapala@imec.be**PARTNERS**BRIGHTWAY VISION, PROPRS,
AITEK, **SNCF**, TECNOSITAF SPA
CON UNICO SOCIO, URZAD
MORSKI W GDYNI**WEBSITE**www.i-allow.eu**I-ALLOW***Imaging analysis in all lighting and off weather conditions***OBJECTIVES**

I-ALLOW's main objective is to develop and demonstrate a civil low-cost imaging solution based on a novel multifunctional approach camera system integrated with a high-performance processing unit addressing a vast variety of outdoor scenarios for safety and security applications. The features of the solution will be specified, tested and benchmarked with the involvement of potential end-users operating in transportation and logistics and responsible for monitoring of critical infrastructures (railways, motorways, harbours).

I-ALLOW's detailed objectives:

Business: to introduce a breakthrough imaging solution at a very competitive price

- To provide to a wide range of end-users, a low-cost imaging solution for low light and harsh conditions with an integrated system with multiple functionalities.
- To design and develop an EAR 99* product.
- To target the world-wide active imaging market, starting from European excellences

Technical: solve current outdoor imaging limitation by a single image sensor approach

To design and develop a day-and-night, multispectral active-gated imaging solution for low lighting and harsh weather conditions (rain, snow, smog) based on the integration of:

- a novel Gated CMOS Imager Sensor ("GCMOS");
- a novel hyper-spectral filter monolithically integrated on top of the GCMOS sensor (i.e. narrow spectral filters [~nm] coupled with wide spectral filters [~150nm]);
- a novel high efficiency pulsed light NIR.

The imaging solution will be integrated with a high-performance processing module to provide users' functions and communication interfaces for integration in real-world cases and industrial applications. The Integrated System Prototype will be designed and tested in field with the involvement of End-Users interested in the use and adoption of solutions based on the new technology.

PROJECT STRUCTURE

Not available



IMPACT-1

STATUS

Underway

BUDGET

€886,819

FUNDING

€299,951

START

September 2016

DURATION

18 months

CALL

H2020-S2R-CFM-CCA-01-2015

CONTRACT No

730816

LEAD ORGANISATION

DLR

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TRAFIKVERKET

WEBSITE

http://projects.shift2rail.org/s2r_ipcc_n.aspx?p=IMPACT-1

IMPACT-1

Indicator Monitoring for a new railway PARadigm in seamlessly integrated Cross modal Transport chains – Phase 1

OBJECTIVES

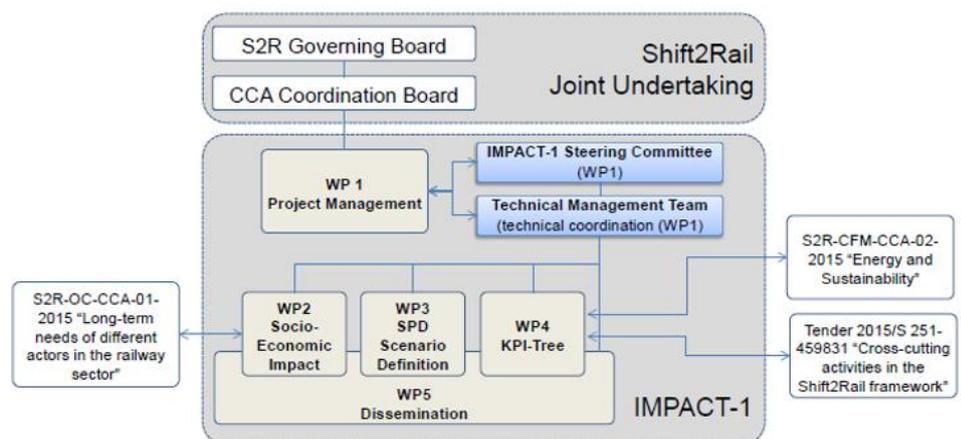
The objective of IMPACT-1 is to help maximise the impact of Shift2Rail by analysing the socioeconomic impact of the S2R developments, identifying the future application use cases by System platform demonstrator scenarios and assess the impact of the development by using Key Performance Indicators.

The objectives of this proposal IMPACT-1 are:

- Evaluating the effects for mobility, society and environment induced by new technology solutions and developments,
- Introducing relevant targets and needs to create a more attractive, a more competitive and more sustainable rail system
- Defining System Platform Demonstrators (SPD) that represent future application use cases
- Defining Key Performance Indicators (KPIs) that enable the monitoring and assessment of the Shift2Rail overall target achievement.

These objectives will be reached by performing a socio-economic impact analysis for high speed, regional, urban and freight. The model of the KPI shows the relation of the low-level KPI to the overall targets defined in the S2R Master Plan.

PROJECT STRUCTURE





IMPACT-2

STATUS

Underway

BUDGET

€7,102,821

FUNDING

€3,153,652

START

September 2017

DURATION

60 months

CALL

H2020-S2R-CFM-CCA-01-2017

CONTRACT No

777513

LEAD ORGANISATION

TRAFIKVERKET

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INDRA, SIEMENS, **SNCF**,
THALES

WEBSITE

http://projects.shift2rail.org/s2r_ipcc_n.aspx?p=IMPACT-2

IMPACT-2

Indicator Monitoring for a new railway PARadigm in seamlessly integrated Cross modal Transport chains – Phase 2

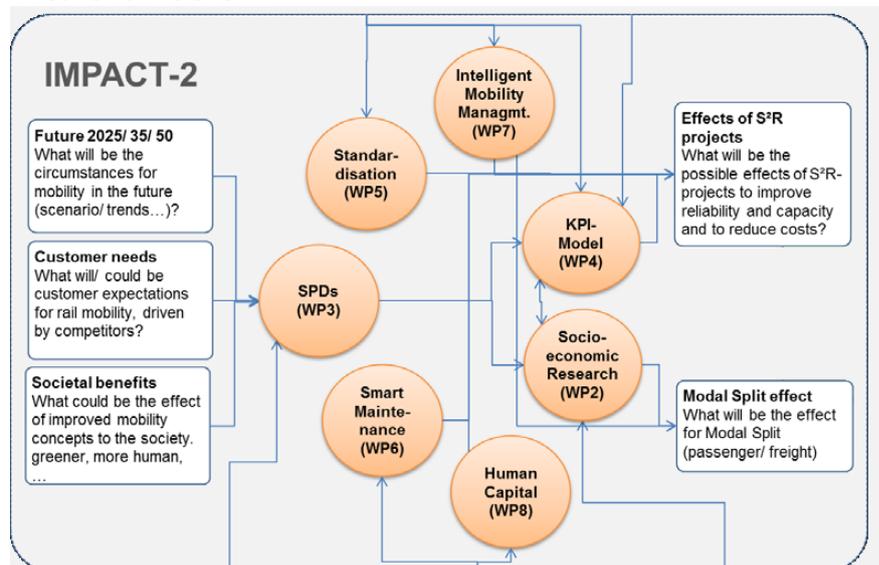
OBJECTIVES

The comprehensive objective of IMPACT-2 is to help maximising the impact of Shift2Rail by preparing the socio-economic framework. It contains analysing the socio-economic impact of the S2R developments, assess the impact of the Shift2Rail development by using key performance indicators and System Platform Demonstrators (SPD) as well as starting the standardisation of the S2R technologies. Another objective is to integrate the different rail service operations via a common ICT structure. This Integration Layer provide a seamless exchange of involved Traffic Operations and Assets covered under the scope of this program with a specified data structure to enable legacy and new applications to unambiguously use the available information as input to optimize their service offer. Finally, the transversal aspects of smart maintenance and human capital are covered.

Specific objectives of IMPACT-2 are:

- Assess the effects for mobility, society and environment induced by new technology solutions and developments
- Introducing relevant targets and needs to create a more attractive, a more competitive and more sustainable rail system,
- Defining System Platform Demonstrators (SPD) that represent future application use cases
- Defining Key Performance Indicators (KPIs) that enable the monitoring and assessment of the Shift2Rail overall target achievement,
- Smart Maintenance
- Prepare an efficient process for bringing Shift2Rail results into standardisation
- Develop a common platform for the intelligent mobility management
- Human resources

PROJECT STRUCTURE





STATUS

Underway

BUDGET

€17,998,546

FUNDING

€17,998,546

START

May 2015

DURATION

36 months

CALL

H2020-MG-2.1-2014

CONTRACT No

635900

LEAD ORGANISATION

NETWORK RAIL

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WEBSITE

www.in2rail.eu

IN2RAIL

Innovative Intelligent Rail

OBJECTIVES

IN2RAIL is to set the foundations for a resilient, consistent, cost-efficient, high capacity European network by delivering important building blocks that unlock the innovation potential that exists in SHIFT2RAIL: innovative technologies will be explored and resulting concepts embedded in a systems framework where infrastructure, information management, maintenance techniques, energy, and engineering are integrated, optimised, shared and exploited.

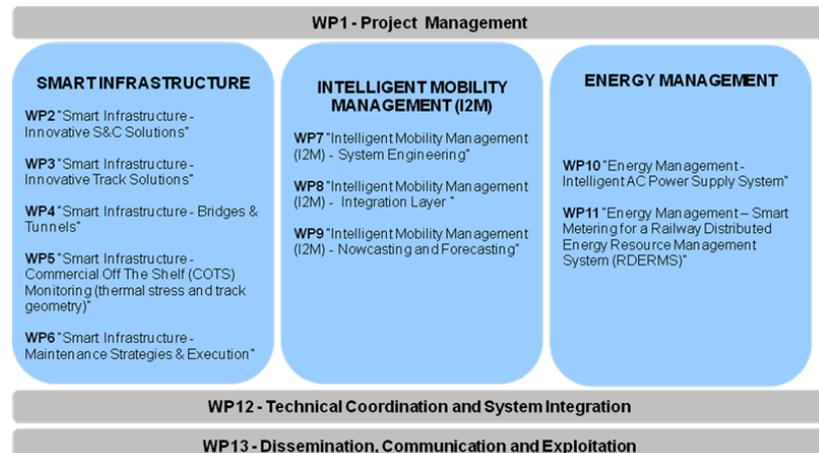
IN2RAIL will make advances towards SHIFT2RAIL objectives: enhancing the existing capacity fulfilling user demand; increasing the reliability delivering better and consistent quality of service; reducing the LCC increasing competitiveness of the EU rail system.

To achieve the above, a holistic approach covering Smart Infrastructures, Intelligent Mobility Management (I2M) and Rail Power Supply and Energy Management will be applied. Smart Infrastructure addresses the fundamental design of critical assets - switches and crossings and tracks. It will research components capable of meeting future railway demands and will utilise modern technologies in the process. Risk and condition-based LEAN approaches to optimise RAMS and LCC in asset maintenance activities will be created to tackle the root causes of degradation.

I2M researches automated, interoperable and inter-connected advanced traffic management systems; scalable and upgradable systems, utilising standardised products and interfaces, enabling easy migration from legacy systems; the wealth of data and information on assets and traffic status; information management systems adding the capability of nowcasting and forecasting of critical asset statuses.

Rail Power Supply and Energy Management create solutions to improve the energy performance of the railway system. Research on new power systems characterised by reduced losses and capable of balancing energy demands, along with innovative energy management systems enabling accurate and precise estimates of energy flows.

PROJECT STRUCTURE





IN2SMART

Intelligent Innovative Smart Maintenance of Assets by integRated Technologies

STATUS

Underway

BUDGET

€16,405,562

FUNDING

€7,290,632

START

September 2016

DURATION

36 months

CALL

H2020-S2R-CFM-IP3-02-2016

CONTRACT No

730569

LEAD ORGANISATION

ANSALDO STS

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DLR, FRAUNHOFER, ACCIONA CONSTRUCCION, **SNCF,** VVAC+,
WIENER LINIEN, MERMEC,

WEBSITE

http://projects.shift2rail.org/s2r_ip3_n.aspx?p=IN2SMART

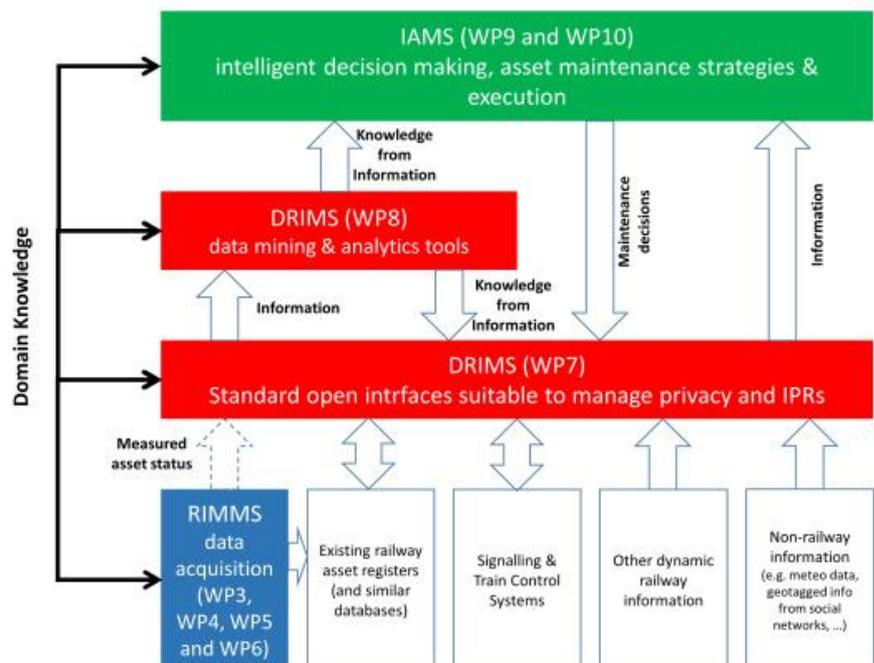
OBJECTIVES

IN2SMART aims to contribute to the overall concept for Intelligent Asset Management based on the following three main interlinked layers:

- Measuring and Monitoring systems to collect, process and aggregate a set of heterogeneous railway asset status data, by developing (when necessary) or applying specific monitoring systems or data diagnostic collection techniques.
- Data management, data mining and data analytics procedures to process data from the field and from other sources by applying standard open interfaces to access heterogeneous maintenance-related data and developing analytic tools to automatic detect anomalies and predict railway assets decay towards prescriptive maintenance.
- Decision making, maintenance strategies and execution procedures to develop a generic framework, based on the combination of traditional and data driven degradation models to pave the road for future decision support tools and systems.

IN2SMART will complement the work of the IN2RAIL lighthouse project to reach a homogeneous TRL4/5 demonstrator.

PROJECT STRUCTURE





STATUS

Underway

BUDGET

€13,440,000

FUNDING

€5,972,723

START

September 2017

DURATION

60 months

CALL

H2020-S2R-CFM-IP3-01-2017

CONTRACT No

777515

LEAD ORGANISATION

NETWORK RAIL

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 UNIVERSIDADE DO PORTO

WEBSITE

http://projects.shift2rail.org/s2r_ip3_n.aspx?p=IN2stempo

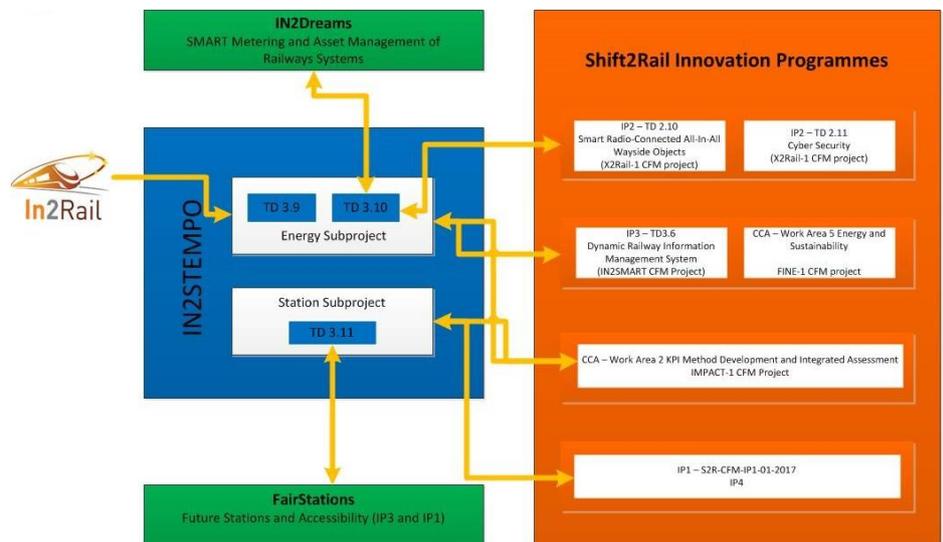
IN2STEMPO

Innovative Solutions in Future Stations, Energy Metering and Power Supply

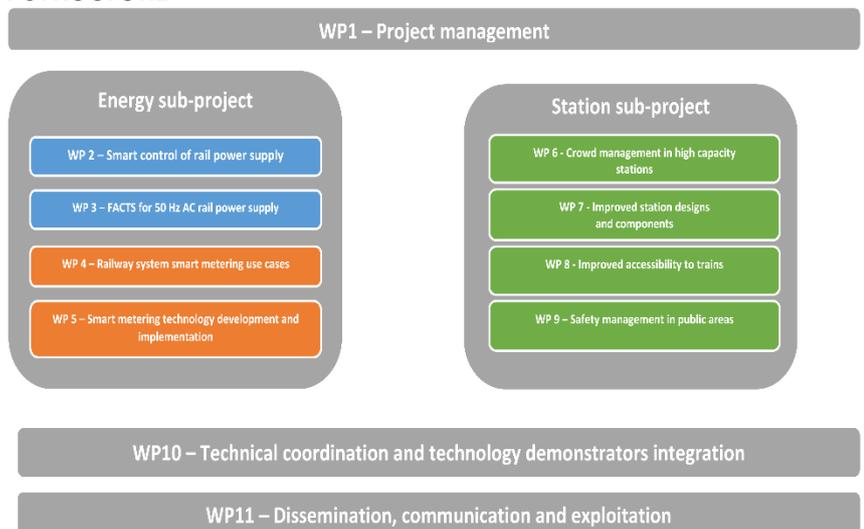
OBJECTIVES

IN2STEMPO has three primary objectives, which address the topic of “Smart system energy management solution and future station solutions”. They are:

- Smart Power Supply Demonstrator (TD3.9) – The project seeks to develop a smart railway power grid, in an interconnected and communicated system
- Smart Metering for Railway Distributed Energy Resource Management System Demonstrator (TD3.10) – The project seeks to achieve a fine mapping of energy flows within the entire railway system, forming the basis of later energy management strategy
- Future Stations Demonstrator – (TD3.11) – The Project will improve the customer experience at Railway Stations



PROJECT STRUCTURE



**STATUS**

Underway

BUDGET

€6,366,942

FUNDING

€2,799,993

START

September 2016

DURATION

30 months

CALL

H2020-S2R-CFM-IP3-01-2016

CONTRACT No

730841

LEAD ORGANISATION

TRAFIKVERKET

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INFRAESTRUTURAS DE
PORTUGAL, SBB, TCDD, FTA,
SZ, BLS) NETWORK RAIL,
 RAIENIUM, TATA STEEL,
 VOSSLOH, **SNCF**, UNIVERSIDAD
 DEL PAIS VASCO/ EUSKAL
 HERRIKO UNIBERTSITATEA,
 Others

WEBSITE

http://projects.shift2rail.org/s2r_ip3_n.aspx?p=IN2TRACK

IN2TRACK

Research into enhanced tracks, switches and structures

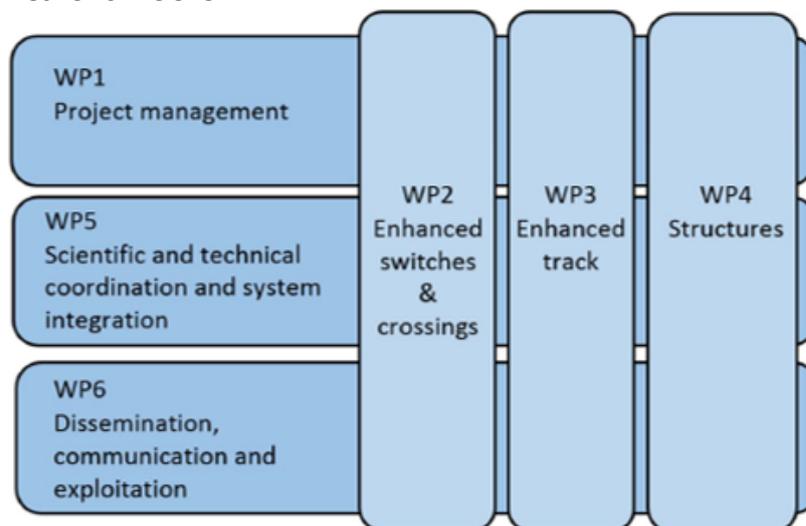
OBJECTIVES

The main objective of In2Track project is to set the foundations for a resilient, consistent, cost-efficient, high capacity European network by delivering important building blocks that unlock the innovation potential that have been identified as part of the Shift2Rail Innovation Programme 3.

The specific objectives of IN2TRACK are divided into three parts;

- Enhancing and optimising the switch & crossings and track systems in order to ensure the optimal line usage and capacity;
- Investigating novel ways of extending the life of bridges and tunnel assets through new approaches to maintaining, repairing and upgrading these structures;
- Development and adoption of a holistic, whole system-approach.

A whole-system approach, which is defined as the system boundaries extending from dynamic wheel-rail interaction (loading input) through to degradation of the S&C system, sub-systems, individual components, and underlying track foundation, will also be at the heart of IN2TRACK on how to reach the objectives.

PROJECT STRUCTURE

**STATUS**

Underway

BUDGET

€3,361,000

FUNDING

€3,361,000

START

October 2016

DURATION

48 months

CALL

H2020-EEB-04-2016

CONTRACT No

723916

LEAD ORGANISATION

CONSIGLIO NAZIONALE DELLE RICERCHE

COORDINATOR

Dr. Adriana Bernardi

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PROIGMENES EREVNITIKES & DIAHIRISTIKES EFARMOGES, R.E.D., FUNDACION TECNALIA, GUIDOLIN GIUSEPPE – ECO, PIETRE EDIL, IZNAB, **ZAG**, MAGNETTI BUILDING, DIMOS VARIS VOULAS VOULIAGMENIS

WEBSITEwww.innowee.eu**InnoWEE**

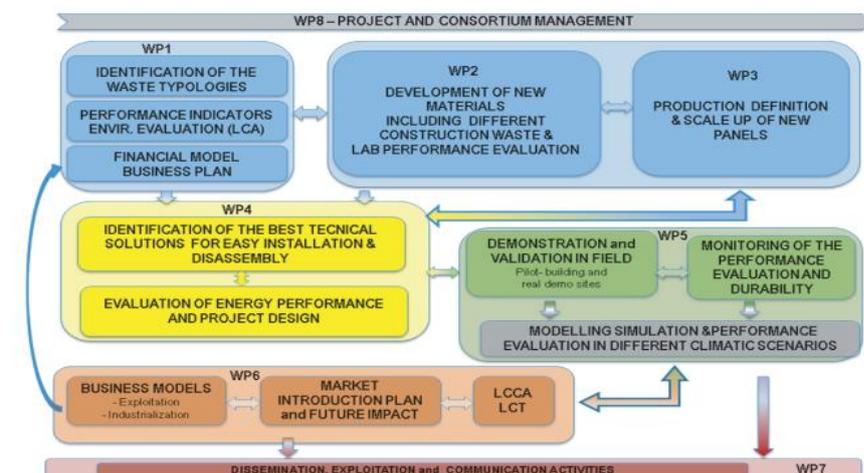
Innovative pre-fabricated components including different waste construction materials reducing building energy and minimising environmental impacts

OBJECTIVES

The basic idea is to embed the waste from building demolition (fragmented bricks, fragmented plaster or concrete, fragmented glasses, machined wood from windows frame or from wood beams after demolition etc.) in a geopolymer matrix to produce prefabricated panels for different use. The main objective of InnoWEE is in fact the development of an optimized reuse of Construction and Demolition Waste (CDW) materials producing high add value prefabricated insulating and radiating panels to be used in energy efficient buildings.

The proposal is based on:

- 1) Recovery, selection and disassembling of CDW that will be characterized and eventually treated to yield suitable raw materials to be used for production of prefabricated components.
- 2) Development of new high performance prefabricated insulating geopolymeric panels for building walls envelopes and radiating panels for indoor wall and ceilings with low environmental impact, low embodied energy, low CO₂ emissions, high thermal performance. Panels will be fabricated recycling cement, bricks, mortars, glass and wood reaching at least 30% of CDW.
- 3) To install the panels in demo sites characterized by different climate to evaluate their performance in terms of reducing energy use and minimizing environmental impacts.
- 4) To use an integrated design process and a holistic approach for the whole life cycle of the materials and components and produce a material that is cost effective, competitive, robust, reliable and low maintenance.
- 5) To create practical and sustainable building solutions that are easy to integrate into building designs, easy to install, take in consideration the needs of the stakeholders that strongly influence the market, and have been tested to meet all the current standards.

PROJECT STRUCTURE



STATUS

Underway

BUDGET

€12,025,000

FUNDING

€12,025,000

START

May 2015

DURATION

30 months

CALL

H2020-MG-2.2-2014

CONTRACT No

636078

LEAD ORGANISATION

UNIFE

COORDINATOR

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 HACON, OLTIS GROUP,
TRENITALIA, CERIEL, POLIMI,
 FRAUNHOFER, ATTOMA, **SNCF**,
 UPC, HERE GLOBAL, CEA,
 UNIVERSITY OF NOTTINGHAM,
 EPF, **RSSB**, CNC, UITP, VBB,
 TMB, CYBERNETICA,
 D'APPOLONIA, ILUNION
 ACCESIBILIDAD, ESTUDIOS Y
 PROYECTOS, Others

WEBSITE

www.it2rail.eu

IT2RAIL

Information Technologies for Shift2Rail

OBJECTIVES

The IT²RAIL -“Information Technologies for Shift to rail” proposal, first step towards the long term IP4 -“IT for an Attractive Railway” SHIFT²RAIL Innovation Programme, aims at providing a new seamless travel experience, giving access to a complete multimodal travel offer which connects the first and last mile to long distance journeys.

This is achieved through the introduction of a ground breaking Technical Enabler based on two concepts:

- the traveller is placed at the heart of innovative solutions, accessing all multimodal travel services (shopping, ticketing, and tracking) through its travel-companion.
- An open published framework is providing full interoperability whilst limiting impacts on existing systems, without prerequisites for centralized standardization.

This Technical Enabler will be completely settled in the context of the SHIFT²RAIL IP4, and IT²RAIL is proposing a reduced approach to the scale of a specified use case without weakening any of the key concepts of IP4, such as the usage of Semantic Web technologies, meta planning on distributed data, travel companion with a protected and secured personal wallet stored in the cloud and including the rights to travel.

The use case will be defined as a specific instantiation of our open concepts and will benefit from a completely scalable architecture fully instantiated in IP4.

This approach is addressing all the key challenges of the work program, supporting a complete door-to-door intermodal travel offer and proposing a seamless integration of the very diverse existing and future services for planning, one-stop-shop ticketing, and real-time re-accommodation.

Moreover, thanks to an Interoperability framework which insulates travel applications from the standards fragmentation in multimodal transport, IT²RAIL liberates business-model innovations in the market-place, guaranteeing the economic self-sustainability of these e-services in the long-term.

PROJECT STRUCTURE





MASAI

Mobility based on Aggregation of Services and Applications

STATUS

Underway

BUDGET

€3,309,968

FUNDING

€3,309,968

START

June 2015

DURATION

36 months

CALL

H2020-MG-7.2a-2014

CONTRACT No

636281

LEAD ORGANISATION

MTA-MOBILITY, TICKETING &
APPLICATIONS

COORDINATOR

N.C.

CONTACT

N.C.

PARTNERS

CARD4B – SYSTEMS,
DIGIMOBEE, **DB SYSTEL**, CHESS
IT INTERNATIONAL

WEBSITE

<http://masai.solutions/>

OBJECTIVES

MASAI addresses the interconnection of digital services to facilitate mobility in heterogeneous and varying environment. MASAI designs, prototypes and pilots in the field a MObility Open Network of Services (MOONS) as an interconnected distributed environment, on which any service module can be easily plugged to interact with others (using principles such as DNS-SD). MASAI feeds the mobile apps ecosystem. MASAI investigates also app-2-app direct communication, app being able to call/feed other apps (iOS 8 promise). MASAI is an alternative to having centralized integration platforms – showing their limits. MOONS is then instrumental in favouring plug & play services (trip planners, ticketing, community services, infotainment...) in an open ecosystem.

In this way, a “Concierge” app (or access app which is the user entry point, a trip-planner for example) in a NFC Phone address the citizen need by combining output of several services related to ticketing, trip planners, city guide, etc, provided by modules from service operators. A set of existing (SIRI, NETEX...) and under development (such as TS13149-part9) standards are paving the way. MASAI in return will target results that may feed this standardization process.

MASAI vision is supported by a consortium composed by innovative SMEs previously involved in such developments (MTA, DIGIMOBEE, CARD4B, CHESS IX), completing partial approaches by enlarging the full scope to the mobility eco-system within a plug & play mobility services vision. It includes DB Systel (Deutsche Bahn - IT) as a key user reference which has identified MASAI as an open, innovative and consistent approach for building a seamless services experience for their customers, open to any applications supplier.

MASAI vision is demonstrated in a variety of environments inducing cross-fertilisation in terms of delivery of independent plug & play services capable of being aggregated on any MASAI environment through open and public specifications.

PROJECT STRUCTURE

Not available

**STATUS**

Underway

BUDGET

€4,002,645

FUNDING

€2,550,798

START

September 2017

DURATION

48 months

CALL

H2020-NFRP-2016-2017-1

CONTRACT No

755151

LEAD ORGANISATION

CIEMAT

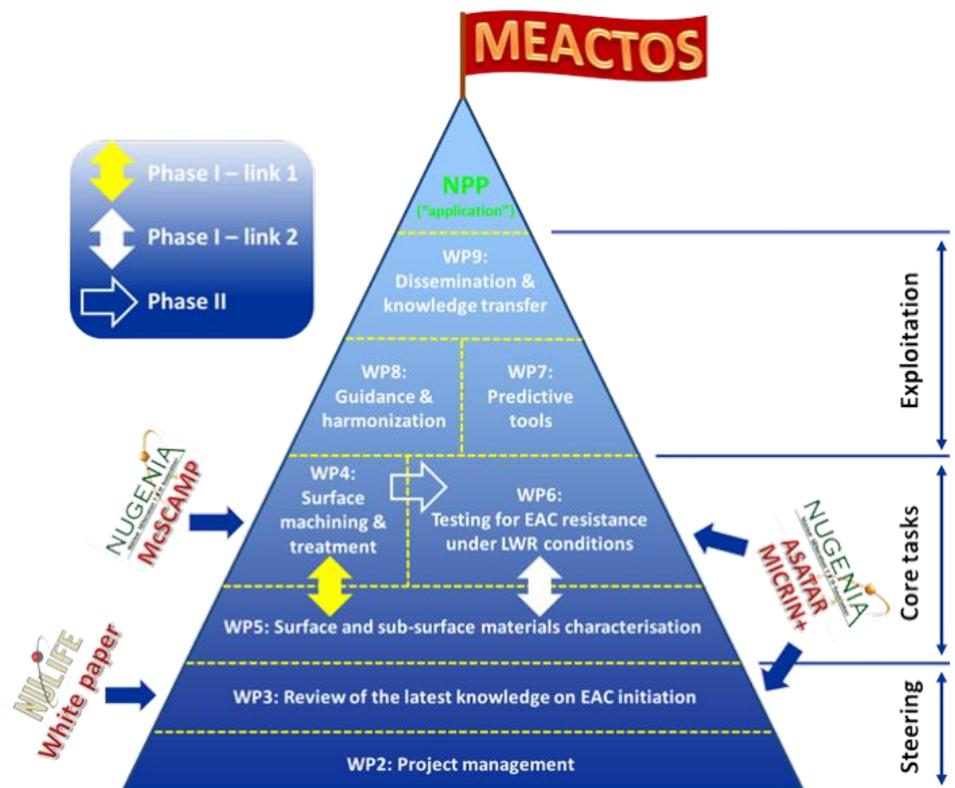
COORDINATORFrancisco Javier Perosan
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UNIVERSITY OF MANCHESTER,
CVR, SCK CEN, AREVA, PSI,
STU, EDF, **ZAG**, RATEN, JRC,
ENSA, IDETRA, WOORD**WEBSITE**www.meactos.eu**MEACTOS**

*Mitigating Environmentally Assisted Cracking Through
Optimisation of Surface Condition*

OBJECTIVES

The goal of the MEACTOS project is to improve the safety and reliability of Generation II and III nuclear power plants (NPPs) by improving the resistance of critical locations, including welds, to environmentally-assisted cracking (EAC) through the application of optimized surface machining and improved surface treatments. This project will quantify the effect of various surface machining and treatment techniques on the EAC behaviour of specific structural materials in the primary circuit of NPPs. The gained knowledge will be summarized in practical guidelines, which can be used for incorporation into key nuclear design and manufacturing codes. Furthermore, a tailored roadmap for harmonization of guidelines and codes will be produced. In these ways, MEACTOS will improve safe and reliable economic nuclear energy production in Europe.

MEACTOS will contribute to tackling the obsolescence of the machining practices used in the nuclear field with direct application to the construction of the new plants. Finland, France, United Kingdom, Slovakia, Bulgaria, Belarus, Poland and also Russia are building or planning to build new plants to start its first operation in in the coming years.

PROJECT STRUCTURE

STATUS

Underway

BUDGET

€5,467,305

FUNDING

€5,453,555

START

June 2015

DURATION

36 months

CALL

H2020-MG-2.1-2014

CONTRACT No

636237

LEAD ORGANISATION

UNIVERSITY OF SHEFFIELD

COORDINATOR

Dr. David Fletcher

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TCDD, INTADER, VTI, **SZ**, RCCF**WEBSITE**www.netirail.eu

NeTIRail-INFRA

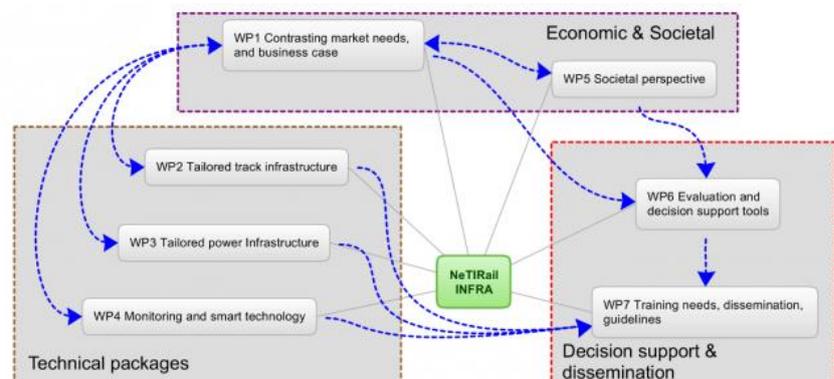
Needs Tailored Interoperable Railway

OBJECTIVES

The Needs Tailored Interoperable Railway project (NeTIRail-INFRA) focuses on infrastructure challenges affecting the large number of people and the large geographical proportion of Europe (especially recent accession countries) that are served by conventional rail lines. These lines have huge potential for a step change in productivity which must be addressed to ensure economic viability. The work will address growing demand for already busy services, and future growth of underutilised lines, with technical solutions for track, power supply and support of new smart services.

Technical developments in NeTIRail-INFRA will focus on modular infrastructure, i.e. standard designs with multiple application in different locations, thereby reducing planning cycles, enabling a lean design process for new installation and retro-fit. Accompanying economic and social impact research is packaged as decision support tools to implement the findings in management of the rail network. Holistic treatment of the economy of operation will be developed, including societal impacts of rail investment decisions, to increase attractiveness of rail for all passenger categories. This focus differentiates NeTIRail-INFRA from purely technical development projects and will ensure its outputs have a real market and achieve genuine impact.

The project targets the Shift2Rail priorities of enhancing capacity, increasing the reliability and quality of services, and significantly reducing life cycle costs, and supports the Transport White Paper 'Roadmap to a Single European Transport Area' target that by 2050 the majority of medium-distance passenger transport should be by rail. The project targets reliability/availability up ~20%, capacity utilisation of 70-90%, and recurrent costs down 25-45%. Alongside its impact on transport, the skills developed in the project will allow European businesses and researchers to export their knowledge to wider markets, supporting EU competitiveness and growth.

PROJECT STRUCTURE

**STATUS**

Underway

BUDGET

€797,130

FUNDING

€797,130

START

November 2016

DURATION

30 months

CALL

H2020-S2R-OC-CCA-02-2015

CONTRACT No

730827

LEAD ORGANISATION

UNIVERSITY OF NEWCASTLE

COORDINATOR

Prof. Roberto Palacin

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ROSTOCK, STADLER RAIL
VALENCIA**WEBSITE**www.opeus-project.eu**OPEUS**

Modelling and strategies for the assessment and OPTimisation of Energy USage aspects of rail innovation

OBJECTIVES

The aim of OPEUS is to develop a simulation methodology and accompanying modelling tool to evaluate, improve and optimise the energy consumption of rail systems with a particular focus on in-vehicle innovation.

The OPEUS concept is based on the need to understand and measure the energy being used by each of the relevant components of the rail system and in particular the vehicle. This includes the energy losses in the traction chain, the use of technologies to reduce these and to optimise energy consumption (e.g. ESSs). Specifically, the OPEUS approach has three components at its core: i) the energy simulation model ii) the energy use requirements (e.g. duty cycles) and iii) the energy usage outlook and optimisation strategies recommendation.

The concept builds on an extensive range of knowledge and outcomes generated by a number of key collaborative projects (e.g. CleanER-D, MERLIN, OSIRIS, RailEnergy, ROLL2RAIL) underpinning the research proposed, ALL of which have been led by OPEUS consortium members. Particularly the tool developed for the CleanER-D project will be used as starting point. Significant complementary work from the academic community will also be used to enhance the activities of the project. Specifically, these previous projects input will be used to:

- Expand and develop the simulation tool (CleanER-D, MERLIN);
- Complete the operational requirements by enhancing the urban duty cycles (OSIRIS);
- Provide a global vision of energy consumption in railways (CleanER-D, OSIRIS, RailEnergy)

OPEUS' ambition is to firmly contribute to the following key areas:

- Understand energy consumption of urban railways;
- Develop a tool to objectively compare technologies and strategies aimed at optimising the energy usage of railway systems;
- Unlock the potential contribution that novel technologies and associated strategies can make to optimising rail energy consumption;
- Share a global vision for how energy is used in railways

PROJECT STRUCTURE

WP01: Urban rail systems energy requirements
 WP02: Simulation model and tool development
 WP03: Reference scenarios simulation
 WP04: DAS study
 WP05: In-vehicle energy losses study
 WP06: Advanced ESSs study
 WP07: Global vision of energy in railways
 WP08: Engagement
 WP09: Management



STATUS

Underway

BUDGET

€1,499,900

FUNDING

€1,499,900

START

October 2017

DURATION

24 months

CALL

H2020-S2R-OC-IP5-01-2017

CONTRACT No

777594

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WEBSITE

<https://shift2rail.org/ip5/optiyard/>

OPTIYARD

Optimised Real-time Yard and Network Management

OBJECTIVES

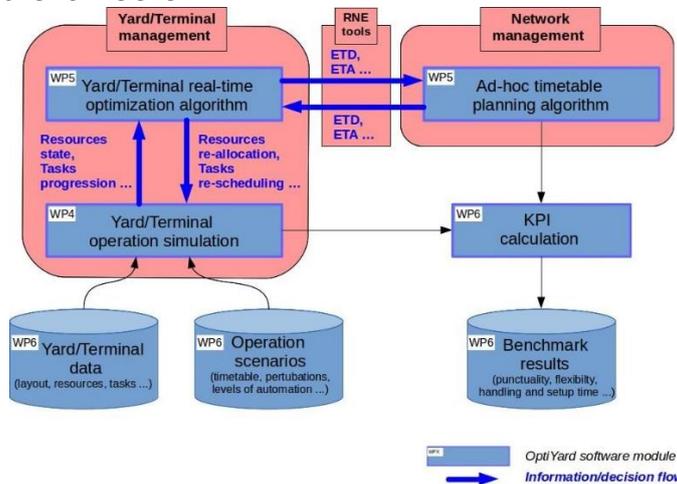
The main objective of OptiYard is to improve capacity and service reliability by focusing on Yard Operations, namely by providing an optimised decision support system for Yard Managers.

Specifically, OptiYard will address the following objectives:

- Automate yard management optimization: an innovative algorithm to automate and optimize the organization of the processes to be performed in a marshalling yard will be delivered;
- Real-time interaction with the surrounding railway network: a novel decision support tool for automated ad-hoc timetabling and traffic management to include the yard management in a globally optimized system will be produced;
- Simulate intelligent real-time yard operations: the project will build on a state-of-the-art yard simulation platform compatible with short term innovations, in order to achieve improved modelling and communication system, and to integrate optimized decisions into the real-time simulation;
- Improve information and communication processes: new effective structures for the flows of data towards and from the terminals, necessary for communication and information sharing between infrastructure managers and railway undertakings for yard management will be defined;
- A technical demonstrator in the form of a fully functional software module will be built to show how the developed intelligent real-time simulation can provide concrete and validated optimal decision support for dispatchers in yards, with a link to network management.

OptiYard addresses explicit simulation modelling of the real-time operations in yard and the relevant network eco system, and explicit process optimisation to generate the optimal decisions to manage the yard operations and the network traffic flows. We propose to fully specify an intelligent simulation environment for an integrated rail freight yard and relevant network eco system management.

PROJECT STRUCTURE



**STATUS**

Underway

BUDGET

€9,217,196

FUNDING

€7,826,081

START

June 2017

DURATION

48 months

CALL

H2020-CIRC-01-2016-2017

CONTRACT No

730305

LEAD ORGANISATION

ACCIONA CONSTRUCCION

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N.C.

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WEBSITEwww.paperchain.eu

PAPERCHAIN

New market niches for the Pulp and Paper Industry waste based on circular economy approaches

OBJECTIVES

PAPERCHAIN project brings in an industrial symbiosis model centred in the use of different waste streams generated by the European Pulp and Paper Industry, as valuable feedstock for three resource hungry industrial sectors: construction sector, mining sector and the chemical industry. Different waste streams are produced as a result of the manufacturing processes of the Pulp and Paper industry to produce paper, board and other cellulose-based products.

Pulp can be obtained from wood virgin fibre by chemical or mechanical means. It is also produced by the re-pulping of recycling paper which accounts for about 50 % of the fibres used and involves cleaning and deinking processes.

PAPERCHAIN tackles the valorisation of almost the totality of these PPI waste streams. The project focuses on those waste streams whose current fate is mainly landfilling, such as the causticizing residuals, and those which are produced in major quantities, such as sludge or ashes. Only boiler and furnace ash has been discarded due to the low technical performance for construction applications and their potential for fertilizers, in favour of wastepaper ash, much more promising for the construction sector. Finally, pulp and paper mill rejects have not been considered directly, as they are usually destined for energy recovery.

The project will demonstrate the valorisation of the PPI waste streams in three different ways: with no modifications (Green liquor dregs for mining applications), minimal processing (Slaker grits, lime mud and Waste paper ash) and under any treatments (Green liquor dregs for asphalt pavements, Deinking paper sludge + Waste paper ash, fibre sludge).

For railways, the project will explore the valorisation of deinking paper sludge and waste paper ash produced by Recycling Pulp mills for the rehabilitation and slope stabilization of landslides in Railway lines.

PROJECT STRUCTURE

Not available

**STATUS**

Underway

BUDGET

€29,201,993

FUNDING

€12,977,366

START

November 2016

DURATION

28 months

CALL

S2R-CFM-IP1-01-2016

CONTRACT No

730668

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WEBSITE

http://projects.shift2rail.org/str_ip1_n.aspx?p=PINTA

PINTA**IP1 Traction TD1 and Brakes TD5 – Phase 1****OBJECTIVES**

PINTA addresses two key topics:

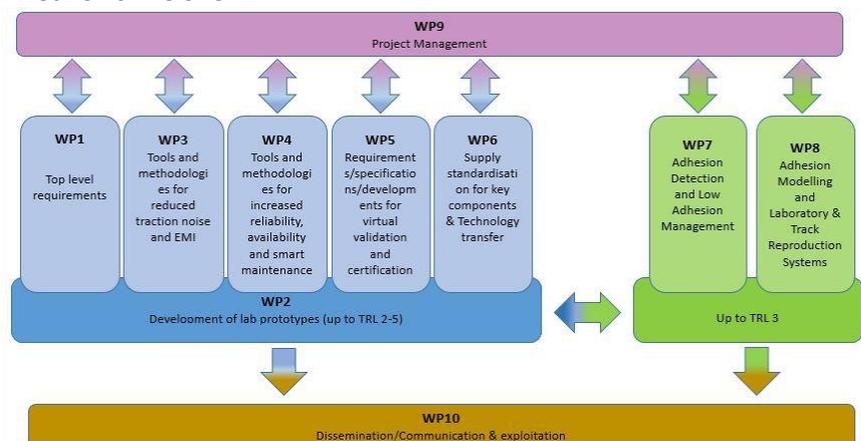
- Development of concepts towards the next generation of traction Systems.
- Management of wheel/rail adhesion.

Traction subproject focuses on the improvement of seven technical and economical performances of the Traction system that have been agreed and defined in Roll2Rail. These performances have to be improved on five different train applications. Traction sub-project address the Shift2Rail MAAP objectives as follows:

- Railway system LCC reduction by reduction in validation & certification cost.
- Operational reliability increase via higher reliability/availability of components.
- Train & Line capacity increase through weight, volume and noise savings of Traction equipment.

Adhesion subproject focussed on contributing in formulating new performance specifications for Adhesion Recovery Systems. Moreover, improved requirements for Wheel Slide Protection test procedures should be developed, followed by new specifications for Automatic Test benches. The Adhesion sub-project main specific objectives are:

- Improvement of braking degradation limit in poor adhesion condition.
- Management of all adhesion conditions in a way that brake distances are optimised.
- Improvement of the overall train safety, which relies substantially on the management of the wheel/rail contact.
- Reduction of wheel Life-Cycle-Costs through optimised wheel/rail contact in braking.

PROJECT STRUCTURE

**STATUS**

Underway

BUDGET

€786,349

FUNDING

€349,453

START

September 2016

DURATION

24 months

CALL

H2020-S2R-CFM-CCA-03-2015

CONTRACT No

730814

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http://projects.shift2rail.org/s2r_ipcc_n.aspx?p=PLASA

PLASA

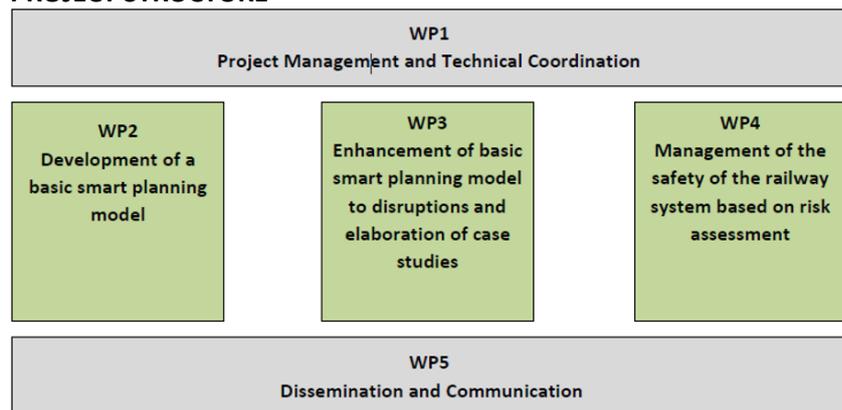
Smart Planning and Safety for a safer and more robust European railway sector

OBJECTIVES

The PLASA project intends to significantly increase customer experience and system robustness in the European rail sector. It aims at ensuring that the Research & Innovations Activities dealing partially or entirely with railway planning, relevant data or safety issues within the different S2R Innovation Programmes are considered completely and holistically.

Furthermore, this project encompasses additional research and innovation activities, which foster significant improvements in long term railway traffic planning. These coherent improvements will enhance performance and resilience whilst lowering costs in future railway activities.

PLASA consists of two sub-projects, Smart Planning and Safety. The objectives of the project will be achieved by a holistic approach involving partners of the rail industry, the operators and universities

PROJECT STRUCTURE



PORTIS

PORT-Cities: Integrating Sustainability

STATUS

Underway

BUDGET

€17,678,400

FUNDING

€16,376,774

START

September 2016

DURATION

48 months

CALL

H2020-MG-5.5a-2015

CONTRACT No

690713

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ABERDEENSHIRE COUNCIL,
ABERDEEN HARBOUR BOARD,
COMUNE DI TRIESTE, Others

WEBSITE

www.civitas.eu/portis

OBJECTIVES

Port Cities can be seen as multidimensional laboratories where challenges connected with urban mobility are more complex due to the dual system of gravity centre: the city, the port, not to mention their shared hinterland. These peculiarities are at once a challenge and an opportunity, as they provide scope for planning, researching and implementing integrated mobility solutions in distinctively complex urban contexts.

Civitas PORTIS designs, demonstrates and evaluates integrated sets of sustainable mobility measures in 5 major port cities located on the North Sea (Aberdeen and Antwerp), the Mediterranean Sea (Trieste), the Black Sea (Constanta), and Baltic Sea (Klaipeda). The project also involves a major international follower port city on the East China Sea (Ningbo).

Thanks to the Civitas Initiative, the partner cities expect to prove that more efficient and sustainable mobility is conducive to the establishment of vital and multi-modal hubs for urban, regional, national and International movements of passengers and goods. To do this, they establish integrated living laboratories clustering local measures according to four major aspects of sustainable urban mobility:

1. Governance: to increase port-city collaborative planning and participation, leading to enhanced forms of SUMPs.
2. People: to foster less car-dependent mobility styles, leading to modal shift in favour of collective and more active transport.
3. Transport system: to strengthen the efficiency of road traffic management to/from the port and through the city and foster the use of clean vehicles.
4. Goods: to enhance logistics and freight transport, improving the efficiency and coordination of city, port and regional freight movements.

Working with port cities, Civitas PORTIS will generate a strong and twofold replication potential: 1) specifically to other port cities, and 2) more generally to cities presenting major transport nodes and attractors for the benefit of the whole CIVITAS Initiative.

PROJECT STRUCTURE

Not available

Q-AIR GLASS FAÇADE

INNOVATION IN ACTION

STATUS

Underway

BUDGET

€3,424,850

FUNDING

€2,497,532

START

January 2017

DURATION

24 months

CALL

H2020-FTIPilot-2016-01

CONTRACT No

737757

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WEBSITE

<https://trimo-group.com/en/trimo/products/facades-and-walls/q-air/q-air-project-h2020/#tab-1038>

Q-Air

Sustainable Prefabricated Glass Façade with Performance

Exceeding State-of-the-art Glass Façades

OBJECTIVES

The proposed project is about an innovative breakthrough solution in glass façade design for more sustainable architecture and construction. Qbiss Air is the perfect match to European and global needs to improve energy efficiency, cut CO₂ emissions, reduce Europe's dependency on energy imports and provide healthy indoor living and working conditions. Using innovative, patented multi-chamber insulating core, Qbiss Air provides superior thermal insulation, $U_{cw} \geq 0.3$ kWh/m²K, which is at least two times better compared to state-of-the-art glass facades.

The revolution is fully transparent façade without the use of external sun shades which enables low energy building level 15-35 kWh/m²a without reducing internal comfort. Also, Qbiss Air increases daylighting vs. current glass facades, at the same thermal performance level.

These benefits are unmatched by any other glass facades worldwide. Qbiss Air brings high-end overall building performance and benefits through the entire life cycle, including indoor comfort, economic value, environmental friendliness and high quality. For successful European and global market take-up, Qbiss Air needs final development, testing, certification, BIM integration and exploitation activities. Wide commercial potential for Qbiss Air is in new construction, renovation and segments with high-end performance and sustainable requirements. Consortium partners are key supply chain experts and will address all stakeholders – architects, facade consultants, installers, institutions and policy makers during the project and beyond.

Qbiss Air innovation is appealing to potential clients, it will enable consortium partner's turnover growth, create new jobs, strengthen European competitiveness and innovativeness. Qbiss Air will move sustainable glass building construction to a higher level and enable faster achievement of nearly Zero Energy Buildings (nZEB), 2030 Climate and Energy Framework and Roadmap 2050 targets.

PROJECT STRUCTURE

WP 1 - Management

WP 2 - Q-Air façade system development with improved characteristics and more competitive production cost

WP 3 - Testing and certification

WP 4 - Development of Building Information Modelling (BIM) process

WP 5 - Analytical characterisation and sustainability analysis

WP 6 - Innovation dissemination and exploitation.

**STATUS**

Underway

BUDGET

€3,325,912

FUNDING

€2,998,412

START

September 2016

DURATION

24 months

CALL

H2020-MG-8.4a- 2015

CONTRACT No

690660

LEAD ORGANISATION

FUNDACION TECNALIA

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NETWORK RAIL**WEBSITE**www.ragtime-asset.eu**RAGTIME**

Risk based approaches for Asset inteGriTy multimodal Transport Infrastructure ManagEment

OBJECTIVES

An efficient asset management process is needed to ensure cost-effectiveness, in planning, delivery, operation and maintenance of large infrastructures or infrastructures network. Infrastructure asset management generally focuses on the later stages of a facility's life cycle, specifically maintenance, rehabilitation, and replacement. However, a process of efficient asset management must define methods and tools for asset tracking, management of maintenance activity, determine the life cycle and replacement costs of the assets, assistance in determining funding strategies, optimizing capital investments in operation and maintenance, and help with the replacement of assets.

Currently, the procurement, design, construction, exploitation and public communication to the final users and society regarding to the land transport infrastructures are:

- not multimodal, not cross-assets, but focused on individual assets.
- not correctly linked, not being able to exchange information by different stakeholders.
- lack of a common risk-based approach and the implementation of resilient concepts throughout the whole life cycle

The aim of the proposal is to establish a common framework for governance, management and finance of transport infrastructure projects in order to ensure the best possible return from limited investment funds in transport infrastructures

The main objective of RAGTIME is to develop, demonstrate and validate an innovative management approach and to lay out a whole system planning software platform, based on standard multiscale data models, able to facilitate a holistic management throughout the entire lifecycle of the infrastructure, providing an integrated view of risk based approach, implementing risk based models, resilient concepts and mitigation actions, with specific reference to climate change related threats perspective, and monitored with smart systems, in order to optimize ROI, management, guarantee LOS and improve resilience through maintaining the service.

PROJECT STRUCTURE

- WP 1 - DEVELOPMENT OF AAIM FRAMEWORK
- WP 2 - GOVERNANCE MODULE
- WP 3 - FINANCIAL, ECONOMIC AND RISK MODULE
- WP 4 - TECHNICAL MANAGEMENT MODULE
- WP 5 - RAGTIME CLOUD-BASED PLATFORM FOR AAIM
- WP 6 - USE CASES FOR IMPLEMENTATION AND VALIDATION
- WP 7 - DISSEMINATION, COMMUNICATION AND EXPLOITATION
- WP 8 - COORDINATION AND MANAGEMENT
- WP9 - ETHICS REQUIREMENTS

STATUS

Completed

BUDGET

€998,235

FUNDING

€998,235

START

May 2015

DURATION

24 months

CALL

H2020-MG-8.1b-2014

CONTRACT No

653789

LEAD ORGANISATION

CSTB

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 PARTNERS INTERNATIONAL

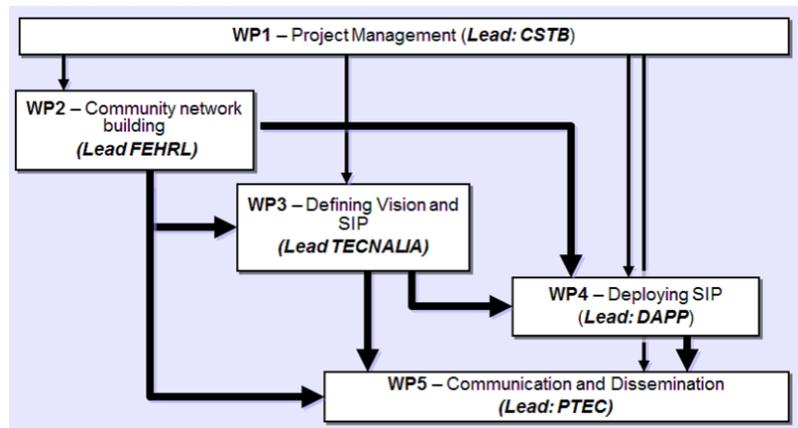
WEBSITEwww.refinet.eu**REFINET***REthinking Future Infrastructure NETworks***OBJECTIVES**

Launching a European long-term ambition and initiative to increase the overall performance of multimodal transport infrastructures, the REFINET CSA intends to:

- 1) create a sustainable network of European and international stakeholders' representatives of all transport modes and transport infrastructure sectors,
- 2) deliver a shared European vision of how to specify, design, build or renovate, and maintain the multimodal European transport infrastructure network of the future along with innovative processes so as to enhance the effectiveness of the sector, and
- 3) elaborate a Strategic Implementation Plan with a comprehensive set of prioritised actions to make the REFINET vision a reality – as well as providing private and public decision makers with a set of up-to-date recommendations and guidelines (including good practices and lessons learnt) for strategic actions and required levels of cooperation between all stakeholders.

REFINET will consider two complementary scenarios, namely maintenance and upgrading of existing transport infrastructures, and development of new transport infrastructures. REFINET will contribute to create a European-wide consensus on where to focus in terms of research and innovation to improve the productivity of the assets (reducing maintenance costs, extending the life span...) and reduce drastically traffic disruptions of transport flows from inspection, construction and maintenance activities, and to accommodate increasing/changing traffic demand.

Thus, REFINET will pave the way to enhanced technology integration and transfer and mass-market development for innovative materials, components, systems and processes supporting the pan-European generalisation of advanced multimodal infrastructures, handling the demand within various industrial sectors and help match the EU-2020 Strategy, and achieve goals of main stakeholders. The REFINET consortium is made of 8 partners from 5 European countries (Spain, France, Italy, Belgium, United Kingdom).

PROJECT STRUCTURE



STATUS

Underway

BUDGET

€16,000,000

FUNDING

€16,000,000

START

May 2015

DURATION

30 months

CALL

H2020-MG-2.3-2014

CONTRACT No

636032

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WEBSITE

www.roll2rail.eu

ROLL2RAIL

New Dependable Rolling Stock for a more Sustainable, Intelligent and Comfortable Rail Transport in Europe

OBJECTIVES

The ROLL2RAIL project aims to develop key technologies and to remove already identified blocking points for radical innovation in the field of railway vehicles, as part of a longer-term strategy to revolutionise the rolling stock for the future. The high-level objectives of the work are to pave the way to:

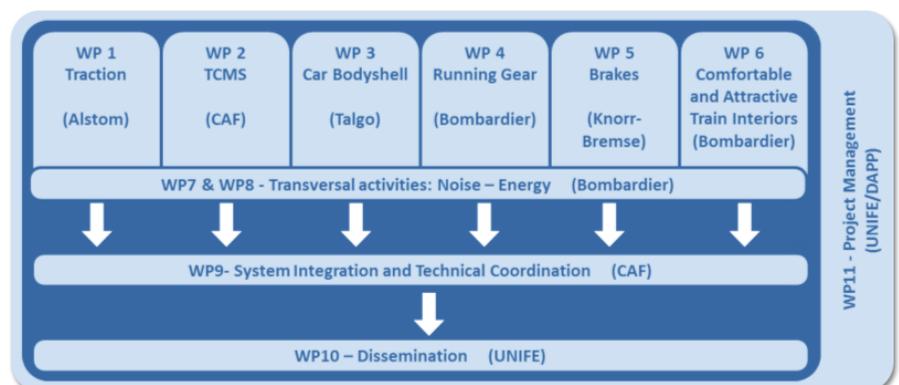
- Increase the capacity of the railway system and bring flexibility to adapt capacity to demand
- Increase availability, operational reliability and therefore punctuality of the vehicles
- Reduce the life cycle costs of the vehicle and the track
- Increase the energy efficiency of the system
- Improve passenger comfort and the attractiveness of rail transport

Specific developments are proposed the scope of ROLL2RAIL:

- Basis of a radically new traction technology based on emerging electronic components leading towards more energy-efficient traction, which is lighter and more reliable while reducing the noise emitted
- New wireless technology applied to train control functionalities will allow more flexible coupling to increase line capacity
- Carbody solutions based on lightweight composite materials to reduce weight
- A way of quantifying the life-cycle cost impact of new technological solutions for running gear;
- Knowledge database of the variety of requirements in Europe for the braking systems to bring down barriers to step-change innovation in this area
- Standardised methodologies for assessing attractiveness and comfort from the passenger's point of view
- Methodology for noise source separation techniques allowing implementation of novel and more efficient noise mitigation measures

It is also the objective of ROLL2RAIL to serve as a preparation for a fast and smooth start-up of the large-scale initiative SHIFT2RAIL. All ROLL2RAIL results will ultimately lead to demonstration in real vehicles or relevant environments in SHIFT2RAIL.

PROJECT STRUCTURE



**STATUS**

Underway

BUDGET

€2,997,000

FUNDING

€2,997,000

START

May 2017

DURATION

36 months

CALL

H2020-MG-3.4-2016

CONTRACT No

723254

LEAD ORGANISATION

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ROD

WEBSITE

www.safe10tproject.eu

SAFE-10-T

Safety of Transport Infrastructure on the TEN-T Network

OBJECTIVES

The SAFE-10-T project will develop a Safety Framework to ensure high safety performance while allowing longer life-cycles for critical infrastructure across the road, rail and inland waterway modes. Moving from considering critical infrastructure such as bridges, tunnels and earthworks as inert objects to being intelligent (self-learning objects) the SAFE-10-T project will provide a means of virtually eradicating sudden failures. This will be achieved by:

- The Safety framework will incorporate remote monitoring data stored in a BIM model that feeds into a decision support framework (DST) that enables decisions to be made automatically with maintenance prioritised for elements exhibiting stress.
- A major advance that will be achieved in the project is that the algorithms at an object level and at a network level will incorporate machine learning to train the system to evolve with time using available monitoring data.
- A trans-disciplinary approach with experts in Artificial Intelligence and big data management working with owners, engineers with expertise in risk and modelling and sociologists to make decisions.
- Our major European infrastructure managers will undertake demonstration projects at critical interchanges and nodes of the TEN-T transport network

PROJECT STRUCTURE

WP1 – Monitoring and Modeling (MAP)

WP2 – Network Analysis (FLOW)

WP3 – Global Safety Framework (SAFE)

WP4 – Demonstration projects (DEMO)

WP5 – Integration and dissemination

WP6 – Project management

**STATUS**

Underway

BUDGET

€4,888,927

FUNDING

€4,888,927

START

May 2017

DURATION

36 months

CALL

H2020-MG-3.4-2016

CONTRACT No

723205

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UTBM

WEBSITEwww.safer-lc.eu

SAFER-LC

SAFER Level Crossing by integrating and optimizing road-rail infrastructure management and design

OBJECTIVES

Over the past few years, one person has been killed and close to one seriously injured every day on level crossings. Therefore, The EU project SAFER-LC (Safer level crossing by integrating and optimizing road-rail infrastructure management and design) aims to improve safety and minimize risk by developing a fully integrated cross-modal set of innovative solutions and tools for the proactive management and design of level-crossing infrastructure. The project aims at:

- Developing a toolbox accessible through a user-friendly interface which will integrate all the project results and solutions to help both rail and road managers to improve safety at level crossings.
- Demonstrating how these new technological and non-technological solutions can be integrated, validate their feasibility and evaluate their performance taking into account, the level crossing user's perspective and behaviour.
- Delivering a bundle of recommended technical specifications, human processes and organizational and legal frameworks for implementation.
- Developing innovative solutions to enhance the safety of level crossings for road as well as rail users.

SAFER-LC will combine state-of-the-art safety monitoring systems and advanced mobile communication technologies, including the use of CCTV and cooperative communications to develop innovative solutions. It will develop a "human factor" methodological framework based on existing data sources and analytical tools that will be used to evaluate the efficiency of LC layouts and safety measures from the users' point of view.

While each solution will by itself mark an advance in its own field of application, the significant step forward will be achieved when the technologies are integrated and combined into one road-rail anti-collision warning system.

SAFER-LC will provide recommendations on technical specifications, human processes, as well as on the organizational and legal framework when implementing the proposed solutions. The most relevant and practical information collected and produced during the project SAFER-LC will be available publicly in the SAFERLC toolbox.

PROJECT STRUCTURE

WP1 – LC IN EUROPE AND BEYOND: RAIL AND ROAD SAFETY MANAGEMENT REQUIREMENTS

WP2 – HUMAN FACTORS AT LC: DESIGN FOR SELF-EXPLAINING AND FORGIVING INFRASTRUCTURE

WP3 – SMARTER LC: DEVELOPMENT AND INTEGRATION OF TECHNICAL SOLUTIONS

WP4 – LAB TEST, FIELD IMPLEMENTATION AND EVALUATION

WP5 – COST-BENEFIT ANALYSIS AND FINAL RECOMMENDATIONS FOR SAFER LC

WP6 – DISSEMINATION AND EXPLOITATION OF THE RESULTS

WP7 – MANAGEMENT



S-CODE

STATUS

Underway

BUDGET

€4,999,771

FUNDING

€4,999,771

START

November 2016

DURATION

36 months

CALL

H2020-S2RJU-OC-2016-01-2

CONTRACT No

730849

LEAD ORGANISATION

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WEBSITE

www.s-code.info

S-CODE

Switch and Crossing Optimal Design and Evaluation

OBJECTIVES

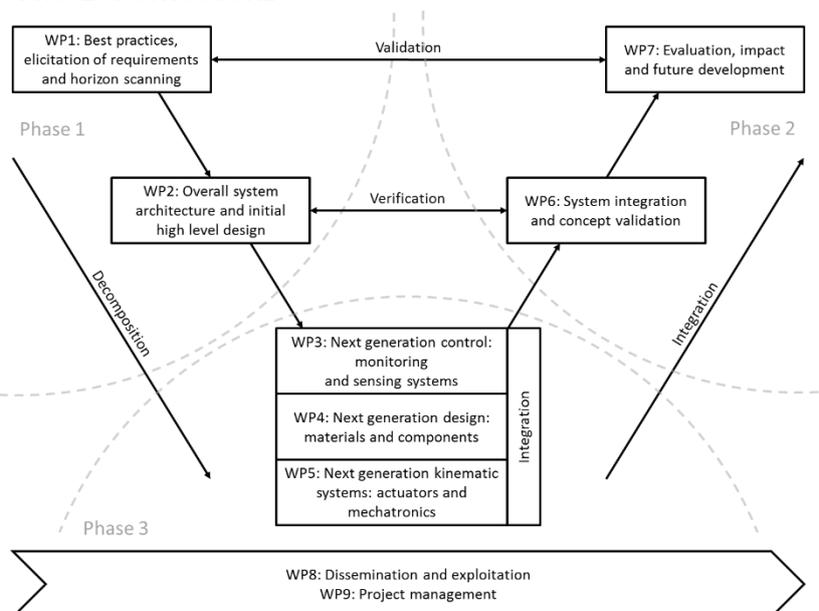
The overall aim of the S-CODE project is to investigate, develop, validate and initially integrate radically new concepts for switches and crossings that have the potential to lead to increases in capacity, reliability and safety while reducing investment and operating costs.

The S-CODE project will build on existing European and national research projects (in particular, the lighthouse project In2Rail, Capacity4Rail and Innotrack) to identify radically different technology concepts that can be integrated together to achieve significantly improved performance for S&C based around new operating concepts (e.g. super-fast switching, self-healing switch).

The project is divided into three phases:

- **Phase 1:** Requirements and initial design – focusing on understanding constraints and critical requirements, and developing a radically different architecture and operation that makes use of technologies from other domains;
- **Phase 2:** Technical development – undertaking detailed modelling and simulation to identify an optimal configuration to maximise performance;
- **Phase 3:** Validation and evaluation – testing (to TRL4) the design concepts and formally evaluating their performance in order that an integrated design can be presented for further development.

PROJECT STRUCTURE



SETRIS

STATUS

Underway

BUDGET

€2,999,405

FUNDING

€2,999,405

START

May 2015

DURATION

24 months

CALL

H2020-MG-9.6-2014

CONTRACT No

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SEA, UITP, **UIC**, UNIFE, TNO,
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WEBSITE

www.newrail.org/setris/

SETRIS

Strengthening European Transport Research and Innovation Strategies

OBJECTIVES

This proposal specifically addresses the topic MG.9.6-2014. Strengthening the research and innovation strategies of the transport industries in Europe.

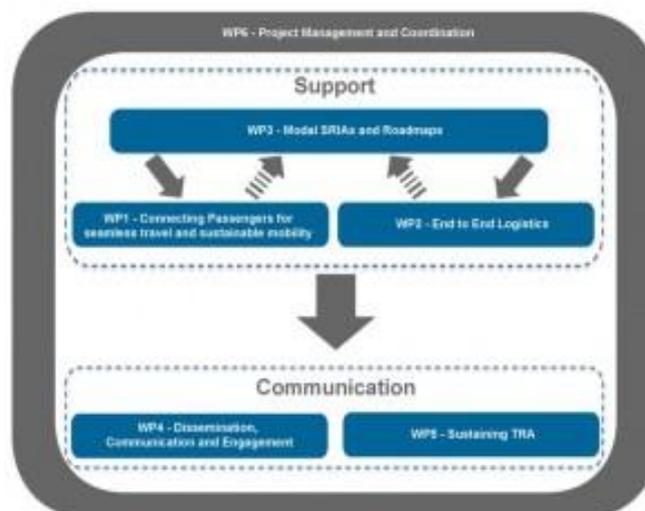
The aim of SETRIS is to deliver a cohesive and coordinated approach to research and innovation strategies for all transport modes in Europe. To fulfil the aim of SETRIS, the following objectives are envisaged:

1. To identify synergies between the transport European Technology Platforms (ETPs) strategic and research and innovation agendas (SRIAs) and between these and relevant national platforms;
2. To review and update the existing SRIAs for each of the transport ETPs within a multi-modal and integrated transport system framework;
3. To benchmark past and present research initiatives affecting the achievement of integrated transport SRIAs and market uptake;
4. To define comprehensive, credible and realistic implementation plans for each SRIAs in a coordinated framework of running ETPs;
5. To support, shape and contribute to future TRA events.

Objectives 1-4 lead to two integrated agendas highlighting not only innovations or research activities that need to be done but also the changes in governance that are required to facilitate these Agendas.

These objectives will be implemented through the involvement, for the first time, of representatives of all relevant transport modes and European Technology Platforms within one single collaborative initiative. The ETPs will develop a framework for long-term cooperation between actors from all transport modes that will support the cohesive and coordinated approaches to research and innovation strategies that will facilitate the delivery of a truly integrated transport system.

PROJECT STRUCTURE



**STATUS**

Underway

BUDGET

€2,991,672

FUNDING

€2,991,672

START

October 2016

DURATION

36 months

CALL

H2020-MG-8.3-2016

CONTRACT No

723989

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 FIRENZE, BIVV, FUNDACION
 VALENCIAPORT, ECTRI,
 TYOTHOSEURA, POLITECNICO
 DI TORINO, AS, TU BERLIN

WEBSITEwww.skillfulproject.eu**SKILLFUL**

*Skills and competences development of future transportation
 professionals at all levels*

OBJECTIVES

The Transportation sector employs over 10 million persons in the EU today. At the same time, Transport is a social sector that is rapidly developing, changing and being influenced to the maximum extent by the development of automation, electrification and greening of transport, among others, thus facing problems in staffing its several domains with appropriate and qualified personnel. This fact, makes the need for changes in training and education content, curricula, tools and methodologies absolutely imperative, incorporating lifelong learning aspects for the professionals in all transports areas. SKILLFUL vision is to identify the skills and competences needed by the Transport workforce of the future and define the training methods and tools to meet them. For all the above trends, employability will be strongly connected by SKILLFUL to future transport job requirements for all transportation modes and multimodal chains (which constitute a key transport of the future trend) and for all levels/types of workers, while all training modes will be included and integrated in a balanced way.

To achieve this, SKILLFUL aims

- to review the existing, emerging and future knowledge and skills requirements of workers at all levels in the transportation sector,
- to structure the key specifications and components of the curricula and training courses that will be needed to meet these competence requirements optimally and
- to identify and propose new business roles in the education and training chain, such as those of “knowledge aggregator”, “training certifier” and training promoter”, in order to achieve European wide competence development.

Project results are verified through a wide number of Pilots with low to high skilled workers from all transportation modes Europewide.

PROJECT STRUCTURE

WP1: Future trends in transport systems and their job impact assessment
 WP2: Benchmarking and critical review of training schemes, curricula and tools
 WP3: Novel curricula and training courses
 WP4: Definition of competences, profiles and training provision business scenarios
 WP5: Pilots
 WP6: Dissemination and Exploitation
 WP7: Project management

SMART RAIL

STATUS

Underway

BUDGET

€5,999,213

FUNDING

€5,999,213

START

May 2015

DURATION

36 months

CALL

H2020-MG-2.2-2014

CONTRACT No

636071

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WEBSITE

www.smartrail-project.eu

Smart-Rail

Smart Supply Chain Oriented Rail Freight Services – Smart-Rail

OBJECTIVES

The SMART-RAIL project aims to improve the freight rail services offered to the shippers by focusing on making improvements on the five main aspects. SMART-RAIL focuses on innovative solutions and their implementation in the rail freight sector. In order to achieve this, three important preconditions for operationalization will be addressed in this project. These preconditions are:

1. An alignment of the business models of the different stakeholders within the rail sector.
2. A mental shift of stakeholders towards a more customer- and collaboration-oriented approach.
3. Improved data availability from different public and private sources.

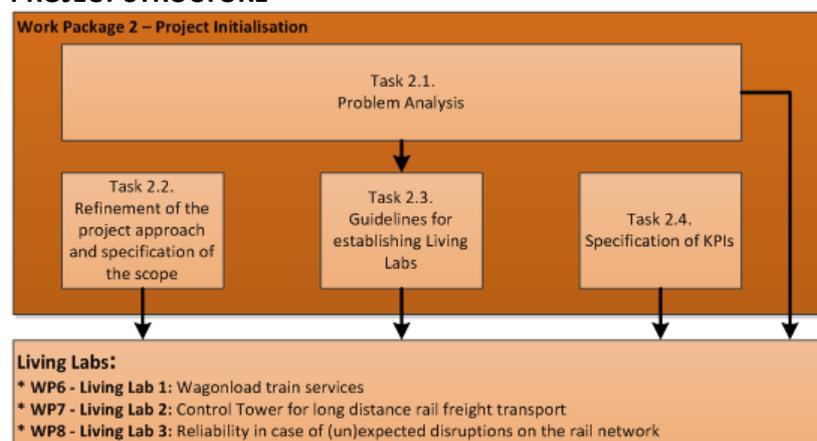
Solutions developed on these three topics will be implemented and tested in three Continuous Improvement Tracks. These Continuous Improvement Tracks focus on different aspects of the SMART-RAIL solutions and furthermore aim to make improvements on different corridors.

Continuous Improvement Track 1: Wagonload train services. This CIT aims to create and validate a concept for wagon-load trains on two corridors that has proven to be most effective with the support of the stakeholders involved.

Continuous Improvement Track 2: Managing connectivity of rail with other modes; Control tower for long distance rail freight transport. This CIT aims to increase the reliability for both planned and unplanned disruptions and to increase the visibility of the supply chain.

Continuous Improvement Track 3: Reliability in case of (unexpected) obstructions on the track. This CIT aims to increase the flexibility and reliability of rail freight transport within a multimodal transport system.

PROJECT STRUCTURE



**STATUS**

Underway

BUDGET

€5,953,083

FUNDING

€5,384,645

START

June 2015

DURATION

36 months

CALL

H2020-MG-7.1-2014

CONTRACT No

636427

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 TTS, IBI GROUP, CONCEPT
 FACTORY, Others

WEBSITEwww.socialcar-project.eu**SocialCar***Open social transport network for urban approach to carpooling***OBJECTIVES**

Many current journey planning tools do not provide information for multi-modal journeys connecting individual and collective transport services. Often, the proposed options require multiple public transport interchanges and result in long and convoluted multi-leg journeys to make a successful door-to-door trip. SocialCar enhances the public transport network by introducing a wider variety of complementary services including carpooling/sharing, bike sharing, taxi and other on-demand services. Citizens will be given access to this unique service that optimises the use of all available mobility resources in the sharing economy. SocialCar will reduce travel times and costs, increase convenience, and contribute to better environmental performance of urban transport networks.

SocialCar will provide a 'one-stop shop' planning, booking and payment service for multimodal and multi-service trips, via web and a mobile app. The project responds to the challenge of matching travel requests with the integrated public-private transport supply. The design of SocialCar is based on open source software, and the user experience is complemented by a reputation-based social mechanism. The SocialCar innovation is twofold: technological (the potential of open data and GNSS, the electronic payment services for transport) and economic (new mobility service models, public-private partnerships in the passengers transport domain). With an Innovation Management Board, the project involves external influencers who regularly provide advice and pave the way for a market roll-out and mainstreaming of the developed solutions.

PROJECT STRUCTURE

Not available

ST4RT

Semantic Transformations
for Rail Transportation

STATUS

Underway

BUDGET

€1,000,000

FUNDING

€1,000,000

START

November 2016

DURATION

24 months

CALL

H2020-S2R-OC-IP4-02-2016

CONTRACT No

730842

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WEBSITE

www.st4rt.eu

ST4RT

Semantic Transformations for Rail Transportation

OBJECTIVES

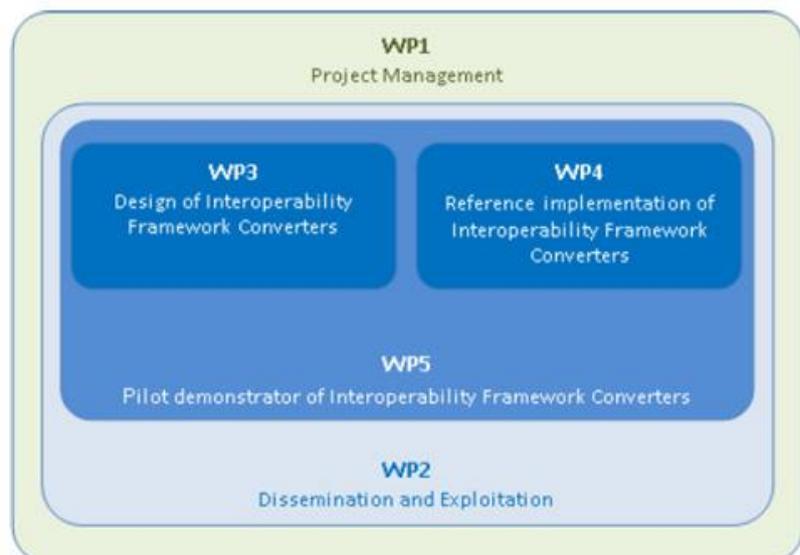
The scope of **ST4RT (Semantic Transformations for Rail Transportation)** project is to fill in a specific role within the Shift2Rail Innovation Programme related to Passenger Services (IP4) by providing the transformation technology which is necessary to assure that technical interoperability can be deployed effectively and cost-efficiently by market actors in order to create service offerings that substantially improve mobility.

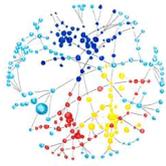
Such transformation technology is a powerful tool that will allow the project to meet the challenge to overcome the complex misalignment of eco-system services due to differences in business models and legacy systems.

The primary objective of the ST4RT (Semantic Transformations for Rail Transportation) project is to develop a demonstrator tool that will provide ontology-based transformations between different standards and protocols, resulting in enhanced semantic interoperability between disparate, heterogeneous legacy systems.

Such transformation technology is essential to achieving the goals for the Interoperability Framework (IF) that will provide the right tools in order to introduce seamless mobility services, foster the development of multi-modal travel services and help to overcome the obstacles currently impeding the development of market innovation and limiting a large acceptance of the semantic web for transportation.

PROJECT STRUCTURE





Synchro-NET

STATUS

Underway

BUDGET

€7,554,195

FUNDING

€7,301,194

START

May 2015

DURATION

42 months

CALL

H2020-MG-6.2-2014

CONTRACT No

636354

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WEBSITE

www.synchronet.eu

SYNCHRO-NET

Synchro-modal Supply Chain Eco-Net

OBJECTIVES

SYNCHRO-NET will demonstrate how a powerful and innovative SYNCHRO-modal supply chain eco-NET can catalyse the uptake of the slow steaming concept and synchro-modality, guaranteeing cost-effective robust solutions that de-stress the supply chain to reduce emissions and costs for logistics operations while simultaneously increasing reliability and service levels for logistics users.

The core of the SYNCHRO-NET solution will be an integrated optimisation and simulation eco-net, incorporating: real-time synchro-modal logistics optimisation (e-Freight-enabled); slow steaming ship simulation & control systems; synchro-modal risk/benefit analysis statistical modelling; dynamic stakeholder impact assessment solution; and a synchro-operability communications and governance architecture.

Perhaps the most important output of SYNCHRO-NET will be the demonstration that slow steaming, coupled with synchro-modal logistics optimisation delivers amazing benefits to all stakeholders in the supply chain: massive reduction in emissions for shipping and land-based transport due to modal shift to greener modes AND optimised planning processes leading to reduced empty kms for trucks and fewer wasted repositioning movements.

This will lead to lower costs for ALL stakeholders – shipping companies and logistics operators will benefit from massive reduction in fuel usage, faster turnaround times in ports & terminals and increased resource utilisation/efficiency. Customers and end users will have greater control of their supply chain, leading to more reliable replenishment activity and therefore reduced safety stocks and expensive warehousing. Authorities and governmental organisations will benefit from a smoother, more controlled flow of goods through busy terminals, and reduction of congestion on major roads, thus maximising the utilisation of current infrastructure and making the resourcing of vital activities such as import/export control, policing and border security less costly.

PROJECT STRUCTURE

Not available

**STATUS**

Underway

BUDGET

€18,694,796

FUNDING

€14,631,935

START

January 2017

DURATION

30 months

CALL

H2020-ICT-2016-1

CONTRACT No

731932

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WEBSITE

www.transformingtransport.eu

TT*Transforming Transport***OBJECTIVES**

Big Data will have a profound economic and societal impact in the mobility and logistics sector, which is one of the most-used industries in the world contributing to approximately 15% of GDP. Big Data is expected to lead to 500 billion USD in value worldwide in the form of time and fuel savings, and savings of 380 megatons CO2 in mobility and logistics. With freight transport activities projected to increase by 40 % in 2030, transforming the current mobility and logistics processes to become significantly more efficient, will have a profound impact. A 10% efficiency improvement may lead to EU cost savings of EUR 100 billion. Despite these promises, interestingly only 19 % of EU mobility and logistics companies employ Big Data solutions as part of value creation and business processes.

The TransformingTransport project will demonstrate, in a realistic, measurable, and replicable way the transformations that Big Data will bring to the mobility and logistics market. To this end, TransformingTransport, validates the technical and economic viability of Big Data to reshape transport processes and services to significantly increase operational efficiency, deliver improved customer experience, and foster new business models. TransformingTransport will address seven pilot domains of major importance for the mobility and logistics sector in Europe:

- Smart High-ways
- Sustainable Vehicle Fleets
- Proactive Rail Infrastructures
- Ports as Intelligent Logistics Hubs
- Efficient Air Transport
- Multi-modal Urban Mobility
- Dynamic Supply Chains

The TransformingTransport consortium combines knowledge and solutions of major European ICT and Big Data technology providers together with the competence and experience of key European industry players in the mobility and logistics domain.

PROJECT STRUCTURE

Not available

**STATUS**

Underway

BUDGET

€1,008,826

FUNDING

€1,008,826

START

November 2016

DURATION

24 months

CALL

H2020-S2R-OC-IP2-02-2015

CONTRACT No

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WEBSITE

[https://shift2rail.org/projects/
vite/](https://shift2rail.org/projects/vite/)

VITE

Virtualisation of the testing environment

OBJECTIVES

The main objective of VITE project is to reduce on-site tests for signalling systems leading to reducing overall testing costs. To achieve this main objective the work is organised in two main streams:

First, to propose a testing framework by carefully analysing user's needs and current situation and from there building a process that can be accepted by all railway stakeholders who will be able to perform as many tests as possible in the lab. An analysis of uncertainties and a simulation of GSMR QoS as well as a proposed methodology for test protocols optimisation will also be addressed.

Secondly, to propose a standard architecture for the lab testing including the interface specifications for both the connection between real equipment and the lab tools as for the connection between different labs for remote testing. This architecture will be developed together with some software tools that will help to automatise lab testing.

The expected impact of the project is to significantly contribute to the development of a Zero Onsite testing environment.

PROJECT STRUCTURE

Not available



WRIST

Innovative Welding Processes for New Rail Infrastructures

STATUS

Underway

BUDGET

€4,188,356

FUNDING

€4,188,356

START

May 2015

DURATION

36 months

CALL

H2020-MG-8.1a-2014

CONTRACT No

636164

LEAD ORGANISATION

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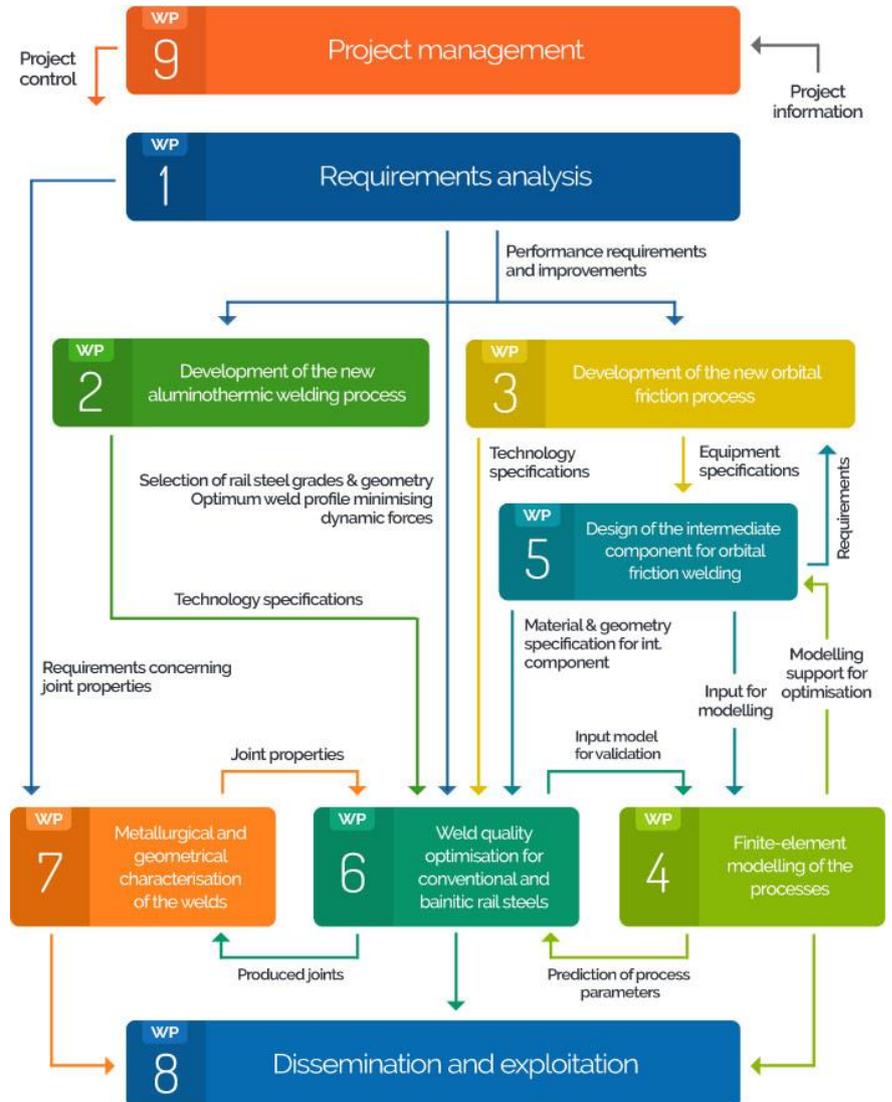
WEBSITE

www.wrist-project.eu

OBJECTIVES

WRIST will develop and demonstrate flexible and cost-effective joining processes for rail products, and in particular for the more recently introduced bainitic rail steel grades, for which currently available conventional welding techniques have been shown to be inadequate. The project will offer a step change in the joint performance and reliability, providing an extended in-service life for a range of rail materials, which are facing increasing demands due to the increasing speed and growth of railway's load. This will be delivered by the combined development of the joining processes itself, computational modelling, material and joint characterisation and testing, both on small-scale laboratory tests and full-scale trials in test or industrial tracks.

PROJECT STRUCTURE



X2RAIL 1

STATUS

Underway

BUDGET

€45,003,870

FUNDING

€19,972,078

START

September 2016

DURATION

36 months

CALL

H2020-S2R-CFM-IP2-01-2015

CONTRACT No

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SNCF, THALES, **TRAFIKVERKET**

WEBSITE

http://projects.shift2rail.org/s2r_ip2_n.aspx?p=X2RAIL-1

X2Rail-1

Start-up activities for Advanced Signalling and Automation Systems

OBJECTIVES

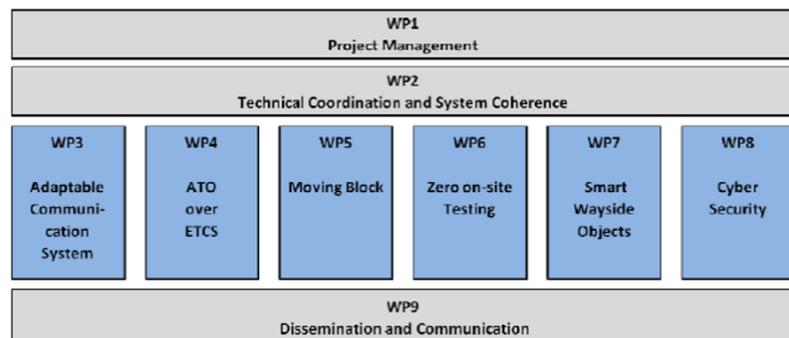
The X2Rail-1 project aims to research and develop six selected key technologies to foster innovations in the field of railway signalling and automation systems towards a flexible, real-time, intelligent traffic management and decision support system.

The actions to be undertaken in the scope of X2Rail-1 are related to the following specific objectives:

- To overcome the limitations of the existing communication system by adapting radio communication systems which establish the backbone for the next generation advanced rail automation systems.
- To improve the usable track capacity by introducing more Automatic Train Operation (ATO) systems and Moving Block systems.
- To innovate the signalling architecture towards a more decentralized and less cost intensive system by incorporating Moving Block systems and Smart Wayside Objects.
- To minimize energy consumption and to improve train punctuality through more extensive use of Automatic Train Operation (ATO) systems.
- To increase innovation in the field of lab testing by developing architectures for new lab test systems and simulations for control, command and communication systems in order to reduce costs.
- To ensure security among all connected signalling and control systems by developing new cyber security systems dedicated to railways.

The results of X2Rail-1 will contribute to additional research and development work streams of future projects and will also be expanded into further fields such as Traffic Management. The future projects will also allow concepts developed in the phase of this X2Rail-1 project to be further implemented to higher technical readiness level (TRL).

PROJECT STRUCTURE



X2RAIL 2

STATUS

Underway

BUDGET

€30,152,828

FUNDING

€13,199,916

START

September 2017

DURATION

36 months

CALL

H2020-S2R-CFM-IP2-01-2017

CONTRACT No

777465

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MERMEC, **NETWORK RAIL**,
SIEMENS, **SNCF**, THALES,
TRAFIKVERKET

WEBSITE

http://projects.shift2rail.org/s2r_ip2_n.aspx?p=X2RAIL-2

X2Rail-2

Enhancing railway signalling systems based on train satellite positioning, on-board safe train integrity, formal methods approach and standard interfaces, enhancing Traffic Management System functions

OBJECTIVES

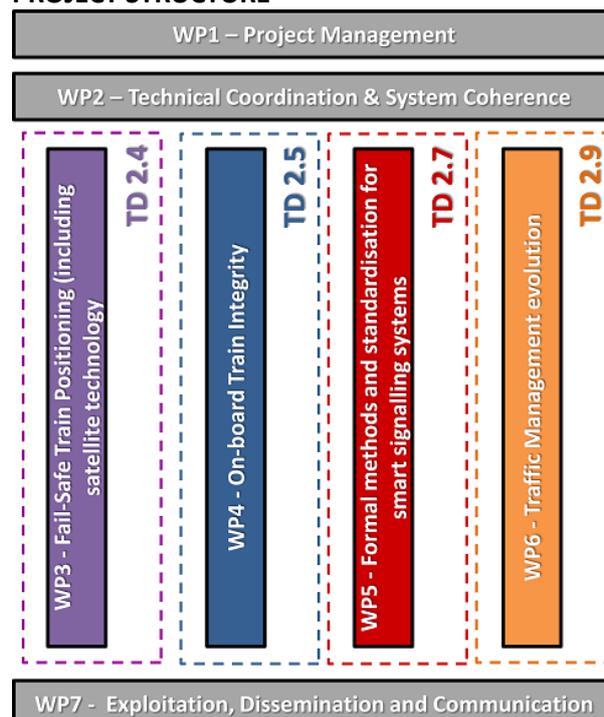
Taking into account the nature of signalling and automation systems, X2Rail-2 aims to improve the performance at a railway system level by introducing new functionalities at sub-system level as well as on the architectural level that should revolutionize the signalling and automation concept for the future (see Figure 1).

X2Rail-2 follows a holistic system approach to create the building blocks for Shift2Rail IP2. Thus, the outcomes at individual technology level will be combined to bring a benefit at system level.

The key technologies within X2Rail-2 cover GNSS application in Railway and advanced technologies for implementing new signalling and automation functionalities. These functionalities are addressed in individual but interconnected work streams, each focusing on different key technologies such as safe on-board systems, TMS, etc.

In order to enable a rapid ramp up of these new technologies, new lab test strategies and environments are addressed as well in cooperation with ongoing IP2 projects (e.g.: X2Rail-1), facilitating the approval and time-to market procedures. To make best use of technical innovations developed and provided by other sectors, X2Rail-2 consists also of non-railway domain partners that will provide knowledge for possible adaptation of relevant and emerging technologies to the railway system.

PROJECT STRUCTURE



List of projects per capability served

All the above-presented projects are grouped below under the capability(ies) they serve for an easier overview of the ROC involvement in achieving the future European railway system. Many projects serve more than one capability and thus appear in all the relevant tables.

1	Automated Train Operation
ARCC	
FR8RAIL	
X2Rail-1	
X2Rail-2	

2	Mobility as a service
ATTRACKTIVE	
BODEGA	
BONVOYAGE	
CLUSTERS 2.0	
CO-ACTIVE	
COHESIVE	
CONNECTIVE	
DESTinationRail	
EuTravel	
GoF4R	
IT2RAIL	
MASAI	
PLASA	
SocialCar	
ST4RT	

3	Logistics on demand
ARCC	
BONVOYAGE	
FR8HUB	
OPTIYARD	
SMARTRAIL	
SYNCHRO-NET	

5	Optimum Energy Use
CONNECTA	
FFL4E	
FINE1	
FR8HUB	
IN2RAIL	
IN2STEMPO	
OPEUS	
OPTIYARD	
PINTA	
ROLL2RAIL	
SYNCHRO-NET	

4	More value from Data
ATTRACKTIVE	
CIPSEC	
CONNECTIVE	
CYRail	
DESTinationRAIL	
ERSAT EAV	
EuTravel	
FINESSE	
FR8RAIL	
GoF4R	
I-ALLOW	
IN2SMART	
IN2TRACK	
IT2RAIL	
MASAI	
OPEUS	
RAGTIME	
SAFE-10-T	
S-CODE	
SMART-RAIL	
SocialCar	
ST4RT	
SYNCHRO-NET	
TT	

6	Service Operation timed to the second
ARCC	
BONVOYAGE	
CYRail	
ERSAT EAV	
GoF4R	
OPTIYARD	
PLASA	
RAGTIME	
S-CODE	
X2Rail-1	
X2Rail-2	

7	Low Cost Railway
DYNAFREIGHT	
ERSAT EAV	
FFL4E	
FR8HUB	
IN2RAIL	
IN2TRACK	
NeTIRAIL-INFRA	

9	Intelligent Trains
CONNECTA	
DYNAFREIGHT	
FR8RAIL	
ROLL2RAIL	
S-CODE	
X2Rail-1	
X2Rail-2	

10	Stations and 'smart' city mobility
DESTinationRAIL	
DYNAFREIGHT	
IN2RAIL	
IN2STEMPO	
IN2TRACK	
NeTIRAIL-INFRA	
RAGTIME	
REFINET	
S-CODE	

11	Environmental and social sustainability
BODEGA	
DYNAFREIGHT	
FFL4E	
FINE1	
FR8HUB	
PORTIS	
Q-Air	
ROLL2RAIL	
SYNCHRO-NET	
WRIST	

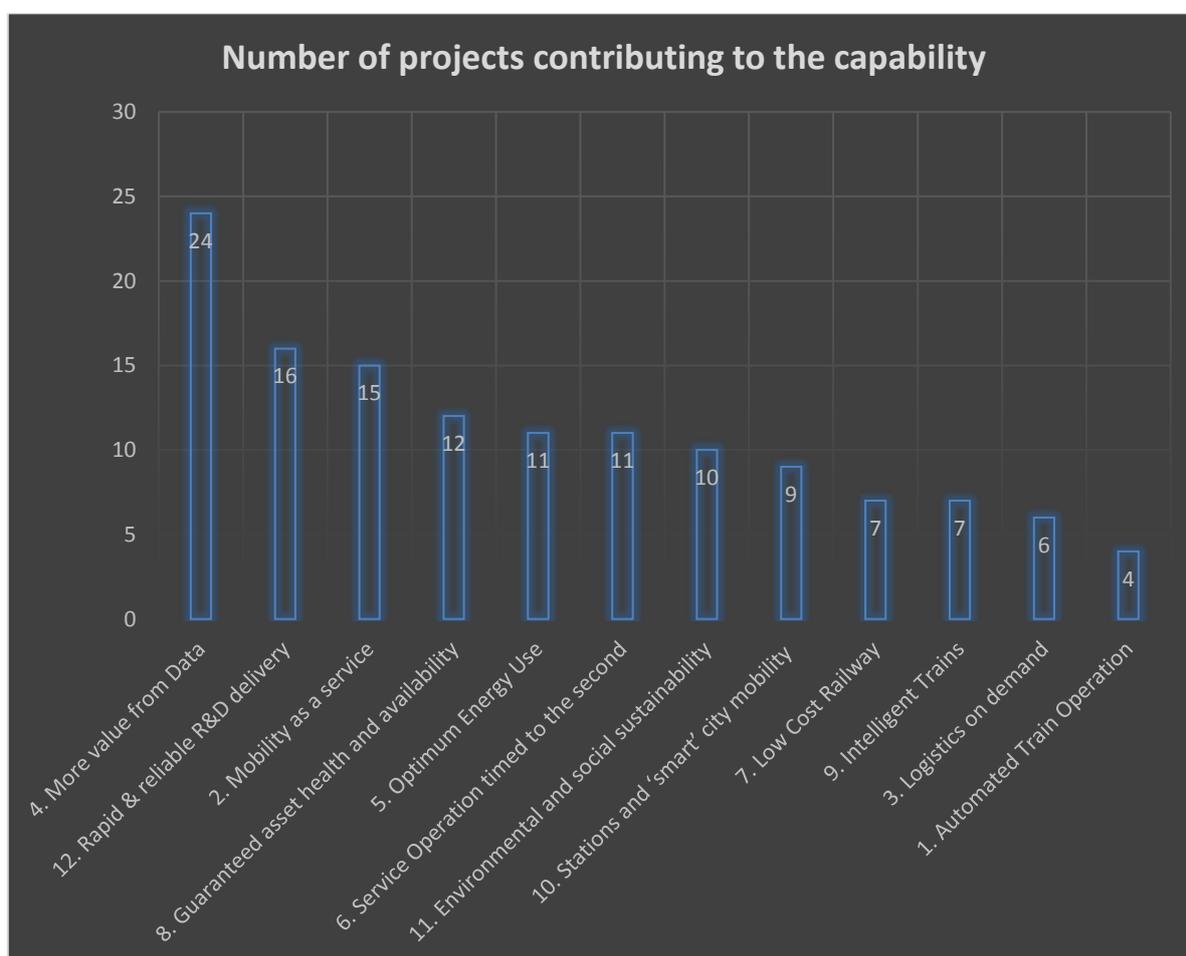
8	Guaranteed asset health and availability
DESTinationRAIL	
ECOROADS	
FINESSE	
FR8RAIL	
I-ALLOW	
IN2SMART	
IN2TRACK	
PAPERCHAIN	
SAFE-10-T	
SAFER-LC	
TT	
WRIST	

12	R&D rapid & reliable delivery
CLUSTERS 2.0	
ECOROADS	
EuTravel	
FOX	
IMPACT-1	
IMPACT-2	
MEACTOS	
InnoWEE	
PAPERCHAIN	
PORTIS	
Q-Air	
REFINET	
ROLL2RAIL	
SETRIS	
SKILLFUL	
VITE	

Conclusion

Taking a look at the projects per capability served, it becomes clear that the ROC RICG members focussed their interest on three capabilities. Out of 59 projects, 24 contributed to build the capability *4. More value from Data* – confirming that digitalisation is now a core feature for developing railways of the 21st century. In addition, 16 projects were serving the capability *12. Rapid and reliable R&D delivery* and 15 projects were supporting the capability *2. Mobility as a Service*.

The projects supporting capability *12. Rapid and reliable R&D delivery* are numerous thanks to a common component in projects aiming at fostering information sharing, best practice and technology transfer. However, this figure also benefits from a number of projects which, while not directly concerning rail, cover a number of technologies from outside the rail sector which could have a use in the rail system.



At the other end of the spectrum, 7 projects contribute to capability *9. Intelligent trains*, 6 to capability *3. Logistics on demand* and 4 to capability *1. Automated Train Operations*. These capabilities, which are cornerstones for the Future European Railway System, will likely receive an increased attention in the subsequent years.

ANNEX – The 12 Capabilities

1. Automated Train Operations

Trains are able to operate themselves and run closer together based on an automated train operation system, boosting the capacity significantly on existing lines. Autonomous and remote controls provide a safe operation. Rail operations are partly or fully automated.

- Automated (passengers and freight) trains run closer together with increased flexibility
- Passenger and freight train preparation processes are automated
- Vehicles split and join on the move. New operational approaches (*e.g. virtual coupling, convoying, reduced headway, communication connections between trains/units*) are employed.
- Self-propelled automated / autonomous single units guide themselves through the system

2. Mobility as a service

Customer demand-driven services lead the railways to provide excellent service within the overall mobility chain. Connections between the railways and the other modes are seamless, making mode interchange as simple and as efficient as possible. Information is permanently available to make travel safe and efficient along the travel chain including at stations. All customers and potential customers are connected to mobility services.

- Tailored guidance to the best use of available transport services is provided so that each customer appreciates a personalised service
- Every journey is provided intelligently and seamlessly, with rail physically integrated with the other modes
- Continuous flow of information eases the journey, making connections between the different modes seamless
- Electronic ticketing and payment are the norm

3. Logistics on demand

Logistics services are driven by customer demand, with freight moved reliably in wagons designed to carry various loads. Better planning, tracking and shipment information capabilities combine to offer customers flexibility and capacity at reasonable, attractive prices. The rail system is fully integrated with the multimodal logistic chain.

- Planning and scheduling are synchronised in real-time to customer demand
- Flexible, interchangeable, multipurpose and smart freight transport units increase handling flexibility and unit utilisation

- Shipments are moved effectively, efficiently, safely and securely throughout the “physical internet” logistic chain
- Freight trains are able to integrate within high-intensity passenger operations
- Automated yards, intermodal hubs, ports and cross-modal interchange locations connect the rail system into the multimodal logistic chain

4. More value from data

To deliver on all the capabilities, rail manages a growing volume of data contributing to the data economy. Collection, analysis, interpretation and prediction are automated to provide consistent up-to-date information supporting fast, well-informed decisions and business benefits. This is achieved through a robust, resilient and secure information architecture and governance structure. Taking into account data privacy management, relevant information is shared across the industry and more widely, enabling the development of new services and applications to the benefit of the railway and its customers.

- Secure, robust, scalable and resilient open architecture and protocols allow full interoperability
- The Internet of Things (IoT) and Artificial Intelligent (AI) provide efficient capture, storage, management and interpretation of data
- The customer and the rail system communicate intelligently with each other
- Railway businesses exploit new data-driven revenue streams
- Big Data analytics enables a range of new and improved services to be developed state of the art cybersecurity ensures reliable and secure ICT services, protection of the rail system and business continuity in case of an incident.

5. Optimum energy use

Railways maintain their position as the most environment-friendly mode of transport by decreasing energy consumption. This is achieved together with lowered operating costs through the use of an intelligent energy management system. The introduction of new technologies and methods as supporting tools enable reduced and optimised demand-led energy use and energy efficiency.

- Alternative propulsion concepts such as fuel cells are introduced. Hybrid powertrains allow running over non-electrified track sections. Discontinuous electrification at stations and on branch lines dramatically reduces the capital costs of extending electrification.
- Automated Train Operations (ATO) improves energy efficiency.

- Optimised on-board and line-side energy storage and charging technologies (e.g. dynamic wireless power transfer) allow the railway to redistribute energy throughout the system according to supply and demand.
- A high proportion of energy is recovered through regenerative braking, and small-scale energy generation and harvesting technologies feed energy efficient trackside systems.
- A fully integrated system approach to intelligent energy supply maximises renewable energy generation and the use of smart grids, including those outside the railway system, through links with the wider energy supply sector.

6. Service timed to the second

Situational awareness, where each train's location and speed is known at all times and in real-time, supports service operation timed to the second. This results in increased and enhanced operational flexibility and contributes to a more robust, resilient and reliable service as well as faster recovery from service disruption.

- Automated vehicle identification and monitoring is the basis of precise service operation
- Smart traffic management ensures every train is in the right place and travelling at the right speed
- Automated dynamic timetables are facilitated
- Automated recovery from perturbation (a "self-healing" process) quickly restores normal service

7. Low cost railway

New models to deliver efficient and affordable infrastructure, rolling stock and railway operation allow the rail mode to be viable in areas of low demand and to compete for new transport links. Design, service solutions, technologies draw inspiration from other sectors such as light rail, automotive and aviation.

- A low-cost, affordable rail system supports the rural economy. This is supported by the application of tailored standards.
- Simplified control-command system appropriate for low-intensity operation is used, allowing various degrees of autonomy.
- The use of lightweight materials for rolling stock reduces maintenance costs and energy consumption.
- A whole life operating cost approach balances the use of low-cost technical assets and good value service.

8. Guaranteed asset health and availability

Optimised maintenance keeps the railway continuously open, fostering minimal disruption to train services. Shared real-time monitoring of asset health by a wide array of sensors connected together in an Internet of Things (IoT) environment feed the predictive maintenance decision-making process. Asset health and availability is further improved by machine-learning, artificial intelligence and big data analytics. Robust modular units and infrastructure are easily maintained and repaired through a robotic automated system, making the operation punctual, safe and quick.

- The Internet of Things (IoT) enables real-time monitoring through connected sensors (ground/air/embedded)
- Artificial Intelligence (AI) supports predictive maintenance decision-making to reduce manual interventions on infrastructure and rolling stock
- Greater use of robotics, modularity and automation simplifies maintenance and reduces the number of components
- Remote maintenance of trains and infrastructure allows operations to continue uninterrupted
- Performance based service specifications encourages a diverse supply chain

9. Intelligent trains

Intelligent trains are aware of themselves, their passengers/loads and their surroundings, knowing where they need to be and when, and able to automatically adjust journeys to meet demand. In addition, they intelligently feed information of infrastructure to support preventive maintenance. A network of fully intelligent trains can be self-regulating, negotiating vehicle to vehicle to resolve movement authorities and potential conflicts at junctions in the network and react to unexpected situations. The trains are also aware of and able to take account of the status of other transport modes.

- Autonomous trains can monitor and regulate themselves.
- Communications is possible between trains, between train and infrastructure and between train and passenger/freight customers
- Trains feature advanced mechatronics, reducing dependence on wheel conicity and permitting simplified running gear design.
- In-train signalling capability is used to resolve conflicts at junctions and stations.

10. Stations and 'smart' city mobility

Rail is the backbone of urban mobility, with stations at the heart of 'smart' cities, being places to work, live, meet and communicate, where individual transport modes, including public transport and long-distance rail transport, are physically connected. New station designs provide easy access

and seamless interchange between the transport modes, enabling railways to manage growing passenger volumes and mobility demands.

- Railways are a core part of smart city mobility management systems and city fulfilment and delivery services. Stations are key to smart city governance structure and development plans
- Railways are connected to smart city mobility platforms for a seamless end to end journey within and beyond the city
- New designs of infrastructure and rail vehicles provide easy access and interchange between transport modes
- Flow management systems guide customers safely and efficiently through stations and to/from adjacent transport hub and city infrastructure, using dynamic way finding, barrier free access and multi-sensory information systems
- Platform management systems help passengers position themselves for their train and facilitate efficient boarding
- Security and revenue protection at stations and interchanges are based on electronic gates using smart wireless technologies, ticket detection systems and biometrics

11. Environmental and social sustainability

Railways continue to deliver sustainable transport solutions as overall travel demand intensifies. Rail makes an increased contribution to the transport economic mix, decoupling environmental harm from transport growth. Railways are able to operate with minimal environmental impact and with a low carbon footprint. Inclusive and easy access is available for all citizens to railway facilities, products and services.

- Adoption of 'circular economy' principles enables the railway to move towards 'zero-waste' operation
- Sustainable and ethical procurement and production reduces the carbon footprint, with a whole life approach and focus on inputs to the system, recycling, transport of materials, renewable energy, operations and disposals.
- A climate change adaptive approach mitigates the impact of climate change on the railway
- Green technologies enable the railway to operate exhaust emissions free and with low noise and vibration levels.
- Information and accessible facilities put railways within the reach of citizens as an inclusive, affordable and accessible transport system

12. Rapid and reliable R&D delivery

An ecosystem for R&D, based on effective collaboration, the provision of greater technology demonstration capability and the rapid integration of technology into the railways, remove barriers to the adoption of new technologies and decrease time to market.

- An R&D ecosystem with centres of excellence fosters a high participation in knowledge networks, opening new forms of collaboration, technology transfer from other industry sectors and keeping railway skill sets fresh.
- The sector has a strong commercial focus and awareness of the maturity levels of new technologies. There is a well-coordinated and fast decision-making process, reducing time to market.
- Virtual testing and efficient implementation processes speed up production and deployment of new products. There is close cooperation within the sector for standardisation and testing. Component-driven development, modularised products are key elements of a rapid deployment of innovation to the market. Railways have a permanent focus on disruptive technologies, using their challenges to increase their innovation capabilities and speed
- Agile development approaches, Labs, Hackathons, early involvement of customers are the elements of customer centric innovations. Open-labs invite end-users/customers to be part of the innovation process.
