



INTERNATIONAL UNION
OF RAILWAYS

2018

The Railway Operating Community (ROC) involvement in EU projects

RICG members in action

RICG Common Collaboration Working Group

Foreword from Bo Olsson, RICG Chairman



The idea of producing a project book listing those projects benefitting from European funding emerged in 2017 from within the Research and Innovation and Coordination Group (RICG), which I have the pleasure to chair. After having identified a vision of 12 key Capabilities for the 2050 European railway system, the Railway Operating Community (ROC) members around the table expressed the need to understand what was already being undertaken in terms of railway-related research and innovation and how the projects would help building this vision for the future. The rationale is that foundational stones for the Capabilities vision to become a reality are deeply rooted in the present and recent past. As a result, a working group was launched to put this idea to work, using publicly available

information from the European institutions. The very first EU-funded projects book came out a year later, in January 2018.

Some 59 Eu-funded projects were then identified, described and matched with our 12 Capabilities. The 12 Capabilities do present 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, the 12 Capabilities cannot be dissociated from one another and none takes precedence over the others. Only a swift coordinated development of their focus will eventually make the Future European Railway System ambition a reality.

The project book was well received by the RICG members, providing them with a summary of information usually scattered around the web and offering them a snapshot of 2017 in terms of railway research and innovation. However, we all know innovation is a never-ending and continuous process: that 2017 picture needed a review and an update to reflect the 2018 changes. With the RICG supporting this action, the work began swiftly in 2019 to provide the group with this updated perspective. I am proud today to introduce the 2018 Railway Operating Community (ROC) involvement in EU projects, listing no less than 85 EU-funded projects in which RICG members are involved and which are even further reaching than those seen in 2017.

This exercise will again help the RICG and the ROC to update their knowledge on the current R&I developments undertaken with EU-funding and understand the current priorities. Those are, I must say, remarkably well aligned with the European Commission's and those set by ERRAC in its Rail 2050 Vision. I am convinced that this document will also reinforce the transparency on railways activities and cooperation that the RICG is endlessly promoting. We hope that this document will provide you with a better view of what the ROC is doing with European funds and, who knows, raise your interest in a potential collaboration with us toward the Future European Railway System!

Bo Olsson

RICG Chairman,
Trafikverket

Table of contents

Foreword from Bo Olsson, RICG Chairman	1
What is the RICG?.....	5
The 12 Railway Operating Community (ROC) Capabilities	6
What is this project book about?	8
Projects list	9
Projects	9
Presentation	11
5G EVE.....	12
5G-MOBIX	13
AMONTRACK	14
ARCC.....	15
ASSETS4RAIL.....	16
ATTRACKTIVE	17
BODEGA	18
BONVOYAGE.....	19
CHARIOT	20
CIPSEC	21
CLEVER Cities	22
CLUSTERS 2.0	23
CO-ACTIVE.....	24
COHESIVE	25
CONNECTA	26
CONNECTA-2.....	27
CONNECTIVE.....	28
CYBERWISER.EU	29
CYRail	30
DESTinationRAIL.....	31
DYNAFREIGHT.....	32
E-LOBSTER.....	33
ERSAT GCC	34
ETOPIA	35
FFL4E	36

FINE1	37
FINESSE	38
FORESEE	39
FR8HUB	40
FR8RAIL	41
FR8RAIL II	42
GATE4RAIL	43
GoF4R	44
HERILAND	45
IMPACT-1	46
IMPACT-2	47
IN2DREAMS	48
IN2RAIL	49
IN2SMART	50
IN2STEMPO	51
IN2TRACK	52
IN2TRACK2	53
infra4Dfuture	54
INFRALERT	55
INNOWAG	56
IT2RAIL	57
M2O	58
MASAI	59
MeBeSafe	60
MOMIT	61
NeTIRail-INFRA	62
OPEUS	63
OPTIYARD	65
PAPERCHAIN	66
PINTA	67
PINTA 2	68
PIVOT	69
PLASA	70
PLASA 2	71

PORTIS	72
RAGTIME	73
ROMSOC	74
SAFE-10-T	75
SAFER-LC	76
SAFEWAY	77
SCENT	78
S-CODE	79
SECREDas	80
SIA	81
SKILLFUL	82
SMART-RAIL	83
SOCIALCAR	84
SPRINT	85
ST4RT	86
SYNCHRO-NET	87
TER4RAIL	88
TT	89
VisloN	90
VITAL NODES	91
VITE	92
WRIST	93
X2Rail-1	94
X2Rail-2	95
X2Rail-3	96
List of projects per capability served	97
Conclusion	100
ANNEX – The 12 Capabilities	102

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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.

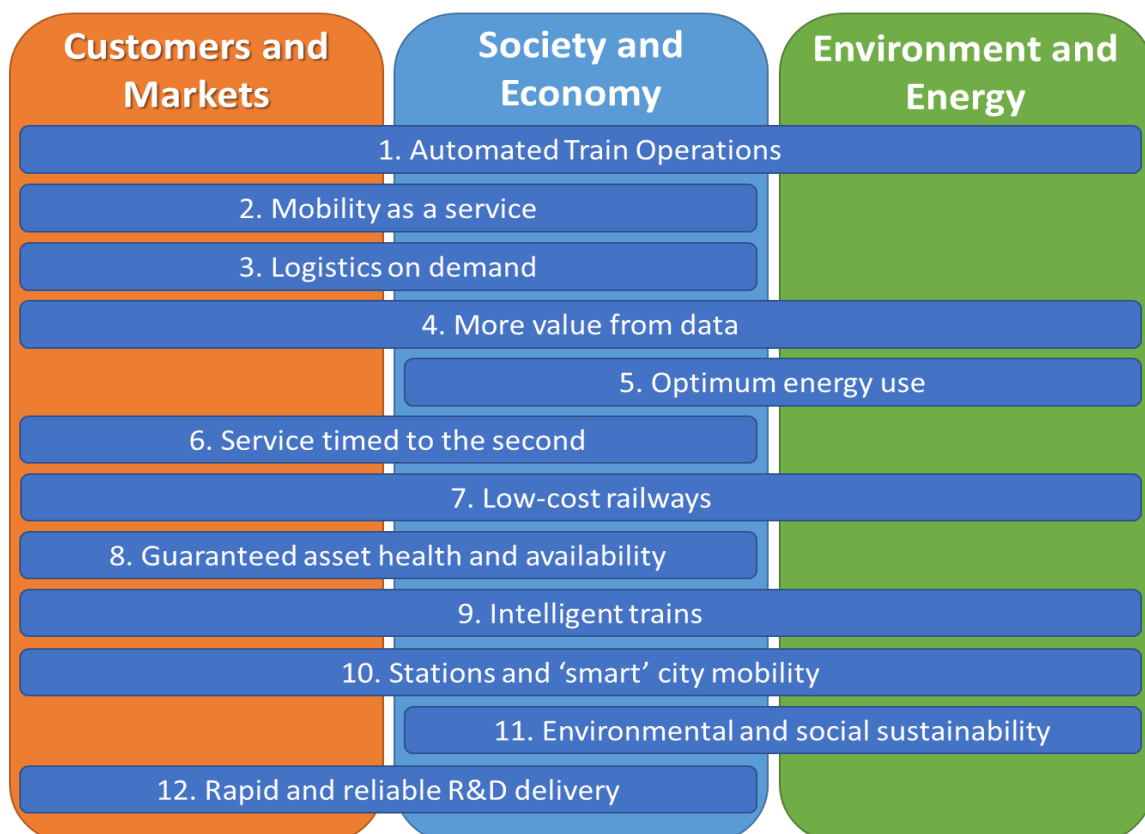
The 12 Railway Operating Community (ROC) Capabilities

RICG was tasked with the preparation of a strategic direction, from the ROC standpoint, 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 2018, containing:

- Projects that started in 2018
- Projects that started before 2018 and are still ongoing
- Projects that were completed in 2018


Projects list

Projects

Below are listed some 85 EC-funded projects in which the Railway Operating Community members of RICG were involved in 2018. They are listed here and in the following pages in alphabetical order.

5G EVE	INFRALERT
5G MOBIX	INNOWAG
AMONTRACK	IT2RAIL
ARCC	M2O
ASSETS4RAIL	MASAI
ATTRACKTIVE	MeBeSafe
BODEGA	MOMIT
BONVOYAGE	NETIRAIL
CHARIOT	OPEUS
CIPSEC	OPTIMUM
CLEVER CITIES	OPTIYARD
CLUSTERS 2.0	PAPERCHAIN
CO-ACTIVE	PINTA
COHESIVE	PINTA-2
CONNECTA	PIVOT
CONNECTA-2	PLASA
CONNECTIVE	PLASA 2
CYBERWISER	PORTIS
CYRAIL	RAGTIME
DESTinationRAIL	ROMSOC
DYNAFREIGHT	SAFE-10-T
E-LOBSTER	SAFER-LC
ERSAT GCC	SAFEWAY
ETOPIA	SCENT
FF4LE	S-CODE
FINE1	SECRETAS
FINESSE	SIA
FORESEE	SKILLFUL
FR8HUB	SMARTRAIL
FR8RAIL	SOCIALCAR
FR8RAIL II	SPRINT
GATE4RAIL	ST4RT
GoF4R	SYNCHRO-NET
HERILAND	TER4RAIL
IMPACT-1	TT
IMPACT-2	VisIoN
IN2DREAMS	VITAL NODES
IN2RAIL	VITE
IN2SMART	WRIST
IN2STEMPO	X2Rail-1

IN2TRACK	X2Rail-2
IN2TRACK2	X2Rail-3
INFRA4DFUTURE	

Almost half of these projects are funded within the Shift2Rail¹ Joint Undertaking framework - (S2R): these 42 S2R projects are listed on the next page for an easier traceability. They will be marked with the S2R logo in the following pages: 

S2R projects	
ARCC	IN2STEMPO
ASSETS4RAIL	IN2TRACK
ATTRACKTIVE	IN2TRACK2
CO-ACTIVE	INNOWAG
COHESIVE	M2O
CONNECTA	OPEUS
CONNECTA-2	OPTIYARD
CONNECTIVE	PINTA
CYRAIL	PINTA-2
DYNAFREIGHT	PIVOT
FF4LE	PLASA
FINE1	PLASA 2
FR8HUB	S-CODE
FR8RAIL	SPRINT
FR8RAIL II	ST4RT
GATE4RAIL	TER4RAIL
GoF4R	VITE
IMPACT-1	WRIST
IMPACT-2	X2Rail-1
IN2DREAMS	X2Rail-2
IN2SMART	X2Rail-3

The following 11 projects, present in the previous edition of this project book, have been removed due to them having closed before 2018 or due to other reasons (member leaving UIC, RICG member terminating participation in a project, etc.).

Projects removed	
ECORoads	MEACTOS
ERSAT EAV	Q-Air
EUTRAVEL	REFINET
FOX	ROLL2RAIL
iALLOW	SETRIS
INNOWEE	

Their details remain available in the 2017 EU-funded project book available on the [UIC website](#) and on the UIC Extranet RICG workspace (*requires the creation of an account*).

¹ www.shift2rail.org

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.



5G EVE

STATUS

Ongoing

BUDGET

€15,742,222.50

FUNDING

€15,737,785

START

July 2018

END

June 2019

CALL

H2020-ICT-2018-1

CONTRACT No

815074

LEAD ORGANISATION

TELECOM ITALIA SPA

COORDINATOR

N.A.

CONTACT

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PARTNERS

ORANGE, ORANGE ROMANIA, ORANGE POLSKA, TELEFONICA INVESTIGACION Y DESARROLLO, OTE AE, ERICSSON ESPANA, ERICSSON HELLAS, NOKIA BELL LABS, B-COM, NEXTWORKS, EURECOM, EURESCOM, **TRENITALIA**, Others

WEBSITE

www.5g-eve.eu/

5G EVE

4

8

12

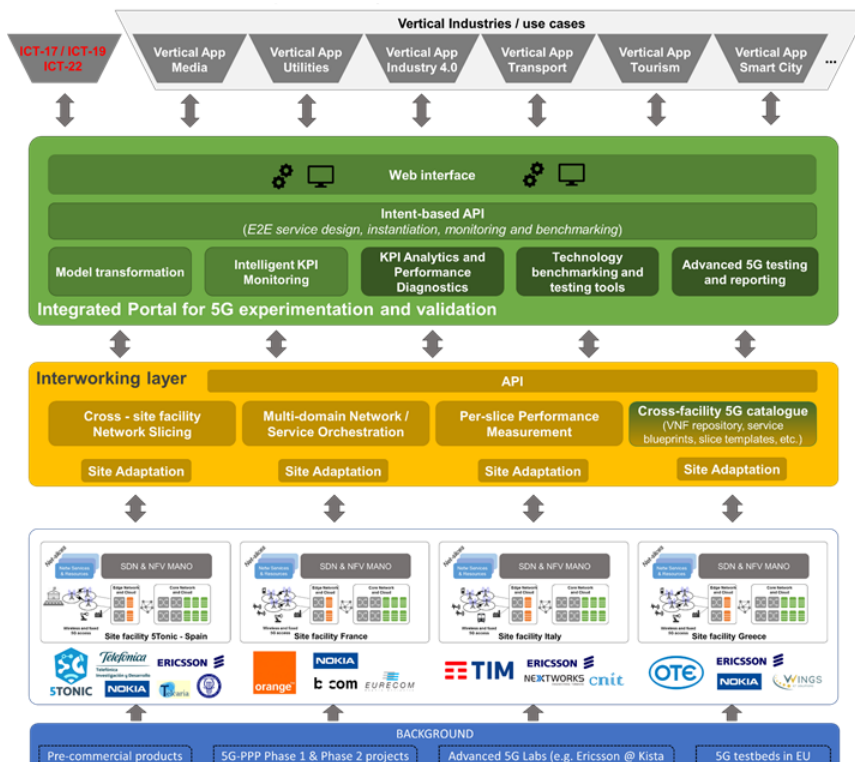
5G European Validation platform for Extensive trials

OBJECTIVES

5G EVE is the European 5G validation platform for extensive trials. The goal is to implement and test advanced 5G infrastructures in Europe. 5G-EVE will develop and interconnect four existing European sites to create a unique 5G end-to-end facility. We will offer the facility to vertical industries for execution and validation of pilots. Access will be through a unified functional and operational API. The 5G EVE end-to-end facility will enable experimentation and validation with full sets of 5G capabilities. They will be initially Release 15-compliant, and by the end of the project they will be Release 16-compliant.

The technical objectives include:

- Implementing Release 16 compatible technologies in the four sites, starting from the evolutions of current Release 15. Specific pilots will validate that 5G KPIs can be achieved.
- Designing and implementing site interworking and multi-x slicing/ orchestration mechanisms.
- Implementing a vertical-oriented open framework.
- Creating an advanced 5G testing mechanisms to validate advanced 5G challenges.



PROJECT STRUCTURE

N.A.

**STATUS**

Ongoing

BUDGET

€26,711,677.75

FUNDING

€21,410,205.15

START

November 2018

END

October 2021

CALL

H2020-ICT-2018-2

CONTRACT No

825496

LEAD ORGANISATION

ERTICO

COORDINATOR

François FISCHER

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 VE TICARET ANONIM SIRKETI,
 SATELLITE APPLICATIONS
 CATAPULT LIMITED, DAIMLER
 AG, IP, CHINA ACADEMY OF
 TELECOMMUNICATIONS
 TECHNOLOGY, KOREA
 AUTOMOTIVE TECHNOLOGY
 INSTITUTE, Others

WEBSITEwww.5g-mobix.com**5G-MOBIX**

5G for cooperative & connected automated MOBility on X-border corridors

OBJECTIVES

5G-MOBIX will develop and test automated vehicle functionalities using 5G core technological innovations along multiple cross-border corridors and urban trial sites, under conditions of vehicular traffic, network coverage, service demand, as well as considering the inherently distinct legal, business and social local aspects.

The project will evaluate benefits in the CCAM context as well as define deployment scenarios and identify and respond to standardisation and spectrum gaps. The expected benefit of 5G will be tested during trials on 5G corridors in different EU countries as well as China and Korea.

Several automated mobility use cases are potential candidates to benefit from 5G such as cooperative overtake, highway lane merging, truck platooning, valet parking, urban environment driving, road user detection, vehicle remote control, see through, HD map update, media & entertainment.

5G-MOBIX will scale up and replicate in order to provide global 5G deployment scenarios and recommendations for EU-wide 5G corridor deployment and beyond.

5G-MOBIX will define critical scenarios needing advanced connectivity provided by 5G, and the required features to enable some advanced CCAM use cases built on the cross-border and urban trials and the evaluation results. Recommendations will be provided to policy makers for the adoption of developed 5G technologies in European transport infrastructures.

PROJECT STRUCTURE

N.A.

AMONTRACK

STATUS

Ongoing

BUDGET

€100,018.80

FUNDING

€100,018.80

START

May 2018

END

June 2019

CALL

H2020-MSCA-IF-2016

CONTRACT No

744605

LEAD ORGANISATION

DB SYSTEMTECHNIK GMBH

COORDINATOR

N.A.

CONTACT

N.A.

PARTNERS

N.A.

WEBSITE

N.A.

AMONTRACK

Acoustic monitoring of railway track quality

OBJECTIVES

The AMONTRACK project focuses on acoustic track monitoring and aims at pushing forward this monitoring technique to a point, where track faults such as squats, deteriorated rail joints or hanging sleepers can be automatically detected and quantified. This is achieved by combining advanced measurement techniques - involving sound pressure signals due to radiation from rail and wheel as well as axle box vibrations – with advanced simulation techniques for wheel/rail interaction.

In cooperation with the Chalmers University of Technology in Goteborg, Sweden, DB Systemtechnik is developing a fully automated method for acoustic pattern recognition as part of the AMONTRACK research project. The basic idea of the AMONTRACK project is to use the measurement signals acquired in large quantities and at regular intervals (airborne and structure-borne noise signals) to gain information on other rail parameters and changes to them and to expand the range of services provided by the noise monitoring cars on this basis. The first step aims to identify non-acoustic objects such as surface defects, rail joints or cavities. In the second step, conclusions are also to be drawn on dynamic track parameters (track decay rate) and the acoustic condition of the running surface (and thus, indirectly, the quality of grinding measures carried out).

PROJECT STRUCTURE

The project is divided into the following subprojects:

- Extension and validation of an existing simulation model based on the results of a measurement campaign carried out in the Roll2Rail innovation project
- Study of acoustic signatures of various track errors using the validated simulation model
- Implementation of a pattern recognition method to identify track faults in the measurement data of the SMT
- Feasibility study for indirect measurement of acoustically relevant track parameters


STATUS

Ongoing

BUDGET

€3,600,360

FUNDING

€1,600,000

START

September 2016

END

August 2019

CALL

H2020-S2RJU-CFM-2015-01-1

CONTRACT No

730813

LEAD ORGANISATION

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COORDINATOR

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WEBSITE

https://projects.shift2rail.org/s2r_ip5_n.aspx?p=ARCC

ARCC

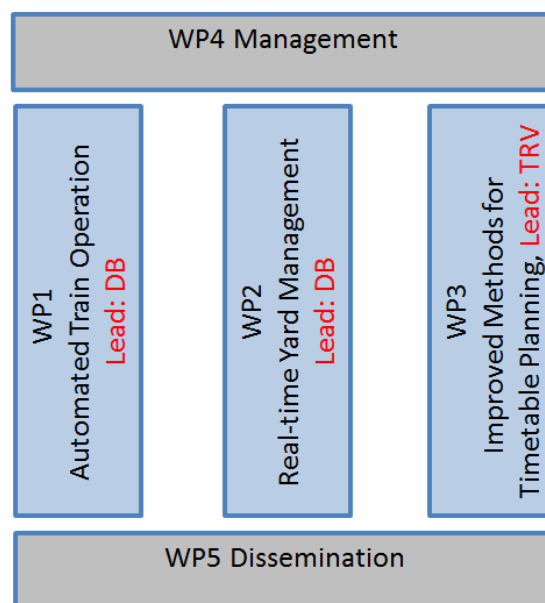
Automated Rail Cargo Consortium: Rail freight automation research activities to boost levels of quality, efficiency and cost effectiveness in all areas of rail freight operations

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




ASSETS4RAIL

Measuring, monitoring and data handling for railway assets; bridges, tunnels, tracks and safety systems

STATUS

Ongoing

BUDGET

€ 5,506,631.25

FUNDING

€4,710,167.25

START

December 2018

END

May 2021

CALL

H2020-S2R-OC-IP3-01-2018

CONTRACT No

826250

LEAD ORGANISATION

FUNDACIO EURECAT

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WEBSITE

www.assets4rail.eu

OBJECTIVES

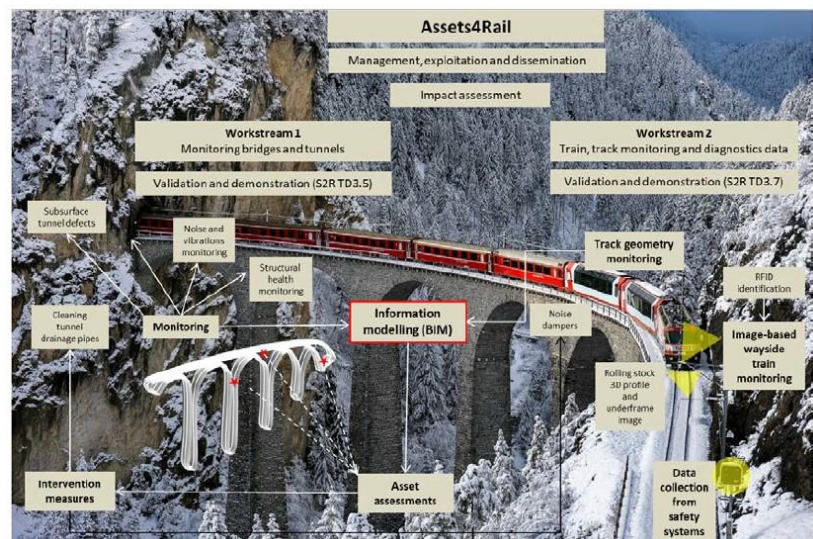
The main objective of ASSETS4RAIL is to develop a set of cost-efficient and cutting-edge asset-specific measuring and monitoring devices. These will collect and deliver the status data of the railway system (infrastructure and rolling stock). The information collected by such devices will then be processed to generate relevant maintenance infrastructure-related information to support asset management decisions. This will generate the following benefits:

- 30% decreased track disturbance
- 15% decrease on noise levels

To that aim, Assets4Rail is divided into 2 workstreams that have specific objectives.

In Workstream 1 Assets4Rail objective is to contribute improving the inspection, maintenance and upgrade methods for cost reduction and quality improvement of railway bridges and tunnels; it is also an objective the noise and vibration reduction in bridges.

In Workstream 2 Assets4Rail objective is to contribute to build a common measuring and monitoring data representation layer suitable to elaborate data coming from all source segments (onboard, wayside and remote), to correlate the different data and to obtain a holistic view of the railway system conditions.



PROJECT STRUCTURE

N.A.

STATUS

Ongoing

BUDGET

€5,059,579

FUNDING

€2,248,477

START

September 2016

END

May 2019

CALL

H2020-S2R-CFM-IP4-02-2015

CONTRACT No

730822

LEAD ORGANISATION

HACON

INGENIEURGESELLSCHAFT

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PARTNERS

DIGINEXT, INDRA SYSTEMAS,
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RAIL**, ANSALDO STS

WEBSITE

https://projects.shift2rail.org/s2r_ip4_n.aspx?p=ATTRACKTIVE

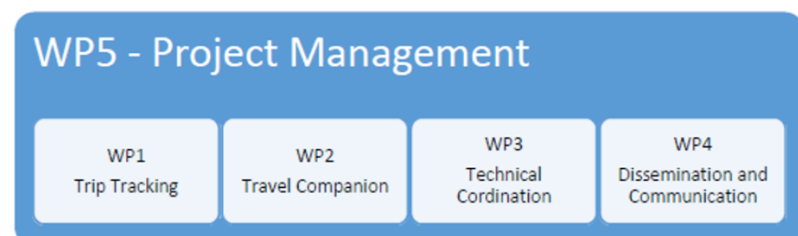
ATTRACKTIVE

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

Completed

BUDGET

€4,999,238

FUNDING

€4,999,238

START

June 2015

END

October 2018

CALL

H2020-BES-14-2014

CONTRACT No

653676

LEAD ORGANISATION

VTT

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PARTNERS

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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.

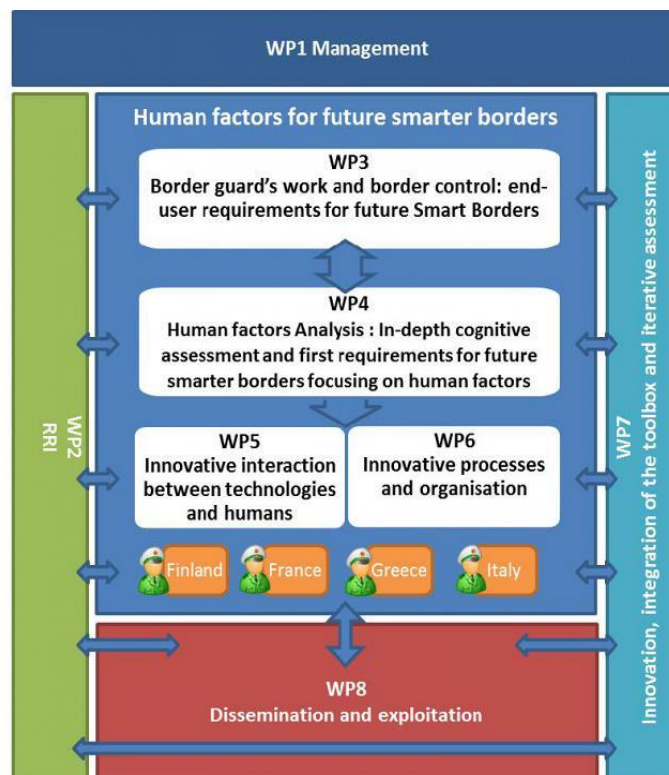


Design and pilot game and e-learning solutions for border control operators and travelers, aiming at mitigating the impact of cognitive biases on their decision making process and usage of new technology.



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





STATUS

Completed

BUDGET

€4,000,000

FUNDING

€4,000,000

START

May 2015

END

April 2018

CALL

H2020-MG-7.2a-2014

CONTRACT No

635867

LEAD ORGANISATION

CNIT

COORDINATORS

Prof. Andrea DETTI

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PARTNERS

CNIT, ATOS, TRANSPORTES AZKAR, CEA-LETI, CITY OF BILBAO, MLC ITS EUSKADI, CRAT, FLUIDTIME, NPRA, SINTEF, **TRENITALIA**

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



CHARIOT

Cognitive Heterogeneous Architecture for Industrial IoT

STATUS

Ongoing

BUDGET

€4,928,562.50

FUNDING

€4,928,562.50

START

Janvier 2015

END

December 2020

CALL

H2020-IoT-03-2017

CONTRACT No

780075

LEAD ORGANISATION

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WEBSITE

www.chariotproject.eu

OBJECTIVES

CHARIOT will advance state of the art by providing a design method and cognitive computing platform supporting a unified approach towards Privacy, Security and Safety (PSS) of IoT Systems, that places devices and hardware at the root of trust, in turn contributing to high security and integrity of industrial IoT. More specifically, for each of the PSS 'imperatives', a highly innovative approach is proposed as follows:

- A Privacy and Security Protection method building on concepts from state-of-the-art Public Key Infrastructure (PKI) technologies, to enable the coupling of a pre-programmed private key deployed to IoT devices with a corresponding private key on Blockchain system for the purposes of affirming and approving valid transactions.
- A Blockchain ledger in which categories of IoT physical, operational and functional changes are both recorded and affirmed/approved through a combination of coupling a cognitive engine and private key hashing between the cognitive engine and IoT devices to authorise change and, likewise, invalidating any and all other changes whether malicious or otherwise. Such a ledger provides a compelling journal and audit log from which, through machine learning, past patterns can be used as a basis to highlight present anomalies and inconsistencies and, in turn, halting execution in situations where transactions and workflows deviate from established patterns of behaviour.
- A fog-based decentralised infrastructure for Firmware and Operational Security integrity checking that leverages a Blockchain ledger to enhance physical, operational and functional security of IoT systems, such as actuation, deactivation, transactions of all types including business process workflows and their associated business logic.
- An accompanying IoT Safety Supervision Engine providing a novel solution to the challenges of securing IoT data, devices and functionality for new and existing industry-specific safety critical systems.
- A Cognitive System and Method with accompanying supervision, analytics and prediction models that encapsulates these latter capabilities, with the end goal of high-fidelity security and integrity of Industrial IoT.
- New methods and tools for static code analysis of IoT devices, resulting in more efficient secure and safer IoT software development and V&V.

PROJECT STRUCTURE

N.A.



CIPSEC

*Enhancing Critical Infrastructure Protection with innovative
SECurity framework*

STATUS

Ongoing

BUDGET

€7,017,235

FUNDING

€5,258,316

START

May 2016

END

April 2019

CALL

H2020-DS-03-2015-1

CONTRACT No

700378

LEAD ORGANISATION

ATOS SPAIN

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WEBSITE

www.cipsec.eu

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 – Analysing 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

CLEVER Cities

CLEVER Cities - Co-designing Locally tailored Ecological solutions for Value added, socially inclusive Regeneration in Cities

STATUS

Ongoing

BUDGET

€14,864,688.84

FUNDING

€14,214,660.63

START

June 2018

END

May 2023

CALL

H2020-SCC-02-2016-2017

CONTRACT No

776604

LEAD ORGANISATION

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WEBSITE

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OBJECTIVES

With three quarters of the European Union's population living in cities and further increases expected, societies are increasingly facing socio-political shifts and marginalization. Limited availability of physical space, changing urban demographics, and increasing cultural diversity compound these challenges and create issues like high crime rates, social inequality, poverty, health threats, and unemployment. Some areas are particularly vulnerable, such as economically deprived, abandoned and neglected urban areas with a low share of green spaces. The Horizon2020 funded project "CLEVER Cities" responds to these challenges by designing and implementing locally tailored nature-based solutions (NBS) to foster sustainable and socially inclusive urban regeneration.

Coordinated by the City of Hamburg, CLEVER Cities (i.e. Co-designing Locally tailored Ecological solutions for Value added, socially inclusive Regeneration in Cities) involves 33 partners from Europe, South America, and China. The cities of Hamburg, London and Milan will implement a range of NBS interventions during the project, and partake in exchanges with six further cities (Sfântu Gheorghe, Quito, Madrid, Belgrade, Larissa, and Malmö) to share experiences, facilitate mutual learning and stimulate local NBS planning. In particular, the locally-tailored NBS will focus on improving human health and well-being, sustainable economic prosperity, social cohesion and environmental justice, and citizen security for urban populations. The deployment, monitoring, and replication of a range of ecological solutions will help CLEVER Cities to achieve the following objectives over its five-year duration.

CLEVER Cities aim to:

- increase and improve local knowledge of nature-based solutions,
- demonstrate that greener cities work better for people and communities,
- contribute data and information to EU policymaking, and ultimately
- promote and enable the uptake of nature-based solutions in urban planning world-wide.

PROJECT STRUCTURE

N.A.

STATUS

Ongoing

BUDGET

€6,329,619

FUNDING

€5,998,744

START

May 2017

END

April 2020

CALL

H2020-MG-5.1-2016

CONTRACT No

723265

LEAD ORGANISATION

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CONSULTING, NALLIAN NV,
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

Ongoing

BUDGET

€7,818,365

FUNDING

€3,474,482

START

September 2016

END

May 2019

CALL

H2020- S2R-CFM-IP4-01-2015

CONTRACT No

730846

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WEBSITE

http://projects.shift2rail.org/s2r_ip4_n.aspx?p=CO-ACTIVE

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**

Ongoing

BUDGET

€4,039,419

FUNDING

€1,795,150

START

September 2017

END

June 2022

CALL

H2020-S2R-CFM-IP4-02-2017

CONTRACT No

777599

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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**

Completed

BUDGET

€13,291,984

FUNDING

€5,906,957

START

September 2016

END

September 2018

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.

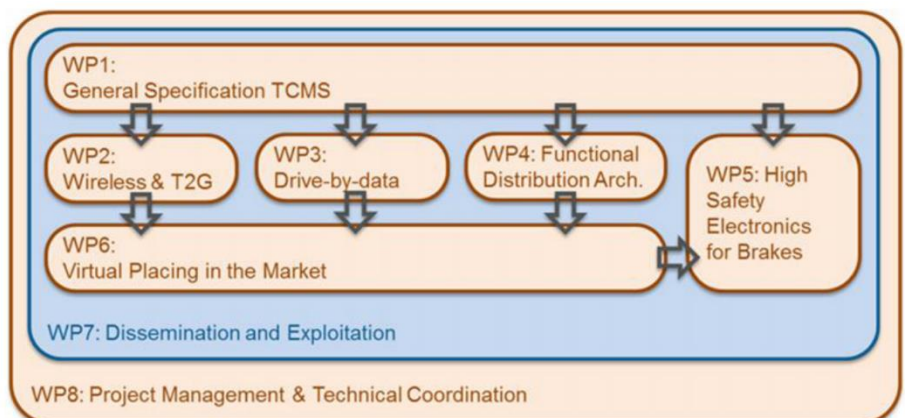
OBJECTIVES

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

**STATUS**

Completed

BUDGET

€10,575,889

FUNDING

€4,699,925

START

October 2018

END

March 2021

CALL

H2020-S2R-CFM-IP1-02-2018

CONTRACT No

826098

LEAD ORGANISATION

CAF

COORDINATOR

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SIEMENS, **SNCF****WEBSITE**https://projects.shift2rail.org/s2r_ip1_n.aspx?p=CONNECTA-2

CONNECTA-2

CONtributing to Shift2Rail's NExt generation of high Capable and safe TCMS and brAkes. Phase 2

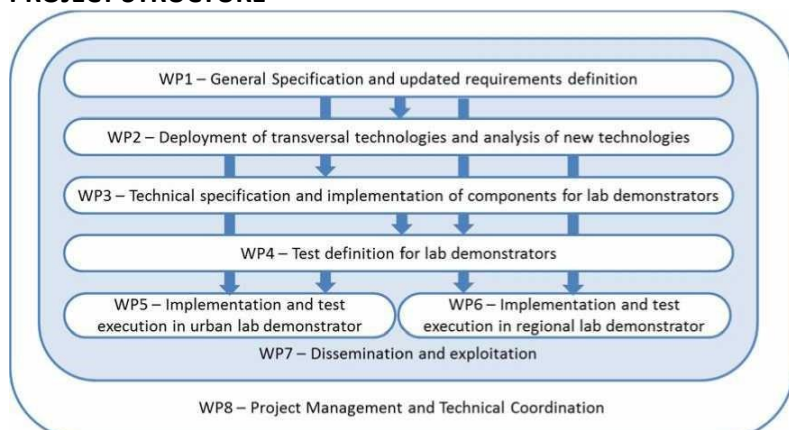
OBJECTIVES

CONNECTA-2 aims at contributing to the Shift2Rail's next generation of TCMS architectures and components, combining the new drive-by-data concept for train control together with wireless information transmissions. This project envisions paving the way towards a 50% increase in the availability of trains related to the functioning of train control and monitoring, a 50% reduction in cost, time and effort in certification, commissioning and maintenance phases, while at the same time developing the ability to implement SIL4 functions in the TCMS and supporting the development of the "virtual coupling" concept, which can dramatically increase the capacity of lines.

The high-level objective of the work is to continue the activities started in CONNECTA-1 to bring the technologies to TRL5 and deploying them in two laboratory demonstrators. CONNECTA-2 plans:

- To continue the development of wireless technologies for the train communication networks, including the wireless ECN, the wireless ETB, the train-to-ground communication and the train-to-train communication.
- To implement the new train-wide communication network (known as NG-TCN) for full TCMS support including the replacement of train lines, connecting safety functions up to SIL4 and support of "fail-safe" and "fail-tolerant" principles, to provide an optimal train network for TCMS and OMTS (Onboard Multimedia and Telematic Services) as well as communication mean for non-TCMS functions, as defined in CONNECTA-1.
- To continue with the standardisation of functional interfaces of functions (application profiles).
- To implement the Functional Open Coupling (FOC) concept to facilitate the coupling of two or more consists supplied by different manufacturers and which could have different train functions.
- To develop the simulation framework, defined by CONNECTA-1, in which all subsystems of the train can be simulated, allowing remote and distributed testing including hardware in-the-loop through heterogeneous communication networks.
- To implement the Functional Distribution Framework (fdf) to allow the new function-centric approach for the TCMS and the reduction of the number of onboard electronics and of complexity.
- To integrate into the NG-TCN safety critical functions.
- To validate non-railway standards and technologies for use in safety-related railway applications.

PROJECT STRUCTURE





CONNECTIVE

STATUS

Ongoing

BUDGET

€7,906,243

FUNDING

€3,513,534

START

September 2017

END

June 2022

CALL

H2020-S2R-CFM-IP4-01-2017

CONTRACT No

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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

**STATUS**

Ongoing

BUDGET

€5,323,407.50

FUNDING

€4,134,245

START

September 2018

END

February 2021

CALL

H2020-DS-SC7-DS-07-2017

CONTRACT No

786668

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 SYSTEM

WEBSITEwww.cyberwiser.eu**CYBERWISER.EU**

Civil Cyber Range Platform for a novel approach to cybersecurity threats simulation and professional training

OBJECTIVES

CYBERWISER.eu is a European initiative that addresses the need for effective, user-friendly environments dedicated to training of professionals in the field of cybersecurity. The project will consider the needs of both private and public end-users, preparing organisations' response and decision-making processes, especially in the evolving regulatory context, leveraging on state-of-the-art methodologies and tools successfully tested in operational environments and taking the advantage of a rigorous, high-impact validation phase with 3 full-scale pilots, one in academia, and two in critical infrastructures (energy and transport). A clear go-to-market strategy will be implemented to achieve sustainability within 18 months after project completion, owing to the open pilot stream active as part of the CYBERWISER.eu workplan.

CYBERWISER.EU will be an educational, collaborative, real-time civil cyber range platform where cybersecurity competitions will take place, making it the EU's reference, authoritative, independent cybersecurity platform for professional training. Users can play the role of attackers and/or defenders in different scalable and configurable scenarios, composed of a set of virtual resources representing a company ICT infrastructure.

The platform will be completely web-based, to facilitate adoption, collaborative support from end-users and continuous upgrade. CYBERWISER.EU expands and builds on the results and users community of the H2020 IA named WISER [2015-2017], thereby providing a jump-start situation from a consolidated raising awareness and past investment point of view.

The 9 domain-skilled partners from 7 European Countries bring relevant assets to the project and are complementary and include 3 full-scale pilots (2 of which in critical infrastructures), viz.: 1. energy distribution; 2. railroad transport; 3. High Education, in the specific context of a University Master course on cybersecurity. An influential Stakeholder Expert Board (SEB) supports the consortium.

The project will provide a set of innovative tools to generate highly detailed exercise scenarios simulating ICT infrastructures to be used for cybersecurity professional training, together with tools and solutions to simulate cyberattacks and defensive countermeasures and a set of highly descriptive economic models for cyber risk assessment and countermeasure suggestion, to boost user training and performance evaluation.

PROJECT STRUCTURE

N.A.



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STATUS

Completed

BUDGET

€1,498,150

FUNDING

€1,498,150

START

October 2016

End

September 2018

CALL

H2020-S2RJU-OC-2015-01-2

CONTRACT No

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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**

Completed

BUDGET

€3,924,800

FUNDING

€2,997,000

START

May 2015

END

April 2018

CALL

H2020-MG-2.1- 2014

CONTRACT No

636285

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GEOSOLUTIONS**COORDINATOR**

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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**

Completed

BUDGET

€999,822

FUNDING

€999,822

START

November 2016

END

June 2018

CALL

H2020-S2R-OC-IP5-02-2015

CONTRACT No

730811

LEAD ORGANISATION

UNIFE

COORDINATOR

Andrea DEMADONNA

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STADLER RAIL VALENCIA,
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TEKNISKA HOEGSKOLAN, **ADIF**,
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CONTROLS EUROPE

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

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

OBJECTIVES

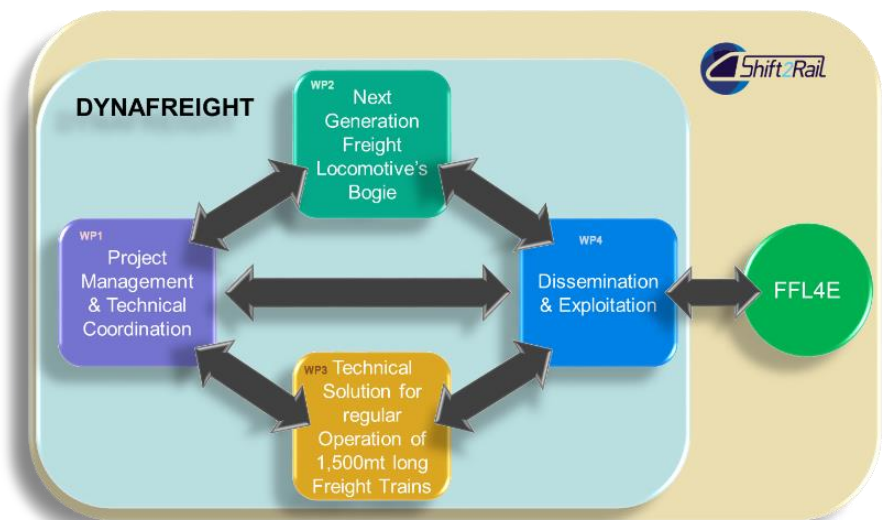
The goal of DYNAREIGHT (Innovative technical solutions for improved train DYNAMics and operation of longer FREIGHT Trains) is to provide the necessary inputs for the development of the next railway freight propulsion concepts within Shift2Rail. The project contributes to overcoming the problems of operational 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**

Ongoing

BUDGET

€3,999,102.50

FUNDING

€3,999,102.50

START

June 2018

END

November 2021

CALL

H2020-LCE-2017-SGS

CONTRACT No

774392

LEAD ORGANISATION

RINA CONSULTING SPA

COORDINATOR

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 BIRMINGHAM, LITHIUM
 BALANCE A/S, METRO DE
 MADRID, UNIVERSITY OF
 NEWCASTLE, **FFE**, UITP

WEBSITEwww.e-lobster.eu**E-LOBSTER**

Electric LOSses Balancing through integrated Storage and power Electronics towards increased synergy between Railways and electricity distribution networks

OBJECTIVES

There is a global need to increase the penetration of low-carbon technologies (LCTs) and, at the same time, there is a strong need to provide people, especially in urban centres, with sustainable form of transport, i.e. electric cars and trains, which are also connected to the same power distribution networks.

Both distributed generation with renewable power sources and electric transport have been developed so far as independent energy networks, both relying on the resilience and robustness of existing power supplies. However, their progressive penetration introduced an increasing degree of uncertainty on the direction of power flows and the power demand, which may have a very strong impact on the operation of distribution grids.

This is why E-LOBSTER proposes for the first time a substantial integration with renewable sources, electrified road and rail transport with advanced power electronics technologies and energy storage that will be managed by a unique Control Management system that will operate considering the mutual benefit of both transport and distribution network prioritizing distribution losses reduction.

E-LOBSTER main objectives are:

- Develop an innovative unique tool for the real-time monitoring of losses and energy consumption of power distribution networks and railway electrification networks validated through real data
- Develop advanced power electronics that will allow a unique management of the energy between traction substations and distribution network
- Develop and validate a new real-time optimized Railway to Grid/Grid to Railway (R+G) energy management aiming to optimize the interaction between electrified transport and distribution networks using shared assets
- Identify and validate the most suitable storage technologies for the mutual synergy interconnection of electrified transport and distribution network increasing the penetration of RES and promoting EVs solutions transferring the knowledge and expertise of the automotive sector to the power distribution and railway sectors
- Demonstrate E-LOBSTER innovative solutions and technologies in real conditions in the Metro of Madrid

PROJECT STRUCTURE

N.A.

**STATUS**

Ongoing

BUDGET

€3,834,911.25

FUNDING

€3,107,286.75

START

December 2017

END

November 2019

CALL

H2020-GALILEO-GSA-2017-1

CONTRACT No

776039

LEAD ORGANISATION**RFI****COORDINATOR**

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 DLR, **TRENITALIA**, UNIFE, **SNCF**,
 BUREAU VERITAS ITALIA

WEBSITEwww.ersat-ggc.eu**ERSAT GCC***ERTMS on SATELLITE Galileo Game Changer***OBJECTIVES**

ERSAT GGC (Galileo Game Changer) innovation project represents a fundamental contribution to the roadmap of the ERTMS for the adoption of the EGNSS satellite technology, already identified as one of the game-changer technologies of the ERTMS evolution. Particular focus is given to the certification process of the satellite assets to allow the ERTMS to operate seamlessly with Virtual Balises which are functionally equivalent to the physical balise in order to ensuring the end to end compatibility with the ERTMS. ERSAT GGC is linked with previous projects achievements on ERSAT EAV, NGTC, RHINOS and STARS co-funded by GSA and EC. The objective is to create a unique flow of information to bear fruits on the best exploitation of the EGNSS infrastructures already available and the new game-changer features of GALILEO that is expected to be fully operational by 2020.

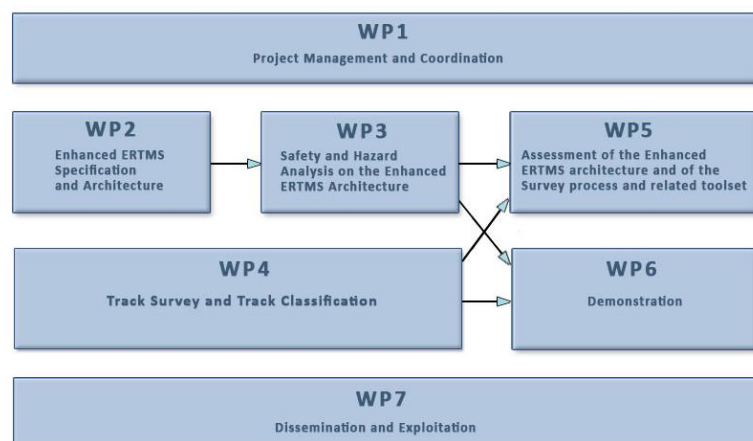
The Project's high-level objectives are the following:

- Validation of EGNSS assets and relevant certification process compatible with the ERTMS Standards
- Definition and Certification of a STANDARD Process, Methodology and the related Toolset for Classifying Track Areas as "Suitable" or "Not Suitable" for locating Virtual Balises;
- Consolidation and Certification of the Enhancement of the Functional ERTMS Architecture integrated with satellite-based Location Determination System (LDS).

Furthermore, ERSAT GGC will contribute to the standardization process & dissemination of results on the satellite and rail stakeholders which will be impacting on:

- the definition of new ERTMS TSI;
- the evolution of EGNSS requirements to implement efficiently virtual balises

All in all, the objective of ERSAT GGC is to agree the certification process and develop the tools to support the validation of the satellite technology in view of its operational exploitation.

PROJECT STRUCTURE

**STATUS**

Ongoing

BUDGET

€3,060,300.96

FUNDING

€3,060,300.96

START

April 2019

END

March 2023

CALL

H2020-MSCA-ITN-2018

CONTRACT No

812753

LEAD ORGANISATION

UNIVERSITEIT TWENTE

COORDINATOR

N.A.

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N.A.

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 UNIVERSITY OF NOTTINGHAM,
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 THALES NEDERLAND, THE
 INSTITUTE OF ELECTRICAL AND
 ELECTRONICS ENGINEERS,
NETWORK RAIL, Others

WEBSITE
www.etopia-itn.org
ETOPIA

*European Training network Of PhD researchers on Innovative EMI
 analysis and power Applications*

OBJECTIVES

Our modern society becomes highly interconnected where power supply is not only providing energy between many distributed sources and loads but are also a main path of interference, especially in large complex systems, platforms and facilities, where interoperability of the electronic systems has to be achieved. There is an urgent need to train new researchers with a closer interaction of electrical power and power electronics with information technology and communications equipment.

The ETOPIA consortium of key academic partners, supported by industry, has been brought together not only to train a sufficient number of qualified researchers but also to provide the fundamental research that underpins future technological developments. The detailed coordinated multidisciplinary multinational doctoral training program will provide the trainee researchers with a complete broad experience and at the same time allow them to develop and eventually lead their focused area of research. The program will focus on the development of novel methods to model, simulate, design, evaluate, measure and monitor.

ETOPIA will also develop corrective economical measures for a safe, reliable, efficient and greener electrical power distribution system in and between buildings and vehicles. Specific innovations expected to be achieved through ETOPIA are methodologies to optimize the design of complex electrical/ electronic installations with respect to compatibility and efficiency. Dissemination methods to realize optimal impact will include scientific publications, workshops, training of engineers in industry, and dissemination through newsletters, interviews, social media.

PROJECT STRUCTURE

WP1 - Management
 WP2 - Training
 WP3 - Dissemination
 WP4 - Outreach
 WP5 - Non-conventional modelling and measurements
 WP6 - Multi-domain optimisation
 WP7 - EM-Coexistence


STATUS

Ongoing

BUDGET

€3,375,017

FUNDING

€1,499,857

START

September 2016

END

June 2019

CALL

H2020-S2R-CFM-IP5-03-2015

CONTRACT No

730823

LEAD ORGANISATION

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WEBSITE

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

FFL4E

Future Freight Locomotive for Europe

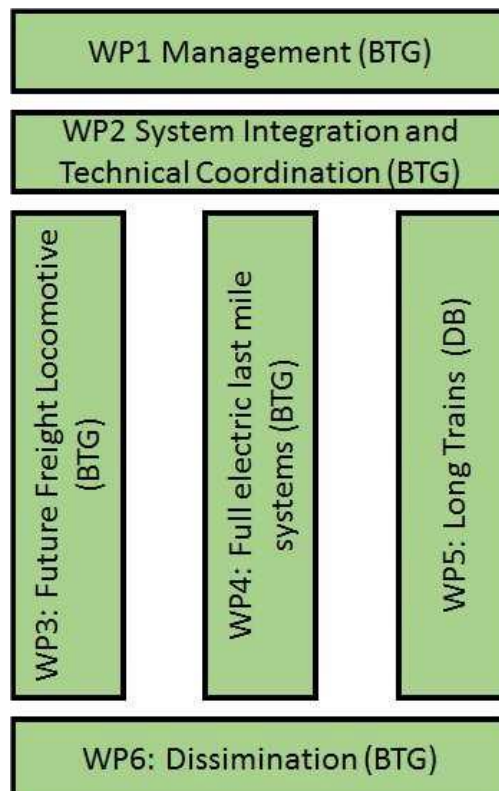
OBJECTIVES

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

Ongoing

BUDGET

€3,017,282

FUNDING

€1,340,880

START

September 2016

END

August 2019

CALL

H2020-S2R-CFM-CCA-02-2015

CONTRACT No

730818

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COORDINATOR

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DLR, TALGO, **SNCF**,
TRAFIKVERKET

WEBSITE

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

FINE1

Future Improvement for Energy and Noise

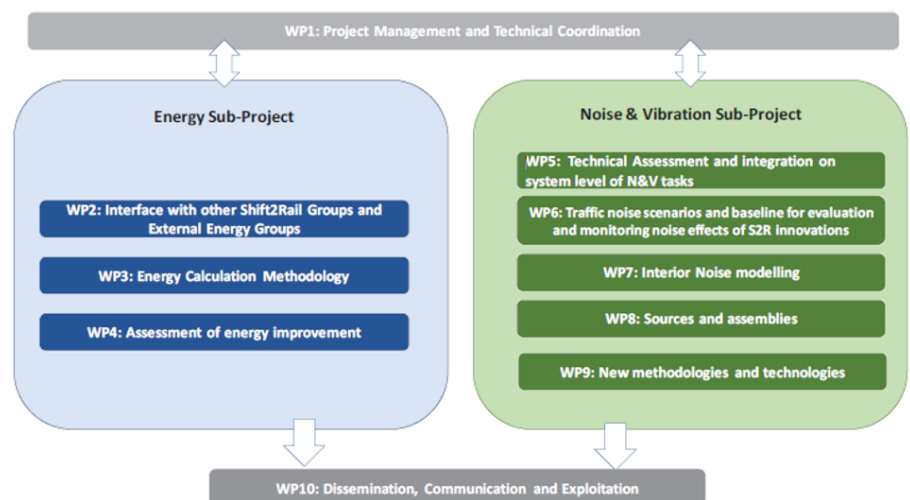
OBJECTIVES

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**

Ongoing

BUDGET

€3,880,324

FUNDING

€3,880,324

START

October 2016

END

September 2020

CALL

H2020-MSCA-ITN-2016

CONTRACT No

722509

LEAD ORGANISATIONECOLE POLYTECHNIQUE
FEDERALE DE LAUSANNE**COORDINATOR**

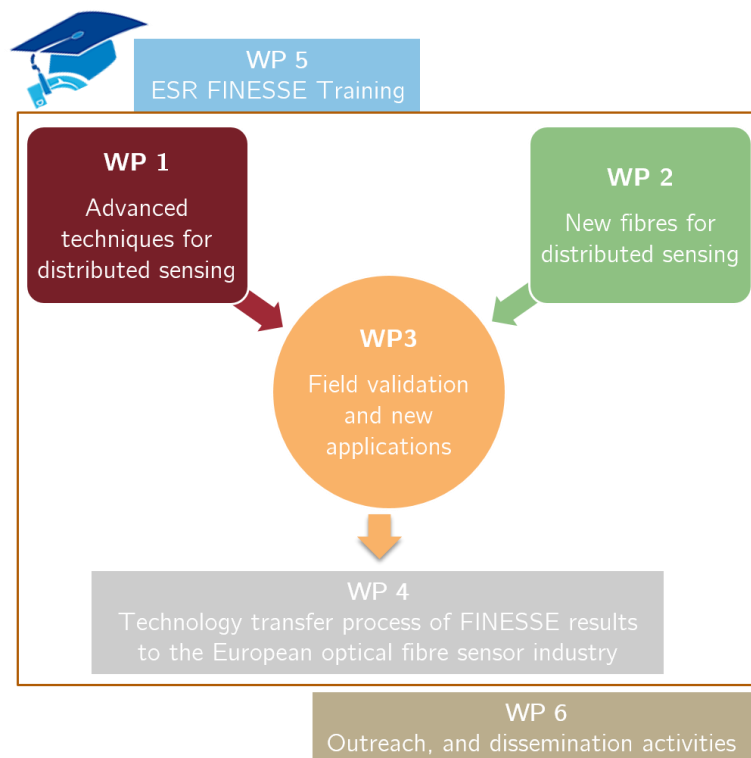
Dr. Can YAO

CONTACTfinesse@epfl.ch**PARTNERS**UAH, VUB, ANDRA,
UNIVERSITAT POLITECNICA DE
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

FORESEE

STATUS

Ongoing

BUDGET

€4,995,147.50

FUNDING

€4,995,147.50

START

September 2018

END

February 2022

CALL

H2020-MG-7-1-2017

CONTRACT No

769373

LEAD ORGANISATION

FUNDACIÓN TECNALIA
RESEARCH INNOVATION

COORDINATOR

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CEMOSA, LOUIS BERGER
SPAIN, INGENIERIA Y
CONSERVACION
CONTRAINCENDIOS, IP, AISCAT
SERVIZI, ERF, AUTOSTRADA
PER L'ITALIA, Others

WEBSITE

<http://foreseeproject.eu/>

FORESEE

*Future proofing strategies FOR RESilient transport networks
against Extreme Events*

OBJECTIVES

The FORESEE project is developing a toolkit to provide short- and long-term resilience schemes for rail and road corridors and logistics terminals that are able to reduce the magnitude and/or duration of disruptive events produced by humans or the nature.

The multidisciplinary team of experts working in the consortium will facilitate the use of methodologies and tools already existing in the market to study the risk and costs associated with the impact of extreme events. The research will also integrate satellite and terrestrial data in the analysis and assessment of hazards with their respective impact on passengers and freight terminals.

The innovative multimodal approach will deploy cutting-edge technologies able to deploy long-term asset management strategies. FORESEE will provide road authorities and managers with a solution to anticipate, absorb, adapt and rapidly recover from a potentially disruptive hazard during the entire lifecycle of the transport infrastructure: planning, design, construction, operation and maintenance.



Establish preventive maintenance and upgrading strategies able to improve resilience of transport infrastructures towards human (accidents) and natural hazards (extreme weather events, landslides and earthquakes)



Predict and alert of potential risk scenarios at different time scales considering age, conditions and residual life of engineering components



Reduce the social and economic impact on critical transport assets (bridges, tunnels, pavement, slopes, terminals) when those disruptive events happen



Facilitate the deployment of mobility contingency protocols for citizens and freight in such critical situations to ensure safe and efficient evacuation including emergency operations and contingency plans



Demonstrate positive costs and benefits balance associated to resilience investments during the full lifecycle of the infrastructure

PROJECT STRUCTURE

Not available


STATUS

Ongoing

BUDGET

€9,900,990

FUNDING

€4,400,000

START

September 2017

END

August 2020

CALL

H2020-S2R-CFM-IP5-01-2017

CONTRACT No

777402

LEAD ORGANISATION
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PARTNERS

DB, BOMBARDIER, CAP, ANSALDO STS, INDRA, CONTRAFFIC, CEIC, DLR, DIE BAHNINDUSTRIE, VIRTUAL VEHICLE, AVL, **EUROC (ÖBB Infra)**

WEBSITE

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

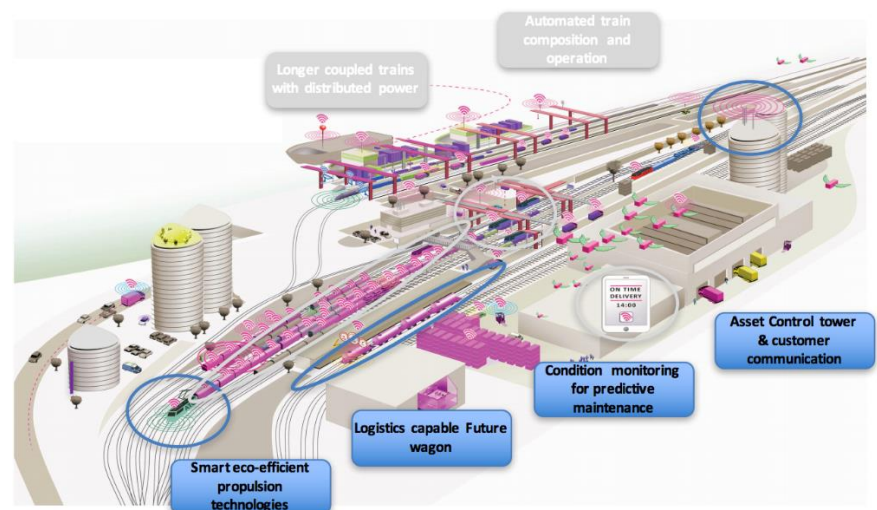
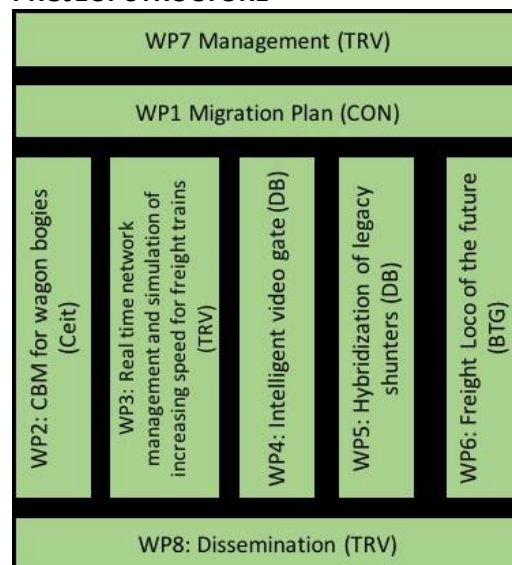
FR8HUB

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

Ongoing

BUDGET

€7,826,783

FUNDING

€3,478,222

START

September 2016

END

August 2019

CALL

H2020-S2R-CFM-IP5-01-2015

CONTRACT No

730617

LEAD ORGANISATION

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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:

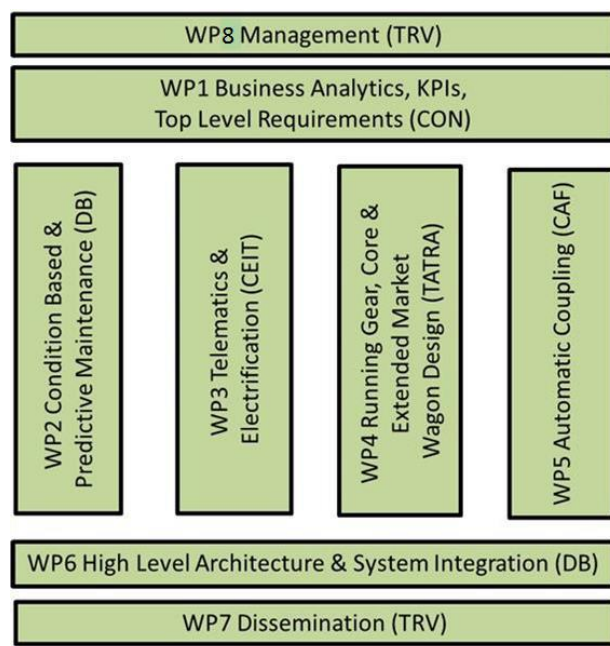
- A 10 % reduction in the cost of freight transport measured by tonnes per Km,
- A 20 % reduction in the time variations during dwelling, and
- increase attractiveness of logistic chains by making available 100 % of the rail freight transport information to logistic chain information sy
- stems.

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





FR8RAIL II

STATUS

Ongoing

BUDGET

€12,375,552.16

FUNDING

€5,499,695.38

START

May 2018

END

April 2021

CALL

S2R-CFM-IP5-01-2018

CONTRACT No

826206

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TRANSPORTS, WBN, CEIT, ACT
RESEARCH, PJM, MCL, INDRA
SISTEMAS, **SNCF**, ANSALDO
STS, KNORR-BREMSE,
TATRAVAGONKA

WEBSITE

https://projects.shift2rail.org/s2r_ip5_n.aspx?p=FR8RAIL%20ii

FR8RAIL II

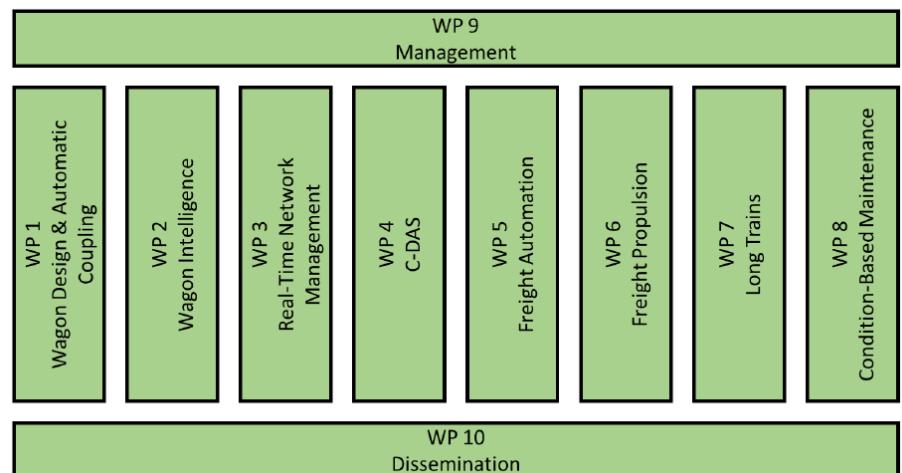
Digitalization and Automation of Freight Rail

OBJECTIVES

The objective of the FR8RAIL II project is to further develop technologies relevant for the rail freight sector to reach the goal highlighted in the S2R Master Plan. The work partly bases on results achieved in the foregoing projects of the AWP 2015-2017 (FFL4E, ARCC, FR8RAIL, FR8HUB) and seeks to increase the TRL of the specific technologies. Thus, to be consistent with the expected results, FR8RAIL II addresses following challenges:

1. New Automatic Couplers, provided with electrical power supply and data transmission functionalities
2. Telematics and Electrification for Condition Based Maintenance (CBM) and Cargo Monitoring System (CMS)
3. Improved methods for annual and short-term timetable planning in traffic operations will increase overall capacity and raise punctuality for both passenger and freight traffic.
4. Real-time network management to reduce or even eliminate manual communication
5. Future freight wagon design for the core and extended market
6. Freight automation with highly flexible freight propulsion systems
7. Distributed Power in freight trains
8. Connection of Automated Train Operation (ATO) and Connected Driver Advisory Systems (C-DAS) to the Traffic Management System (TMS)

PROJECT STRUCTURE



**STATUS**

Ongoing

BUDGET

€1,019,993.75

FUNDING

€1,019,993.75

START

December 2018

END

November 2020

CALL

H2020-S2RJU-OC-IP2-02-2018

CONTRACT No

826324

LEAD ORGANISATION

RADIOLABS

COORDINATOR

Alessandro NERI

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IFSTTAR, M3 SYSTEMS, **RFI**,
 UNIFE, BUREAU VERITAS
 ITALIA, CEDEX, INECO, GUIDE-
 GNSS

WEBSITE<http://gate4rail.eu/>

GATE4RAIL

GNSS Automated Virtualized Test Environment for RAIL

OBJECTIVES

GNSS Automated Virtualized Test Environment for Rail (GATE4Rail) deals with tasks TD2.4 and TD2.6 of the Shift2Rail Multi Annual Action Plan. Particularly, its main goals are: i) achieving a realistic characterization of the environment in terms of railway and GNSS infrastructures able to evaluate the performances and properties of some fail-safe train positioning components in nominal and fault conditions; ii) defining a common test process framework for zero on-site testing instead of testing on-site saving effort and time.

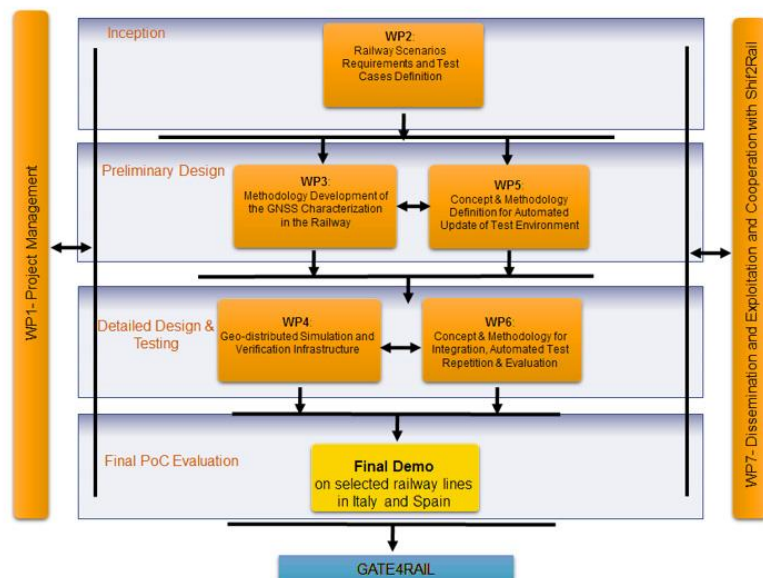
Concerning the first goal, GATE4RAIL will define and develop a geo-distributed simulation and verification infrastructure connecting remotely GNSS excellence centres and ERTMS/ETCS laboratories to evaluate the GNSS performances in the railway environment. Proper methodology and tools will be identified to simulate GNSS behaviour in different railway scenarios in nominal or in presence of global and local hazards.

In this sense, GATE4Rail offers the unique advantage to stress the global system in presence of very rare fault events instead of performing long and expensive measurement campaigns on field for detecting them and analysing their impact on ETCS. Then, a standardized method to derive and describe GNSS and railway test cases will be developed.

Concerning the second goal, GATE4RAIL will develop methodology and tools for automated update of tests environment, continuous integration, their automated repetition and evaluation through Model-Based System Engineering philosophy. It will ensure that the simulation infrastructure can be maintained and extended reducing the need for re-assessments, increasing the test environment efficiency. The entire process will account for the Notified Body requirements, so that in the future it can be approved by an independent Safety Assessor.

A demo on representative railway lines in Italy and Spain will be deployed at the end of the project to show the all functionalities and tools developed in GATE4Rail.

PROJECT STRUCTURE



**STATUS**

Completed

BUDGET

€2,000,000

FUNDING

€2,000,000

START

November 2016

END

October 2018

CALL

H2020- S2R-OC-IP4-01-2016

CONTRACT No

730844

LEAD ORGANISATION

UNIFE

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

WEBSITEwww.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

Ongoing

BUDGET

€4,002,356.61

FUNDING

€4,002,356.61

START

April 2019

END

March 2023

CALL

H2020-MSCA-ITN-2018

CONTRACT No

813883

LEAD ORGANISATION

STICHTING VU

COORDINATOR

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PARTNERS

UNIVERSITY OF NEWCASTLE,
GOETEBORGS UNIVERSITET,
UNIVERSITA DEGLI STUDI
ROMA TRE, TU DELFT, BEZALEL
ACADEMY OF ARTS AND
DESIGN, ROMA CAPITALE,
TRAFIKVERKET, ISRAEL
ANTIQUITIES AUTHORITY,
NORTH OF ENGLAND CIVIC
TRUST, DLR, ORGANIZATION
OF WORLD HERITAGE CITIES,
Others

WEBSITE

www.heriland.eu

OBJECTIVES

European countries have a long and successful history of conserving their rich heritage and landscape assets in town and country, and of capitalising on them culturally and economically. Throughout the 20th century, great progress was made in creating structures and promulgating principles to guide heritage and landscape conservation, but as the 21st century proceeds, society is challenged by new far-reaching changes. These include various forms of migration, greater digital connection, environmental degradation and climate change, shifts in the public/private balance in society at large, and a renewed pressure for growth. Confronted with such a fast-changing context, heritage management needs new ideas, tools and training to ensure that interdisciplinary, research-based heritage, landscape management and spatial planning are positively integrated with business activity, development and democratic decision making. Through HERILAND, a consortium of 7 key academic and non-academic organizations, with 21 partners in civil society and business, aims to empower a new generation of academics, policy makers, practitioners, professionals and entrepreneurs.

The overriding aim of HERILAND is the empowerment of a new generation of academics, policy makers, practitioners, professionals and entrepreneurs. This new generation must devise and guide transdisciplinary, cross-sectoral and mainstreamed planning and design strategies for regenerating European heritage and landscape, foster social inclusiveness, and create socially, economically and environmentally sustainable future landscapes.

Our research design positions heritage in the frame of five transformation processes which we identify as key challenges to the heritage management of the 21st century: The Spatial Turn, Democratisation, Digital Transformations, Shifting Demographies and Contested Identities, and Changing Environments. Using this framework, 15 PhD researchers will be provided with advanced training combining theoretical and instrumental knowledge in a series of research seminars, living labs and secondments with our public and private partners. By doing this, HERILAND will establish a new pan-European, trans-national, interdisciplinary and cross-sectoral research and training standard, which will be codified in a HERILAND Handbook for Heritage Planning and instrumentalised through an ongoing HERILAND College for Heritage Planning.

PROJECT STRUCTURE

Not available



IMPACT-1

STATUS

Completed

BUDGET

€886,819

FUNDING

€299,951

START

September 2016

END

February 2018

CALL

H2020-S2R-CFM-CCA-01-2015

CONTRACT No

730816

LEAD ORGANISATION

DLR

COORDINATOR

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PARTNERS

ANSALDO STS, BOMBARDIER, CAF, **DB**, SIEMENS, **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

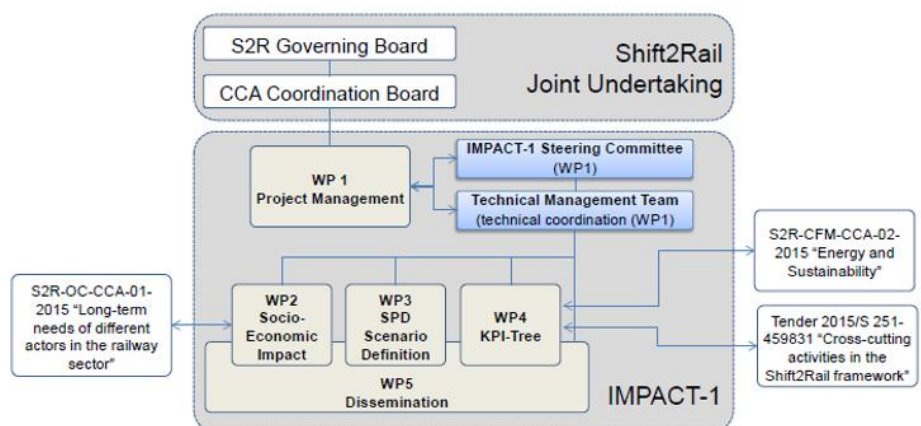
The objective of IMPACT-1 is to help maximise the impact of Shift2Rail by analysing the socioeconomic impact of the S2R developments, identifying the future application use cases by System platform demonstrator scenarios and assess the impact of the development by using Key Performance Indicators.

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

Ongoing

BUDGET

€7,102,821

FUNDING

€3,153,652

START

September 2017

END

August 2022

CALL

H2020-S2R-CFM-CCA-01-2017

CONTRACT No

777513

LEAD ORGANISATION

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PARTNERS

DLR, ANSTADO STS,
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(CP, TCDD), DB, HACON,
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

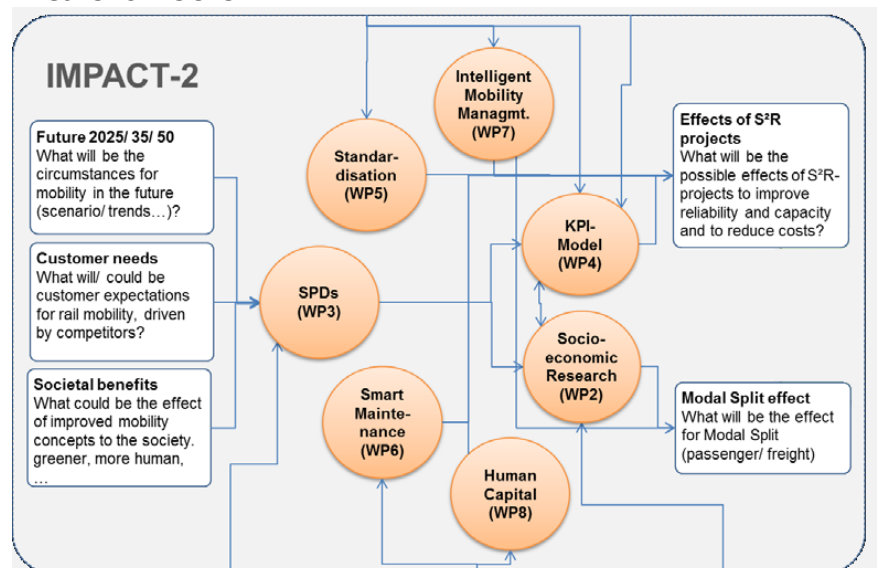
OBJECTIVES

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



IN2DREAMS

STATUS

Ongoing

BUDGET

€2,195,715

FUNDING

€2,195,715

START

September 2017

END

August 2019

CALL

H2020-S2R-OC-IP3-01-2017

CONTRACT No

777596

LEAD ORGANISATION

UNIFE

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PARTNERS

UNIVERSITY OF BRISTOL,
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GENOVA, DATVISION,
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RINA, PURELIFI, UNIVERSITÄT
KONSTANZ, RFI, ISKRATEL,
IASA, LEM

WEBSITE

www.in2dreams.eu

IN2DREAMS

INtelligent solutions 2ward the Development of Railway Energy and Asset Management Systems in Europe

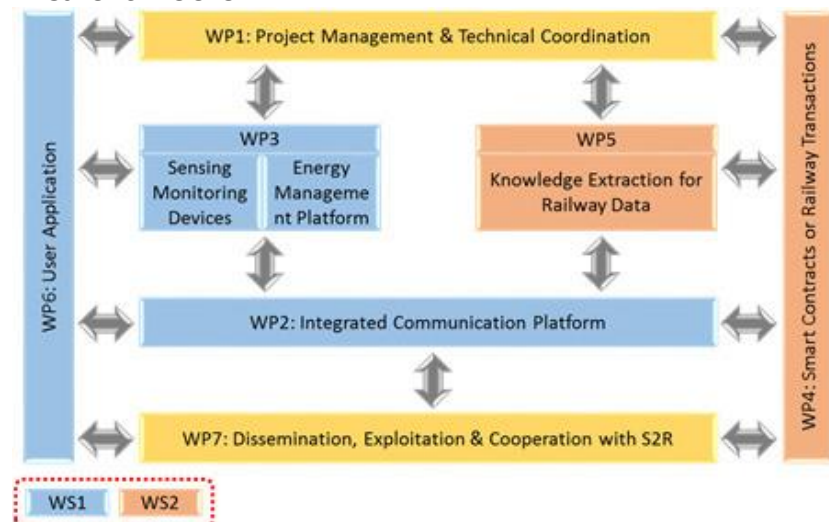
OBJECTIVES

The predicted growth of transport, especially in European railway infrastructures, is expected to introduce a dramatic increase in freight and passenger services by the end of 2050. To support sustainable development of these infrastructures, novel data-driven ICT solutions are required. These will enable monitoring, analysis and exploitation of energy and asset information for the entire railway system including power grid, stations, rolling stock and infrastructure. IN2DREAMS (INtelligent solutions 2ward the Development of Railway Energy and Asset Management Systems in Europe) will address these challenges through two distinct work streams: WS1, focusing on the management of energy-related data and WS2, focusing on the management of asset-related data.

IN2DREAMS will develop and demonstrate a modular cloud-based open data management platform (ODM) facilitating ubiquitous support of both energy and asset services. WS1 will provide energy metering services through a dynamically reconfigurable platform offering improved reliability, ease of monitoring and on-the-fly optimisation for the entire railway system.

This will include a heterogeneous secure and resilient telecommunication platform comprising both wireless and wireline technologies converging energy and telecom services. This infrastructure will interconnect a plethora of monitoring devices and end-users to the railway control centre and will include an ODM platform for data collection, aggregation and analysis, able to scale with the railway operators needs. This platform will be non-intrusive exploiting advanced signal processing and intelligent learning algorithms. Within WS2, IN2DREAMS will concentrate on defining IT solutions and methodologies for business-secure decision support in the field of data processing and analytics for railway asset management. The general aim is to study and proof the application of smart contracts in the railway ecosystems, by addressing also legal and regulatory implications, and advanced visual and rule-based data analytics, including metrics for performance assessment.

PROJECT STRUCTURE



**STATUS**

Completed

BUDGET

€17,998,546

FUNDING

€17,998,546

START

May 2015

END

April 2018

CALL

H2020-MG-2.1-2014

CONTRACT No

635900

LEAD ORGANISATION**NETWORK RAIL****COORDINATOR**

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PARTNERS

ALSTOM, ANSALDO STS, BOMBARDIER, RFI, MERMEC, SIEMENS, STRUCKTON, **TRAFIKVERKET**, THALES, UNIFE, ACCIONA, **ADIF**, AZD PRAHA, CAF, EMTE, D'APPOLONIA, **DB**, DLR, EVOLEO, **SNCF**, **SYSTRA**, **ÖBB INFRA**, EFRTC, Others

WEBSITE

www.in2rail.eu

IN2RAIL*Innovative Intelligent Rail***OBJECTIVES**

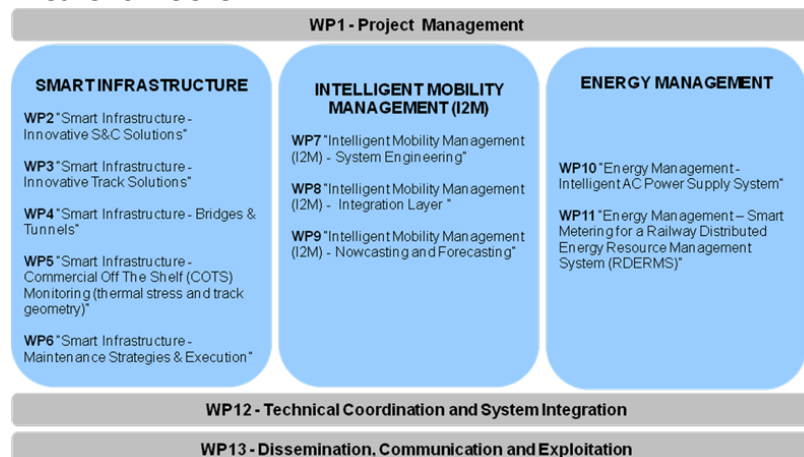
IN2RAIL is to set the foundations for a resilient, consistent, cost-efficient, high capacity European network by delivering important building blocks that unlock the innovation potential that exists in SHIFT2RAIL: innovative technologies will be explored and resulting concepts embedded in a systems framework 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

**STATUS**

Completed

BUDGET

€16,405,562

FUNDING

€7,290,632

START

September 2016

END

August 2019

CALL

H2020-S2R-CFM-IP3-02-2016

CONTRACT No

730569

LEAD ORGANISATION

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PARTNERS

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THALES, **TRAFIKVERKET**, **DB**,
EUROC (INFRAESTRUTURAS DE PORTUGAL, ÖBB, SBB, TCDD), STRUCKTON, CEMOSA,
DLR, **SNCF**, Others

WEBSITE

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

IN2SMART

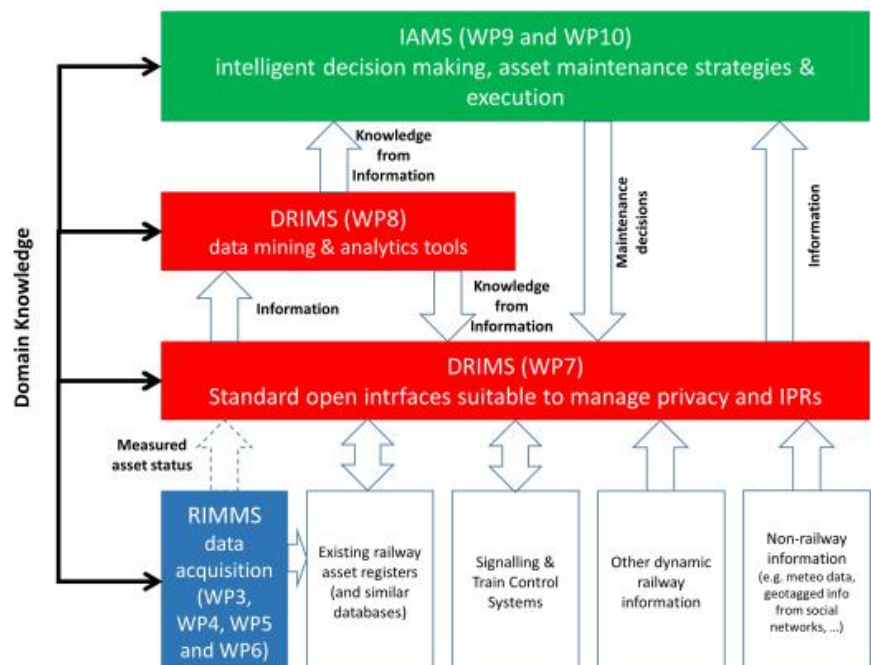
Intelligent Innovative Smart Maintenance of Assets by integrated Technologies

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

Ongoing

BUDGET

€13,440,000

FUNDING

€5,972,723

START

September 2017

END

August 2022

CALL

H2020-S2R-CFM-IP3-01-2017

CONTRACT No

777515

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WEBSITE

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

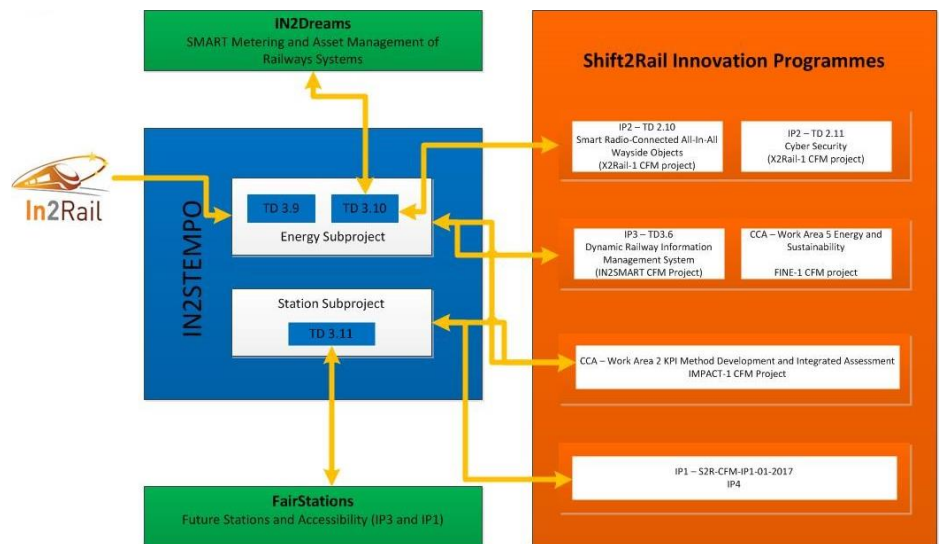
IN2STEMPO

Innovative Solutions in Future Stations, Energy Metering and Power Supply

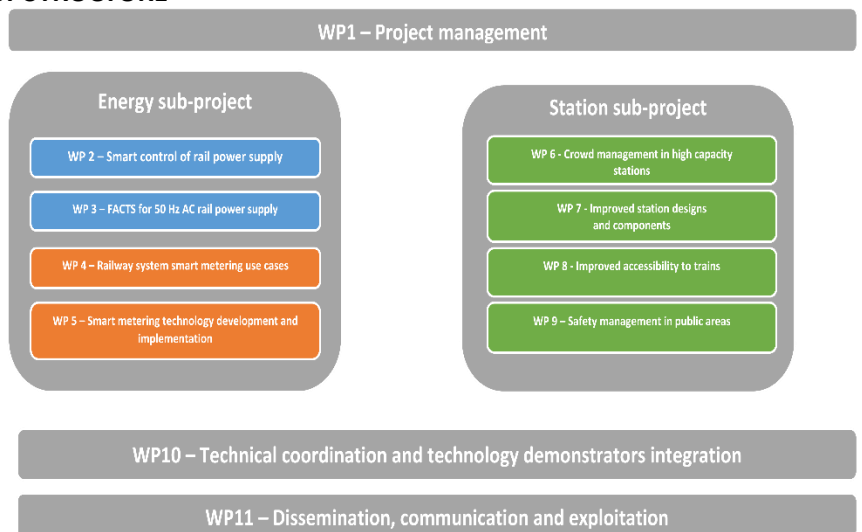
OBJECTIVES

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



IN2TRACK

STATUS

Completed

BUDGET

€6,366,942

FUNDING

€2,799,993

START

September 2016

END

August 2019

CALL

H2020-S2R-CFM-IP3-01-2016

CONTRACT No

730841

LEAD ORGANISATION

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EUROC (ÖBB INFRA,
INFRAESTRUTURAS DE
PORTUGAL, SBB, TCDD, FTA,
SZ, BLS) NETWORK RAIL,
RAILENIUM, 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

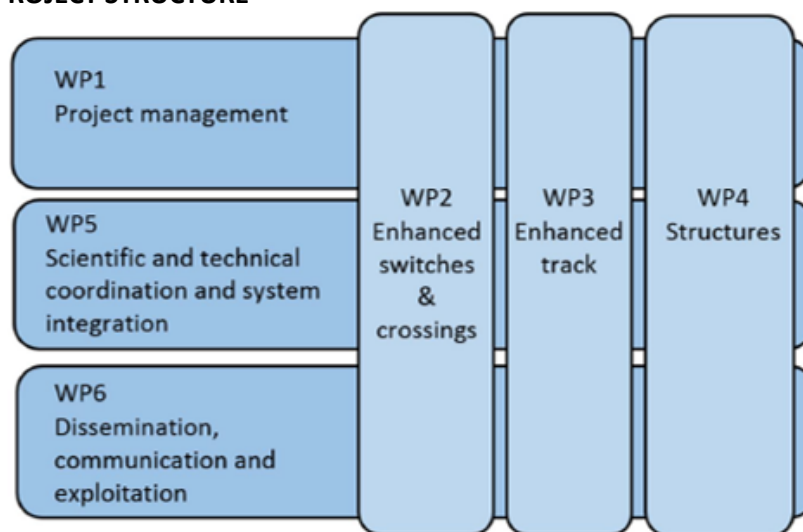
The main objective of In2Track project is to set the foundations for a resilient, consistent, cost-efficient, high capacity European network by delivering important building blocks that unlock the innovation potential that have been identified as part of the Shift2Rail Innovation Programme 3.

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





IN2TRACK2

STATUS

Ongoing

BUDGET

€30,162,671.14

FUNDING

€13,409,656.14

START

November 2018

END

April 2021

CALL

S2R-CFM-IP3-01-2018

CONTRACT No

826255

LEAD ORGANISATION

NETWORK RAIL

COORDINATOR

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PARTNERS

ACT RESEARCH, ACCIONA CONSTRUCTION, ANSALDO STS, CEMOSA, **DB**, FCP, RAILENIUM, GETZNER, **EUROC (IP, ÖBB Infra, PRORAIL, TCDD, SZ)**, VIRTUAL VEHICLE, BRITISH STEEL, **TRAFIKVERKET, SNCF**, MCL, PLASSER & THEURER, KIRCHDORFER, UNIVERSIDAD DEL PAIS VASCO, UNIVERSIDADE DO MINHO, Others

WEBSITE

https://projects.shift2rail.org/s2r_ip3_n.aspx?p=IN2TRACK2

IN2TRACK2

Research into enhanced track and switch and crossing system 2

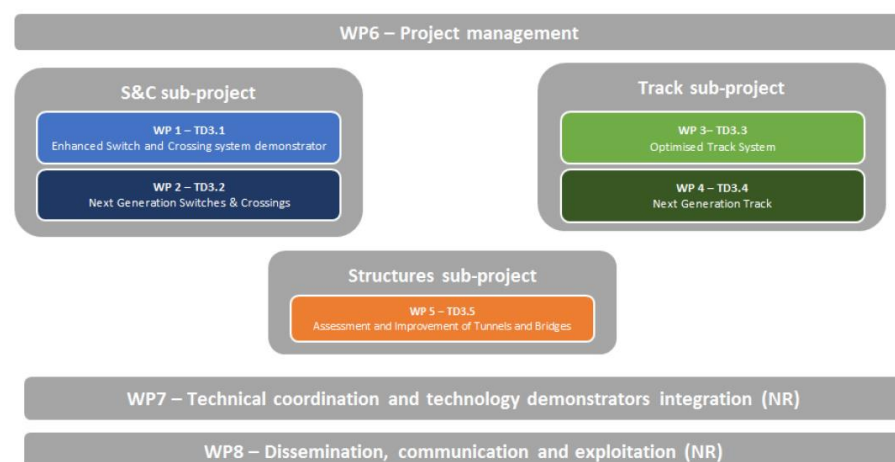
OBJECTIVES

The IN2TRACK2 proposal addresses the topic of “Research into optimised and future railway infrastructure” of the 2018 HORIZON 2020 SHIFT2RAIL Call for proposals for the Joint Undertaking Members (S2R-CFM-IP3-01-2018). IN2TRACK2 deals with rail infrastructure sub-system and covers all the works on Switch & Crossing (S&C), Track and Structures (Bridges and Tunnels) included in the SHIFT2RAIL Innovation Programme 3 (including the project IN2TRACK) and contributes to the full longer-term SHIFT2RAIL objectives. IN2TRACK2 represents the opportunity to choose some high-risk, innovative activities from the current SHIFT2RAIL work programme for development under intensive collaboration as the right path for success.

IN2TRACK2 aims to reduce lifecycle costs, improve reliability and punctuality, whilst increasing capacity, enhancing interoperability and improving the customer experience. The structure of the work plan is designed around the development of a certain number of well-focused technological innovations in several areas (S&C, Track and Structures), each and all together, will contribute to achieve the desired impact at the overall railway system level.

The IN2TRACK2 proposal is organised around three technical sub-projects, which are interconnected: S&C, Track and Structures. S&C activities aim at both improving the operational performance of existing S&C and providing radical new S&C system solutions that deliver a step-change in performance of the asset. The IN2TRACK2 Track activities aim at both exploring new track construction to optimise the today track system and improving the track system substantially to provide a step change in performance. The IN2TRACK 2 Bridges and Tunnels activities aim at improving methods and repair techniques to reduce costs, improve quality and extend the service life of structures. By enhancing S&C, Track and Structures, IN2TRACK2 contributes to all of the expected impacts identified in the Shift2Rail Annual Work Plan 2018.

PROJECT STRUCTURE



**STATUS**

Ongoing

BUDGET

€1,218,006.25

FUNDING

€1,204,006.25

START

October 2018

END

September 2020

CALLH2020-MG-2-4-2018-
SingleStage-INEA**CONTRACT No**

824269

LEAD ORGANISATION

RIJKSWATERSTAAT

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MINISTERSTWO
INFRASTRUKTUR, MINISTERIO
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GEWEST, ANAS, DANISH ROAD
DIRECTORATE, LATVIJAS
VALSTS CELI, BMVI, BMVIT,
TRAFIKVERKET, Others

WEBSITEwww.i4df.eu**infra4Dfuture***Infrastructure for the Future***OBJECTIVES**

infra4Dfuture is a 24-month project under the H2020 topic of MG-2-4-2018-“Infrastructure Innovation for the Future”. infra4Dfuture will develop a demand-driven overarching strategy and coordination mechanism for the modernization of transport infrastructure including a shared strategic vision on future infrastructure capabilities and common pathways for innovation development and implementation.

Facing a variety of emerging challenges, such as climate change, resilience, ageing infrastructure, maintenance, digitalisation, automation, energy and electrification, the National Transport Infrastructure Authorities (NTIA) have urgent requirements for infrastructure innovation. In view of the long cycle times in infrastructure management and the rapid mounting pressure from these challenges, there is a need for fast delivery of ready-to-implement, cost-effective innovative solutions matching the requirements of the NTIA that jointly build the TEN-T network.

The infra4Dfuture consortium encompasses 20 partners from 17 countries, 19 of them being NTIA, joining forces to develop:

- a strategic coordination mechanism aiming to deliver a concerted cooperation and collaboration across a portfolio of relevant European and national innovation programmes and initiatives;
- a shared strategic vision on future infrastructure capabilities, each capability encompassing a series of innovation focus areas for innovation.

infra4Dfuture is based on a sound and coherent consultation and dialogue process with relevant stakeholders. This process will be structured in a sequence of strategic, decision-making conferences and a supporting, tactical sequence of expert workshops and regional events. These will culminate in the founding of the infra4Dfuture Stakeholder Platform for Infrastructure Innovation and Implementation (ISPIII) at the TRA 2020. ISPIII will ensure a continuance of the coordination mechanism and shared vision beyond the duration of the action. Follow-up ISPIII events will take place at the consecutive biannual TRA conferences.

PROJECT STRUCTURE

Not available



Linear infrastructure efficiency improvement by automated learning and optimized predictive maintenance techniques

STATUS

Completed

BUDGET

€3,183,243.75

FUNDING

€3,183,243.75

START

May 2015

END

April 2018

CALL

H2020-MG-8.1a-
2014_TwoStages

CONTRACT No

636496

LEAD ORGANISATION

FRAUNHOFER

COORDINATOR

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PARTNERS

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RESZVENYTARSASAG,
UNIVERSIDAD DE SEVILLA,
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IP

WEBSITE

www.infralert.eu

INFRALERT

Linear infrastructure efficiency improvement by automated learning and optimised predictive maintenance techniques

OBJECTIVES

INFRALERT aims to develop an expert-based information system to support and automate infrastructure management from measurement to maintenance. This includes the collection, storage and analysis of inspection data, the determination of maintenance tasks necessary to keep the performance of the infrastructure system in optimal condition, and the optimal planning of interventions.

The major challenges of INFRALERT are:

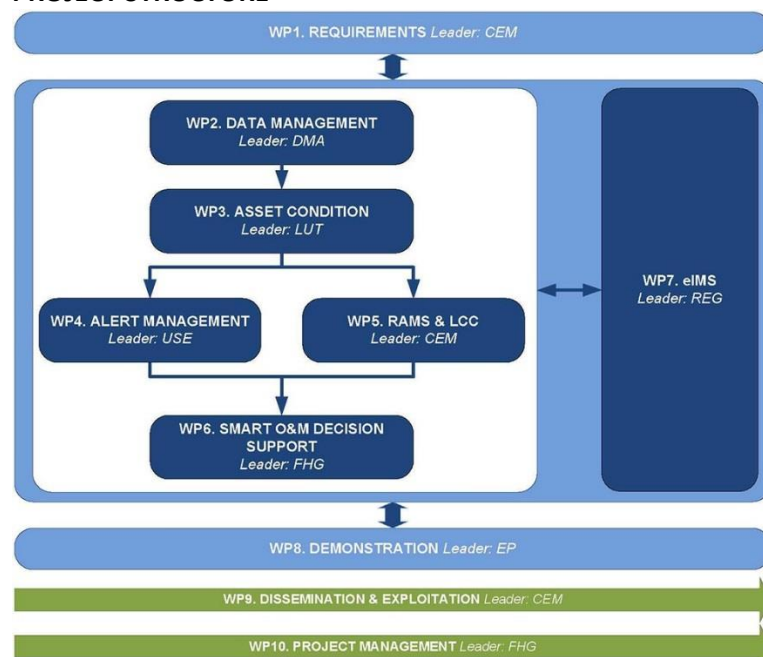
- Developing the information technologies and standard procedures applicable to linear transport systems in general.
- Developing expert-based toolkits built on artificial intelligence and optimization techniques to support decision making in maintenance planning, renewal and new construction.
- Integrating all previous models and tools in a cloud-based framework compatible with existing asset management systems.

The main outcomes of INFRALERT will be:

- Ensuring service reliability and safety by minimising incidences and failures of decaying assets
- Keeping and increasing the availability by optimising operational maintenance interventions and strategic long-term decisions on new construction
- Ensuring the operability under traffic disruptions due to interventions.

The INFRALERT developments will be demonstrated in two real-world pilots chosen for their potential for replication: a railway network in Sweden and a road network in Portugal. In both cases, extensive data from auscultation campaigns are available since some years ago. The empirical development of the whole project will be based on these pilot cases.

PROJECT STRUCTURE





INNOWAG

INNOvative monitoring and predictive maintenance solutions on lightweight WAGon

STATUS

Completed

BUDGET

€1,500,562.50

FUNDING

€1,500,562.50

START

November 2016

END

June 2019

CALL

S2R-OC-IP5-03-2015

CONTRACT No

730863

LEAD ORGANISATION

NEWRAIL

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LUCCHINI RS, NEWOPERA,
PERPETUUM, POLITECNICO DI
MILANO, TU BERLIN, UNIFE,
UVAIUD, **CD VUZ**

WEBSITE

<http://newrail.org/innowag/>

OBJECTIVES

The aim of the INNOWAG project is to develop intelligent cargo monitoring and predictive maintenance solutions integrated on a novel concept of lightweight wagon, which would respond to major challenges in rail freight competitiveness, in relation to the increase of transport capacity, logistic capability and an improved RAMS and lower LCC.

The INNOWAG project will determine how to effectively integrate innovative technologies for cargo condition monitoring into a novel high-performance lightweight freight wagon, supported by effective health monitoring technologies, and predictive maintenance models for sustainable and attractive European rail freight. The development of novel technology concepts and predictive maintenance models and procedures will be separately addressed by the INNOWAG work streams.

The INNOWAG project will work towards increasing rail freight competitiveness and the development of the next generation of lightweight and intelligent freight wagons by addressing specific challenges in the three essential areas, identified by the call, through three subsequent work streams, namely:

- Work Stream 1 (WS1): Cargo condition monitoring;
- Work Stream 2 (WS2): Wagon design; and
- Work Stream 3 (WS3): Predictive maintenance.

Moreover, INNOWAG will consider the compatibility between the solutions proposed and researched in the three areas, as well as their integration into a novel wagon concept.

PROJECT STRUCTURE

Work Stream 1 (WS1): Cargo condition monitoring

Work Stream 2 (WS2): Wagon design

Work Stream 3 (WS3): Predictive maintenance

**STATUS**

Completed

BUDGET

€12,025,000

FUNDING

€12,025,000

START

May 2015

END

April 2018

CALL

H2020-MG-2.2-2014

CONTRACT No

636078

LEAD ORGANISATION

UNIFE

COORDINATOR

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 UPC, HERE GLOBAL, CEA,
 UNIVERSITY OF NOTTINGHAM,
 EPF, **RSSB**, CNC, UITP, VBB,
 TMB, CYBERNETICA,
 D'APPOLONIA, ILUNION
 ACCESIBILIDAD, ESTUDIOS Y
 PROYECTOS, Others

WEBSITEwww.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:

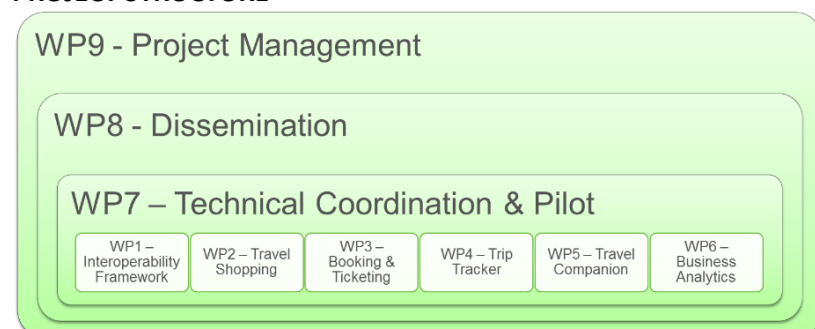
- the traveller is placed at the heart of innovative solutions, accessing all multimodal travel services (shopping, ticketing, and tracking) through its travel-companion.
- An open published framework is providing full interoperability whilst limiting impacts on existing systems, without prerequisites 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 marketplace, guaranteeing the economic self-sustainability of these e-services in the long-term.

PROJECT STRUCTURE

**STATUS**

Ongoing

BUDGET

€599,955

FUNDING

€599,955

START

December 2018

END

November 2020

CALL

H2020-S2R-OC-IP5-01-2018

CONTRACT No

826087

LEAD ORGANISATIONUNIVERSITY OF ROME TOR
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INGEGNERIA, TÜV SÜD,
FUNKWERK**WEBSITE**<https://www.marathon2operation.eu/web/>**M20***MAke RAil The HOpe for protecting Nature 2 future OPERATION***OBJECTIVES**

M20 project, financed by Shift2Rail initiative, is a step further to implement and to overcome the results of the Marathon project which has shown the feasibility of the long heavy consist created by coupling two trains with distributed traction: one locomotive (Traction Unit) at the head of the train and one other remote controlled in the middle. The Marathon train, tested twice in France in 2014, has a total length of 1524m, and is composed by 72 wagons for a total of 210 TEUs carrying 4036 tons. M20 aims at overcoming the configurations of the Marathon project with long and heavy consists involving up to four active locos. The project develops and delivers a reliable radio communication system based on GSM-R, compatible with various types of locomotives, and simulates the in-train forces in all possible operational situations ensuring safety and security. The consortium incorporates partners of the FP7 Marathon project having already experienced the tests performed in 2014 and the specialist of TrainDy, a software that simulates the in-train forces in all various operational situations in nominal and degraded modes. A qualifying part of the M20 project development is the intense collaboration with the partners of the FR8RAIL II project. This synergy will deliver the safety and certification-related (TRL5) part necessary for the running of two test trains in 2019 and 2020, so that the solutions developed are ready for exploitation into the marketplace. The M20 proposed solution is aimed to be compatible with various suppliers of GSM-R and its safety analysed by NIER Ingegneria and assessed by TÜV SÜD. The solution is integrated in the train DPS and the safety of the system is studied to cope with the various operational situations. Having set the radio communication system, the project defines the main possible train consists characteristics in terms of speed, type of wagons, acceptable load and its distribution along the train by using TrainDy simulations to ensure that the consist runs safely. These simulations will be monitored by Nier Ingegneria in terms of safety to ensure that the various hazards have been correctly taken into consideration while performing the simulations and that the adequate mitigations have been elaborated. M20 project results and developments will be properly disseminated to interested stakeholders and general public in order to raise awareness and boost consensus.

PROJECT STRUCTURE

WP1 – Project Management
 WP2 – System definition to transmit traction and braking commands
 WP3 – Simulation of in-train forces within an integrated safety analysis
 WP4 – Preliminary assessment and support for certification
 WP5 – Dissemination, exploitation of results and Roadmap for implementation

**STATUS**

Completed

BUDGET

€3,309,968

FUNDING

€3,309,968

START

June 2015

END

May 2018

CALL

H2020-MG-7.2a-2014

CONTRACT No

636281

LEAD ORGANISATIONMTA-MOBILITY, TICKETING &
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N.C.

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PARTNERSCARD4B – SYSTEMS,
DIGIMOBEE, **DB SYSTEL**, CHESS
IT INTERNATIONAL**WEBSITE**<http://masai.solutions/>**MASAI***Mobility based on Aggregation of Services and Applications***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**

Ongoing

BUDGET

€7,136,979

FUNDING

€7,136,979

START

May 2017

END

October 2020

CALLH2020-MG-3.5-2016-Two-
Stages**CONTRACT No**

723430

LEAD ORGANISATION

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HEIJMANS, SWOV, UNIVERSITY
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CRANFIELD UNIVERSITY,
CYGNIFY, **TRAFIKVERKET**,
Others**WEBSITE**www.mebesafe.eu

MeBeSafe

Measures for behaving safely in traffic

OBJECTIVES

Navigating traffic is mostly habitual. Our behaviour neither requires a lot of elaborate conscious decision-making, nor is it purely automatic/reflexive. However, most current measures intended to get traffic users to behave safer appeal to our deliberate self (awareness campaigns, speed signs), act autonomously on our behalf (autonomous braking, traffic lights), or seek to “assist” us by presenting feedback/information (Forward Collision Warning, roadside speed displays). However, the latter category of measures is often not effective as users either switch them off or do not act on the information provided.

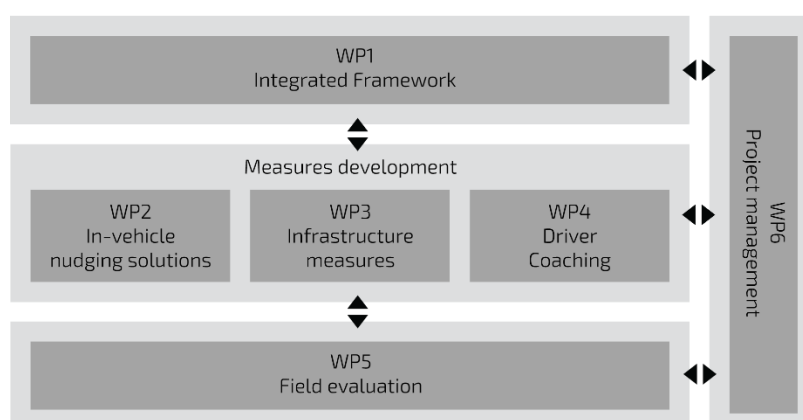
MeBeSafe is looking to directly change our habitual traffic behaviour using “nudging”. This concept from behavioural economics relates to subconsciously stimulating us to make a desired choice, without forcing us if we want to go a different way. Nudging measures are less invasive, give the user choice (but predispose him to make a desired choice) and can be provided earlier in the chain of events leading to a critical situation.

We plan to implement nudging feedback both for in-vehicle Advanced Driver Assistance Systems (ADAS, existing or close-to-market), and through roadside infrastructure (e.g. measures directed at cyclists). Currently no roadside equivalent of ADAS exists, and we will prototype and demonstrate one version.

We will prospectively analyse the effectiveness of suggested nudging measures first by modelling, followed by controlled experiments. We will furthermore conduct a field trial to evaluate the long-term learning effect for one proposed nudging measure.

Our consortium includes automotive OEMs and suppliers, road infrastructure and fleet owners, SME’s involved in traffic data analysis, and leading organisations in traffic safety research and modelling.

PROJECT STRUCTURE





MOMIT
MULTI-SCALE OBSERVATION
AND MONITORING OF RAILWAY
INFRASTRUCTURE THREATS

STATUS

Completed

BUDGET

€599,172.50

FUNDING

€599,172.50

START

September 2017

END

August 2019

CALL

H2020-MG-3.5-2016-Two-
Stages

CONTRACT No

777630

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WEBSITE

www.momit-project.eu

MOMIT

Multi-scale Observation and Monitoring of railway Infrastructure Threats

OBJECTIVES

The MOMIT project aims at developing and demonstrating a new use of remote sensing technologies for railway infrastructures monitoring. MOMIT solutions will mainly aim at supporting the maintenance and prevention processes within the infrastructure management lifecycle.

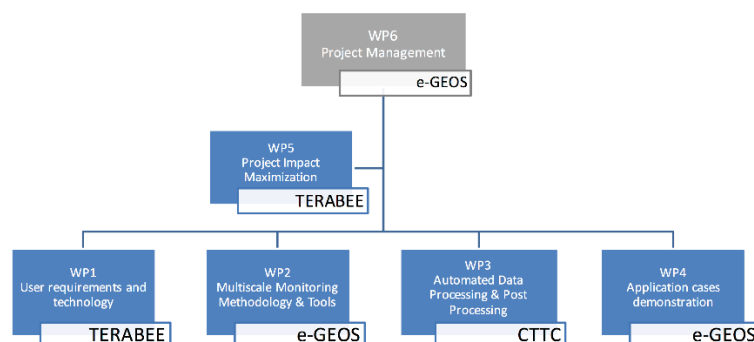
The overall concept underpinning MOMIT project is the demonstration of the benefits brought by Earth Observation and Remote Sensing to the monitoring of railways networks both in terms of the infrastructure and of the surrounding environment, where activities and phenomena impacting the infrastructure could be present. MOMIT will leverage on state-of-the-art technologies in the fields of ICT and space-based remote sensing and RPAS-based to perform different kind of analysis thanks to the wide variety of sensors they could be equipped with.

Events like the train derailment near Barcelona in November 20, 2018 (see this news), highlight the importance of the research performed in MOMIT Project on the definition of methodologies and tools to prevent landslides and other hazards.

MOMIT's vision is distilled to the following objectives:

- To bring at cutting edge level the remote sensing technology applied to railways infrastructure monitoring for both RPAS and Satellite based solutions.
- To demonstrate value added capabilities of satellite data, which are able not only to integrate standard technologies (including in situ data and RPAS-based monitoring) but also to complement or substitute them in some cases, with evident benefits in terms of costs, reliability, service coverage.
- To develop new platform independent tools supporting data analysis and the decision-making process. Automation and flexibility will be the key words.
- To define operational criteria for an effective and efficient use of unmanned technology highlighting benefits, complementarities and limitations with respect to standard monitoring technologies, taking into account economic and sustainability criteria for the adoption of the developed solutions on the basis of clear evidence derived by in field demonstrators' results.
- To maximise the coverage of all monitoring needs for railway networks, in complementarity with the Shift2Rail JU project IN2SMART, taking into account both MOMIT Internal User specific needs and IN2SMART project technological/operational gaps.

PROJECT STRUCTURE



STATUS

Completed

BUDGET

€5,467,305

FUNDING

€5,453,555

START

June 2015

END

May 2018

CALL

H2020-MG-2.1-2014

CONTRACT No

636237

LEAD ORGANISATION

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COORDINATOR

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TU Delft, ALU FR, IFSTTAR,
TCDD, INTADER, VTI, **SZ**, RCCF**WEBSITE**www.netirail.eu

NeTIRail-INFRA

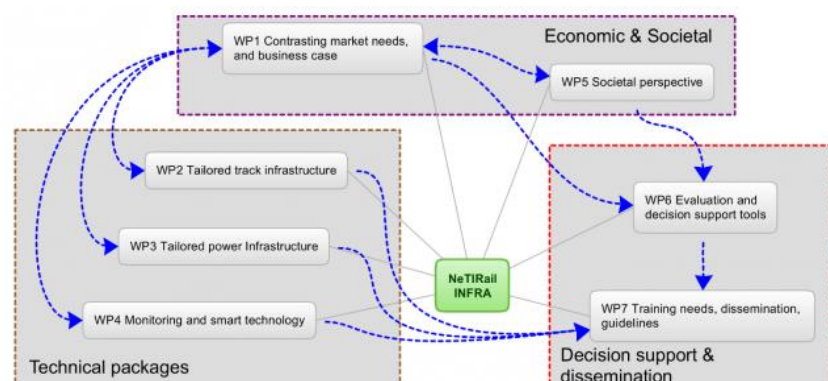
Needs Tailored Interoperable Railway

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**

Ongoing

BUDGET

€797,130

FUNDING

€797,130

START

November 2016

END

October 2019

CALL

H2020-S2R-OC-CCA-02-2015

CONTRACT No

730827

LEAD ORGANISATION

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ROSTOCK, STADLER RAIL

VALENCIA

WEBSITEwww.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**

Completed

BUDGET

€5,966,186.25

FUNDING

€5,966,186.25

START

May 2015

END

August 2018

CALLH2020-MG-7.1-
2014_TwoStages**CONTRACT No**

636160

LEAD ORGANISATION

INTRASOFT INTERNATIONAL

COORDINATOR

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WEBSITEwww.optimumproject.eu**OPTIMUM**

Multi-source Big Data Fusion Driven Proactivity for Intelligent Mobility

OBJECTIVES

OPTIMUM establishes largely scalable architecture for the management and processing of multisource big data, which enables the continuous monitoring of transportation system needs while facilitating proactive decisions and actions in a semi-automated way. The project follows a cognitive approach based on the big data supply chain loop "Observe, Orient, Decide, Act", with the aim of achieving continuous situational awareness.

The project aims to:

- capitalise on the benefits and potential of big data fusion and proactive behaviour in the context of diverse and multimodal transportation by designing a distributed and scalable architecture;
- enable comprehensive observations of the transport ecosystem by designing and developing a smart sensing system able to cope with huge amounts of heterogeneous data in real time (Observe);
- enable semantic understanding of acquired data and predict the status of transport networks for short- and medium-term horizons by designing and developing an efficient management framework for dynamic (proactive) and context-aware forecasting and the detection of situations of interest on the basis of complex and predictive data analysis algorithms and event detection (Orient);
- realise sustainable transportation behaviours through system-aware optimisation mechanisms that integrate adaptive charging and crediting models and real-time multimodal routing and navigation algorithms (Decide);
- support proactive decisions and sustainable transportation behaviours through proactive information provisioning and personalisation (Act);
- deploy proposed solutions in real-life pilots to place challenging use cases in the domain of the proactive improvement of transport system quality and efficiency, such as proactive charging for freight transport and Car2X communication integration; and
- enable the provision of suitable business models for the commercialisation of results beyond selected end-user pilots to ensure the impact of the OPTIMUM approach

PROJECT STRUCTURE

Pilot Study 1: Proactive improvement of transport systems quality and efficiency

Pilot Study 2: Proactive charging schemes for freight transport

Pilot Study 3: Integrated Car2X communication platform



STATUS

Ongoing

BUDGET

€1,499,900

FUNDING

€1,499,900

START

October 2017

END

September 2019

CALL

H2020-S2R-OC-IP5-01-2017

CONTRACT No

777594

LEAD ORGANISATION

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SAPIENZA UNIVERSITA DI ROMA, IFSTTAR, UIRR, UNIVERSITY OF NEWCASTLE UPON TYNE, UNIVERSITY OF LEEDS, **CD CARGO**, EURNEX, OLTIS GROUP, NEWOPERA, SIMCON, TECHNISCHE UNIVERSITAET DRESDEN, ADRIAER

WEBSITE

<https://optiyard.eu/>

OPTIYARD

Optimised Real-time Yard and Network Management

OBJECTIVES

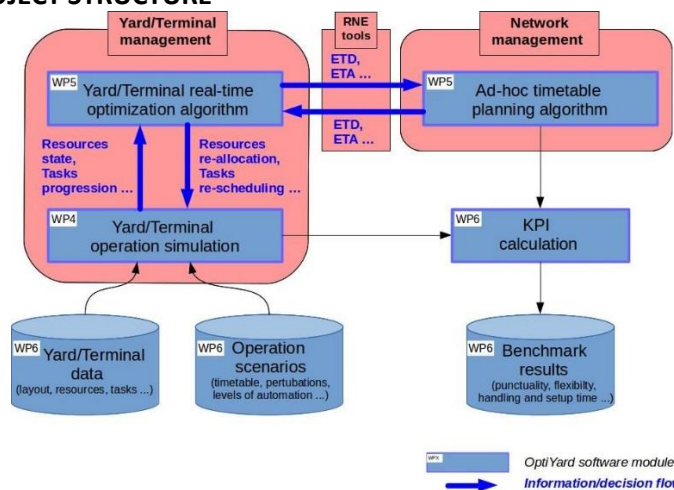
The main objective of OptiYard is to improve capacity and service reliability by focusing on Yard Operations, namely by providing an optimised decision support system for Yard Managers.

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**

Ongoing

BUDGET

€9,217,196

FUNDING

€7,826,081

START

June 2017

END

May 2021

CALL

H2020-CIRC-01-2016-2017

CONTRACT No

730305

LEAD ORGANISATION

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VIPAP, ZAG

WEBSITE

www.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**

Completed

BUDGET

€29,201,993

FUNDING

€12,977,366

START

November 2016

END

November 2018

CALL

H2020-S2R-CFM-IP1-01-2016

CONTRACT No

730668

LEAD ORGANISATION

ALSTOM

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WEBSITE

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

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

PINTA addresses two key topics:

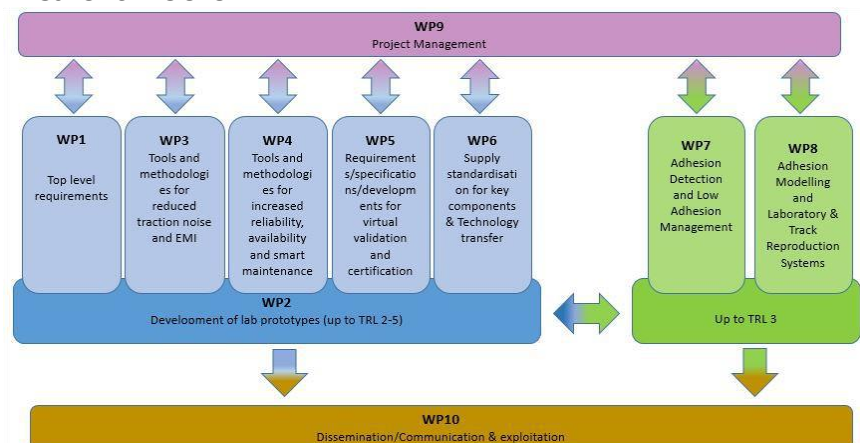
- Development of concepts towards the next generation of traction Systems.
- Management of wheel/rail adhesion.

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



PINTA2

STATUS

Ongoing

BUDGET

€28,534,183.73

FUNDING

€12,680,591.25

START

September 2018

END

November 2020

CALL

H2020-S2R-CFM-IP1-01-2018

CONTRACT No

826054

LEAD ORGANISATION

ALSTOM

COORDINATOR

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WEBSITE

https://projects.shift2rail.org/s2r_ip1_n.aspx?p=PINTA2

PINTA 2

IP1 Traction TD1 and Brakes TD5 – Phase 2

OBJECTIVES

This proposal has been developed to tackle the two main challenges related to Traction systems and Adhesion highlighted in the Call text.

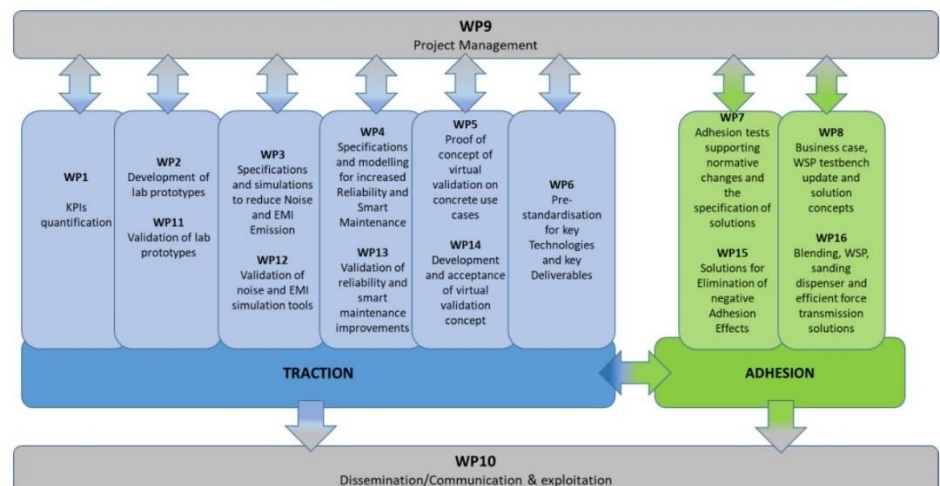
The traction sub-project will address these objectives as follows:

- Railway system LCC reduction. Traction system cost reduction by reduction in validation & certification cost via simplification, harmonization of rules and shifting/replacement of “on site” certification experiments by numerical simulation and/or static test bench tests.
- Operational reliability increase via higher reliability/availability of components. Progress on methodologies and tools in these fields, especially in WP4 & WP13, will be applied to new Traction systems developed within the project. The benefit will be a dramatic reduction in the number of In-service failures per million km;
- Train & Line capacity increase through weight, volume and noise savings of Traction equipment. These improvements will permit new train architectures to increase the number of seats and/or passenger comfort.

The main specific objectives of adhesion management for brakes are:

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

PROJECT STRUCTURE



**STATUS**

Completed

BUDGET

€18,901,890

FUNDING

€8,400,000

START

October 2017

END

September 2019

CALL

H2020-S2R-CFM-IP1-01-2017

CONTRACT No

777629

LEAD ORGANISATIONBOMBARDIER
TRANSPORTATION**COORDINATOR**

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CAF, **DB**, **EUROC (CP)**, FTT,
KNORR-BREMSE,
NETWORKRAIL, SIEMENS,
SNCF, TALGO, **TRAFIKVERKET**,
VIRTUAL VEHICLE**WEBSITE**https://projects.shift2rail.org/s2r_ip1_n.aspx?p=pivot

PIVOT

Performance Improvement for Vehicles on Track

OBJECTIVES

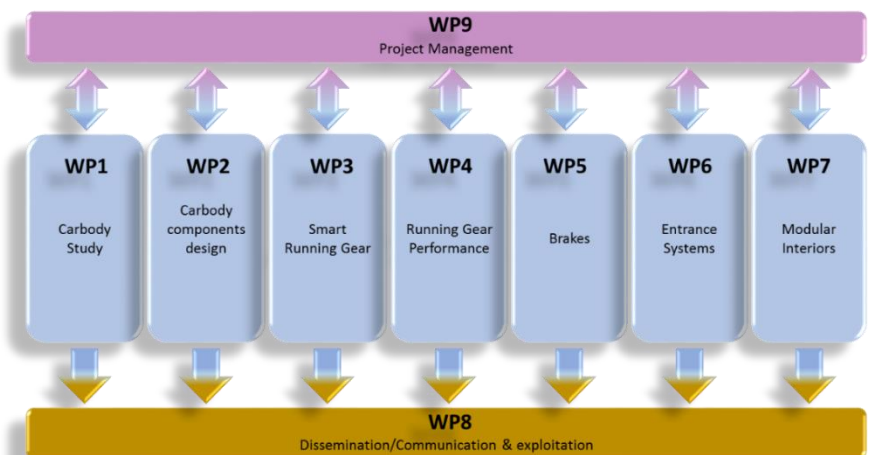
PIVOT combines the development of activities in several key Rolling Stock sub-systems to contribute to the achievement of the key S2R Master Plan objectives (high reliability, high capacity, low cost and improved performance) within Innovation Programme 1.

PIVOT seeks to extend the focus of innovation beyond the historic procurement limits using the sort of methodology developed in Roll2Rail's Universal Cost Model as shown below.

The objectives are:

- Explore the materials, joining techniques and manufacturing for innovative carbodies and develop a risk-assessed demonstrator specification. Develop conceptual carbody components for alternative materials.
- Provide smart solutions for running gear considering functions such as health monitoring and active suspension systems. These include new sensor system architecture and affordable hardware providing sufficient reliability and robustness. Develop a common technical specification, to innovatively use both new and existing materials and to scope the authorisation demands arising for running gear performances
- Develop next generation brake products/systems to offer attractive and efficient rail traffic both for operators and passengers.
- Provide specification of the access door systems. Perform research activities necessary for innovative conceptual design of leaves and implement new technologies, architectures and devices
- Work on the pre-project (ideation, conceptualisation and maturation process) of an adaptive train interiors and driver cabin to increase flexibility of use and adapt the train to the needs.

PROJECT STRUCTURE



**STATUS**

Completed

BUDGET

€786,349

FUNDING

€349,453

START

September 2016

END

August 2018

CALL

H2020-S2R-CFM-CCA-03-2015

CONTRACT No

730814

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PARTNERSHACON, **SNCF**, THALES,**TRAFIKVERKET**, ANSALDO STS**WEBSITE**

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

PLASA

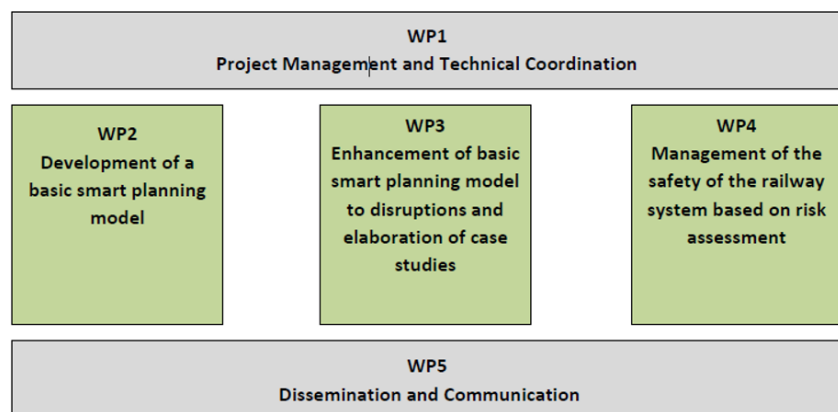
Smart Planning and Safety for a safer and more robust European railway sector

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

**STATUS**

Ongoing

BUDGET

€1,853,347.78

FUNDING

€823,643.75

START

September 2018

END

October 2020

CALL

S2R-CFM-CCA-01-2018

CONTRACT No

826151

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PLASA 2

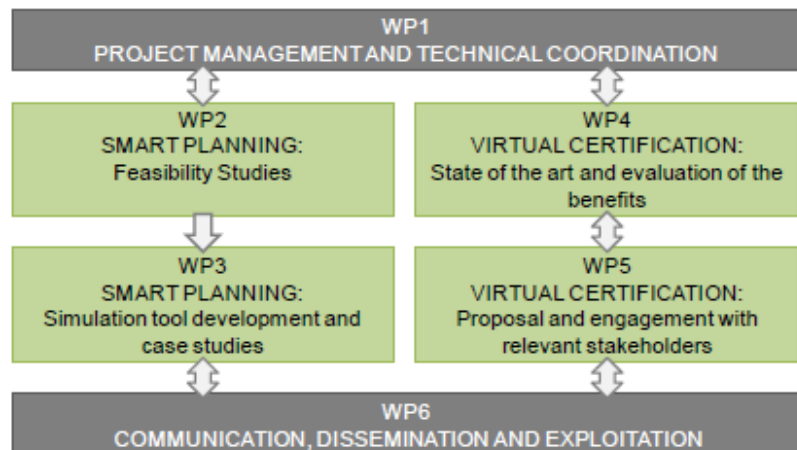
Smart Planning and Virtual Certification

OBJECTIVES

The PLASA-2 project aims at significantly increasing system robustness in the European rail sector. On the one hand, it aims at facilitating planning activities of various stakeholders in the railway system, making the effects of planning decisions on large, complex railway networks measurable and predictable. On the other hand, it aims to provide recommendations for a mixed virtual/experimental authorisation process, which shall ultimately lead to a significant reduction of authorisation costs and duration.

It is foreseen that PLASA-2 will contribute to the foundation of the following objectives:

- Improving the planning processes of railway operators by developing an integrated Smart Planning approach that goes beyond state-of-the-art, enabling the analysis of entire networks.
- Enabling cross-border simulations for European corridors and larger networks as a basis for SERA.
- Contributing to an overall railway system life cycle cost (LCC) reduction thanks to a reduction in the capital cost of vehicles to be achieved including through enhanced authorisation processes that rely both on virtual methods and physical tests rather than exclusively on extensive field tests.

PROJECT STRUCTURE

**STATUS**

Ongoing

BUDGET

€17,678,400

FUNDING

€16,376,774

START

September 2016

END

August 2020

CALL

H2020-MG-5.5a-2015

CONTRACT No

690713

LEAD ORGANISATION

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CITY, COUNCIL, Others

WEBSITE

www.civitas.eu/portis

PORTIS

PORT-Cities: Integrating Sustainability

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 SUMP.
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

**STATUS**

Ongoing

BUDGET

€3,325,912

FUNDING

€2,998,412

START

September 2016

END

August 2019

CALL

H2020-MG-8.4a- 2015

CONTRACT No

690660

LEAD ORGANISATION

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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**

Ongoing

BUDGET

€2,781,920.13

FUNDING

€2,781,920.13

START

September 2017

END

August 2021

CALL

H2020-MSCA-ITN-2017

CONTRACT No

765374

LEAD ORGANISATION

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CARGO, EU MATHS, FAU,
 INRIA, ITMATI, JYU, MATH
 CONSULT, MATHTEC,
 MATHLAB, MICROGATE,
 MICROFLOWN TECHNOLOGIES,
 Others

WEBSITEwww.romsoc.eu**ROMSOC**

Reduced Order Modelling, Simulation and Optimization of Coupled systems

OBJECTIVES

ROMSOC is a European Industrial Doctorate (EID) project that will run for four years bringing together 15 international academic institutions and 11 industry partners. It supports the recruitment of eleven Early Stage Researchers (ESRs) working on individual research projects. The main objective of the ROMSOC project is to develop a common framework and, driven by industrial applications as optical and electronic systems, material engineering, or economic processes, to lift mathematical MSO and MOR to a new level of quality. The development of high dimensional and coupled systems presents a major challenge for simulation and optimization and requires new MOR techniques.

The development of high-quality products and processes is essential for the future competitiveness of the European economy. In most key technology areas product development is increasingly based on simulation and optimization via mathematical models that allow to optimize design and functionality using free design parameters (Best performance of modelling, simulation and optimization (MSO) techniques).

ROMSOC will work towards this goal for high dimensional and coupled systems that describe different physical phenomena on different scales; it will derive a common framework for different industrial applications and train the next generation of researchers in this highly interdisciplinary field. It will focus on the three major methodologies: coupling methods, model reduction methods, and optimization methods, for industrial applications in well selected areas, such as optical and electronic systems, economic processes, and materials.

ROMSOC will develop novel MSO techniques and associated software with adaptability to user-defined accuracy and efficiency needs in different scientific disciplines. It will transfer synergies between different industrial sectors, in particular for SMEs.

PROJECT STRUCTURE

Project 1: Real Time Computing Methods for Adaptive Optics

Project 2: Mathematical modelling and numerical simulation of coupled thermo-acoustic multi-layer systems for enabling particle velocity measurements in the presence of airflow

Project 3: An Optimal Transportation computational approach of inverse free-form optical surfaces design for extended sources

Project 4: Data driven model adaptations for coil sensitivities in MR systems

Project 5: Coupling of Model Order Reduction and Multirate Techniques for coupled heterogeneous time-dependent systems in an industrial optimization flow

Project 6: Model order reduction for parametric high dimensional models in the analysis of financial Risk

Project 7: Integrated Optimization of International Transportation Networks

Project 8: Efficient computational strategies for complex coupled flow, thermal and structural phenomena in parametrized settings

Project 9: Numerical simulations and reduced models of the fluid-structure interaction arising in blood pumps based on wave membranes.

Project 10: Coupled parameterized reduced order modelling of thermo-hydro-mechanical phenomena arising in blast furnaces.

Project 11: Optimal Shape Design of Air Ducts in Combustion Engines

**STATUS**

Ongoing

BUDGET

€2,997,000

FUNDING

€2,997,000

START

May 2017

END

April 2020

CALL

H2020-MG-3.4-2016

CONTRACT No

723254

LEAD ORGANISATIONGAVIN AND DOHERTY
GEOSOLUTIONS**COORDINATOR**

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PLAN, **HZ INFRASTRUCTURA**,
UNIZA, IMC, VIRTUS IT, TU
DELFT, **NETWORK RAIL**, RWS,
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**

Ongoing

BUDGET

€4,888,927

FUNDING

€4,888,927

START

May 2017

END

April 2020

CALL

H2020-MG-3.4-2016

CONTRACT No

723205

LEAD ORGANISATION**UIC****COORDINATOR**

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 INTADER, CEREMA, GLS,
 RWTH, UNIROMA TRE,
 COMMSIGNIA, IRU, **SNCF**, DLR,
 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



STATUS

Ongoing

BUDGET

€4,535,600

FUNDING

€4,521,100

START

September 2018

END

February 2022

CALL

H2020-MG-7.1-2017-Two-
Stages

CONTRACT No

769255

LEAD ORGANISATION

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INNOFACTORY, TØI

WEBSITE

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SAFEWAY

*GIS-based infrastructure management system for optimized
response to extreme events on terrestrial transport networks*

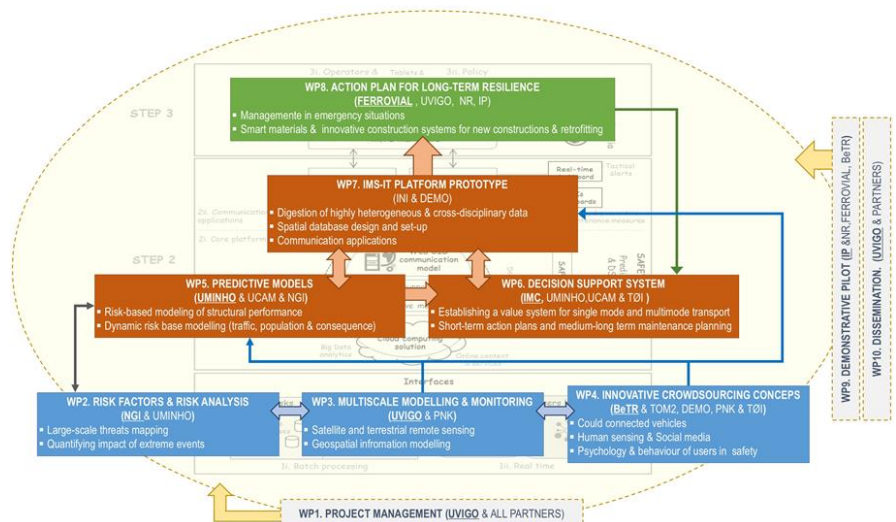
OBJECTIVES

SAFEWAY leads to significantly improved resilience of transport infrastructures, developing a holistic toolset with transversal application to anticipate and mitigate the effects extreme events at all modes of disaster cycle

According to European TEN-T guidelines, due consideration must be given to the risk assessments and adaptation measures during infrastructure planning, in order to improve resilience to disasters. SAFEWAY's main aim is to design, validate and implement holistic methods, strategies, tools and technical interventions to significantly increase the resilience of inland transport infrastructure. SAFEWAY leads to significantly improved resilience of transport infrastructures by developing a holistic toolset with transversal application to anticipate and mitigate the effects extreme events at all modes of disaster cycle:

- "Preparation": the pillar of the SAFEWAY approach is settled in a substantial improvement of prediction, monitoring and decision tools that will contribute to the anticipation, prevention and preparation of critical European transport infrastructures for the damaging impacts of extreme events,
- "Response and Recovery": the incorporation of SAFEWAY Big Data and Smart ICT into emergency plans, as well as the real-time optimised communication with operators and end users (via crowdsourcing and social media) will contribute to the recovery on a short-term scale; the solutions adopted in the pre- and peri-event have a direct and crucial effect in recovery on a long-term scale.
- "Mitigation": improving precision in the adoption of mitigation actions by impact analysis of the different scenarios together with new construction systems and smart materials that will contribute to the resistance & absorption of the damage impact.

PROJECT STRUCTURE



SCENT

STATUS

Ongoing

BUDGET

€2,388,813.12

FUNDING

€2,388,813.12

START

September 2018

END

August 2022

CALL

H2020-MSCA-ITN-2018

CONTRACT No

812391

LEAD ORGANISATION

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WEBSITE

N.A.

SCENT

Smart Cities EMC Network for Training

OBJECTIVES

The global vision of Smart and Sustainable Cities is greatly restricted by the rapid increase of interference and interoperability problems which occur through the interaction of electrical power with information technology and communications equipment. This interconnected systems-of-systems infrastructure creates a complex electromagnetic environment in which interoperability of the electronic systems has to be achieved. There is an urgent need to conduct greater understanding in Power Quality (PQ) and (conducted) Electromagnetic Compatibility (EMC) due to the changing dynamics of the field. The main issue is the insufficient number of qualified engineers for the latest developments in smart cities, renewable generation and electric vehicles. A highly trained cadre of engineers (a new breed) is required to lead this area. To date no specific doctoral programme in this field is available in Europe resulting in well trained researchers and engineers being scarce.

SCENT will create a network to train highly skilled engineers through an integrated doctoral training program based on the essential research required in PQ and EMC that can underpin all future technological developments, strongly linked to industry, and bridging the gap between research and industry for translation of new knowledge. Designed into the project are specific innovations with methodologies to optimize the design of power distribution networks inside buildings and industrial plants, as well as transport systems, with respect to compatibility (no interference) and efficiency in the distribution networks and connected electronic systems. The partners of the network consist of leaders in these fields and relevant industrial stakeholders resulting in a unique and effective network in Europe and globally. Dissemination methods to realize optimal impact will include scientific publications, workshops, training of engineers in industry, and dissemination through newsletters, interviews, social media.

PROJECT STRUCTURE

Not available



S-CODE

STATUS

Completed

BUDGET

€4,999,771

FUNDING

€4,999,771

START

November 2016

END

October 2018

CALL

H2020-S2RJU-OC-2016-01-2

CONTRACT No

730849

LEAD ORGANISATION

UNIVERSITY OF BIRMINGHAM

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WEBSITE

www.s-code.info

S-CODE

Switch and Crossing Optimal Design and Evaluation

OBJECTIVES

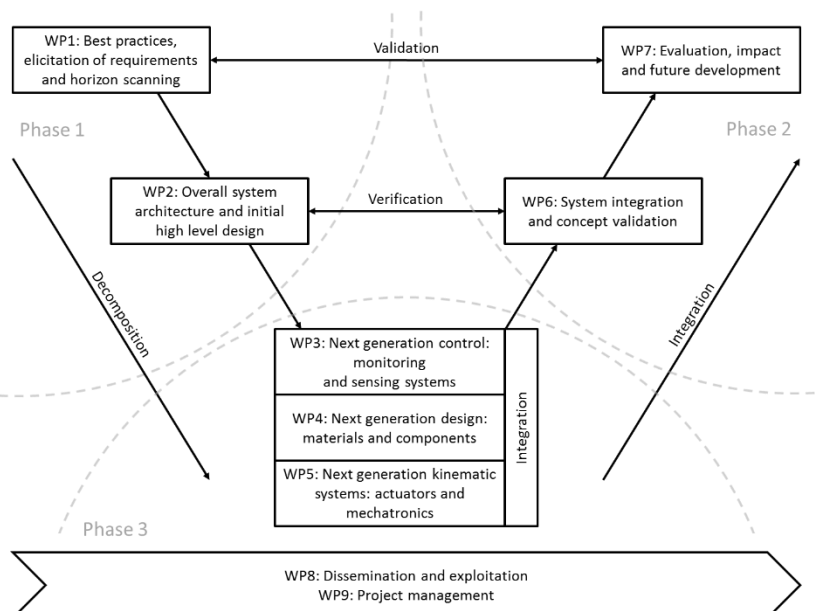
The overall aim of the S-CODE project is to investigate, develop, validate and initially integrate radically new concepts for switches and crossings that have the potential to lead to increases in capacity, reliability and safety while reducing investment and operating costs.

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



**STATUS**

Ongoing

BUDGET

€51,561,545.78

FUNDING

€14,853,891.30

START

May 2018

END

April 2021

CALL

H2020-ECSEL-2017-2-RIA-two-stage

CONTRACT No

783119

LEAD ORGANISATIONNXP SEMICONDUCTORS
NETHERLANDS**COORDINATOR**

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RISCURE, ZF, SENETICS,
GEMALTO, INTERNET OF
TRUST, TST, GDANSK
UNIVERSITY OF TECHNOLOGY,
CANON, TNO, INDRA, PHILIPS,
THALES, IP, FOCISA, PDM,
TECNALIA, IFSTTAR, Others**WEBSITE**<https://secredas.eu>

SECREDAS

Cyber Security for Cross Domain Reliable Dependable Automated Systems

OBJECTIVES

SECREDAS aims to develop and validate multi-domain architecting methodologies, reference architectures & components for autonomous systems, combining high security and privacy protection while preserving functional-safety and operational performance. The project objectives for Automotive, Rail and Healthcare are the Development and Validation of multi-Domain architecting methodologies, reference architectures & components for autonomous Systems; and the Incorporation of high security and privacy protection while preserving functional-safety and operational performance.

To follow the approach of SECREDAS in the design and validation of the different technological components (HW/SW), the following steps are planned:

- *Step 1:* Elaboration of User Scenarios which are relevant for safety, security and privacy aspects. All user scenarios will be studied from a theoretical point of view including the impact on architectural and design requirements. The user scenarios have been selected based on validation potential, societal impact, technology benchmarking and market relevance. An overview of the User Scenarios considered is given in section below.
- *Step 2:* Definition of reference architecture for introducing high security and privacy protection in automated systems while preserving functional-safety and operational performance and applicable component requirements.
- *Step 3:* Development of a number of design patterns & common technology elements or components.
- *Step 4:* Development of domain-specific solutions, incl. integration of common technology elements.
- *Step 5:* Integration of the scenarios and the different technology solutions towards performing common demonstrations.
- *Step 6:* Study concerning towards consumer concerns, increasing acceptance & legislation.

Method

- Build a secure platform
- Use innovative data algorithms
- Process sensor data
- Create safety concepts

The safety concepts can later be used in autonomously driving automobiles or in monitoring the health of the driver.

The scenarios studied in SECREDAS are the following:

1. Road Intersections
2. Automated truck with driver suffering health problems
3. Vehicle updating
4. Advanced access to vehicle
5. Rail safety

PROJECT STRUCTURE

Not available

**STATUS**

Ongoing

BUDGET

€3,395,036.25

FUNDING

€2,901,948.76

START

March 2018

END

February 2021

CALL

H2020-GALILEO-GSA-2017-1

CONTRACT No

776402

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CEIT-IK4

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WEBSITE<https://siaproject.eu/>**SIA**

System for vehicle-infrastructure Interaction Assets health status monitoring

OBJECTIVES

SIA has for main objective the development of four ready-to-use new services (iWheelMon, iRailMon, iPantMon and iCatMon) providing prognostic information on the health status of the railway's most demanding assets in terms of maintenance costs (wheel, rail, pantograph and catenary):

- iWheelMon for railway operators will provide real time information about wheel status
- iPantMon for railway operators will provide real time information about the pantograph status
- iRailMon for rail infrastructure managers and maintenance subcontractors will provide real time information about the rail status
- iCatMon for rail infrastructure managers and maintenance subcontractors will provide real time information about the catenary status

These new services will help to reduce the 15% of railway maintenance costs, 25% of maintenance unscheduled events and 15% of derailments associated to the rail-wheel interface. To tackle this challenge, the SIA consortium brings together multidisciplinary and cross sector partners (EGNSS technology providers, research centres, IT companies and railway stakeholders) that will co-design EGNSS solutions truly adapted to the needs of the rail sector.

SIA objectives

- Development of low-cost sensor nodes (SIA_NoS) for wheel to rail and pantograph to catenary interaction characterisation
- Development of a data hub (SIA_DH) that collects on-board information, provides accurate position and time stamping with high availability, and transmits the information to a trackside visualisation platform
- Development of predictive component degradation models (SIA_CDM) that will enable to connect the monitoring information from wheelset, rail, catenary and pantograph with the asset management information system of end-users

PROJECT STRUCTURE

WP1 - Project Management

WP2 - End user functionality and SIA architecture definition

WP3 - EGNOS and Galileo based on-board low-cost receiver and algorithms for railway specific domain

WP4- Integration of sensors, communications and energy supply for on-board sensing nodes

WP5 - Component degradation predictive algorithms

WP6 - Visualization environment for railway specific maintenance applications

WP7 - Integration with end-user specific application layer

WP8 - Test setup development and validation

WP9 - Dissemination, communication and result exploitation

**STATUS**

Completed

BUDGET

€2,991,672

FUNDING

€2,991,672

START

October 2016

END

September 2019

CALL

H2020-MG-8.3-2016

CONTRACT No

723989

LEAD ORGANISATION

FEHRL

COORDINATOR

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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

STATUS

Completed

BUDGET

€5,999,213

FUNDING

€5,999,213

START

May 2015

END

April 2018

CALL

H2020-MG-2.2-2014

CONTRACT No

636071

LEAD ORGANISATION

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COORDINATOR

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ROTTERDAM, **PRORAIL**, BD
RAIL SERVICES, ZLC

WEBSITEwww.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:

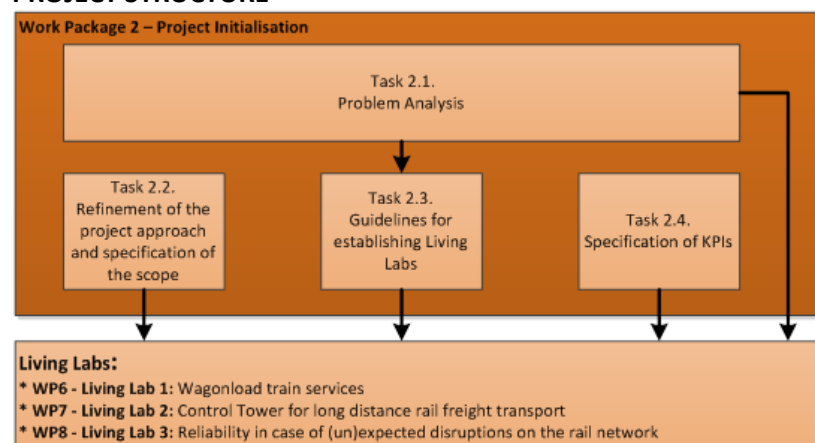
1. An alignment of the business models of the different stakeholders within the rail sector.
2. A mental shift of stakeholders towards a more customer- and collaboration-oriented approach.
3. Improved data availability from different public and private sources.

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



socialcar

STATUS

Completed

BUDGET

€5,953,083

FUNDING

€5,384,645

START

June 2015

END

May 2018

CALL

H2020-MG-7.1-2014

CONTRACT No

636427

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WEBSITE

www.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

**STATUS**

Ongoing

BUDGET

€1,999,500

FUNDING

€1,999,500

START

December 2018

END

December 2020

CALL

H2020-S2RJU-OC-IP4-01-2018

CONTRACT No

826172

LEAD ORGANISATION

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WEBSITEwww.sprint-transport.eu**SPRINT**

Semantics for PerfoRmant and scalable INteroperability of multimodal Transport

OBJECTIVES

The Interoperability Framework (IF), which is one of the Technology Demonstrators (TD) of the fourth Innovation Program (IP4) dealing with “IT Solutions for Attractive Railway Services”, has first been released by the IT2Rail project (2015-2018). The IF enables technical interoperability of all multimodal services by relieving consumer applications from the task of locating, harmonising and understanding multiple and independent sources of data, events, and service resources, which are consequently made available “as a service”. The IF realises its definition by:

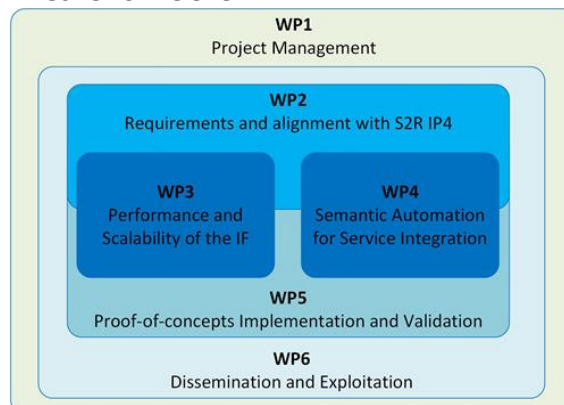
- providing travel applications with a uniform abstraction of data and services distributed over the world wide web as a “web of transportation data” in the form of linked data and service descriptors annotated with machine-readable logical statements which describe their semantics;
- providing applications with technical means (i.e., packaged resolvers) to operate on such “web of transportation data” – publishing, querying, etc. – where the semantic annotations are used to automate the process of discovering and matching datasets and service descriptors.

The SPRINT project (Semantics for PerfoRmant and scalable INteroperability of multimodal Transport) will make steps towards the uptake of the IP4 multimodal transport ecosystem by addressing the following specific challenges arising from TD4.1’s objectives:

- Define a reference architecture for the Shift2Rail Interoperability Framework (IF), which will take into account recent advances in the design and development of distributed systems, and in particular of cloud-based ones;
- Define techniques facilitating, in particular by increasing their level of automation, activities that are central to the concept of IF, such as the collaborative creation and management of ontologies and of semantic-based mappings between heterogeneous data representations;
- Demonstrate the proposed improvements to the IF through a proof-of-concept implementation that will reach at least TRL 4.

Moreover, SPRINT contributes to the realisation of the IF by:

- masking the complexity of interoperability to travel applications by publishing in the IF’s Assets Manager uniform abstractions of services enabling travel applications to know how to communicate with them (e.g., web service/API interfaces, communication protocols);
- providing additional technical means to operate on the “web of transportation data”; for example, the IF will enhance its ability to act as a (distributed) broker to communicate with different services and as a means to dynamically discover, bind and inject data and services, including the Mobility Service Provider (MSP) identification on the basis of their geographical area and offered service capabilities.

PROJECT STRUCTURE

**STATUS**

Completed

BUDGET

€1,000,000

FUNDING

€1,000,000

START

November 2016

END

October 2018

CALL

H2020-S2R-OC-IP4-02-2016

CONTRACT No

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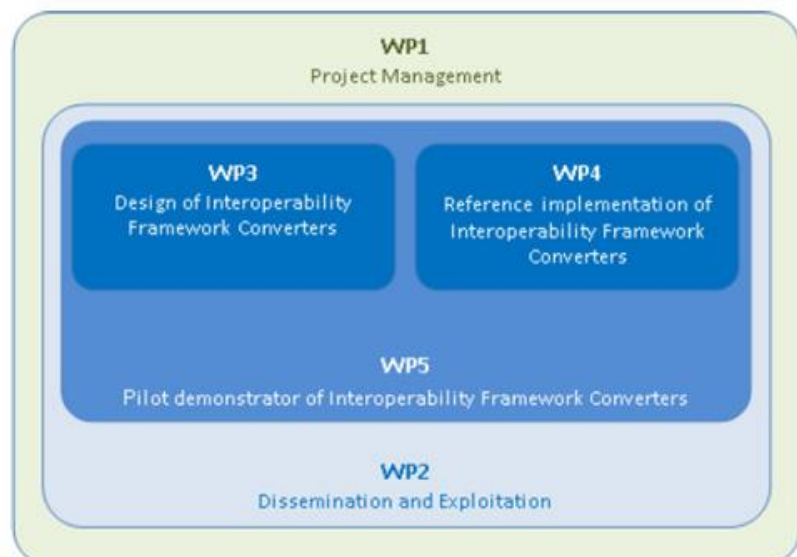
WEBSITEwww.st4rt.eu**ST4RT***Semantic Transformations for Rail Transportation***OBJECTIVES**

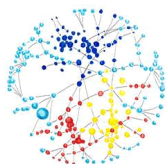
The scope of **ST4RT (Semantic Transformations for Rail Transportation)** project is to fill in a specific role within the Shift2Rail Innovation Programme related to Passenger Services (IP4) by providing the transformation technology which is necessary to assure that technical interoperability can be 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

Completed

BUDGET

€7,554,195

FUNDING

€7,301,194

START

May 2015

END

October 2018

CALL

H2020-MG-6.2-2014

CONTRACT No

636354

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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

Ongoing

BUDGET

€499,992.50

FUNDING

€499,992.50

START

December 2018

END

November 2020

CALL

H2020-S2RJU-OC-IPX-02-2018

CONTRACT No

826055

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WEBSITE

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TER4RAIL

Transversal Exploratory Research Activities for Railway

OBJECTIVES

TER4RAIL entails a coordination and support action to determine transversal exploratory research activities among different actors that are beneficial for railways. The Shift2Rail Multi Annual Action Plan (MAAP) will play a central role in the establishment of future interoperable railway systems suitable for European society and environment. However, due to the rapid pace of technological change and innovation, it is necessary to be aware of the novel possibilities that can enable an increasingly sustainable progress in this regard.

Additionally, the European railway community is represented by different actors (industry, academia, users, researchers, and policy makers) with different perceptions regarding technological applications and different objectives for the future.

With regard to this context, the work of TER4RAIL is organised as follows:

- TER4RAIL will identify and monitor new opportunities for innovative research and facilitate the cross-fertilisation of knowledge from other disciplines, at what is referred to as the Rail Innovative Research Observatory. Permanent contact with other relevant sectors will have a prominent role in importing disruptive perspectives from other disciplines and facilitating interactions.
- TER4RAIL will determine and assess the existing roadmaps that drive the future of railways and compare them with the interpretations obtained from the observatory. This analysis will indicate the gaps that require to be covered and serve as the anchor for the prospective roadmaps, among others, the Shift2Rail Multi Annual Action Plan (MAAP).
- TER4RAIL considers railways as the backbone of future European mobility, as stated in the rail sector's European Railway Research Advisory Council's (ERRAC) Rail 2050 Vision published in December 2017, and therefore, it is necessary that TER4RAIL raise arguments that can sustain this essential system. To that end, data analysis and statistical reporting are foreseen and conducted.
- Finally, the work performed under TER4RAIL will be communicated to the transport community, liaising with the Shift2Rail communication team with a correlated communication strategy. A strategy of exploitation of the results will guarantee that these are properly employed in this area with maximum impact.
- TER4RAIL will be able to select and summarise a considerable amount of information regarding railways' futures and transmit them in a consolidated, improved, clear, and understandable manner. This should facilitate the realisation of TER4RAIL's ambition of being the CSA of reference for the evolution of EU railways.

PROJECT STRUCTURE

WP1 - Rail Innovative Research Observatory

WP2 - Roadmaps

WP3 - Arguments supporting rail

WP4 - Dissemination, exploitation, and knowledge transfer

WP5 - Coordination and management

**STATUS**

Completed

BUDGET

€18,694,796

FUNDING

€14,631,935

START

January 2017

END

July 2019

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**

Ongoing

BUDGET

€3,752,913.96

FUNDING

€3,752,913.96

START

September 2017

END

August 2021

CALL

H2020-MSCA-ITN-2017

CONTRACT No

764461

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DE GRAN CANARIA, OZYEGIN
UNIVERSITESI, INSTITUTO DE
TELECOMUNICACOES, FORD
OTOSAN, OLEDCOMM,
OSRAM, PHILIPS,
NETWORKRAIL, LIGHTBEE,
SQS, INSTITUT FRESNEL

WEBSITEwww.vision-itn.eu/project/**VisIoN***European Training Network on Visible light-based Interoperability and Networking***OBJECTIVES**

New generations of LEDs have attractive features such as a long life expectancy, lower power consumption and reduced heat dissipation. In line with governmental plans worldwide, it is predicted that LEDs will be the ultimate light source in the near future. Besides indoor illumination, LEDs are being widely used in street lighting, traffic signs, advertising displays, transportation, etc. Visible light communication (VLC) is one of the most promising current areas of research with a significant potential for high-impact results, and successful outcomes might revolutionize utilization of LEDs for modern infrastructures to add novel functionalities in addition to illumination. VLC has been proposed for smart homes and streets, manufacturing and medical environments for increased data security and reduced interference, or a two-way vehicle-to-vehicle and vehicle-to-roadside infrastructure communications as part of the emerging intelligent transportation systems for increasing road safety. The proposed "European Training Network on Visible-light based Interoperability and Networking (Vision)" aims to train a new generation of early-stage researchers (ESRs) in the emerging area of VLC. Through research on co-supervised individual projects focusing on selected applications, Vision will make significant contributions to the fundamental scientific understanding and technical knowhow. Targeted application areas include indoor and outdoor VLC access, smart transportation, and medical and manufacturing environments. In addition to technical training through PhD courses, dedicated tutorials and workshops organized by the Network, the ESRs will benefit from a wide range of complementary non-technical training activities such as entrepreneurship, authoring scientific papers/patents, dissemination, etc. The participation of industrial partners will further promote research training with commercialisation perspectives enabling ESRs to fully integrate theory with hands-on practice.

VisIoN is a European project funded by the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement n° 764461. The project is a Marie Skłodowska-Curie Innovative Training Network (MSCA ITN); a joint research training and doctoral programme, implemented by a partnership of high-profile universities, research institutions and industrial research partners that are located in 7 different countries.

This project aims to train a new generation of early-stage researchers (ESRs) in the emerging area of Visible-Light Communications (VLC). The programme is structured around 15 Individual Research Projects within 3 main research topics:

- Smart Cities, Offices and Homes
- Smart Transportation
- Manufacturing and Medical

These researches will serve to develop a better knowhow on Li-Fi (Light Fidelity) which is a VLC system running wireless communications that uses light-emitting diodes (LEDs) for data transmission. Li-Fi is a term often used to describe high speed VLC in application scenarios where Wi-Fi might also be used. The term Li-Fi is similar to Wi-Fi with the exception that light rather than radio is used for transmission. Li-Fi might be considered as complementary to Wi-Fi.

PROJECT STRUCTURE

WP1 - Coordination
WP2 - Smart Cities, Offices and Homes
WP3 - Smart Transportation
WP4 - Manufacturing and Medical

**STATUS**

Ongoing

BUDGET

€1,998,715

FUNDING

€1,998,715

START

November 2017

END

October 2019

CALLH2020-MG-4.3-2017-
SingleStage-RTD-MOVE**CONTRACT No**

769458

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CONSULT, **TRAFIKVERKET**,
UNIRESEARCH, URBAN
INNOVATION VIENNA**WEBSITE**<https://vitalnodes.eu/>**VITAL NODES***Building a lasting expert network that delivers evidence-based
recommendations for Vital Urban Nodes along TEN-T Corridors***OBJECTIVES**

The VitalNodes CSA will build a lasting European network of key stakeholders based on existing European, national and regional networks. By enriching and applying a proven approach for the optimisation of economic, social and environmental vitality of urban areas from the perspective of multimodal transport infrastructure and spatial development ('Networking for Urban Vitality', NUVit). VitalNodes will deliver evidence-based recommendations for more (cost) efficient and sustainable integration of all 88 urban nodes in the TEN-T network corridors, addressing specifically the multi- and intermodal connection between long-distance and last-mile freight logistics. These recommendations will be validated by applying an appraisal tool and involving experts from the growing VitalNodes network.

VitalNodes will deliver three major results:

1. a self-sustaining 'network of networks' consisting of experts, end-users and case-owners;
2. a proven VitalNodes approach for future cases consisting of an enriched and fine-tuned toolbox, an appraisal methodology, and a format for workshops and deployment strategy;
3. validated recommendations on integration of urban nodes in TEN-T core network corridors.

As a result of increasing freight traffic, these urban nodes need to cope with challenges such as congestion, poor air quality, noise and road safety risks. Vital Nodes wants to improve European interconnection, and to develop sustainable solutions for the last mile.

Vital Nodes delivers evidence-based recommendations for the integration of the urban nodes into the trans-European transport network (TEN-T) corridors. It addresses multi and intermodality between long-distance and last-mile freight logistics.

The Vital Nodes approach integrates of six dimensions of mobility, land-use and infrastructure planning to exploit synergy effects. The integration goes beyond SUMP (Sustainable Urban Mobility Plan) and takes regional and (inter)national mobility and infrastructure networks and broader spatial opportunities into account. It is based on the NUVit conceptual model which has been developed and checked on basis of analysis of cases, workshops and group discussions with international experts.

Vital Nodes approach focuses on integrating land-use and infrastructure planning, as both planning sectors can have considerable impact on each other. The transport system affects a region's accessibility, which affects the planning of land-use in that region and the activities that will take place. This in turn will affect mobility and subsequently the further development of the transport system, thereby starting a new cycle, also known as the Land Use, Transport Feedback Cycle.

PROJECT STRUCTURE

Not Available

**STATUS**

Completed

BUDGET

€1,008,826

FUNDING

€1,008,826

START

November 2016

END

October 2018

CALL

H2020-S2R-OC-IP2-02-2015

CONTRACT No

730815

LEAD ORGANISATION

INECO

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WEBSITE<https://www.vite-project.com/>**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

WP1 – Project Coordination

WP2 – Test process framework

WP3 – Lab architecture

WP4 – Demonstration

WP5 – Assessment of the test framework and methodology proposed

WP6 – Dissemination



WRIST

Innovative Welding Processes for New Rail Infrastructures

STATUS

Ongoing

BUDGET

€4,188,356

FUNDING

€4,188,356

START

May 2015

END

January 2019

CALL

H2020-MG-8.1a-2014

CONTRACT No

636164

LEAD ORGANISATION

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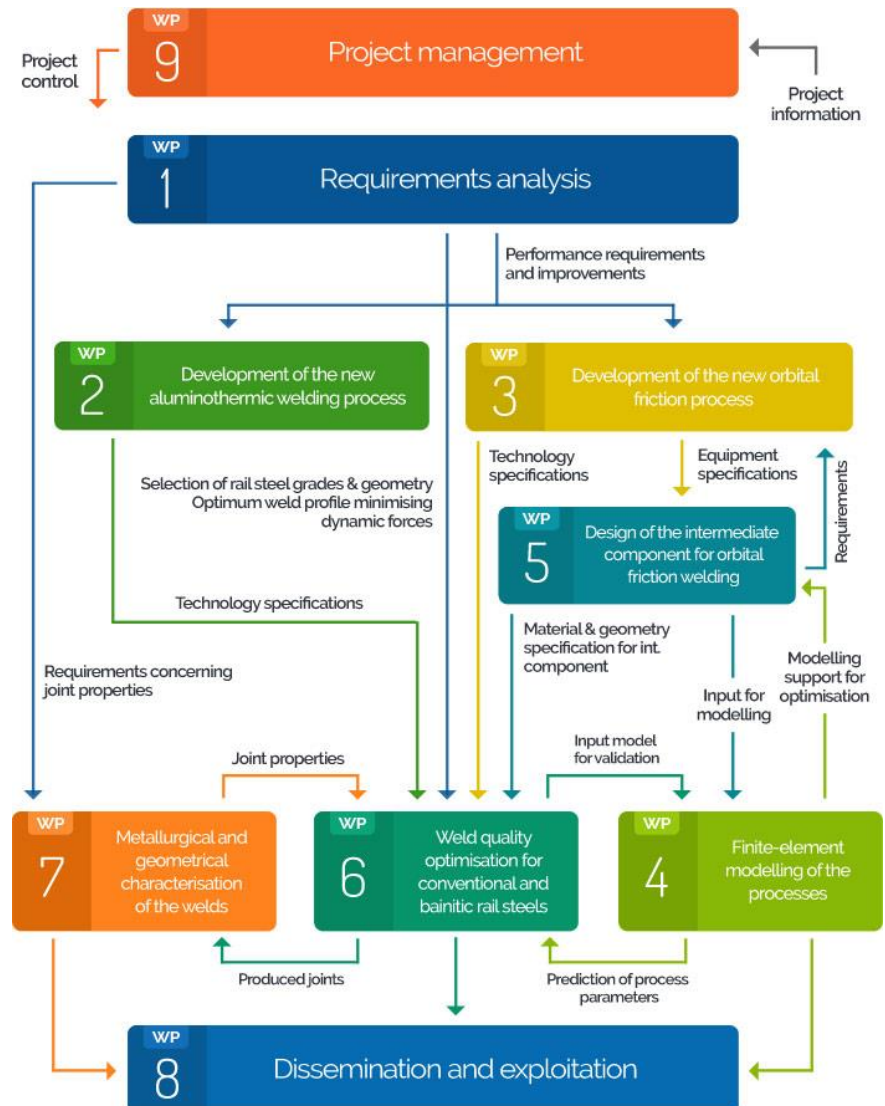
WEBSITE

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

Completed

BUDGET

€45,003,870

FUNDING

€19,972,078

START

September 2016

END

August 2019

CALL

H2020-S2R-CFM-IP2-01-2015

CONTRACT No

730640

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WEBSITE

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

X2Rail-1

Start-up activities for Advanced Signalling and Automation Systems

OBJECTIVES

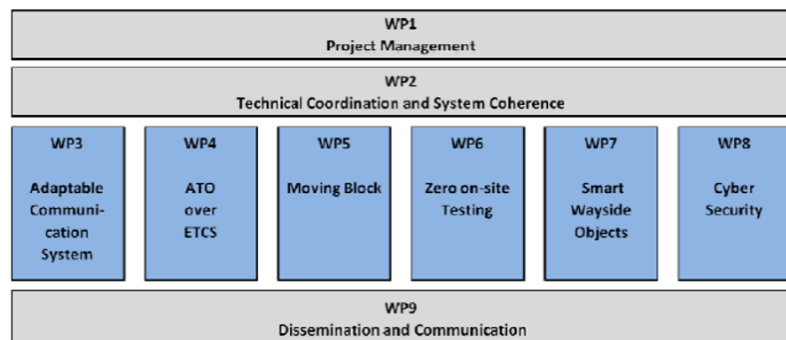
The X2Rail-1 project aims to research and develop six selected key technologies to foster innovations in the field of railway signalling and automation systems towards a flexible, real-time, intelligent traffic management and decision support system.

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

Ongoing

BUDGET

€30,152,828

FUNDING

€13,199,916

START

September 2017

END

August 2020

CALL

H2020-S2R-CFM-IP2-01-2017

CONTRACT No

777465

LEAD ORGANISATION

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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

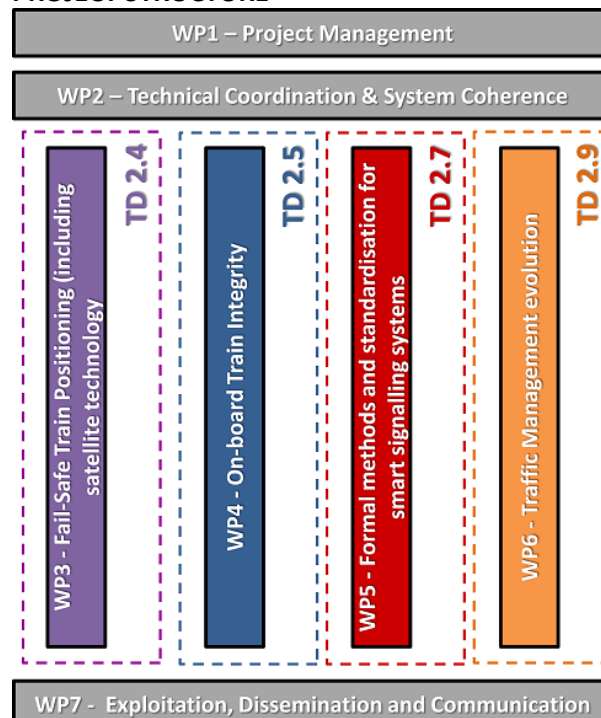
Taking into account the nature of signalling and automation systems, X2Rail-2 aims to improve the performance at a railway system level by introducing new functionalities at sub-system level as well as on the architectural level that should revolutionize the signalling and automation concept for the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



X2RAIL 3

STATUS

Ongoing

BUDGET

€38,885,434.82

FUNDING

€17,281,436.44

START

December 2018

END

November 2021

CALL

H2020-S2R-CFM-IP2-01-2018

CONTRACT No

826141

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WEBSITE

https://projects.shift2rail.org/2r_ip2_n.aspx?p=X2RAIL-3

X2Rail-3

Advanced Signalling, Automation and Communication System (IP2 and IP5) – Prototyping the future by means of capacity increase, autonomy and flexible communication

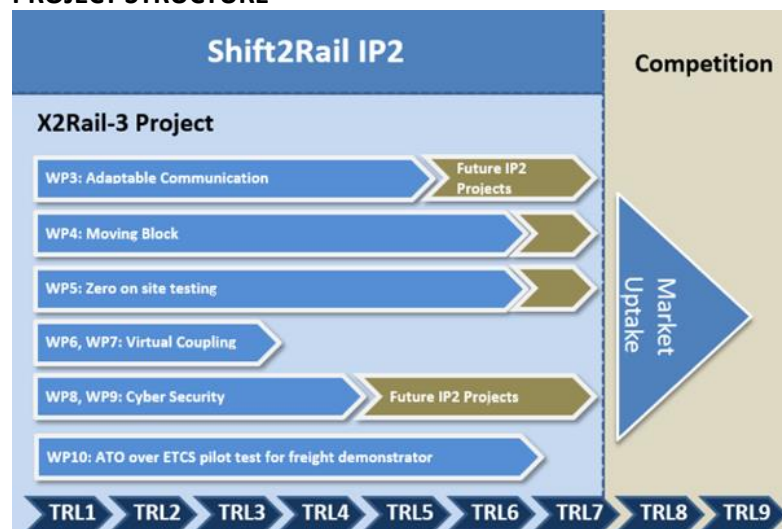
OBJECTIVES

The project aims to continue the research and development of key technologies to foster innovations in the field of railway signalling, telecommunication, testing methodologies and Cyber Security, as part of a longer term Shift2Rail IP2 strategy towards a flexible, real-time, intelligent traffic control management and decision support system. X2Rail-3 will also explore Virtual Coupling, an innovative concept capable of operating trains much closer to one another (inside their absolute or relative braking distance) and dynamically modifying their own composition on the move.

The actions to be undertaken in the scope of X2Rail-3 are related to the following specific objectives:

- To improve line capacity and to achieve a significant reduction of the use of traditional train detection systems by means of the introduction of the Moving Block together with train positioning;
- 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 ensure security among all connected signalling and control systems by developing new cyber security systems dedicated to railways;
- To analyse new signalling concepts (Virtual Coupling) that potentially would be able to improve line capacity, reduce LCC and enhance system reliability.
- To improve standardization and integration of the testing methodologies reducing time to market and improving effectiveness in the introduction of new signalling and supervision systems;
- To ensure the evolution and backward compatibility of ERTMS/ETCS technologies, notwithstanding of the required functional enrichment of the future signalling and control systems.

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 Operations	
5GMOBIX		SECRETAS
ARCC		X2Rail-1
FR8RAIL		X2Rail-2
FR8RAIL II		X2Rail-3

2	Mobility as a Service	
ATTRACKTIVE		IT2RAIL
BODEGA		MASAI
BONVOYAGE		PLASA
CO-ACTIVE		SOCIALCAR
COHESIVE		SPRINT
CONNECTIVE		ST4RT
GoF4R		

3	Logistics on Demand	
ARCC		INNOWAG
BONVOYAGE		OPTIYARD
CLUSTERS 2.0		SMARTRAIL
FR8HUB		SYNCHRO-NET
FR8RAIL II		

4	More Value from Data	
5GEVE		INFRALERT
5GMOBIX		IT2RAIL
AMONTRACK		M2O
ASSETS4RAIL		MASAI
ATTRACKTIVE		MOMIT
CHARIOT		OPEUS
CIPSEC		OPTIYARD
CONNECTIVE		PLASA 2
CYBERWISER		RAGTIME
CYRAIL		SAFE-10-T
DESTinationRAIL		SAFEWAY
ERSAT GCC		S-CODE
FINESSE		SECRETAS
FR8RAIL		SIA
GATE4RAIL		SMARTRAIL
GoF4R		SOCIALCAR

IN2DREAMS	SPRINT
IN2SMART	ST4RT
IN2TRACK	SYNCHRO-NET
IN2TRACK2	TT

5	Optimum Energy use
CONNECTA	IN2DREAMS
E-LOBSTER	IN2RAIL
ETOPIA	IN2STEMPO
FF4LE	OPEUS
FINE1	PINTA
FR8HUB	SYNCHRO-NET

6	Service timed to the second
ARCC	PLASA
BONVOYAGE	RAGTIME
CYRAIL	SAFEWAY
ERSAT GCC	S-CODE
FR8RAIL II	X2Rail-1
GATE4RAIL	X2Rail-2
GoF4R	X2Rail-3
OPTIYARD	

7	Lower cost railways
ASSETS4RAIL	IN2TRACK2
DYNAFREIGHT	MOMIT
FF4LE	NETIRAIL
FR8HUB	PINTA-2
IN2RAIL	PIVOT
IN2TRACK	PLASA 2

8	Guaranteed asset health and availability
5GEVE	INFRAALERT
AMONTRACK	INNOWAG
ASSETS4RAIL	MOMIT
DESTinationRAIL	PAPERCHAIN
DYNAFREIGHT	SAFE-10-T
FINESSE	SAFER-LC
FORESEE	SAFEWAY
FR8RAIL II	SIA
IN2SMART	TT
IN2TRACK	WRIST
IN2TRACK2	

9	Intelligent Trains	
5GMOBIX		PIVOT
CONNECTA		S-CODE
CONNECTA-2		SECREDAS
DYNAFREIGHT		X2Rail-1
FR8RAIL		X2Rail-2
FR8RAIL II		X2Rail-3
M2O		

10	Stations and 'smart' city mobility	
5GMOBIX		IN2TRACK
CLEVER CITIES		IN2TRACK2
DESTinationRAIL		NETIRAIL
DYNAFREIGHT		RAGTIME
FR8RAIL		SCENT
IN2RAIL		S-CODE
IN2STEMPO		

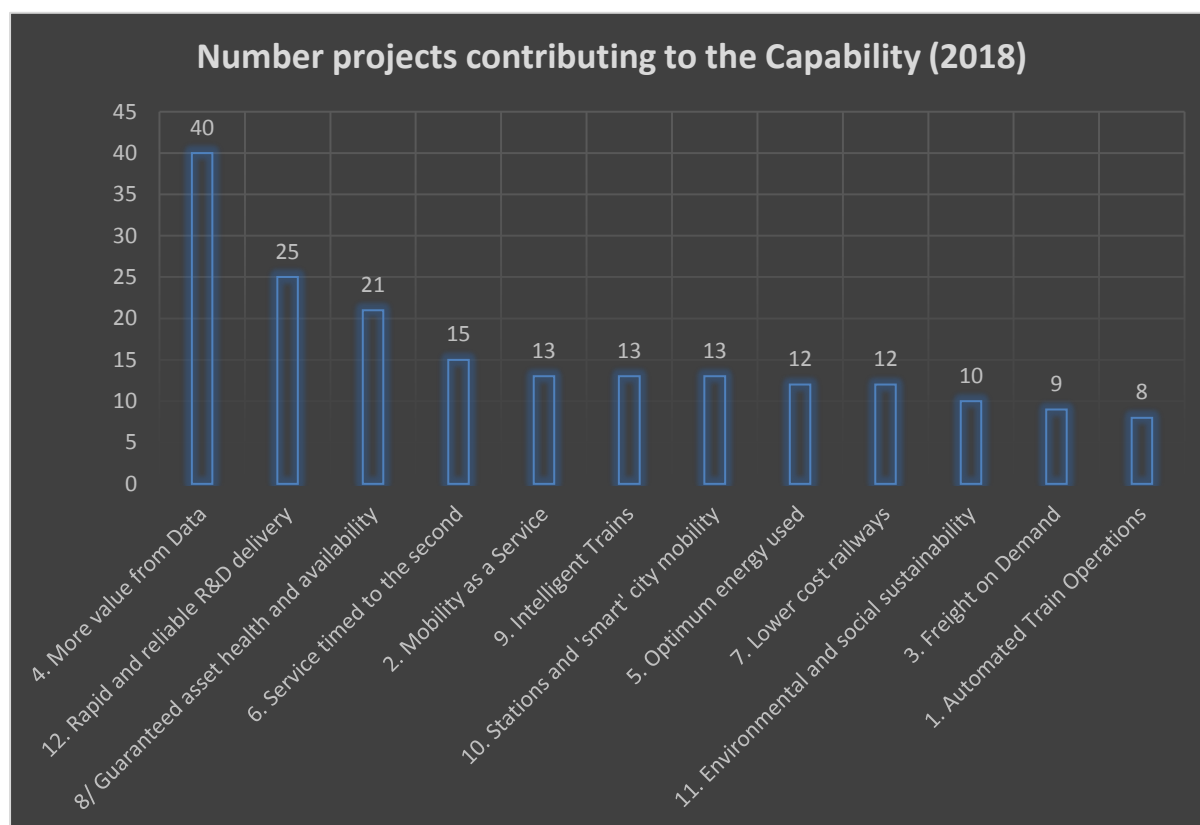
11	Environmental and social sustainability	
BODEGA		FR8HUB
CLEVER CITIES		HERILAND
FF4LE		PORTIS
FINE1		SYNCHRO-NET
FORESEE		WRIST

12	Rapid and reliable R&D Delivery	
5GEVE		OPTIMUM
5GMOBIX		PAPERCHAIN
CLEVER CITIES		PLASA 2
CLUSTERS 2.0		PORTIS
CYBERWISER		ROMSOC
ERSAT GCC		SAFEWAY
ETOPIA		SCENT
FORESEE		SKILLFUL
HERILAND		TER4RAIL
IMPACT-1		VisIoN
IMPACT-2		VITAL NODES
INFRA4DFUTURE		VITE
MeBeSafe		

Conclusion

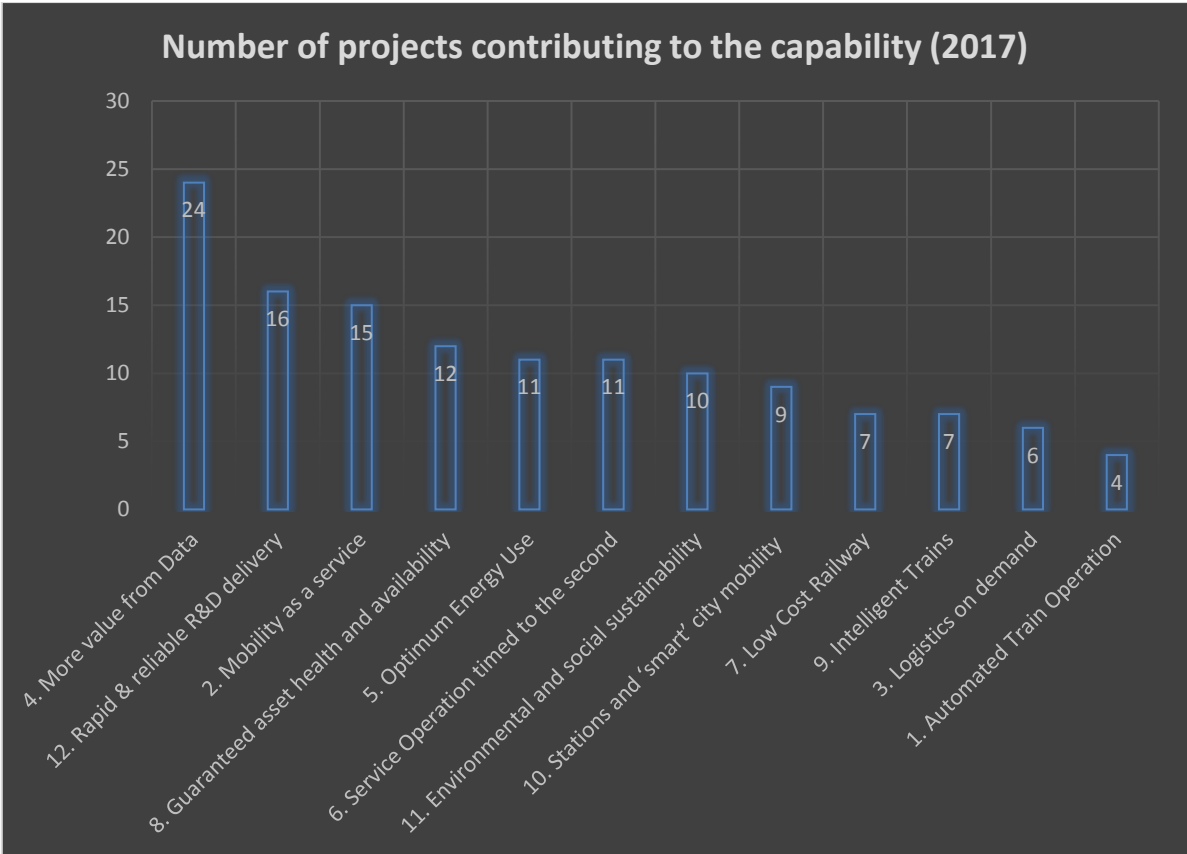
Compared to the 2017 EU-funded projects book, the ROC RICG members have maintained their interest in further exploring how railways can use data and boosting the delivery of R&D. Out of 85 projects, 40 contributed to build the capability *4. More value from Data* – confirming once more railways have now embraced digitalisation as the next key evolution they must undertake. 25 projects were contributing to capability *12. Rapid and reliable R&D delivery* and 21 to capability *8. Guaranteed asset health and availability*.

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.

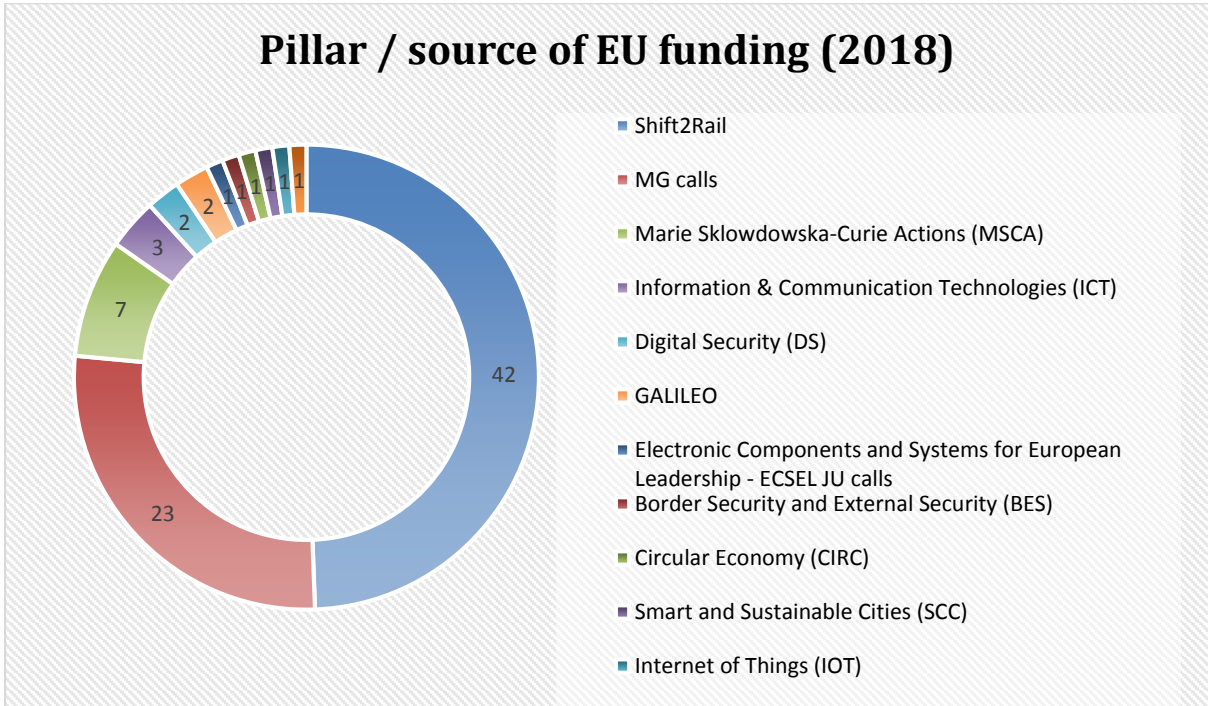


At the other end of the spectrum, 10 projects contribute to capability *11. Environmental and social sustainability*, 9 to capability *3. Freight on Demand* and 8 to capability *1. Automated Train Operations*. These capabilities, which are cornerstones for the Future European Railway System, although seemingly receiving less attention are actually part of large projects. These will bear important results once completed which will be taken on board by further projects.

A quick view at the 2017 graph shows that the RICG ROC members are constant in their efforts and that those are well aligned with the priorities set by the European Commission for 2050.



This 2019 version of the EU-funded book also identified the pillar on which these projects draw their funding, to see where the RICG ROC members are actually involved in terms of sources. The Shift2Rail calls and regular Horizon 2020 MG calls are the most represented source of funding, respectively totalling 42 and 23 projects. Lesser known, the ROC RICG members are also relying on Marie Skłodowska-Curie Actions (7 projects) and other pillars (ICT, IoT, etc) along other sectors to bring in the railways business needs in key cross-sectoral research.



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. Lower 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.
