SHIFT2RAIL
Innovation Programme 3

Cost efficient – High capacity infrastructure

FIF

Levallois

2015 December, 15th

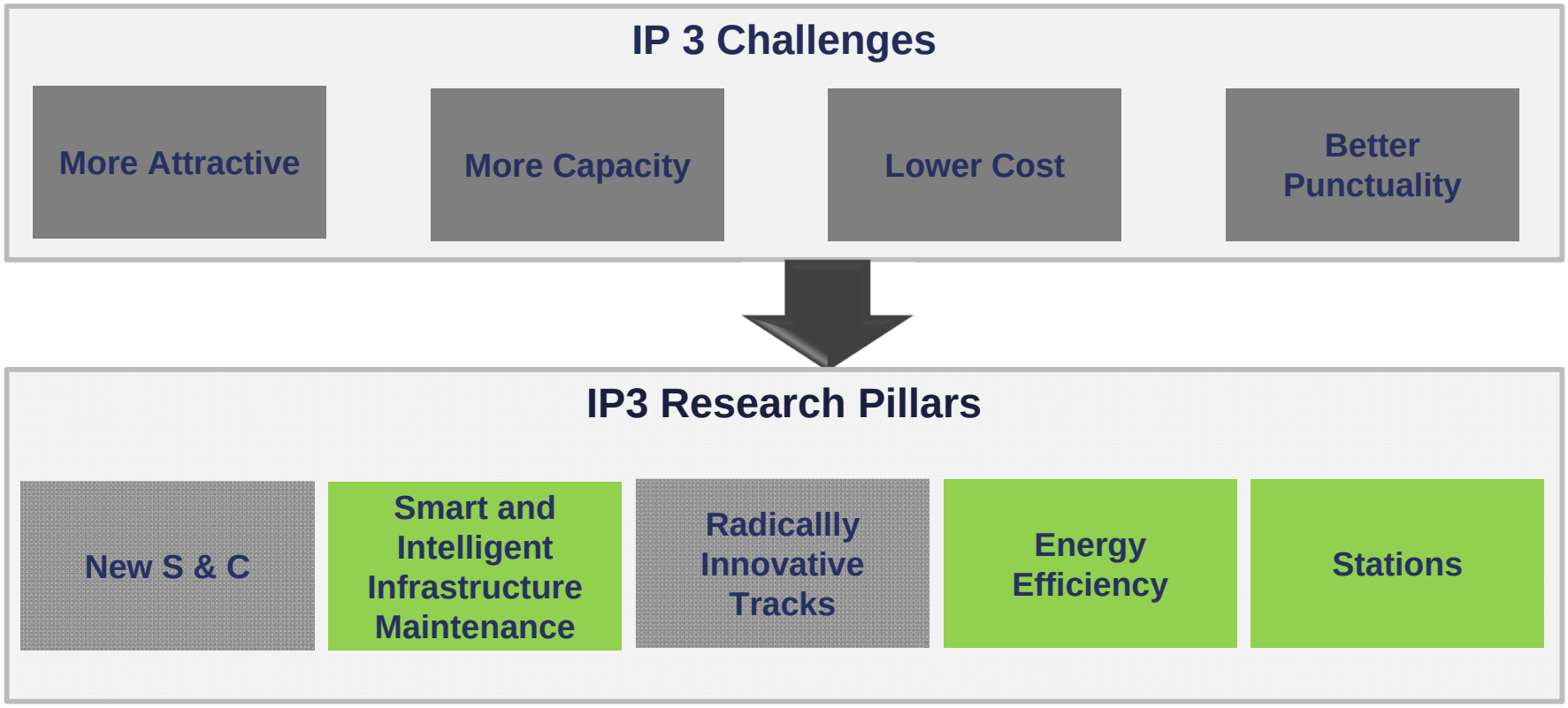
TECHNOLOGICAL RESEARCH INSTITUTE
RAILENIUM

Objectives

High level objectives for the activities within IP3 :

- New Switches & Crossing, that reduce their current part on infrastructure failures on European Railway from 30% to 10%;
- New track system i.e Ballast/Substructure/Rail, to reduce carbon demand by 50%, reduce whole life cost by 30%, maintain passenger safety and improve safety of track/maintenance workers;
- Intelligent maintenance , fully integrated with the traffic management; embedded monitoring, self adjusting, self repairing, able to predict against traffic demand and usage;
- Enable further savings in infrastructure Managers budgets by 30%.

Introduction: Areas of interest



TECHNOLOGICAL RESEARCH INSTITUTE
RAILENIUM

IP3 Technical Demonstrators

Technology Demonstrator (TD)	TD Description	Lead IP3 Company	Who	E-Mail
TD3.0	IP3 Coordinator	Network Rail	James Lewis	james.lewis2@networkrail.co.uk
TD3.1	Short/medium term Switch & Crossing	Network Rail	Tom Tivey	Tom.tivey@networkrail.co.uk
TD3.2	Long term radical Switch & Crossing	Network Rail	Tom Tivey	Tom.tivey@networkrail.co.uk
TD3.3	Short/medium term Track	Trafikverket	Anders Carolin	anders.carolin@trafikverket.se
TD3.4	Track Long Term	Trafikverket	Anders Carolin	anders.carolin@trafikverket.se
TD3.5	Proactive Bridge and Tunnel Assessment and Repairing/Upgrading	Trafikverket	Anders Carolin	anders.carolin@trafikverket.se
TD3.6	Intelligent Maintenance (DRIMS)	Ansaldo STS	Nadia Mazzino	Nadia.Mazzino@ansaldo-sts.com
TD3.7	Intelligent Maintenance (RIMMS)	Ansaldo STS	Nadia Mazzino	Nadia.Mazzino@ansaldo-sts.com
TD3.8	Intelligent Maintenance (ISMES)	Network Rail	James Lewis	james.lewis2@networkrail.co.uk
TD3.9	Smart AC Power supply	Siemens	Albrecht Brodkorb	albrecht.brodkorb@siemens.com
TD3.10	Smart metering for railway distributed energy resource management systems (RDERMS)	Alstom	Marius Iordache	marius.iordache@transport.alstom.com
TD3.11	Stations	Network Rail	James Lewis	james.lewis2@networkrail.co.uk

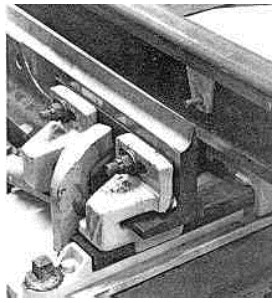
TECHNOLOGICAL RESEARCH INSTITUTE
RAILENIUM

TD3.1 medium term &TD3.2 long term

New Switches & Crossings (S&C)

- Improvement of existing S&C and new concept of train direction changing (Mechatronic S&C) to reduce the noise, the number of delays attributable to failures in such equipment and the maintenance costs.

SWITCHES and COMMON CROSSINGS

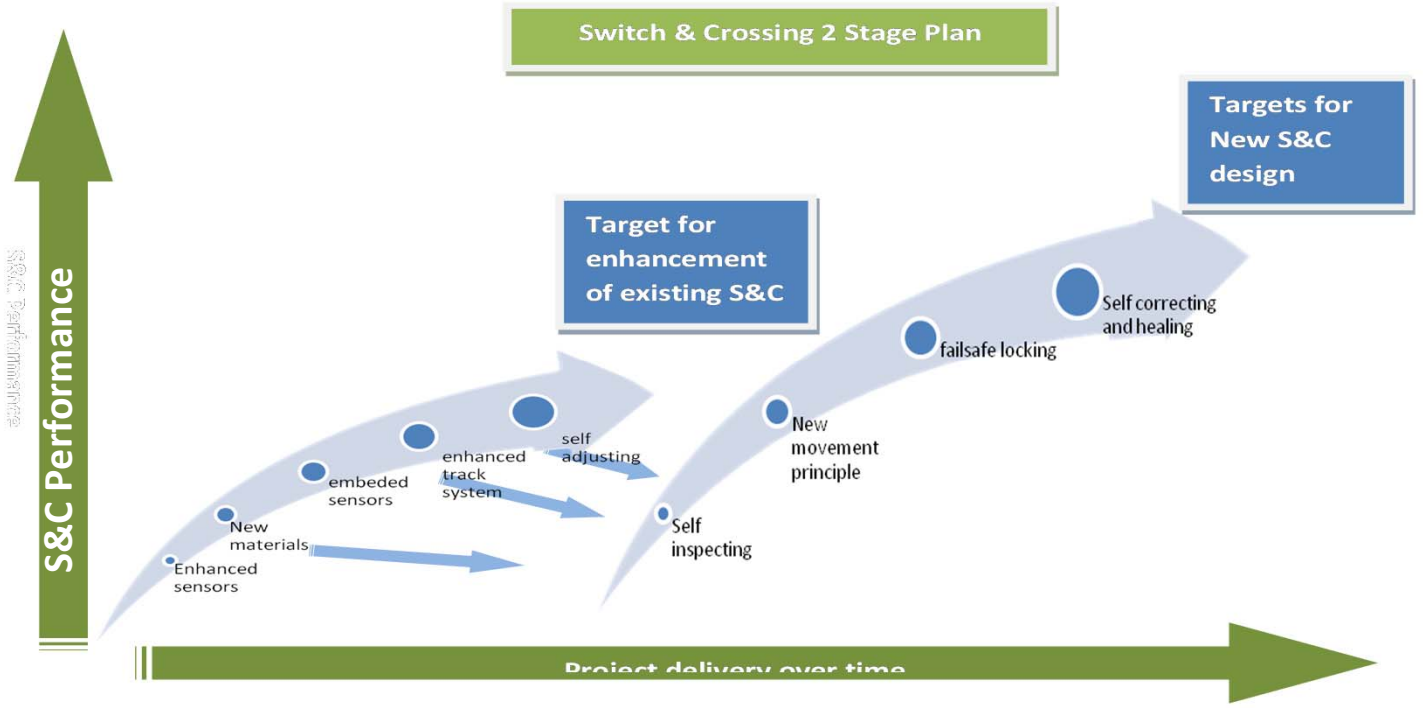


TECHNOLOGICAL RESEARCH INSTITUTE
RAILENIUM

TD3.1 et TD3.2

Advanced and expected impacts on TD3.1 – TD3.2

- Reduced maintenance ➔ cost reduction
- Improved reliability ➔ reduced traffic disruption
- Standardisation and pre-fabricated components ➔ investment reduction, construction timeline reduction

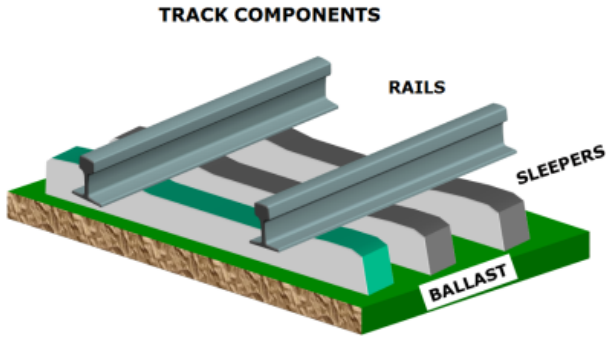


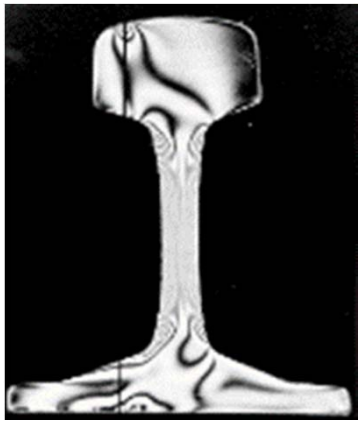
TECHNOLOGICAL RESEARCH INSTITUTE
RAILENIUM

TD3.3 medium term &TD3.4 long term

Radically Innovative Tracks

- Optimisation of the entire track: New design of the entire track in order to optimise the response of it to traffic loads and developement/ implementation of new technologies (e.g. « self-healing » rail steel to reduce rolling contact fatigue phenomenon).

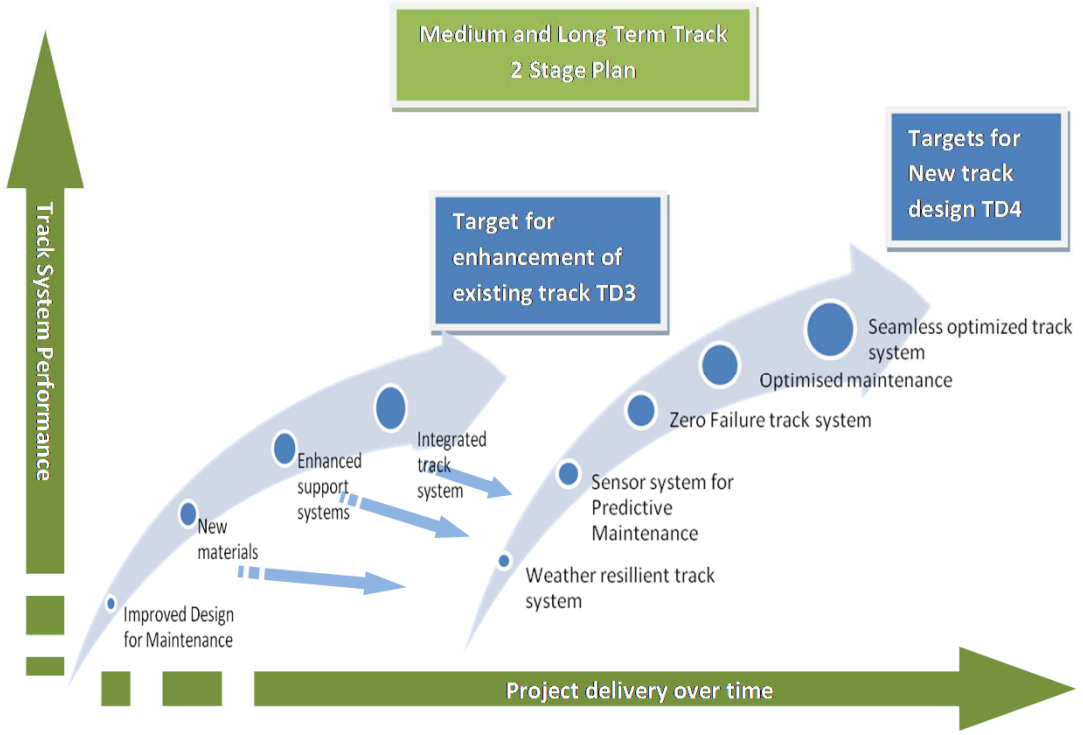




TECHNOLOGICAL RESEARCH INSTITUTE
RAILENIUM

TD3.3 – Medium Term

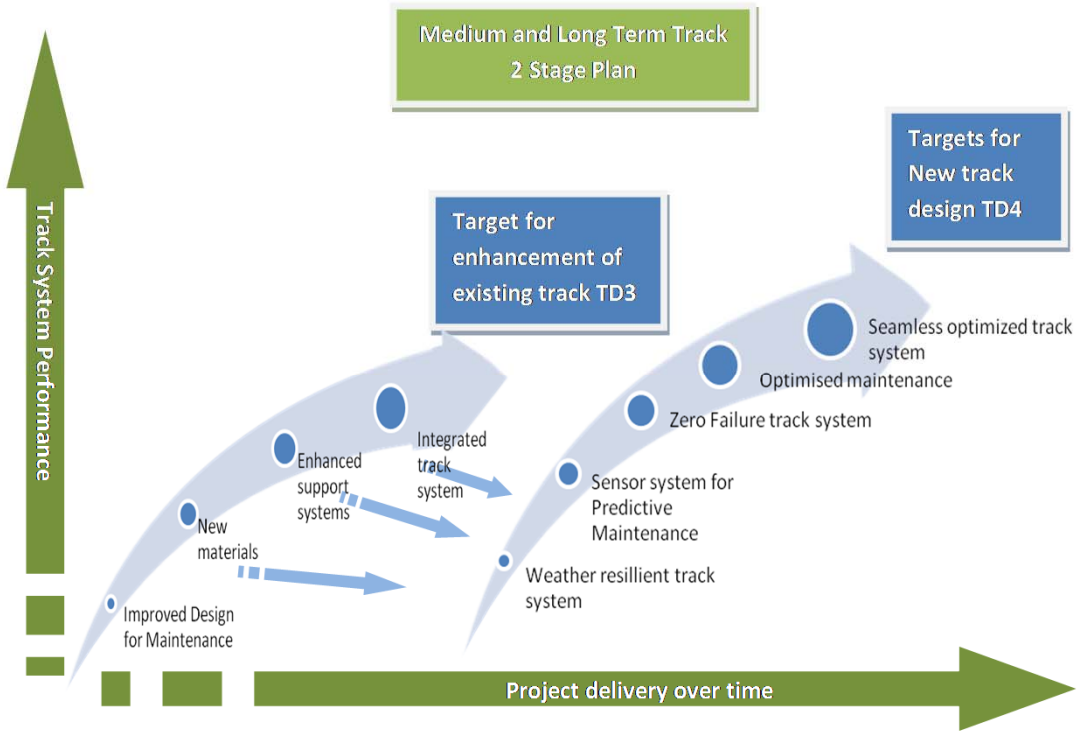
1. Increase lifetime of track by 100%;
2. Decrease traffic disturbance due to track maintenance and faults by 50%;
3. Develop and deploy tools to allow for infrastructure managers to determine track solutions that are technically, economically, environmentally and operationally beneficial including LCC and RAMS evaluation of solutions;
4. Deploy tools to provide the infrastructure manager with means for pro-active management.



TECHNOLOGICAL RESEARCH INSTITUTE
RAILENIUM

TD3.4 – Long-Term

1. Increase lifetime of track by 150%
2. Decrease traffic disturbance due to track maintenance and faults by 75%
3. Develop and deploy seamlessly integrated tools to allow for infrastructure managers to evaluate track solutions from a technical, economic, environmental and operational perspective including LCC and RAMS evaluations
4. Extend these tools to provide the infrastructure manager with means to optimize a pro-active management plan from a system perspective



TECHNOLOGICAL RESEARCH INSTITUTE
RAILENIUM

TD3.5 – Proactive Bridge and Tunnel Assessment

Objectives	Deliverables
Enhanced tunnel inspection, both regarding quality and effectiveness.	Standards for new methods. Prototypes of new equipment
Enhanced bridge inspections, both regarding quality and effectiveness.	Guidelines and case studies including demonstration of new methods.
Enhanced tunnel and bridge repair and upgrading methods with reduced time closure.	Guidelines and case studies with results from tests with new methodologies. Design concepts of new mechanised equipment for the improvements of tunnels.
Enhanced tunnel and bridge technology for Design, Construction and Maintenance	Suggestions for codes and standards together with case studies including use of new technologies
Spread knowledge how new and enhanced technology for bridge and tunnels should be used.	Case studies with application of new technologies and guidelines how it can be used.
Reduce noise and vibration intensity related to structures	Guidelines for design of noise and vibration reduction system for bridges and tunnels

TECHNOLOGICAL RESEARCH INSTITUTE
RAILENIUM

TD3.6 - TD3.7 - TD3.8 – Smart Maintenance

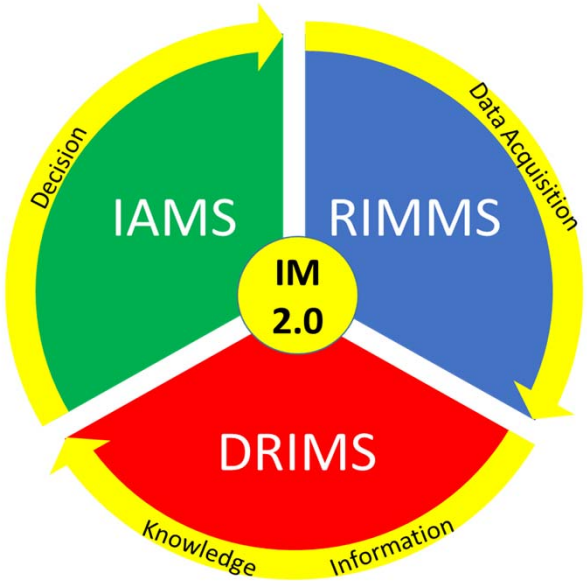
Smart and Intelligent Infrastructure Maintenance

- New solutions for Rail Asset Registers, Cutting edge measuring and monitoring tools, use based maintenance instead of condition based (maintenance engineering) and maintainability by design will further contribute to minimize cost, increase capacity and reduce noise.

TECHNOLOGICAL RESEARCH INSTITUTE
RAILENIUM

TD3.7 RIMMS focuses on asset status data collection (measuring and monitoring) and processing and data aggregation producing data and/or information on the measured/monitored status of assets

TD3.8 IAMS concentrates on decision making (based also but not only on TD3.6 input); validation and implementation of degradation models based on the combination of traditional and data driven degradation models and embedding them in the operational maintenance process based upon domain knowledge; system modelling; strategies & human decision support.



- **Composed by an integrated set of cutting-edge on-board, wayside and remote-sensing asset-specific measuring and monitoring sub-systems**

- **Aimed at condition based and/or predictive system maintenance.**

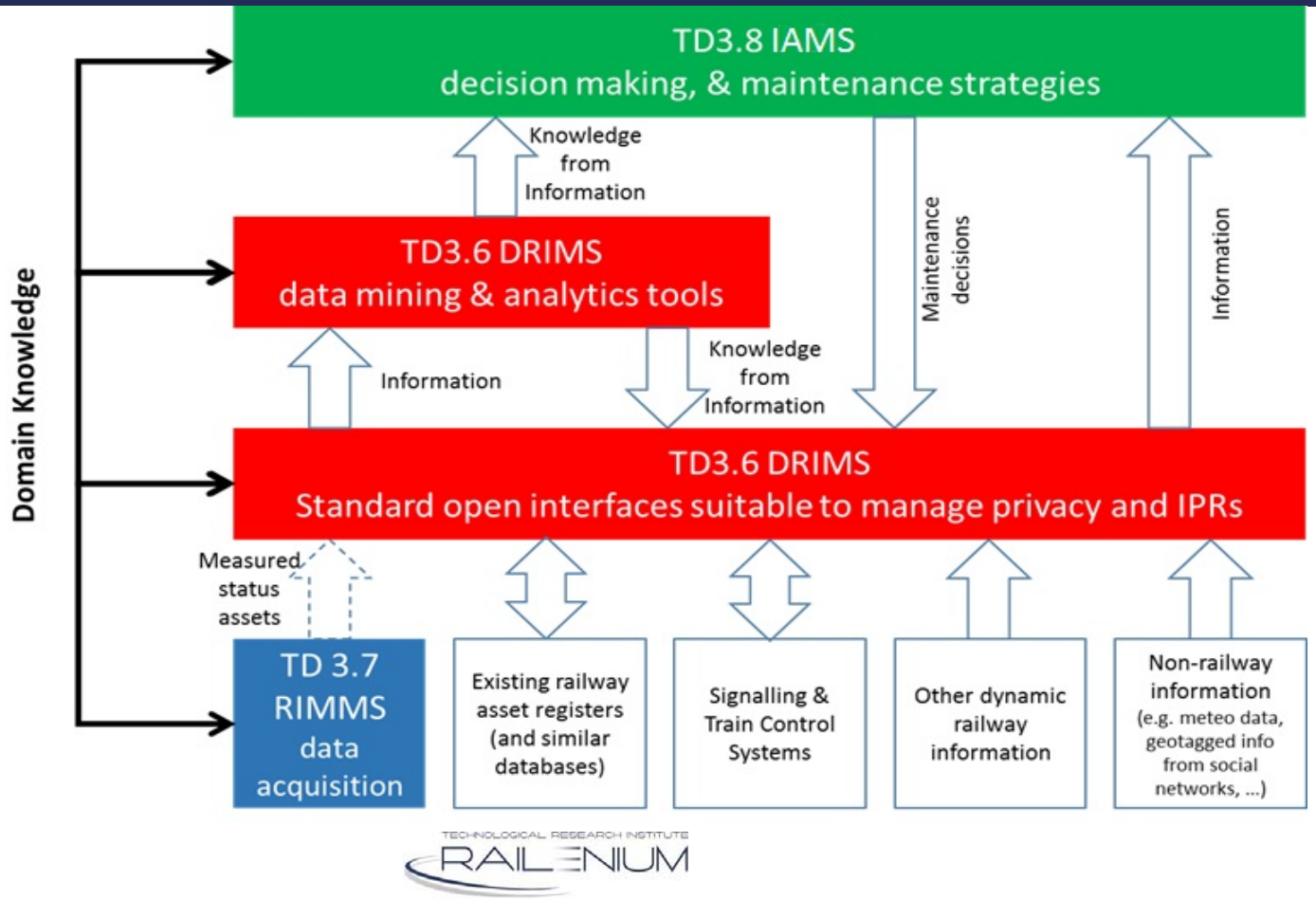
TD3.6: Dynamic Railway Information Management System (DRIMS) Demonstrator

TD3.6 DRIMS focuses on interfaces with external systems; maintenance-related data management and data mining and data analytics; asset degradation modelling covering both degradation modelling driven by data and domain knowledge and the enhancement of existing models using data/new insights.

- **Able to store, process and manage dynamic heterogeneous information** to provide input not only to the maintenance but also to other railway tasks.

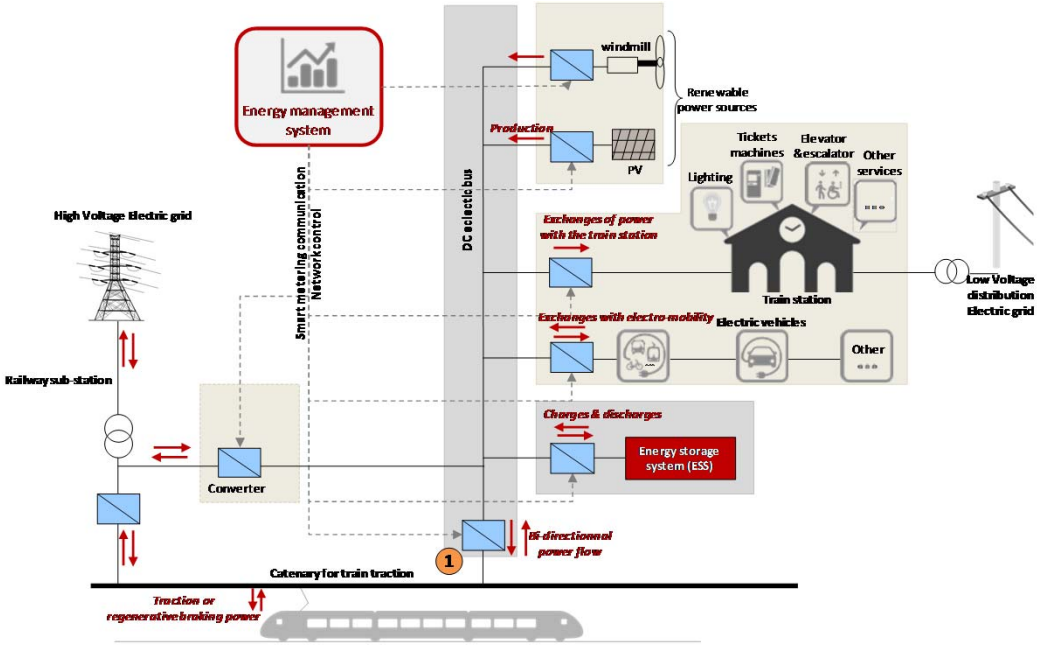
TECHNOLOGICAL RESEARCH INSTITUTE
RAILENIUM

Correlation between TD3.6 – TD3.7 – TD3.8



TD3.9: Smart Power Supply Demonstrator

TD3.9 “Smart Power supply” is aimed at defining and demonstrating solutions to optimize the Traction power supply systems of AC electrified railways.



TECHNOLOGICAL RESEARCH INSTITUTE
RAILENIUM

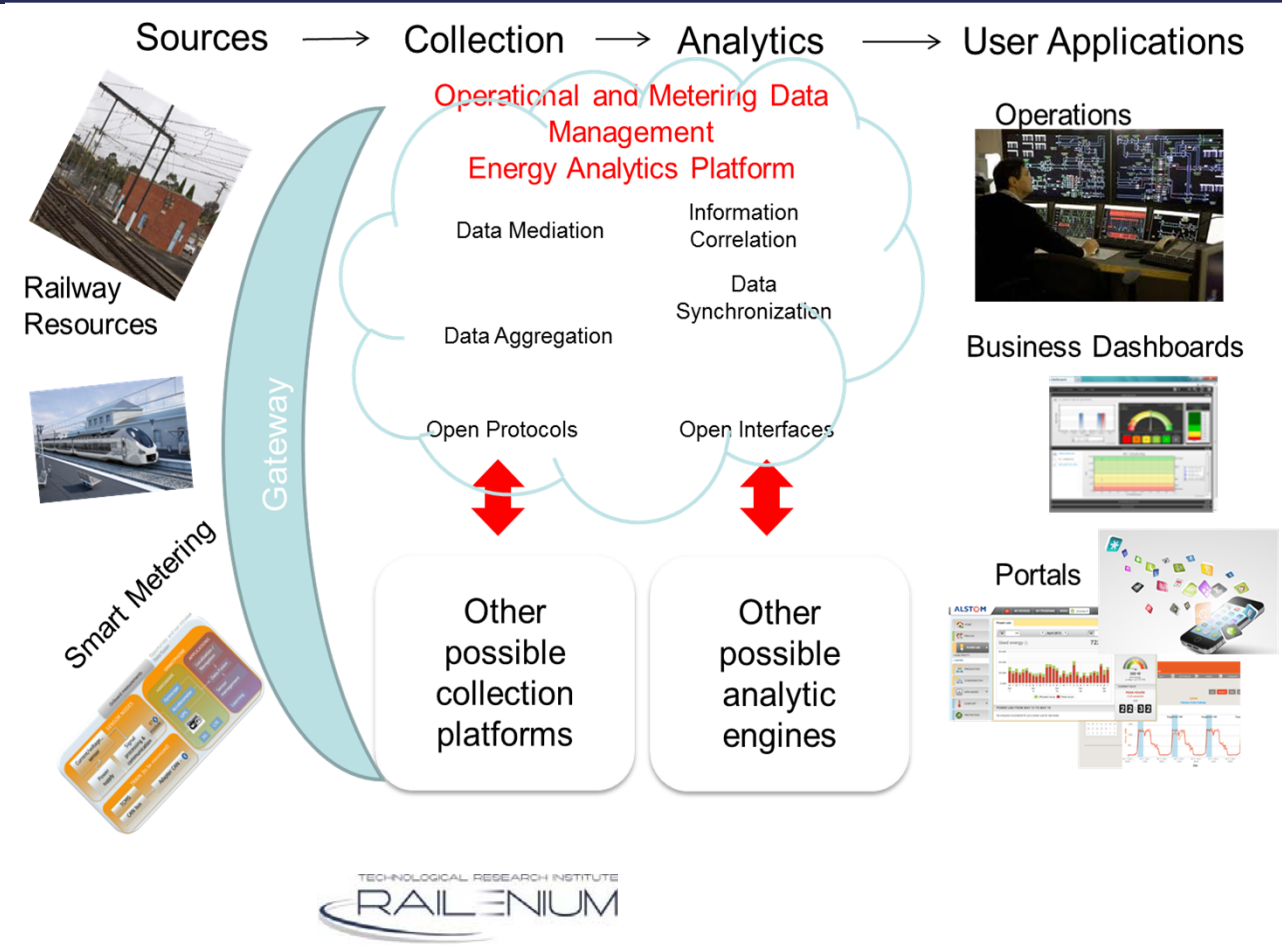
TD3.9: Smart Power Supply Demonstrator

TD3.9 “Smart AC Power supply”, technical demonstrators covering the following topics:

- Innovative control and protection systems for traction substations;
- Control procedures for networks of intelligent substations considering the interaction with rail operation and feeding grid.

TECHNOLOGICAL RESEARCH INSTITUTE
RAILENIUM

TD3.10: Smart Metering for Railway Distributed Energy Resource Management System Demonstrator



TECHNOLOGICAL RESEARCH INSTITUTE
RAILENIUM

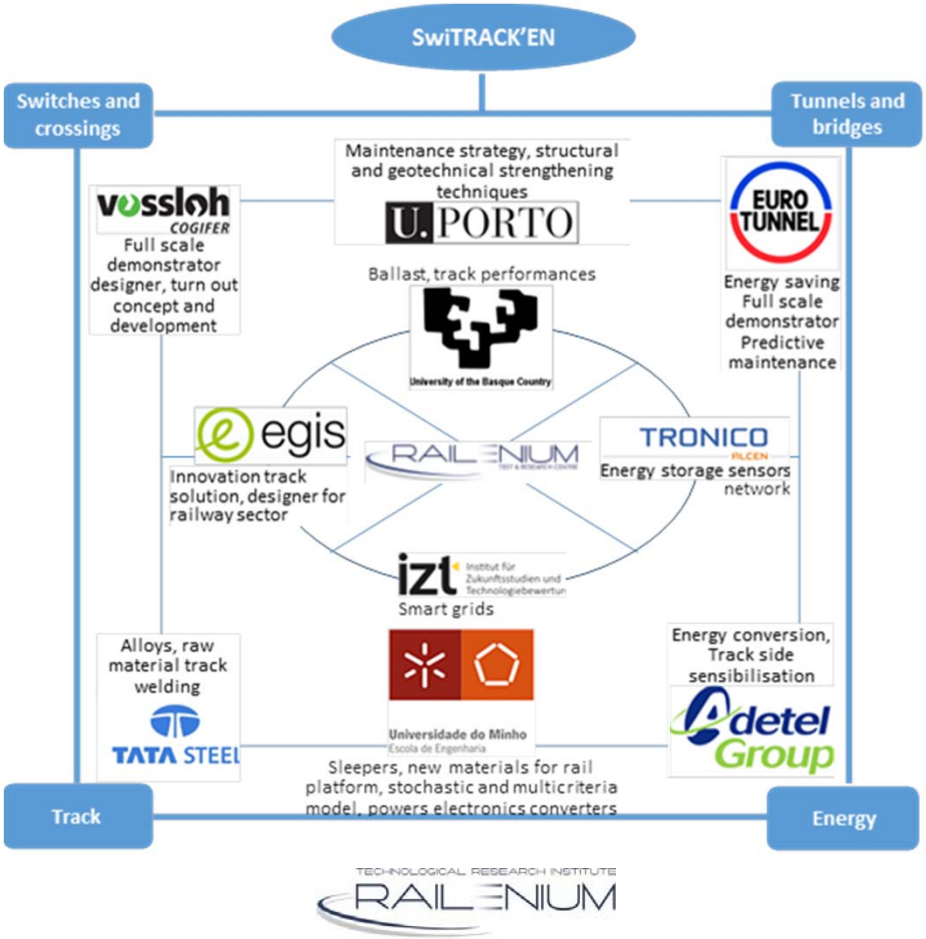
TD3.10: Smart Metering for Railway Distributed Energy Resource Management System Demonstrator

The technical ambition :

- Adaptation of the wireless sensor networks to railway energy networks measurements;
- Autonomous supplied sensor nodes;
- Data aggregation and data fusion algorithms;
- Energy consumption estimation algorithms for non-intrusive measurements;
- Analysis of smartphone or other low cost communicating sensors for on-board and track side energy measurements;
- Development of embedded learning algorithms for energy estimation and mobile device navigation applications;
- Development of a global architecture for the data collection, data synchronization, post-processing, analysis and applications;
- Integrate the railway applications in the generic energy analytics ODM platforms as a distinct use case.

TECHNOLOGICAL RESEARCH INSTITUTE
RAILENIUM

Railenium is associated across SwiTRACK'EN consortium



Merci pour votre collaboration

Carole Magniez : carole.magniez@railenium.eu
Moïse Vouters : moise.vouters@railenium.eu

TECHNOLOGICAL RESEARCH INSTITUTE
RAILENIUM