

Intelligent Innovative Smart Maintenance of Assets by integRated Technologies



Project in a nutshell

IN2SMART addresses the “S2R-CFM-IP3-02-2016, Intelligent Maintenance Systems and Strategies” call launched by the Shift2Rail (S2R) Joint Undertaking (JU). IN2SMART delivers an Intelligent Asset Maintenance System, creating new and optimised strategies, frameworks, processes and methodologies, tools, products and systems for the implementation of a step change in risk based, prescriptive and holistic asset management in the rail sector.



This project has received funding from the Shift2Rail Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement No: 730569



Project objectives

IN2SMART aims at reaching the following threefold objectives:

1. Development of Railway Information Measuring and Monitoring Systems (RIMMS) based on:

- Calibrated track and S&C monitoring (TRL4).
- Monitoring from unmanned autonomous vehicles (TRL3/4).
- Sensor systems embedded in switches & crossings (TRL4)
- Signalling systems diagnostics for maintenance (TRL4)
- Monitoring of impact of rolling stock on infrastructure (TRL4)

2. Development of a Dynamic Railway Information Management System (DRIMS) based on:

- Standard open interfaces to access existing heterogeneous multi-owner maintenance-related data: Open standard interfaces for maintenance applications (TRL4)
- Analytic tools for automatic detection of anomalies, discovering and describing the maintenance workflow processes and predicting railway assets decay towards prescriptive maintenance: Algorithms to extract knowledge from data (TRL4)

3. Development of Intelligent Asset Management Strategies (IAMS) based on:

- Approaches for risk-based Asset Management (AM), for linking Enterprise Risk Management (ERP) and related business objectives with risk-based AM and related RAM4S objectives, for harmonising all identified operational and maintenance risks and asset's LCC for decision purposes: Decision support framework and tools (TRL4).
- New automated and smart working tools, methods and procedures for LEAN execution: Optimised tamping tool (TRL5) and Robot platform for maintenance works (TRL4/5).



Contribution to Shift2Rail

As set-out in the Shift2Rail Multi-Annual Action Plan (MAAP) IN2SMART belongs to the Intelligent Asset Maintenance Pillar, a driver to deliver innovative asset management solutions meeting the best practice set out in ISO 55000 in the railway sector. The Intelligent Asset Management pillar within Shift2Rail is made up of three interlinked Technology Demonstrators (TDs):

- **TD3.7 Railway Information Measuring and Monitoring System (RIMMS)** focuses on asset status data collection (measuring and monitoring), processing and data aggregation producing data and information on the status of assets;
- **TD3.6 Dynamic Railway Information Management System (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;
- **TD3.8 Intelligent Asset Management Strategies (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 and human decision support; automated execution of work.



Project organisation

IN2SMART is organised around 12 Work-Packages (WP), where 8 are technical WPs (from WP3 to WP10) and the other 4 in support to the project management, requirement specification, dissemination and ethics concerns. The technical WPs are described here below.

WP3 RIMMS Satellites and autonomous intelligent monitoring systems

WP3 aims at enabling the development of autonomous and unmanned vehicles (satellites, UAV's and robotics applications) for railway network monitoring. This work will be a step towards automated inspection that, together with WP10, will allow autonomous monitoring for the railway network.

WP4 RIMMS Track and Switch & Crossings Monitoring

The objectives of WP4 are to develop calibrated prototypes of integrated monitoring systems installed on in-service trains to identify surface errors in the rail tread, which are key parameters for the degradation prediction and fail root cause identification of track geometry and S&Cs .

WP5 RIMMS Signalling and Telecommunications

WP5 is focused on gathering diagnostic data from legacy and new signalling and telecom systems to support asset maintenance without impacting on safety. The WP also develops a framework toolset to be used to develop a converter proxy for diagnostic data into a format defined by this project as open standard interfaces.

WP6 RIMMS Operations

The WP6 objective is to achieve an integrated, standardised, easily-installed and low-cost solution for monitoring the trains and their impact on the infrastructure, compliant with the maintenance process proposed by the project. The WP6 monitoring solution will comprise systems for rolling stock measurement, a train loads and wheel defects detection and standardised rolling stock identification.

WP7 DRIMS Open Standard Interfaces

WP7 is dealing with the definition and further development of an open standard interface to access existing heterogeneous multi-owner maintenance-related data with the adequate degree of privacy, security and quality to be used in a canonical railway environment.

WP8 DRIMS Data Mining and Predictive Analytics

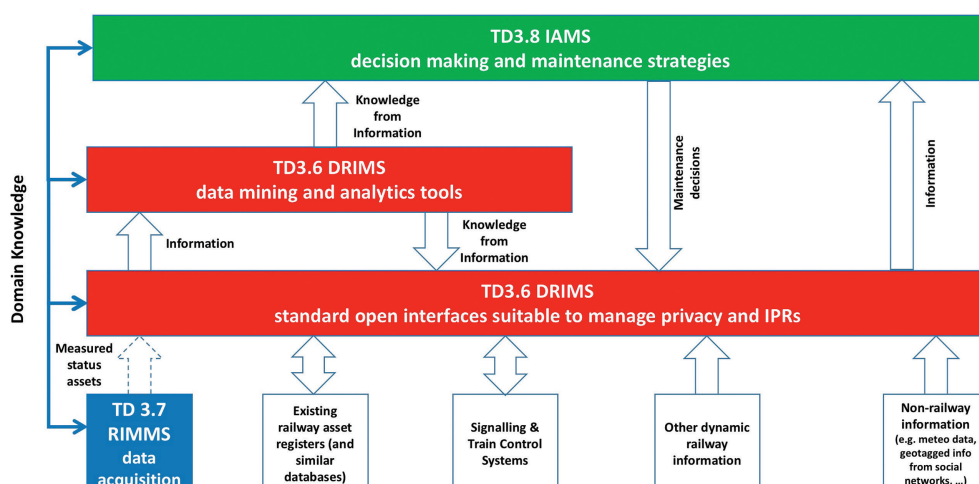
The objective of WP8 is to identify, design and develop the most suitable data mining and big data analytics approaches, for extracting information and knowledge from datasets collected by RIMMS solutions. Analytics will enable online and real-time identification and modelling of assets' status and behaviour, that can be used for diagnostics and prognostics purposes.

WP9 IAMS Asset Management and Decision Support

The aim of this WP is to specify the scope, objectives, workflow and outcomes of the decision-making process for asset management interventions planning and to lay the foundation of a generic framework for an intelligent asset management decision support system mainly based on the information coming from DRIMS.

WP10 IAMS Maintenance Execution, Work Methods and Tools

WP10 is focused on the development of lean inspection and tamping process and robotic maintenance execution. The objective of the lean inspection and tamping is to replace the pre-measurements needed by the tamping machines with inspection data measured by track recording cars while the objective of the robotic maintenance execution task is to develop the core of an autonomous robotic vehicle system to enable automatic inspection and maintenance activities.



Project coordinator

Ansaldo STS

A Hitachi Group Company

Partners



Ingeniería y Control



AN ANGEL COMPANY



Deutsches Zentrum
für Luft- und Raumfahrt
German Aerospace Center



the evolution of mobility



Topic: S2R-CFM-IP3-02-2016
Duration: from 01/09/2016 to 31/08/2019
Coordinator: Carlo Crovetto
Carlo.Crovetto@ansaldo-sts.com

Total Project Value: € 16 405 562,56
S2R (Of H2020) co-funding: € 7 290 632,50
Complementary OCs projects: IN2DREAMS, MOMIT