sprint

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Shift2Rail

SPRINT • Semantics for PerfoRmant and scalable INteroperability of multimodal Transport

PROJECT IN A NUTSHELL

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.

IT2Rail has laid the foundations for the achievement of the objectives of TD4.1 - Interoperability Framework - described in the Shift2Rail Joint Undertaking Multi-Annual Action Plan (MAAP). The improvement and enhancement of IT2Rail's results has been and is under development in the IP4 TD4.1 projects (GoF4R, ST4RT and CONNECTIVE).

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 and explicitly addressed in the work programme topic S2R-OC-IP4-01-2018 Semantic framework for multimodal transport services:

- Improve IF performance and scalability to sustain a large deployment.

- Simplify/automate all the necessary steps needed to integrate new services and sub-systems in the IP4 ecosystem.
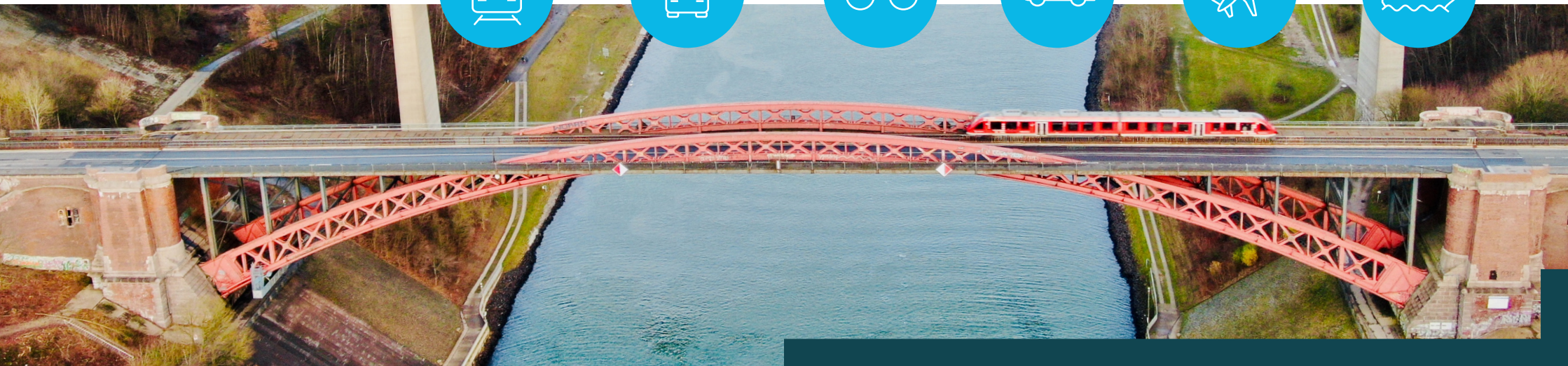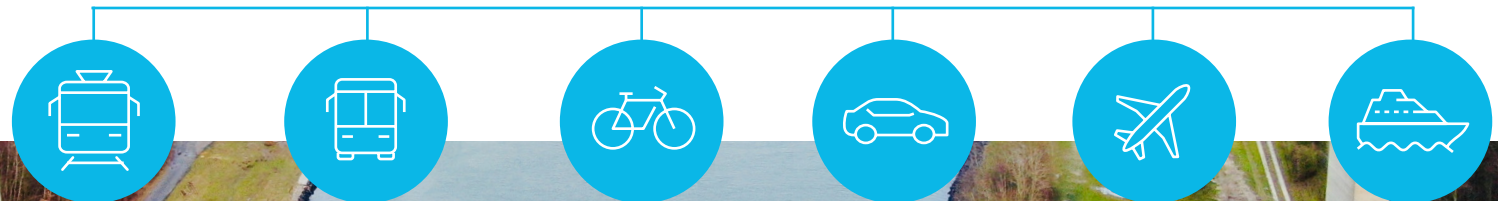
PROJECT OBJECTIVES

Consistently with its scope, the SPRINT project will pursue the following objectives:
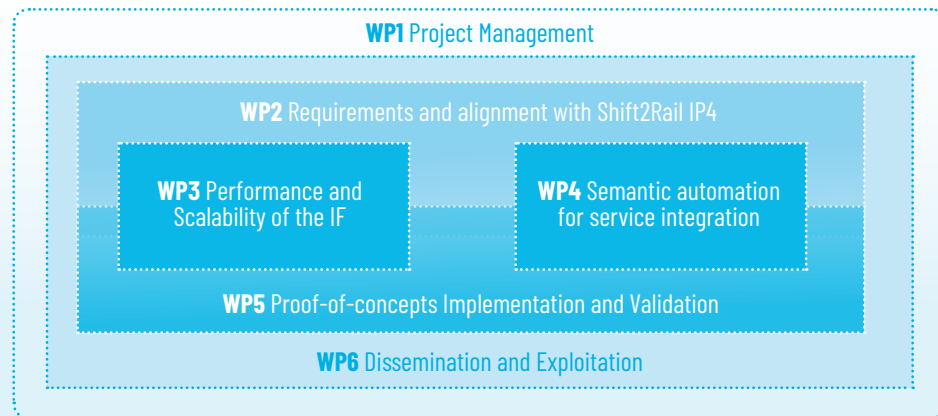
- Define a reference architecture for the Shift2Rail Interoperability Framework (IF), which will take into account recent advances in the design and development of distributed systems, and in particular of cloud-based ones;

- 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

WP1 Project Management

WP2 Requirements and alignment with Shift2Rail IP4

WP3 Performance and Scalability of the IF

WP4 Semantic automation for service integration

WP5 Proof-of-concepts Implementation and Validation

WP6 Dissemination and Exploitation

WP2 - Requirements and alignment with Shift2Rail IP4 • *Leading Partner: International Association of Public Transport (UITP)*
This work package will foster the alignment of SPRINT with Shift2Rail IP4 projects and related EU Initiatives (e.g., NeTEx, SIRI, Smart Ticketing Alliance, ITxPT, National Access Point and the new EIF) by defining requirements for WP3-WP5 to make the SPRINT outcomes compatible to and complementary with them. Moreover, this work package will also define recommendations to Shift2Rail IP4 and document best practices resulting from solutions as assessed and proposed in the project.

WP3 - Performance and scalability of the Interoperability Framework (IF) • *Leading Partner: Politecnico di Milano*
Starting from the analysis of the state-of-the-art and best practices in architecting systems processing semantic data and from the assessment of the performance of current Shift2Rail IF components, this work package will design and compare alternative architectural solutions for the IF and select the best architecture as the reference one. Moreover, this work package will define the performance and scalability testing infrastructure and KPIs for the proof-of-concepts validation in WP5.

WP4 - Semantic automation for service integration
Leading Partner: CEFRIEL
Starting from the analysis of the state-of-the-art in semantic automation for service integration and from the assessment of current Shift2Rail TD 4.1 solutions for the creation, integration, usage and management of IF assets, this work package will define a reference solution to support the progressive automation of the generation of ontologies, mappings and annotations simplifying the integration of legacy transportation systems in the IP4 ecosystem. Moreover, this work package will analyse, compare and select tools on the market to be adopted and, in case, extended by WP5 to support the identified reference solution.

WP5 - Proof-of-concepts implementation and validation • *Leading Partner: OLTIS Group*
This work package will realize the proof-of-concepts implementation and validation of the reference solutions identified by WP3 and WP4 and the performance and scalability testing infrastructure defined by WP3.

The work plan is completed by a **Project Management** work package **(WP1)** in which activities are aimed to ensure the smooth execution of the work plan according to common quality and timetable guidelines and a **Dissemination and Exploitation** work package **(WP6)** to make sure that the results of the project are disseminated appropriately to the relevant channels within and outside the Shift2Rail programme.

MAJOR OUTCOMES/ BENEFITS

The SPRINT project will contribute to promote a modal shift towards green modes of transport, such as rail, by improving the intermodality between different transport modes. The development of multimodal travel information, planning and booking services and the interoperability between business applications is currently limited due to the fragmentation and incompatibility of interchange formats and protocols, both within and across transport sectors as well as within the supply chain.

Within Shift2Rail, TD4.1 aims to enable a complete transformation of the European Transportation ecosystem into a global asset marketplace, liberated from technological barriers where actors and business models will be able to emerge and prosper for the benefit of European Travelers. The Interoperability Framework released by the IT2Rail project represents only a first step towards such marketplace. Complementary IP4 projects are expanding the scope of the IF with the integration of new assets and promoting the inclusion of new transportation modes, operators and providers. Consequently, the reliability of the IF mechanisms needs to be reinforced.

The SPRINT project will assess the results from such projects and will evaluate alternative architectures and new software paradigms to sustain a large deployment of the IF, overcoming performance and scalability issues. The evaluation of alternative IF architectures will also check their complementarity with the results of Shift2Rail IP4 projects and with the running initiatives in the public transport sector (e.g., NeTEx, SIRI, Smart Ticketing Alliance, ITxPT, National Access Point) to contribute to the Single European Railway Area (SERA).

Moreover, the current approaches proposed by TD 4.1 projects (e.g., the ST4RT conversion process) to ontology-based annotations and mappings of legacy data representations enabling the conversion/translation of heterogeneous messages exchanged by different systems require a significant set of tasks to be performed by skilled software designers. Such designers need a deep understanding of both semantic technologies and the application domain since they are the key actors of an efficient conversion process. Currently designers spend an excessive amount of time in error-prone, tedious manual tasks due to the lack of maturity of semantic interoperability tools and a not-yet-optimised conversion process.

The SPRINT project will identify and evaluate new mechanisms to automate the generation/extension/revision of ontologies (especially lightweight ontologies) and the definition/revision of ontology-based annotations and mappings. These mechanisms will be based on extending the current state-of-the-art in methods, techniques and tools for the collaborative development of ontologies.

CONTRIBUTIONS TO SHIFT2RAIL
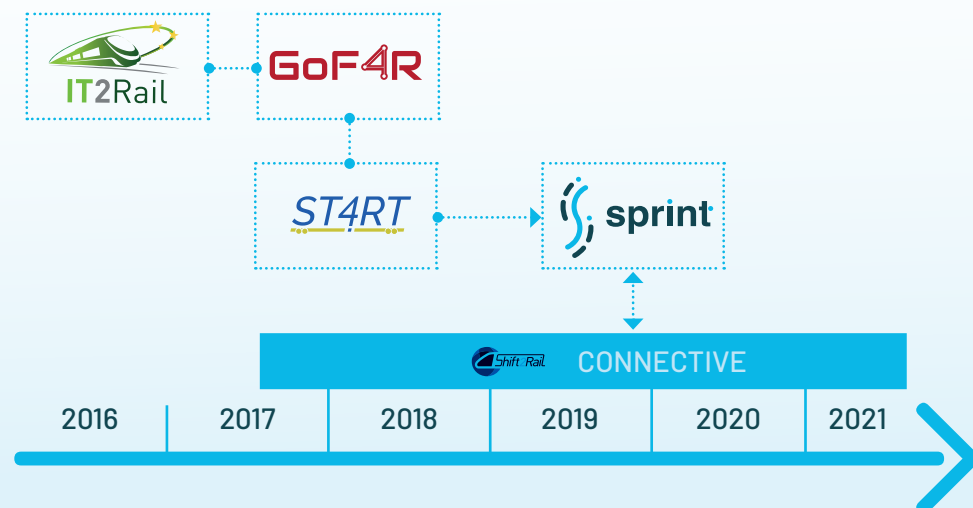
The SPRINT project will deliver results that are an integral part of the Shift2Rail IP4 work programme, in close continuity with previous and complementary projects in this domain.

Some of these IP4 projects have been funded through Open Calls (OC) – i.e. ST4RT, GoF4R, My-TRAC, and some others through Calls For Members (CFM) – i.e., Co-Active, ATTRACkTIVE, COHESIVE and CONNECTIVE. Prior to these OC and CFM projects, the IT2Rail project, which is one of the four "lighthouse" projects that started before IP4 projects were launched, is the project that kick-started the IP4 activities, addressing all of the Technology Demonstrators in this particular Innovation Program.

As shown in the figure, SPRINT will start its activities with the assessment of the results produced by the related IP4 TD4.1 projects IT2Rail, GoF4R and ST4RT. Moreover, SPRINT will assess the first outcomes from CONNECTIVE, expected in December 2018. SPRINT will remain compatible with the approach currently developed within IP4, to allow the adaptation of the IF mechanisms developed in the parallel complementary project CONNECTIVE. The

project will also collect requirements concerning the usage of the IF from ATTRACkTIVE, Co-Active, My-TRAC, COHESIVE and from future TD4.2-TD4.7 CFM/OC projects, even if not directly involved in TD4.1 development. Since these projects make use of the IF to offer to the customer more intuitive and engaging services for door-to-door intermodal journeys, the solutions proposed by SPRINT will also empower these services in terms of performance and scalability. Furthermore, since SPRINT aims to define and use realistic target KPIs to evaluate its solutions, past and ongoing Shift2Rail Cross-Cutting Activities (CCA), such as the results of the projects IMPACT-1 and IMPACT-2 on enabling the monitoring and assessment of the Shift2Rail overall target achievements, will be investigated and a close cooperation with these CCA is expected. The implementation will be validated according to defined functional and non-functional KPIs in relevant use case scenarios with the objective to define recommendations for IP4 to support the market uptake by simplifying / automating all the necessary steps which are needed to integrate new services and sub-systems in the multi-modal transport ecosystem.

SPRINT CONSORTIUM

PARTNERS

FACTS AND FIGURES

€ Total Budget
1 999 500

8 Partners

Project Start Date
1st December 2018

Project End Date
31st December 2020

Duration
25 Months

Grant Agreement
No: **826172**

CONTACT US : Project Coordinator
UNIFE – The European Rail Industry

→ **STEFANOS GOGOS**
stefanos.gogos@unife.org