D5.3 - Dissemination and Exploitation activities

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0.7	2019-10-30	UNIFE	Consolidation of input and release of final version

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Introduction

This document provides a description of the ASTRail dissemination and communication activities carried out during the whole duration of the project. The aim of this report is to provide a detailed description of the dissemination strategy and how this was implemented during the 26 months of project implementation, including the materials and strategies that have been used to facilitate a wide spread of information and knowledge of the results created by the project. The dissemination of ASTRail has been essential throughout the project's life and been carried out with the cooperation of all Work Packages.

First, materials and strategies for communicating and disseminating RUN2Rail to railway stakeholders, the scientific community and the general public are presented. Those include: the creation of a project identity; the creation of a website; the production of two newsletters; the creation of a project brochure; the organization of dissemination events; the participation at conferences; and the publication of results in relevant journals. Moreover, this report describes how expert groups have interacted with the technical Work Packages and how the results have been disseminated to the Shift2Rail public-private partnership. Finally, a calendar of events is presented.

Scope

ASTRail (Satellite-based Signalling and Automation Systems on Railways along with Formal Method and Moving Block Validation) is a 24 months Shift2Rail IP2 Open Call project within the Horizon2020 Programme of the European Commission.

The main objective of ASTRail is to increase the efficiency and safety in the railway sector. ASTRail has contributed to enhancing the signalling and automation of the railway system thanks to innovative solutions that exploit cutting edge technologies already in use in sectors different from the rail, such as the aeronautic or the automotive sectors. Investigation of such technologies and assessment of their reusability in the railway field have been done taking particular care of issues related to safety and performance in the rail system.
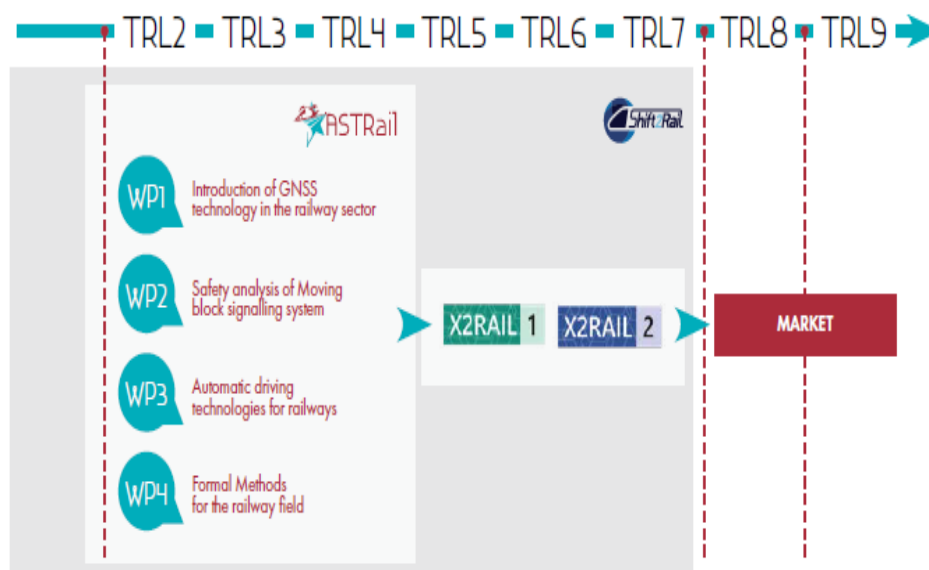

Figure 1 - Project structure within S2R framework

The dissemination of the project's research activities and results are fundamental components of the ASTRail project. The dissemination objectives of this project are:

- to ensure that the outputs of the project are delivered in a form which makes them immediately available for use by the Innovation Programme 2 within Shift2Rail;
- to ensure that all important actors in the European railway sector are informed about ASTRail;
- to facilitate acceptance of the project outcomes by main actors of the EU rail sector.
- to disseminate, engage and promote the project and its research activities to relevant audiences;

In order to address these objectives, the project has a dedicated Work Package (WP5), which has been coordinated and handled the dissemination of ASTRail. UNIFE, LINKS, SIRTI, ARD, ENAC and CNR have engaged in activities such as organising and participating in conferences, congresses, workshops, and showcases. WP5 will also work on the publication and distribution of material like scientific publications, articles and brochures, press releases, newsletters and a website towards accomplishing dissemination of the project results to a wide range of audiences.

The exploitation of ASTRail has been carried out as follows:

- Develop and sign a Collaboration Agreement together with X2Rail-1 and X2Rail-2 Project in order to identify the common areas of work and results which were transferred to them;
- ASTRail has engaged key stakeholders via an ad-hoc Advisory Group meeting during the whole project's duration. The ASTRail partners supported this activity ensuring results with the developments in Regulation and Standardisation bodies in order to safeguard the project's services and conformance to modern standards and regulations.

External Communication

External communication was of key importance for maximizing ASTRail's impact and for disseminating the project results. Communication of the project research activities involved reaching relevant railway stakeholders, the scientific community and creating awareness among the general public. This has been achieved through creating a project identity and a public website, attending conferences and relevant events and publishing articles in relevant journals.

Project Identity

A project identity has been set up at the beginning of the project and it includes templates for presentations and reports, a project brochure as well as the ASTRail logo. The project identity helped dissemination activities and ensured a consistent communication of the project concept, objectives and results. The brochure has been distributed at project workshops and at conferences where project partners have participated.

Figure 2 - ASTRail Identity Set

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Social Media

ASTRail consortium has opted for Twitter as the social media platform for dissemination due to its nimbleness and efficiency. The twitter account (@S2R_ASTRail) was set up at the beginning of the project and all relevant information of the project, events, news, publication, conference,... were tweeted, being accessible to all the community.
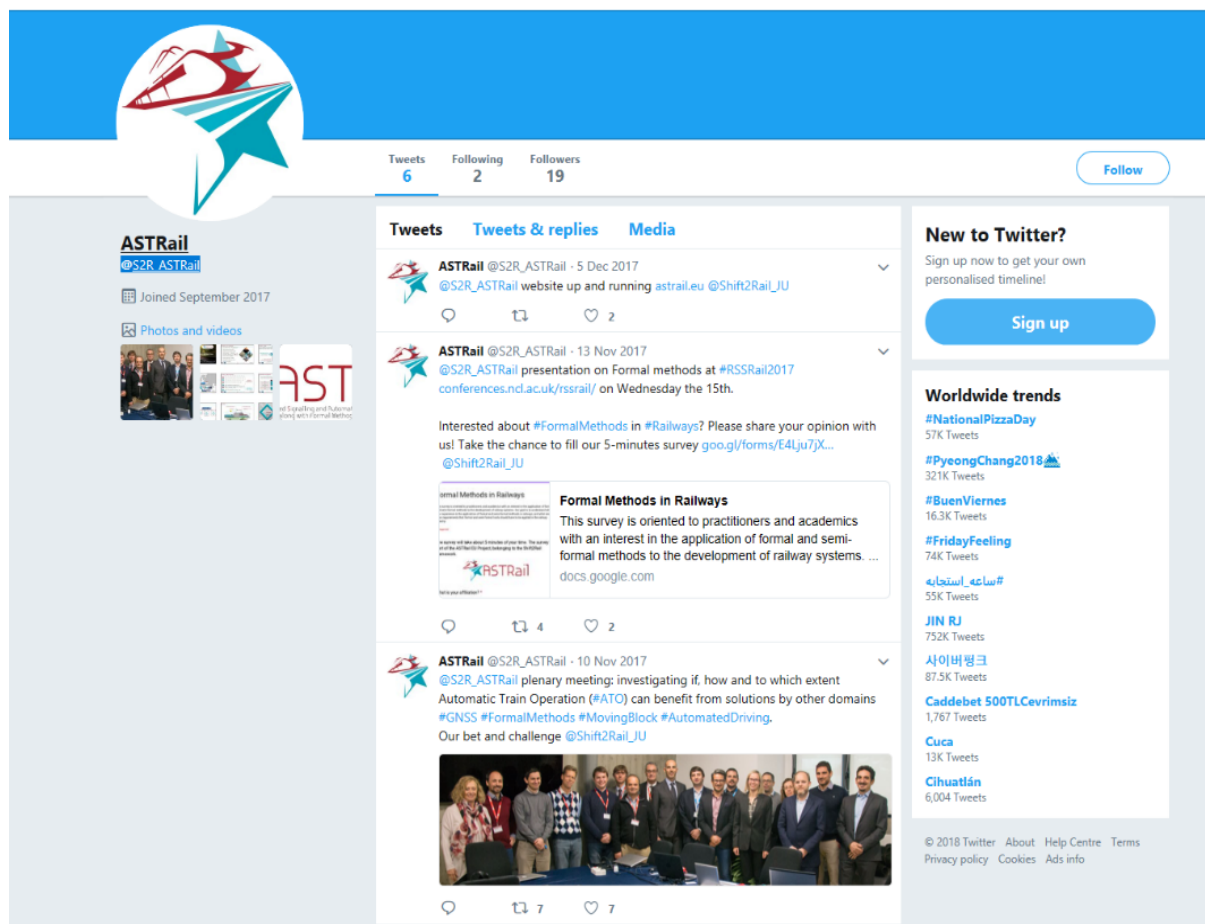

Figure 3 - ASTRail Twitter Account

The ASTRail Twitter account has been used for different purposes throughout the project.

At the beginning it was intended for stimulating technical discussions and, consequently, also some news related to the topics addressed by ASTRail were launched, even if not achieved within the project.

However, over the time, the Partners realized that the relevant stakeholders were not easily reached by the social media and so they changed their approach: ASTRail devoted more effort to other media and channels not initially planned: for instance, they delivered a video (which was also announced over Twitter), they worked more on the engagement of S2R and X2Rail-1 and X2Rail-2 and, differently from what initially planned, used Twitter rather to announce the main events and results of the project.

Public Website

A dedicated website was set up at the beginning of the project. The website (http://www.astrail.eu) has been available throughout the whole project, with a section where visitors can register their interest. It will be divided in two parts: the public portal and the private portal.

The member's area, will act as an exchange platform between the project's partners. The public portal displays the key project information, partners, Deliverables, news/events and links to the partners' institutions. All the

public deliverables have been published on the website and are available for download. In addition, a specific area in the front-page of website has been dedicated to allocate the latest tweets of ASTRail twitter account.

The webpage also lists all related projects and offers links to the Shift2Rail website as well as to the websites of the EC.

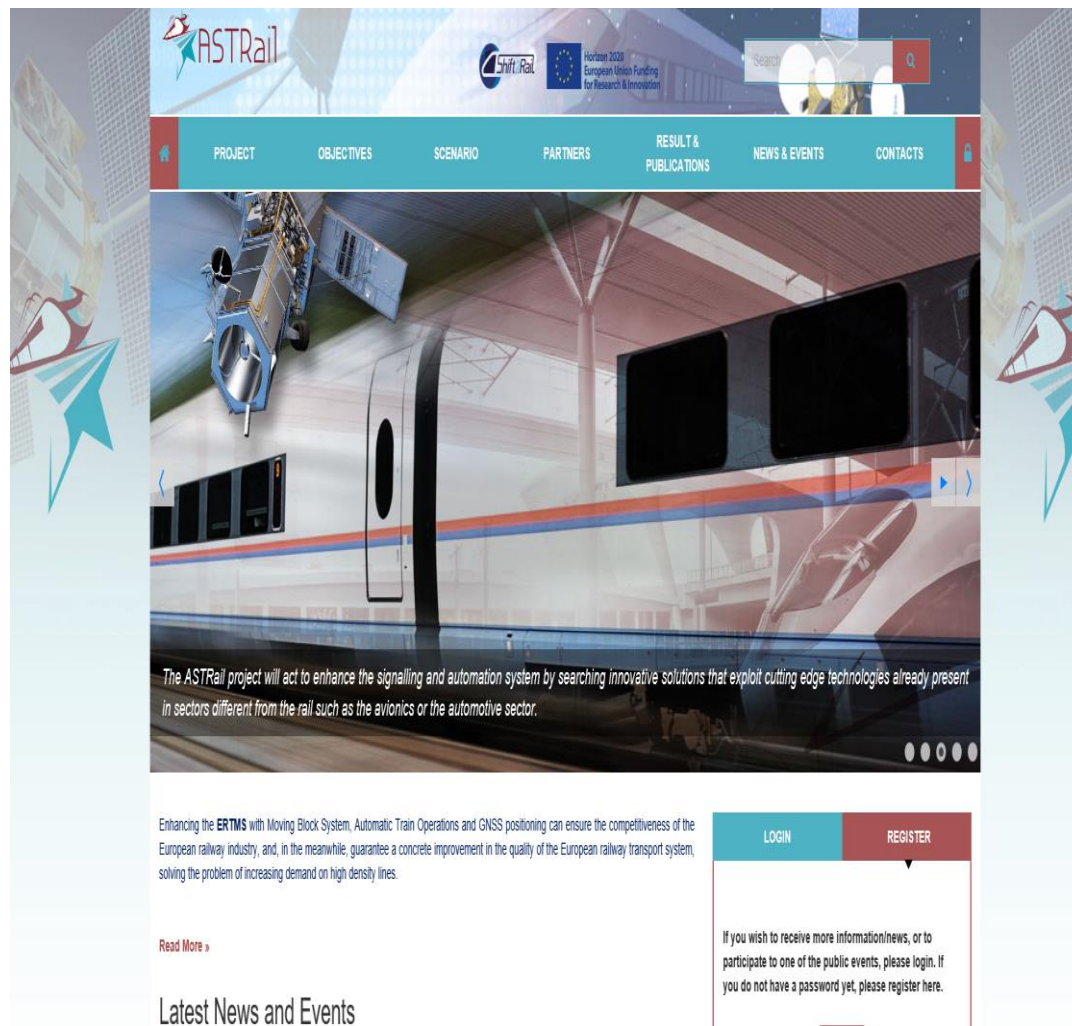The project website will be available after its conclusion.

Figure 4 - ASTRail Website

Newsletter

The project has produced two newsletters to provide up-to-date information on the status and achievements of the project.

The first newsletter was released in June 2018 and the second newsletter was produced in time to be distributed during the Final Conference taking place on 30th October 2019 in Vienna.

The newsletters were circulated via e-mailing lists and in a printed version that complements the project brochure. In order to ensure that the widest audience possible is reached, each partner has used its own mailing list. The newsletters are also uploaded on the project webpage and the printed copy has been distributed at events and workshops.

Figure 5 - Two pages from the 1st and 2nd RUN2Rail newsletters

Brochure

During the first part of the project, a first brochure was delivered. The main objective of this publication was to provide a wide audience with some preliminary information on the goals of the project, the structure and main planned activities and the members of the ASTRail consortium. The brochure anticipated the newsletters and has been distributed at events and workshops.
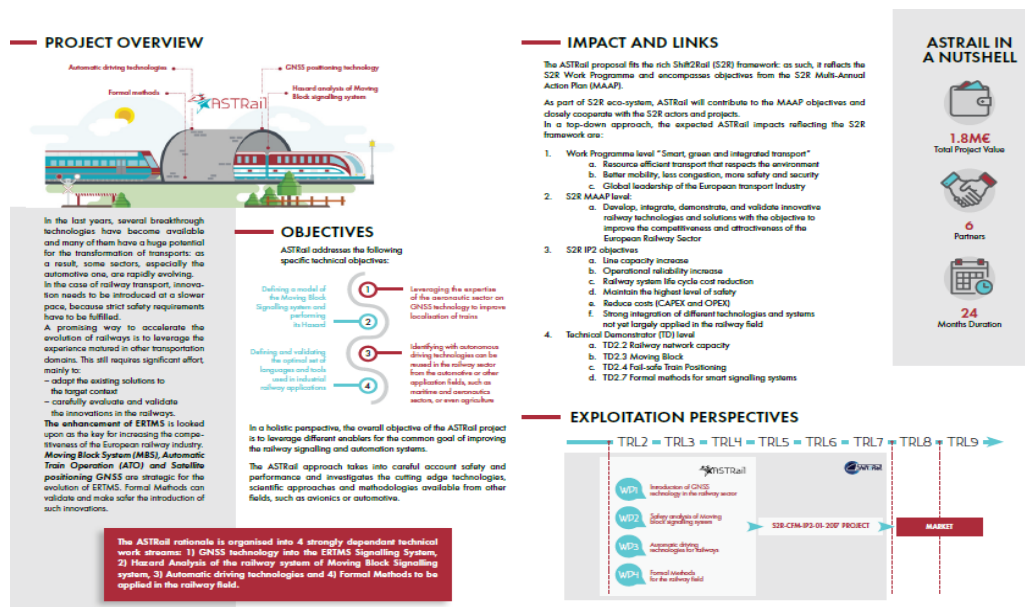

Figure 6 - Extract from 1st ASTRail brochure

In addition, a second brochure summarizing D1.6 'Proposed GNSS Minimum Performance Requirements' was produced and distributed in various events, such EXPO Ferroviaria in Milan and the project Final Conference in Vienna.

Figure 7 - Extract from 2nd ASTRail brochure

ASTRail Video

The ASTRail participation in the TRA 2018 event (Transport Research Arena, https://2018.traconference.eu) offered the opportunity to prepare a roll-up poster and a Video, currently available over Youtube (https://www.youtube.com/watch?v=Rqh0f71ko_g).
The video lasts about 2:30 minutes. Its transcript follows here below:

Railways are strategic for sustainable mobility and perfectly fits the European challenge of "Smart, green and integrated transport".
In fact, rail transport is widely recognized as:
- *Environmentally friendly (Short Pause)*
- *Dependable (Short Pause)*
- *High-speed (Short Pause)*
- *Affordable (Short Pause)*
- *Accessible for people and goods*

A better utilisation of railways will permit to support higher traffic. This will result in economic benefits and will strength the role of railways in European mobility
The 2-year project ASTRail has received funding form the Shift to Rail Joint Undertaking on the European Union Horizon 2020 research and innovation programme.

The six ASTRail partners explore the evolution of ERTMS leveraging the technological solutions already applied in other transportation domains.
ASTRail bets on 4 enablers to improve the railway signalling and automation systems:

      1) the application of GNSS technology to the ERTMS
      2) Safety acceptance of Moving Block Signalling system
      3) the adoption of autonomous ì driving technologies
      4) The use of formal methods to assess the new solutions

These enablers are expected to facilitate the train evolution
The GNSS expertise from the aeronautic sector will be leveraged to improve the trains' localization
The modelling and hazard analysis of the Moving Block Signalling System will facilitate safety acceptance

Autonomous driving technologies are already employed in other transportation domains and will be evaluated for the adoption in the railways
Formal languages and tools will be selected and validated for the development of railway applications.
Check ASTRail achievements and progresses in our website.
ASTRail: with Shift-to-Rail for smarter Rails

Figure 8 – Two screenshots from the video

Educational Dissemination

The contributions to the educational dissemination of ASTRail were the following:

- the ASTRail use case, i.e. the use of GNSS in the rail domain, has been presented during some lessons related to GNSS applications in:
  - the 2nd level specializing Master on Navigation and Related Applications (https://didattica.polito.it/master/navigation/2018/introduction), that is a joint initiative of Politecnico di Torino and LINKS Foundation, with the collaboration of the Istituto Nazionale di Ricerca Metrologica (INRIM) and the United Nations Office for Outer Space Affairs (UN-OOSA).
  - the Master degree on Information and Communication Technologies for smart society at Politecnico di Torino (https://didattica.polito.it/laurea_magistrale/ict_for_smart_societies/en/home).

  The lessons have been organized in Torino, through a close cooperation with the reference professors at Politecnico di Torino. Indeed, ASTRail works on technological aspects that fall in the interest of both the courses.

- ASTRail WP1 topics were presented in the ENAC's monthly seminar on telecom topics in March 2018. The seminar addressed the Reliability Availability, Maintenance and Safety of the Rail Industry and how GNSS standards might be fit to achieve a high quality of service of the rail network. This event addressed ENAC PhD students to share and learn about ENAC research topics through internal dissemination.

Events

The ASTRail's consortium has organised two major project events: a Midterm Conference on 5th February 2019 in Brussels and a Final Conference on the 30th October 2019 in Vienna.
The ASTRail Midterm Conference took place on took place on 5th February 2019 at the PentaHotel in Brussels with the participation of around 30 experts from all around Europe. The event was the opportunity to present the project objectives and results achieved so far and to discuss how these results and future activities may improve the railway signalling and automation system.

The ASTRail Final Conference took place on took place on 30th October 2019 at the Palais Coburg in Vienna. The event was the occasion for Work Package Leaders to present the main results of the project and their important links to Shift2Rail. X2Rail1 and X2Rail2 Project Coordinators were also invited, highlighting the spirit of cooperation between the corresponding projects which was established since the beginning.

Figure 9 – ASTRail consortium at the Final Conference in Vienna

Apart from the Midterm and Final Conference, ASTRail partners promoted the project results during public events organised in Europe and USA during the whole term of the project such as at SEFM 2017 (September 2017, Trento), Forum Méthodes Formelles (Toulose, October 2017), RSSRail International Conference (Pistoia, November 2017), TRA2018 (Vienna, April 2018), ETAPS'18 (Thessaloniki, April 2018), SPLC '18 (Gothenburg, September 2018), InnoTrans 2018 (Berlin, September 2018), ION GNSS+ 2018 (Miami, Florida, September 2018), iFM (Maynooth, September 2018), ISOLA 2018 (Cyprus, November 2018), NAVITEC 2018 (ESA-ESTEC, Noordwijk, The Netherlands, December 2018), ION ITM 2019 (Reston, Virginia, January 2019), Huawei European Research Institute Symposium on Foundations of Software: New Directions in Software Research for Cloud, Pipe and Device (Paris, January 2019), ICL-GNSS 2019 (Nuremberg, Germany, June 2019), RSSRail International Conference (Lille, June 2019), DisCoRail 2019 (Lyngby, June 2019), FMICS 2019 (Amsterdam, August 2019), FM 2019 (Porto, October 2019), EXPO Ferroviaria (Milan, October 2019).

Presentations & Publications

Project results have been published in several specialized magazines, scientific journals and at relevant national and international conferences and workshops. ASTRail has actively looked out for high profile academic and industrial events that are within the domain of interest of the project. At the end of the project, ASTRail has been presented/published in the following events and press (an exhaustive list will be included in the Final Report):

Event/Publication	Title	Authors	Type of audience
Non-scientific and non-peer reviewed publications (popularized publications)			

ERCIM News 2018(112) (2018)	Formal Methods for the Railway Sector	Maurice H. ter Beek, Alessandro Fantechi, Alessio Ferrari, Stefania Gnesi, Riccardo Scopigno	Technical
Scientific publications			
Proceedings of the 31st International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2018), Miami, Florida, September 2018, pp. 3463-3477	An HW-In-the-Loop Approach for the Assessment of GNSS Local Channel Effects in the Railway Environment	G. Falco, M. Nicola, E. Falletti	Technical
IEEE Proceedings of 2018 9th ESA Workshop on Satellite Navigation Technologies and European Workshop on GNSS Signals and Signal Processing (NAVITEC), Noordwijk, Netherlands, 2018, pp. 1-8.	Performance Analysis of FLL Schemes to Track Swept Jammers in an Adaptive Notch Filter	M. Troglia Gamba and E. Falletti	Technical
Proceedings of the 2019 International Technical Meeting of The Institute of Navigation (ION ITM), Reston, Virginia, January 2019, pp. 233-247.	A Comparison of Optimized Mitigation Techniques for Swept-frequency Jammers	W. Qin, M. Troglia Gamba, E. Falletti and F. Dovis	Technical
IEEE Proceedings of 2019 International Conference on Localization and GNSS (ICL-GNSS), Nuremberg, Germany, 2019, pp. 1-6.	Performance Comparison of FLL Adaptive Notch Filters to Counter GNSS Jamming	M. T. Gamba and E. Falletti	Technical
Empirical Software Engineering23(6): 3684-3733 (2018)	Detecting requirements defects with NLP patterns: an industrial experience in the railway domain	Alessio Ferrari, Gloria Gori, Benedetta Rosadini, Iacopo Trotta, Stefano Bacherini, Alessandro Fantechi, Stefania Gnesi	Technical
STTT 20(3): 263-288 (2018)	Towards formal methods diversity in railways: an experience report with seven frameworks	Franco Mazzanti, Alessio Ferrari, Giorgio Oronzo Spagnolo	Technical
Proceedings of International Conference on Reliability, Safety and Security of Railway Systems (RSSRail) November 2017, Pistoia, Italy	Dependable Dynamic Routing for Urban Transport Systems Through Integer Linear Programming	Davide Basile, Felicita Di Giandomenico, Stefania Gnesi	Technical

Proceedings of International Conference on Software Engineering and Formal Methods (SEFM'17), November 2017, Trento, Italy	A Refinement Approach to Analyse Critical Cyber-Physical Systems	Davide Basile, Felicita Di Giandomenico, Stefania Gnesi	Technical
Proceedings of European Joint Conference on Theory and Practice of Software (ETAPS'18), April 14-20, 2018, Thessaloniki, Greece	Ten Diverse Formal Models for a CBTC Automatic Train Supervision System.	Franco Mazzanti, Alessio Ferrari	Technical
Proceedings of Systems and Software Product Line Conference 2018 (SPLC '18), September 10–14, 2018, Gothenburg, Sweden	Product line models of large cyber-physical systems: the case of ERTMS/ETCS	Maurice H. ter Beek, Alessandro Fantechi, Stefania Gnesi	Technical
Proceedings of 14th International Conference on integrated Formal Methods 5th -7th September 2018, Maynooth University, Ireland	On the Industrial Uptake of Formal Methods in the Railway Domain - A Survey with Stakeholders	Davide Basile, Maurice H. ter Beek, Alessandro Fantechi, Stefania Gnesi, Franco Mazzanti, Andrea Piattino, Daniele Trentini, Alessio Ferrari	Technical
Proceedings of International Symposium on Leveraging Applications of Formal Methods, Verification and Validation 2018 (ISOLA 2018), November 2018, Cyprus	Statistical Model Checking of a Moving Block Railway Signalling Scenario with Uppaal SMC	Davide Basile, Maurice H. ter Beek, Vincenzo Ciancia	Technical
Proceedings of RSSRail International Conference (Lille, June 2019)	Survey on Formal Methods and Tools in Railways: The ASTRail Approach	Alessio Ferrari, Maurice H. ter Beek, Franco Mazzanti, Davide Basile, Alessandro Fantechi, Stefania Gnesi, Andrea Piattino and Daniele Trentini	Technical
Proceedings of FMICS 2019, 24th International Conference on formal methods for industrial critical systems, 30-31 August 2019, Amsterdam, the Netherlands	Modelling and Analysing ERTMS L3 Moving Block Railway Signalling with Simulink and Uppaal SMC	Davide Basile, Maurice H. ter Beek, Alessio Ferrari, Axel Legay	Technical
3rd World Congress on Formal Methods (FM 2019), Porto, Portugal, October 7-11, 2019.	Adopting Formal Methods in an Industrial Setting: The Railways Case	Maurice H. ter Beek, Arne Borälv, Alessandro Fantechi, Alessio Ferrari, Stefania Gnesi, Christer Löfving, Franco Mazzanti	Technical
Participation to a conference			

Forum Méthodes Formelles - "Véhicules Autonomes et Méthodes Formelles" - Toulouse, 10 October 2017	Invited talk - Deadlock free dispatching for fleets of vehicles	Franco Mazzanti, Alessio Ferrari and Giorgio O. Spagnolo	Technical
ION GNSS+ 2018 International Conference (Miami, Florida, September 2018)	An HW-In-the-Loop Approach for the Assessment of GNSS Local Channel Effects in the Railway Environment	G. Falco, M. Nicola, E. Falletti	Technical
NAVITEC 2018 Conference (ESA-ESTEC, Noordwijk, The Netherlands, 5-7 December 2018)	Performance Analysis of FLL Schemes to Track Swept Jammers in an Adaptive Notch Filter	M. Troglia Gamba and E. Falletti	Technical
"Huawei European Research Institute Symposium on Foundations of Software: New Directions in Software Research for Cloud, Pipe and Device", Westin Paris - Vendôme a Paris, France, 16 January 2019.	"Formal Methods and Tools: Techniques and Experiences"	Maurice ter Beek	Technical
ICL-GNSS 2019 International Conference (Nuremberg, Germany, June 2019)	Performance Comparison of FLL Adaptive Notch Filters to Counter GNSS Jamming	M. T. Gamba and E. Falletti	Technical
DisCoRail 2019 - International Workshop on Distributed Computing in Future Railway Systems- Lyngby, 17 June 2019	Invited talk - "Modelling a moving block train control system: different techniques and tools"	Franco Mazzanti	Technical
Institute of Navigation, International Technical Meeting 2019	Diagnostics of GNSS-based Virtual Balise in Railway Using Embedded Odometry and Track Geometry	Heekwon No, Jérémy Vezinet, Carl Milner	Technical
Institute of Navigation, GNSS 2019	Simplified GNSS Fusion-based Train Positioning System and its Diagnosis	Heekwon No, Jérémy Vezinet, Carl Milner	Technical
Participation to an event other than a conference or workshop			
InnoTrans 2108 (Berlin, September 2018)	Safety analysis of Moving block signalling system &	Veronika Nedviga,	Managerial

	Formal Methods for the railway field		

Table 1: Targeted Publications and Conferences

Advisory group

An Advisory group in charge of Standardisation/Regulation monitoring was established to safeguard the project's services and conformance to modern standards and regulations. Initially ASTRail intended this action, committed in the Grant Agreement, as something to be actively carried out in direct touch with the Official Standardization Bodies. However the Shift-to-Rail JU, together with the main projects X2RAIL1 and X2RAIL-2, explained the overall work and roles within the IP2SC and proposed to relay the ASTRail information to the Official Bodies, so to prevent any possible contradictory, immature, uncoordinated or non-fully agreed information.

As a result, the Advisory Group has been mainly built by the members of the CFM projects X2Rail1 and X2Rail2 - as the main beneficiaries of the outcomes of ASTRail.

A meeting with the Advisory Board was organized in Brussels on 26th September 2018, following the Consortium Plenary meeting.

During this meeting the four topics addressed by ASTRail were discussed.

- Being the WP2 and WP3 already over, on their respective topics the discussion was limited, however the ASTRail results were well understood.

The participation and discussion was more active on WP1 and WP4 and the event was respectively important for the two because:

- It laid the foundations for a more structured exchange of information and ideas on the GNSS topic (WP1)
- It permitted to review once more what done on formal methods (WP4), to disseminate the qualitative results achieved and to collect new feedbacks from the stakeholders.

The indications by the Advisory Group in the September's meeting were useful to organize also the mid-term event.

Considering that the Advisory Group is exclusively composed by X2Rail-1 and X2Rail-2 participant, with no possibility to directly contact the Official (standardization) Bodies and that ASTRail WP2 and WP3 were already over at the time of the first (and only) meeting, it was decided that the following exchanges on WP1 and WP4 would avoid the Advisory Group, but would rather consist in a specific coordination between ASTRail and X2Rail-2.

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Figure 10 – ASTRail Advisory Board meeting agenda

Interaction with S2Rail IP2

ASTRail has set the foundations for many of the technologies that will be continued within Shift2Rail's Innovation Programme 2: 'Advanced Traffic Management and Control Systems'. Therefore, the dissemination/exploitation of the project's results to IP2 of Shift2Rail has been ensured by tight collaboration (in terms of common Work Packages) with the CFM projects X2Rail-1 and X2Rail-2, with which a Collaboration Agreement was signed.

More in details, the following actions took place:

- Periodic calls and updates with the Project Officer, also as facilitator of the communication with the IP2SC
- Preparation of periodic reports to the IP2SC, as requested by the PO (and also remote participation to the IP2SC meeting, when requested).
- Agreement and Signature of two separate Collaboration Agreements (COLAs), with X2Rail-1 and X2Rail-2 (and with all the partners of the respective projects), with a detailed plan of exchange of information (through TINs or Technical Informative Notes).
- Delivery of all the planned TINs due by ASTRail and analysis of the TINs received – considering also the comments – when possible – in the revision of ASTRail deliverables.
- Organization of an Advisory Board with X2Rail-1 and X2Rail-2 partners relevant for ASTRail topic and organization of a meeting in the first year (until it made sense for the number of WPs active).
- Invitation of both the projects to the Mid-term event and to the final event of the ASTRail project.
- Organization of separate coordinated exchanges between X2Rail-2 and ASTRail on WP1 and WP4 in the second year, some remote meetings and some held in person (for instance on GNSS on 17th September 2018).

Conclusions

This report has provided an exhaustive list of all dissemination/communication activities carried out during the 26 months of project implementation. A large audience has been reached by ASTRail messages and the project has at the same time ensured proper dissemination towards the Shift2Rail Joint Undertaking to ensure a smooth and effective transfer of results into the Shift2Rail projects.

Acronyms

Acronym	Explanation
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
ERA	European Railway Agency
EU	European Union
S2R	Shift2Rail
WP	Work Package
IP2	Innovation Programme 2
EC	European Commission

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