



ANNUAL ACTIVITY REPORT 2016

7 June 2017

In accordance with Article 20 of the Statutes of the S2R JU annexed to Council Regulation (EU) No 642/2014 and with Article 20 of the Financial Rules of the S2R JU.

The annual activity report will be made publicly available after its approval by the Governing Board.

Contents

FACTSHEET	4
EXECUTIVE SUMMARY.....	6
INTRODUCTION	7
1. IMPLEMENTATION OF THE ANNUAL WORK PLAN 2016	9
1.1. Key objectives 2016 and associated risks.....	9
1.2. R&I activities: the S2R Programme	12
1.3. Call for proposals and grant information	13
1.4. Progress against KPIs / Statistics (Annex C).....	15
1.5. Evaluation: procedures and global evaluation outcome, redress, statistics.....	16
1.6. S2R Programme: S2R Lighthouse Projects	17
1.7. Activities carried out in Grant Agreement for Other Members (CFM) and Open Calls (OC)	23
1.7.1. IP1 Cost-efficient and Reliable Trains, including high-capacity trains and high speed trains	23
1.7.2. IP2 Advanced Traffic Management and Control System.....	26
1.7.3. IP3 Cost Efficient and Reliable High Capacity Infrastructure	31
1.7.4. IP4 IT Solutions for Attractive Railways Services.....	34
1.7.5. IP5 Technology for Sustainable and Attractive European Rail Freight.....	38
1.7.6. CCA Cross Cutting Activities	43
1.8. Calls for tenders	49
1.9. Dissemination and information about projects results.....	49
1.10. Operational budget execution	50
1.11. In-Kind Contributions	50
1.12. Synergies with the Union Programmes/ Funds and national funded R&I	54
1.13. Launch of 2017 Calls for Proposals and Tenders.....	55
2. SUPPORT TO OPERATIONS	56
2.1. Communication activities.....	56
2.1.1. Events	57
2.1.2. On-line communication.....	58
2.2. Legal and financial framework	59
2.3. Budgetary and financial management	59
2.4. Procurement and contracts.....	62
2.5. IT and logistics	63
2.6. Human Resources.....	63

3. GOVERNANCE.....	64
3.1. Governing Board.....	64
3.2. Executive Director	64
3.3. States Representatives Group.....	65
3.4. Scientific Committee	65
3.5. Innovation Programme's Steering Committees	66
3.6. European Railway Agency	66
4. INTERNAL CONTROL FRAMEWORK	66
4.1. Financial Procedures	66
4.2. Ex-ante Controls on operational Expenditure	67
4.3. Ex-post Control of Operational Expenditure and Error Rates Identified	68
4.4. Audit of the European Court of Auditors	68
4.5. Internal Audit	68
4.6. Risk management and conflict of interest	68
4.7. Compliance and effectiveness of Internal Control.....	69
5. MANAGEMENT ASSURANCE	69
5.1. Assessment of the Annual Activity Report by the Governing Board.....	69
5.2. Elements supporting assurance	69
5.3. Reservations	70
5.4. Overall conclusion	70
6. DECLARATION OF ASSURANCE	71
7. ANNEXES.....	72
ANNEX A Organisational chart of the S2R JU	72
ANNEX B Establishment plan.....	73
ANNEX C Indicators and Scoreboard of KPIs	74
TABLE I - Horizon 2020 Key Performance Indicators common to all JUs	74
TABLE II - Indicators for monitoring H2020 Cross-Cutting Issues common to all JTI JUs	80
TABLE III - Key Performance Indicators specific for the S2R JU	87
ANNEX D Annual accounts	89
BALANCE SHEET	89
ANNEXE E LIST OF ACRONYMS.....	91

FACTSHEET

Name	Shift2Rail Joint Undertaking (S2R JU)
Objectives	The Shift2Rail Joint Undertaking is a public-private partnership in the rail sector, providing a platform for cooperation that drives innovation in the years to come. The S2R JU pursues research and innovation (R&I) activities in support of the achievement of the Single European Railway Area and should improve the attractiveness and competitiveness of the European rail system. The S2R JU contributes to: • a 50 % reduction of the life-cycle cost of the railway transport system (i.e. costs of building, operating, maintaining and renewing infrastructure and rolling stock), • a 100 % increase in the capacity of the railway transport system, • a 50 % increase in the reliability and punctuality of rail services (measured as a 50 % decrease in unreliability and late arrivals). The S2R JU shall propose innovative solutions to be explored, tested and demonstrated in operational environment and/or “zero on site” to achieve market uptake. Beyond that, with the deployment of its innovative solutions the S2R JU will foster connections between people, regions, cities, and businesses, supporting the socioeconomic objectives of the Union
Founding Legal Act	Council Regulation (EU) No 642/2014 of 16 June 2014 establishing the Shift2Rail Joint Undertaking ¹ (S2R Regulation)
Executive Director	Mr Carlo M. Borghini, Executive Director, as from 16 May 2016
Governing Board	EC members (at 31/12/2016): • Henrik HOLOLEI, DG MOVE • Robert-Jan SMITS, DG RTD EC alternate (at 31/12/2016): • Matthew BALDWIN, DG MOVE • Clara DE LA TORRE, DG RTD Industry members (at 31/12/2016): • ALSTOM Nicolas CASTRES-SAINT-MARTIN • ANSALDO STS Nadia MAZZINO • • AZD Praha Michal PAVEL • BOMBARDIER TRANSPORTATION Philippe OGIER • CAF José GORTAZAR • DEUTSCHE BAHN Kay EULER • EUROC Jose Carlos CLEMENTE • HACON Lars DEITERDING • INDRA Jose Miguel Rubio SANCHEZ • KNORR - BREMSE Gert FREGIEN

¹ OJ L 177, 17.6.2014, p. 9

	• NETWORK RAIL (Industrial Spokesperson) Andy DOHERTY • SIEMENS Roland EDEL • SMARTDEMAIN Henk SAMSON • SMARTRACON Michael Meyer zu HÖRSTE • SNCF Carol DENOST • THALES Yves PERREAL • TRAFIKVERKET Bo OLSSON • VVAC+ Martin ROSENBERGER Industry alternates (at 31/12/2016): • ALSTOM Sophie PERROCHEAU • ANSALDO STS Antonio CASAZZA • AZD Praha Vladimir KAMPIK • AZD Praha Martin SEVERA • BOMBARDIER TRANSPORTATION Richard FRENCH • CAF Aitor GALARZA • DEUTSCHE BAHN Ralf MARXEN • EUROOC Mark TOPAL-GOEKCELI • HACON Rolf GOOßMANN • INDRA Javier Rivilla LIZANO • KNORR - BREMSE Johannes GRAEBER • KNORR - BREMSE Martin DEUTER • NETWORK RAIL Graham HOPKINS • SIEMENS Jürgen SCHLACHT • SIEMENS Lars BERGMANN • SMARTDEMAIN Javier Bonilla DÍAZ • SMARTRACON Juan MELENDEZ • SNCF Christophe Chéron • THALES Christian GREGOIRE • TRAFIKVERKET Christer LOFVING • VVAC+ Erik STOCKER Other participants (at 31/12/2016): • Carlo M BORGHINI Executive Director of the S2R JU Observers (at 31/12/2016): • Josef DOPPELBAUER • Ny Tiana TOURNIER • Miroslav HALTUF
Other bodies	Scientific Committee States Representatives Group Innovation Programmes' Steering Committees
Staff	17 (On-going staff recruitment) at 31 December 2016
2016 Budget	Total voted budget of EUR 50.2 million in commitment appropriations, of which EUR 44.1 million for operational expenditure, EUR 3.3 million for administrative expenditure and EUR 2.8 million for unused appropriations not required in the financial year. Voted budget of EUR 52.3 million in payment appropriations, of which EUR 47.1 million for operational expenditure, EUR 3.5 million for administrative expenditure and EUR 1.7 million for unused appropriations not required in the financial year but needed to meet early 2017 payments.
Budget implementation	Operational budget of EUR 44.1 million in commitment appropriations and of EUR 40.8 million in payment appropriations.

	Administrative budget of EUR 3.3 million in commitment appropriations and of EUR 1.9 million in payment appropriations (the difference in the value of payment appropriations vs commitment appropriations is due to contractual services becoming due in 2017 and afterwards).
Grants	In June 2016 the S2R JU awarded 27 grants (13 to proposals from its Other Members and 14 Open Call) as a result of the 2015/2016 Calls launched on 17 December 2015. The corresponding grants agreements were signed between July and October 2016 allowing the start of the first projects already in September 2016. With regard to the 2015/2016 Calls, the total value of the R&I activities amounted to EUR 167.3 million, of which the maximum co-funding was EUR 88.0 million.
Strategic Research Agenda	The S2R JU Programme is described in the Multi-Annual Action Plan (MAAP) adopted by the Governing Board in 2015.
Call implementation	On 10 November 2016, the S2R JU published the 2017 Calls to progress activities in the execution of the S2R R&I Programme. The call is split into - calls open to the S2R JU Other Members, which are expected to realize activities for EUR 92.9 million, to be co-funded up to EUR 41.3 million by the S2R JU resulting in a net in-kind contribution of EUR 51.6 million, and - Open Calls for a total value of around EUR 19.5 million, fully funded by the S2R JU.
Participation, including SMEs	SMEs participating under both the open calls and the calls designated for Other Members were 108 and 53 were retained for funding representing respectively the 24.3% and the 20.7% of total and retained participants for funding. In the Open Calls only, more than 30% of the participants of funded Projects are SMEs.

EXECUTIVE SUMMARY

The Shift2Rail Joint Undertaking (S2R JU) is a public-private partnership under the Horizon 2020 Framework Programme² established to manage and coordinate Research and Innovation (R&I) activities in support of better rail services in Europe.

The S2R JU was officially established on 7 July 2014, following the adoption of Council Regulation (EU) No 642/2014 of 16 June 2014 establishing the Shift2Rail Joint Undertaking (S2R Regulation).

Until 24 May 2016, date of S2R operational autonomy, and in accordance with Article 19 of the S2R Regulation, the S2R JU remained under the responsibility of the European Commission. All its initial operations were run by the Commission Services, in collaboration with the S2R JU Founding Members other than the Union and the Associated Members of the S2R JU (Founding Members other than the Union and Associated Members are hereinafter collectively referred to as Other Members).³ and under the guidance of an Interim Executive Director appointed by the Commission. On 16 February 2016, the Governing Board appointed the Executive Director and he took office on 16 May 2016.

² Council Decision (EU) No 2013/743/EU of 3 December 2013 establishing the specific programme implementing Horizon 2020 (2014-2020), OJ L 347, 20.12.2013, p. 965.

³ Founding Members and Associated Members are respectively defined in Article 1.1 and 1.2 respectively of the S2R Statutes ().

Following the Decision of the Governing Board of 11 May 2016, by written procedure, on the “autonomy package” the JU became autonomous as from 24 May 2016.

2016 focused, on the one hand, on ensuring the ramp up phase of the Programme through the launch of the initial (R&I) activities directly awarded and, on the other hand, on setting up the organization to warrant sound financial management, legality and regularity.

In June 2016 the S2R JU awarded 27 grants (13 to proposals from its Members and 14 Open Call) as a result of the 2015/2016 call launched on 17 December 2015. The corresponding grants agreements were signed between July and October 2016 allowing the start of the first projects already in September 2016. The value of the R&I activities of the 2015/2016 Calls amounts to EUR 167.3 million, to be co-funded by S2R up to a maximum of EUR 79.1 million.

The participation to the calls was very broad with 454 participants of which 439 from the 28 EU Member States and 15 from countries Associated to the Horizon 2020 Framework Programme. Retained for funding were 252 and 4 respectively.

SMEs participating to the calls were 108 of which 53 were retained for funding.

The projects under this 2015/2016 call are expected to contribute to developing innovative solutions to increase the quality, reliability and punctuality of rail services while also slashing costs and facilitating cross-border travel.

On 10 November 2016, the S2R JU published its 2017 Call to progress activities in the execution of the S2R R&I Programme. The Call is split into

- calls open to the S2R JU Other Members, which are expected to realize activities for EUR 92.9 million, to be co-funded up to EUR 41.3 million by the S2R JU resulting in a net contribution of EUR 51.6 million, and
- Open Calls for a total value of around EUR 19.5 million, fully funded by the S2R JU.

In order to provide administrative support to the Programme execution, the JU has progressed in the recruitment of staff filling budgetary open positions. Two Temporary Agents and five Contract Agents have been recruited replacing five EC officials who had been assigned to the JU on temporary basis before its autonomy.

Following the participation to the WCRR 2016, the last part of the year has also been marked by the participation of the S2R JU to other key events, in particular InnoTrans 2016 where for the first time the S2R Programme was presented at different levels, including at the Members’ stand.

It can be concluded that 2016 has seen the S2R JU becoming autonomous and moving in its full operational activities to start delivering its first results.

INTRODUCTION

The S2R JU was established by Council Regulation (EU) No 642/2014 of 16 June 2014 (S2R Regulation) with, in Annexe I, the S2R Statutes.

The S2R JU is a public-private partnership in the rail sector established under Article 187 of the Treaty on the Functioning of the European Union, providing a platform for the rail sector as a whole to work together with a view to driving innovation in the years to come. Inter alia, the S2R JU shall manage all rail-focused R&I actions co-funded by the Union.

Rail R&I conducted within the S2R JU must contribute to addressing the challenges faced by the rail sector, through a comprehensive and coordinated approach to R&I focusing on the needs of the rail system and of its users, including in Member States that do not currently have a railway system within their territory.

In addition to the Union, the S2R JU has eight Founding Members other than the Union⁴ and nineteen Associated Members. The latter were selected following a call for expression of interest to become Associated Member of the S2R JU^{5 6}.

In this respect, its main objective is to implement the S2R Programme, R&I activities in the railway sector in Europe, through the collaboration between stakeholders in the entire railway value chain, also outside the traditional rail sector, with particular attention to SMEs, research and technology centres and universities.

The rail R&I activities to be performed within the S2R JU are defined in the S2R Regulation and Statutes, translated in the strategic S2R Master Plan⁷, further detailed in the S2R Multi-Annual Action Plan (MAAP)⁸. Overall, the S2R JU shall:

- contribute to the implementation of H2020 Regulation and in particular part of the Smart, Green and Integrated Transport Challenge under the Societal Challenges pillar of Decision No 2013/743/EU;
- contribute to the achievement of the Single European Railway Area, to a faster and less costly transition to a more attractive, user-friendly (including for persons with reduced mobility), competitive, efficient and sustainable European rail system, and to the development of a strong and globally competitive European rail industry;
- play a major role in rail-related R&I, ensuring coordination among projects within its overall Programme. It provides all stakeholders with relevant and available information on R&I activities funded across Europe. It shall also manage all rail-focused R&I actions co-funded by the Union;
- actively promote the participation and close involvement of all relevant stakeholders from the full rail value chain and from outside the traditional rail industry. In particular, it fosters the involvement of small and medium sized enterprises (SMEs), as defined in Commission Recommendation 2003/361/EC (8);
- develop demonstration projects in interested Member States including those that do not currently have a railway system established within their territory.

The S2R Joint Undertaking shall, more specifically, seek to develop, integrate, demonstrate, and validate innovative technologies and solutions that uphold the strictest safety and security standards and the value of which can be measured against, inter alia, the following key performance indicators:

- a 50 % reduction of the life-cycle cost of the railway transport system, through a reduction of the costs of developing, maintaining, operating and renewing infrastructure and rolling stock, as well as through increased energy efficiency;

⁴ Consisting of rail equipment manufacturers Alstom Transport, Ansaldo STS, Bombardier Transportation, Construcciones y Auxiliar de Ferrocarriles (CAF), Siemens AG, Thales and infrastructure managers Trafikverket and Network Rail

⁵ Commission Decision N° C(2014) 7084 final

⁶ AERFITEC consortium, Amadeus IT Group SA, AZD Praha s.r.o., CFW consortium, Deutsche Bahn AG, DIGINEXT, EUROCC consortium, Faiveley Transport, HaCon Ingenieurgesellschaft mbH, Indra Sistemas S.A., Kapsch CarrierCom, Knorr-Bremse GmbH, MER MEC S.p.A., Patentes Talgo S.L., Railenium Swi'TRACK'EN consortium, Smart DeMain consortium, SmartRaCon consortium, SNCF, Virtual Vehicle Austria consortium+

⁷ <http://ec.europa.eu/transport/modes/rail/doc/2015-03-31-decisionn4-2015-adoption-s2r-masterplan.pdf>

⁸ http://www.shift2rail.org/wp-content/uploads/2013/07/S2R-JU-GB_Decision-N-15-2015-MAAP.pdf

- a 100 % increase in the capacity of the railway transport system, to meet increased demand for passenger and freight railway services;
- a 50 % increase in the reliability and punctuality of rail services (measured as a 50 % decrease in unreliability and late arrivals);
- the removal of remaining technical obstacles holding back the rail sector in terms of interoperability, product implementation and efficiency, in particular by endeavouring to close points which remain open in Technical Specifications for Interoperability (TSIs) due to lack of technological solutions and by ensuring that all relevant systems and solutions developed by the S2R Joint Undertaking are fully interoperable and fitted, where appropriate, for upgrading;
- the reduction of negative externalities linked to railway transport, in particular noise, vibrations, emissions and other environmental impacts.

R&I activities are performed by the Other Members and any other eligible entity co-funded by S2R in accordance with its budget availabilities and in compliance with the H2020 Regulation⁹ and its Rules of participation¹⁰. To this end, the S2R JU shall organise calls for proposals and/or for tenders for supporting the R&I activities.

As specified in Article 17 of the S2R Statutes,

- up to 40% of the total Union financial contribution to the S2R JU overall budget shall be allocated to the R&I activities performed by its Founding Members other than the Union and their affiliated entities,
- 30% shall be allocated to the Associated Members and their affiliated entities
- a minimum of 30% through open and competitive calls .

As for the “open and competitive calls” (point c. here above), also the award of the R&I activities to the Other Members (a. and b. here above) is through competitive calls in compliance with H2020 Rules of Participation and/or calls for tenders, under the relevant eligibility criteria.

1. IMPLEMENTATION OF THE ANNUAL WORK PLAN 2016

1.1. Key objectives 2016 and associated risks

2016 has been a crucial year for the S2R JU insofar it achieved important milestones and paved the way for the execution of its R&I Programme:

- achievement of the budgetary autonomy.
- finalisation of the first call for proposals to progress the execution of the S2R R&I Programme on the basis of the activities performed in the Lighthouse projects,
- signature of the underpinning Grant Agreements and ramp up phase of the R&I activities,
- launch of the 2017 Call for proposals,
- consolidation of the JU structure in order to ensure sound management, legality and regularity in the Programme execution,

The following sections describe the activities performed and the resources used to achieve the objectives. In Annex C the performances are measured against the set of agreed KPIs.

⁹ <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:347:0104:0173:EN:PDF>

¹⁰ http://ec.europa.eu/research/participants/data/ref/h2020/legal_basis/rules_participation/h2020-rules-participation_en.pdf

Preparatory actions for S2R JU autonomy

During the first months of 2016, the S2R JU progressed in the implementation of the preparatory actions towards its autonomy – achieved on 24 May 2016 – according to an action plan divided in two parts:

- The first part focuses on the state of readiness of the requirements for autonomy of the S2R JU, based on the checklist of criteria developed by DG RTD. It includes gap analysis, risk assessment, actions to be taken and timelines;
- The second part focuses on the building of the S2R JU Internal Control Framework.

The implementation of the Action Plan was subject to a Readiness Assessment Report¹¹ which stated that the S2R JU met the key requirements including the establishment of its bodies, the recruitment of the Executive Director, the adoption of its Financial Rules and of the Internal Control Standards, the adoption of Staff Regulation Implementing Rules, the setting-up of the physical infrastructure, and the conclusion of a number of Service Level Agreements (SLAs).

One of the key elements necessary for the autonomy was the finalization of the recruitment process of the Executive Director, who was appointed on 16 February 2016 and entered into service on 16 May 2016.

On 11 May 2016, by written procedure, the Governing Board adopted the decision on the “autonomy package” related to the JU which was implemented as from 24 May 2016.

Risks

The list below refers to risks related to the objectives set in the Annual Work Plan 2016 and has been updated by year end.

Risk identified	Action
In accordance with the H2020 Rules of Participations and considering the resources available on a yearly basis, the Programme shall be implemented through Projects financed by annual grants. Largely, this may result in a piecemeal approach instead of innovative solutions towards a new railway integrated, connected and automated system. This may result on questioning the sound financial management of the implementation process through grants, especially with regards to Members selected through open competition and commitment.	Qualitative mitigating measures are identified and implemented to contain and monitor the identified risks. The 2017 Call for proposals launched in 2016 has been prepared under the oversight of the Governing Board, and with the support of SIWG and Innovation Programmes’ SteeCos maintaining a Programme view compared to a piecemeal project view. In addition the S2R JU, in agreement with the GB, set up a Multi-Project Cooperation Tool and requested the Other Members to use it to implement the Programme. This measure has also been taken to ensure consistency of approaches/processes and facilitate the sharing of information among Projects. This tool also allow the Programme Office to have a view at

¹¹ Governing Board Decision No 13/2016 of 17 May 2016 - https://shift2rail.org/wp-content/uploads/2016/09/Decision-13_2016-Autonomy_ISG-comments_signed.pdf

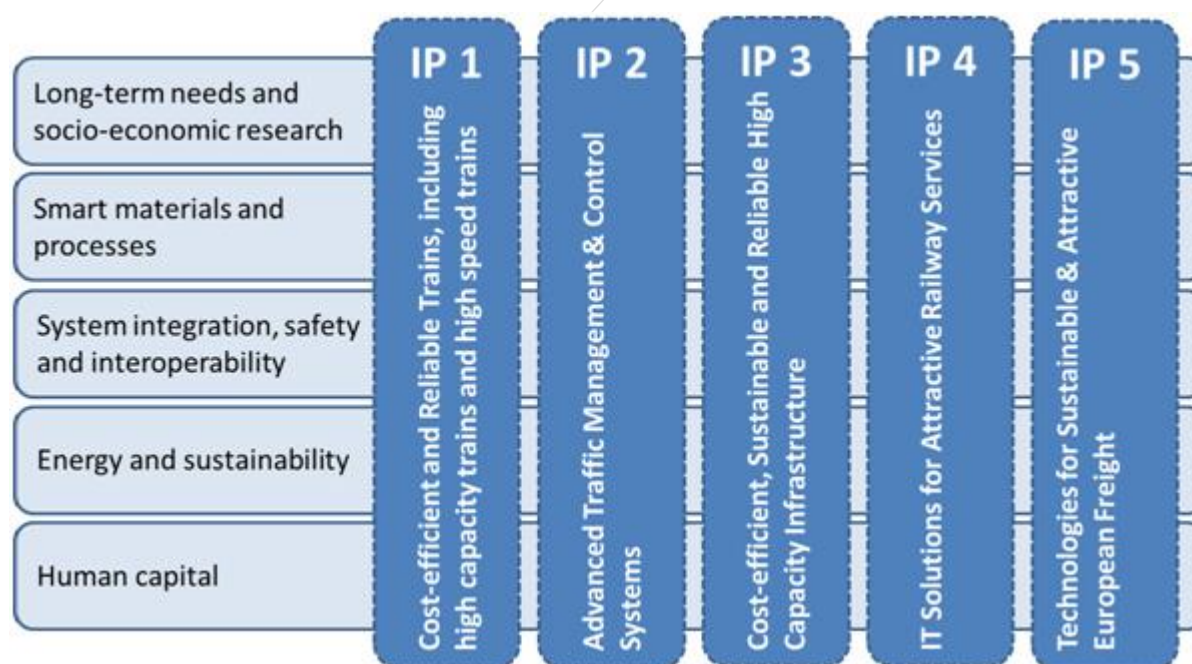
Risk identified	Action
	Programme level, by IP and by Other Member, of the progress of the Programme.
Failure of members to submit successful proposals in the 2015/2016 Calls leading to a risk that they may not fulfil their commitments to the S2R JU.	In 2016, the JU has organised information meetings for the open calls participants and the Other Members. It constructively organized, together with their Coordinators, the IP Steering Committee meetings to keep the focus on an integrated Programme.
Time to grant is delayed due to disputes within the consortium or failure of beneficiaries to provide relevant information, or to develop consortia agreements.	The S2R JU put in place a strict monitoring of the grant preparation phase, anticipating possible issues and partnering with the different consortia to address possible issues. This allowed to overcome system shortcomings in the initial phase of the grant preparation phase.
Projects kick-off and activities are delayed due to un-clarity of the rules and inefficiency of the Consortia	The S2R JU organised a dedicated information day for the Project Coordinators, inviting both the CFM and OC Projects. In addition dedicated financial training was provided as well. When possible risk of delay was detected, specific measures were adopted, such as direct follow-up.
Projects have independent grants and have been built in parallel with risks related to their complementarity.	The S2R JU decided to make mandatory the establishment of a Collaboration Agreement for the most of the signed Grants. The S2R JU developed a model Collaboration Agreement to facilitate its swift adaptation and avoid scattered approaches; it also exhorted the Other Members to conclude collaboration agreements by the first reporting period due soon after the starts of the projects, at the beginning of 2017. The S2R JU continues monitoring the situation, also through regular status update from the Coordinator of CFM and OC projects in the context of the IP Steering Committees.
Time to grant is delayed due to bottlenecks in the S2R JU due to insufficient staff resources	The planning of the activities allowed reducing at a minimum possible risks related to insufficient staff resources.
S2R JU members fail to deliver on additional activities.	Additional activities plan is contained in the membership agreement. Work with the members on preparation and implementation of the certification and reporting requirements.

Risk identified	Action
Lack of adequate dissemination of result may result in vague information to the end-user/interested parties and could compromise the JU impact.	In 2016 efforts have been made to standardise the dissemination plans, to monitor the dissemination actions and to prepare for the promotion of the first project results.

1.2. R&I activities: the S2R Programme

The S2R Programme is an integrated set of R&I activities structured around five asset-specific Innovation Programmes (IPs), covering all the different structural (technical) and functional (process) subsystems of the rail system, with a number of common cross-cutting activities (CCA):

- IP1: Cost-efficient and Reliable Trains, including high-capacity trains and high-speed trains
- IP2: Advanced Traffic Management & Control Systems
- IP3: Cost-efficient, Sustainable and Reliable High-Capacity Infrastructure
- IP4: IT Solutions for Attractive Railway Services
- IP5: Technologies for Sustainable & Attractive European Freight.



Inter alia, the role of the S2R JU is to ensure that interactions between the various IPs are adequately considered and managed, given that technological developments in one part of the system could lead to changes in performance or even create barriers in other parts. In addition, cross-cutting activities include research on long-term economic and societal trends such as customer needs and human capital and skills, which must be taken into account by the different IPs.

The Programme is developed through different types of activities, including:

- studies, fundamental and “blue-sky” research (TRL 0 – 2),
- scientific/applied research and laboratory demonstrations (TRL 3 – 6)
- operational demonstrations and innovation activities (TRL 6-7)

- other supporting activities.

In addition to these activities that are co-funded by the S2R JU and conducted within the scope of the S2R Programme, the Other Members are required to conduct Additional Activities with a view to leveraging the effect of the overall R&I. These Additional Activities are not eligible for financial support from the S2R JU but must contribute directly to the broader objectives set out in the Master Plan.

1.3. Call for proposals and grant information

Considering the annual budget availabilities, the S2R Programme is implemented through multi-annual Projects which are combined in a structured interdependent manner to fulfil the R&I activities planned in the S2R MAAP. This structured interdependence of S2R Projects reflects the Technological Demonstrators (TD) and Work Areas (WA) approach set within the Programme and each IP and CCA.

The following table summarises the **amounts and topics available under the different types of the 2015/2016 calls, against Budget Commitments of 2015 and 2016**. These calls were launched as one single batch in December 2015 and awarded by the JU following the Decision of the Governing Board of 9 June 2016¹².

Call	Type	Estimated S2R JU funding	Number of topics
H2020-S2RJU-2015-01	CFM	34.6 M€	9
	OC	10.0 M€	10
H2020-S2RJU-2016-01	CFM	29.1 M€	4
	OC	16.1 M€	5

The total number of proposals received in response to both calls for proposals was 57:

Call	Type	Number of proposals	Number of topics
H2020-S2RJU-2015-01	CFM	10	9
	OC	33	10
H2020-S2RJU-2016-01	CFM	4	4
	OC	10	5

The total S2R JU contribution requested by all the submitted proposals amounted to EUR 167.9 million compared to EUR 89.8 million available for funding:

Call	Type	Requested S2R JU funding	Estimated S2R JU funding available
H2020-S2RJU-2015-01	CFM	59.3 M€	34.6 M€
	OC	37.5 M€	10.0 M€

¹² Governing Board Decision No 14/2016 of 9 June 2016 https://shift2rail.org/wp-content/uploads/2016/09/Decision-14_2016-list-of-actions-under-S2R-JU-calls_signed.pdf

H2020-S2RJU-2016-01	CFM	29.0 M€	29.1 M€
	OC	42.1 M€	16.1 M€

The S2R JU Other Members submitted project proposals to cover all 13 call topics open to them. The value of activities to be performed by the S2R JU Other Members during the next three years amounts to EUR 142.4 million that will be co-funded by the S2R JU up to EUR 63.3 million. These projects, which started on the 1 September 2016, are well on their ramp up phase.

The applicants to the Open call for proposals for non-JU Members covered 14 out of 15 topics open to them. The value of the activities to be performed by the awarded consortia amounts to EUR 24.7 million and will be financed by the S2R JU up to 100% of the eligible costs.

The Governing Board at its meeting on 9 June 2016 approved the list of actions selected for funding proposed by the Executive Director; evaluation result letters were sent to all applicants on 17 June 2016. In line with the available budget, one proposal from each call topic was retained for funding, the first in the ranking list of the evaluation outcome. The activities related to the topic which did not receive any proposals were postponed.

Call topics open to S2R JU Other Members and awarded projects

TOPIC	ACRONYM	TITLE	Project Value	Grant	Inkind contr.	STARTING DATE	END DATE
S2R-CFM-IP2-01-2015	X2Rail-1	Start-up activities for Advanced Signalling and Automation System	45.0	20.0	25.0	01/09/2016	31/08/2019
S2R-CFM-IP5-01-2015	FR8RAIL	Development of functional requirements for sustainable and attractive European rail freight	7.9	3.5	4.4	01/09/2016	31/08/2019
S2R-CFM-IP5-02-2015	ARCC	Start-up activities for freight automation	3.6	1.6	2.0	01/09/2016	31/08/2019
S2R-CFM-CCA-02-2015	FINE 1	Energy and sustainability, including noise and vibrations baselines assessment	2.9	1.3	1.6	01/09/2016	31/08/2019
S2R-CFM-IP4-01-2015	Co-Active	Shopping, booking and ticketing of multimodal travel solutions	7.9	3.5	4.4	01/09/2016	31/12/2018
S2R-CFM-IP4-02-2015	ATTRACKTIVE	Travel companion and tracking services	5.0	2.2	2.8	01/09/2016	31/12/2018
S2R-CFM-IP5-03-2015	FFL4E	Freight propulsion concepts	3.4	1.5	1.9	01/09/2016	31/05/2019
S2R-CFM-CCA-01-2015	IMPACT-1	Start-up activities for System Platform Demonstrator Integrated Assessment and socio-economic effects	0.7	0.3	0.4	01/09/2016	28/02/2018
S2R-CFM-CCA-03-2015	PLASA	Integrated Mobility and Safety Management	0.8	0.4	0.4	01/09/2016	31/08/2018

S2R-CFM-IP1-02-2016	CONNECTA	Development of 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	13.3	5.9	7.4	01/09/2016	31/08/2018
S2R-CFM-IP3-02-2016	IN2SMART	Intelligent maintenance systems and strategies	16.4	7.3	9.1	01/09/2016	31/08/2019
S2R-CFM-IP3-01-2016	IN2TRACK	Research into enhanced track and switch and crossing system	6.3	2.8	3.5	01/09/2016	28/02/2019
S2R-CFM-IP1-01-2016	PINTA	Development of concepts towards the next generation of traction systems and management of wheel/rail adhesion	29.2	13.0	16.2	01/09/2016	30/11/2018
TOTAL			142.4	63.3	79.1		

Open calls topics for S2R JU non-Members and awarded projects

TOPIC	ACRONYM	TITLE	Project Value	Grant	Inkind contr.	STARTING DATE	END DATE
S2R-OC-IP2-01-2015	CYRail	Threat detection and profile protection definition for cyber-security assessment	1.5	1.5		01/10/2016	30/09/2018
S2R-OC-IP2-03-2015	MISTRAL	Technical specifications for a new Adaptable Communication system for all Railways.	0.5	0.5		01/11/2016	31/10/2018
S2R-OC-IP5-01-	SMART	Freight Automation on lines and in yards	1.0	1.0		01/10/2016	30/09/2019
S2R-OC-CCA-02-2015	OPEUS	Energy usage, generation and saving approaches	0.8	0.8		01/11/2016	30/04/2019
S2R-OC-CCA-03-2015	DESTINATE	Noise reduction methodologies	1.0	1.0		01/11/2016	31/10/2018
S2R-OC-IP2-02-2015	VITE	IT virtualisation of testing environment	1.0	1.0		01/10/2016	30/09/2018
S2R-OC-IP5-02-	DYNAREIG	Improved vehicle/train dynamics	1.0	1.0		01/11/2016	30/06/2018
S2R-OC-IP5-03-2015	INNOWAG	Intelligent freight wagon with predictive maintenance	1.5	1.5		01/11/2016	30/04/2019
S2R-OC-CCA-01-2015	NEAR2050	Long-term needs of different actors in the railway sector	0.4	0.4		01/10/2016	31/03/2018
S2R-OC-CCA-04-2015	GoSAFE RAIL	Safer infrastructure – improved object detection and prevention of safety critical events and integrated mobility	1.3	1.3		01/10/2016	30/09/2019
S2R-OC-IP3-01-2016	S-CODE	Research into new radical ways of changing trains between tracks	5.0	5.0		01/11/2016	31/10/2019
S2R-OC-IP4-01-2016	GoF4R	Interoperability Framework governance, ensuring its market uptake and sustainability	2.0	2.0		01/11/2016	31/10/2018
S2R-OC-IP4-02-	ST4RT	Interoperability Framework Converters	1.0	1.0		01/11/2016	31/10/2018
S2R-OC-IP1-02-2016	SAFE4RAIL	Technology feasibility studies supporting the development of next generation TCMS, and safe control for brakes	6.7	6.7		01/10/2016	30/09/2018
TOTAL			24.7	24.7			

It should be noted that the Consortium Destinate included a Swiss partner who will perform the project without co-funding for a value of EUR 0.3 million; thus the overall Project value of this call is EUR 25.0 million.

For the members' projects, the respective grant agreements were signed in August and all the activities started on 1 September. The last project from the open call started activities on 1 November.

1.4. Progress against KPIs / Statistics (Annex C)

The Key performance Indicator results for the year 2016 are presented in Annex C. The JU has taken into its scoreboard all H2020 indicators, which have been established for the entire Research family by the Commission, to the extent they are applicable to the JU and provide meaningful results.

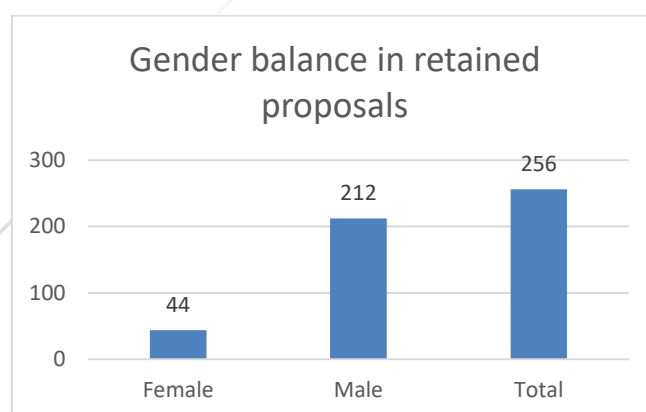
Comments to some individual indicators are provided in the table in the Annex or in the related section of the report, to which the indicators refer. In addition, the S2R JU is presenting more detailed results of its performance monitoring in specific areas, e.g. key figures provided in the section dealing with the calls for proposals and the following evaluation process.

The S2R JU uses the H2020 tools for processing the grant agreements' preparation, which demonstrated not to be perfectly designed in supporting the S2R activities for swift processes and technical approaches expected by a Public-Private Partnership that is managing a Programme. As the first call went through these systems, issues were encountered. Nonetheless, all delays were recovered by the efforts and commitment put forward by the Programme Office, which worked with the IT Services to address the technical issues and together with the grant beneficiaries to comply with the agreed start date of the Programme. As a result, the JU was capable to conclude the process well below the maximum 8 months' time to grant.

1.5. Evaluation: procedures and global evaluation outcome, redress, statistics

The present section refers to the 2015/2016 Calls as a single batch, as previously indicated.

The evaluation process took place in April and May 2016. The proposals were evaluated by 28 external experts, divided in five different panels, with a dedicated rapporteur for each panel. A member of the JU Programme Office acted as moderator in each panel (moderator). During the consensus meetings, an independent observer monitored the whole process. The total number of proposal evaluated was 55, as one was inadmissible, and 27 were retained for funding with a success rate of 49.1%. The number of participants evaluated was 444 (67 female, 367 male and 10 no gender given) and 256 were retained for funding with a success rate of 57.7%. Out of the retained participants, 44 were female (success rate 65.7%) and 212 were male (success rate 57.8%).



SMEs participating under both calls were 108 and 53 were retained for funding representing respectively the 24.3% and the 20.7% of total and retained participants for funding. In the Open Calls only, more than 30% of the participants of funded Projects are SMEs. The overall success rate for SMEs was 49.1%. From a geographical perspective, 27 Countries participated to the call, 22 were from the UE and 5 from Associated Countries. After the evaluation, the participating Countries to the retained project for funding were 20 of which 17 from EU and 3 from Associated Countries.

One evaluation review request (redress) was submitted concerning the results of the evaluation process. An Evaluation Review Committee, appointed to address such cases, examined the request. After detailed examination of the request and all the relevant documentation the committee concluded that there were no grounds to support the complaint and that the evaluation procedure was carried out in accordance with the applicable procedures, ensuring fairness, transparency and equal treatment.

All the Grant Agreements were signed well before the timeframe of maximum 8 months from the deadline for the call publication (Time To Grant – TTG).

With its first calls for proposals the S2R JU launched EUR 167.3 million of interdependent R&I activities and granted EUR 88 million for their completion. The Projects that S2R launched, cover most areas of S2R Programme.

The 2015/2016 Projects resulted from the award of grants in answer to the calls for proposals 2015/2016 launched at the end of 2015 and concluded with the decision of the Governing Board of 9 June 2016.

1.6. S2R Programme: S2R Lighthouse Projects

This section presents the S2R Lighthouse Projects as part of the S2R initiative, in accordance with the S2R Regulation, and considering that their activities are part of the MAAP. These Projects are administered by the European Commission.

In May 2015, while the S2R JU was still in its setup phase, under the Horizon 2020 Transport Programme and the its call 2014, EUR 52 million were awarded by the European Commission to the so-called four “S2R Lighthouse Projects”, lightening the way towards the Innovation Programmes at the heart of Shift2Rail.

The project Coordinators of the S2R Lighthouse Projects have been already invited in 2016 to attend the respective IP Steering Committees and they presented the results already achieved. The discussion on the transfer and usability of results (deliverables but not only) to the S2R JU Members Projects has also been initiated.

Project Acronym	Topic from H2020 Call 2014	Linked IP / CCA	Grant (€)	Start date	Duration	Management ¹³
IN2RAIL	MG-2.1	IP3, CCA (IP2)	17,998,546	01/05/2015	36	DG MOVE
IT2RAIL	MG-2.2	IP4	12,000,000	01/05/2015	30	DG MOVE
ROLL2RAIL	MG-2.3	IP1, CCA (IP2)	16,000,000	01/05/2015	30	DG RTD
Smart-Rail	MG-2.2	IP5	5,999,213	01/05/2015	36	DG MOVE
TOTAL			51,997,759			

In2Rail

This project sets the foundation for a resilient, consistent, cost-efficient, high capacity European rail network. It paves the way for the optimisation of the design of core infrastructure elements as well as improve the management of the railway system by adopting a holistic approach. In2Rail plans to achieve this by embracing innovation through three technical sub-projects:

- Smart Infrastructure;

¹³ The overall management will be performed by DG MOVE and DG RTD respectively, while the S2R JU shall performing a technical oversight and ensuring consistencies between the lighthouse projects and the projects stemming from the S2R calls

- Intelligent Mobility Management (I2M);
- Power Supply and Energy Management Systems.

These sub-projects directly feed into IP3 (Cost Efficient and Reliable High Capacity Infrastructure), CCA (Cross Cutting Activities) and indirectly, through the I2M activity of the CCA, also the IP2 (Advanced Traffic Management & Control Systems).

The objectives are 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,
- Explore Innovative technologies and embed resulting concepts in a systems framework where infrastructure, information management, maintenance techniques, energy, and engineering are integrated, optimised, shared and exploited.
- 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.

Through the work realized until 2016, first achievements include among others:

- the state of the art situation across various European partners
- the development of a common approach to innovation value analysis (for both In2Rail & the rest of the Programme)
- building upon European project outputs at TRL3 moving on the work in S2R to TRL 6
- first promising results are beginning to emerge from radical new concepts across the project (e.g. radical switch design in Work-Package 2 (WP2), potential 3D printing of track components)
- improvement of maintenance activities (e.g. Rail head repair technology using low pre heat temperature – less time / cost to implement) and in engaging key suppliers in further developing existing radical Technologies
- initial concepts for condition and risk based planning, practical guidelines around an generic asset management framework (in light with the UIC asset management framework) and requirements and a proof of concept for a working method for tamping eliminating pre-alignment as an example for an improved working method
- low cost system to be mounted on commercial trains for relevant geometry parameters and stress free temperature
- design guidelines for a workstation and design concept for the integration layer of the Intelligent Mobility Management including nowcasting and forecasting
- intelligent AC power supply and smart metering system architecture main blocks and the definition of all subsystems and their functional specifications

The project also completed 21 deliverables (out of 67). Among its dissemination activities it participated and presented, along with the S2R JU, its results at InnoTrans 2016 (September) and at a public Mid-Term Event (November 2016).

IT2Rail

The project is the first step towards IP4 (IT Solutions for Attractive Railway Services). Through the introduction of new technologies and solutions, European citizens' global travel interactions will be transformed into a fully integrated and new seamless travel experience,

giving access to a complete multimodal travel offer which connects the first and last mile to long distance journeys.

The objectives are to:

- Conceive and develop a new seamless travel experience,
- Complete multimodal travel offer connecting the first and last mile to long distance journeys,
- Develop a system with the traveller at the heart of innovative solutions, accessing all multimodal travel services (shopping, ticketing, and tracking) through its travel companion,
- Build an open published framework providing full interoperability whilst limiting impacts on existing systems, without prerequisites for centralised standardisation.

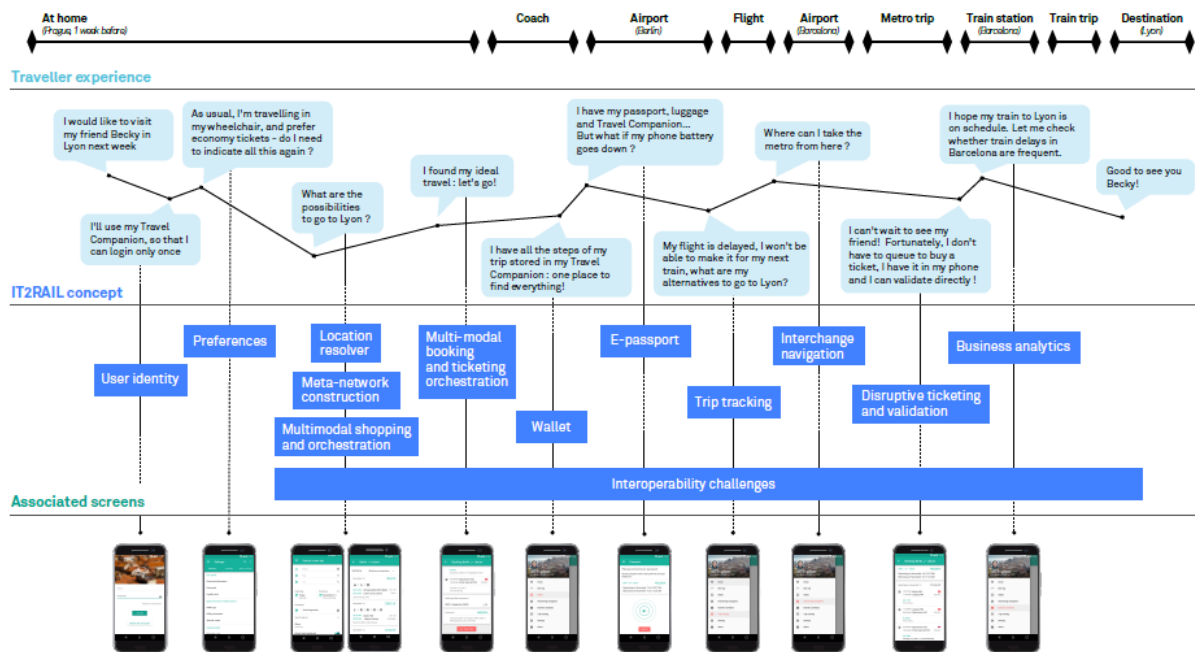
The use case are planned to be defined as a specific instantiation of the open concepts that benefit from a completely scalable architecture fully instantiated in IP4. This approach allows a complete door-to-door intermodal travel offer and proposes a seamless integration of the very diverse existing 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 current standards fragmentation in multimodal transport, IT2Rail sets the ground for new business-model innovations in the market-place (also coming from other players than the participants of IP4), contributing to the economic self-sustainability of these e-services in the long-term.

The first achievements include among others the release of reports investigating and proposing technical solutions for an integrated system. The investigations have been focusing on the following topics:

- d. User ID and preferences
- e. Travel shopping functionalities like a location resolver, a metaroute explorer (considering travel experts, network, travel time, density, user preferences, etc.), a offer builder (calling travel experts, aggregating itineraries, routing, etc.)
- f. Booking and Ticketing orchestrators analysing co-modal and intermodal business models but limiting its work on the co-modal
- g. Wallet and e-passport using cloud and LDS2 management
- h. Trip tracker, able to track the journey, register and processing events, alert the traveller and provide alternative routing/modes
- i. Innovative concepts of navigation guidance
- j. e-Ticketing validation, scaling it horizontally to allow small actors to participate
- k. Business Analytics modules and functionalities integrating KPI computation, weather forecast, social networks, etc.

Among its dissemination activities it participated and presented, along with the S2R JU, its results at InnoTrans 2016 (September) and at a public Mid-Term Event (November 2016) where the IT2Rail technical developments have been explained through an instance of travel experience, see figure below:



Roll2Rail

The project is setting the foundation for many of the technologies that will be continued within IP1, CCA and indirectly, through the TCMS of IP1, also in IP2. Roll2Rail aims to develop key technologies that will overcome hurdles to innovation in rolling stock development. It forms part of a longer-term strategy to revolutionise the rolling stock of the future and the associated energy/noise management.

The objectives are to:

- Increase the capacity of the railway system and bring flexibility to adapt capacity to demand,
- Increase availability, operational reliability and therefore punctuality of the vehicles,
- Reduce life cycle costs of the vehicle and the track,
- Increase the energy efficiency of the system,
- Improve passenger comfort and the attractiveness of the rail transport,
- Reduce the environmental impact of railways.

The key research challenges and the planned outcomes of Roll2Rail are here listed in the figure below:



The first achievements include, among others:

- The completion of two field measurement campaigns:
 - Different measurement methodologies to separate wheel and track noise
 - Characterisation of the railway environment for radio transmission enabling wireless TCMS (using LTE, WiFi, etc.)
- Initial development of silicon carbide technology for traction in Light Rail, Metro, Sub -Urban, Regional and High Speed market applications (including specifications, analysis on available SiC and GaN semiconductor technologies and mechanical outline, architecture, topology development, sensors, EMI + RAMS analysis, etc.)
- Simulation of Carbody prototypes made with lightweight materials, including design of subassemblies, static assessment and stiffness calculation/analysis, design proposal for urban, optimisation of fibre orientation, joints, etc.
- Universal cost model for quantifying the whole life cycle cost from Running Gear WP
- Standardisation Activities and technical requirements analysis for brakes in EU countries leading to vehicle authorisation
- Survey on passenger comfort, trends and future proofing trains.

Among its dissemination activities it participated and presented, along with the S2R JU, its results at InnoTrans 2016 (September) and at a public Mid-Term Event (November 2016).

Smart Rail

The project aims at improving rail freight services offered to shippers, focusing on five main aspects that are important to shippers, namely reliability, lead time, costs, flexibility and visibility. The project focuses on innovative solutions and their implementation in the rail freight sector by testing them in three Continuous Improvement Tracks, along certain specified rail corridors.

The outcome of this project will be a valuable contribution for IP5. The project will deliver operational solutions if three important preconditions will be addressed in this project.

These preconditions are:

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

Solutions developed on these three topics are planned to be implemented and tested in three Continuous Improvement Tracks on different corridors.

1. Wagonload train services: a concept for wagon-load trains on two corridors, the Lyon-Munich with a continuation to Austria, Czech Republic, Slovakia and Hungary.
2. Managing connectivity of rail with other modes: control tower for long distance rail freight transport to increase the reliability for both planned and unplanned disruptions and to increase the visibility of the supply chain. Two long distance intermodal rail connections are covered, namely UK to Poland and UK to France, Spain and Italy.
3. Reliability in case of (unexpected) obstructions on the track: aims to increase the flexibility and reliability of rail freight transport within a multimodal transport system. Solutions are planned to be tested on the Rotterdam-Genoa corridor.

The first achievements includes among others:

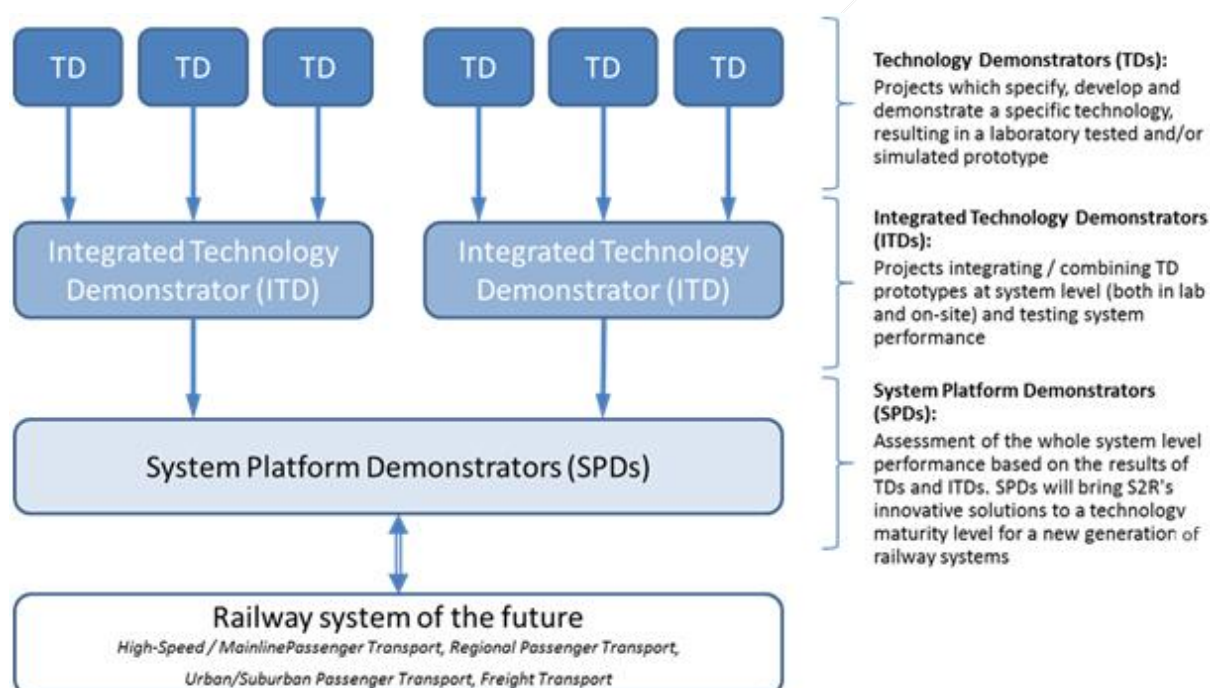
- Guidelines on how a Logistic Service Provider (LSP) can extend its control tower with rail freight information, including process of implementing the data exchange measures and value cases + ICT solutions
- Analysis on the measures for improving flexibility and reliability of a multi-modal freight transport, including identification of issues
- Operation of a “smart-rail” wagon load service, and development of business models (see the route used in the figure below)
- Analysis on new business model to improve collaboration within the rail sector and the supply chain



1.7. Activities carried out in Grant Agreement for Other Members (CFM) and Open Calls (OC)

The “S2R Lighthouse Projects” are on the way to deliver important building blocks providing the S2R JU with the basis to drive R&I towards innovative solutions and concepts to be integrated in a system perspective.

The first wave of calls for proposals launched by S2R JU – 2015/2016 – aims at integrating the results expected from the “S2R Lighthouse Projects” to push forward to TDs and successively to ITDs and SPDs.



This section presents the ongoing projects implementing the R&I activities per IP and highlighting some interdependencies.

1.7.1. IP1 Cost-efficient and Reliable Trains, including high-capacity trains and high speed trains

TOPIC	ACRONYM	TITLE	Project Value	Grant	Inkind contr.	STARTING DATE	END DATE
S2R-CFM-IP1-02-2016	CONNECTA	Development of 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	13.3	5.9	7.4	01/09/2016	31/08/2018
S2R-CFM-IP1-01-2016	PINTA	Development of concepts towards the next generation of traction systems and management of wheel/rail adhesion	29.2	13.0	16.2	01/09/2016	30/11/2018

S2R-OC-IP1-02-2016	SAFE4RAIL	Technology feasibility studies supporting the development of next generation TCMS, and safe control for brakes	6.7	6.7		01/10/2016	30/09/2018
--------------------	-----------	--	-----	-----	--	------------	------------

Work is organised around the following Technical Demonstrators (TDs), covering all the R&I areas indicated in the Master Plan: Traction, Train Control and Monitoring System, Car body shell, Running Gear, Brakes, Doors and intelligent access systems and Train interiors.

- **Traction system** (TD 1.1) will develop new traction components and subsystems using mainly silicon carbide (SiC) technologies, which lead to new architectures. The work will produce TDs to implement into a Metro, a Regional train and a High-Speed Train.
- **Train control and monitoring system** (TCMS) (TD 1.2). The development of a new-generation TCMS will allow overcoming current bottlenecks caused by physically coupled trains. The new drive-by-data concept for train control, along with wireless information transmission, aims to make new control functions possible.
- **The new generation of car-body shells** (TD 1.3) using composite or other lightweight materials will be a step change in the sector, leading to significantly lighter vehicles that carry more passengers within the same axle load constraints, use less energy and have a reduced impact on rail infrastructure.
- **Running gear** (TD 1.4) will develop innovative combinations of new architectural concepts, new actuators in new lighter materials leading to new functionalities, and significantly improved performance levels with the possibility of vibration energy recovery.
- **New braking systems** (TD 1.5) with higher brake rates and lower noise emissions will provide major capacity gains in terms of mass and volume in bogies, paving the way for a fresh revisit of bogie design. Combining these with traction innovations, the next generation of passenger rolling stock will be able to offer improvements in acceleration and deceleration rates, leading to greater overall line capacity for trains.
- **Innovative doors** (TD 1.6) aim to move away from current access solutions. New lightweight composite structures will react faster at existing safety and reliability levels, reducing platform dwell times and increasing overall line capacity. Customer-friendly information systems and improved access for people with reduced mobility using sensitive edges and light curtains are part of this new development.
- **Train modularity in use** (TD 1.7) will develop new modular concepts for train interiors that allow operators to adapt the vehicle layout to the actual usage conditions, and will improve passenger flows and optimise both the capacity of the vehicle and dwell times.

The CFM projects launched in 2016 are PINTA and CONNECTA, complemented by the OC project SAFE4RAIL.

The IP coordination has been very effective and was able to promptly structure the TDs inputs to the S2R JU during the whole 2016. One CFM project, CONNECTA, has clearly set the example in term of readiness to undertake the GAP. The cooperation spirit between CFM and OC Projects is also very effective.

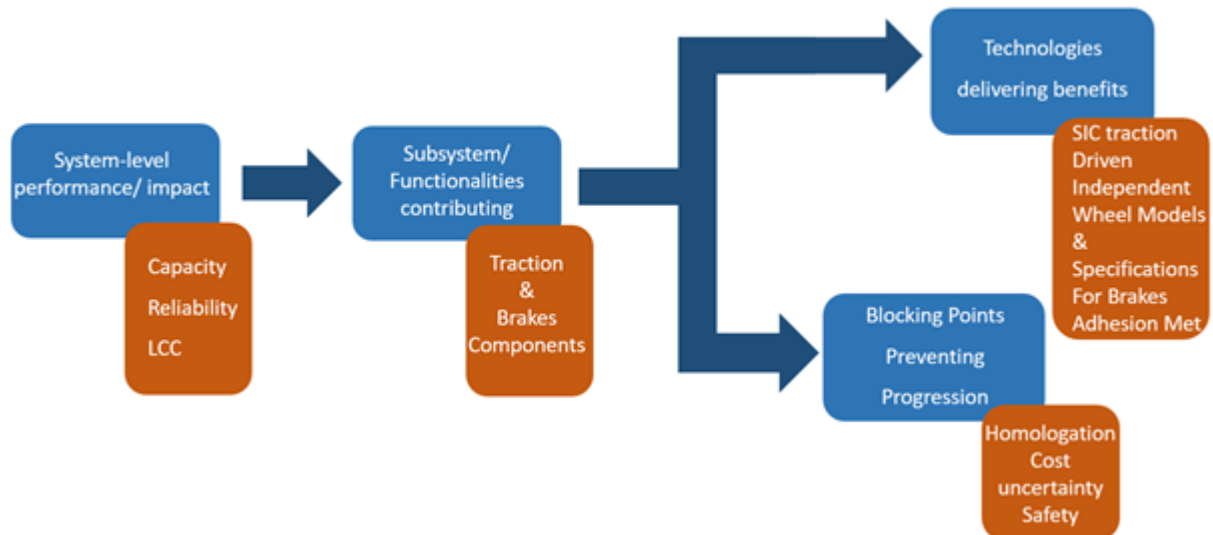
PINTA (TD1.1 and TD 1.5)

The Project addresses the two key topics: Traction and Adhesion Management.

Traction subproject focuses on the improvement of seven technical and economical performances of the Traction system that have been agreed and defined in the “S2R Lighthouse Project” Roll2Rail. The results will have positive impact on line capacity, operational reliability and on railways system Life Cycle Cost (LCC), and have different train applications spanning from tramways to HST.

The Adhesion Management subproject aims at the achievement of a number of important objectives linked to Brakes, such as reducing degradation, management of all adhesion conditions, overall train safety improvement and reduction of wheels LCC

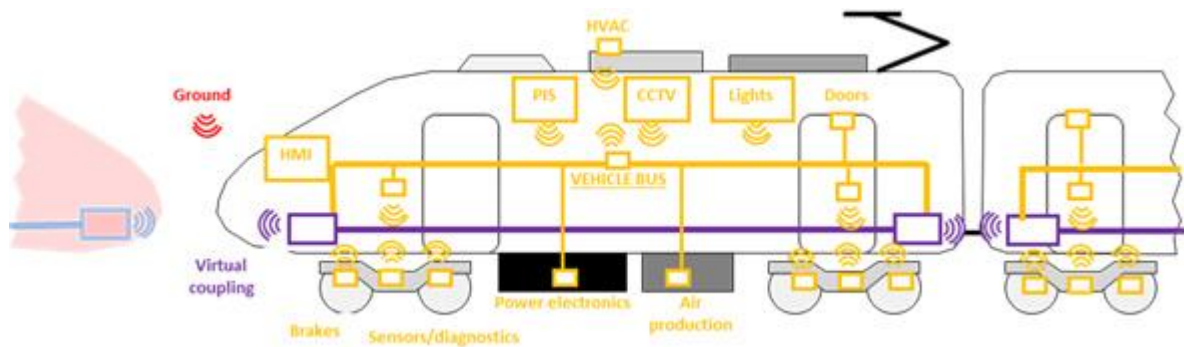
The activities should contribute in formulating new performance specifications for Adhesion Recovery Systems. Moreover, improved requirements will be developed for Wheel Slide Protection test procedures, followed by new specifications for Automatic Test benches.



CONNECTA (TD1.2 and TD1.5)

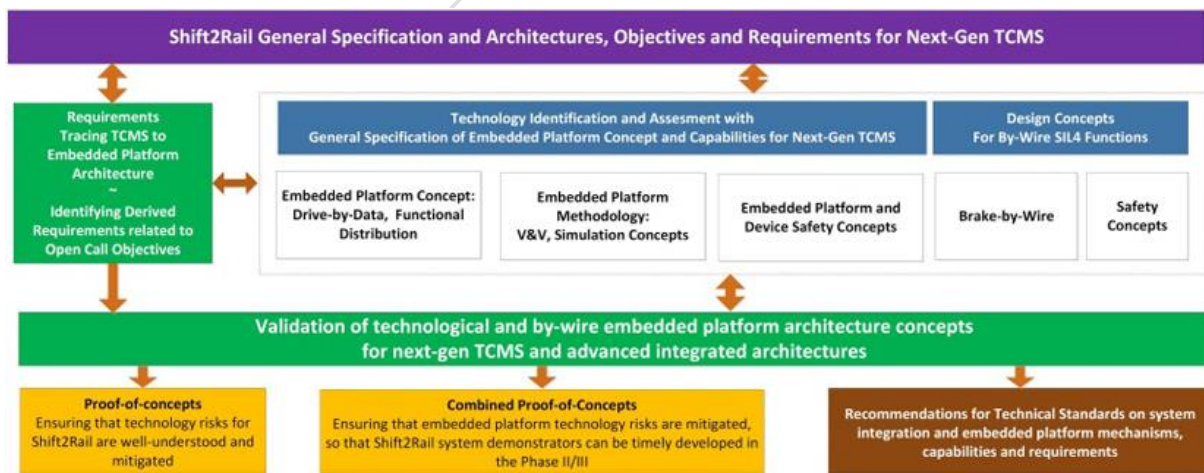
The project aims at contributing to next generation of TCMS architectures and components with wireless capabilities as well as to the next generation of electronic braking systems.

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 develops in four phases of work: define general specifications for TCMS technologies and high-level architectures, progress and implement new architectures and technologies, tools, norms and standards, simulate and test virtually all the communication networks and functions of the new generation TCMS subsystems, evaluate results, disseminate, communicate and exploit as much as possible at this TRL3-4 level of achievements. This project reinforces and extends the early work done in the TCMS part of the “S2R Lighthouse” project Roll2Rail as well as starts some specific activities of the Shift2Rail MAAP.



SAFE4RAIL (TD1.2 and TD1.5)

This project is complementary to CONNECTA and it provides the baseline for a fundamentally simplified embedded computing and networked TCMS platform, for modular integration and certification of all safety-functions up to SIL4. The SAFE4RAIL simulation and testing environment is based on the hardware abstraction and domain separation concepts allowing rapid deployment and testing of applications, e.g. by supporting early functional integration testing long before vehicle integration. A SIL4 brake-by-wire system safety concept demonstrates the effectiveness of SAFE4RAIL results. The project will provide recommendations for standardization and certification of next generation TCMS embedded platforms, and will reduce TCMS system lifecycle and operating costs. SAFE4RAIL results will encourage interoperability, efficient, safe and secure interconnection of technical solutions among European railway providers, boosting the worldwide competitiveness and preserving the global leadership of the European transport industry.



1.7.2. IP2 Advanced Traffic Management and Control System

TOPIC	ACRONYM	TITLE	Project Value	Grant	Inkind contr.	STARTING DATE	END DATE
S2R-CFM-IP2-01-2015	X2Rail-1	Start-up activities for Advanced Signalling and Automation System	45.0	20.0	25.0	01/09/2016	31/08/2019

S2R-OC-IP2-01-2015	CYRail	Threat detection and profile protection definition for cyber-security assessment	1.5	1.5		01/10/2016	30/09/2018
S2R-OC-IP2-03-2015	MISTRAL	Technical specifications for a new Adaptable Communication system for all Railways.	0.5	0.5		01/11/2016	31/10/2018
S2R-OC-IP2-02-2015	VITE	IT virtualisation of testing environment	1.0	1.0		01/10/2016	30/09/2018

Work is organised around the following Technical Demonstrators (TDs), covering all the R&I areas indicated in the Shift2Rail Master Plan: Smart, fail-safe communications and positioning systems; Traffic Management Evolution; Automation; Moving block and train integrity; Smart procurement and testing; Virtual coupling and Cyber security.

- The development of a new **Communication System** (TD 2.1) aims at overcoming the limitations in the current European Train Control System (ETCS) and Communications-Based Train Control (CBTC) and delivering an adaptable train-to-ground communications system usable for train control applications in all market segments, using packet switching/IP technologies (GPRS, EDGE, LTE, Satellite, Wi-Fi, etc.).
- **Automatic Train Operation** (ATO) (TD 2.2). The aim is to develop and validate a standard ATO up to GoA3/4 over ETCS, where applicable, for all railway market segments (mainline/high speed, urban/suburban, regional and freight lines).
- **Moving Block** (TD 2.3) ensuring compatibility with existing ERTMS, the project aims at improving line capacity by decoupling the signaling from the physical infrastructure, and removing the constraints imposed by trackside train detection, thereby allowing more trains on a given main line, especially for high-density passenger services.
- **Safe Train Positioning** (TD 2.4) aims at developing a fail-safe, multi-sensor train positioning system applying Global Navigation Satellite Systems (GNSS) technology to the current ERTMS/ETCS core and possibly introducing an add-on for fulfilling the scope. It will enable the use of other new technologies or sensors to boost the quality of train localisation and integrity information, while also reducing overall costs.
- **Train Integrity** (TD 2.5) focusing on those market segments lacking this function, the project aims to specify and prototype an innovative on-board train integrity solution, capable of autonomous train-tail localisation, wireless communication between the tail and the front cab, safe detection (SIL4) of train interruption and autonomous power supply functionality without the deployment of any fixed trackside equipment.
- The development of a **new laboratory test framework** (TD 2.6) comprises simulation tools and testing procedures for carrying out open test architecture with clear operational rules and simple certification of test results, minimising on-site testing by performing full laboratory test processes.
- The development of a set of **standardised engineering and operational rules** (TD 2.7) aims at contributing to the creation of an open standard interface (if supported by positive business cases) and a functional ETCS description model, all based on formal methods. It will ease verification and authorisation processes, eventually leading to improved interoperability, while reducing the need for extensive field tests in future.
- **Virtual Coupling** (TD 2.8) aims at enabling ‘virtually coupled trains’ to operate much closer to one another (within their absolute braking distance) and dynamically modify their own composition on the move (virtual coupling/uncoupling of train convoys), while ensuring at least the same level of safety as is currently provided.
- An optimised **Traffic Management System** (TD 2.9) aims to improve traffic management operations with automated processes for data integration and exchange with other rail business services. The backbone of the new architecture will be a scalable, interoperable and standardised communication structure applicable within an integrated rail services management system.

Combining these features with new business service applications will allow for predictive and dynamic traffic management in both regular and degraded situations.

- **Smart radio-connected all-in-all wayside objects** (TD 2.10). This TD aims at developing autonomous, complete, intelligent, self-sufficient smart equipment ('boxes') able to connect not only with control centres (e.g. interlocking) or other wayside objects and communicating devices in the area (by radio or satellite), but also, for instance, with on-board units. It will provide opportunities in terms of cost reduction and asset management improvement, and set out new means of railway network' information management and control.
- **Cyber Security** (TD 2.11) aims at achieving the optimal level of protection against any significant threat to the signaling and telecom systems in the most economical way

The CFM Project launched in 2016 is CFM - X2Rail-1, complemented by the OC Projects CYRail, VITE and MISTRAL.

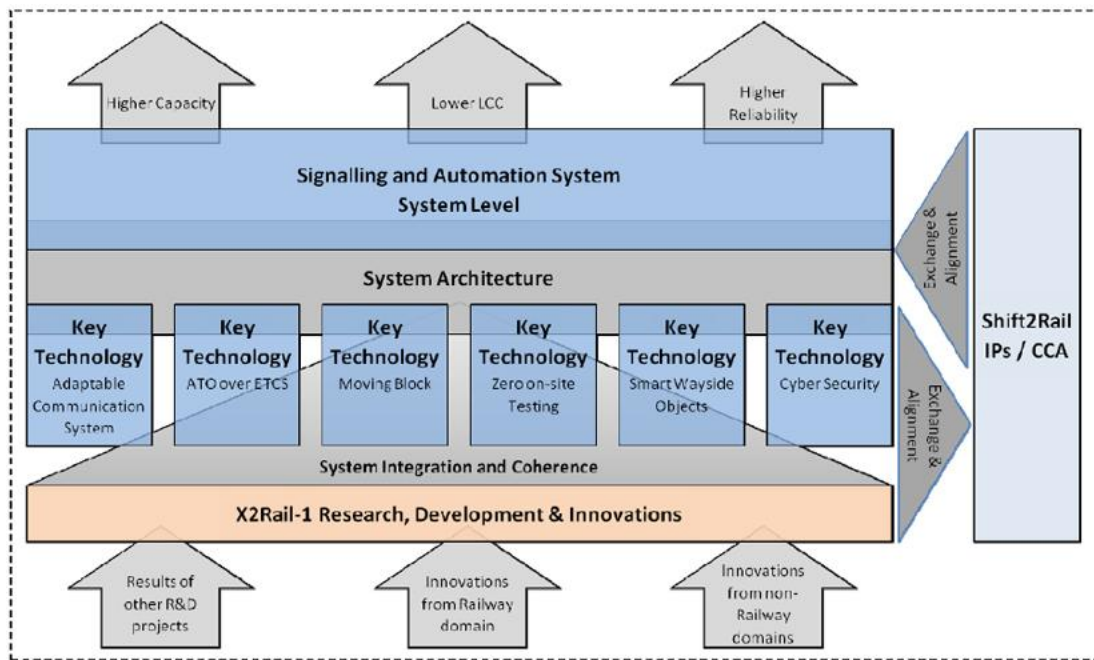
The system approach and the numerous stakeholders of IP2 have been well managed by the IP coordinator, which has worked efficiently with the JU Programme Office. All IP2 projects have professionally managed the GAP and are on track.

X2Rail-1 (TD2.1, TD2.2, TD2.3, TD2.6, TD2.10 and TD2.11)

The 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 objectives of X2Rail-1 are:

- To overcome the limitations of the existing communication systems
- To improve the usable track capacity by introducing more Automatic Train Operation (ATO) systems and Moving Block systems.
- To innovate the signalling architectures towards more decentralized and less cost intensive systems,
- To minimize energy consumption and to improve train punctuality.
- To increase innovation in the field of lab testing.
- To ensure security among all connected signalling and control systems.
- To ensure the backward compatibility of ERMTS/ETCS technologies, notwithstanding of the required functional enrichment of the future signalling and control systems.



CYRail (TD2.11)

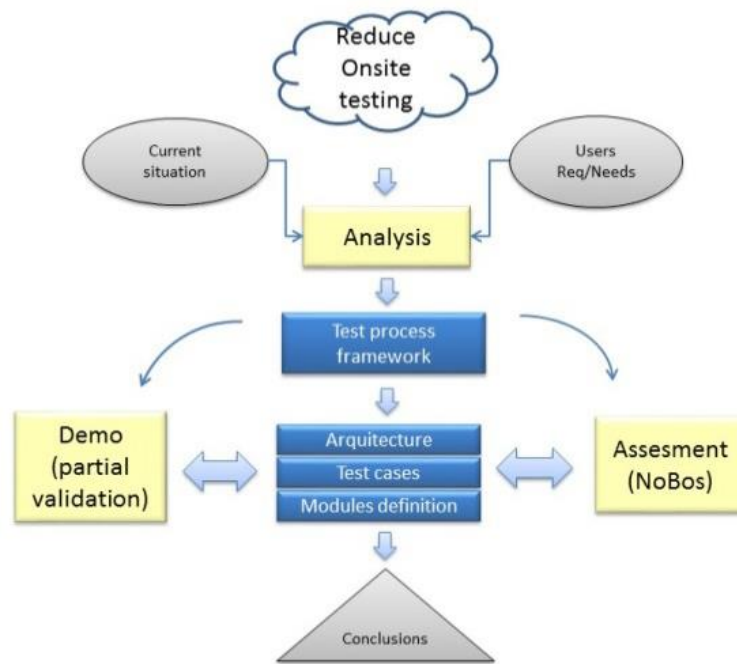
This project is complementary to X2Rail-1 and it will address railway system cyber security through a methodical diagnosis and specification process, enforced at each step of the cyber-security chain: defining operational context and scenarios, followed by a security assessments of railway systems. The project develops an analysis of threats targeting infrastructures as well as innovative, attack detection and alerting techniques. Assessing the potential impact on operations, it defines adapted mitigation plans and countermeasures. Protection Profiles for railway control and signalling applications are also delivered to ensure security by design of new rail infrastructures.

VITE (TD2.6)

This project is complementary to X2Rail-1 and its main is to reduce on-site tests for signalling systems leading to reducing overall testing costs; the work is organized in two main streams:

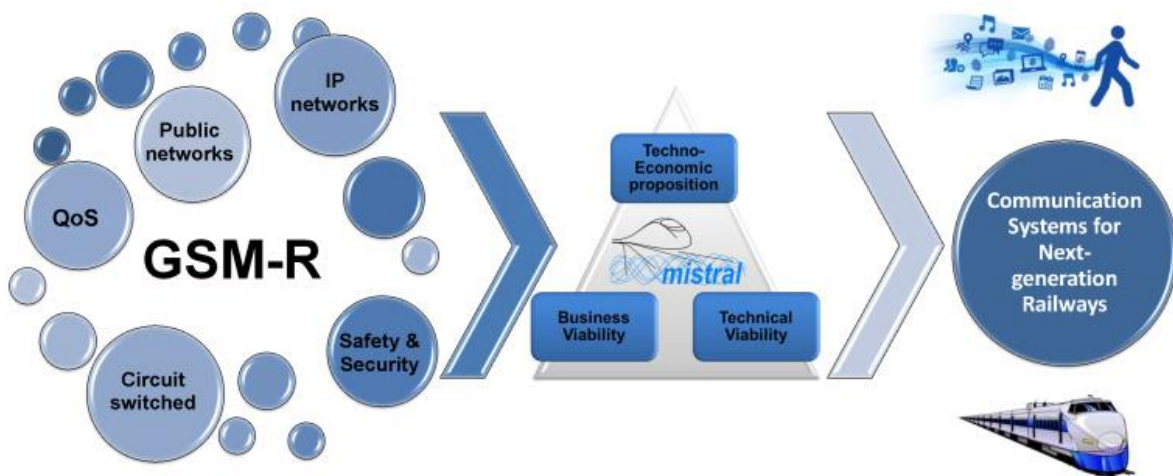
- First, to propose a testing framework based on user's needs and current situation and from there building a process accepted by all railway stakeholders, performing as many tests as possible in the lab. The project addresses an analysis of uncertainties and a simulation of GSMR QoS as well as a proposed methodology for test protocols optimisation.
- Second, 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 develops together with some SW tools that will help to automatise lab testing.

The project significantly contributes to the development of a Zero Onsite testing environment.



MISTRAL (TD2.1)

This project is complementary to X2Rail-1 and its objective is the elaboration of the Technical Specification of the future communication system for all railways in light of the migration from the current obsolete GSM-R. The new radio system will leverage the broadband capacity of IP-based wireless communication to enhance signalling but also to make possible innovative services for both users and train automation/control. MISTRAL generates firstly a portfolio of foreseeable future communication scenarios and then defines a Techno-Economic Proposition consistent with future scenarios, including a portfolio of innovative services ushered-in by new technologies and compliant with new users' requirements as well as with safety, security and QoS requirements. The Techno-Economic proposition will be subject to a Business Viability Analysis -and to a Technical Viability Analysis. The results of such Business and Technical Viability Analysis constitute the basis to refine and finalize the Validated Techno-Economic proposition, which will thus rely on an optimized life-cycle cost and on a sound portfolio of innovative services. The Validated Techno-Economic proposition will be the main output of MISTRAL.



1.7.3. IP3 Cost Efficient and Reliable High Capacity Infrastructure

TOPIC	ACRONYM	TITLE	Project Value	Grant	Inkind contr.	STARTING DATE	END DATE
S2R-CFM-IP3-02-2016	IN2SMART	Intelligent maintenance systems and strategies	16.4	7.3	9.1	01/09/2016	31/08/2019
S2R-CFM-IP3-01-2016	IN2TRACK	Research into enhanced track and switch and crossing system	6.3	2.8	3.5	01/09/2016	28/02/2019
S2R-OC-IP3-01-2016	S-CODE	Research into new radical ways of changing trains between tracks	5.0	5.0		01/11/2016	31/10/2019

Work in IP3 covers all R&I areas indicated in the S2R Master Plan; it is organised around 11 Technical Demonstrators (TDs) strongly interconnected focusing on improved management of infrastructure,

The main objective of the ‘**Enhanced Switch & Crossing System**’ (TD 3.1) is to improve the operational performance of existing Switch & Crossing (S&C) designs through the delivery of new S&C subsystems with enhanced reliability, availability, maintainability and safety (RAMS), life-cycle costs (LCCs), with enhanced sensing and monitoring capabilities, self-adjustment, noise and vibration performance, interoperability and modularity.

The ‘**Next Generation Switch & Crossing System**’ (TD 3.2) aims to provide radical, novel system solutions that deliver new methods for directing trains to change tracks with the aim of increasing capacity, while reducing maintenance needs, traffic disturbances and LCCs.

The ‘**Optimised Track System**’ (TD 3.3) will challenge track construction assumptions currently implicit in track design and will explore how innovative solutions in the form of products, processes and procedures can provide higher levels of reliability, sustainability, capacity and LCC savings. The aim is to derive medium-term solutions, which calls for the solutions to be harmonised with current solutions and regulations.

The ‘**Next-Generation Track System**’ (TD 3.4) aims at drastically improving the track system performances, targeting a time range some 40 years beyond the present state of the art. The TD process will follow a tightly integrated chain, setting out by initially identifying the long-term needs of the railway and the potential solutions for meeting these.

The main objective of the ‘**Proactive Bridge and Tunnel Assessment, Repair and Upgrade**’ (TD 3.5) is to improve inspection methods and repair techniques to reduce costs, improve quality and extend their service life. Moreover, the reduction of noise and vibrations are prioritised objectives.

The ‘**Dynamic Railway Information Management System (DRIMS)**’ (TD 3.6) aims at defining an innovative system for the management, processing and analysis of railway data. This TD’ activities are strongly linked with the other two TDs in the area of information capturing and management. DRIMS will collect information from the Railway Integrated Measuring and Monitoring System (RIMMS – TD 3.7) and provide high-quality input to the Intelligent Asset Management Strategies (IAMS – TD 3.8).

The ‘**Railway Integrated Measuring and Monitoring System (RIMMS)**’ (TD 3.7) is to provide innovative tools and techniques for capturing information on the current status of assets in a non-intrusive and fully integrated manner.

The vision of the ‘**Intelligent Asset Management Strategies (IAMS)**’ (TD 3.8) is a holistic, whole-system approach of asset management employing collected and processed data provided by TD3.6 and TD3.7.

This includes putting long-term strategies in the context of day-to-day execution of the maintenance and other maintenance activities.

The wider objective of the '**Smart Power Supply**' (TD 3.9) is to develop a railway power grid in an overall interconnected and communicating system.

The objective of the '**Smart Metering for Railway Distributed Energy Resource Management System**' (TD 3.10) is to achieve a fine mapping of energy flows within the entire railway system, as the basis of any energy management strategy.

The primary objective of the '**Future Stations**' (TD 3.11) is the provision of improved customer experience at stations.

The 11 TDs are strongly interrelated and they are clustered together into Integrated Technology Demonstrators (ITDs).

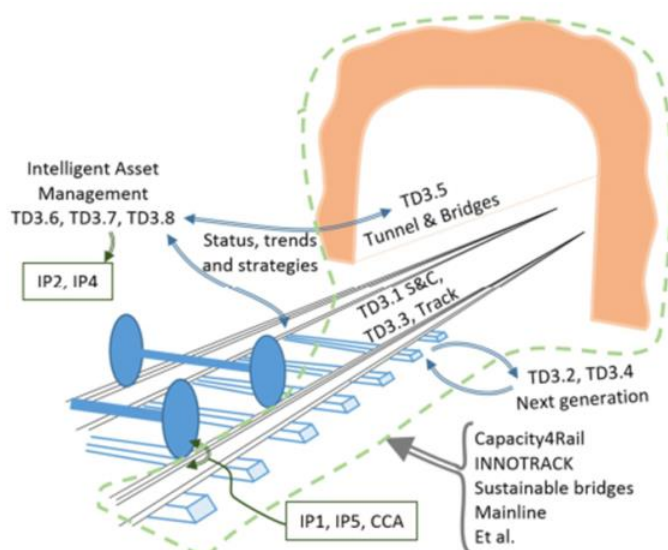
In 2016 the two CFM Projects IN2TRACK and IN2SMART were launched together with the OC Project S-CODE. It should also be noted that the IP suffered in 2016 the absence of the appointed IP Steering Coordinator for large part of the year. This gap has been fulfilled during the last quarter of 2016 and the progress of the work seems to go in the correct direction.

IN2TRACK had suffered from an initial slow preparation phase.

IN2TRACK (TD3.1, TD3.3, TD3.5 and TD3.8)

The main objective of the 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 identified as part of the Shift2Rail Innovation Programme 3. IN2TRACK will build upon the work of the IN2RAIL S2R Lighthouse Project focusing on:

- 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.



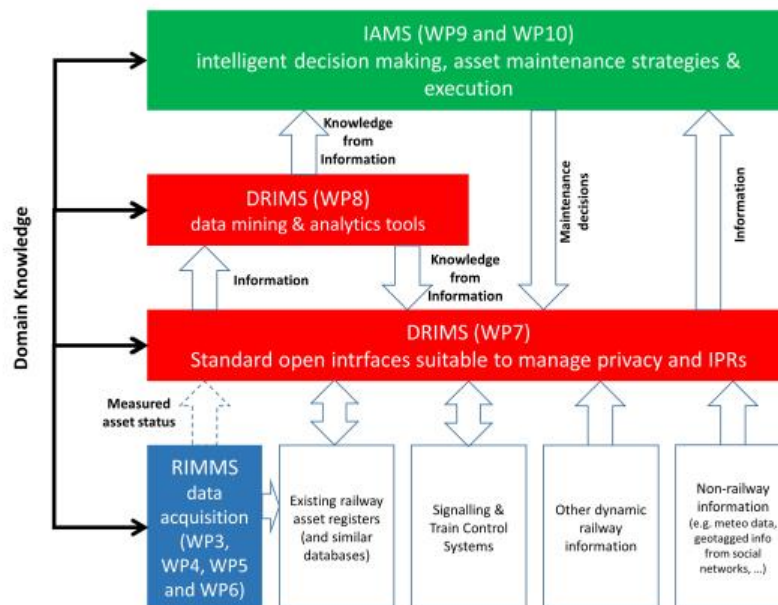
IN2SMART (TD3.6, TD3.7 and TD3.8)

IN2SMART aims at contributing to the overall concept for Intelligent Asset Management based on three steps: data collection and management, and decision making.

The project develops measuring and monitoring systems to collect, process and aggregate a set of heterogeneous railway asset status data; defines data mining and data analytics procedures to process data from the field and from other sources. Thus providing the elements to set 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 S2R Lighthouse Project to reach a homogeneous TRL4/5 demonstrator.

One of the key risks associated to this project relates to the access to data owned by different actors of the value chain and their management.

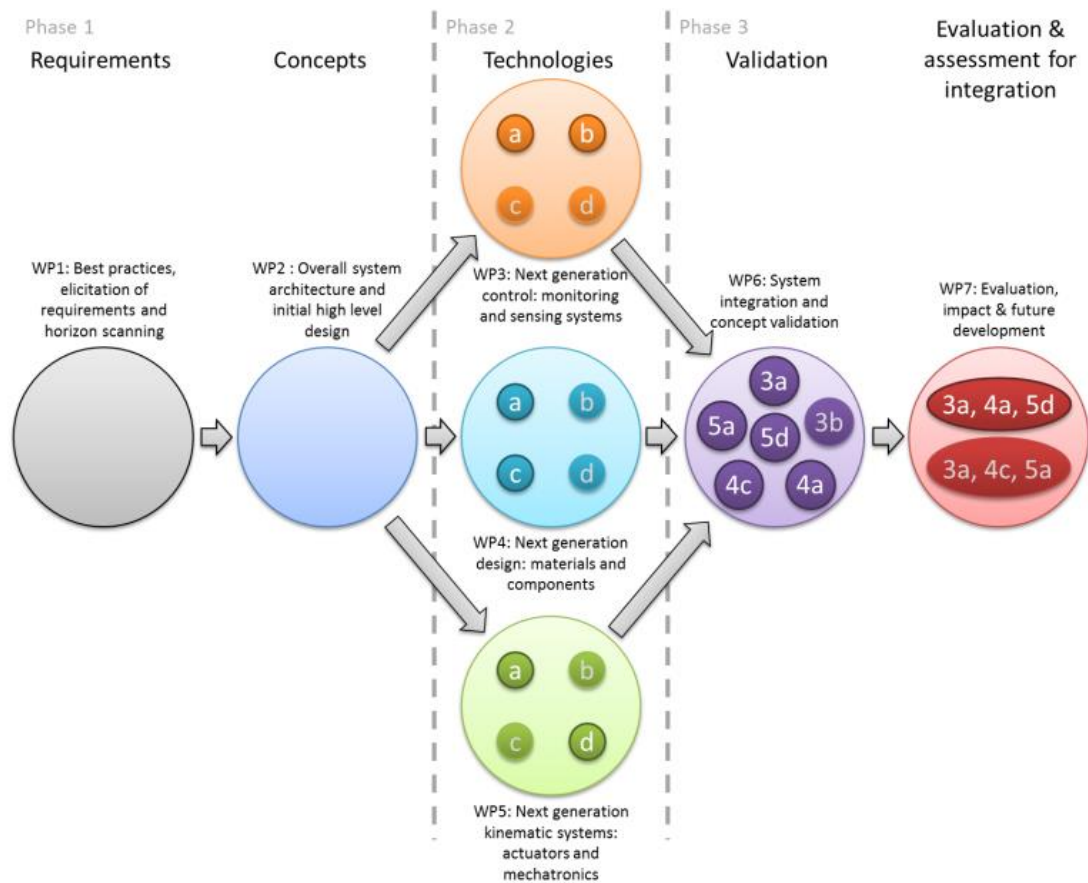


S-CODE (TD3.2)

This project is complementary to IN2TRACK and its overall aim 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 builds on existing European and national research projects (in particular, the S2R 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), etc.

The interaction with IN2SMART and especially its next stage focusing on TD3.2 will demonstrate the capacity of the latter project coordinator to leverage cross-results.



1.7.4. IP4 IT Solutions for Attractive Railways Services

TOPIC	ACRONYM	TITLE	Project Value	Grant	Inkind contr.	STARTING DATE	END DATE
S2R-CFM-IP4-01-2015	Co-Active	Shopping, booking and ticketing of multimodal travel solutions	7.9	3.5	4.4	01/09/2016	31/12/2018
S2R-CFM-IP4-02-2015	ATTRACKTIVE	Travel companion and tracking services	5.0	2.2	2.8	01/09/2016	31/12/2018
S2R-OC-IP4-01-2016	GoF4R	Interoperability Framework governance, ensuring its market uptake and sustainability	2.0	2.0		01/11/2016	31/10/2018
S2R-OC-IP4-02-	ST4RT	Interoperability Framework Converters	1.0	1.0		01/11/2016	31/10/2018

Work in IP4 is organised to achieve all R&I areas of the S2R Master Plan: Technical framework, Customer experience applications and Multimodal travel services.

The aim of the '**Interoperability Framework**' (TD4.1) is to facilitate multimodal travel in a highly diverse environment and with many transport modes. The world of transportation service providers needs to be open-ended; it evolves at its own pace, and uses multiple data formats and interfaces. Interoperability at the semantic level defines formal and explicit models of the transportation domain in an open, standard, machine-readable language that is exchanged automatically by computers.

The **‘Travel Shopping’** (TD4.2) aims at providing a comprehensive shopping application enabler which combines all modes of transport, all operators and all geographies; it provides a list of customer-relevant trip offers which are guaranteed available for booking, purchase and ticketing.

The **‘Booking & Ticketing’** (TD4.3) will orchestrate multiple but parallel interactions with several booking, payment and ticketing engines, including the all-important roll-back activities, should any single transaction fail, in order to minimize risks.

The **‘Trip-tracker’** (TD4.4) will give travellers in-trip assistance when navigating transport nodes, while also providing personalised information (related to predefined preferences) and up-to-date status reports on subsequent legs of the journey; it will support them in case of disruption, by proposing updated booking possibilities together with updated rights to travel.

The traveller will have full control of the journey, thanks to their own personal and secured **‘Travel Companion’** (TD4.5), which stores and shares their personal preferences in a wallet.

All the services related to individual travels and to additional sensors will generate a great deal of data having great value for both operators and end users. It will be the role of the **‘Business Analytics’** (TD4.6) to manage those data creating numerous possibilities to generate unprecedented insights for all the actors of the ecosystem, and new intelligence for the benefit of operators and travellers.

Although IP4 is organised around 6 Technology Demonstrators (TDs) with clear and non-overlapping objectives, all input will contribute to a specific **IP4-integrated Technical Demonstrator** (iT4.7), which will act as the orchestrator of other TDs’ developments, and which will ensure the systems approach to integrate the different TDs’ results.

The CFM projects launched in 2016 are Co-Active and ATTRAkTIVE, complemented by the OC Projects GoF4R and ST4RT.

IP4 benefited in 2016 from a good coordination; nevertheless, contrary to the S2R Lighthouse Project IT2Rail, IP4 suffers from the minor participation of rail operating companies – from the different market segments – due to its initial design. This will be addressed during 2017, possibly through a review of the IP participation in order to have a more sustained involvement of rail operating companies in this strategic IP, with the final objective to obtain results meeting users’ expectations for a large actual implementation. In addition, early 2017 one of the key partners announced ongoing negotiations to sell their own ticketing business; this may require a more extensive review of the IP, including the need for a re-assessment of its overall focus and performance.

All IP4 projects have professionally managed the GAP and are on track.

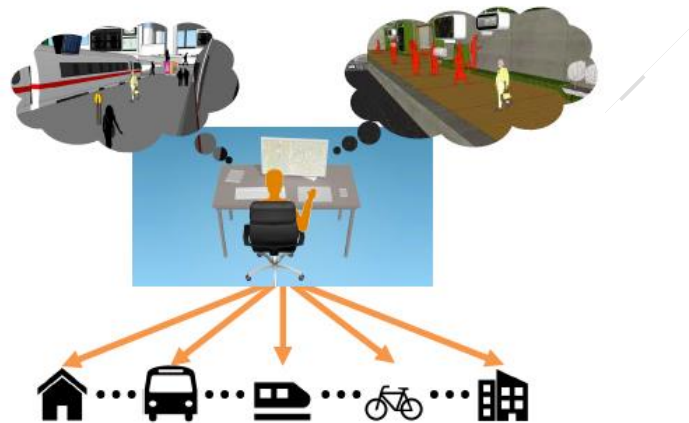
The two following Projects, Co-Active and ATTRACKTIVE have the same aim to complement each other to provide to customers attractive, seamless, stress free, and even engaging journey experiences in a one stop shop, starting from the initial development done in the S2R Lighthouse Project IT2Rail.

Co-Active (TD4.2 and TD4.3)

The overall objective of CO-ACTIVE is building on the “one-stop-shop” capability initiated in the IT2Rail S2R Lighthouse Project, 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. Compared to IT2Rail it further completes the scope of functionality by addressing post-sale business

transactions, and an underlying payment-settlement solution for co-modally retailed products and services.

It focuses specifically on those aspects whose level of customer-perceived risk discourages the advance purchase of co-modal travel entitlements, like a) the one-stop-shop capability, b) the managing retailer-TSP settlement integrating today's multiple settlement system infrastructures, c) the automation and orchestration of previously generated travel entitlements, for enabling the processing of cancellations, ticket exchanges and refunds.



ATTRACKTIVE (TD4.4 and TD4.5)

Specifically it focuses its activities on 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.

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.

It implements both the Shift2Rail Trip Tracker and Travel Companion, 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.

GoF4R (TD4.1 and TD4.6)

This project is complementary to both ATTRACKTIVE and CO-ACTIVE, focusing on the establishment of good governance to secure the confidence of the industry to use the Interoperability Framework (IF) semantic technologies that will be established under IP4. The objective of the Governance of the Interoperability Framework for Rail and Intermodal Mobility (GoF4R) project is to define sustainable governance for the IF creating the right conditions to introduce seamless mobility services and fostering 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”, integrating the TAP-TSI specifications as one of its elements.

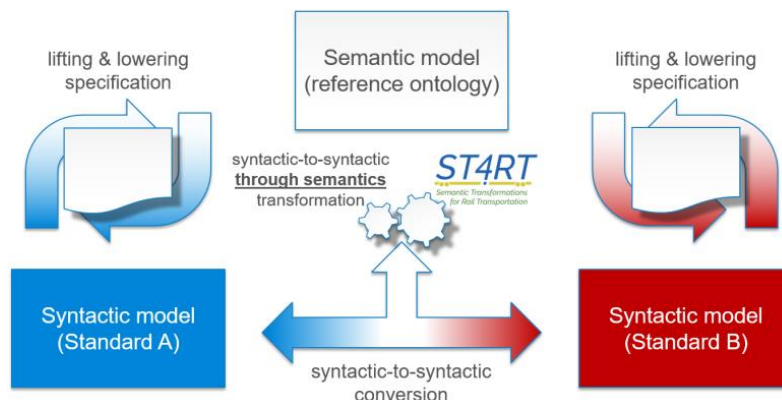
The objectives will be achieved through a partnership of specialist participants including research institutions, a major European rail operator, industry associations representing the passenger and multi-modal transport sectors and public transportation authorities.



ST4RT (TD4.1 and TD4.6)

This project is complementary to both ATTRACKTIVE and CO-ACTIVE, its objective is the research in semantic, ontology based automation of transformations between heterogeneous data formats (including TAP-TSI), and its application to a complex ‘after-sales’ process use case in an actual run-time demonstration scenario. The technology will leverage S2R Interoperability Framework (IF) components developed in the IT2Rail S2R Lighthouse Project, extending it for use in the Co-Active and ATTRACKTIVE. The project extends the capabilities of 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 specification as one of its elements.

The objectives will be achieved through a partnership of specialist participants including research institutions, a major European rail operator, industry associations representing the rail sector and public transportation authorities, and industrial providers of mission critical ICT solutions to the rail sector.



1.7.5. IP5 Technology for Sustainable and Attractive European Rail Freight

TOPIC	ACRONYM	TITLE	Project Value	Grant	Inkind contr.	STARTING DATE	END DATE
S2R-CFM-IP5-01-2015	FR8RAIL	Development of functional requirements for sustainable and attractive European rail freight	7.9	3.5	4.4	01/09/2016	31/08/2019
S2R-CFM-IP5-02-2015	ARCC	Start-up activities for freight automation	3.6	1.6	2.0	01/09/2016	31/08/2019
S2R-CFM-IP5-03-2015	FFL4E	Freight propulsion concepts	3.4	1.5	1.9	01/09/2016	31/05/2019
S2R-OC-IP5-01-	SMART	Freight Automation on lines and in yards	1.0	1.0		01/10/2016	30/09/2019
S2R-OC-IP5-02-	DYNAREIG	Improved vehicle/train dynamics	1.0	1.0		01/11/2016	30/06/2018
S2R-OC-IP5-03-2015	INNOWAG	Intelligent freight wagon with predictive maintenance	1.5	1.5		01/11/2016	30/04/2019

Work in IP5 covers all R&I areas indicated in the S2R Master Plan; it is organised around 7 interconnected Technical Demonstrators (TDs).

The main objective of TD 5.0 is the **‘Implementation Strategies and Business Analytics’** to provide guidance on implementing new technology solutions on a large scale (migration plan) and allocate efficiently resources within the IP, based on input from past and current research activities.

The **‘Freight Electrification, Brake and Telematics’** (TD 5.1) aims at improving strategic areas of rail transport by developing key components such as condition-based maintenance of locomotives and wagons, and wagon monitoring systems and telematics, as well as automatic coupling of wagons.

The **‘Access & Operations’** (TD 5.2) aims at improving service planning and operation, thereby supporting better utilisation of available capacity, by optimising access and operation of local hubs (e.g. marshalling yards and sidings) which are essential but cost-intensive subsystems for rail freight business.

The main objective of the **‘Wagon Design’** (TD 5.3) is to produce technical demonstrations of the next generation of freight bogies and freight wagons, in order to prove their competitiveness and show that a rail freight option is equal to the freight market demands of the year 2020, so that a change in modal split becomes feasible.

The project **‘Novel Terminal, Hubs, Marshalling yards, Sidings’** (TD 5.4) has a twofold objective: to provide improved data gathering, steering, operation and coordination of intermodal transport with a terminal design that allows efficient change of transport modes; and the hybridisation of the legacy shunting fleet operating in marshalling yards and sidings by means of retrofitting.

The main objective of the **‘New Freight Propulsion Concepts’** (TD 5.5) is to provide more attractive rail freight services to the final customer, with competitive rail solutions maximising flexibility and efficiency while reducing the operating and maintenance costs. The focus of this TD will be on improving the overall performance of today’s locomotives by adding and integrating additional functionalities and technologies.

The project **‘Autonomous train operation’** (TD 5.6) aims to actively pursue the objective of Autonomous Train Operation (ATO), realised progressively until 2030, for mainline freight operation and the underlying operations, in order to increase the railway’s competitiveness and to achieve operational efficiency gains and optimised resource utilisation.

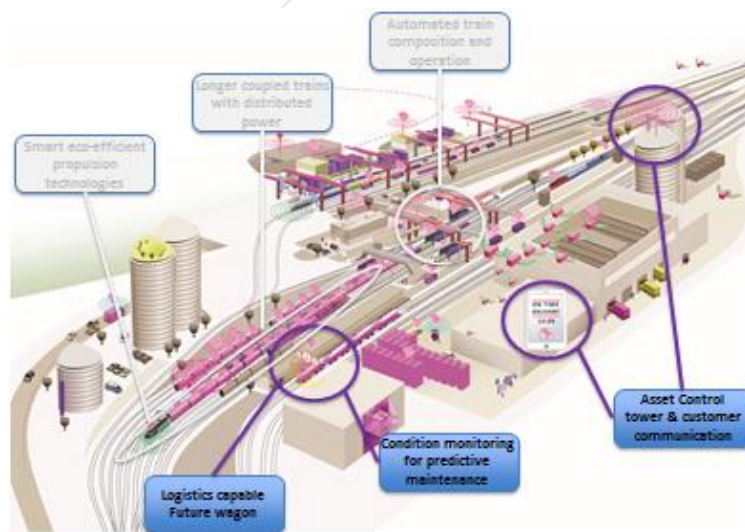
The CFM projects launched in 2016 are FR8RAIL, ARCC and FFL4E, complemented by the OC projects SMART and DYNAREIGHT.

Despite IP5 represents a market segment per se, it shall not be looked in isolation as for example it is building on solutions coming from IP2 (especially on automation) but also from IP1 and CCA. In addition, IP5 is interconnected with other modes of transport in an overall encompassing logistic view. One of the CFM Projects, FR8RAIL suffered in the GAP phase from lack of knowledge of its coordinator about the relative processes and procedures

FR8RAIL (TD5.0 and TD5.1)

The main aim of the FR8RAIL project is the development of functional requirements for sustainable and attractive European rail freight by reducing (10%) the cost of freight transport measured by tonnes per Km, by reducing (20%) the time variation during dwelling. Furthermore, the project will increase the attractiveness of logistic chains making available 100 % of the rail freight transport information to logistic chain information systems.

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.

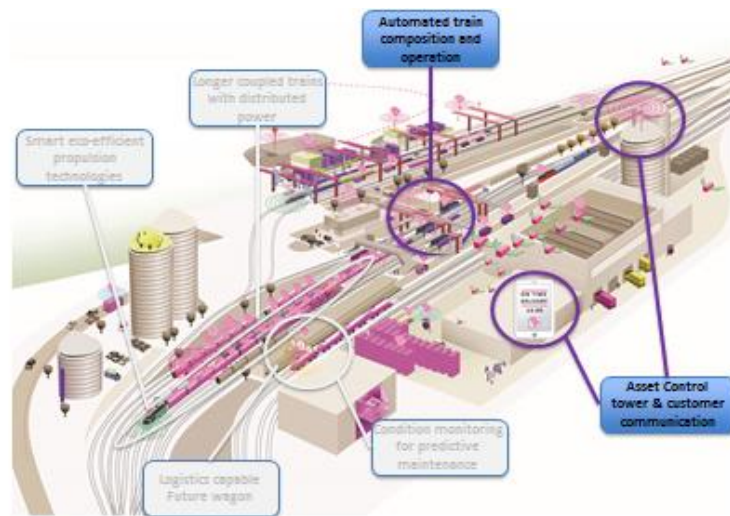


ARCC (TD5.2 and TD5.6)

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. Research will focus on the use of automated train, on the development of automated support processes that are carried out at the system's nodes (e.g. terminals, yards and transshipment points), on the improvement of yard and railway network management through advanced timetable planning.

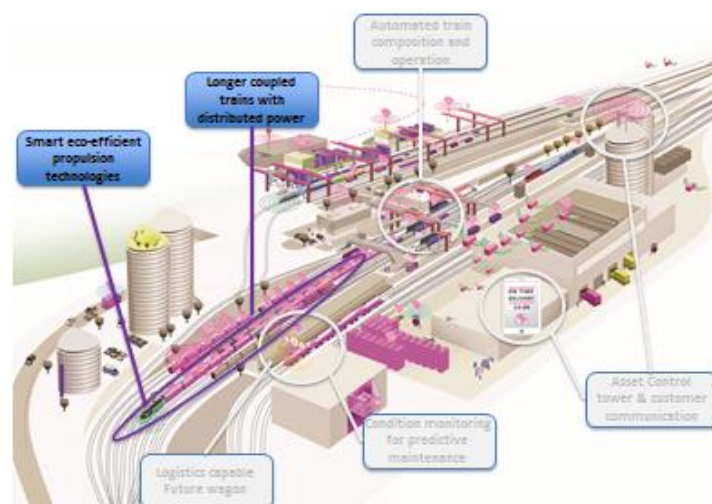
Improving the connections between different nodes (e.g. terminals, yards and transshipment points) and improving information flows transferred between different nodes in real-time and network

management systems and supporting eco-efficient and energy-efficient driving are key parts of the project activities.
Strong collaboration with IP2 is expected from this project.



FFL4E (TD5.5)

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 project will take the freight locomotive to the next level by improving the efficiency of propulsion systems with hybrid technologies and energy storage systems, by improving last mile concepts, by reducing LCCs, including wear, by enabling longer trains up to 1500 meters, by reducing emissions, including noise, by introducing driver advisory systems (DAS) and by enabling autonomous driving. Additional Knowhow stemming from the DYNAREIGHT project will contribute to accelerate the development process.

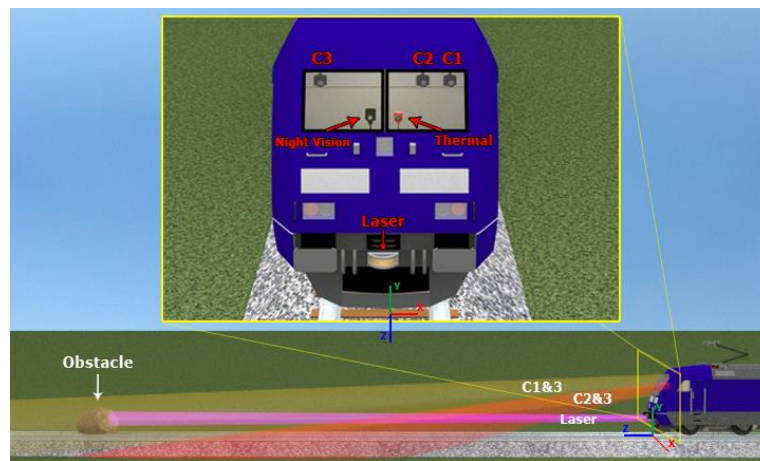


SMART (TD5.2 and TD5.6)

This project is complementary to ARCC and its main goal is to increase the quality of rail freight, as well as its effectiveness and capacity, through the contribution to automation of railway cargo haul at European railways. The project focuses on two streams: development of a prototype of an autonomous obstacle detection system, and development a real-time marshalling yard management system.

The SMART prototype solution for obstacle detection will provide prototype hardware and software algorithms for obstacle detection, as well as standardised interfaces for integration into ATO module. The system will combine two night vision technologies, thermal camera and image intensifier, so that the system will be capable, beside reliable detection of obstacles up to 1000 m, to provide short range (< 200 m) wagon recognition for shunting operations.

The SMART real-time marshalling yard management system will provide optimisation of available resources and planning of marshalling operations in order to decrease overall transport time and costs associated with cargo handling. It will provide real time data about resources available over open and TAF/TSI standard data formats for connection to external network systems and shared usage of marshalling yards between different service providers.



DYNAFREIGHT (TD5.5)

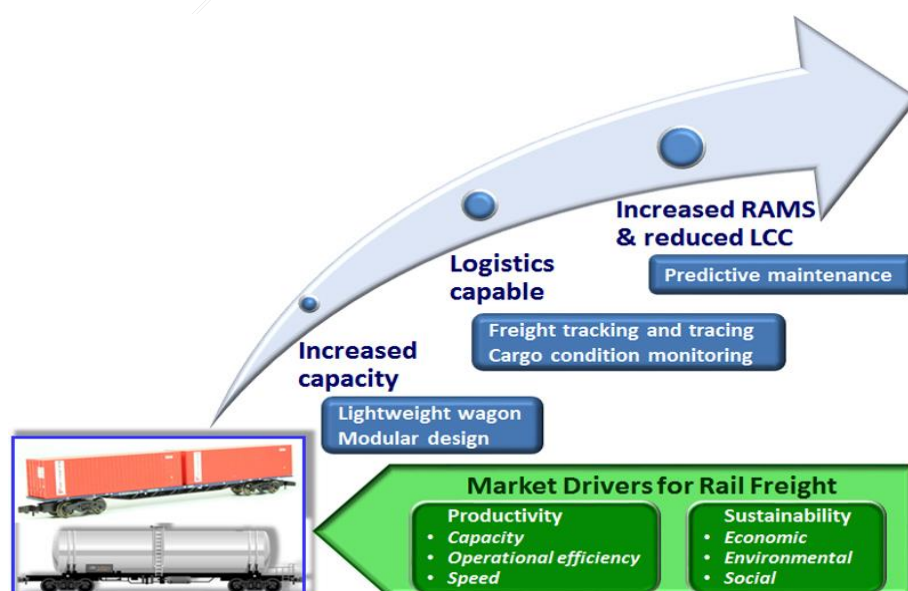
This project is complementary to FFL4E and its goal is to provide the necessary inputs for the development of the next railway freight propulsion concepts, overcoming existing operational/technical problems. The project addresses two main areas: 1) Freight running gear for locomotives developing concepts to 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 a past project MARATHON. The project plans therefore to deliver improved performances on traction, speed, running dynamics, and wheel/rail effort; reduced rail freight noise at the source; enhanced capacity/traffic throughput with the operation of longer trains; and reduction of maintenance costs.



INNOWAG (TD5.3)

This project is complementary to FR8RAIL and its goal is to develop intelligent cargo monitoring and predictive maintenance solutions integrated on a novel concept of lightweight wagon, which responds 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 project aims at determining 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.



© 2016 — Shift2Rail

1.7.6. CCA Cross Cutting Activities

TOPIC	ACRONYM	TITLE	Project Value	Grant	Inkind contr.	STARTING DATE	END DATE
S2R-CFM-CCA-02-2015	FINE 1	Energy and sustainability, including noise and vibrations baselines assessment	2.9	1.3	1.6	01/09/2016	31/08/2019
S2R-CFM-CCA-01-2015	IMPACT-1	Start-up activities for System Platform Demonstrator Integrated Assessment and socio-economic effects	0.7	0.3	0.4	01/09/2016	28/02/2018
S2R-CFM-CCA-03-2015	PLASA	Integrated Mobility and Safety Management	0.8	0.4	0.4	01/09/2016	31/08/2018
S2R-OC-CCA-02-2015	OPEUS	Energy usage, generation and saving approaches	0.8	0.8		01/11/2016	30/04/2019
S2R-OC-CCA-03-2015	DESTINATE	Noise reduction methodologies	1.0	1.0		01/11/2016	31/10/2018
S2R-OC-CCA-01-2015	NEAR2050	Long-term needs of different actors in the railway sector	0.4	0.4		01/10/2016	31/03/2018
S2R-OC-CCA-04-2015	GoSAFE RAIL	Safer infrastructure – improved object detection and prevention of safety critical events and integrated mobility	1.3	1.3		01/10/2016	30/09/2019

CCA work is organised so as to achieve the objectives of the following areas indicated in the Shift2Rail Master Plan: Long-term needs and socio-economic research; Smart materials and processes; System integration, Safety and interoperability; Energy and sustainability and Human capital. In addition to these areas, CCAs also covers the development of a common methodology for assessing the achievement of the S2R objectives (KPI work area).

Practically, and similarly to the IP structured approach, the CCA divided its activities in the following Work Areas (WA) and sub-work areas:

WA1. Socio-economic & SPDs

Create knowledge of success factors for a future railway system based on customer needs and mobility behaviour of users, and better understanding of key trends such as urbanisation, demographic changes, ageing of society, and hyper-connectivity. Definition of the four System Platform Demonstrators (SPDs): Freight, Urban, Regional and High Speed.

WA2. KPI

KPI method development and integrated assessment. Methodology for assessing the achievement of the Shift2Rail objectives (improved services for users and customer quality, reduced system costs, simplified business process and enhanced interoperability), and the contribution of IPs and TDs.

WA3. Safety, Standardisation, Smart Maintenance
WA3.1. Safety

Perform a global approach to safety of the railway system. Manage safety levels of the existing railway system, Quantify the safety improvements carried out in Shift2Rail TDs.

and Smart
Materials

WA3. Safety, Standardisation, Smart Maintenance and Smart Materials	WA3.2. Standardisation	Coordinate and address standardisation issues for all IPs, to ensure it is possible to meet overall Shift2Rail targets.
	WA3.3. Smart Maintenance	Lower maintenance costs by using new knowledge opportunities on vehicle condition thanks to digitalisation. This will have a marked impact on reliability, availability and LCCs, and thus on the attractiveness and competitiveness of rail traffic.
	WA3.4. Smart Materials	Study and evaluate the maturity of smart materials in other sectors, e.g. nano materials and self-healing, adaptive and active materials. Propose possible technology transfer for application in the railway sector.
WA4. Smart Mobility	WA3.5. Virtual certification	New methodology and tools to implement more virtual validation and authorisation of the components, subsystems and systems transfer of tests from on-track train testing to bench testing and simulations.
	WA4.1. Smart Planning	Improve planning activities of various stakeholders in the railway system by means of precise railway simulation. Its concept will cover all phases of railway planning and include an outlook on operation.
WA4. Smart Mobility	WA4.2. I2M (Integrated Mobility Management)	Specification and implementation of substructures needed for automated message exchanges between Freight operations and Traffic management systems via the Integration Layer.

WA5. Energy and sustainability	WA5.1. Energy	Achieve and assess the overall energy reduction on all ITDs and SPDs, and demonstrate cost-effectiveness and energy-saving features. Help and support all energy-saving-related work across IPs and TDs. Stimulate the emergence of pre-normative texts, when needed, to pave the way for a European shared understanding of energy figures in railways. Link energy and sustainability actions with existing initiatives outside Shift2Rail, in order to align understanding and positions from railways and energy stakeholders.
WA5. Energy and sustainability	WA5.2. Noise	Develop future methods for predicting overall noise and vibration performance at system level, with proper ranking and characterisation of each contributing source, so as to include different combinations of entire vehicles and infrastructure, and to optimise cost-benefit scenarios as well as exposure and comfort. Ensure that the NoV aspects are properly considered and integrated in all relevant TDs within the different IPs of Shift2Rail.
WA6. Human Capital		Achieve a number of benefits and overcome the challenges implicit in an ageing workforce by: • increasing diversity and flexibility for both employer and (blue collar) employees; • building a healthier workforce, thanks to automated and robotic systems that reduce physical strain on humans; Ensuring life-long development of new skills, and change in job profiles.

The CFM projects launched in 2016 are IMPACT-1, FINE-1, PLASA, complemented by the OC projects NEAR 2050, OPEUS, DESTINATE and GoSAFE RAIL. In October the S2R JU launched two tenders on “Long term needs & socio economic research” and “human Capital”.

The IP coordination has proven to be complex due to the diverse nature of the activities and the need of strong cooperation with the other IPs. The work achieved in 2016 is satisfactory but it needs acceleration especially in the KPI (including its respective CFM project) and standardisation areas.

IMPACT-1 (WA1 and WA2)

The objective of IMPACT-1 is to help maximise the impact of Shift2Rail by analysing the effects of the S2R developments on socioeconomic aspects, identifying the future application use cases by System

platform demonstrator scenarios and assess the impact of the development by using Key Performance Indicators.

The project focuses on different aspects 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. Furthermore, it defines System Platform Demonstrators (SPD) that represent future application use cases; and identifies Key Performance Indicators (KPIs) that enable the monitoring and assessment of the Shift2Rail overall target achievement.

IMPACT-1 performs a socio-economic impact analysis for high speed, regional, urban and freight. It develops a model of the KPI that shows the relation of the low-level KPI to the overall targets defined in the S2R Master Plan.

FINE-1 (WA5)

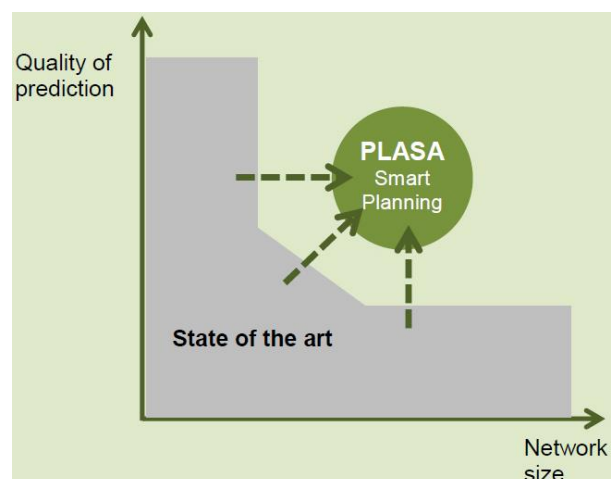
The FINE 1 project aims at reducing operational costs of railways by a reduction of energy use and noise related to rail traffic. The project results should allow an increase of traffic in Europe and enhance the attractiveness of railway in relation to other modes of transport.

The project activities will support the innovation process within the S2R TDs by providing methodology and knowhow 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 results of FINE-1 in respect of noise modelling and control as well as of 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.

PLASA (WA3 and WA4)

The objective is to significantly increase customer experience and system robustness in the European rail sector by ensuring that the Research & Innovations Activities dealing partially or entirely with railway planning, relevant data or safety issues within the different S2R IP are considered completely and holistically. Furthermore, this project encompasses additional R&I 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.

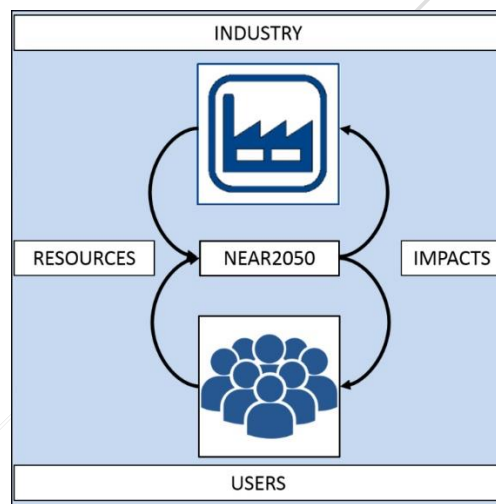
PLASA consists of two sub-projects, Smart Planning and Safety. The objectives of the project will be achieved by a holistic approach involving partners of the rail industry, the operators and universities.



NEAR 2050 (WA1)

This project is complementary to IMPACT-1 and, focusing both on passenger and freight transport, its overall objective is to determine the long-term needs of different actors in the railway sector. NEAR2050 analyses and takes in to account developing technologies, new societal trends, and changing demographics among others in order to obtain a full account of what users currently need and expect from the rail sector and what their expectations and needs will be based on mega trend based scenarios in 2022, 2030 and 2050.

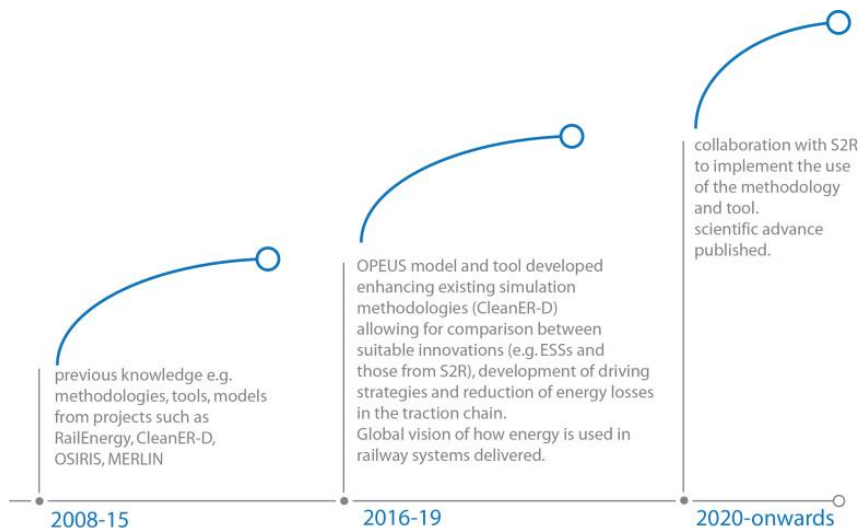
Using the future needs determined over the course of this project, NEAR2050 looks at what each of the actors can implement, how difficult the implementation is, and makes recommendations of implementation plans. The project looks at other mobility modes, make a determination of their development over the time scenarios and with that make a determination as to the type of cooperation that is required and how this can be implemented.



OPEUS (WA5)

This project is complementary to FINE-1 and it aims 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.



DESTINATE (WA5)

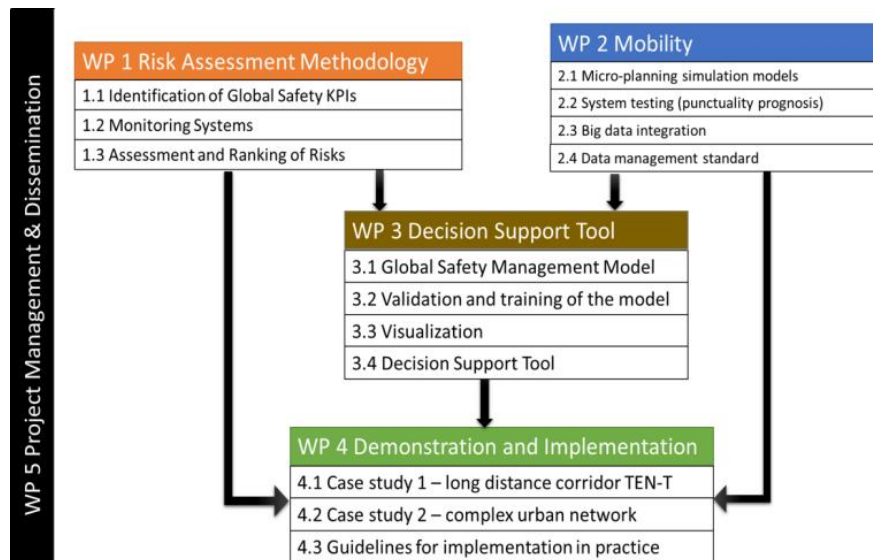
This project is complementary to FINE-1 and it aims at developing tools and methodologies for railway noise simulation and cost-benefit analysis of mitigation actions of interior and exterior noise. For accurate noise prediction it is essential to characterize the structure-borne and airborne sound sources accurately in order to create valid input for sound prediction simulation models. The calculated interior and exterior noise can be auralised and visualised in a studio so that in the vehicle design process, potential mitigation measures can be evaluated on the basis of the sound quality and sound comfort.



GoSAFE RAIL (WA4)

This project is complementary to PLASA and it aims to transform the approach of asset safety in the rail sector. The project aligns directly with three TD projects in the Intelligent Asset Maintenance pillar (TD 3.6, 3.7 and 3.8). It plans to develop Open-Linked Data from a range of sources and transformation to allow for direct use in a safety framework incorporating network modelling, Real-time methods for object detection, Analytical models incorporating Artificial Intelligence (AI) algorithms to predict asset degradation and the safety framework.

Through the development of a Network Decision Support Tool the project provides integrated solutions to issues related to infrastructure safety and planning considering a number of common problems faced by EU infrastructure managers.



1.8. Calls for tenders

The S2R JU published the following three open calls for tenders in 2016:

- S2R.2016.OP.01 Cross-cutting activities: Long-term needs & socio-economic research,
- S2R.2016.OP.02 Cross-cutting activities: Human Capital,
- S2R.2016.OP.03 Shift2Rail Multi-project Cooperation Tool.

The details of procedure No S2R.2016.OP.01 are as follows:

- Contract notice published in EU Official Journal 19 August 2016,
- Contract awarded 24 November 2016 to consortium comprised of Panteia, Abirail CZ and University of Newcastle upon Tyne,
- Contract signed 12 January 2017 for a duration of 4 years,
- Maximum total contract value: EUR 0.4 million

Procedure S2R.2016.OP.02 was terminated without award and a new negotiated procedure involving the economic operators which took part in the initial call is under preparation with a view to an award of the contract by September 2017.

The details of procedure No S2R.2016.OP.03 are as follows:

- Contract notice published in EU Official Journal 24 August 2016,
- Contract awarded 25 November 2016 to Centro Nuova Comunicazione srl (CNC),
- Contract signed 19 December for a maximum total duration of 8 years,
- Maximum total contract value: EUR 0.5 million.

1.9. Dissemination and information about projects results

The S2R JU aims at the dissemination of its innovative Programme results achieved through the current and future Projects. The dissemination activities in this section are particularly addressed towards the European scientific and academic community but not only. They play a pivotal role within the S2R Programme and are at the base of its success.

The dissemination activities start with the concept of building the S2R JU as a platform for R&I in the railway sector, where all interested parties may found and exchange as necessary. The S2R JU website

will host the specific CFM Projects activities and will connect to the OC Project websites and disseminations activities, as well as the Lighthouse Projects and other similar.

The websites of these seven Shift2Rail precursor projects are the following:

- <http://www.in2rail.eu/>
- <http://www.it2rail.eu/>
- <http://www.roll2rail.eu/>
- www.smartrail-project.eu
- www.destinationrail.eu
- <http://www.hermes-h2020.eu/>
- <http://www.netirail.eu/>

In November 2016, the 4 Lighthouse Projects mentioned above presented the progress they achieved since their start in a Mid-Term Event. This event, under the responsibility of the respective coordinators but with the participation of the S2R JU, was attended by more than 200 participants from all railway sector background, including the scientific community.

Over 100 publications and a video have already been produced under these initial projects.

1.10. Operational budget execution

In terms of Commitment Appropriations, Title 3 represents 87.8% of the overall S2R 2016 Budget, including Title 4. The execution rate of the Operational budget in both Commitment and Payment Appropriations was respectively 99.9% and 86.6%. The Payment appropriation were used for the pre-financing of the Grants resulting from the 2015 and 2016 Calls for Proposals, for a total amount of EUR 40.8 million.

Budget Amendment No 1, adopted by the Governing Board at its meeting in October, included a transfer of EUR 1.1 million of the un-used resources to a Title 4. These available resources were due from the S2R Call S2R_OC_IP1_01_2016 which did not receive any applications. The amount will be re-introduced to the operational budget and used for the activities in future years.

Budget Amendment No 2¹⁴, which did not have impact on the activities in the Annual Work Plan 2016, adopted by the Governing Board by written procedure on 16 December 2016, included an increase of the Payment Credits of EUR 1.8 million to meet its payment obligations in the near future.

1.11. In-Kind Contributions

In accordance with article 4(3) of the S2R Regulation, *“the members of the S2R Joint Undertaking other than the Union shall report by 31 January each year to the Governing Board of the S2R JU on the value of the contributions referred to in paragraph 2 made in each of the previous financial years”*.

Article 4(2) of the S2R Regulation establishes that the total contribution to be provided by the Other Members and totalling EUR 470 million shall consist of:

¹⁴ Governing Board Decision No 26/2016 of 16 December 2016, https://shift2rail.org/wp-content/uploads/2016/04/Decision-26_2016-on-Amendment_2-of-Budget-2016.pdf

- **IKOP (in-kind operational)**: at least EUR 350 million, including at least EUR 200 million from the founding members other than the Union and their affiliated entities, and at least EUR 150 million from Associated Members and their affiliated entities. In accordance with Article 16(3)b of the S2R Statutes, IKOP consists “of the costs incurred by them [the Other Members] in implementing indirect actions less the contribution of the S2RJU and any other Union contribution to those costs”.
- **IKAA (in-kind other activities)**: of at least EUR 120 million, of which at least EUR 70 million from the Founding Members other than the Union and their affiliated entities, and at least EUR 50 million from associated members and their affiliated entities. These contributions shall consist of the costs incurred by them in implementing additional activities outside the work plan of the S2R Joint Undertaking, which are complementary to this work plan and contribute to the objectives of the S2R Master Plan. Other Union funding programmes may support those costs in compliance with the applicable rules and procedures. In such cases, Union financing shall not substitute for the in-kind contributions from the members other than the Union or their affiliated entities.

The aforementioned In-Kind Contributions are in addition to the financial contribution of the Other Members to the 50% of the administrative costs of the JU.

Other Members’ reporting for 2016

The Other Members of S2R submitted their reporting on IKOP and IKAA to the JU by 10 February 2017. Only one Member did not provide any reporting in line with the fact that its involvement in the R&I activities will start not before 2017.

This is the first reporting of the Other Members’ and the following shall be duly considered:

- the JU reached the autonomy on 24 May 2016,
- the agreements related to the first S2R JU grants launched only at the beginning of 2016 were signed by the end of August 2016. The related R&I activities started on 1 September 2016; consequently this first report covers the initial months of the ramp-up phase of the Programme activities from their real beginning,
- the Lighthouse projects are excluded from this reporting as assimilated to open calls and within the administrative management of the European Commission.

With regard to the future years, the Other Members’ Project grants for the following intermediary reports are aligned to the financial year.

As a result, this first report covers only IKOP related to 4 months of R&I activities; while in terms of IKAA the activities are considered eligible as from the date of acceptance by the Other Members of the S2R JU Statutes, by means of their respective letters of endorsement.

In accordance with Article 4(4) of the S2R Regulation, the Other Members shall have the costs related to IKOP and IKAA certified by an independent external auditor appointed by the entity concerned.

By the deadline of 31 January, none of the Other Members was in the position to have its costs related to IKOP and IKAA certified. Nonetheless, this is in line with Commission position communicated officially in July 2016, which clarifies that the certification of costs (based on which IKOP is calculated) should be annual and it should be transmitted to the relevant JU by its members by 30 April. This is

also essential for the preparation of the Final Annual Accounts of the JU to avoid an external auditor's qualified opinion on them.

With regard to the Final Annual Accounts of S2R, considering that

- only around 50% of IKOP/IKAA was certified,
- the validation of IKOP by the JU will be performed during 2017 once the Projects will submit their cost statements by the end of February 2017,

the aforementioned IKOP contributions will be accounted for as "to be validated". On the 1 June 2017, based on the audit certificate received and the Projects' cost statements, the situation of IKOP and IKAA is as following:

	IKOP as at 1 June 2017				
	Total Project Cost A	Requested S2R Co-Financing B	IKOP C = A - B	of which "Certified" Total Project Cost D	of which "Certified" IKOP E = D - B (per Member Project)
Alstom	543,145	264,949	278,197	-	-
Ansaldo STS	913,614	406,010	507,604	913,614	507,604
Bombardier Transportation	497,678	305,278	192,400	-	-
CAF	750,538	311,614	438,923	723,145	423,699
Network Rail	213,738	92,474	121,264	-	-
Siemens	531,552	226,665	304,887	531,552	304,887
Thales	352,585	163,344	189,241	211,121	98,980
Trafikverket	596,641	241,502	355,139	-	-
Founding Members	4,399,490.52	2,011,836.47	2,387,654.05	2,379,430.91	1,335,169.98
Aerfitec	-	-	-	-	-
Amadeus	2,256	1,579	677	-	-
AZD Praha	80,294	35,683	44,612	80,294	44,612
Competitive Freight Wagon	220,681	98,073	122,608	-	-
Deutsche Bahn AG	1,265,005	351,627	913,378	1,265,005	913,378
Diginext	116,281	51,675	64,606	-	-
EUROC	57,805	17,554	40,251	-	-
Faively	328,322	120,477	207,845	328,322	207,845
Hacon	237,191	105,763	131,428	237,191	131,428
Indra	244,161	108,464	135,697	244,161	135,697
Kapsch	83,908	37,289	46,619	83,908	46,619
KnorrBremse	92,533	41,122	51,411	-	-
MerMec	93,049	41,412	51,637	93,049	51,637
SmartDeMain	60,256	27,621	32,635	30,384	16,433
SmartRaCon	118,744	47,449	71,295	-	-
SNCF	111,737	50,742	60,995	-	-
SWITRACKEN	23,502	11,890	11,612	10,322	5,742
Talgo	8,937	3,972	4,966	-	-
Virtual Vehicle Austria Consortium VVAC	304,876	137,365	167,510	222,637	121,253
Associated Members	3,449,536.56	1,289,756.75	2,159,779.81	2,595,273.46	1,674,643.06
Total 2016	7,849,027.08	3,301,593.22	4,547,433.86	4,974,704.37	3,009,813.04

	IKAA	
	In-Kind Additional Activities as at 1 June 2017	of which Certified as at 1 June 2017
Alstom	-	-
Ansaldo STS	253,146	253,146
Bombardier Transportation	6,635,077	-
CAF	5,451,319	5,451,319
Network Rail	1,520,477	-
Siemens	5,000,000	5,000,000
Thales	2,153,518	2,153,518
Trafikverket	7,857,021	-
Founding Members	28,870,558.36	12,857,983.49
Aerfitec	-	-
Amadeus	-	-
AZD Praha	304,439	304,439
Competitive Freight Wagon	165,421	-
Deutsche Bahn AG	11,276,093	11,276,093
Diginext	280,000	-
EUROC	1,192,513	-
Faively	2,871,825	2,871,825
Hacon	1,776,809	1,776,809
Indra	1,530,492	1,436,492
Kapsch	483,117	483,117
KnorrBremse	1,366,435	1,366,435
MerMec	456,040	456,040
SmartDeMain	1,073,142	490,939
SmartRaCon	255,938	-
SNCF	530,218	-
SWITRACKEN	187,461	2,461
Talgo	422,786	422,786
Virtual Vehicle Austria Consortium VVAC	1,978,369	1,495,257
Associated Members	26,151,096.89	22,382,692.36
Total 2016	55,021,655.25	35,240,675.85

2016 IKOP

As already indicated, the 2016 IKOP by the Other Members corresponds to the activities performed in the ramp-up phase of the Programme. In this respect, the progress and acceleration realized in few months is well in line with the usual Programme Management S-Curve.

As indicated under the definition of IKOP, these costs represent the difference between the Total Project Value and the S2R JU co-funding (or estimated).

The 2016 IKOP is the results of the 2015/2016 activities awarded by the S2R JU to the Other Members:

<i>EUR million</i>	Call 2015/2016	2016 IKOP reporting	%
Total Value of R&I	142.4	7.8	5.5%
S2R co-funding	63.2	3.3	5.2%
IKOP	79.1	4.5	5.7%

In order to allow the S2R JU to be in the position to sign the relevant grant agreements, the Union provided the necessary Commitment Appropriations to match the S2R co-funding of EUR 63.2 million above (excluding OC), against the Other Members' commitment of EUR 142.4 million. In terms of Union Payment Appropriations, they were used to provide the pre-financing up to 45% of the estimated co-funding in accordance with the relevant provisions established by the JU in the grant agreements.

It should be noted that the estimated requested co-funding included in the 2016 Other Members' declarations is within the limits of the provision of the relevant Membership Agreements. In fact, Article 2.2 of each Other Member's Membership Agreement signed with the S2R JU establishes that *"the Member agrees to limit its reimbursement request in each indirect action funded under Article 3.1(a) of the S2R JU Regulation to an amount not exceeding 44.44% of the Member's total costs in implementing that indirect action. The minimum financial contribution to the S2R JU referred to in Article 4.2(a) of the S2R JU Regulation shall thus be respected"*.

The percentage resulting from the declarations of 2016 is 42.06%, within the maximum level of 44.44%.

2016 IKAA

In terms of IKAA, the total expected contribution by the end of the S2R Programme is estimated at EUR 163 million (minimum EUR 120 million in accordance with the S2R Regulation). It should be highlighted that the IKAA declared for 2016 by the 1 June 2017 amount to EUR 55.0 million (of which 64.0% already certified in accordance with the S2R Regulation), corresponding already to **33.8% of the total Programme estimated value**.

1.12. Synergies with the Union Programmes/ Funds and national funded R&I

During the first months since its autonomy, the S2R JU started some activities and participated to Regional events organized by the Committee of the Regions and European Economic and Social Committee to consider how to make use of activities planned in other Union Programmes and Funds in relation with the Railway sector, in particular EFSI, Regional and Cohesion Fund. This work stream will further develop during 2017.

In terms of national funded R&I activities in the Railway sector, the S2R JU invites the relevant MS to present their programmes and projects in the context of the meetings of the SRG. This allows discussion on way to interconnect the different activities and ensure that resources are leveraged for the best results. This is an ongoing process and it is becoming more and more relevant in view of standardization processes and market uptake.

1.13. Launch of 2017 Calls for Proposals and Tenders

On 10 November 2016, to meet the stakeholders' expectations to have the call topics available beyond the three months average period of other H2020 financed calls, with the agreement of its Governing Board the JU launched the 2017 Calls for Proposals. As indicated in the Calls, the Projects are expected to be awarded mid-2017 and scheduled to start on 1 September building upon a integrated approach to Programme Management and result delivery.

The R&I planned to be performed complements the activities already ongoing, including the Lighthouse Projects, with the objectives to reach higher TRLs (up to 7) or start work on specific domains (TRL 0 – 3). The following tables give a synopsis of the calls.

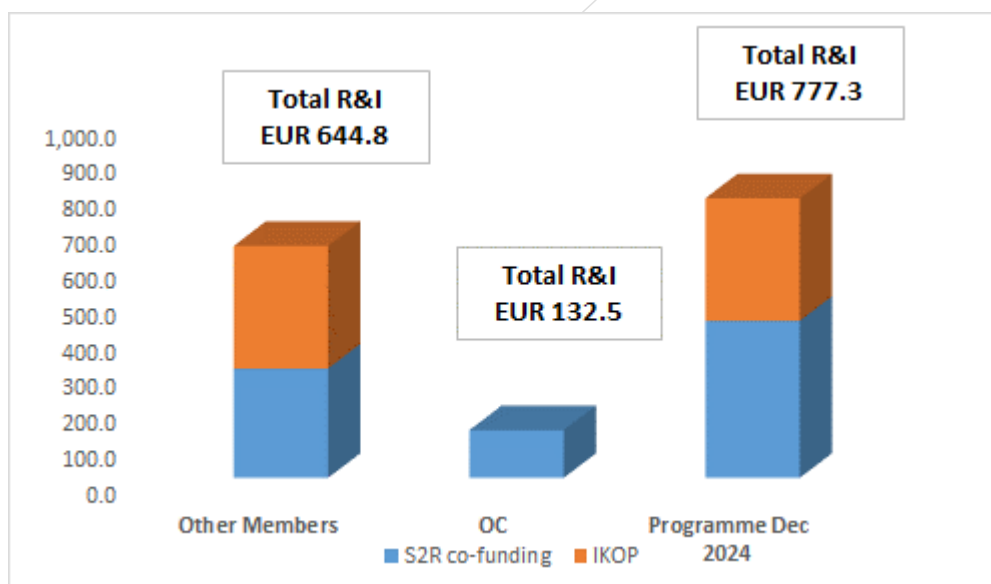
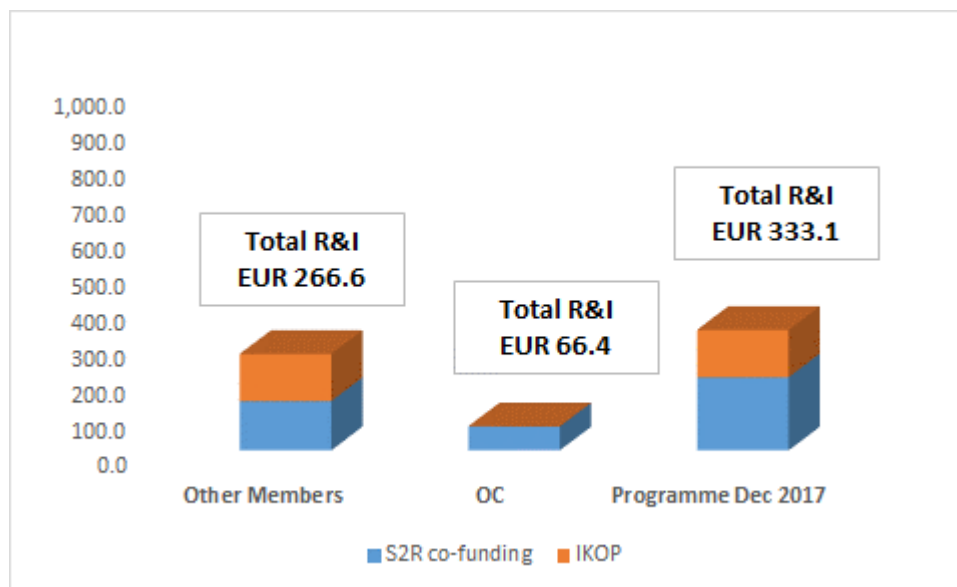
Activity EUR million	Type of call	Value of the actions (*)	Maximum S2R co-funding	In-kind contribution	Publication date	Indicative dates of GA / contracts
Calls for Proposals	Open to S2R Other Members only	92,9	41,3	51,6	10 Nov 2016	Jul-Sep 2017
Calls for Proposals	Open ¹⁵	19,5	19,5	n/a	10 Nov 2016	Jul - Sep 2017
Call for Tenders	Open ¹⁶	0,7	0,7	n/a	Q2 2017	Sept – Oct 2017
Total		113,1	61,5	n/a		

With the Calls 2017 R&I activities up and running, the R&I activities performed in the Programme will reach EUR 333.1 million (including Lighthouse Projects as part of the S2R initiative), of which EUR 266.6 million performed by the Other Members with a co-funding made available by the S2R JU up to a maximum of EUR 135.9 million.

The OCs are fully funded by S2R JU in accordance with H2020 Rules of participation

¹⁵ Open to non Other Members

¹⁶ Open to non Other Members



2. SUPPORT TO OPERATIONS

2.1. Communication activities

Communication plays an integral role in engaging and informing the Railway community about the S2R Programme. A number of communication activities were organised to ensure political and public awareness about the S2R JU's activities. As a new Joint Undertaking, the main objective was to foster awareness towards EU and national policy makers, as well as stakeholders of the railway sector.

Since October 2015, a Communications Officer has been made available by DGMOVE/SRD to support the work of the S2R JU in the setting-up phase, with a view to developing a communications strategy for the S2R JU, publicising and disseminating information about its programmes and activities, and

fostering a strong stakeholders' network. This strategy, which the S2R JU Programme Office started to develop in 2015 and continued to develop, in consultation with the S2R JU Governing Board through 2016, focuses also on dissemination of information on the progress of actions and their results specific actions in order to ensure outreach to both stakeholders and public. The Communication Strategy is expected to be finally adopted by the Governing Board at its first meeting of 2017.

In Q4, the S2R JU specific Communications and Stakeholders' Relations Officer was recruited.

2.1.1. Events

The S2R JU participated in meetings and conferences organised in Brussels and in some EU Member States in order to disseminate information about S2R JU activities, in particular:

S2R JU Info Day for Open Call for Proposals (2016), Brussels

S2R JU held its first Info Day for Open calls for non members in Brussels on 20 January 2016. More than 300 participants attended a full day of information on S2R JU and further legal and financial information on how to apply for grant. The latter part of the afternoon provided an area for brokerage for participants.

WCRR 2016, Milan

S2R JU attended the World Congress on Railway Research held from 29 May to 2 June. The Executive Director was invited to participate in the Plenary Session on Technology & Innovation on 31 May where he presented the S2R Programme to a global audience. The S2R Programme coordinator moderated one technical session. The Programme activities raised a lot of interest from representatives of the scientific community, industry and stakeholders from all around the world.

TEN-T Days 2016, Rotterdam

The TEN-T days 2016 took place from 20 to 22 June 2016 in Rotterdam within the context of the Netherlands Presidency of the Council of the European Union and had a record attendance of over 2500 participants. S2R JU had a stand at the event and it participated in panels on Rail Freight Corridors with high relevance for S2R and in particular IP5. The conference was attended by key participants in the sector, from Member State, EU Presidency, Commission, Associations and stakeholders. It was marked by discussions on the stakeholders' expectations for innovative solutions addressing some of the shortcomings undermining the performance and the potential of freight railway transport.

InnoTrans 2016, Berlin

Shift2Rail was present at the leading international trade fair for railway transport technology, InnoTrans2016 from 20 to 23 September in Berlin. S2R JU given its 2016 financial autonomy had an opportunity to share a stand with European Union Agency for Railways. The S2R JU organised key events on the stand and the JU's presence was extremely successful. Overall trade visitor numbers at Innotrans 2016 was almost 145 000 and participation and general footfall at the S2R venue was very high. The key event for the S2R JU was official launch of the Programme Activities following financial autonomy at the presence of Commissioner Bulc and its Other Members. Other key panels took place at the different Other Members' stand who also agreed to promote their active participation to the Programme.

European Week of Regions and Cities 2016

As already mentioned, the S2R JU is working towards establishing relations at regional level in view of the future deployment its innovative solutions. The S2R Programme is first and foremost driven by answering the needs of passengers and freight, to connect people, business, regions around Europe.

Hosted by the Union Committee of Regions, Brussels, with 140 participants, which included representatives of the European Commission, numerous regional offices as well as academic institutions S2R JU took part in the focus event on held on 11 October titled "Enhance Regional Innovation and Growth: possibilities for integrated funding through regional cooperation with Jus". This was a successful event and permitted S2R JU to be profiled at Regional level and particularly with and article inclusion in a special supplement to the Parliament Magazine.

Regional Information Days on S2R JU open call for proposals (2017)

In 2016, S2R JU presented the Open Call for 2017 on

- 11 November 2016 in London
- 2 December in Paris
- 13 December 2016 in Brno

Bilateral with Other Members and stakeholders

Since his arrival, the new Executive Director together with other key relevant staff when needed, organized bilateral with the Other Members to discuss the progress of the work and their involvement in the Programme, their views on the future evolution of the R&I activities, possible risks and opportunities. In particular, the S2R JU met the staff of the Other Members working in the Programme to demonstrate how the Programme is the result of the collective and collaborative work of each individual.

2.1.2. On-line communication

Website

In 2016, the S2R JU website was entirely revamped and re-launched in May. The website showed a growth of 73% visitors in 2016. The events calendar is loaded constantly with all S2R JU events and meetings. Documents approved by the Governing Board are accessible and Press Releases or articles covering S2R activities are regularly posted under the section titled *Latest News*.

Social media

The S2R JU invested time and energy in developing social media platforms – Twitter, LinkedIn & Facebook – as an instrument to communicate the progress of its work and connect with stakeholders, individual, scientific community, etc. Twitter proved to be the most effective means to engage with stakeholders and promote S2R activities. Twitter followers increased by 278% in 2016 while the number of views/impressions peaked significantly during key events. The S2R JU also engaged with stakeholders through LinkedIn (200 members) and Facebook with regular postings. However, as the effectiveness of Facebook when measured as a launch pad to the S2R JU website was less effective than other platforms, the account has been made dormant for the time being.

Press

In 2016 the S2R JU focused its press activities on developing outreach with industry press and member media channels. The S2R JU was featured in articles in a range of magazines and online media:

- Trade or specialised press, including Railway Gazette International, Adjacent Government
- Brussels based press as the Parliament Magazine
- Member media (SNCF, VCRR+, THALES)

Much of the press interest stemmed from the nomination of the S2R JU Executive Director in February 2016 and his subsequent appointment in May 2016 and key transport events such as InnoTrans and European Week of Regions and Cities 2016.

2.2. Legal and financial framework

The S2R JU legal framework refers predominantly to:

- Council Regulation (EU) N°642/2014 of 16 June 2014 establishing the Shift2Rail Joint Undertaking (OJ L 177, 17.6.2014, p. 9),
- The Financial Rules of the S2R JU, as adopted by the Governing Board of the S2R JU on 30 July 2014 and the revised Financial Rules of the S2R JU, as adopted by the Governing Board of the S2R JU on 11 December 2015.
- The Governing Board Decisions adopted since its establishment which framed the functioning of the S2R JU within the boundaries of the S2R Regulation and its Financial Rules.

In addition:

- Regulation (EU) No 1291/2013 of the European Parliament and of the Council of 11 December 2013 establishing Horizon 2020 — the Framework Programme for R&I for the period 2014-2020 and repealing Decision No 1982/2006/EC (OJ L 347, 20.12.2013, p. 104), as well as Regulation (EU) No 1290/2013 of the European Parliament and of the Council of 11 December 2013 laying down the rules for participation and dissemination in Horizon 2020 (OJ L 347, 20.12.2013, p. 81) is applicable to the grants awarded by S2R;
- The Staff Regulations of officials and the conditions of employment of other servants of the European Union are applicable to the staff of the S2R JU.

Additional reference documents may be found on the S2R JU's dedicated webpage: <http://shift2rail.org/about-shift2rail/reference-documents/>.

2.3. Budgetary and financial management

S2R gained its autonomy on 24 May 2016. Consequently, the reporting on 2016 budget implementation can be divided into two parts: a period prior and a period after the autonomy.

In the period prior to the autonomy, and in accordance with Article 19 of the S2R Regulation, the Directorate General of Mobility and Transport (DG MOVE) of the European Commission was in charge of the S2R JU budget execution.

On 24 May, the budget non-executed by DG MOVE was transferred to S2R's own administration. Thus under the mandate and responsibility of the newly appointed Executive Director.

The present document reports on the S2R key activities and financial transactions of the year 2016; it should be noted that, as already mentioned and in accordance with Article 19 of the S2R Regulation, the European Commission was responsible of the the establishment and initial operation of the S2R JU until 24 May 2016.

The main highlights of the 2016 Budget implementation are as follows:

In 2016, the JU reached 99.9% rate of implementation for the commitment appropriations. The payment appropriations were executed up to 84.3% of the available funds.

In accordance with the S2R Financial Rules, the S2R JU has established in its Budget Title 4, which includes the expected Un-used Appropriations not required in the year. These Appropriations are recognised available for applying n+3 rule on the following budgetary years, in accordance with the S2R JU Financial Rules Art.6§5.

Shift2Rail Joint Undertaking								
Breakdown & changes in Commitment Appropriations					Payment Appropriations			
Item	Initial adopted budget	Amending budgets and transfers	Final budget adopted		EUR '000			
	1	2	3=1+2	%	Initial budget adopted	Amending budgets and transfers	Final adopted budget	
	4	5	6=4+5	%				
Title 1: Staff Expenditure	1,254	36	1,290	3%	1,254	90	1,344	7%
Title 2: Infrastructure and operating Expenditure	1,987	23	2,010	1%	1,987	219	2,206	11%
Title 3: Operational Expenditure	45,249	(1,149)	44,100	-3%	24,888	22,203	47,092	89%
Title 4: Unused appropriations not required in Current year	0	2,832	2,832	100%	0	1,683	1,683	100%
TOTAL	48,490	732	50,232	4%	28,130	24,194	52,324	86%

Administrative costs

Title 1 and Title 2 of the S2R Budget was executed up to 98.6% in commitment appropriations, demonstrating a reliable budgetary planning.

Chapter 1.1 - Staff Expenditure was mainly used for the statutory staff of the JU. 17 posts were filled in as of 31 December 2016, representing 100% of the planned position of the Establishment Plan. During the year, the JU made recourse to external support, to fill the gaps during the recruitment process and to cope with the important workload resulting from ramp up phase of the activities (under Chapters 1.1 and 2.6).

The execution rate of the Payment Appropriations was 53.7%; this execution rate is lower than Commitment Appropriations due to payments for some of the contractual services becoming due in 2017 and afterwards.

It should be noted that during 2016 S2R collected the contributions due by the Members other than the Union that were not collected before its autonomy and related also to years 2014 and 2015.

Operational costs

Title 3 of the S2R Budget constitutes the JU's Operational Budget. In terms of commitment appropriations, Title 3 represents 87.8% of the overall S2R Budget, including Title 4. The execution rate of the Operational budget in both Commitment and Payment Appropriations was respectively 99.9% and 86.6%. The Payment Appropriations were used for the pre-financing of the Grants resulting from the 2015 and 2016 Calls for Proposals. The Budget Amendment No 2 of December 2016 provided the complementary resources to ensure the JU being able to meet the payment commitments of the following months.

Shift2Rail Joint Undertaking
Budget 2016: Implementation of commitment appropriations

EUR '000

Item	Commitments made					Appropriations un-used	
	Total approp. Availab.	from final adopt. Budget DG MOVE	from final adopt. Budget S2R	Total	%	from final adopt. budget	Total
	1	2	3	4= 2+3	5=4/1	6	7
Title 1: Staff Expenditure	1,290	266	1,012	1,278	99.1%	12	12
Title 2: Infrastructure and operating Expenditure	2,010	160	1,815	1,974	98.2%	35	35
Title 3: Operational Expenditure	44,100	0	44,100	44,100	100.0%	0	0
TOTAL 1+2+3	47,400	426	46,927	47,353	99.9%	47	47
Title 4: Unused appropriations not required in Current year	2,832	0	0	0	0.0%	2,832	2,832

Shift2Rail Joint Undertaking
Budget 2016: Implementation of payment appropriations

EUR '000

Item	Payments made					Appropriations un-used	
	Total approp. availab.	from final adopt. Budget DG MOVE	from final adopt. Budget S2R	Total	%	from final budget	Total
	8	9	10	11=9+10	12=11/8	13	14
Title 1: Staff Expenditure	1,344	284	801	1,085	80.8%	258	258
Title 2: Infrastructure and operating Expenditure	2,206	285	538	822	37.3%	1,383	1,383
Title 3: Operational Expenditure	47,092	0	40,798	40,798	86.6%	6,293	6,293

TOTAL 1+2+3	50,641	569	42,137	42,706	84.3%	7,935	7,935
--------------------	--------	-----	--------	--------	-------	-------	-------

Title 4: Unused appropriations not required in Current year	1,683	0	0	0	0.0%	1,683	1,683
--	-------	---	---	---	------	-------	-------

Unused appropriations

As already indicated, the amount included under Title 4 – Administrative Budget for EUR 1.6 million is mostly due to S2R collecting the contribution from its Members other than the Union related to the financial years 2014 - 2015. To this some adjustments to the 2016 Budget were transferred to Title 4 too.

The amount included under Title 4 – Operational Budget (EUR 1.1 million) represents the value initially reserved for Call S2R_OC_IP1_01_2016 to which S2R did not receive any proposals.

In terms of Payment Appropriations, the unused appropriations amount at EUR 9.6 million. Nevertheless, it should be noted that this amount does not correspond in cash available in the JU. In fact, following the decision of the S2R Governing Board¹⁷, the Treasury of the JU – as well as the Accounting Officer function – is performed by the Commission Accounting Officer. As a result, the unused payment appropriations are an accounting amount of the payment appropriations available to face the initial payments at the beginning of 2017.

2.4. Procurement and contracts

In order to reach its objectives and adequately support its operations and infrastructures, the S2R JU allocated funds to procure the necessary services and supplies. In the interest of sound financial management and to the possible extent, the S2R JU made use of SLAs (Service Level Agreements) with relevant Commission services (ICT, training, payroll, mission, experts reimbursements, interim staff, etc.) multiannual framework contracts and inter-institutional tenders. In addition, for services related to its premises, the S2R JU share them with all the other JUs in the same building.

¹⁷ Governing Board Decision No /2016 of 18 March 2016, https://shift2rail.org/wp-content/uploads/2016/09/Decision-6_2016-Appointment-Accounting-Officer_signed.pdf

In 2016, the S2R JU resorted exclusively to low-value contracts and inter-institutional framework contracts. Apart the S2R Cooperation Tool call for tender which shall support the operational activities of the S2R JU, no other open or restricted calls for tenders were launched for the acquisition of administrative services or supplies.

2.5. IT and logistics

In August 2016, an IT Support Officer joined the organization to bridge the IT service providers with the business by providing technical expertise, operational and strategic support as well as represent the S2R JU at relevant European Commission, Joint Undertakings and Executive Agencies' working groups. The overall objective was to establish the initial ICT services underpinning the functioning of the JU, including those related to cybersecurity.

During 2016, after the autonomy, the S2R participation in Commission DIGIT Framework Contracts has been reviewed and updated, which enabled IT cost optimisation of equipment and services purchases at competitive prices and service levels.

As a result, office computer equipment and indispensable accessories have been acquired to provide S2R staff and temporary personnel, meeting rooms, etc. with the necessary IT tools. In parallel, the software licensing needs have been reviewed, inventoried and actions have been taken to close any open licensing gaps.

The S2R JU uses the European Commission's budget and finance tool called ABAC Workflow for its financial management. The implementation of the new governance structure allowed better transparency and segregation of duties within the application. The roles of Local Profile Manager and IT Security Officer have been assigned to the ICT Officer and access security profiles have been reviewed and updated. In addition, the S2R JU is in the process to deploy the document management software, ARES, and SYSPER Light respectively for document management and staff administration.

The teleconferencing facilities have been improved by implementing dedicated phone bridges, and by acquisition of additional voice conferencing equipment.

In order to ensure 24/7 remote access to its data and reduce ICT infrastructure costs, the S2R JU has signed a memorandum of understanding to Join Inter-Agency Broker Model Cloud Framework Contract, under auspices of ICTAC group, in the strategic view to migrate the IT infrastructure and applications to the Union agencies private cloud-computing platform. Till the new contract will be in place, the shared infrastructure will be moved to a private cloud, as the existing shared equipment is nearing end of life.

Finally, as already mentioned, following the procurement of the new S2R Cooperation Tool, the Other Members will be able to share information and collaborate between themselves and with the Programme Office as from February 2017. The setup work for the tool was performed during the month of December 2016 and testes in the first months of 2017.

2.6. Human Resources

In 2016, in accordance with the staff establishment plan, S2R JU recruited seven staff members in accordance with its Staff Establishment Plan: the Executive Director, the Head of Administration and Finance, the Communication Officer, the IT Assistant, three Programme Managers including one

instead of the third post of Secretary initially planned. One Programme Manager recruited 2015 left the team and was replaced.

All Officials except the Communication Officer seconded by the Commission during the starting up phase of S2R JU returned to the Commission when the JU became autonomous in May 2016.

On top of the recruitment activities, other HR activities were also carried out including the concrete implementation in the S2R JU of HR-related decisions adopted by the Governing Board (Implementing rules), the in-boarding of newcomers, the daily HR management etc. Service level Agreements have been reviewed and established with the relevant Commission services (DG HR and PMO) aiming to ensure HR administration. Thanks to these agreements, staff members had the opportunity to ensure their development, although in high workload environment, in areas in relation with the core business of the JU. End 2016, the S2R JU team consisted of 17 staff members as foreseen in the establishment plan.

3. GOVERNANCE

3.1. Governing Board

In accordance with the S2R Regulation, the Governing Board continued its work steering the JU through decisions to be implemented and executed by the Executive Director. Four meetings of the Board were convened in 2016 dealing with both operational and administrative aspects. Important decisions were taken, such as the appointment of the Executive Director, the determination of the voting rights, the approval of the date for the financial autonomy including the underpinning documentation, the approval of the list of actions proposed by the Executive Director selected for funding under the 2015-20016 Calls, the appointment of the representatives of associated members to the Board, etc.

Moreover a number of decisions were adopted concerning administrative issues and issues related to the personnel (adoption by analogy of rules of employment of staff of the European Union).

In order to enhance further the transparency and exchange of information, including on the progress of the S2R JU R&I activities, the Governing Board decided to establish the User Requirement and Implementation & Deployment working group (URID-WG) which is participated by the representatives of associations representing the different actors of the Railway System.

3.2. Executive Director

According to Article 10 of the S2R Statutes, the Executive Director is the chief executive responsible for the day-to-day management of the S2R JU in accordance with the decisions of the Governing Board. The Executive Director is the legal representative of the S2R JU. The Executive Director is accountable to the Governing Board. He is supported by the JU staff organized in a Programme Office.

The S2R JU Executive Director was appointed on 16 February 2016. He took his duties on 16 May 2016. The performance of the JU was under the responsibility of an Executive Director ad interim till the new Executive Director was in place.

As from the 25 October, with the adoption by the Governing Board of the new organization chart, the Executive Director is supported by the Head of R&I a.i. and the Head of Finance and Administration.

The Programme Office under its responsibility started to define in details its processes and procedures to monitor of the performance of the Projects that will be implementing the Programme, through an integrated Programme Management approach. The Programme Handbook will be finalized during the first quarter 2017.

3.3. States Representatives Group

To date, 30 countries have nominated representatives to this group. During 2016, the States Representatives Group (SRG) held its fourth and fifth meetings on 26 April and on 15 September respectively. One of the main tasks in both meetings was the consultation with the Member states and the Associated Countries on the JU's Annual Work Plan (AWP) 2017. In both meetings the participants were given the opportunity to present their national R&I plans, in relation to the S2R activities and discussions were held concerning the best possible coordination of national and EU initiatives in the field of R&I in railway. In every meeting, the SRG members were informed in detail about the ongoing and planned activities of the JU.

3.4. Scientific Committee

The Scientific Committee (SC) is composed by 12 members plus 5 reserve members, it is an advisory body to the Governing Board focusing on long-term research identifying scientific and technological achievement and development priorities.

The S2R JU Scientific Committee held its third meeting on 13 April 2016. The JU presented the draft Multi Annual Action Plan (MAAP), an overview on activities of ERRAC Strategic Rail Research Agenda (SRRA) and other relevant or complementary projects and themes. The focus was on the following points: summary of the applications to the first S2R calls for proposals, System Integration Working Group & MAAP revision. The SC examined the first draft 2017 AWP and provided specific comments on the different topics in order to contribute to the document finalisation. An overview of the latest railway research activities at national and European level was presented by SC members.

The fourth meeting of the S2R JU Scientific Committee was held on 16 September 2016. The Executive Director provided an update on the state of play of the S2R JU related to ongoing programme activities focusing on the draft S2R MAAP and explained the role of blue-sky research and the key topics that could be considered for further S2R R&I activities in the forthcoming years. On short-term it focused on the launch of the call, on the ongoing Grants Agreement Preparation and the participation to InnoTrans 2016. The members discussed on the new MAAP, provided the opinion on the final draft Annual Work Plan 2017 and agreed on focusing their individual efforts on specific programmes and topics.

The fifth meeting took place on 14 December 2016. Beside the updating on activities development, including the review of the CFM projects stemming from the Call For Members 2015-2016, the SC focused on the preparation of a roadmap for the AWP 2018 and the possibility to draft calls including topics to explore blue-sky research. The Scientific Committee provided inputs on the MAAP. Members were required to provide inputs on the AWP 2018, MAAP, dissemination and communication activities to promote the research activity of S2R through special issues/editions in journals related to scientific research.

3.5. Innovation Programme's Steering Committees

In 2016 all Innovation Programme's Steering Committees were formally established and each of them adopted its Rules of Procedures, in line with the indications of the Governing Board.

The Steering Committees convened regular meetings (four meetings in total in 2016) and their role was to ensure the necessary coordination of activities within each IP and to provide input in assisting the JU in the planning of its future activities (i.e. input for the AWP 2017 and AWP 2018, the global planning, the MAAP review, etc.). Following the signature of the grants for the 2015-2016 calls, the coordinators of the open call projects were invited to participate to the Steering Committee meetings in order to present their plans in a way to ensure coordination of actions and to maximise synergies among projects.

3.6. European Railway Agency

Article 12 of the S2R Statutes clarifies the areas of cooperation between the JU and the European Union Agency for Railways (ERA). In order to ensure that sufficient cooperation could be established with the European Railway Agency, the rules of procedures of all relevant groups established by the S2R JU foresee the participation of representatives from the ERA (either as observers or direct members of these groups); this should ensure that the Agency is duly prepared to take into account the results of the Programme in its activities.

As a result, staff members of ERA have been participating in meetings of the S2R JU Governing Board (cf. 3.1) and the IP Steering Committees, but also in the groups which were tasked with the drafting of the Multi-Annual Action Plan and contributing to the S2R JU Annual Work Plans (2015 and 2016).

In addition, regular coordination meetings have been organised between the S2R Programme Office, the ERA in order to establish appropriate processes to ensure, where necessary and added value is brought by ERA, that Agency representatives are contributing to the Programme work.

4. INTERNAL CONTROL FRAMEWORK

4.1. Financial Procedures

The S2R JU Financial Rules were adopted by the Governing Board on 30/07/2014 and amended on 11/12/2015. The Financial Rules do not depart from the model Financial Regulation for public-private partnership bodies referred to in Article 209 of the Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council of 25 October 2012. Since its budgetary autonomy, the S2R JU has been using ABAC (accounting system of the European Commission) for its financial management.

The S2R JU manual of Financial Procedures has been prepared in line with Article 17(3) of the Financial Rules of the S2R JU and incorporated. The main purpose of the document is to identify actors, describe the financial circuits and detail procedures regarding the implementation of the S2R JU budget. The financial circuits take into account the structure of S2R JU and the risks associated with the management environment.

The Financial Rules of the S2R stress the need to differentiate between the initiation of a financial transaction and the verification of the same transaction in order to guarantee the principle of segregation of duties.

The S2R JU budget in respect of this document has been divided mainly into two types of expenditure;

- Administrative Expenditure covering both; Titles 1 and 2 of S2R Budget, and
- Operational Expenditure covering Title 3 of the Budget.

The new Title 4 is dedicated to account for un-used appropriations.

Due to their nature and the difference in ICT tools implemented at the S2R JU to manage them, the financial circuits between these two expenditure types are different.

The Manual of Financial Procedures describes in detail financial circuits the S2R JU implements per type of transactions and the roles and responsibilities of each actor involved. To a less extent, it also describes the basic principles on main procedures (grants & procurements).

The Governing Board formally appointed the Accounting Officer of the Commission as the Accounting Officer of the S2R JU on 18/03/2016.

4.2. Ex-ante Controls on operational Expenditure

The S2R JU adopts the standard financial circuits in ABAC Workflow for the commitments and payments. The circuit has a three-step authorisation performed by the following financial actors:

- Initiating Agent (OIA and FIA)
- Verifying Agent (OVA and FVA) and
- Authorising Officer (AO).

Staff members designated by the Authorising Officer to verify financial operations are chosen on the grounds of their knowledge, skills and appropriate professional experience.

The S2R financial circuits comply with the requirements of the four eyes principle, segregation of duties and the independence of the verifier. In addition, in view of the limited staff, they also provide the flexibility necessary to ensure the continuity of operations.

For the operational expenditure of the JU, S2R recognises two different types of transactions: ones solely performed in the ABAC Workflow and ones with the initiation and verification functions outside the ABAC environment in a tool called SYGMA. This tool is also linked to ABAC which allows real time controls over the budget and its implementation.

The nature of the transaction defines the system where the initiation and verification is performed:

- ABAC for all procurement related transactions and
- SYGMA for any transactions related to grant management

In all transactions, whether initiated in SYGMA or ABAC, the Authorising Officer (AO) will give his/her authorisation in ABAC only.

4.3. Ex-post Control of Operational Expenditure and Error Rates Identified

2016 is the first year of the S2R JU being autonomous; the only activities related to the performance of its Programme started on 1 September and since then they entered the ramp up phase. The only operational payments performed by the S2R JU in 2016 related to the payment of the pre-financing the consortia being awarded with grants.

As a result, during 2016 no ex-post controls of operational expenditure were performed. Nevertheless, the S2R JU participated to the definition of the ex-post control strategy and planning together with the other H2020 entities involved in it with the support of the DG RTD - CSC.

A planning for possible ex-post audits to be carried out on behalf of the JU by the Commission services in 2017 as been established. It will be further revised to take into account the risks identified in the first review of the Projects during the first half of 2017.

4.4. Audit of the European Court of Auditors

The European Court of Auditors performed its first mission related to the S2R JU and its activities on their 1st mission from 14 to 18 November 2016. This initial work will be consolidated with the next mission planned in March 2017 on the overall 2016 activities and it will result in an Annual Audit Report in accordance with the ECA mandate as defined in the TFEU. With regard to the Annual Accounts, in accordance with the S2R Regulation and Financial Rules, the S2R JU mandated an independent external auditor to provide an opinion on them. This work, contracted in September 2016, was finalized in March 2017 and it has become input to the ECA report.

4.5. Internal Audit

The Internal Audit Service (IAS) of the European Commission performs the role of Internal Auditor of the S2R JU and, in this respect, it reports to the Governing Board and the Executive Director indirectly.

The first audit mission consisted in establishing a risk profile of the S2R JU with the objective to establish a triennial internal audit work plan. The IAS triennial plan is expected to be presented to the Governing Board at its first meeting of 2017.

4.6. Risk management and conflict of interest

In 2016, in consideration of its financial autonomy, the S2R JU set up a risk policy to manage risks and opportunities related to the execution of the S2R Programme. The S2R JU follows the principles of the recognised international standards and aligns to the requirements of the European Commission as indicated in the Communication SEC (2005) *“Towards an effective and coherent risk management in the Commission services”*.

Risk is defined as *“any event that could occur and adversely impact the achievement of the S2R Joint Undertaking strategic and operational objectives. Lost opportunities are also considered as a risk”*.

The Risk Management system aims at enabling informed decision making with the objective of optimising the ratio between the level of acceptable risk by the S2R JU and the use of the relevant resources by anticipating and proactively identify, analyse, treat, control and monitor risks and opportunities.

With regard to programme specific risk management, the new S2R Cooperation Tool as well as the relevant grant agreements related to the different Projects provide for the framework for management of risks and opportunities, with the possibility to scale them up at the proper level till the Executive Director and Governing Board.

For the purpose of implementing the requirements of Article 23 of its constituent act pertaining to the prevention of conflicts of interest, the S2R JU liaised with the relevant services of the Commission's DG HR during the fourth quarter of 2015. As a result, initial rules governing conflicts of interest in respect of the S2R JU's members, bodies, staff and seconded staff, as well as its Governing Board members were adopted in 2016. The responsibility on conflict of interest is within the competencies of the Executive Director.

4.7. Compliance and effectiveness of Internal Control

In view of the decision on the financial autonomy, the Executive Director in May 2016 adopted the Internal Control Framework applicable to the S2R JU.

The Internal Control Standards (ICS) is based on the Commission's ICS and adapted to the S2R JU's context and specificities.

5. MANAGEMENT ASSURANCE

5.1. Assessment of the Annual Activity Report by the Governing Board

The Executive Director submits the draft Annual Report to the Governing Board for assessment and approval. Once approved by the Governing Board, the Annual Report is made publicly available. No later than 1 July of each year the Annual Report together with its assessment shall be sent by the Executive Director to the Court of Auditors, to the Commission, to the European Parliament and the Council.

The Governing Board takes note of the results achieved and recommends the JU to continue improving its effectiveness and efficiency with the Members' stronger support.

5.2. Elements supporting assurance

In addition to the specific supervisory activities of the Executive Director, the main elements supporting the assurance are:

- the Certificate of the Accounting officer,
- the information received from the Head of R&I, the Head of Administration and Finance and the Data Protection Officer,
- the preliminary results of the first audit of the European Court of Auditors,
- Internal Audit Service risk assessment,
- the overall risk management performed in 2016 as supervised by the Executive Director in view of the financial autonomy,
- the key performance indicators in place
- the dedicated ex-ante controls of the JU's operational expenditure
- the Other Members' reporting of in-kind contributions,

- the follow-up and monitoring of Call process with signature of all CFM and OC projects on time (TTG 100%),
- the exceptions reported in the *“exception and non-compliance register”* and the remedial measures put in place.

5.3. Reservations

The Executive Directors is not aware of any element that would bring to introduced a reservation in the AAR 2016.

5.4. Overall conclusion

Not applicable.

6. DECLARATION OF ASSURANCE

I, the undersigned, Carlo M Borghini, Executive Director of Shift2Rail Joint Undertaking

In my capacity as authorising officer by delegation

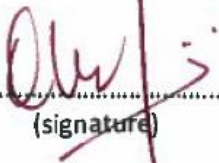
Declare that the information contained in this report gives a true and fair view¹⁸.

State that I have reasonable assurance that the resources assigned to the activities described in this report have been used for their intended purpose and in accordance with the principles of sound financial management, and that the control procedures put in place give the necessary guarantees concerning the legality and regularity of the underlying transactions.

This reasonable assurance is based on my own judgement and on the information at my disposal, such as the results of the self-assessment, ex-post controls, the work of the internal audit capability, the observations of the Internal Audit Service and the lessons learnt from the reports of the Court of Auditors for years prior to the year of this declaration.

Confirm that I am not aware of anything not reported here which could harm the interests of the Joint Undertaking.

Brussels 28/6 2017

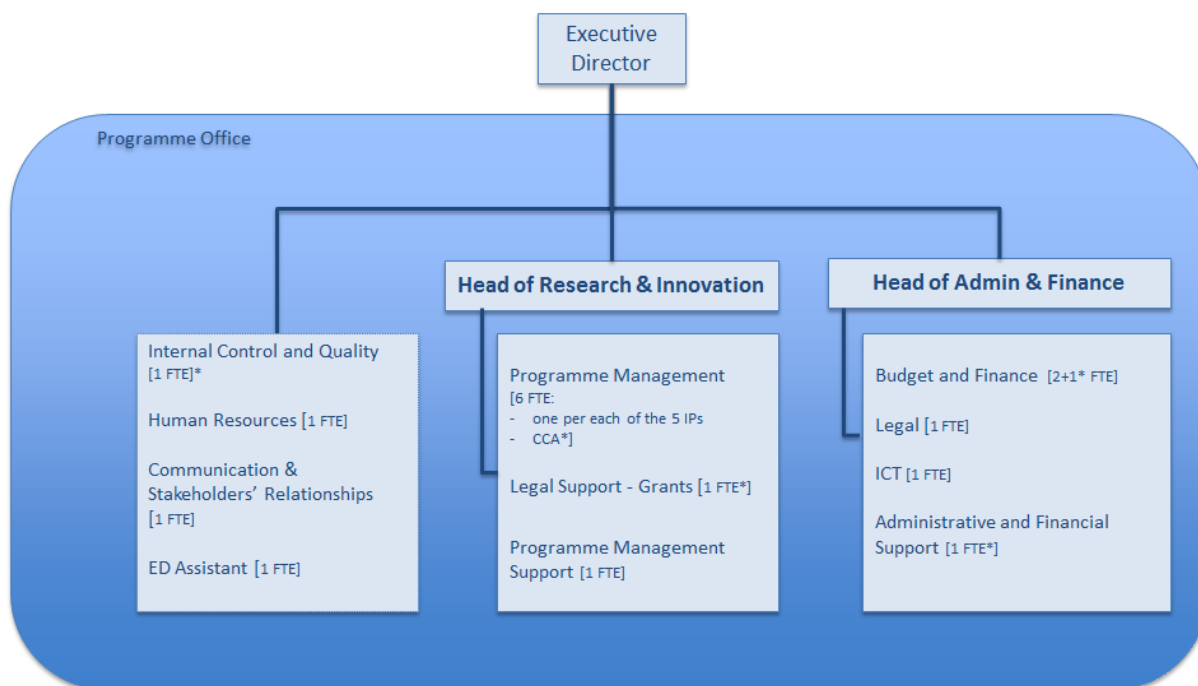

(signature)

carlo m borghini,
Executive Director

¹⁸ True and fair in this context means a reliable, complete and correct view on the state of affairs in the Joint Undertaking.

7. ANNEXES¹⁹

ANNEX A Organisational chart of the S2R JU



The present Organisation Chart, adopted by the Governing Board on 25 October 2016, included 4 posts (1 TA and 3 CAs) that became available on 1 January 2017 following the adoption of the 2017 Union Budget.

¹⁹ It should be noted that the Annexes related to publications from Projects, patents from Projects, materiality criteria are not included considering that the Projects' activities started only 1 September 2016.

ANNEX B Establishment plan

Function group and grade	2014		2015		2016	
	Authorised under the EU Budget	Filled as of 31/12/2014	Authorised under the EU Budget	Filled as of 31/12/2015	Authorised under the EU Budget	Filled as of 31/12/2016
	Temporary posts	Temporary posts	Temporary posts	Temporary posts	Temporary posts	Temporary posts
AD 16						
AD 15						
AD 14	1		1		1	1
AD 13	1					
AD 12						
AD 11						
AD 10						
AD 9			2		2	1
AD 8			1		1	
AD 7				1		1
AD 6						
AD 5		1		1		1
AD TOTAL	2	1	4	2	4	4
AST 1-11						
AST TOTAL						
AST/SC 1-6						
AST/SC TOTAL						
TOTAL	2	2	4	2	4	4
GRAND TOTAL	2	1	4	2	4	4

Contract Agents

Contract agents	Authorised 2014	Filled as of 31/12/2014	Authorised 2015	Filled as of 31/12/2015	Authorised 2016	Filled as of 31/12/2016
Function Group IV	2	3	5	4	7	8
Function Group III	1		3	2	3	3
Function Group II	1		2	2	3	2
Function Group I						
TOTAL	4	3	10	8	13	13

EC Officials assigned on an interim basis

EC Officials	Authorised 2014	Filled as of 31/12/2014	Authorised 2015	Filled as of 31/12/2015	Authorised 2016	Filled as of 31/12/2016
TOTAL		4		6		1

ANNEX C Indicators and Scoreboard of KPIs

TABLE I - Horizon 2020 Key Performance Indicators²⁰ common to all JUs

	Correspondence to general Annex 1	Key Performance Indicator	Definition/Responding to question	Type of data required	Data to be provided by	Baseline at the start of H2020 (latest available)	Target at the end of H2020	Automated	Result 2016 For calls 2015/2016
INDUSTRIAL LEADERSHIP	12	SME - Share of participating SMEs introducing innovations new to the company or the market (covering the period of the project plus three years);	Based on Community Innovation Survey (?). Number and % of participating SMEs that have introduced innovations to the company or to the market;	Number of SMEs that have introduced innovations;	H2020 beneficiaries through project reporting	n.a. [<u>new approach</u> under H2020]	50%	Yes	N.A.
	13	SME - Growth and job creation in participating SMEs	Turnover of company, number of employees	Turnover of company, number of employees;	H2020 beneficiaries through project reporting	n.a. [<u>new approach</u> under H2020]	to be developed based on FP7 ex-post evaluation and /or first H2020 project results	Yes	N.A.
SOCIETAL CHALLENGES	14	Publications in peer-reviewed high impact journals in the area of the JU	The percentage of papers published in the top 10% impact ranked journals by subject category.	Publications from relevant funded projects (DOI: Digital Object Identifiers); Journal impact benchmark (ranking) data to be collected by commercially available bibliometric databases.	H2020 beneficiaries through project reporting; Responsible Directorate/Service (via access to appropriate bibliometric databases)	n.a. [<u>new approach</u> under H2020]	[<u>On average, 20 publications per €10 million funding (for all societal challenges)</u>]	Yes	N.A.

²⁰ (based on Annex II to Council Decision 2013/743/EU)

	Correspondence to general Annex 1	Key Performance Indicator	Definition/Responding to question	Type of data required	Data to be provided by	Baseline at the start of H2020 (latest available)	Target at the end of H2020	Automated	Result 2016 For calls 2015/2016
	15	Patent applications and patents awarded in the area of the JU	Number of patent applications by theme; Number of awarded patents by theme	Patent application number	H2020 beneficiaries through project reporting; Responsible Directorate/Service (via worldwide search engines such as ESPACENET, WOPI)	n.a. [<u>new approach</u> under H2020]	On average, 2 per €10 million funding (2014 - 2020) RTD A6	Yes	N.A.
	16	Number of prototypes testing activities and clinical trials ²¹	Number of prototypes, testing (feasibility/demo) activities, clinical trials	Reports on prototypes, and testing activities, clinical trials	H2020 beneficiaries through project reporting	n.a. [<u>new approach</u> under H2020]	[<u>To be developed on the basis of first Horizon 2020 results</u>]	Yes	N.A.
	17	Number of joint public-private publications in projects	Number and share of joint public-private publications out of all relevant publications.	Properly flagged publications data (DOI) from relevant funded projects	H2020 beneficiaries through project reporting; Responsible Directorate/Service (via DOI and manual data input-flags)	n.a. [<u>new approach</u> under H2020]	[<u>To be developed on the basis of first Horizon 2020 results</u>]	Yes	N.A.
	18*	New products, processes, and methods launched into the market	Number of projects with new innovative products, processes, instruments, methods, technologies	Project count and drop down list allowing to choose the type processes, products, instruments, methods, technologies	H2020 beneficiaries through project reporting	n.a. [<u>new approach</u> under H2020]	[<u>To be developed on the basis of first Horizon 2020 results</u>]	Yes	N.A.

²¹ Clinical trials are IMI specific

	Correspondence to general Annex 1	Key Performance Indicator	Definition/Responding to question	Type of data required	Data to be provided by	Baseline at the start of H2020 (latest available)	Target at the end of H2020	Automated	Result 2016 For calls 2015/2016
EVALUATION	NA	Time to inform (average time in days) <u>all applicants</u> of the outcome of the evaluation of their application from the final date for submission of completed proposals	To provide applicants with high quality and timely evaluation results and feedback after each evaluation step by implementing and monitoring a high scientific level peer reviewed process	Number of days (average)	Joint Undertaking	H2020		Yes	92
	NA	Time to inform (average time in days) <u>successful applicants</u> of the outcome of the evaluation of their application from the final date for submission of completed proposals		Number of days (average)	Joint Undertaking	H2020		Yes	92
	NA	Redress after evaluations	To provide applicants with high quality and timely evaluation results and feedback after each evaluation step by implementing and monitoring a high scientific level peer reviewed process	Number of redresses requested	Joint Undertaking	H2020			1
GRANTS	NA	Time to grant measured (average) from call deadline to signature of grants	To minimise the duration of the granting process aiming at ensuring a prompt implementation of the Grant Agreements through a simple and transparent grant preparation process	Cumulatively in days Average under H2020 (days) TTG < 270 days (as %of GAs signed)	Joint Undertaking (automatized)	H2020		Yes	184
	NA	Time for signing grant agreements from the date of informing successful applicants (average values)		Average under H2020 (days)	Joint Undertaking	H2020		Yes	92

	Correspondence to general Annex 1	Key Performance Indicator	Definition/Responding to question	Type of data required	Data to be provided by	Baseline at the start of H2020 (latest available)	Target at the end of H2020	Automated	Result 2016 For calls 2015/2016
AUDITS	NA	Error rate		% of common representative error; % residual error	CAS	H2020		Yes	N.A.
	NA	Implementation of ex-post audit results		Number of cases implemented; in total €million; 'of cases implemented/total cases	CAS	H2020		Yes	N.A.

PAYMENTS	NA	Time to pay (% made on time) -pre-financing - interim payment -final payment	To optimize the payments circuits, both operational and administrative, including payments to experts	Average number of days for Grants pre-financing, interim payments and final payments; Average number of days for administrative payments; Number of experts appointed	Joint Undertaking	H2020	-pre-financing (30 days) - interim payment (90 days) -final payment ((90days)	Yes	<u>Operational:</u> Pre-financing: 100% Average number of days: 20 Interim/final: N/A <u>Administrative:</u> Pre-financing: N/A Interim/final: 95% Average number of days: 19 <u>Number of experts appointed:</u> 31
HR	NA	Vacancy rate (%)		% of post filled in, composition of the JU staff ²²	Joint Undertaking	H2020			100%

	Correspondence to general Annex 1	Key Performance Indicator	Definition/Responding to question	Type of data required	Data to be provided by	Baseline at the start of H2020 (latest available)	Target at the end of H2020	Automated	Result 2016 For calls 2015/2016
JU EFFICIENCY	NA	Budget implementation/execution: 1. % CA to total budget 2. % PA to total budget	realistic yearly budget proposal, possibility to monitor and report on its execution, both in commitment (CA) and payments (PA), in line with sound financial management principle	% of CA and PA	Joint Undertaking	H2020	100% in CA and 90% in PA	Yes	99.9% in CA 84.3% in PA
	NA	Administrative Budget: Number and % of total of late payments	realistic yearly budget proposal, possibility to monitor and report on its execution in line with sound financial management principle	Number of delayed payments % of delayed payments (of the total)	Joint Undertaking		H2020	Yes	13 late payments 5%

NB: the indicators related to the grants are extracted from data of 9 June 2016.

NOTES:

18* This indicator is not a legally compulsory one, but it covers several additional specific indicators requested for more societal challenges by the services in charge.

²² Additional indicators can be proposed/discussed with R.1 and/or DG HR

TABLE II - Indicators for monitoring H2020 Cross-Cutting Issues²³ common to all JTI JUs

Correspondence in the general Annex 2	Cross-cutting issue	Definition/Responding to question	Type of data required	Data to be provided by	Data to be provided in/to	Direct contribution to ERA	Automat ed	Result 2016 For calls 2015/2016
2	Widening the participation	2.1 Total number of participations by EU-28 Member State	Nationality of H2020 applicants & beneficiaries (number of)	H2020 applicants & beneficiaries at the submission and grant agreement signature stage	JU AAR RTD Monitoring Report	YES	Yes	442 applicants from 22 EU-28 Member States 252 (beneficiaries from 18 EU-28 Member States)
		2.2 Total amount of EU financial contribution by EU-28 Member State (EUR millions)	Nationality of H2020 beneficiaries and corresponding EU financial contribution	H2020 beneficiaries at grant agreement signature stage	JU AAR RTD Monitoring Report	YES	Yes	87,5M€ from 18 EU-28 Member States
NA		Total number of participations by Associated Countries	Nationality of H2020 applicants & beneficiaries (number of)	H2020 applicants & beneficiaries at the submission and grant agreement signature stage	JU AAR RTD Monitoring Report	YES	Yes	14 applicants From 5 countries 4 beneficiaries from 2 countries
NA		Total amount of EU financial contribution by Candidate Country (EUR millions)	Nationality of H2020 beneficiaries and corresponding EU financial contribution	H2020 beneficiaries at grant agreement signature stage	JU AAR RTD Monitoring Report	YES	Yes	1 Candidate Country beneficiary of 0,3 M€
3	SMEs participation	3.1 Share of EU financial contribution going to SMEs (Enabling & industrial tech and Part III of Horizon 2020)	Number of H2020 beneficiaries flagged as SME; % of EU contribution going to beneficiaries flagged as SME	H2020 beneficiaries at grant agreement signature stage	JU AAR RTD Monitoring Report		Yes	53 beneficiaries are SMEs and they benefit of 9.7% of the total contribution

²³ (based on Annex III to Council Decision 2013/743/EU)

Correspondence in the general Annex 2	Cross-cutting issue	Definition/Responding to question	Type of data required	Data to be provided by	Data to be provided in/to	Direct contribution to ERA	Automated	Result 2016 For calls 2015/2016
6	Gender	6.1 Percentage of women participants in H2020 projects	Gender of participants in H2020 projects	H2020 Beneficiaries through project reporting		YES	Yes	15.4% of applicants 17.2% among beneficiaries
		6.2 Percentage of women project coordinators in H2020	Gender of MSC fellows, ERC principle investigators and scientific coordinators in other H2020 activities	H2020 beneficiaries at the grant agreement signature stage		YES	Yes	14.5%
		6.3 Percentage of women in EC advisory groups, expert groups, evaluation panels, individual experts, etc.	Gender of memberships in advisory groups, panels, etc.	Compiled by Responsible Directorate/ Service /Joint Undertaking based on existing administrative data made available by the CSC		YES		• S2R JU Governing Board: ○ 4% of non-Commission Board members are female ○ 50% of Commission Board members are female • S2R JU States Representatives Group: 21% of representatives are female • S2R JU Scientific Committee: 25% of experts are female
7	International cooperation	7.1 Share of third-country participants in Horizon 2020	Nationality of H2020 beneficiaries	H2020 beneficiaries at the grant agreement signature stage	JU AAR RTD Monitoring Report	NO	Yes	0%
		7.2 Percentage of EU financial contribution attributed to third country participants	Nationality of H2020 beneficiaries and corresponding EU financial contribution	H2020 beneficiaries at the grant agreement signature stage	JU AAR RTD Monitoring Report	NO	Yes	0%

Correspondence in the general Annex 2	Cross-cutting issue	Definition/Responding to question	Type of data required	Data to be provided by	Data to be provided in/to	Direct contribution to ERA	Automated	Result 2016 For calls 2015/2016
9	Bridging from discovery to market ²⁴	9.1 Share of projects and EU financial contribution allocated to Innovation Actions (IAs)	Number of IA projects	Project Office – at GA signature stage he/she will be required to flag on SYGMA. Responsible Directorate/Service (WP coordinator)/Joint Undertaking - via tool CCM2	JU AAR RTD Monitoring Report		Yes	7.4% (share of projects) 6.5% (share of financial contribution)
		9.2 Within the innovation actions, share of EU financial contribution focussed on demonstration and first-of-a-kind activities	Topics properly flagged in the WP; follow-up at grant level	Responsible Directorate/Service (WP coordinator)/Joint Undertaking - via tool CCM2	JU AAR RTD Monitoring Report		Yes	100% follow up as per Grant Agreement
NA		Scale of impact of projects (High Technology Readiness Level)	Number of projects addressing TRL ²⁵ between...(4-6, 5-7)?	Joint Undertaking	JU AAR RTD Monitoring Report			TRL 4-6 (incl. projects up to TRL 4): 18 TRL 5-7: 3 Total: 21
11	Private sector participation	11.1 Percentage of H2020 beneficiaries from the private for profit sector	Number of and % of the total H2020 beneficiaries classified by type of activity and legal status	H2020 beneficiaries at grant agreement signature stage	JU AAR RTD Monitoring Report		Yes	136 beneficiaries 53% of the total beneficiaries

²⁴ This indicator (9.2) is initially intended to monitor the Digital Agenda (its applicability could be only partial)

²⁵ TRL: Technology Readiness Level

Correspondence in the general Annex 2	Cross-cutting issue	Definition/Responding to question	Type of data required	Data to be provided by	Data to be provided in/to	Direct contribution to ERA	Automated	Result 2016 For calls 2015/2016
		11.2 Share of EU financial contribution going to private for profit entities (Enabling & industrial tech and Part III of Horizon 2020)	H2020 beneficiaries classified by type of activity; corresponding EU contribution	H2020 beneficiaries at grant agreement signature stage	JU AAR RTD Monitoring Report		Yes	73%
12	Funding for PPPs	12.1 EU financial contribution for PPP (Art 187)	EU contribution to PPP (Art 187)	Responsible Directorate/Service	JU AAR RTD Monitoring Report		Yes	88.0M€
		12.2 PPPs leverage: total amount of funds leveraged through Art. 187 initiatives, including additional activities, divided by the EU contribution	Total funding made by private actors involved in PPPs - in-kind contribution already committed by private members in project selected for funding - additional activities (i.e. research expenditures/investment of industry in the sector, compared to previous year)	Joint Undertaking Services	JU AAR RTD Monitoring Report			148% 206% considering only the S2R Members <i>certification process ongoing</i>

Correspondence in the general Annex 2	Cross-cutting issue	Definition/Responding to question	Type of data required	Data to be provided by	Data to be provided in/to	Direct contribution to ERA	Automated	Result 2016 For calls 2015/2016
13	Communication and dissemination	13.3 Dissemination and outreach activities other than peer-reviewed publications - [Conferences, workshops, press releases, publications, flyers, exhibitions, trainings, social media, web-sites, communication campaigns (e.g radio, TV)]	A drop down list allows to choose the type of dissemination activity. Number of events, funding amount and number of persons reached thanks to the dissemination activities	H2020 Beneficiaries through project reporting	JU AAR RTD Monitoring Report	YES	Yes	N.A.
14	Participation patterns of independent experts	14.2 Proposal evaluators by country	Nationality of proposal evaluators	Responsible Directorate /Service/Joint Undertaking in charge with the management of proposal evaluation				26: EU 2: Associated Countries
		14.3 Proposal evaluators by organisations' type of activity	Type of activity of evaluators' organisations	Responsible Directorate /Service/Joint Undertaking in charge with the management of proposal evaluation				Extract from S2R Experts Pool statistics - Others : 5% - Non-research Public Sector : 12% - Private / Commercial Research Centres : 5% - Non-research Commercial sector including SMEs : 16% - Higher Education Establishments : 22% - Public Research Centres : 4% - Non-research International Organisations (Association of States) : 3% - Private Non-profit Research Centres : 1% - Consultancy firms : 28% - Joint Research Centre : 1% - NONE : 3%

Correspondence in the general Annex 2	Cross-cutting issue	Definition/Responding to question	Type of data required	Data to be provided by	Data to be provided in/to	Direct contribution to ERA	Automated	Result 2016 For calls 2015/2016
NA	Participation of RTOs and Universities	Participation of RTO ²⁶ s and Universities in PPPs (Art 187 initiatives)	Number of participations of RTOs to funded projects and % of the total Number of participations of Universities to funded projects and % of the total % of budget allocated to RTOs and to Universities	H2020 beneficiaries at the grant agreement signature stage	JU AAR RTD Monitoring Report	YES	Yes	24 participations of RTOs to funded projects and 9.5% of the total 31 participations of Universities to funded projects and 12.3% of the total 12.2% of EU funding allocated to RTOs and to Universities
NA	Ethics	The objective is ensuring that research projects funded are compliant with provisions on ethics efficiently	% of proposals not granted because non-compliance with ethical rules/proposals invited do grant (target 0%); time to ethics clearance (target 45 days) ²⁷	Responsible Directorate /Service/Joint Undertaking	JU AAR RTD Monitoring Report			0%

Notes:

*H2020 applicants - all those who submitted H2020 proposals

*H2020 beneficiaries - all those who have signed a H2020 Grant Agreement

*Responsible Directorate - DG RTD Directorates and R&I DGs family in charge with management of H2020 activities

*Services -Executive Agencies and other external bodies in charge with H2020 activities

²⁶ RTO: Research and Technology Organisation

²⁷ Data relates to pre-granting ethics review. This time span runs in parallel to granting process.

*Project officer - is in charge of managing H2020 projects in Responsible Directorate/Service including Executive Agencies

*** the indicators are extracted from data of 9 June 2016.**

TABLE III - Key Performance Indicators specific for the S2R JU

#	Key Performance Indicator	Objective	Data to be provided by	Baseline at the start of H2020	Target at the end of H2020	Automated	Result 2015
S2R							
1	% reduction in the costs of developing, maintaining, operating and renewing infrastructure and rolling stock and increase energy efficiency compared to "State-of-the-art"	Reduce the life-cycle cost of the railway transport system	JU	"State-of-the-art" 2014	> 50 %	No	N.A.
2	% increase the capacity of railway segments to meet increased demand for passenger and freight railway services compared to "State-of-the-art" 2014	Enhance the capacity of the railway transport system	JU	"State-of-the-art" 2014	100%	No	N.A.
3	% decrease in unreliability and late arrivals compared to "State-of-the-art" 2014	Increase in the quality of rail services	JU	"State-of-the-art" 2014	> 50%	No	N.A.
4	Reduce noise emissions and vibrations linked to rolling stock and respectively infrastructure compared to "State-of-the-art" 2014	Reduce the negative externalities linked to railway transport	JU	"State-of-the-art" 2014	> 3 - 10 dBA	No	N.A.
5	Addressing open points in TSIs, compared to "State-of-the-art" 2014	Enhance interoperability of the railway system	JU	"State-of-the-art" 2014		No	N.A.

#	Key Performance Indicator	Objective	Data to be provided by	Baseline at the start of H2020	Target at the end of H2020	Automated	Result 2015
6	Number of Integrated Technology Demonstrators (ITDs) and System Platform demonstrations	Improve market uptake of innovative railway solutions through large-scale demonstration activities	JU	tbd in the Multi-Annual Action Plan		Yes	N.A.
7	Share of the fund allocated to the different Innovation Programmes and to cross-cutting themes	Ensure that funding covers the railway system as a whole	JU	n.a.	> 80%	No	N.A.
8	Percentage of topics resulting in signature of GA	Ensure a sufficiently high call topics success rate	JU	n.a.	> 90%	Yes	N.A.
9	% of resources consumption versus plan (members only)	WP execution by members - resources	JU	n.a.	> 80%	Yes	N.A.
10	% of deliverables available versus plan (members only)	WP execution by members - deliverables	JU	n.a.	> 80%	Yes	N.A.

ANNEX D Annual accounts

BALANCE SHEET

		EUR '000
	Note	31.12.2016
NON-CURRENT ASSETS		
Property, plant and equipment	2.1	284
Pre-financing	2.2	34 026
		34 310
CURRENT ASSETS		
Pre-financing	2.2	6 773
Exchange receivables and non-exchange recoverables	2.3	9 795
		16 567
TOTAL ASSETS		50 877
CURRENT LIABILITIES		
Payables and other liabilities	2.4	(4 737)
Accrued charges and deferred income	2.5	(6 310)
		(11 047)
TOTAL LIABILITIES		(11 047)
NET ASSETS		39 831
NET ASSETS		
Contribution from Members	2.6	51 755
Economic result of the year		(11 925)
NET ASSETS		39 831

STATEMENT OF FINANCIAL PERFORMANCE

		EUR '000
	Note	2016
REVENUE		
Revenue from non-exchange transactions		
Other	3.1	370
Total revenue		370
EXPENSES		
Operating costs	3.2	(10 564)
Staff costs	3.3	(651)
Other expenses	3.4	(1 079)
Total expenses		(12 295)
ECONOMIC RESULT OF THE YEAR		(11 925)

CASHFLOW STATEMENT²⁸

	EUR '000
	2016
<i>Economic result of the year</i>	<i>(11 925)</i>
Operating activities	
<i>Amortisation and depreciation</i>	<i>23</i>
<i>Cash contribution from the Members</i>	<i>51 755</i>
<i>(Increase)/decrease in pre-financing</i>	<i>(40 798)</i>
<i>(Increase)/decrease in exchange receivables and non-exchange recoverables</i>	<i>(9 795)</i>
<i>Increase/(decrease) in accounts payable and other liabilities</i>	<i>4 737</i>
<i>Increase/(decrease) in accrued charges and deferred income</i>	<i>6 310</i>
<i>Other non cash movements</i>	<i>(284)</i>
Investing activities	
<i>(Increase)/decrease in intangible assets and property, plant and equipment</i>	<i>(23)</i>
NET CASHFLOW	-
<i>Net increase/(decrease) in cash and cash equivalents</i>	<i>-</i>
<i>Cash and cash equivalents at the beginning of the year</i>	<i>-</i>
<i>Cash and cash equivalents at year-end</i>	<i>-</i>

STATEMENT OF CHANGES IN NET ASSETS

	EUR '000			
	Contribution from Members	Accumulated Surplus/ (Deficit)	Economic result of the year	Net Assets
<i>Cash contribution</i>	<i>51 755</i>	<i>-</i>	<i>-</i>	<i>51 755</i>
<i>Economic result of the year</i>	<i>-</i>	<i>-</i>	<i>(11 925)</i>	<i>(11 925)</i>
BALANCE AS AT 31.12.2016	51 755	-	(11 925)	39 831

²⁸ Following the appointment of the Accounting Officer of the Commission as the Accounting Officer of S2R JU, the treasury of S2R JU was integrated into the Commission's treasury system. Therefore, S2R JU does not have any bank accounts of its own. All payments and receipts are processed via the Commission's treasury system and registered on intercompany accounts which are presented under the heading exchange receivables.

ANNEXE E LIST OF ACRONYMS

Abbreviation	
ABAC	Accrual Based Accounting
ATO	Automatic Train Operation
AWP	Annual Work Plan
AAR	Annual Activity Report
CA	Commitment Appropriation
CAPEX	Capital Expenditure
CBM	Condition-Based Maintenance
CCA	Cross Cutting Activities
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CFM	Call for Members
CSA	Coordination and support action
DOI	Digital Object Identifier
DRIMS	Dynamic Railway Information Management System
EC	European Commission
ED	Executive Director
EN	European Norm
ERRAC	European Rail Research Advisory Council
ERTMS	European Rail Traffic Management System
ETCS	European Train Controlling System
EU	European Union
EUAR	European Union Agency for Railways
FACTs	Flexible AC Transmission Systems
FFFIS	Form Fit Functional Interface Specifications
FIS	Functional Interface Specifications
GA	Grant Agreement
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GoA	Grade of Automation
H2020	Horizon 2020, EU framework programme for Research and Innovation
IA	Innovation Action
ICT	Information and Communications Technology

IEC	International Electrotechnical Commission
IKAA	in-kind contributions to additional activities
IP	Innovation Programme
IPR	Intellectual Property Rights
ISO	International Standardisation Organisation
IT	Information Technology
ITD	Integrated Technology Demonstrator
JTI	Joint Technology Initiative
JU	Joint Undertaking
KPI	Key Performance Indicator
LCC	Life Cycle Cost
LIDAR	Light Detection and Ranging
LTE	Long-Term Evolution (standard for wireless communication)
MAAP	Multi-annual Action Plan
MB	Moving block
NLOS	non-line-of-sight
NTP	Network Time Protocol
OC	Open Call
ODM	Operational Data Management
OPEX	Operating Expenditure
PA	Payment Appropriation
R&I	Research and Innovation
PPP	Public Private Partnership
PRM	Persons with Reduced Mobility
PTC	Positive Train Control
PTI	Platform Train Interface
RAL	Unpaid amount
RAMS	Reliability and Maintainability System
RBC	Radio Block Centre
RFID	Radio Frequency Identification
RIA	Research and innovation action
RoI	Return of Investment
S2R	Shift2Rail
SC	Scientific Committee

SME	Small and Medium Enterprise
SNE	Seconded National Expert
SPD	System Platform Demonstration
SRG	States Representatives Group
SWL	Single Wagon Load
TAF	Telematic Application for Freight
TAP	Telematic Application for Passengers
TCMS	Train Control and Monitoring System
TC	Tender Call
TD	Technology Demonstrator
TL	Train Load
TMS	Traffic Management System
TRL	Technology Readiness Level
TSI	Technical Specifications for Interoperability
UAV	Unmanned Aerial Vehicle
WA	Work Area