

The Shift2Rail Newsletter – Issue 5



Carole Desnost, Chief Innovation Officer, SNCF: More value from data, the key to unlock the railways of the future

At this particular moment, the railway has to reinvent itself to become the backbone of sustainable mobility. Thanks to all the possibilities digital transition offers, we can imagine new ways of designing, building, maintaining and operating railways. This is especially important for mobility companies, as data means new business models that entail higher efficiency and customer satisfaction.

Data is everywhere. For example, sensors located throughout the infrastructure will help develop predictive maintenance to prevent breakdowns and disruptions.

Data on precise location of trains in the network and their surroundings generated by sensors will support management of autonomous trains and increase lines capacity making traffic more fluid and efficient, thus reducing energy consumption.

Data will also allow us to generate a map of the entire railway network and its immediate surroundings, creating a digital twin of the physical network. This virtual image will enable the testing of innovations in real scenarios, and support future decisions on changes to improve the network.

Algorithms generated by operational research and artificial intelligence will also help operators take the right decisions.

The evolution that has taken place was clear at InnoTrans 2018. Whereas the 2016 edition was digitally oriented in communication, exhibitors at last September's InnoTrans integrated the value from data into a broad number of products and services.

This was the case for example for the new digital brake test for freight trains developed by SNCF in collaboration with Traxens, presented at Shift2Rail's booth. Within Shift2Rail's Innovation Programme 3 for Infrastructure, SNCF Réseau's subsidiary Altametris is also exploring the use of drones for railway operations, mapping rocky cliff faces surrounding rail tracks in collaboration with the Swiss CFF/SBB.

Shift2Rail at InnoTrans 2018



German Federal Minister Andreas Scheuer and Commissioner for Transport Violeta Bulc together with S2R Executive Director Carlo Borghini, at the opening ceremony of Shift2Rail's stand at InnoTrans 2018

Shift2Rail Opening Ceremony: The future of railways starts here

The Shift2Rail Joint Undertaking (S2R JU) had a strong presence in its first appearance at InnoTrans, the largest rail fair in the world – presenting the first results of the initiative, barely two years since its inception. From 18 to 21 September 2018, Shift2Rail presented 20+ demonstrators, the building blocks to develop the next generation of railway systems in Europe.

[Watch the video here: Shift2Rail at InnoTrans 2018.](#)

Commissioner for Mobility and Transport Violeta Bulc and German Federal Minister for Transport Andreas Scheuer were the first guests to visit the Shift2Rail stand as part of the InnoTrans opening tour.

Joined by a crowd of about 150 people, Ms Bulc and Mr Scheuer witnessed the presentation of the Shift2Rail wireless connected trams demonstrator. Broadcast live from Zaragoza, Spain, engineers showed how two trams could move in a coordinated manner without any physical link at a constant distance of about 6 metres, powered by 'virtual coupling' technology. Watch the video here.

Ms Bulc also directly experienced the demonstrator by controlling the trams' destination displays from a tablet – more than 2,000 km away from the actual vehicles.

At the opening, members of the JU presented several other demonstrators in different areas: noise mitigation, energy smart metering, a new ecosystem for easy multi-modal travel booking, an obstacle detection device and a new digital brake test system, among others.

“In two years, you have proved the concept and shown that we were right to support [Shift2Rail]. We want to see railways taking the lead and continue being the real backbone of the European transport

area. For that, we need a lot of innovation”, said Ms Bulc. “Innovation is expensive, that is why we need to cooperate and join forces in order to get return on investment as quickly as possible and in the most efficient way”.

Following this encouraging statement, Ms Bulc presented the Shift2Rail Women in Rail and R&I Awards, acknowledging the best projects in the Shift2Rail initiative. The opening ceremony was then concluded by Shift2Rail JU and the South East Europe Strategic Alliance for Rail Innovation (SEESARI) signing a Cooperation Agreement at Shift2Rail’s stand with SEESARI Chairman, Peter Verlič from Slovenian Railways and Director of the SZ Transport Research Institute. Check out the article and video on the SEESARI [website](#).

“Being able to show this progress to Commissioner Bulc, Minister Scheuer as well as company directors, engineers and students from all over Europe has been a real key moment. I hope that we have showed to the world the capacity of the European rail sector to make a major system transformation and the impact that the European Union can have when sectors join forces. All this is the result of the commitment of Shift2Rail Members”, said Shift2Rail Executive Director Carlo Borghini.

Throughout the four days that lasted InnoTrans, researchers involved in Shift2Rail projects presented more than 20 demonstrators, in front of thousands of visitors. In total, more than 160,000 professionals visited InnoTrans 2018.

With the 2020 edition of InnoTrans in mind, Shift2Rail-funded researchers are already working to develop these solutions further and much more. “We want to pave the way for the deployment of innovative solutions in the market”, said Mr Borghini. “We have not showed you everything in this fair, we are working hard on many other technologies and bridging the gap between ideas on paper and innovation. I think InnoTrans 2020 can be a very good platform to test ourselves and demonstrate where we are”, concluded Head of Research and Innovation at Shift2Rail, Mr Giorgio Travaini.



Interactive zone for live demonstrators at Shift2Rail stand, InnoTrans 2018

Six striking solutions for the next generation of railways

Shift2Rail presented more than 20 cutting-edge solutions for a ground-breaking transformation of railway systems on 18-21 September in Berlin at InnoTrans 2018, the largest rail trade fair in the world, attended by more than 160,000 visitors. It was the first time Shift2Rail presented concrete results, barely two years after starting its R&I activities.

We have gathered for this newsletter six innovations Shift2Rail presented at InnoTrans. See how participants in our projects are inventing the next generation of railways – setting the stones for a rail system revolution to come.

One-click away from anywhere in Europe

Today, apps allow travellers to find the best multimodal routes, although without real time information everywhere or with complex bilateral arrangement often at local/national level. Shift2Rail is bringing this technology to a new level by introducing a real-time European wide and easily implementable system that will enable the planning, booking and purchasing of multimodal trips across Europe with just one click – a preliminary version was available at InnoTrans for public test.

“A multimodal journey across the Europe means that you can use car, bike, train, tram, airplane or any other form of transport to travel in Europe from one place to another,” says Rui Lourenço, a Shift2Rail Innovation Programme for IT Solutions project coordinator from Thales.

For passengers, travelling with public transport becomes easier than ever thanks to multimodality being at their fingertips. They can travel door to door seamlessly, and rail is at the heart of such multimodal system.

Transport service providers will also save money and time, as they will be able to benefit from the S2R interoperable ecosystem without the need of changing their legacy system while keeping control of their own commercial policies. The Interoperability Framework, a Shift2Rail-developed solution, will gather data directly from providers’ current ‘legacy’ systems, thanks to a semantic technology in development, able to understand data from diverse sources.

Big data to feed energy saving strategies

Currently, energy measurements are conducted only on board of trains and are not used to make networks more energy-efficient. A new tool for smart energy metering developed within Shift2Rail aims to change this. The system will permit assessing energy efficiency and flows in rail systems.

“We are gathering data on the temperature, location, CO² emissions and energy flows. With that data, we are able to make proposals on how to reduce the energy consumption of trains,” says Guillaume Pelletier, a Shift2Rail project coordinator from Dotvision together with Marius Lordache from Alstom who leads Shift2Rail’s work with smart energy metering.

The feasibility of this model was tested on-board of two tramways and in a traction substation in Reims, France.

No more wheel-kicking: welcome the digital brake testing

Testing brakes is mandatory every time before a freight train departs in Europe. Right now, this test takes more than 45 minutes and requires two persons to check every brake manually. To change this,

Shift2Rail Members are developing a digital brake test the driver can trigger from his cabin using just a tablet.

“This digital solution can perform these tests twice as fast and it needs just a single person to perform it. This saves time and improves safety and flexibility as every type of train can be equipped with the digital solution,” says Bertrand Minary, a Shift2Rail Innovation Programme for Freight project coordinator from SNCF.

The visitors of InnoTrans were able to sit in the driver’s seat and discover how the digital brake testing makes mandatory checks faster and more efficient.

Less Cable, More savings

Trains today commonly carry more than 10 km of cables and many electronic devices on board to control doors, brakes, traction, signalling and many other functions. To make trains lighter, roomier and more energy-efficient, Shift2Rail is merging all of these devices together into a single wireless platform.

Safety is one of the main challenges when getting rid of cables. How to guarantee brakes will always work under any condition even if the wireless network is overloaded?

“We have to make sure that [the wireless system] is completely free from interference. It is very important that we are always able to brake the train even if some other parts of the system are malfunctioning”, says Arjan Geven, coordinator of the Safe4Rail project together with Javier Goikoetxea who is leading Shift2Rail’s work with train control and monitoring systems.

The TCMS mockup presented at InnoTrans is able to prioritise braking and other safety-critical features of the train even in case of network failure. Non-critical features like CCTV or screens might go off, but essential functions continue working. Safety is guaranteed as the system is certified SIL4, the highest safety standard in the market.

A train that is music to your ears

Shift2Rail-funded researchers are introducing computer simulations to assess different strategies to reduce noise and vibration levels –both for passengers inside trains and passers-by outside.

“For example, we can simulate the difference in [exterior and interior] noise levels between a train equipped with cast iron brake blocks and a train with composite brake blocks,” says Rüdiger Garburg, representing Shift2Rail’s work with noise and vibration reduction.

Visitors at InnoTrans could use virtual reality headsets to experience the different train noise scenarios.

Do you want to discover the next generation of railways? Access videos, photos and technical explanations on the 20+ Shift2Rail demonstrators [here!](#)



Delighted Network Rail managers receive the Women in Rail R&I Award from Commissioner Bulc

Network Rail leadership team wins first Shift2Rail Women in Rail R&I Award

A team of three Network Rail managers won the Shift2Rail ‘Women in Rail Research & Innovation Award’ in its first edition.

Laureates are Amanda Webster, Eleanor Simmons and Alison Smith, prominent managers in infrastructure-related Shift2Rail R&I activities, working on smart infrastructure, intelligent mobility management and sustainable energy management.

The Award is inspired by the ‘EU Platform for Change – Women in Transport’ (of which Shift2Rail is a member), launched in 2017 by EU Commissioner for Mobility and Transport, Ms Violeta Bulc, who bestowed the awards at InnoTrans 2018.

With this Award, the Shift2Rail Joint Undertaking (S2R JU) honours the work of highly qualified and successful women moving the rail industry forward and aims to promote gender equality and break obstacles for women to access opportunities in Research & Innovation.



Members of the CONNECTA project receive their award from Commissioner for Mobility and Transport, Violeta Bulc, and the Executive Director of Shift2Rail, Mr Carlo Borghini

Meet the winners of the first Shift2Rail Research & Innovation Awards

Projects working on new methodologies to optimise energy use in trains, a door-to-door travel booking eco-system and technologies to make trains' communication systems wireless were selected as winners of the Awards.

There were three categories in the Awards: decarbonisation, digitalisation and project management.

OPEUS, part of the S2R cross-cutting activity on Energy and Sustainability, won the decarbonisation Award for its work 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.

IT2Rail, the S2R lighthouse project for IT Solutions for Attractive Railway Services, obtained the digitalisation Award. The project has developed a crucial technical enabler that sets the foundations for further developments in the Shift2Rail Innovation Programme 4, aimed to revolutionise multi-modal travelling in Europe.

CONNECTA, part of the S2R Technology Demonstrator on new Train Control and Monitoring System, and on new Brake systems, was bestowed the Project Management Award for its innovative management processes, market-oriented approach and use of new technologies. The CONNECTA project works on the next generation of TCMS architecture, electronic braking systems and components with wireless capabilities.

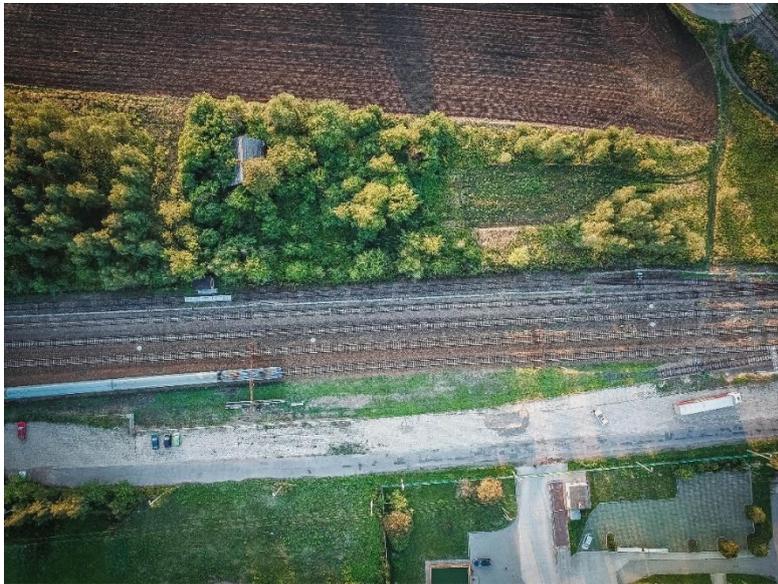
The ceremony for the first edition of the Research and Innovation Awards was part of the opening event of the Shift2Rail stand at InnoTrans 2018.

The Awards acknowledge the commitment and progress accomplished by the teams working, in Europe and beyond, to deliver the S2R Research & Innovation Programme, creating innovative solutions to deliver a dramatic transformation of the European railway systems.

Shift2Rail awards 19 grants for its Call for Proposals 2018

19 projects worth €152.6 million will be funded under the Shift2Rail Joint Undertaking 2018 Call for Proposals for Research & Innovation activities. Shift2Rail's co-funding will amount up to €77.3 million. The new projects aim to accelerate the transition towards the next generation of railway systems in Europe. [Read more here.](#)

Capability in the spotlight: More value from data



A train crosses Poland. What if we could monitor all the rail assets in this picture?

Getting more value from data is essential for railways to take a forward leap. For this quest, 32 out of the 55 Shift2Rail innovations in development within Shift2Rail contribute at least partially to improve collection, analysis and interpretation of data: are we on track to create and harness a 'Railway Internet of Things'?

Automated data collection from sensors on vehicles and rail assets such as tracks, catenaries and tunnels, could provide rail managers with detailed live information on the network, supporting fast and well-informed decisions. Engineers trust data could bring many benefits to railways, especially for maintenance.

Today, technicians review from time to time each rail asset and repair them when broken. Better use of data would enable a radical new approach: Condition Based Maintenance (CBM). Thanks to live information from sensors placed on different elements, technicians will know if an asset needs servicing – leading to reduced downtime of infrastructure and rolling stock, which entails less delays for passengers.

Not only that, algorithms and models under development in Shift2Rail would feed the CBM system, able to predict the performance of assets based on pattern recognition and machine learning technology, informing future maintenance strategies to be more efficient.

“Now we have a new tool we can use to better understand what really happens in our components”, says Mr Ackermann, rail maintenance expert at Deutsche Bahn and member of the IMPACT-2 project, working on smarter maintenance strategies as part of the Shift2Rail Cross-Cutting Activities programme.

S2R is creating a series of concrete case studies for which CBM would help improve rail upkeep. Engineers are collecting real information from different components in rail fleets in service and linking the resulting data with events actually happening in the vehicles. The first step is to find where CBM would help best.

“A vehicle has thousands of components and hundreds of maintenance tasks, you have to choose the right task, you cannot [collect data] for the whole vehicle”, says Mr Ackermann. Once suitable tasks and components are identified, researchers will analyse the resulting data and will create rules for maintenance, taking into account European standard and data-sharing regulations.

By 2022, project managers expect issuing a set of smarter maintenance recommendations to be implemented at service stations and workshops.

Collaboration within Shift2Rail is proving itself instrumental for developing maintenance strategies applicable to railways across Europe, with all stakeholders pulling together: “We can talk with colleagues from other rolling stock cooperating companies or directly with the manufacturers. Otherwise, we would have little chances to do that”, says Mr Ackermann.

Shift2Rail Programme Manager for Infrastructure Nikolaos Athanasopoulos is convinced that creating a ‘Railway Internet of Things’ to get more value from data will bring important rolling stock maintenance savings for rail undertakings, while guaranteeing even higher safety levels.

Wheels are a clear example, he says, one of the most expensive parts to maintain in a train. “Wheel regular maintenance entails well-known and predictable costs but if a wheel is suddenly out of order, costs for upkeep become unpredictable and indirect costs increase dramatically. With better data from the rolling stock, we could monitor the wheels and predict their behaviour, saving extraordinary servicing costs and preventing unforeseen disruptions”.

The path ahead is clear for European railways: to shift from periodical corrective and preventive upkeep strategies to Condition Based Maintenance (CBM) and predictive maintenance – harnessing the full potential of data, and leading to higher cost-efficiency and reliability for rail vehicles and infrastructure.

“More value from data” is one of the twelve capabilities Shift2Rail is developing for the next generation of railway systems in Europe. An interactive map showing how each of these capabilities will contribute to the future of railways is available [here](#).

Shift2Rail at Politico Connected Transport Summit

Sponsored by the Shift2Rail JU, the Politico Connected Transport Summit took place on 16 October. At the event, high-level speakers gave their insights on how to build the future of mobility, including the Vice President of the European Commission for Energy Union, Maroš Šefčovič, and the EU Commissioner for Transport and Mobility, Violeta Bulc.

As part of a panel on multi-modality and smart mobility, Shift2Rail Executive Director Carlo Borghini gave his views on how research and innovation in railway can contribute to a true development of multi-modality, with rail as an essential piece.

Florian Guillermet, SESAR JU Executive Director, and Claire Depré, Head of Unit for Intelligent Transport Systems at the European Commission joined Mr Borghini at the discussion, moderated by Politico transport reporter Josh Posaner.

Pictures and videos from the event are available on the [Politico Connected Transport Summit website](#).

Shift2Rail in the news:

- Shift2Rail was featured in the August 2018 issue of the Railway Gazette. “The quest for quieter trams” (pages 46-48) introduces S2R’s project In2Track that works on reducing the noise of railways.
- [Technologist magazine writes about Shift2Rail](#) in its article “The race for rail-on-demand” (27 August). The article includes comments from Giorgio Travaini who says that Shift2Rail is focused on delivering rail-centred mobility and on-demand service that lay the basis for rail-on-demand.
- [German publication Zevrail writes how Shift2Rail](#) is at the centre of the European railway innovation (Issue 05, 2018). The article includes comments from Shift2Rail’s Executive Director, Carlo Borghini, who explains the goals of S2R.
- [The Rail Journal writes about automated train operation and features Shift2Rail’s work on virtual coupling](#) (28 September). The article includes an interview with Léa Paties, a programme manager from S2R.
- Shift2Rail was widely featured in the media when the results for the Call for Proposal 2018 were released (see below):
 - [Railway Gazette](#)
 - [Railtech](#)
 - [Railway Pro](#)

- [International Railway Journal](#)
- [Kowi.de](#)
- [International Railway Journal wrote an article on noise reduction](#) (12 November) of trains and features Shift2Rail's work in the field. Shift2Rail will reduce the noise of railways by introducing simulations that allow to measure the interior and exterior noise of trains.
- [Shift2Rail's project DESTINATE that focuses on noise reduction was featured in the Global Railway Review](#) (4 December). The journal introduced the project in an in-depth article focusing on the methods and results of the project.

Upcoming events

Shift2Rail Information Day 2019

The Shift2Rail 2019 Information Day will take place on 6 February 2019 and will aim to provide an overview of the Shift2Rail Research & Innovation programme, focusing on upcoming funding opportunities under the Horizon 2020 umbrella.

The event will be a meeting point for companies and research organisations that meet Horizon 2020 eligibility criteria and wish to carry out collaborative R&I projects in the area of railway mobility, in collaboration with ongoing and future projects of Shift2Rail Members.

There will be a special opportunity for SMEs to network and brainstorm on projects they could create together to improve the rail system of the future.

The Joint Undertaking expects to build on last edition's success, in which more than 250 rail stakeholders participated.

Shift2Rail will participate at Rail Live! Bilbao 2019

The Shift2Rail JU will be an Official Innovation Partner at Rail Live! 2019, taking place on 5-7 March 2019 in Bilbao, Spain. Rail Live! is an exhibition and conference that will bring together senior experts from across the world of rail.

The event will showcase the full range of innovation in the sector from IoT, cutting edge innovation to new machine tools, civil engineering and construction. The conference will concentrate on how new technologies are being applied to a very traditional industry with revolutionary outcomes for operators, infrastructure managers and their partners.

Shift2Rail will be sending a senior delegation to the conference and expo with Executive Director Carlo Borghini and Head of Research & Innovation Giorgio Travaini taking part in the event, speaking and moderating on the important topics of digitalisation and automation of the rail industry.

More than 3,000 attendees, including operators, infrastructure managers, construction companies and government organisations are expected to attend. Shift2Rail is proud to be participating with a

stand in the exhibition and we look forward to sharing more information as available. The programme and registration are available [here](#).

Other events Shift2Rail will participate in during 2019:

13-17 January: [Transport Research Board Annual Meeting](#) – Washington DC, USA

22 January: [Final Conference Shift2Rail-funded project on IP3 Infrastructure, In2Track](#) – Paris, France

6 February: Shift2Rail Information Day 2019

12 February: Shift2Rail Spanish Event

20-22 February: International Railway Summit IRITS – Frankfurt, Germany

6-7 March: Rail Live! Bilbao – Bilbao, Spain

18-19 March: Space for Innovation in Rail – Vienna, Austria

26-28 March: SIFER 2019 – Lille, France

28 October – 1 November: 12th World Congress on Railway Research – Tokyo, Japan

More information on the above events will follow in 2019.