C4R
Capacity for Rail

Towards an affordable, resilient, innovative and high-capacity European Railway System for 2030/2050

Newsletter Issue 2, April 2016

Foreword

Here is the second issue of the Capacity4Rail project Newsletter.

Started in October 2013, Capacity4Rail is now well in its third year. The project is now running full speed. Innovative track concepts have emerged, requirements for future freight systems have been specified, current practices to improve capacity have been reviewed, future monitoring strategies are being shaped and the vision for 2030/2050 is getting clear.

This year, the project will focus on technological developments, Demonstration activities and Exploitation mechanisms.

This second issue highlights the main achievements so far and a special focus is given to SP2 - New Concepts for Efficient Freight systems.

Public reports will progressively be made available to download on the Capacity4Rail web page.

Visit us regularly to keep informed.

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement n° 605650

News from the consortium

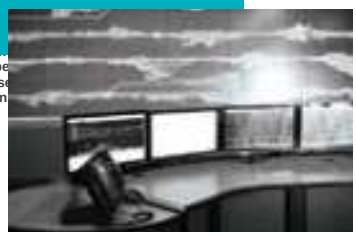
After merging with SNCF-Réseau, the activities of Réseau Ferré de France (RFF) have been taken over by SNCF. Resulting from the merger of Rede Ferroviaria Nacional (REFER) and the Road infrastructure Manager, Infraestructura de Portugal (IP) is welcomed in the consortium. Additionally, Van Dieren AB has been renamed to Samskip Van Dieren Multimodal AB.

Forthcoming public events

Don't miss out!

- Capacity4Rail will be showcased at TRA 2016, the 6th European Transport Research Conference, Warsaw, 18- 21 April 2016
  More info on www.traconference.eu
- The Mid-Term Conference of the project will be held in October 2016.

For more information, visit www.capacity4rail.eu!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Short report on Work progress

SP1- Infrastructure Railway track of the future.

The development of new concepts for railway track of the future for both mixed traffic & high speed (cost savings, rapid construction, advance maintainability through health monitoring, global lower LCC, resilience to natural hazards and environmental efficiency) focuses on two innovative slab-based track concepts equipped with multi-blocks system and on a breakthrough of innovative concepts of Switches & Crossings (S&C).

Following a complete review of the S&C operational failure modes (Deliverable D1.3.1), a innovative S&C designs have been investigated and proposed, aiming towards reduced material deterioration (wear, plastic deformation, rolling contact fatigue) and failures (C4R task 1.3.2). Based on numerical simulations of dynamic vehicle-track interaction using validated models and software, it has been demonstrated how rail and track degradation can be reduced by optimisation of geometry and stiffness properties of the turnout, leading to reduced Life Cycle Cost (LCC).

Figure 1 –The selected reference switch and blade/stock rail couple, for the numerical simulation of wear and rolling contact fatigue in WP1.3 (from D1.3.2)

Various laboratory and field demonstration activities will be carried out within the next few months, to validate some assumptions and design options.

SP3 – Operation for enhanced capacity

SP3 focuses on railway operations strategies that will increasingly use automation for optimised performance and enhanced capacity

In an extensive review of existing practices to improve capacity on the European rail network (deliverable D3.1.1), SP3 underlined that although the overarching needs of the 2050 railway system are widely recognised and shared across the European countries (high capacity; low cost; reliability and seamless integration with the broader transport network), the general effort to make the ambition of making railways the primary mode of transport comes true, still suffers from a segmented approach reflecting the heterogeneity in strategies, objectives and local conditions within by the member States.

Work is Task 3.1.1 is currently focussed on the development of a 'Capability Trade-offs Assessment Tool', a decision support tool based on a whole-systems approach for use at the strategic level to evaluate the impact on capacity of changes to system capabilities. The tool is being designed to look at the overall impacts on the 5 aspects relevant to C4R, affordability, adaptability, resilience, automation and capacity when innovations related to different parts of the railway system are being considered or being introduced. The design and specification for the tool are being developed jointly by TRL and the University of Birmingham, supported by Network Rail. The software for the tool will be developed by Oltis Ltd. It is planned that the prototype of the tool will be demonstrated at Innotrans 2016 in Berlin.

In WP3.2 Linköping University has developed an optimisation model for stochastic prediction of train delays in real time. Initial evaluations have been successful. Next step is to develop a link between Linköping U model and Oltis timetable

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system KADR. The demonstrator developed by Oltis is called CAIN – Capacity of infrastructure.

WP3.3 deals with the automation of the traffic management process. The main result achieved up to now is the formalization of the process implemented to cope with major traffic perturbations, for example in case of extreme weather. The formalization through SysML activity diagrams allows the analysis of the automation of the whole process to be decomposed into the analysis of the specific level of automation of the different activities. This analysis is ongoing, and we expect it to supply valuable insights for the next step of the work. This next step will concern the observation of some case studies of disruption management process implemented for dealing with extreme weather. The lessons learned here, in turn, will be the starting blocks for a roadmap for automation increase.

Passenger satisfaction with the rail network is at its lowest during periods of disruption, and a frequently stated reason for this is the lack of information provided. Railway operators are faced with a difficult problem during disrupted operations, as they often do not have good situational awareness of ongoing disruptions, due to the geographical remoteness of many parts of the rail network. Passengers on site however, may have good awareness of the issue, and thanks to smartphones also have the ability to communicate that information to the rest of the world. Social media platforms represent a rich vein of situational data that could be used in support of railway operations. WP3.4 of C4R is looking at how this data can be mined, allowing relevant data to be identified and reported.

SP4 Advanced monitoring

In order to reduce the number of technical disruptions and delay minutes, as well as reducing the related life cycle costs of the switches, a simple key performance indicator related to the availability for controlling substantial production means has been established. All switches have been classified based on availability criteria, equipment standards for the complete system switch or diagnostic to fulfil performance requirements has been defined and a strategy for the preventive maintenance and implementation concept has been developed. Monitoring the dynamic behaviour of the switch and the frog & blade rail for defects is necessary. The new technology to be developed is based on the identified technologies, the technology evaluation and the context. Two essential questions remain open: which technologies could be developed given the Market Place and what is missing in the Market Place to move forward with the technologies? Specific monitoring requirements and techniques for the new infrastructure elements including built-in technologies and plug&play have been looked at and an analysis of the interaction/interference between sensors and infrastructure elements made: every vibration mode is related to a track component and every change in natural frequencies is related to a failure. RFID technology, widely used in railway infrastructure for identification and localisation, will be used. Concerning the migration of innovative technologies to existing structures, a first evaluation of an –Optasence- fingerprint of a highspeed line has been done and should be analysed by track specialists at DB.

SP5 - System assessment and migration

"What will the railway of 2050 look like?" SP5 ensures a whole-system approach across the SPs to identify visions, future requirements and boundaries by identifying necessary steps, developing migration scenarios, and improving tools for assessment, assessing technologies/scenarios, identifying optimal capacity enhancement scenarios and performing demonstrations. The corridors and sites selected are the fundamental basis for further work and "real" analyses in the project.

A "corridor template" has been developed to acquire knowledge on availability of data. The analysis of bottlenecks (e.g. interoperability, noise and ground bourn vibrations, cross section of tunnels, capacity limitations …) takes into account future demands and requirements such as change

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in markets. Next steps include the completion of bottleneck analysis (global analysis for corridors, detailed analysis on single sections, extension to RRT …) on selected corridors and mapping the identified bottlenecks with respect to the targets / working areas of the project. Scenarios and migration paths will be developed for some sections. Evaluation Templates and Data Templates for RAMS, LCC and LCA will be developed. WP5.5 will coordinate, carry out and evaluate the demonstrations (on-track, in laboratory or in a virtual environment) to be performed in the other subprojects. Detailed demonstration plans will be defined, safety and risk assessment of the demonstrations will be performed, demonstrations in different environments will be carried out and a final assessment of the innovations will be provided. The WP5.5 Demonstration, evaluation and assessment met in Madrid on 1 March 2016.

Project coordination

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The consortium

Capacity4Rail is bringing together a range of 46 stakeholders from 13 nations in an ambitious partnership: infrastructure managers, railway undertakings, logistics developers, research institutes and universities, industrial equipment providers, engineering companies, end-users…

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Special Focus

SP2 - New Concepts for Efficient Freight systems

The main objective of the subproject (SP2) on freight is to develop the rail freight systems of the future, for 2020, 2030 and beyond, by building on the current state of the art using a conceptual design approach. Virtual simulation, used as guidance for real demonstrators, adapted to real situations in different European regions, will be produced and disseminated to the various actors of Europe's transport sector and policy-makers. The newly designed systems will be market-driven ensuring seamless low cost operations for service providers and customers alike.

The developments will be based on the introduction of economically feasible technical development of rolling stock, capacity management, terminal operations, infrastructure maintenance and upgrading. It is recognised that new traffic management systems for better utilization of existing network capacity can only be fully exploited together with better performing rolling stock.

To achieve this, the work has been broken down into four main work packages;

- How to progress beyond the state-of-the-art in Rail Freight Systems
- Novel Rail Freight Vehicles
- Co-modal Transhipments and Terminals
- Rail Freight Systems of the Future

State-of-the-Art in Rail Freight Systems

The work in progress beyond the state-of-the-art (SOTA) in Rail Freight Systems (WP2.1) is aimed at forecasting scenarios for freight flows up to 2030/2050 and identifying the gaps in vehicles, intermodal systems and operation principles which needed to be bridged to accomplish these scenarios.

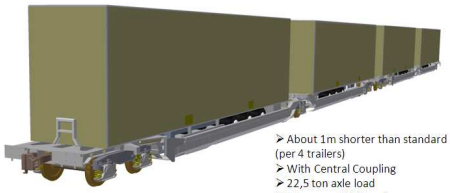
A first draft of the report on "Requirements towards the freight system of 2030/2050" completed a thorough and extensive analysis of the current demand and trends for freight flow in Europe, towards 2030/2050. Costumers' requirements for different goods segments have been identified and the competitiveness of rail compared to other modes assessed. An extensive set of possible solutions regarding technical developments, and operational processes have been scrutinised to set up the prerequisites for an efficient and attractive rail freight system in 2030/2050. The final version of this report will be available soon.

Novel Rail Freight Vehicles

This work package (WP2.2) is aimed at designing the rail freight vehicles of the future. From the general trends and state of art developed in the previous area and from the EU goals for freight developed in the White paper whilst also responding to the precise needs of customers allowing them to choose rail, this area deals with the design of the wagon to enhance its carrying capacity, including the braking system to increase safety, train length and failure detection possibilities in order to allow more possibilities to draw reliable paths for rail freight on the network.

The key elements for the design of new vehicles have been established and several new designs have been proposed.

- With Central Coupling
- Articulated
- 120 km/h
- Max axle load 18 tons
- 760 mm wheels
- Block brake or disc brake
- Pneumatic, EoT or EP brake
- Max number of cars to be loaded 30



- About 1m shorter than standard (per 4 trailers)
- With Central Coupling
- 22,5 ton axle load
- Max speed 120 km/h
- 920mm wheels
- Block brake or disc brake
- Pneumatic, EoT or EP brake
- Max weight of trailer 38 tons

- With Central Coupling
- Articulated
- Max speed 120 km/h
- Max axle load 20 tons
- 840 mm wheels
- Lower weight by 10-15%
- Block brake or disc brake
- Pneumatic, EoT or EP brake

This work needs to be followed up by simulations to confirm the validity of these concepts so that they may be taken forward in a new project. A complete cost benefit analysis will start just along with the simulations to assess the global financial viability of these technically proven concepts. The introduction on the network will be studied by Infrastructure Managers and a migration plan will be elaborated supported by proposals on how to share the benefits to give a just return to the stakeholders which will have to fund the investments.

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Co-modal Transhipments and Terminals

The specific objectives of WP2.3 are the conceptual design of transhipment technologies and interchanges of the future (rail yards, intermodal terminals, shunting facilities, rail-sea ports, etc.), according to their role in co-modal transhipment to influence freight demand distribution, both by operation improvements and logistic leverages.

WP2.3 has delivered the intermediate version of its first key deliverable 'Co-modal Transhipments and Terminals' which deals with the contributions of terminals to future rail freight systems 2030 and 2050. This document examines the expected performances and requisites along with the Key Performance Indicators (KPI) for how the terminals performances can be measured. IT then looks at the integration of innovations and the future scenarios for how the terminals will work and adapt in the future. This work is looking at the three main aspects of terminal work and within each one, key scenarios in real environments have been used. These are;

- Rail-Road: freight interchange (Munich Riem, HUPAC Antwerpen, IFB Antwerpen)
- Rail-Rail: marshalling yard (Hallsberg)
- Rail-Sea: port rail terminal (Valencia Principe Felipe)

Rail Freight Systems of the Future

The work in 'Rail Freight Systems of the Future' (WP2.4) only started in Month 24 of the project and a kick off meeting for the WP was held in November 2015. The main objectives of the work are to study and design new concepts for network-based services for fully integrated rail freight systems to meet the requirements of 2030/2050. This will be done by studying the performance of newly designed fully integrated rail freight systems using simulations and analysing the potential of newly designed, fully integrated rail freight systems and understanding the expected market up take levels. The work will result in a catalogue on rail freight systems which will contribute to the Commission's goals for 2030 and 2050 along with suggested standards for fully integrated rail freight systems.

Freight Dissemination Workshop

A dissemination workshop on the first results from WP2.2 (Novel Rail Freight Vehicles) and WP2.3 (Co-modal Transshipments and Terminals) was held in Brussels on 10 September 2015. It was considered a great success with over 40 people attending, from academia, manufacturers, suppliers, infrastructure managers and the European Commission.

The presentations on Novel Rail Freight Vehicles (WP2.2) explained that the work had taken into account the general trends established in WP2.1 (SOTA in Rail Freight Systems) and was now developing the designs based on market requirements taking into account customers needs. For this purpose, Van Dieren, a large forwarder already operating Trans-European trains, developed views on the gaps in the market and their expectations. STVA a car carrier operator involved in multimodal transport involving rail links suggested improvements on the wagon design and on certain functionalities to improve its efficiency.

NtnetAB, an Industrial partner is developing new wagon designs and Knorr Bremse, an equipment provider, is developing solutions to meet market needs and to enhance efficiency, safety, reliability and competitiveness of the rail links in the supply chains. Finally, Knorr-Bremse introduced a research development in asset intelligence by opening the field of synchronized braking, predictive maintenance and automated coupling.

KTH Royal University of technology presented the state of the studies on the impact of the proposed solutions on safety and maintenance aspects. KTH also presented the actual trends in the industry to compare with the proposed evolutions. Finally, the Infrastructure Manager, Trafikverket, gave their opinion on the possible introduction of trains incorporating the proposed innovations on the network.

A lively discussion was held and many suggestions and comments were made and one of the key issues raised was about the concerns on cost, reliability and flexibility.

In the area of Co-modal Transhipments and Terminals (WP2.3) a general viewpoint was presented by KTH – Royal Institute of Technology, describing the achievements on operation of logistic chains, where the terminals are integrated.

Case study feedback was presented by DB/DUSS about the München Riem freight interchange, by Newrail about the terminals in Antwerpen, by Trafikverket about the marshalling yard in Hallsberg and by Fundacion ValenciaPort about the Principe Felipe rail terminal in the port of Valencia.

During the presentations and in the following dedicated session many items were discussed following many questions from the floor.

SP2 is led by Trafikverket

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