

NOTE TO THE GOVERNING BOARD THE EUROPEAN DAC DELIVERY PROGRAMME

Background

On 28 May 2020, the S2R ED presented the European DAC Delivery Programme to be integrated within the activities of the S2R JU, to the ED Programme Board after having explored informally the possible set up with DG MOVE, large part of the IP5 community and rail associations.

No comments were formulated at the ED Programme Board meeting or later on.

At the meeting of the Governing Board on 22 June, the ED presented the slides on the setting up of the European DAC Delivery Programme, clarifying also the aspects related to possible budgetary impact for the JU, asking for an overall endorsement of the approach by the GB.

The Governing Board, before providing such endorsement while supporting informally the proposed approach, requested the ED to provide a summary paper on the topic.

S2R IP5 DAC

DAC opens the door to the comprehensive automation and digitalization of rail freight transport. It is both an enabler and a driver of innovation. With the DAC the basis for significantly faster and more efficient processes are created.

DAC introduction is also synergies with ETCS Level 3 since it would provide on-board train integrity (a condition sine qua non for ETCS evolution) – this element has been flagged in IP2 activity, while being a key enabler for 740-m long freight trains – a strategic TEN-T objective enshrined in 2013 TEN-T Regulation.

DAC reduces drastically coupling effort for freight trains, meaning major time and manpower cost savings in the consist formation. This time reduction and cost reduction can certainly impact on key aspects for rail freight like price and time response helping the green deal mandate of moving freight from roads to rails. DAC is a clear move towards a much better Health and Safety environment for freight handling reducing the human exposure to risks in the coupling operation. It enables Digitalization, Intelligent maintenance of wagons based on data on which to apply IA strategies and Big Data analysis and eases the deployment of ERTMS and ATO functions addressing the train integrity. It could also be used as an instrument for integration with supply chain Forwarders, Manufacturers, etc. with the availability of real time data regarding position and related information, which also open the door for realistic estimated time of arrival and status of the load. It is also an instrument for the control and management of key safety aspects of the freight rail transport like age, mileage and maintenance condition of each wagon.

Innovation Programme 5 - Technologies for sustainable and attractive European rail freight includes in its activities the Digital Automatic Couplers' (DAC) research and innovation. This is part of the overall

R&I objective to achieve the Intelligent Rail Freight enabled by different technological and operational solutions including those coming from other Innovation Programmes (for example on ATO).

More specifically, the DAC is part of the “Fleet Digitalization and Automation” of IP5. TD 5.1 has the objective to foster and accelerate the development towards condition-based maintenance, which is enabled by digitised assets connected by Digital Automatic Couplers and with an Asset Control Tower for rail freight. The Internet of Things (IoT) architecture supporting Condition-based maintenance (CBM) is in turn an enabler of further condition-based operations and eventually of rail freight automation at the highest grade (GoA 4), which represents the final target state of the IP5 vision according to the MAAP.

In terms of DAC, the objective of the specific Technological Demonstrator includes automatic coupling and decoupling including power, air and data connectivity to serve the electrification of long and heavy trains for condition monitoring of wagon and goods, electropneumatic brake (eP), train integrity testing, which will increase train and yard productivity by up to 30% as well as reduce labour costs, increasing safety, in the train composition process.

Digitalization means integration of data into business and operational model, making use of different technological enablers in an integrated and interoperable manner, built on open standards and interfaces to harvest the value of such transformation.

The start of the DAC work in the S2R Programme meant analysing current state of the art and future need for compiling technical requirements that should be fulfilled by the new DAC¹; it was followed by the establishment of the necessary requirements². Following the specific work performed, the solution will be tested in further steps with the support of Freight Railway Undertakings.

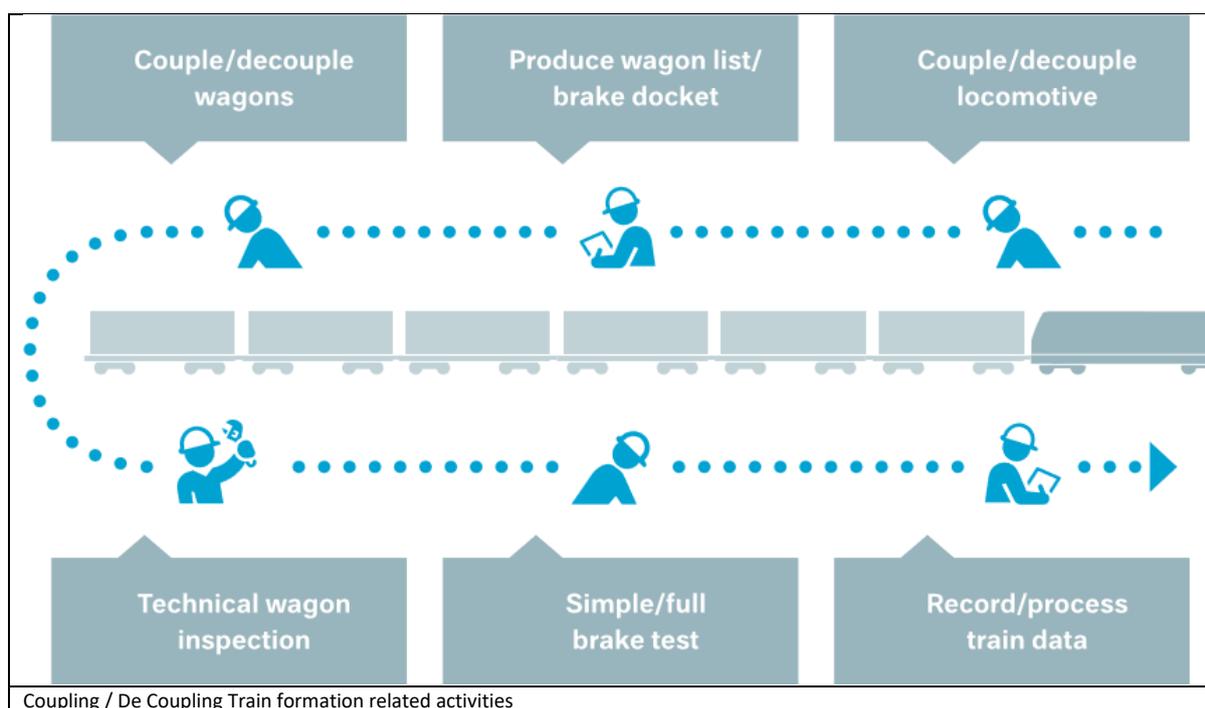
There are different levels of autocouplers ranging from the basic one (Type 1 AutoCoupler) that in an automatic way latches one wagon to the convoy (pure mechanical integration) assuring safe and reliable operations of the trainset to brake pipe connection (Type 2 Coupler), Power (Type 3) and Data (Type 4) and automatic decoupling (Type 5). S2R research activity conducted surveys and derived a business case to identify the kind of coupler with the best potential future business case and also to identify the return on investment.

A Cost/Benefit model was derived to prove the feasibility of the rollout of the concept³. The study is based in transport chains working under different operational scenarios. The model discerns operational processes which are directly or indirectly affected by the introduction of DAC. The processes directly affected are the train composition and de-composition (i.e. the coupling and uncoupling processes); among the processes indirectly affected like the brake test, the train and wagon data collection for train composition and also train availability as DAC may allow trains to operate at a higher overall speed and reducing dwell times at Yards.

¹ Fr8Rail D5.1 - State of the Art on Automatic Couplers

² Fr8Rail Deliverable D 5.3 Technical requirements for automatic couplers

³ FR8Rail D5.5 – CBA for Automatic Couplers



Based on FR8Rail D5.5 – CBA for Automatic Couplers⁴, the analysis for the DAC with different automation levels, and different transport chains (wagonload and intermodal) indicates that once implemented across the network:

- 1) A very positive business case, in most cases, and never negative,
- 2) The cost-benefit-ratio improves strongly when aiming for auto coupling with brakes, power and data capabilities,
- 3) Huge indirect benefits of DAC (i.e. their enabler- and facilitator-role for process improvements beyond the coupling and de-coupling,
- 4) Business case can be achieved even in a market environment with low labour costs.

⁴ pages 25 onwards.

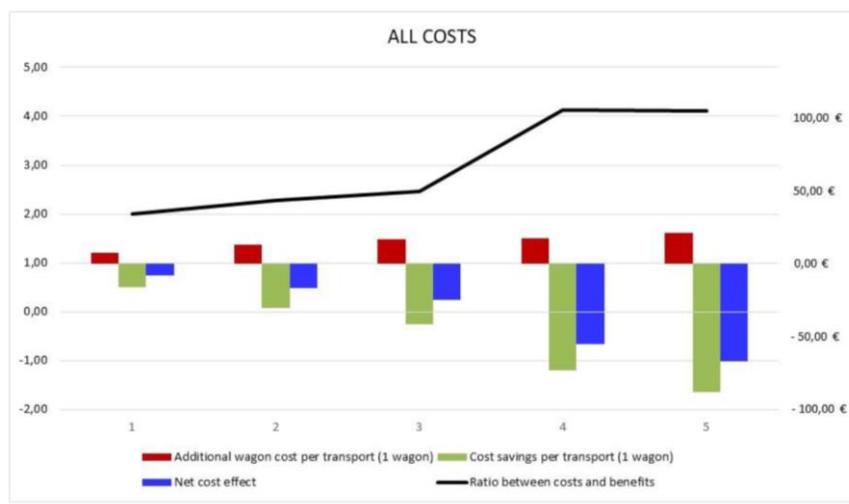


Figure Shows Net Cost effect in negative as negative as any cost reduction is a negative factor in cost build up. The same Rationale applies to cost savings

The R&I effort focuses on the design of a modular DAC. Assuming from the car body or body shell the suspension and energy absorption systems, the DAC system can grow from lower features to full capabilities depending on the expected or absorbable cost, taking into account that cost is a paramount driver in order to be successful⁵. Cost has been very much taken into account in the innovation process and has been considered at every stage of the project: cost has been one of the factors (fragmentation, lack of programme management, migration plans, business cases, etc.) why previous solutions have failed in the European freight sector. Therefore, the target cost for a DAC should correspond to an order of magnitude around the cost of the current non automatic coupling solution.

During the R&I work, some values were determined under different assumptions subject to volumes, retrofitting versus new wagons/locos, etc: it can be expected that under a coordinated programme cost efficiency gains might be achieved.

Within the S2R Programme, CAF is leading the technical part of the development and it is assisted and followed by other relevant S2R members like DB Cargo and Trafikverket. In S2R FR8Rail II project, CAF concluded the detailed design, proved the technology first in a Lab Test Bench and moved to a full scale prototype to be tested up to TRL6 with the focus in validating in laboratory environment the main coupler functionalities and signals of DAC Type 4. The result of these tests are part of D1.7 Automatic Coupling Prototype Tests, initially scheduled to be finished by sept 2020.

As from last quarter of 2020, the following FR8Railx Projects will aim to test S2R DAC Type 4 in a competitive environment, starting from the one in Sweden under specific operational conditions and in different kind of wagons. The aim of these competitive testing was already looking to finish by 2022 with a defined and approved set of specifications for the EU DAC.

Finally, to be noted that the S2R DAC is conceived with growing features and cost alignment. The S2R DAC is thought with the idea that the choice by a wagon owner towards a S2R DAC Type would depends on the specific needs but it will not lock-down the choice to that specific type as the solution

⁵ Ref. SR FR8Rail Project D5.3 Technical requirements for automatic couplers

is interoperable and scalable to other type levels. Hence, the S2R DAC, as indicated technologically led by CAF, is modular by design.

THE EUROPEAN DAC DELIVERY PROGRAMME

As already indicated, the DAC cannot be looked at in isolation but as a key component of the Intelligent Rail Freight. In this respect, a series of solutions based on wireless systems are already on the way to contribute to major improvements in the overall Rail Freight operations, such as digital break test.

The overall objective, that goes beyond the coordination actions undertaken in this European DAC Delivery Programme, is to achieve the Intelligent Freight Rail, building upon different enablers largely within the scope of IP5 – data, telecoms, sensors, positioning, autonomy, etc. – where the Digital Automatic Coupler is considered one of the major game changers whose deployment success results from a shared sector vision.

IP5 shall steer and ensure innovative solutions resulting from R&I become available to be consider for a delivery to the market via specific activities such as this Delivery Programme.

Objective

Mainly, building upon the research and innovation performed in the S2R Programme, and enlarging to the sector the opportunity for additional input, the primary objective is to achieve a European DAC solution delivered through an integrated shared Programme and pave the way for a fast, technically and economically feasible European-wide roll-out.

More specifically, this will include to steer and support:

- the selection of an open, fully functional, operationally tested, safe and sustainable European DAC model ready for industrialization and deployment,
- the delivery of a final open design of the selected model, based on use-cases considerations, by the end of 2021 of which interoperability and safety requirements to be incorporated to TSI, Green Deal & Digitalization Package 2022,
- the production of an efficient and cross-countries compatible migration and business plans,
- the Identification of possible European and national funding opportunities to achieve the migration plan(s).

This objective can only be achieved with a step-by-step approach to take into account the results of initial demonstration activities, national or ad hoc business case(s), etc. to reach an informed and sector shared decision.

In the short-term, the deployment of DAC Type 4 – to generate benefits for the European rail system as soon as possible – will be a key target but not an end to itself: to ensure interoperability and compatibility with a DAC Type 5, the feasibility of the upgrade from Type 4 to Type 5 needs to be embedded in Type 4 and its deployment plan.

To be considered, also,

- the need to provide, at least mechanical and geometrical characteristic of this DAC Type to ERA and to look into the possibility of a critical migration strategy including the inclusion of transition periods,
- a coordinated sector approach toward a possible sector harmonised standardisation, that could be pre-initiated with the outcome of this activity.

Why Shift2Rail and its successor

During the performance of the research and innovation activities, key Members involved in Shift2Rail ensured that the DAC activities would receive the necessary attention to accelerate the market uptake of this valuable work. This to be assessed in the context of the overall S2R Programme and its successor, including a European Traffic Management layer that would optimise the allocation of capacity across Europe.

In the informal discussions with different Members, stakeholders and sector associations, Shift2Rail was indicated as the most recognised, neutral and independent institutional organisation capable to facilitate broad and unconditional sector discussions on impact, transition, migration, deployment and financial aspects.

Nevertheless, some expressed the risks of the decision making process, for something largely affecting the sector, retained in the hands of a limited number of entities represented in the Governing Board of the JU. Taking stock of the discussion and shared sector view on the set up of the “System Pillar” in the successor of S2R, the experience with the Linx4Rail Project in relation to RCA and OCORA, it is proposed to set up an ad hoc supervisory mechanism for the management of the DAC Delivery Programme. This appears reasonable considering that the JU will not fund as such the activities to be performed – due to the exhaustion of the resources available which are expected to be fully used by the Members and Open Call beneficiaries – but only support some high level coordination activities (see below).

In addition, as already indicated, DAC is embedded in the R&I work performed by the JU: its delivery Programme would be one approach to accelerate the market uptake of the investment done within the JU.

How in Shift2Rail

In order to answer to the concerns of the sector,

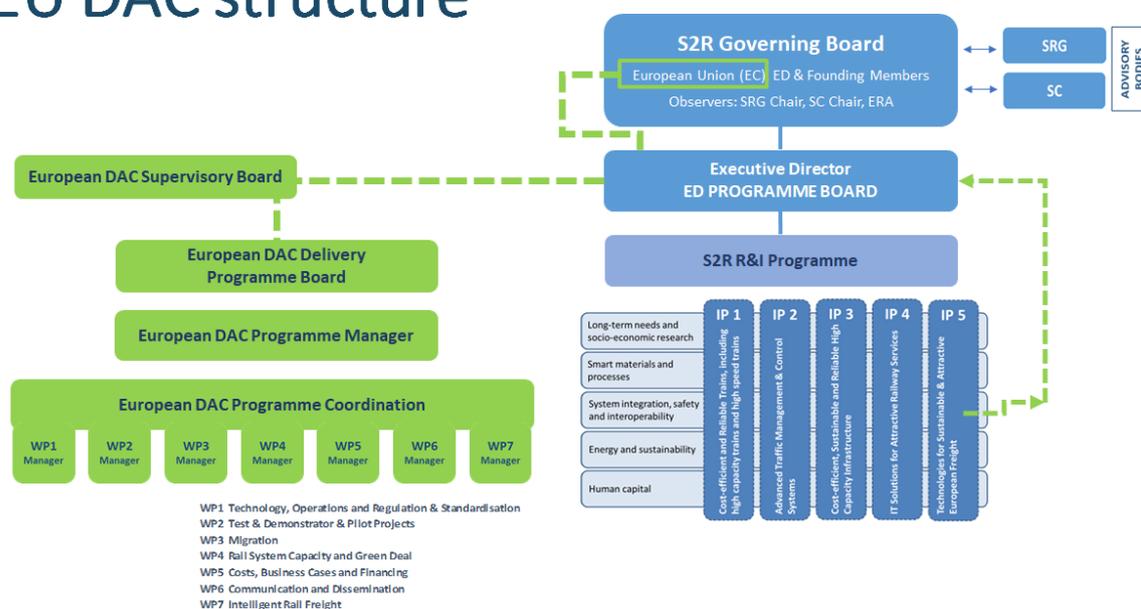
- on the one hand, the Delivery Programme shall have the necessary governance to benefit from the right expertise in the decision making process and the correct representativeness,
- and, on the other hand, the R&I in IP5 shall continue under the clear steering and leadership of the Members there involved

while the ED, assisted by the S2R Programme Board, would ensure the overall coherence of the activities performed.

In this respect, it is proposed to set up a dedicated structure in the form of a specific Programme, consisting of work packages with specific thematic delivery objectives, from technological assessment of the solutions, testing and demos complementing as needed the activities in IP5, definition of migration plans, assessing the interfaces with other programmes, business cases, communication and

dissemination. Finally a specific work package, building upon the work of IP5 and its successor with an enlarged participation as needed, will look into further innovation (see chart below).

EU DAC structure



In order to ensure adequate Programme Management a dedicated person will have to take the leadership in the Programme and they will be mirrored by the S2R Head of Unit for Research and Innovation, supported by the IP5 Programme Manager.

A European DAC Supervisory Board, to be chaired by the Commission – DG MOVE, participated by the European Associations’ representatives, ERA and the S2R ED – who will ensure the liaison and views of the S2R Programme Board – will supervise the progress of the work, formulate recommendations and guidelines to the European DAC Programme Board and provide a final endorsement as needed.

A Programme Board participated by the high level representatives of the entities involved in the Programme and the S2R ED, with the Commission and ERA as observers, will be the decision making body. It is expected to consist of Freight Operators, Infrastructure Managers, Wagon Keepers, DAC producers and relevant suppliers. The necessary measures in terms of CoI and a possible legal framework established to ensure an effective and efficient collaborative approach.

Impact on Shift2Rail resources and funding

As already indicated, with the Call 2020 and the relevant engagements, the JU has made use of all the funding provided by the Union for the S2R Programme.

Nevertheless, it is expected that the 2020 commitment for the Framework Contract Operators would allow allocating an indicative amount of around EUR 0.2 million to support the programme management activities to ensure a proper launch and initial support, as the rail operating community has expressed strong interest in the Programme itself.

In terms of internal resources, the Head of R&I supported by the Programme Manager IP5 will ensure the overall coordination of the activities from the JU point of view.

The above is fully in line with the AWP2020 and in this respect it does not require any amendment or decision by the Governing Board. The resources are against the budget allocated to Open Calls.

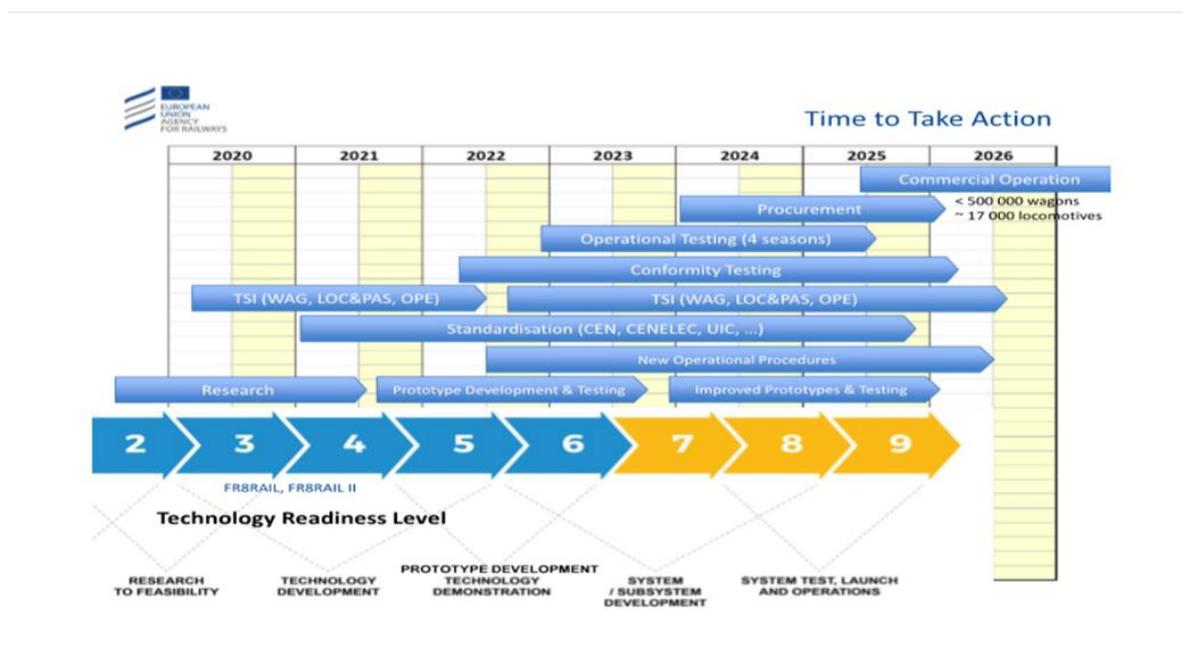
Planning

The initial planning for the European DAC Delivery Programme foresees a start of the activities as from the endorsement of the present approach by the Governing Board, in accordance with the following:

- End July 2020 Invitation for the Supervisory Board followed by the Invitation for the European DAC Programme Board to freight operators, Infra Managers, Wagon Keepers, DAC manufacturers, etc.
- Early Sept 2020 First meetings of the Supervisory Board, Programme Board, Kick-off of the activities
- End of Sept 2020 Start of the different WPs, definition of the activities WBS, target delivery dates, etc.
- During 2021 Monthly meetings of the Programme Board to monitor the progress of the work
- 2nd Quarter 2021 Assessment process of the European DAC solution subject to the test activities during 1st Quarter 2021
- December 2021 Delivery of the DAC open model specifications for the TSI Digital Package

This initial high level planning shall be complemented with the overall possible planning for the DAC.

ERA, at a CER meeting presented a possible timetable including standardization and regulatory aspects that will be considered in setting up the activities:



DECISION FOR THE MINUTES OF THE GB

The ED is hereby requesting the Governing Board to

- take note of the European DAC Delivery Programme to complement the S2R R&I activities of IP5 and the freight R&I in a S2R successor;
- endorse the approach to ensure that the results of IP5, specifically S2R DAC, would be supported towards TRL 9 in order to pave the way to the future deployment;
- confirm the strategic role of IP5 and its Members in steering S2R Research and Innovation towards the achievement of the objectives defined in the Multi-Annual Action Plan May 2019 taking into consideration the feedback and interaction with the European DAC Delivery Programme; support an active role of IP5 in this Programme;
- take note of the impact on the S2R resources of the European DAC Delivery Programme.

The ED will inform regularly the Governing Board of the progress achieved and any additional action would be needed.

Done in Brussels on 1 July 2020