



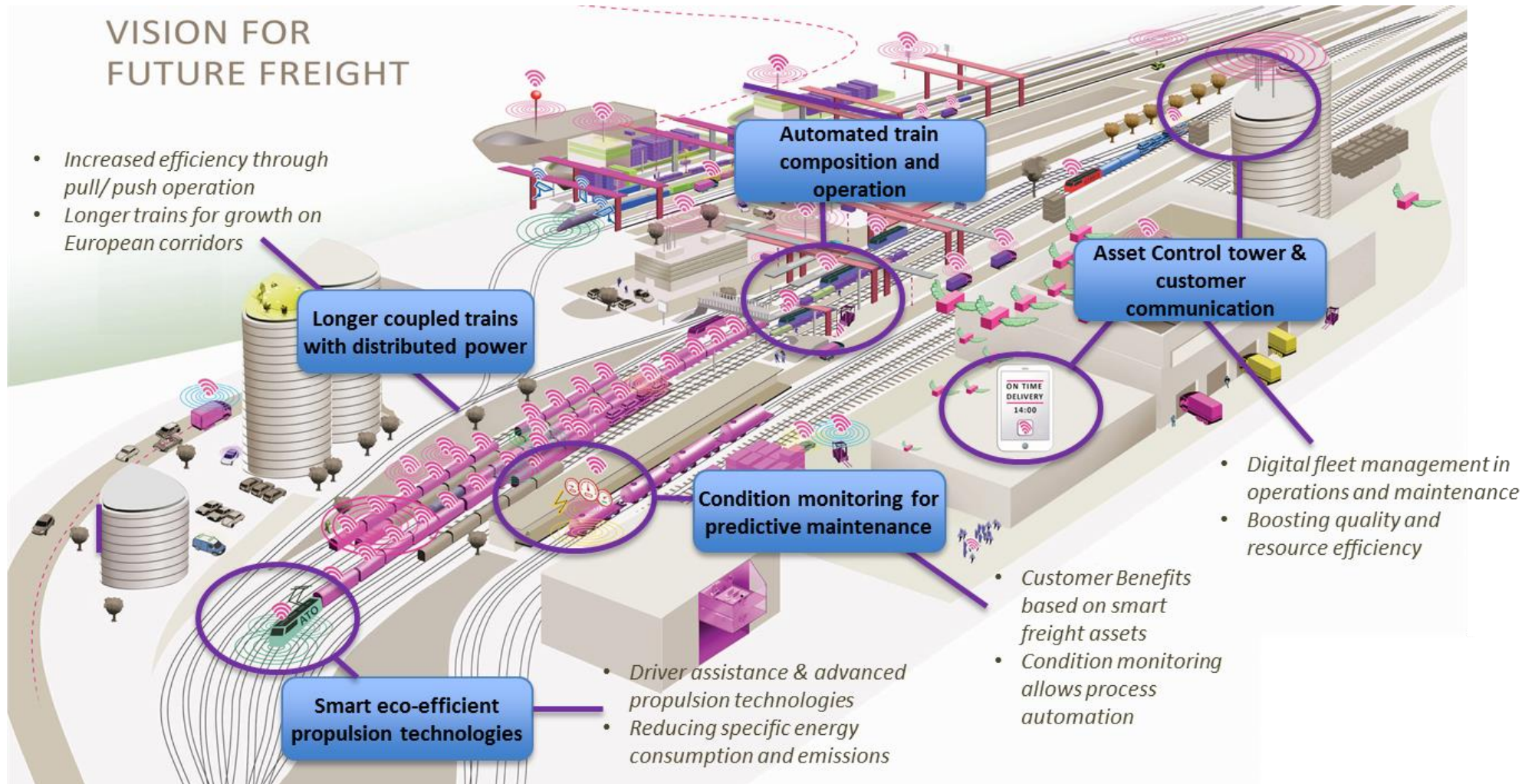
EU Brokerage Event Shift2Rail Calls 2019

Activities within IP5 - IP5 -
Technologies for sustainable &
attractive European rail freight

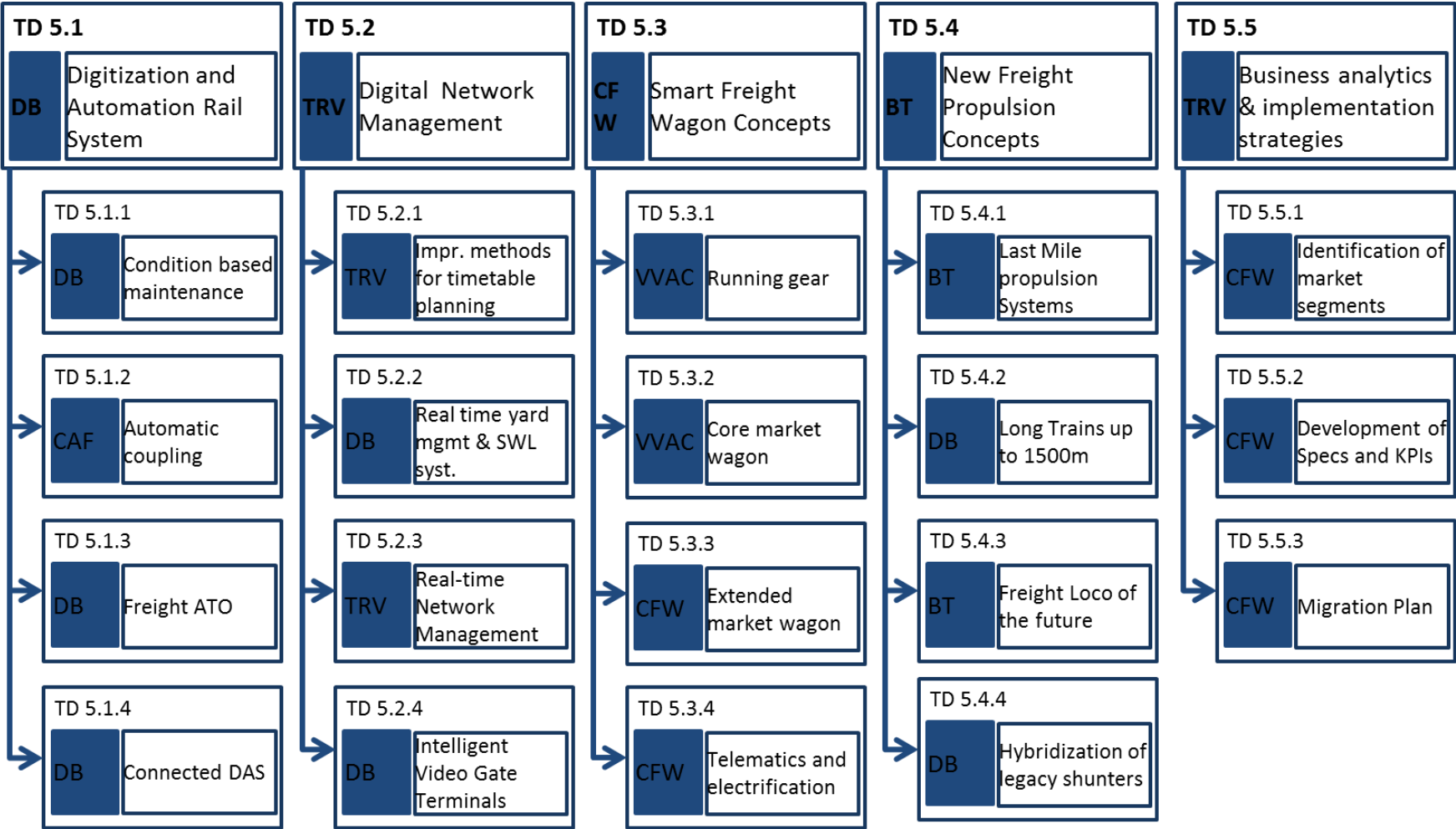
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#Horizon2020



IP5 has defined an integrated vision that guides the individual projects towards joint targets for the rail freight sector



IP5 brings together essential players from rail freight sector and is structured in five TDs



S2R-CFM-IP5-01-2019: Smart data-based assets and efficient rail freight operation

In the framework of the general challenges highlighted in the IP5 part of the S2R Master Plan, the following specific challenges should be addressed by the proposal in answer to this topic:

1) Condition based maintenance (CBM): Rail operators are facing an increasing complexity of influencing factors on their competitiveness. The required flexibility and agility for adaption can only be granted, if digital technologies are used globally – which is today often not the case. Condition Based and Predictive Maintenance need to transform from a support function of rail freight and asset operation to a source of innovation. In the future, CBM plays a key role in identifying additional revenue and profitability potentials using current freight locomotives and wagons. Nowadays each European country is using its own maintenance rulebook with individual thresholds which indicates required maintenance activities. This will affect the roll-out of the defined condition monitoring thresholds tremendously. CBM use cases need to be defined for rail freight, resulting in user-centric specification and design of CBM dashboards with the objective of being used all over Europe with their individual specifications. In this manner, CBM use cases would be aligned with the European rail traffics. The challenge is to create an advanced monitoring solution of locomotive and wagon components to monitor the conditions in different rolling stock types across Europe in a centralised way. Central collection of performance metrics for development of digital maintenance rules is essential.



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2) Real-time Network Management: It is a complex task to manage yards and to interact traffic operations at lines and network with the yard. Today operational traffic in yards is handled manual with much oral communication and the interaction between yards and the network planning and dispatching at infrastructure manager level is poor. This leads to long lead times and manual sequential processes when there are disturbances. The connection between timetable and operational traffic is low. The freight trains are not following their planned train path between yards. This problem has a huge impact on overall system punctuality. The challenges can be described as follows: i) the challenge to improve manual process at yards with better decision support for the personal; ii) The challenge to improve the interaction between the yard manager and the infrastructure manager; iii) the challenge of automation in traffic operation and dispatching processes. These challenges will generate changes in the work for different actors.

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3) Intelligent Video Gate Terminals (IVG): Lack of information and thereby lack of optimal terminal processes with problems in reliability and poor lead times represent a problem in terminals. Therefore, definition of relevant use cases enabling better data capture and information flow for rail freight terminals is important. User-centric specification and design of Intelligent Video Gate Terminals are also affected and are currently suboptimal. It is therefore essential to select a relevant pilot site and performance of a demonstrator for IVG-Terminal Operation tackling the involved challenges. Freight wagon availability and flexibility is a key factor for success in today's rail freight transport market. The market is highly under pressure from road freight transport alternatives which are often more competitive and flexible. This hinders a shift traffic flows from road to rail. Efficiency improvements during the inbound and outbound trains operations at terminal gates and improved data exchange of relevant information between terminals will speed up the process gaining in efficiency (e.g. saving time in terminal operation, increasing punctuality in delivering, etc.) and reducing costs. A collateral benefit that is expected with IVG technology is related the support to wagon inspection useful in maintenance and automatic damaging detection.

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4) Core Market Wagon: Definition of validation scenarios for the novel designs following the 5L-Wagon designs are required in order to accelerate the market-uptake. Enhancing the function of the Core-Market Wagon Design putting it in the context of connected asset by established and affordable add-ons such as Wagon on-Board unit (WoBu) with energy harvesters shall address the challenge of fast and practical deployment of packages. Providing mechanical solutions and interfaces for future solutions such as automatic couplers shall enable modular and scalable system.

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5) Extended Market Wagon: Final specification of the wagon structure and the wagon equipment, the integration of mechanical and electrical components in the wagon design will create the basis for the prototype manufacturing in future projects. This work will include the preparation of the authorisation process for the extend market wagon in TSI Wagon. The main challenges in this area are related to the structural integrity of the wagon and the safety of its technical equipment, especially for the supervision of the wagon. The energy efficiency of rail freight transport in terms of aerodynamic drag can be significantly increased by technical and operational measures. The requirements for a successful optimization of the numerical tools differ greatly from the methods used for passenger trains. The numerical methods must be adapted to these complex flow conditions and validated accordingly in order to be able to carry out loadable resistance predictions.



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6) Telematics & Electrification: Nowadays, digitalisation is changing processes in many sectors, improving competitiveness and offering new innovative services. Rail freight transport is not an exception and it needs to take advantage of digitalisation, i.e. by introducing IoT by means of telematics, sensors and electrification leading to the intelligent wagon. This should fill the gap with respect to other means of freight transport and increase the reliability, trustability and efficiency of the rail freight transport. However, there is a need to clearly develop the required systems and services according to the demand of each operator i.e. cargo monitoring for logistics, wagon monitoring for maintenance, exact weighing, etc. These services make use of other services such as positioning and communication with standardize interfaces. The intelligent wagon will be, among others, one of the enablers of CBM, which will make use of the information provide; or the automatic coupler which could be controlled by the intelligent wagon. The challenge is to develop the required systems and services for the intelligent wagon as enabler for further services.

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7) Freight Loco of the future: The challenge is to further improve the high-power propulsion system of mainline freight locomotive (including the auxiliary network) to lower significantly the LCC and TCO of the traction chain.

S2R-OC-IP5-01-2019: Condition-based and preventive maintenance for locomotive bogie

SPECIFIC CHALLENGE:

The development of intelligent tools and methods for predictive maintenance are needed to optimize the availability of rolling stock, the quality of service, maintenance costs and return of investment. Condition-based and Predictive Maintenance means predicting when a fault is likely to occur and issuing a warning if the component reaches its lifetime limit or even if an overhaul is required. This information will be distributed automatically to fleet and workshop management systems and trigger actions in accordance to maintenance.

Condition-based and Predictive Maintenance requires sensors and communication boxes for data transmission, but more importantly, data analytics and monitoring tools, an asset management centre and a database with maintenance program and rules. The main driver for current maintenance costs is the locomotive bogie. Therefore, the main focus of this proposal shall be given to the condition-based and predictive maintenance of the locomotive bogie (i.e. motor bogie and trailing bogie), which is at the top of the material costs.

S2R-OC-IP5-02-2019: Advanced obstacle detection and track intrusion system for autonomous freight train

SPECIFIC CHALLENGE

The future of rail freight will be fully automated. For the operation in automation grade GoA 3/4 (attended and non-attended operation), all activities and responsibilities of today's train drivers needs to be taken over by several systems.

Among other things, the GoA 3/4 system must be able to:

- Sense the environment to overlook the scene;
- Detect potentially dangerous objects on the train's path;
- React accordingly and in the right way.

The obstacle detection system will need to monitor an environment according to freight specific and general use cases e.g. EN62267 and/or relevant projects working in the field of automation.

Example for challenging situation:

- System should have the ability to detect very long ranges e.g. up to 2 km;
- Encountering troubling weather conditions, including heavy winter and desert-like situations;
- Being able to detect pathways;
- At large speed ranges from 0km/h up to 180 km/h;
- In line with the achievement of SIL 4 for the entire GoA 3/4 system.

THANK YOU

