CER & EIM Position Paper

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"Railway System Architecture"

CER & EIM Position on "Railway System Architecture"

Introduction

Most railway systems in Europe have been developed on the national level or even on regional-technical level, leading to a heterogeneous system at the European level. A common EU railway system architecture is lacking, making innovations and changes to the whole system difficult and costly.

CER & EIM members support a common European vision of the railway sector through the System Pillar (SP), as part of Europe's Rail Joint Undertaking (ERJU). The System Pillar brings together rail sector representatives under a single coordination body. The primary objective of the System Pillar is to develop a coordinated approach to the evolution of the rail system and the strategic vision of the Single European Railways Area (SERA). This includes, among others, considerations related to cyber-security, command, control, and signalling systems (CCS), and Digital Automated Coupling (DAC).

CER & EIM believe that a harmonised/standardised architecture is crucial for the future of the European railway system and that the System Pillar plays a central role in defining this architecture. To unlock the full potential of the System Pillar, we aim to advance the current approach on how to reach this harmonised architecture.

With this paper, we express our support for the approach of the system pillar, commit to its main objectives, acknowledge its challenges, and foster the usability of its results in order to create the best value for the European Railway system.

Current targets and challenges

In order to achieve its objective towards a common and interoperable railway in Europe, the system pillar has to deliver a **harmonised operational concept** and a **modular and harmonised system architecture**. It targets, among others, the development of a CCS system with radio-based ETCS only.

CER & EIM support the objective and deliverables as stated. The architecture, as promoted by the Europe's Rail System Pillar, should be based on principles of **modularity, upgradability, scalability, and economic viability** for all railway sector stakeholders.

However, we highlight that the System Pillar needs to support progress that is achievable rapidly, with fast benefits for the sector, whilst ensuring that investments are and will be protected and that the migration towards SERA is economically viable and feasible for the sector (in particular for those market participants operating in a competitive environment).

Thus, the System Pillar as a whole should put an emphasis on a migration strategy based on the current systems as a starting point and upgradable intermediate stages to sketch the way towards the ultimate SERA system goal.

"Migration Plateaus" for improved usability

These intermediate steps for improved usability, are what we refer to as "**migration plateaus**" (intermediate stages) allowing business continuity along the different areas of use with different migration stages. These migration plateaus should aim to be future-proof and compatible with the final target system. They must **safeguard investments** and enable access to new functionalities that are of added value. This means avoiding forced upgrades and requires a modular system architecture, combined with the corresponding regulations when strictly necessary, that ensure upward and downward compatibility of components throughout their specified lifecycle.

The focus of the migration plateaus should be on harmonising and standardising priority interfaces between the main building blocks of the modular system architecture. These interfaces and rules should enable railway undertakings and infrastructure managers to integrate harmonised solutions according to their migration needs.

The target architecture, as well as solutions that have proven their maturity, should become part of standards to safeguard investments. Migration must be verified by **economic assessments** at different stages.

Proposal for the first migration plateau

CER & EIM consider relevant sections of the Interoperable **Core Network Corridors** as the first and main targets for the deployment of the foreseen architecture. To make the definition of the target system more tangible, we outline a **sketch for the first migration plateau**. Regarding the **architecture**, the first migration plateau should focus on mature solutions. To expedite progress, we favour the utilisation of existing architecture building blocks and the integration of available specifications, providing an immediate match to the later System Pillar top-down development approach. The first migration plateau should aim to support migration paths towards harmonised European operational rules for ETCS only operations.

All of this under the condition that a solid migration plan proves the feasibility of transition in terms of economics and resources for upgrades needed, in particular for those market participants operating in a competitive environment.

The benefits of the target system

Harmonisation through the definition of the target system architecture within the migration plateaus has several advantages. Firstly, the definition of the target system architecture and the interfaces will further provide **stability** to the system, while at the same time, it does enable the **evolution of new technologies**. It will, therefore, provide guidance for the System Pillar Migration work stream.

Secondly, this approach will be a first step towards the alignment of the sector in a common railway architecture, **modular, smoothly upgradable, scalable, and economically viable**, with a similar migration path towards the final target architecture.

Thirdly, the definition of a harmonised architecture and its modules will allow **economically viable investments** in the sub-systems. This approach enables a deployment that can be managed based on economic feasibility in particular avoiding a reduction of competitiveness of railway undertakings and the actual financial capacities and resources of the infrastructure managers and railway undertakings. The definition of the first migration plateau is of utmost importance, defining the first period of reliable stability for the sector.

The long term view designed by the System Pillar will enable the design of migration plateaus and avoiding incompatibilities between them. A migration plateau should be seen as a significant step and could be defined – due to economic and competitive reasons for upgrades within the sector. Major technological leaps are expected to take place every 15-20 years (corresponding to the respective life cycle of parts of subsystems), whereas "smaller intermediate modifications" could be necessary for shorter periods when techniques or solutions are mature and implementation is economic viable, but forced upgrades must be avoided. Overall, a balance must be achieved between stability and innovation and business benefits, so that incompatibilities within the system are avoided and only taken if the scope and functionality enveloped entail major benefits for the sector.

Conclusion

CER & EIM members believe, that following this approach could support paving the way to a harmonized European Railway System Architecture and ultimately SERA, making innovation of the whole system faster, easier, and reachable. We are committed to this goal and are determined to support this initiative of the whole sector.