

# Dispatching Trains from the Cloud

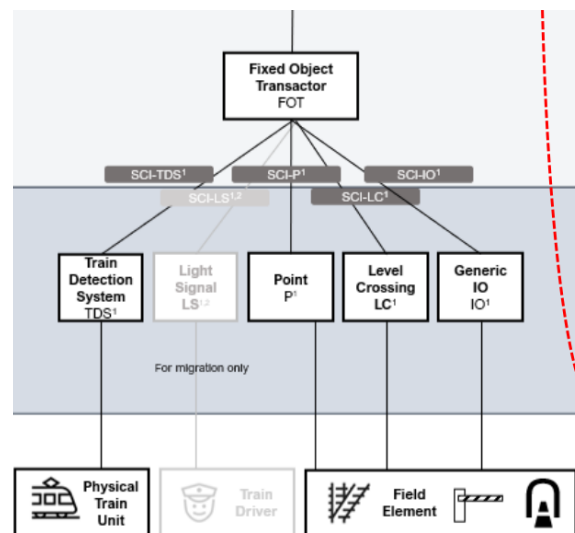


Digital Command, Control and Signalling Infrastructure for Deutsche Bahn  
Operating Systems & Middleware Master Project, Winter Term 2022/2023

European railway agencies are pushing forward a unified and standards-based architecture for digital interlockings and the associated trackside elements (e.g., light signals, points, train detection systems, level crossings). This is part of a large-scale effort to modernize and harmonize the European railway infrastructure [1].

Although many system components carry safety responsibility, the IP-based communication protocols enable more distributed and flexible architectures for the command, control and signalling (CCS) infrastructure. A centralized cloud-based digital CCS infrastructure could be faster to implement, easier to update and cheaper to maintain than today's fragmented distributed systems [2].

The envisioned architecture developed by the RCA ('Reference CCS Architecture') working group shows a fully integrated, layered system with trackside and on-board components. A prototypical implementation of the system was created by Deutsche Bahn (Advanced Protection System, APS).



*Excerpt of the Reference CCS Architecture*

The focus areas of this master project are:

- Identify system components that are suited for centralized deployment in cloud and edge environments
- Prototype and evaluate a runtime environment for portable software execution, meeting the reliability requirements for the railway domain (e.g., by applying software-based segregation, symbolic and diversified execution, NooN architectures).
- Develop fault models and metrics to investigate the reliability of system prototypes created by DB and SBB, leveraging the HPI's EULYNX Live Lab infrastructure

The project will be carried out in close collaboration with various partners from research and industry: TU Berlin, TU Dresden, Uni Passau, DZSF, DB Netz, SBB, Railergy, PaxLife.

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[1] [https://www.bmvi.de/SharedDocs/DE/Anlage/E/machbarkeitsstudie-digitalisierung-schiene.pdf?\\_\\_blob=publicationFile](https://www.bmvi.de/SharedDocs/DE/Anlage/E/machbarkeitsstudie-digitalisierung-schiene.pdf?__blob=publicationFile)

[2] <https://digitale-schiene-deutschland.de/Downloads/Research%20Report%20-%20SIL4%20Data%20Center.pdf>