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codewerk



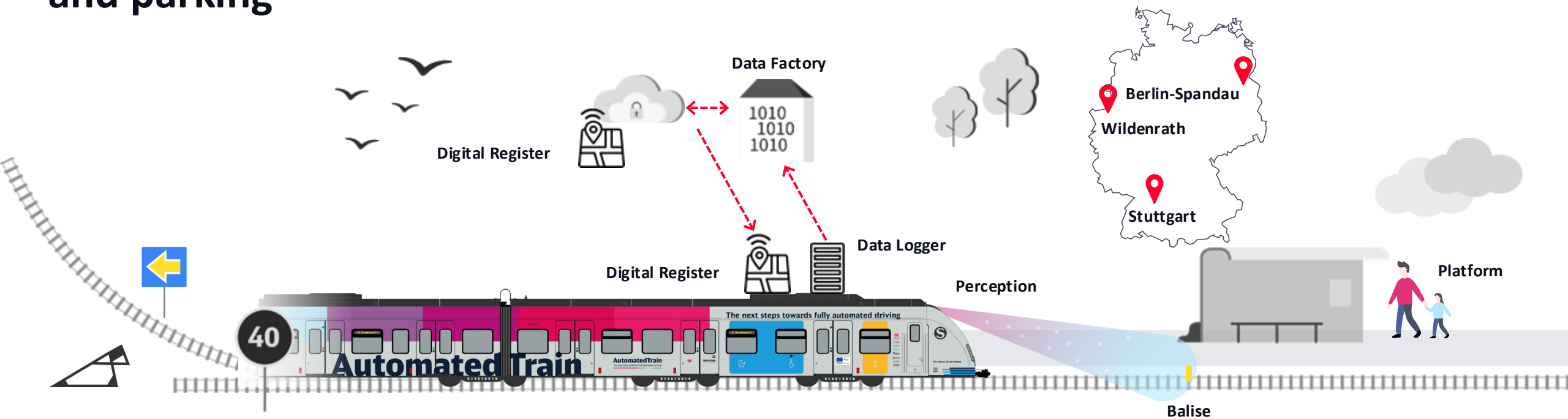
AutomatedTrain

InnoTrans 2026

22.–25. September 2026 | Berlin

- R&D project to demonstrate the technical feasibility of fully automated, driverless driving for the use case of fully automated train dispatching and parking
- Project duration: 3 years
- Funded by the Ministry for Economic Affairs and Energy with 42 Mio EUR

“AutomatedTrain” demonstrates the fully automated train preparation and parking



Stabling area

- Fully automated preparation of the vehicle
- Vehicle performs self-check
- Vehicle sends status to operation center (ready to go or not)

Driving the vehicle

- After getting the drive command, the vehicle drives fully automated at a maximum speed of 40 km/h
- Vehicle is using the perception system to observe its ego track during the drive, sensor data is recorded in a standardized way (Data Factory)
- In combination with the Digital Register and real-time localization, objects on the ego track are detected and a reaction is performed if necessary (e.g. horn, brake)

Stopping at a platform and returning to park position

- After receiving the drive command from the operations-centre, the vehicle stops at the requested position
- After receiving the drive command from the operations-centre the vehicle returns fully automated to the stabling area
- Fully automated parking of the vehicle Switch between GoA2 and GoA4 operation

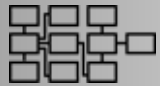
Main Achievements of AutomatedTrain



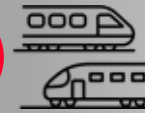
Requirement specifications



Demonstration of project results



System architecture



On two trains: system integration & testing



Modular hardware- and software solutions



In the lab: system integration & testing



CENELEC-conform project setup & execution



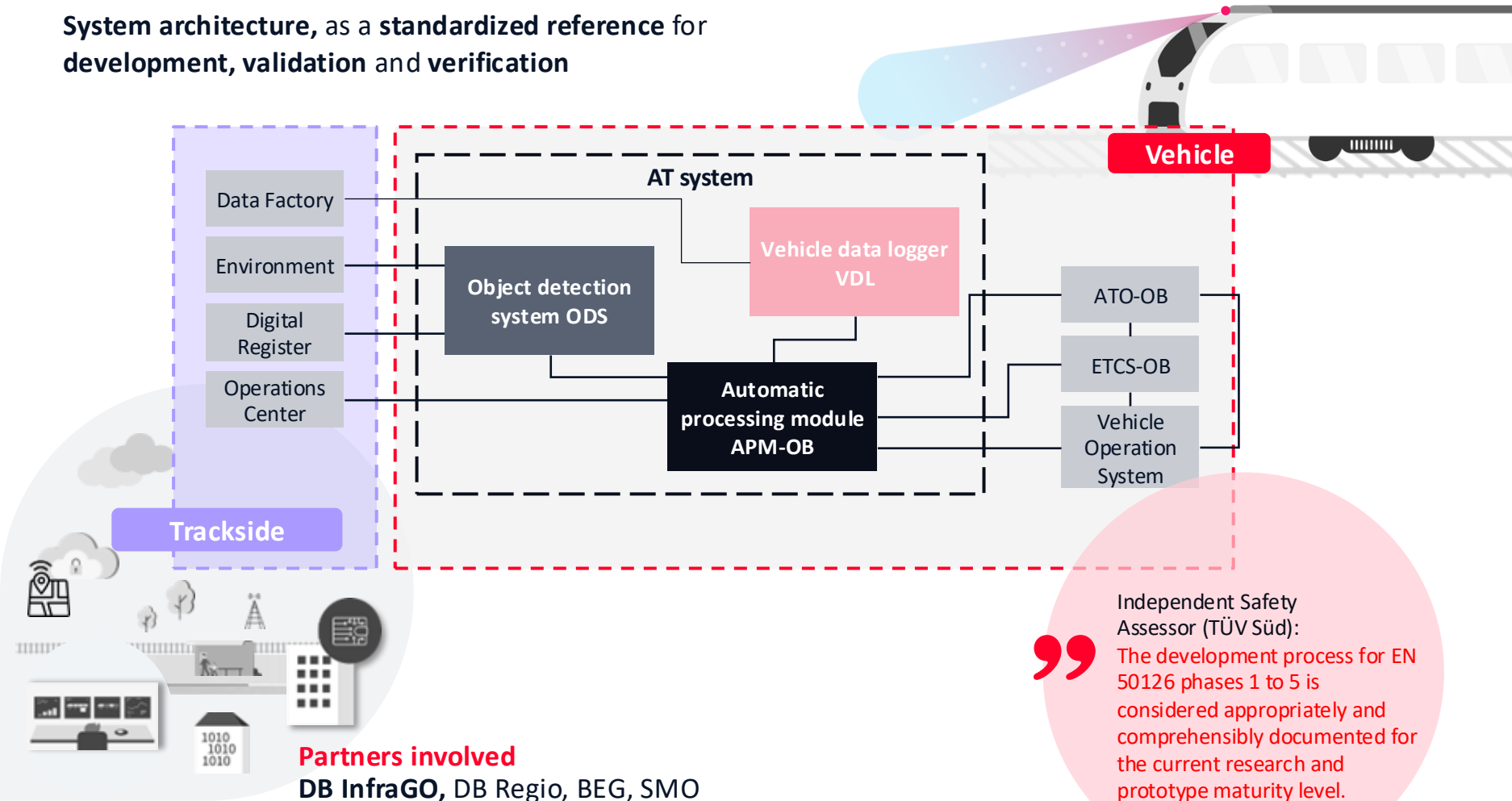
Exchange with **public authorities and independent safety assessor**, e.g. German federal railway association and TÜV Süd

Creation of a basis for product development and the gradual rollout from GoA2 to GoA4

System Architecture AutomatedTrain



System architecture, as a standardized reference for development, validation and verification



EN50126 Phases:

- Operational concept
- System definition
- Risk analysis
- Definition of system requirements, derivation of system architecture, subsystem and interface requirements
- Definition of system integration tests, validation and acceptance

This equates to 50 documents and

- approx. 1800 requirements
- approx. 1800 test cases

”

Independent Safety Assessor (TÜV Süd):

The development process for EN 50126 phases 1 to 5 is considered appropriately and comprehensibly documented for the current research and prototype maturity level.

Object Detection System and Data Collection in an Operational Environment



Prototypically implemented functions:

- Vehicle is using the perception system to observe its ego track and adjacent track
- In combination with the digital map and real-time localization, objects on the ego track are detected (up to 40km/h)
- No AI necessary, thus way forward for homologation possible
- High-performance data recorder developed, recording sensor data
- Technical readiness level of implementation: TRL 6

Test drives for data collection:

- Annotated multi sensor data (approx. 25 min) to be published in Q1 2027
- Approx. 250 h of sensor data recorded in the operational environment of Stuttgart
- Data is available upon request as input for ATO GoA4 system development



Fully Automated Preparation and Parking Realised on Mireo



Live GoA4 Fahrt
in Berlin Spandau –
Book here



Prototypically implemented functions:

- Fully automated GoA4 preparation and parking at a speed of 40km/h with a Mireo
- Automatic start-up and shut down
- Automatic self-check incl. emergency brake loop access
- Fully automated train data entry
- Interfaces for ATO / ETCS adapted for GoA4 operation
- Through lidar-based object detection, digital map and precise localisation the vehicle observes its ego track
- Advanced Vital Vehicle Operation system (SIL 4) controls and monitors the E2E GoA4 drive operation incl. reaction on objects on the ego track and safe communication between train and trackside
- Technical readiness level for the implementation: TRL 6

