Digitale Schiene Deutschland

September 2024 | Berlin

DSD@InnoTrans
Technologies

Information

- European Train Control System (ETCS)
- Digital Interlocking (DSTW)
- Integrated control and operating system (iCOS)
- IT-Platforms & Cloud
- IT /OT Security
- Future Railway Mobile Communication System / 5G (FRMCS)
- Digital Register
- Sensor based Environmental Perception
- Sensors for Relative and Absolute Localization
- Automatic Train Operation (ATO)
- Advanced Digital Infrastructure
- Artificial Intelligence in Incident Management
- Capacity and Traffic Management System

The vision of Digitale Schiene Deutschland is completed by the interaction of new technologies.

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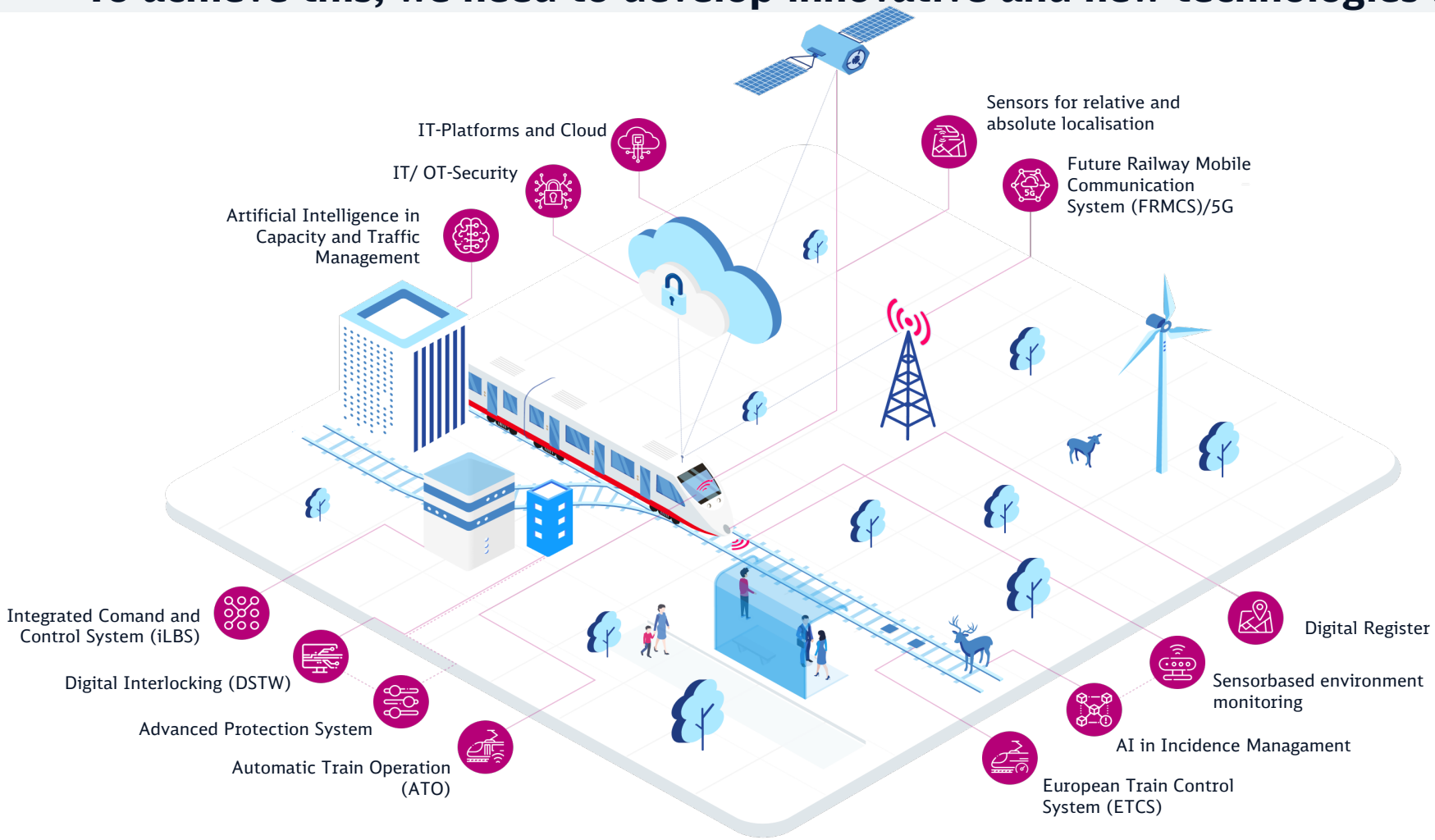
In future, trains should run and react fully automatically - even in the event of malfunction. To achieve this, we need to develop innovative and new technologies .



European Train Control System
(ETCS)

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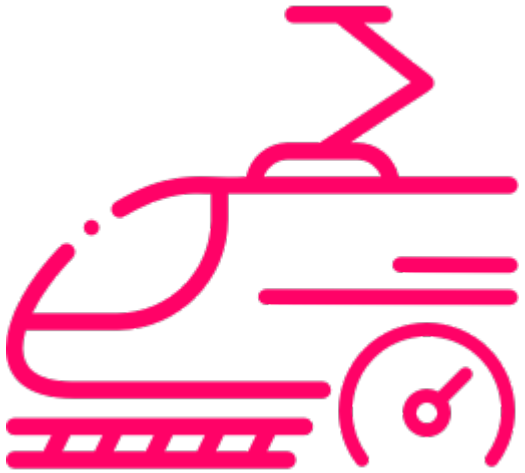

- Simultaneous rollout of ETCS radio-based and digital interlockings enables the digitalisation of rail
- Basis for automated train operation (ATO) and digital rail operations
- Technical enabler for a high-performance, interoperable network
- Increased performance through high-performance signalling block and device-specific speed profiles
- Will result in many years of no construction once the infrastructure is effectively and successfully equipped

Digital Interlocking
(DSTW)

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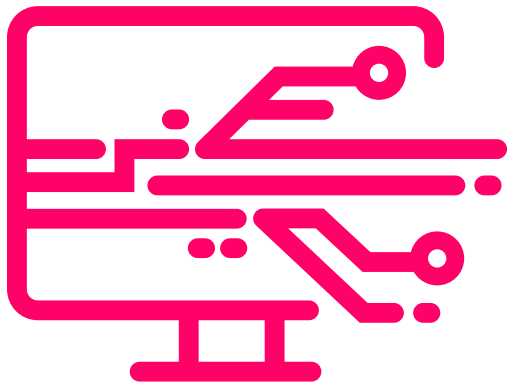

- Modular system architecture with innovative operation
- Standardised interfaces based on network technology
- IT security by design
- Cost-effective solution thanks to:
  - Use of industrial components
  - Condition-based maintenance
  - More competition
  - European market perspective
- In 2024 the digital interlocking in Mertingen-Meitingen went into operation

Integrated control and operating system
(iCOS)

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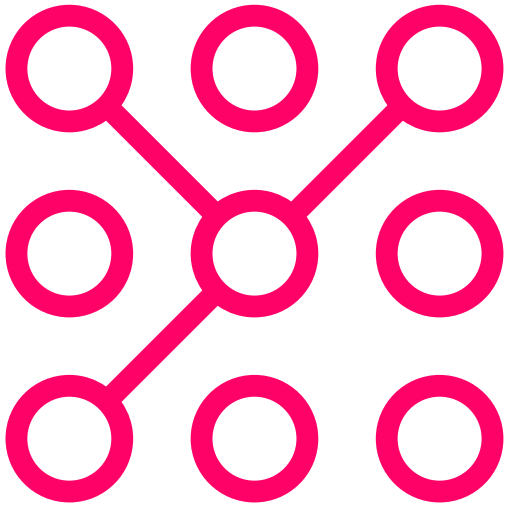
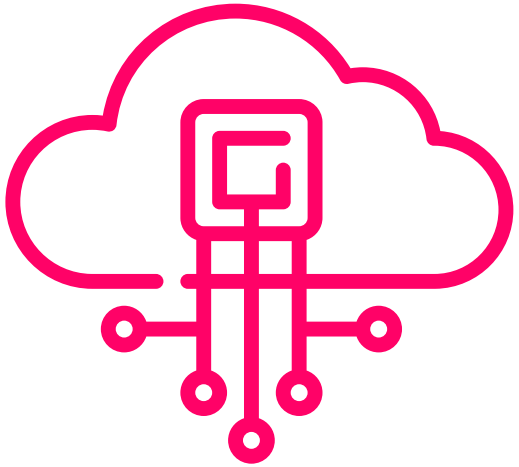


- iCOS bundles the necessary security and operation systems in an integrated application
- Developing Standard interfaces regardless of their manufacturer or hardware for consistent operations
- Central components enable flexible assignation of the operating areas during operation
- iCOS sets new benchmarks in the design of modern workplaces
- iCOS is standing for user-optimized operation, higher operation quality and preventive maintenance

IT-Platforms & Cloud



- Digitalisation of the rail system is introducing many new technologies (e.g. AI, sensor technology) which place high demands on IT platforms.
- For example, large amounts of data often have to be processed in real time with high functional safety requirements.
- This requires new IT platforms
- One of the major paradigm shifts is a standardized separation of applications from the underlying IT platforms
- The focus is on private data centres with cloud-like approaches (e.g., rail-hardened virtualisation) and new onboard IT platforms on trains

IT /OT (Operational Technology) Security

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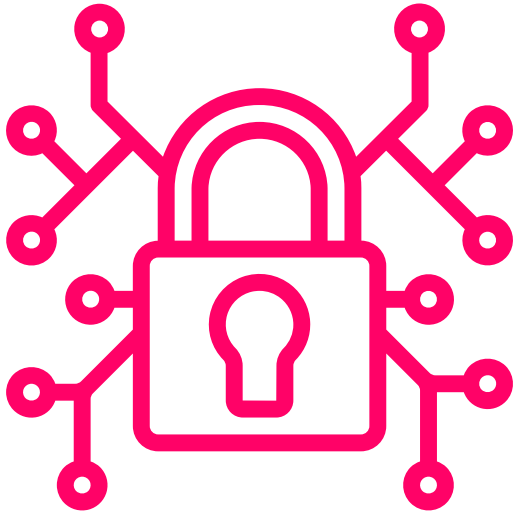


- New technologies such as AI and sensor technology place high requirements on IT and OT security
- That's why IT and OT security architecture is being developed at the same time as the system architecture for the digital rail system.
- Risk and threat analyses are carried out at an early stage and IT and OT security is included in the stage of piloting
- Modern IT tools already take IT and OT security into account during product development (DevSecOps approach)
- IT and OT security is thus inherent to the design of the digital rail system

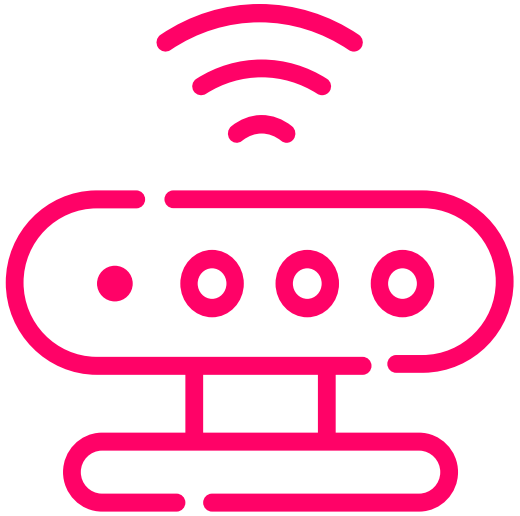
Future Railway Mobile Communication System / 5G (FRMCS)

- Digitalisation of the rail system will significantly increase requirements for connectivity
- High-performance, wireless real-time communication requires, among other things, higher data rates and reduced latencies
- The current GSM-R mobile communications standard is not sufficient and will be replaced by the new 5G-based FRMCS standard for railways
- FRMCS provides other important functionalities: better security, quality of service, hybrid networks, etc.

Digital Register

- Need for highly accurate, up-to-date, and digitally available infrastructure data for railway operations
- Development of a central "Digital Register" as a unified data foundation
- Improvement of efficiency and accuracy of planning and control processes in railway operations
- Support for pilot tests and future digital railway projects through standardized data
- Promotion of interoperability between different digital systems and applications

Sensor based Environmental Perception



- Trains perceive their surroundings using state-of-the-art sensors such as cameras, radar and lidar
- Intelligent AI software analyses and assesses information in real time
- Obstacles can be detected and hazards assessed
- As a result, trains can monitor train journeys themselves
- Together with ATO technologies, this is an important step toward fully automated driving

Sensors for Relative and Absolute Localization

- Need for precise and secure train tracking for optimal traffic management
- Use of various independent location measurements to increase positional accuracy
- Consolidation of data to support AI-based capacity and traffic management
- Improvement of network utilization and enhancement of traffic safety through accurate position determination
- Integration of new digital technologies for continuous and reliable train localization

Automatic Train Operation
(ATO)

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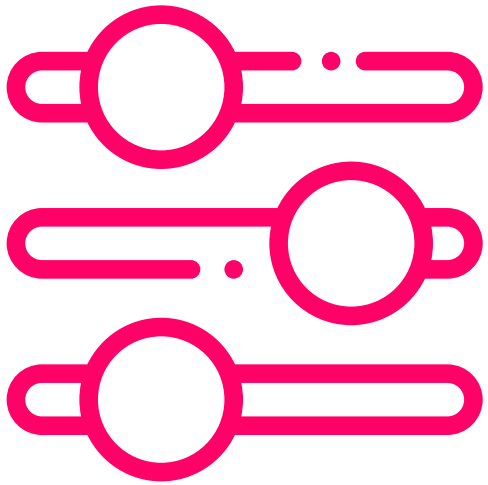
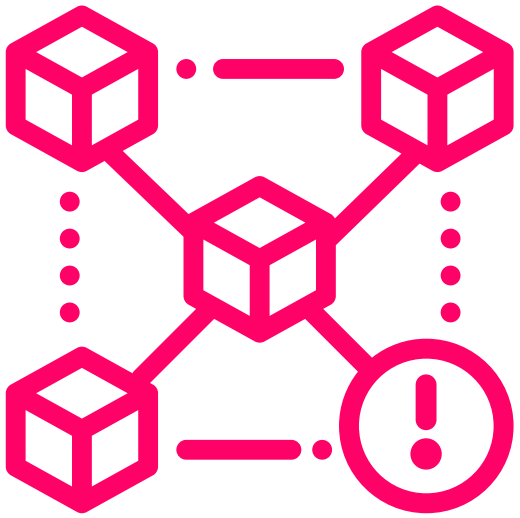
- Trains start, accelerate, brake and stop automatically
- Speed specifications can be adhered to very precisely. This reduces energy consumption and stabilises operations
- More trains can run on the same line, increasing capacity
- There are different grades of automation with and without a driver
- In driverless mode, trains use sensors to detect its surrounding and obstacles

Advanced Digital Infrastructure



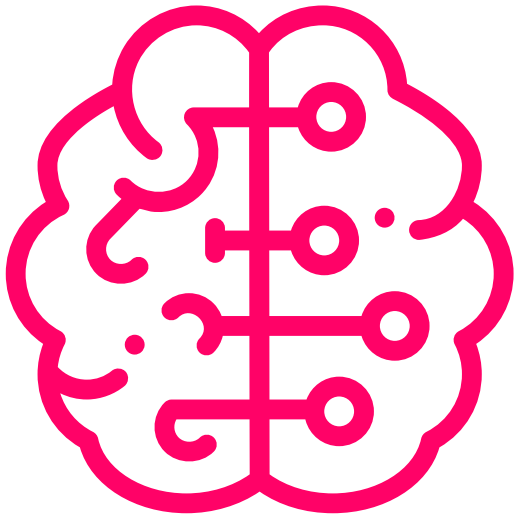
- Development of train-centric safety technology to replace traditional block sections
- Increase in capacity and flexibility in rail transport through innovative safety logic
- Improvement of operational processes and reduction of equipment costs through modern infrastructure
- Collaboration with European partners to implement advanced safety technologies
- Creation of a flexible, scalable safety system for future rail transport

Artificial Intelligence in Incident Management (AI)



- Integration of sensors and AI for the detection and interpretation of the track environment and obstacles
- AI taking over complex tasks such as route monitoring and decision-making
- Challenge of developing and training AI for railway operations due to the high variety of situations
- Support for fully automated driving (GoA4) through advanced incident management
- Improvement of response times and operational safety through intelligent systems

Capacity and Traffic Management System



- Every day, around 40,000 train runs take place on Germany's 33,000 km rail network
- Operations are optimised through a large number of individual decisions with a predominantly local focus
- AI is intended to automate these tasks. Train sequences, route changes, speed, etc. will be optimised from a Germany-wide perspective
- This will result in fewer secondary disruptions, more robust timetables, optimised network utilisation and higher network capacity.
- AI's integrated planning and optimisation capability will also be used for long-term and short-term scheduling

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Mehr Informationen auf www.digitale-schiene-deutschland.de

Vielen Dank für Ihr Interesse

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