

RAILWAY CAPABILITIES

Safety-critical engineering for modern rail systems

SIGNALLING | TRAIN PROTECTION | VITAL COMPUTING | VERIFICATION

ENGINEERING SAFETY INTO EVERY JOURNEY

Bytecraft provides safety-critical and mission-critical software, electronic hardware, system engineering, simulation, verification and integration capabilities for railway applications. We support the lifecycle from requirements and architecture to implementation, integration, validation and certification-oriented evidence.

SAFETY-CRITICAL RAILWAY SOFTWARE

- Safety-critical embedded software
- RTOS integration and deterministic control
- Bootloaders, BSPs and device drivers
- Fault handling and redundancy
- Protocol and interface software
- EN 50128 and SIL 4-oriented support

ETCS / ERTMS & TRAIN PROTECTION

- ETCS/ERTMS application software
- Automatic Train Protection functions
- Balise-data processing and integration
- RBC and Onboard Unit interfaces
- Signalling and interlocking interfaces
- Failure-scenario simulation

VITAL COMPUTING

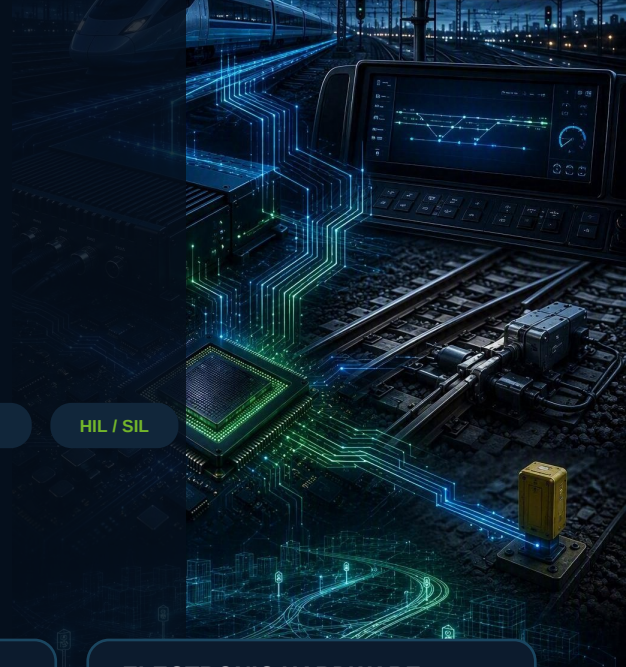
- Vital application software
- Redundant processing architectures
- Safety-related I/O management
- Health and fault management
- Fail-safe state management
- Diagnostics and event logging

SYSTEM ENGINEERING & SAFETY LIFECYCLE

- System requirements and architecture
- HW/SW interface definition
- Integration planning and execution
- Verification and validation
- Acceptance and commissioning
- RAMS and safety-case support

INTEGRATED SOFTWARE, HARDWARE & VERIFICATION

Engineering across onboard and trackside systems



EN 50126

EN 50128

EN 50129

SIL 4

ETCS / ERTMS

ATP

HIL / SIL

SIGNALLING & CONTROL

- Train protection and supervision
- Movement-authority processing
- Train-position calculation
- Balise and trackside data
- RBC and interlocking interfaces
- Operational data recording

VIRTUAL VALIDATION

- Custom virtual subsystem models
- Software-in-the-loop testing
- Hardware-in-the-loop testing
- Deterministic fault reproduction
- Automated build and test pipelines
- Requirements-based verification

ELECTRONIC HARDWARE

- Processor-based architectures
- FPGA and digital design
- Safety-related I/O interfaces
- Power and mixed-signal electronics
- Multilayer and HDI PCB design
- EMI/EMC-conscious design

POTENTIAL RAILWAY SOLUTION AREAS

- Balise systems and ATP integration
- Point-control software and electronics
- ERTMS Level 3 application software
- Vital computers and safety-related I/O
- Onboard and trackside integration

MODULAR SOFTWARE ARCHITECTURES

- Real-time operating systems
- Distribution middleware
- Data modelling
- Logging and configuration
- Health and fault management
- Device and I/O abstraction
- DDS, gRPC and MQTT

SELECTED RAILWAY EXPERIENCE

Previous experience includes prototyping Automatic Train Protection software within the scope of European Vital Computer Software for ETCS/ERTMS. This background is complemented by capabilities in real-time embedded systems, verification, simulation, electronics and system integration.

FROM CONCEPT TO SAFE OPERATION

Bytecraft combines safety-critical software, system engineering, embedded electronics, virtual platforms, verification and integration to support reliable and maintainable railway systems.

WE CRAFT TECHNOLOGY. WE ENGINEER RAILWAY SAFETY.