

MEN Mikro Elektronik GmbH

Rugged Computer Boards and Systems for Harsh, Mobile and Mission-Critical Environments.



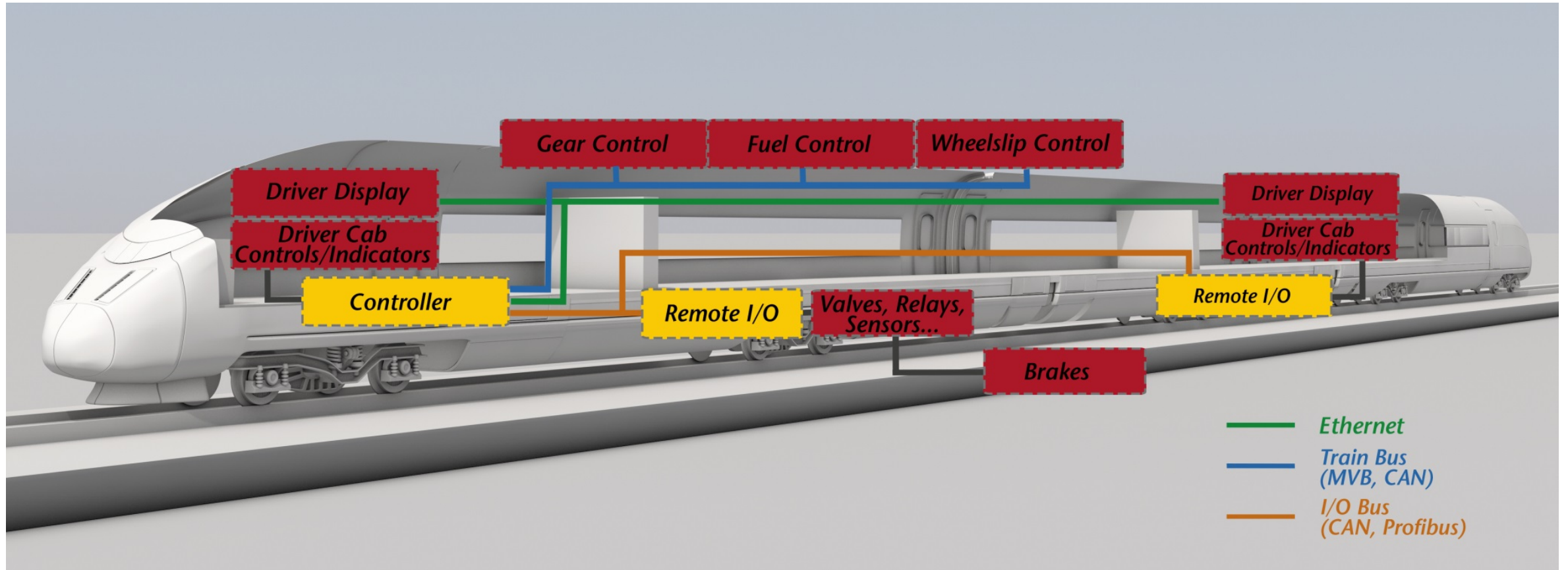
MTCS – Modular Train Control System

Modular SIL 4 certifiable system platform for safety-critical rolling stock applications

- Train Control
- Automatic Train Protection (ETCS)

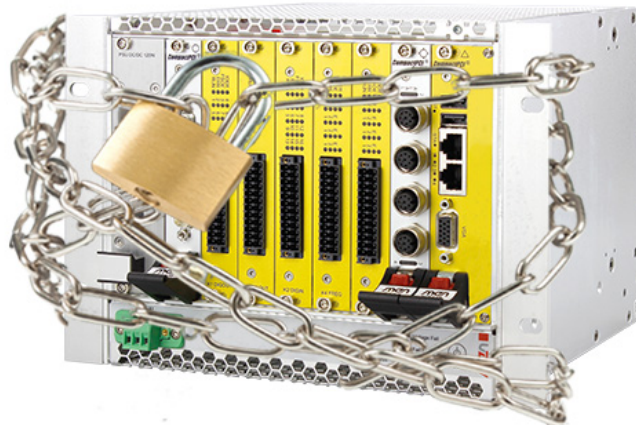


Today's Typical Architecture



Safety Relevant Functionality

- Drive and break control
- Velocity supervision
- Automatic gear control
- Wheelslip and slide protection
- Dead man's switch (Sifa)



Need for Safe Train Control Computers

German government increased safety requirements in public transportation:

- SIRF (Safety Regulations for Vehicles) stage 2
- All new/modified vehicles must fulfill SIRF stage 2 since June 2014
- Vital vehicle functions must fulfill SIL 3/4

Government program in USA:

- Positive Train Control

Other countries with growing demand on safe mass transportation:

- Korea
- Indonesia
- Russia
- China



Germany: SIRF Stage 2

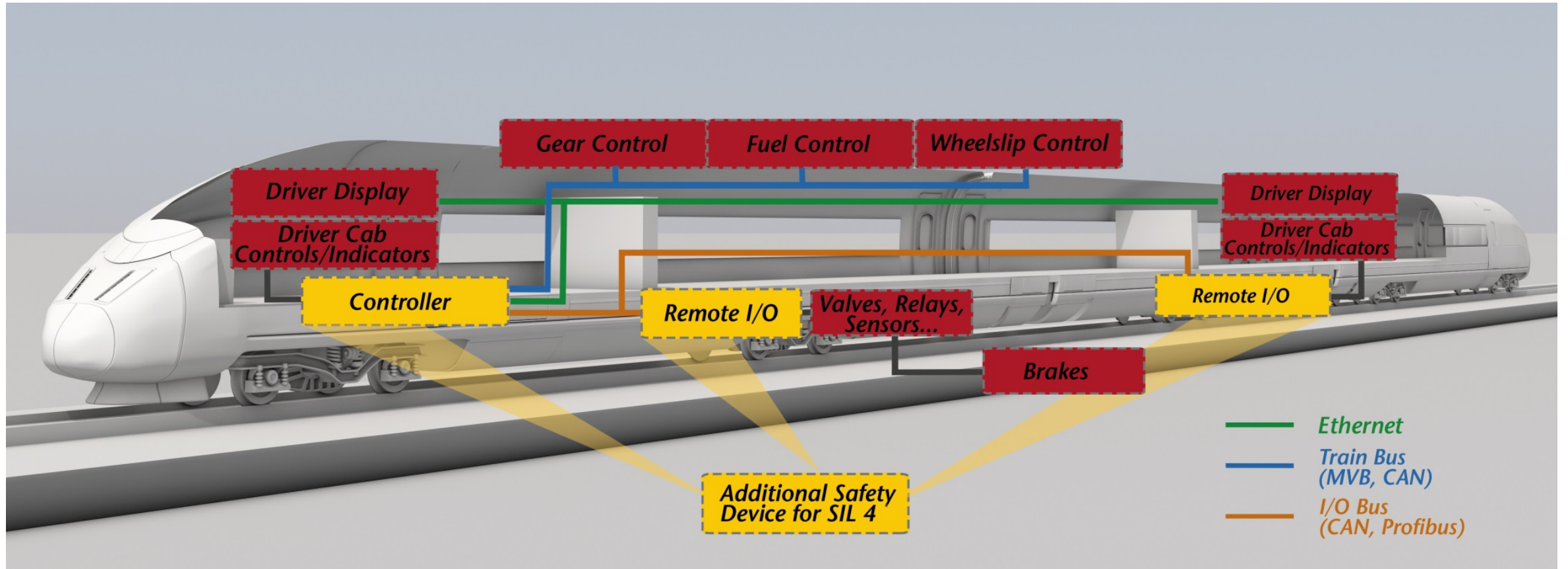


USA: PTC



Korea, Indonesia, ...

Problems with Today's Typical Architecture



Different Formfactors for different countries



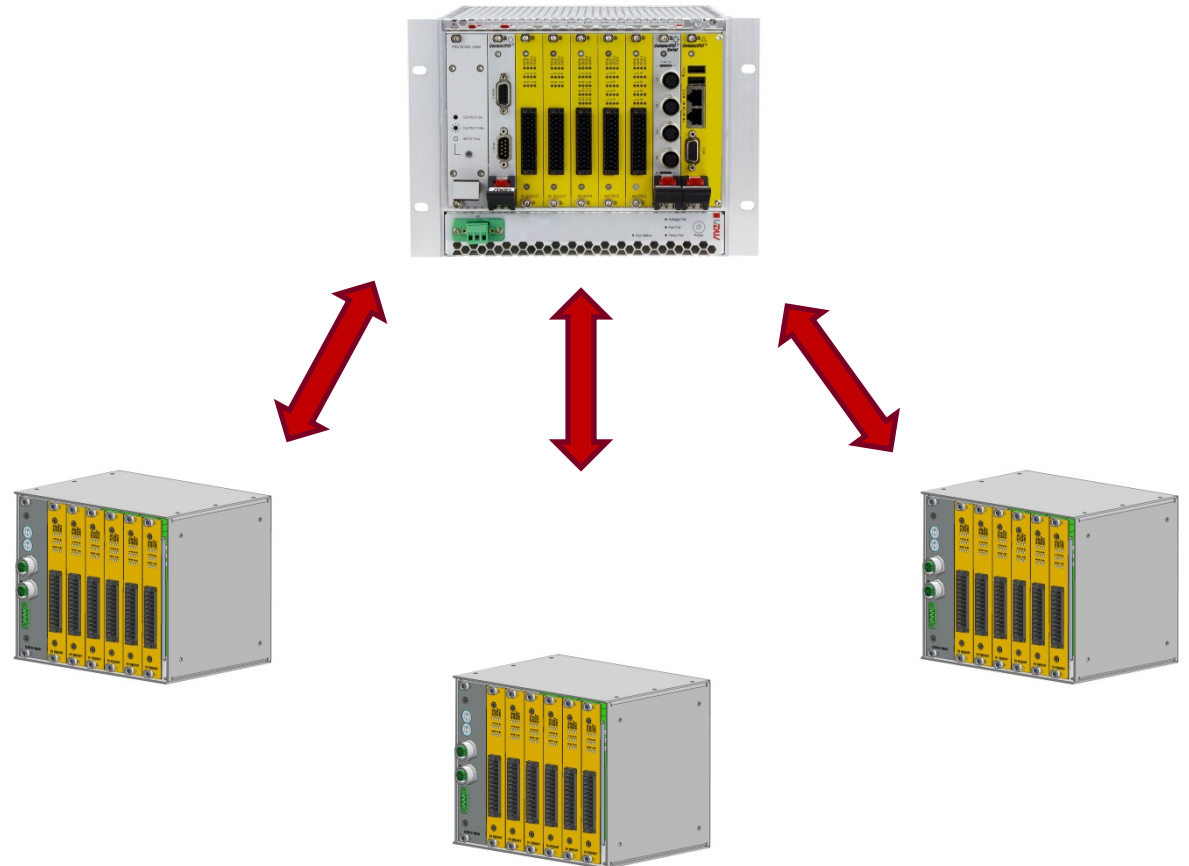
Modular Train Control System MTCS

Modular Train Control System consists of:

- MTCS controller
- MTCS I/O
 - Remote I/O boxes

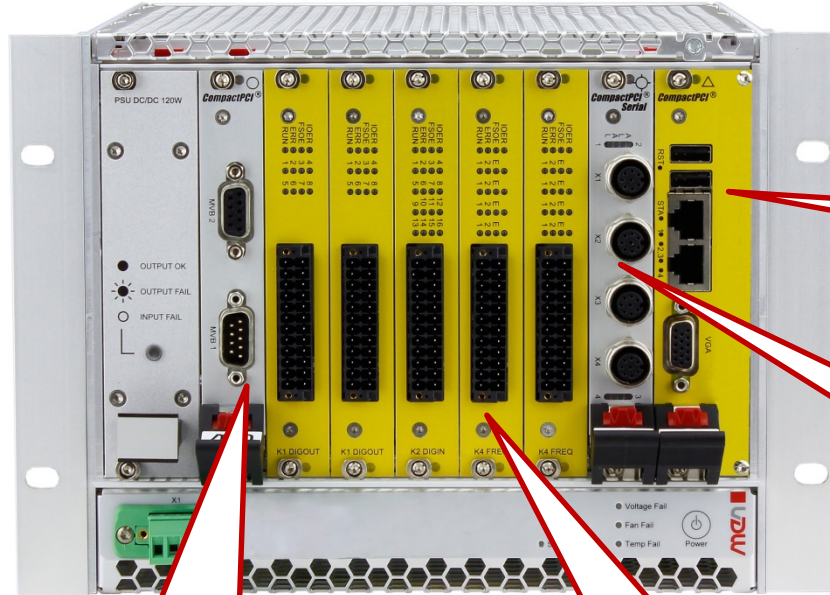
Provides a unique system that is:

- EN5012x SIL4 compliant
- Highly performing
- Fully rolling stock compliant
 - Supports full voltage range in trains 14..154 V
 - Supports full temperature range
- Application-ready

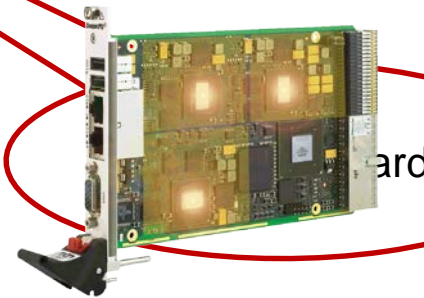


MTCS Controller

CompactPCI®



Safe CPU
3x Intel Atom



Connectivity boards

- MVB
- CANopen
- Serial

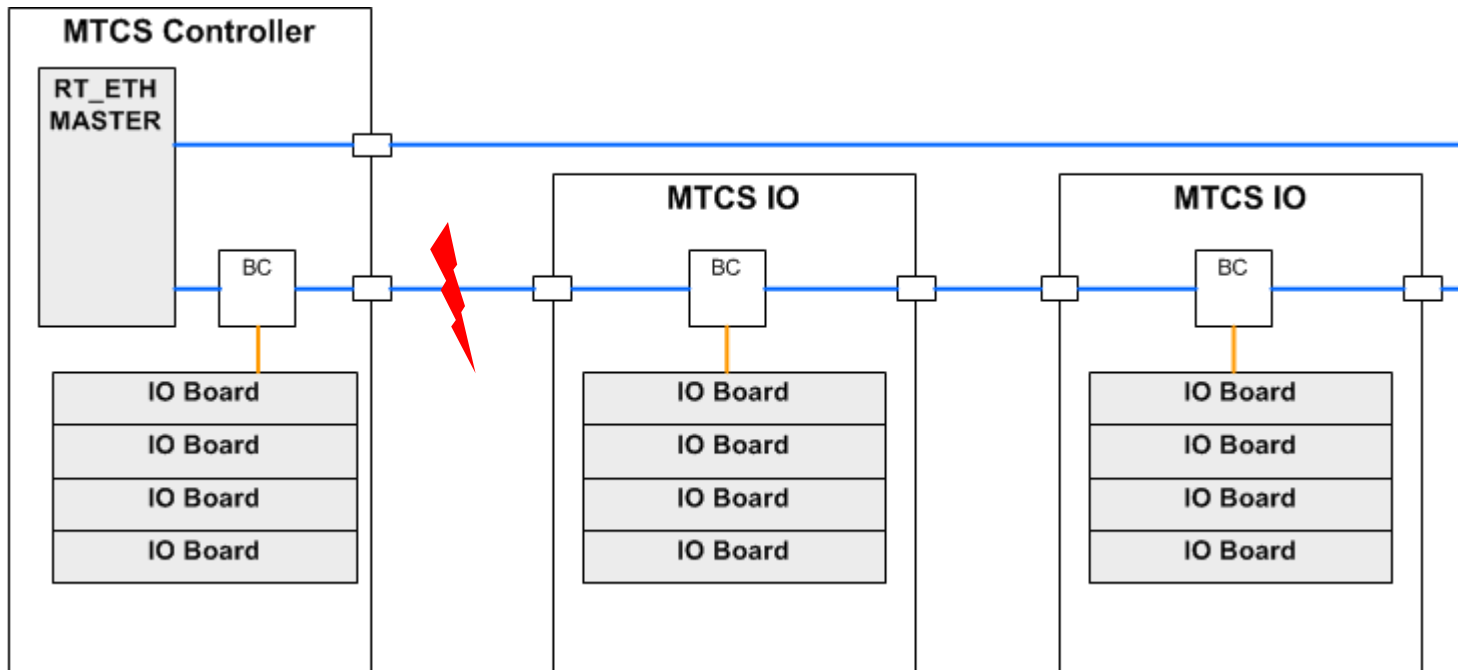
Safe I/Os

- DigIn
- DigOut
- Frequency IN

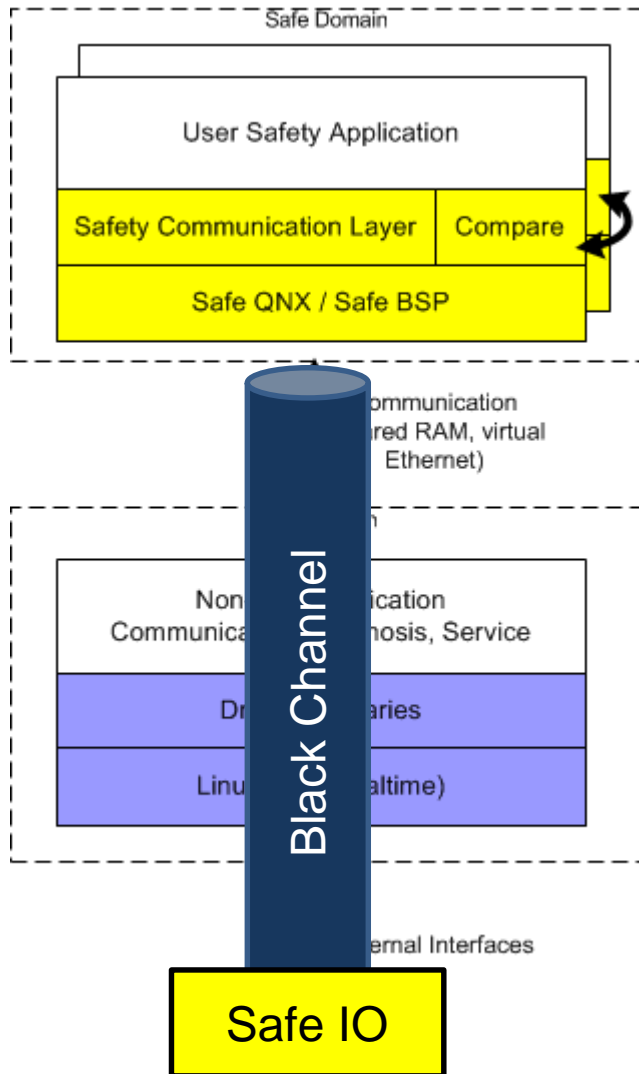
Safe I/O Real-Time Ethernet Topology

All I/Os are connected via real-time Ethernet

- No difference whether I/O card is in central controller or in distributed I/O box
- System connected in ring topology
 - Continue operation in case of cable loss



Software Architecture



Clear separation between

- Safety application and
- Communication

Double execution of safety application

- Running on two separated Intel Atoms
- Compare layer part of BSP

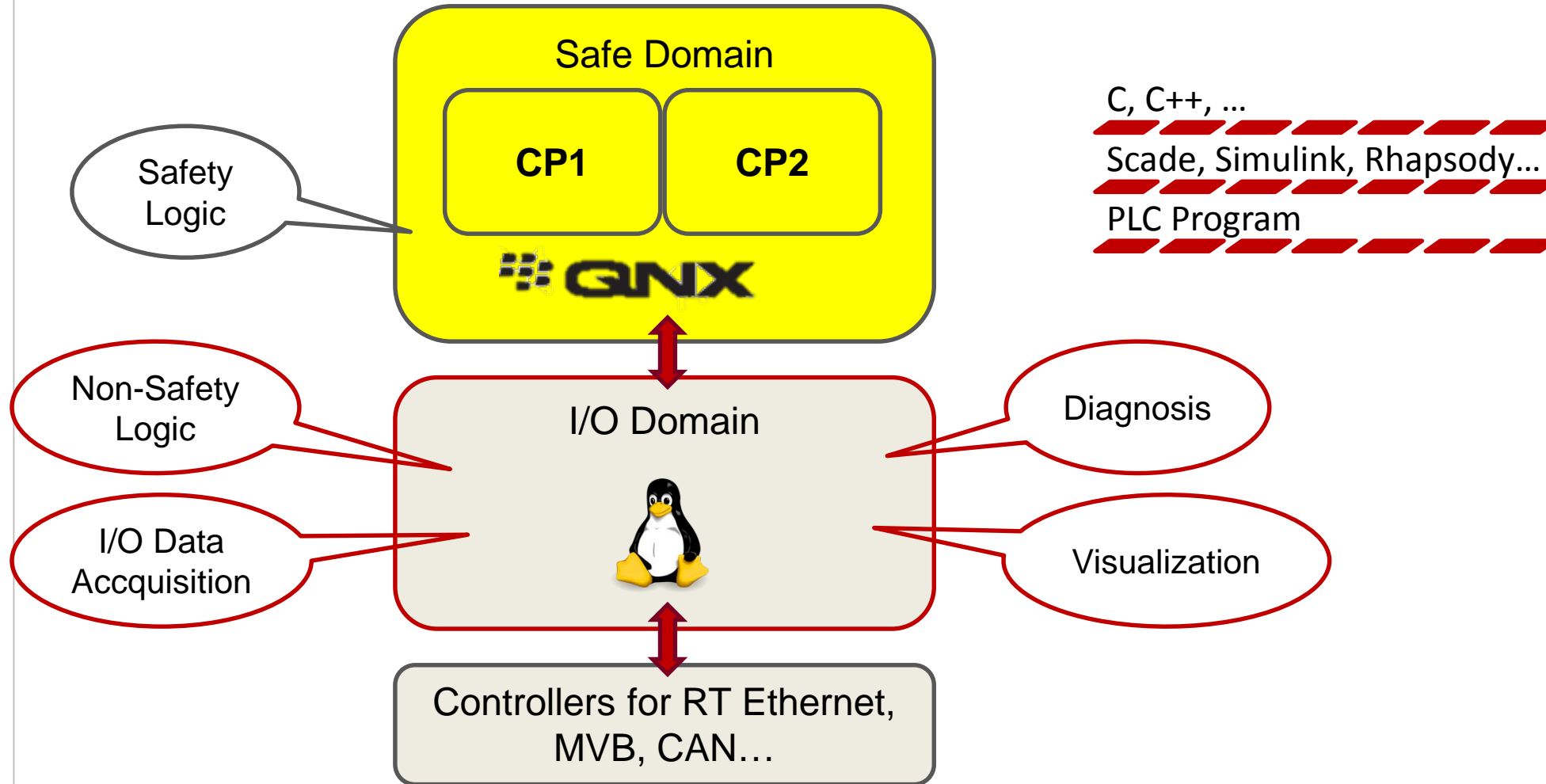
Safety communication layer

- Establish End-to-End protection of transmission to I/O cards

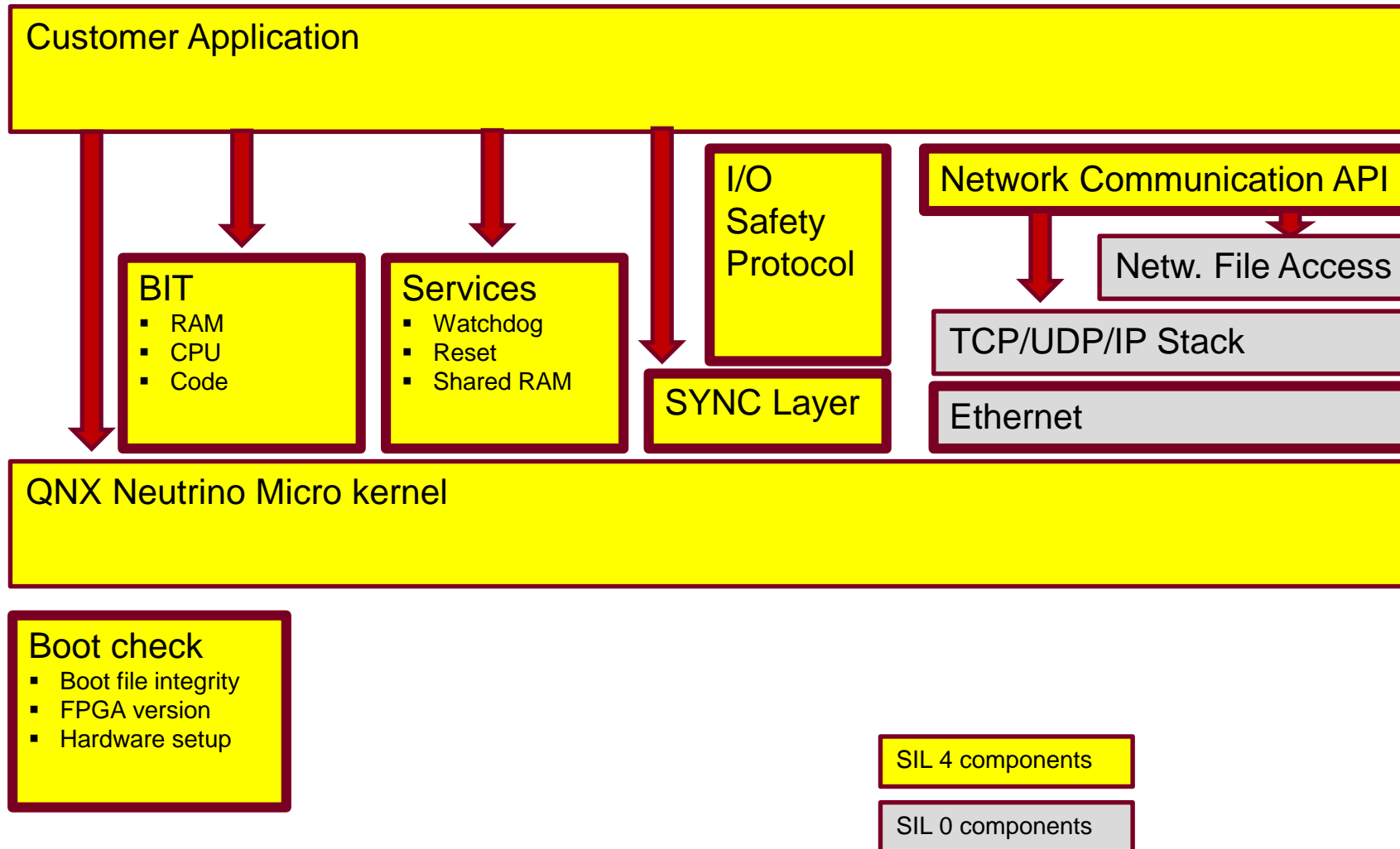
I/O Domain

- Runs on another Intel Atom
- Runs drivers for real-time Ethernet, MVB, CANopen...

Programming Possibilities

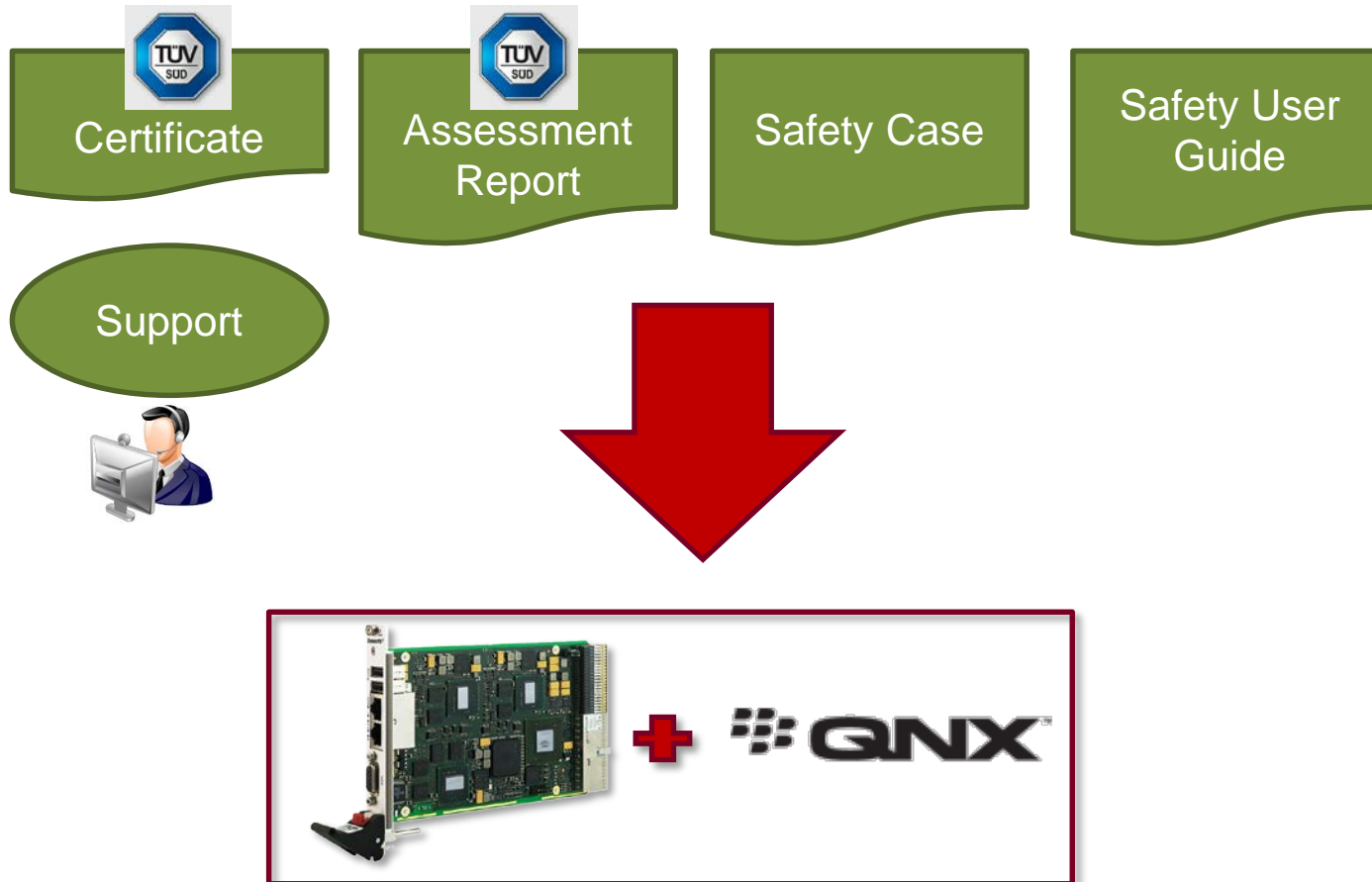


Software Architecture of Safe Domain (per Safe CPU)



Pre-Certified Solution

SIL 4 railway certification package according to EN 5012x



Your Benefits

Excellent technical features

- Fast CPU and fast real-time Ethernet for I/O
- Supports complex applications
- Flexible connection to legacy systems via MVB, CANopen, Profibus, Serial Links
- Compact solution



Modular Train Control System...

- Offers fast time-to-market and saves costs due to pre-certification
- Requires no further redundant systems to reach SIL 4

Summary

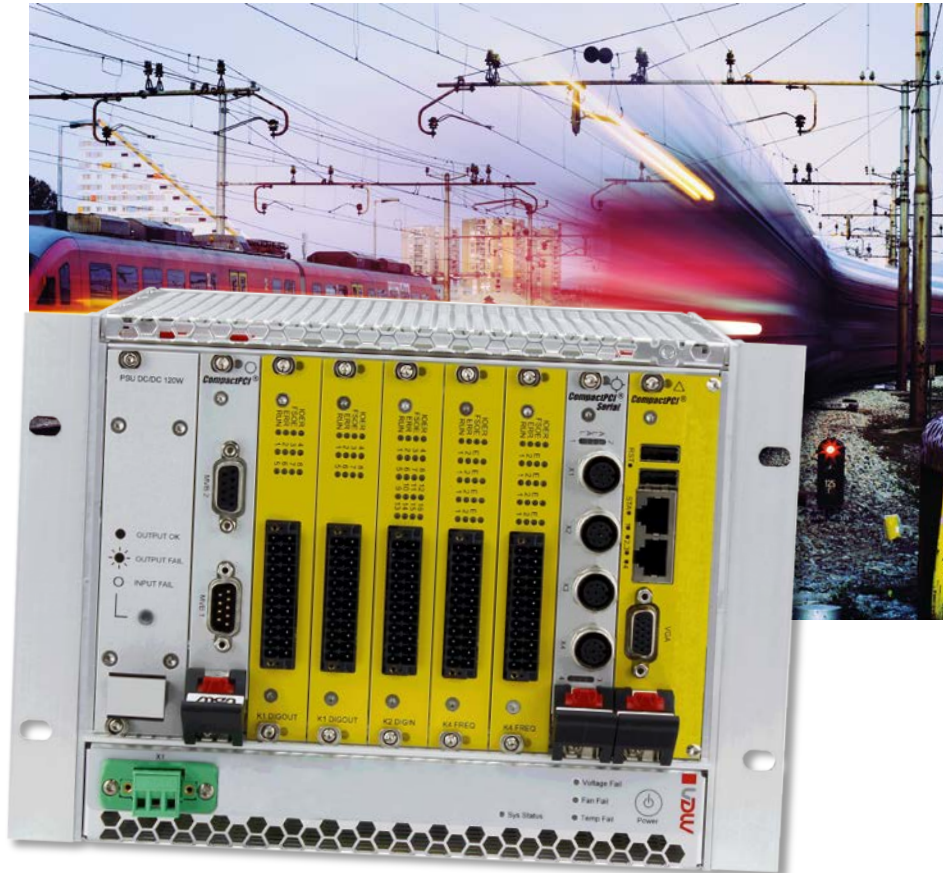
Rolling stock compliant



SIL 4 certified



Freely programmable
(not only a PLC)





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