



A member of
AGON
ELECTRONICS

Critical Embedded Systems

Railway Products and Solutions



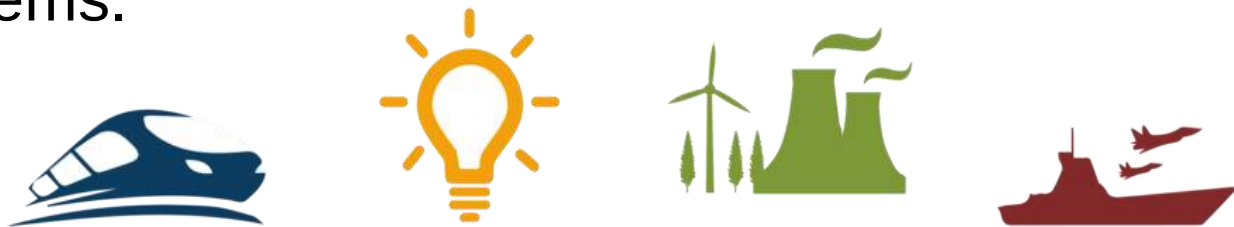
Critical Embedded Systems

Railway Products and Solutions



Since 1983, Leroy Automation **designs and manufactures** control, automation and embedded systems solutions for the railway, energy, defense and industry markets.

MIOS was established in 2011 and has been acquired by AGÔN Electronics in 2023 to complement the products lines dedicated to the railway industry with key subsystems.



We specialize in embedded electronics for on-board **rolling stock**, train **signalling**, and **communication** gateways.

Recognized skills and expertise in the integration of turn key **TCMS** (*Train Control and Monitoring System*) architectures, **JRU** (*Juridical Recorder Units*) and system solutions.



Headquarters: Toulouse (France) and Verona (Italy)
Representation office: Montreal - QC (Canada) and USA
Manufacturing plants: France & Italy
Localization support compliance:

- *Buy America Act*
- *Canadian Contents*
- *Make in India*



Staff ≈ 80 (Leroy) and 30 (Mios)

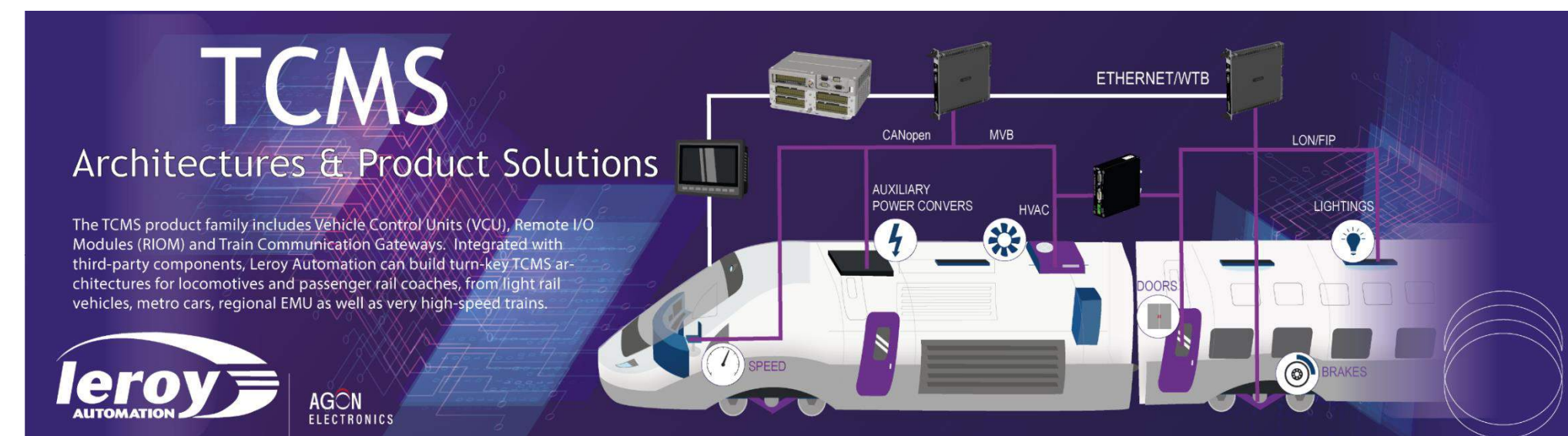
Senior Executives: 5%

Business strategy: 5%

Design and engineering: 50%

Methods, Industrialization and Production: 20%

Quality and support functions: 20%



OUR POLICY

*“AGÔN Electronics by Leroy Automation & Mios Elettronica manufacture **highly reliable** automation products suited for harsh environments. Our company is **a globally recognized** supplier of **control products** designed for the **railway** industry.*

*Each employee is part of a global network of partners linked by a **spirit** of long-term **trust**, continuously fulfilling **commitments** and a proactive drive to meet the **excellence** in our domain of **expertise**.”*

- Alain WOJTASZAK & Massimo PASSARELLA, General Managers





CORPORATE GROUP

Agôn Electronics, a **midcap** consortium of 6 SMEs with **complementary** competencies addressing **high-mix/low-volume** cross industries with **outstanding** quality performance and services.



Core competencies

- Innovation + R&D
- PCBA Prototyping & lean mass production
- Turnkey System Integration
- Maintenance, Repair and Operations (MRO)
- Obsolescence management
- Quality, product life-cycle metrics and analytics



Workforce ≈ 1,430

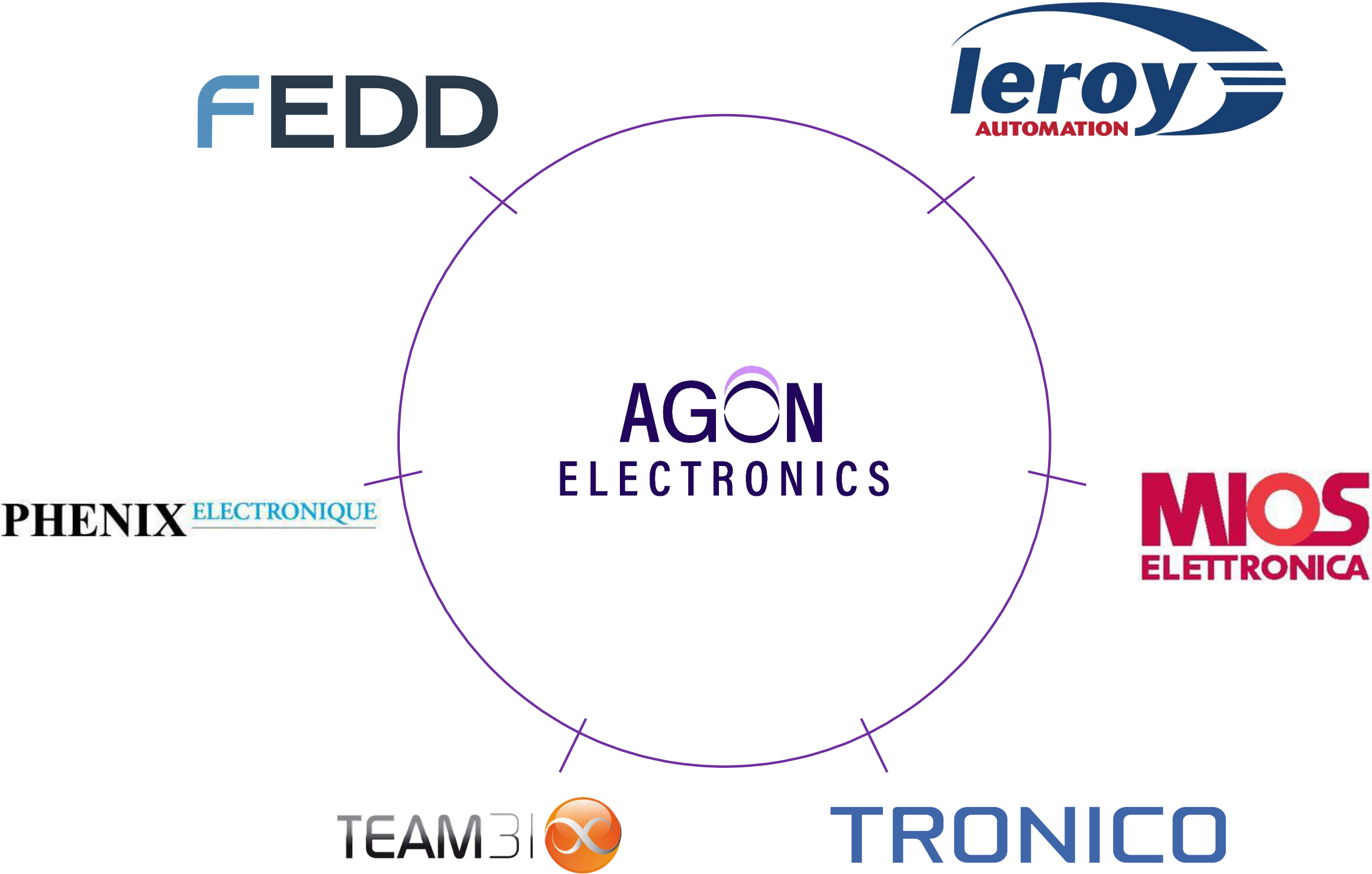
- Systems design engineering
- Electrical and embedded electronics
- Real-time embedded Software
- Mechanical design and integration
- Test, Verification, Validation, Qualification
- IPC-A-6XX certified experts



Turnover ≈ 180 M€

Yearly production ≈ 150,000 systems
Industrial capacity ≈ 20,000 sq. meters

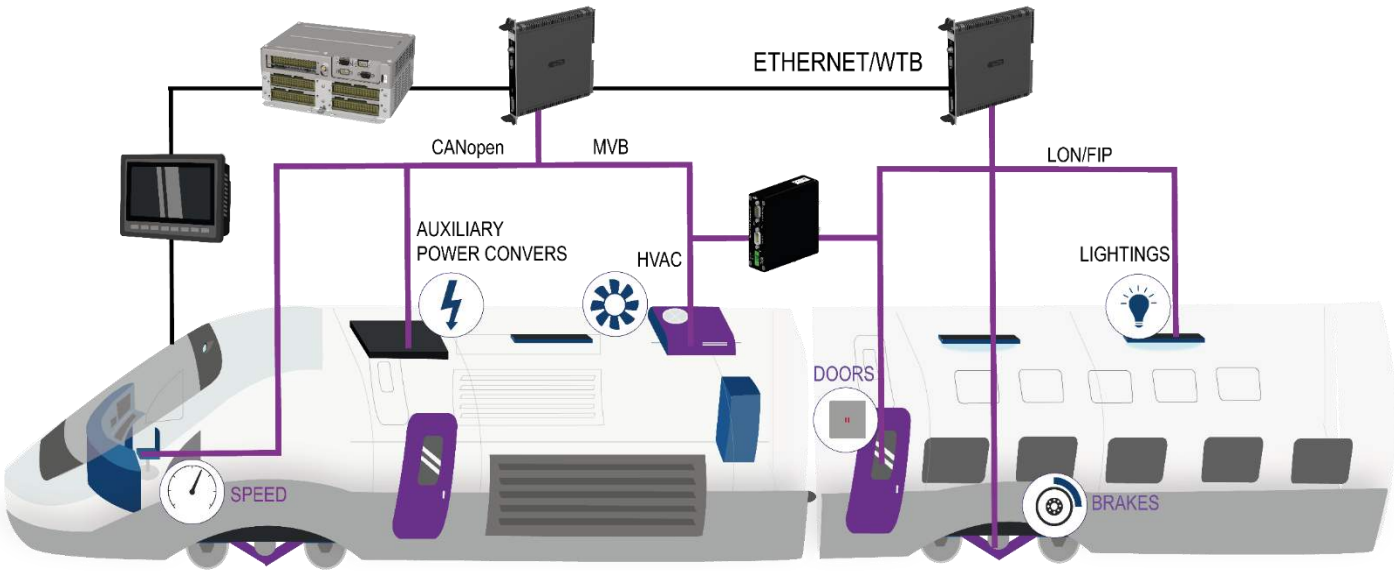
AGÔN ELECTRONICS GROUP



GROUP STRUCTURE

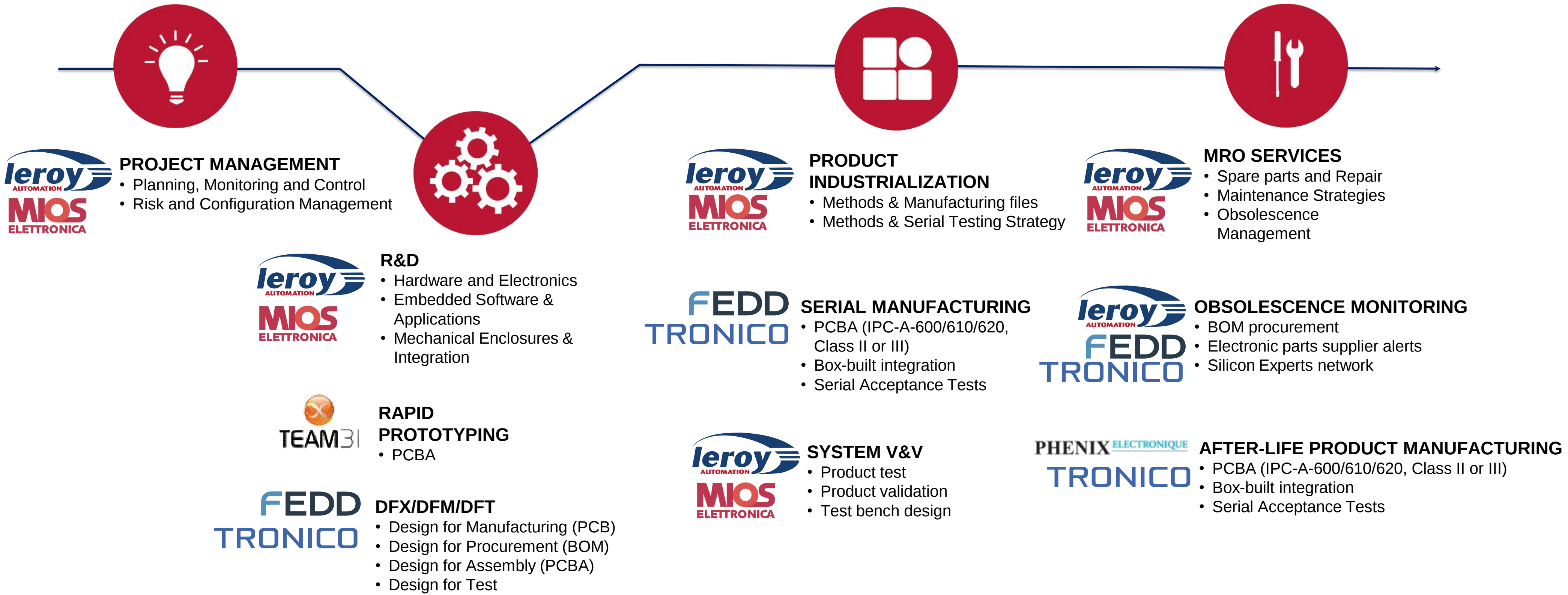


R&D
System integration
Industrialization
Production
Repair & maintenance
Obsolescence management
Product life-cycle sustaining



ERP software
Database applications
Maintenance

GROUP STRATEGY



PRODUCT MILESTONES

LT Energy
Electrical substations
(SNCF)

EN50155 Railway automation (PLC and Remote I/O Modules)

RIOM FIP/MVB/LON *Train Control & Monitoring Systems*

BRIO Ethernet I/O TCMS

SIL2-certified
Fire safety controller

TCMS Solutions *System Architectures*

Communication Gateways *TCMS, CBTC, ETCS, ERTMS*

SIL4 EVC

TMRT/TMCU

BRIO XT

Cybersecurity
2020 *Data Diodes* 2025

BUSINESS MANAGEMENT ECOSYSTEM

Quality Management System



Corporate Social Responsibility



Memberships



Standardization committees



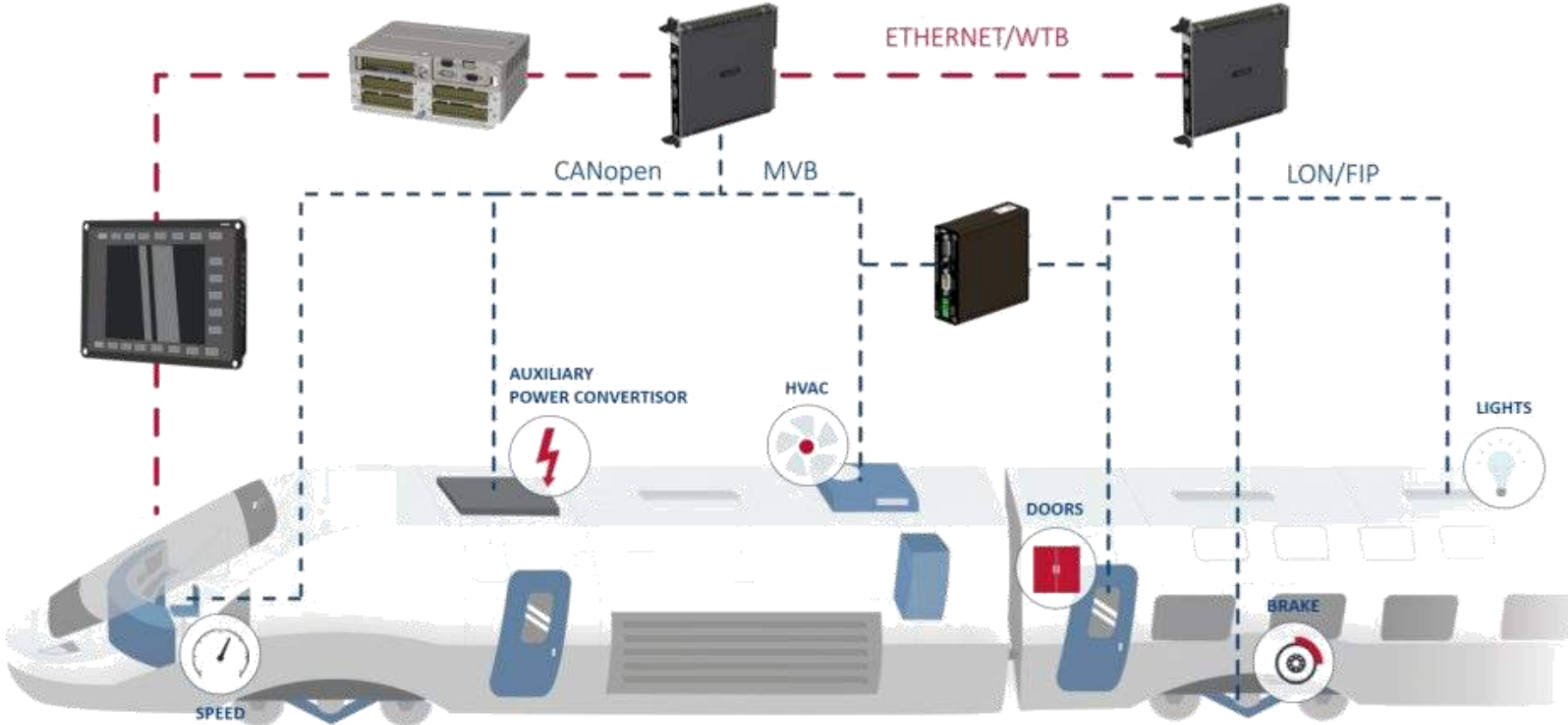
AEO-F Certificate (Customs & Security/Safety)



1

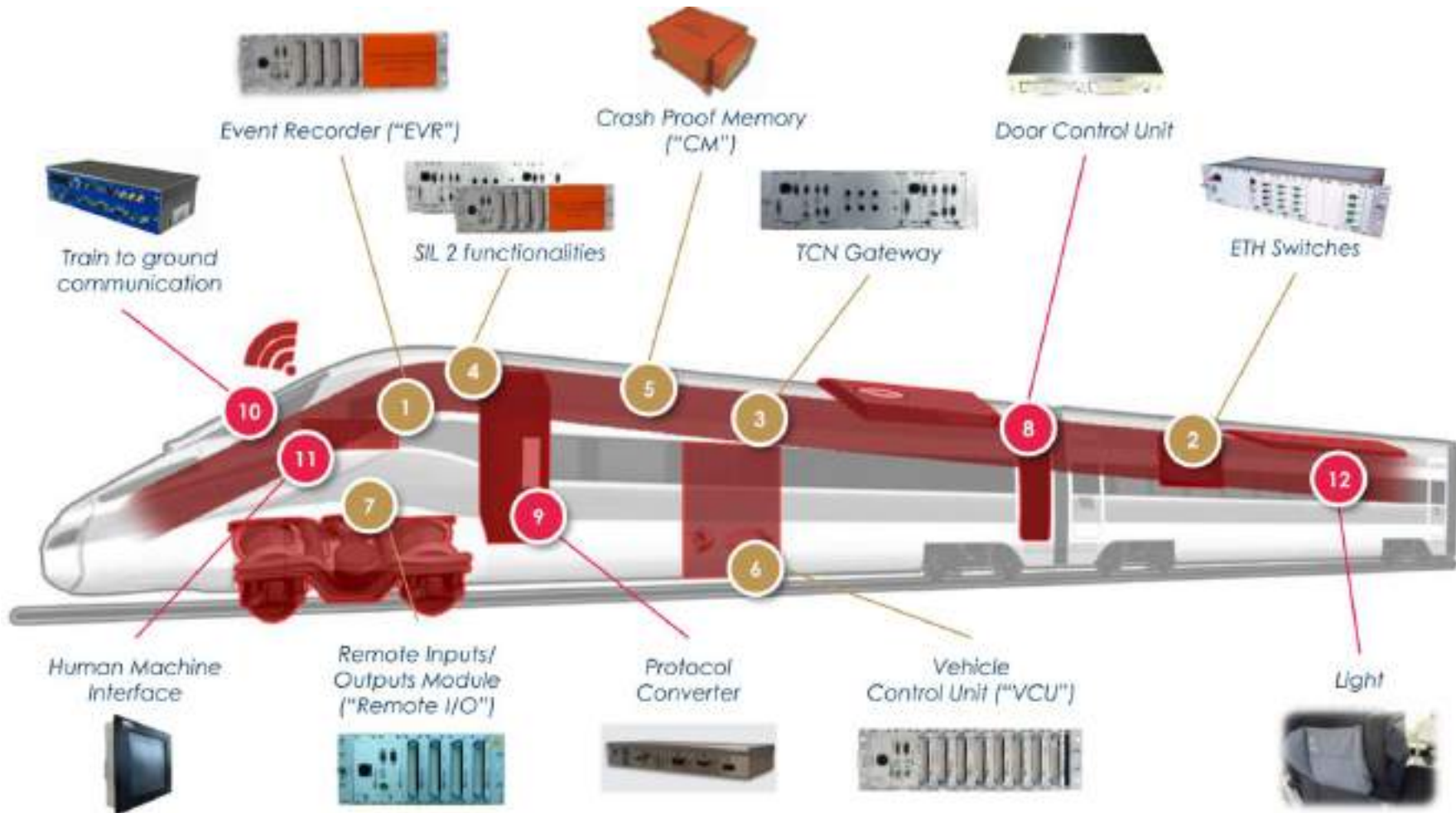
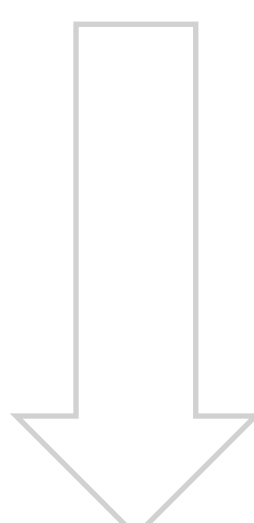
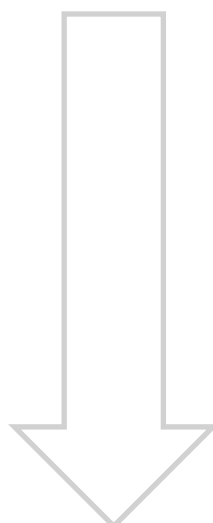
Strategic Markets

RAILWAY BUSINESS STRATEGY



EN 50155 products

- Vehicle Control Unit (VCU)
- Remote I/O Modules
- Communication Gateways



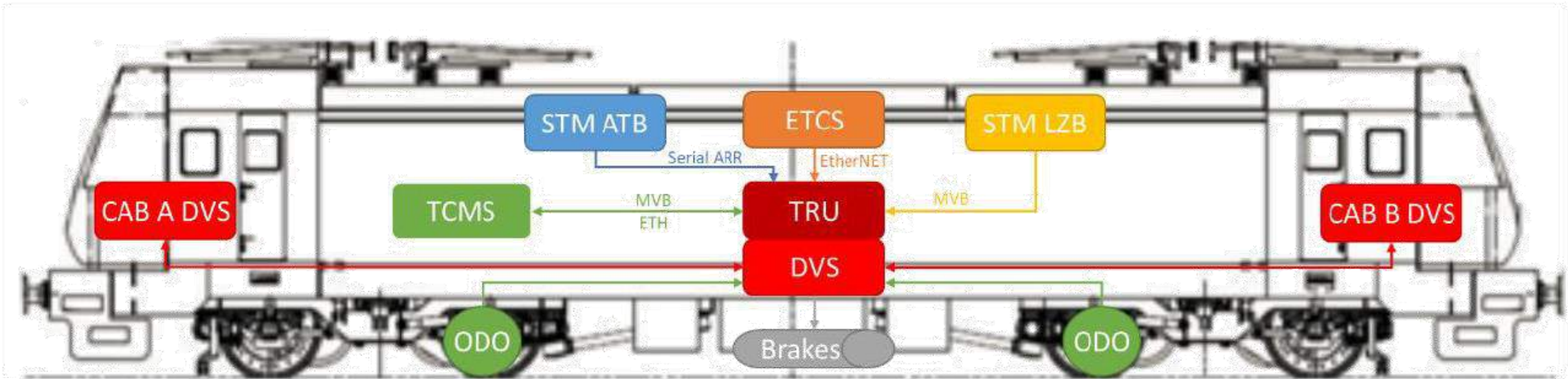
System-level applications

- TCMS
- CBTC, ETCS and ERTMS
- Wayside signalling



R&D innovation

- SIL2 SSPC Module
- SIL4 I/O Module
- SIL4 Next EVC



2

RIOM Product Line: Embedded Controllers (EN 50155)



Used in SIL2 TCMS :



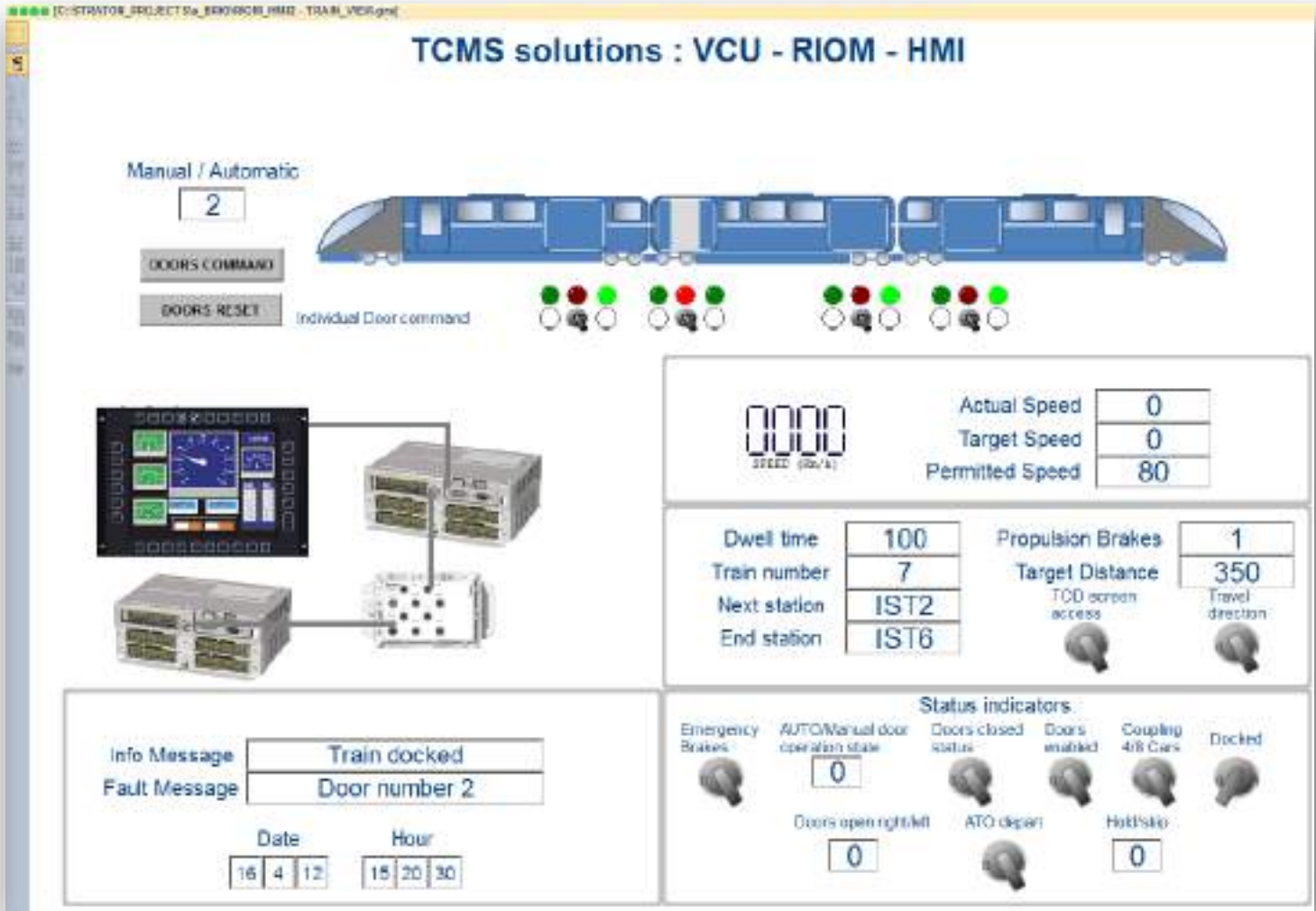
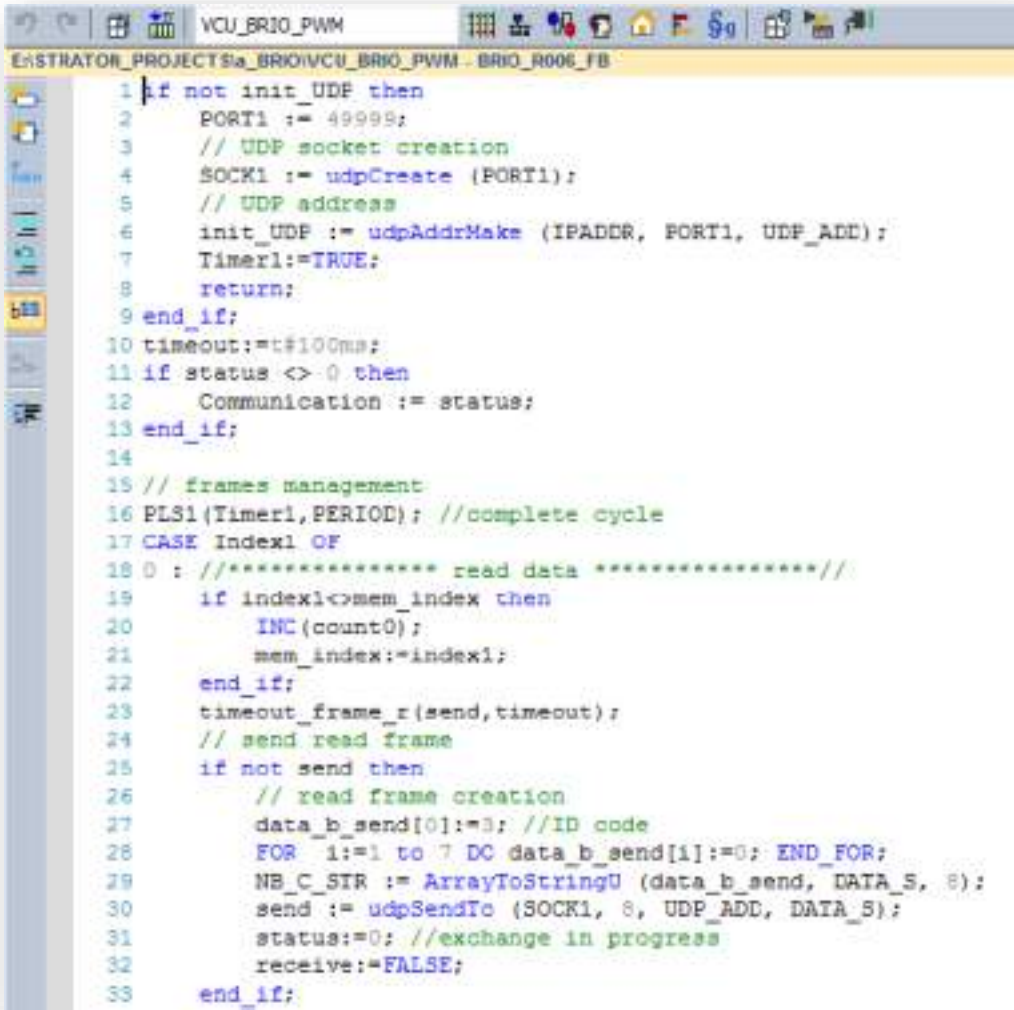
RIOM PRODUCT LINE

Main characteristics

- 24Vdc, 36-48Vdc or 72-110Vdc
- PXA270 processor 64MB RAM/32MB Flash
- 1GB NAND Flash for event log
- Real-Time Clock for synchronization
- Ethernet 10/100
- MVB or LON, CAN 2.0, 2x RS-485
- 64 DI / 32 DO
- 4 AI / 4 AO
- +13Vdc Aux. Power Supply

Product family overview :

- RIOM T51xxx**
 - MVB Process Data only
- RIOM T52xxx**
 - LON works
- RIOM T53xxx**
 - MVB Process Data + Bus Admin.
- RIOM T54xxx**
 - MVB Server PD + MD + Bus Admin.



Programming :

IEC 61131-3 STRATON

- Integrated automation platform
- Design using SFC, LD, ST and FBD
- Ready-to-use communication protocols
 - MVB
 - IEC 61131-3 TRDP
 - MODBUS TCP
- Analysis, off-line tests & simulation
- Integrated commissioning tools

3

BRIO Product Line: Programmable I/O Modules (EN 50155)

BRIO PRODUCT LINE



BRIO R105

- 24-110Vdc
- STM32 μ C + FreeRTOS
- Ethernet 10/100
- 32 DI / 16 DO
- 4 AI / 1 AO



BRIO R125

- 24-110Vdc
- STM32 μ C + FreeRTOS
- Ethernet 10/100
- CAN 2.0 / RS-485
- HDLC expansion port
- 32 DI / 16 DO
- 4 AI / 1 AO



Product family overview :

BRIO R102

- 40 DI / 10 DO
- 4 AI / AO



BRIO R201

- 20 SIL2 DI / 10 SIL2 DO



BRIO R114

- MVB Process Data

BROM SSPC

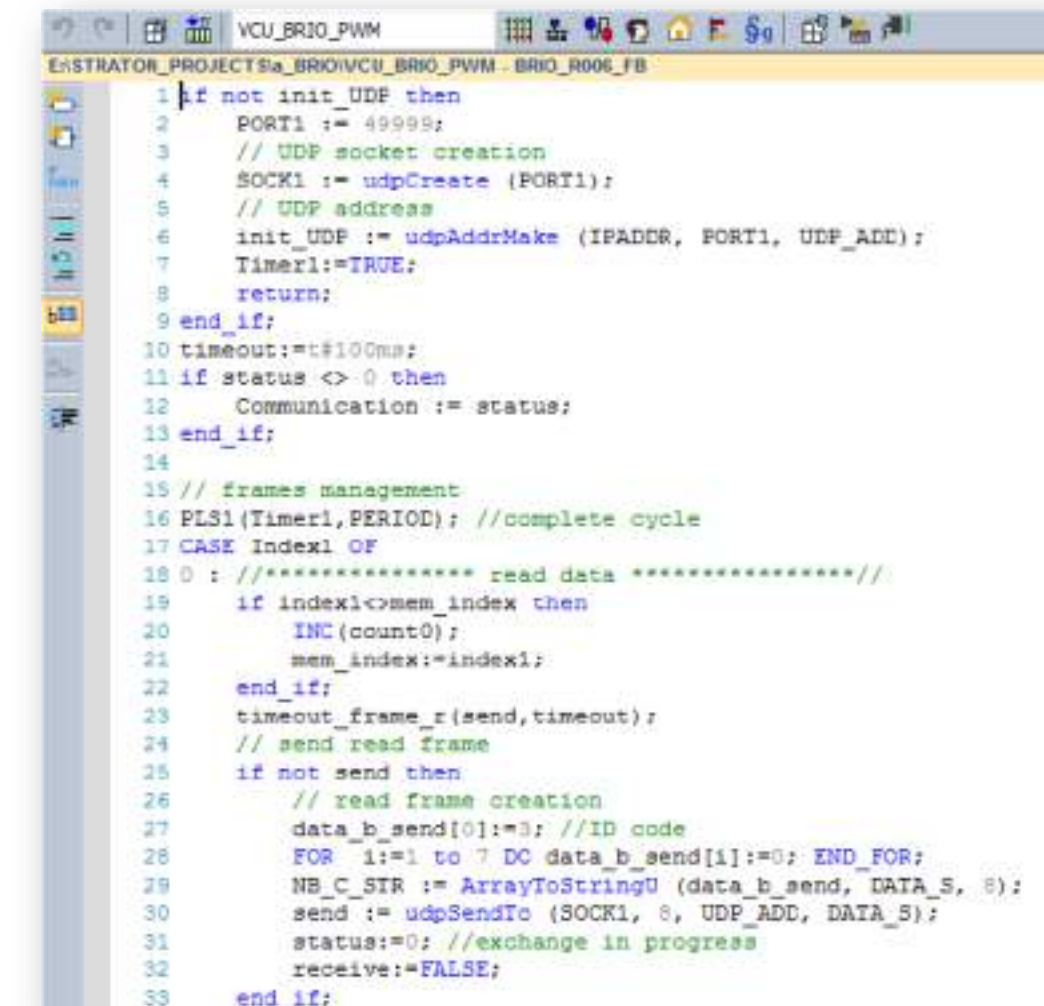
- 8 DO @ 10A. max.



Programming :

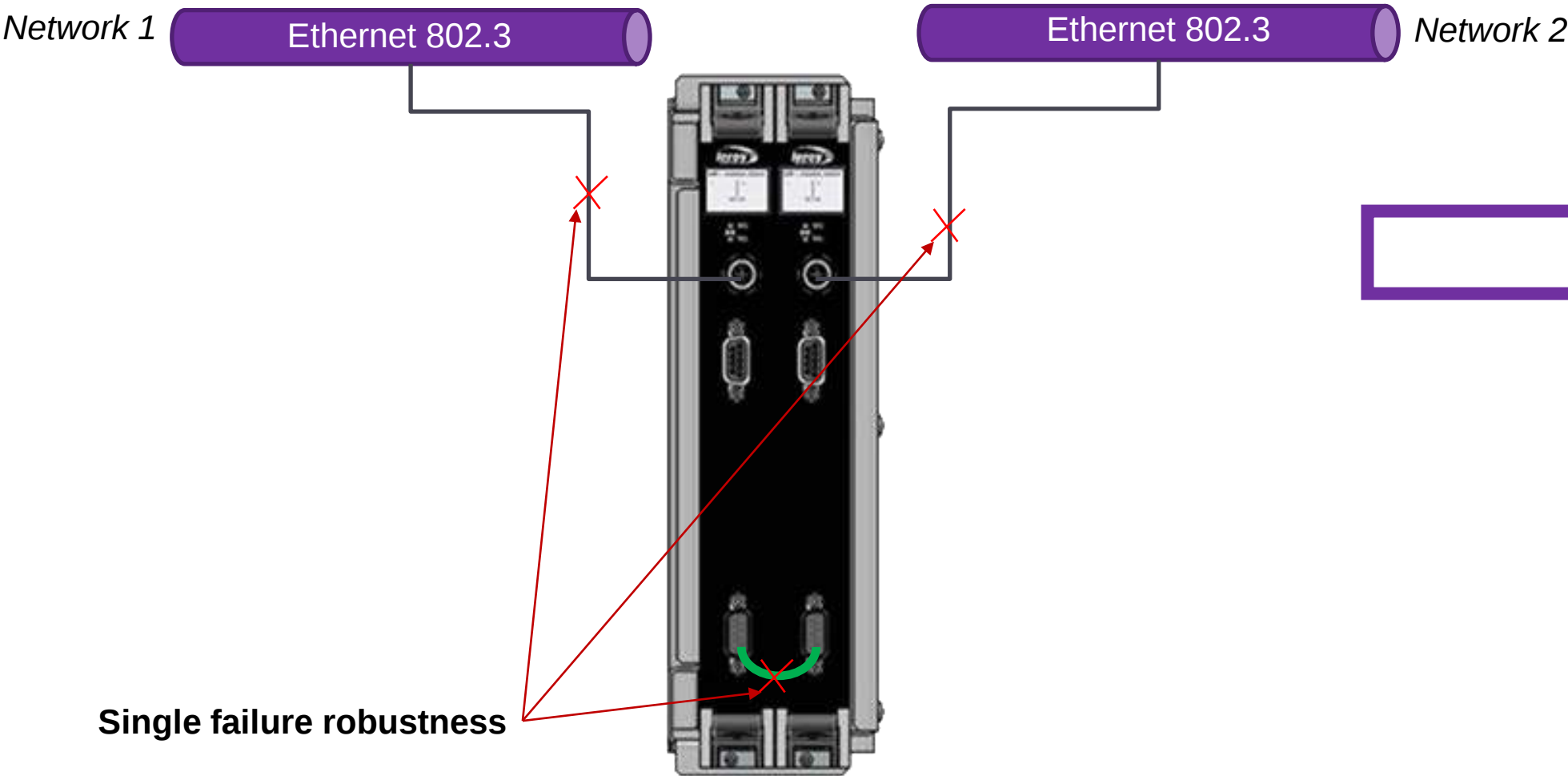
IEC 61131-3 STRATON

- Integrated automation platform
- Design using SFC, LD, ST and FBD
- Ready-to-use communication protocols
 - MVB
 - IEC 61131-3 TRDP
 - MODBUS TCP
- Analysis, off-line tests & simulation
- Integrated commissioning tools

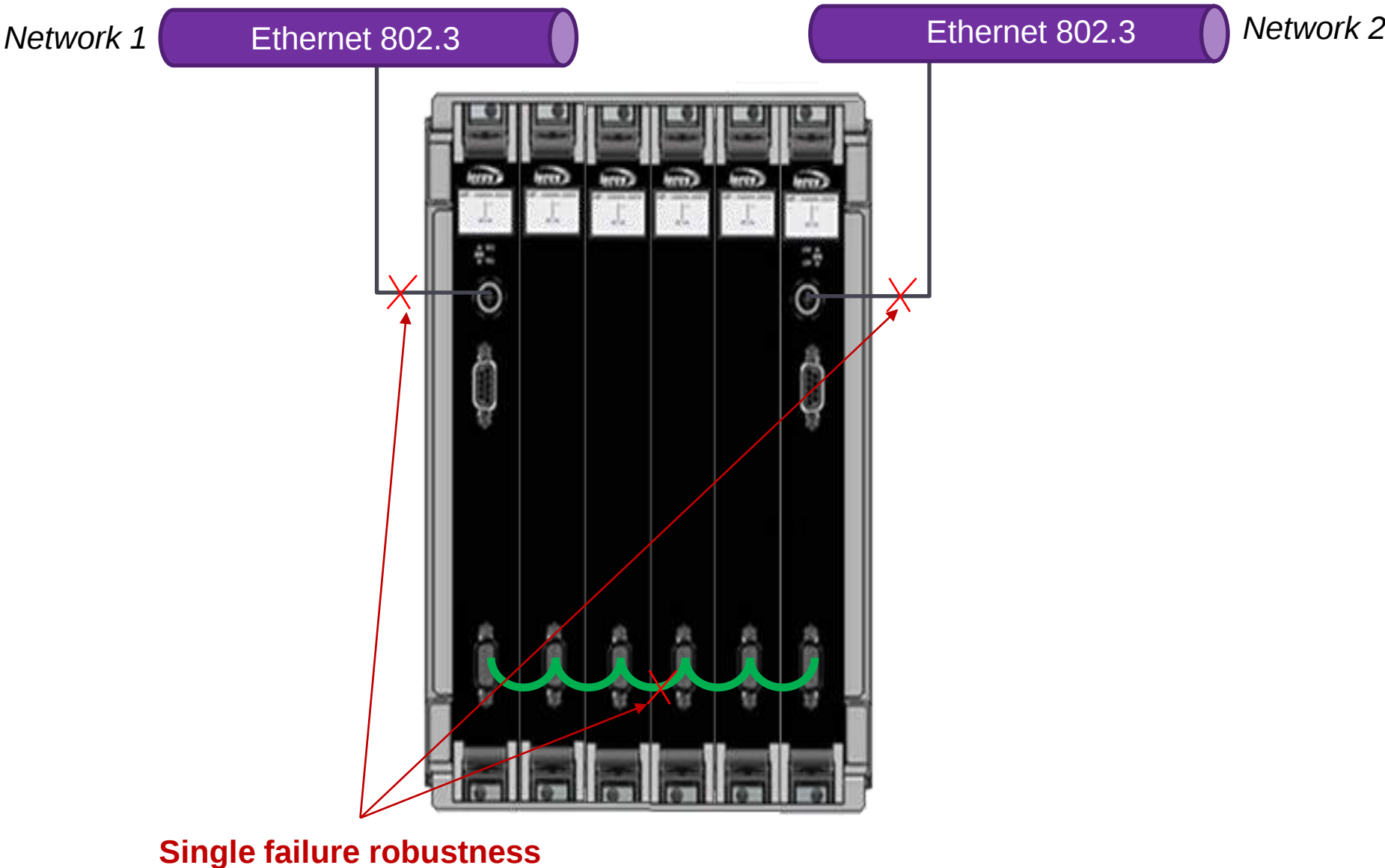


BRIO R12x TECHNICAL FEATURES

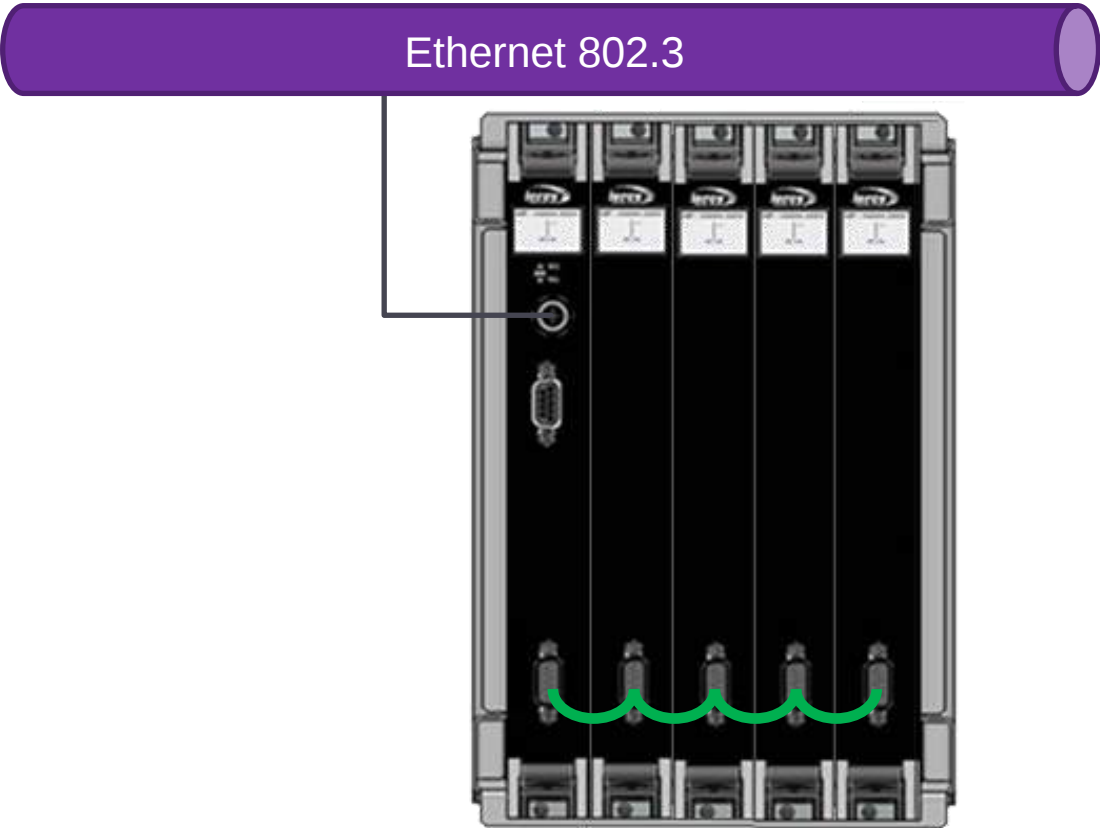
Ethernet redundancy / Dual homing



BRIO Daisy-Chain + TCN redundancy



I/O module extension



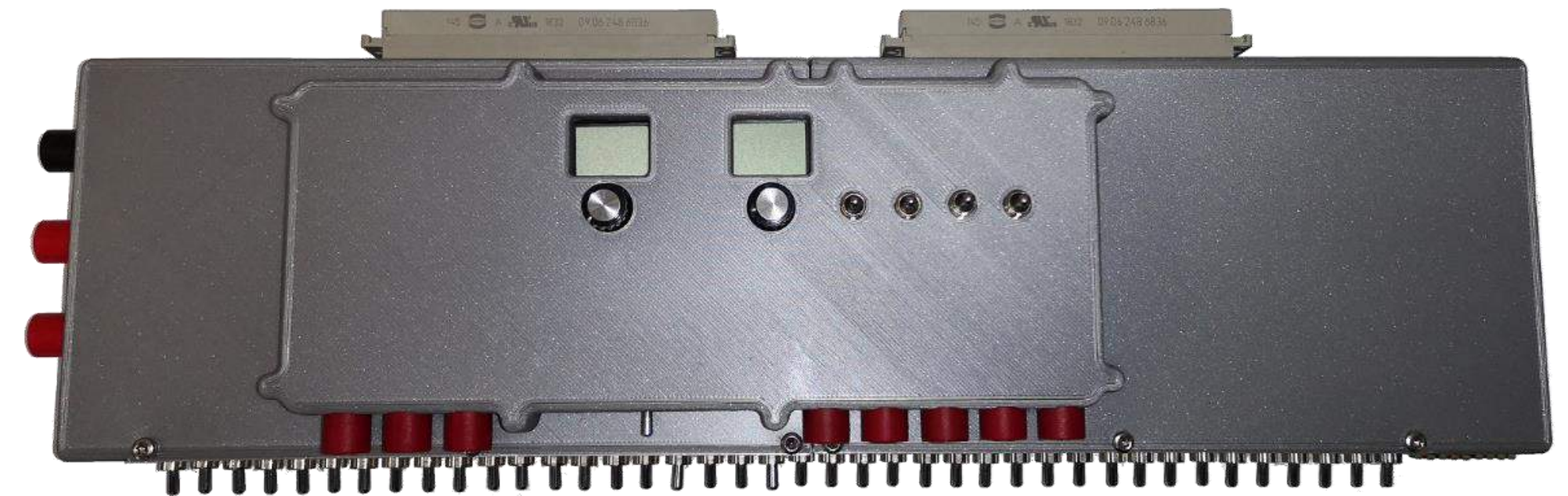
4

Test Equipment & Tools

I/O TEST INTERFACE CARDS

Specific I/O Test Cards

- Power-supply (banana plug connector)
- Digital input emulation (2-pos. switches)
- Digital output visualization (LEDs)
- Analogue input emulation (switch knob)
- Analogue output visualization (LCD display)



Supported product lines

- BRIO
- RIOM



5

Gateway Product Lines: Train Communication Networks (EN 50155)

SLG PRODUCT LINE



SLG 001, 002 and 003

- 24Vdc
- 20mA Current-loop <> RS-422
- Bidirectional converter
- 1200 bauds



BRIO Gateway

- 24-110Vdc
- Ethernet 10/100
- CAN 2.0 or RS-485
- MVB Process Data only
- Optional I/O interfaces



SLG 004 Gateway

- 24-110Vdc
- RS-485 (DB-9)
- RS-485 PROFIBUS (DB-9)

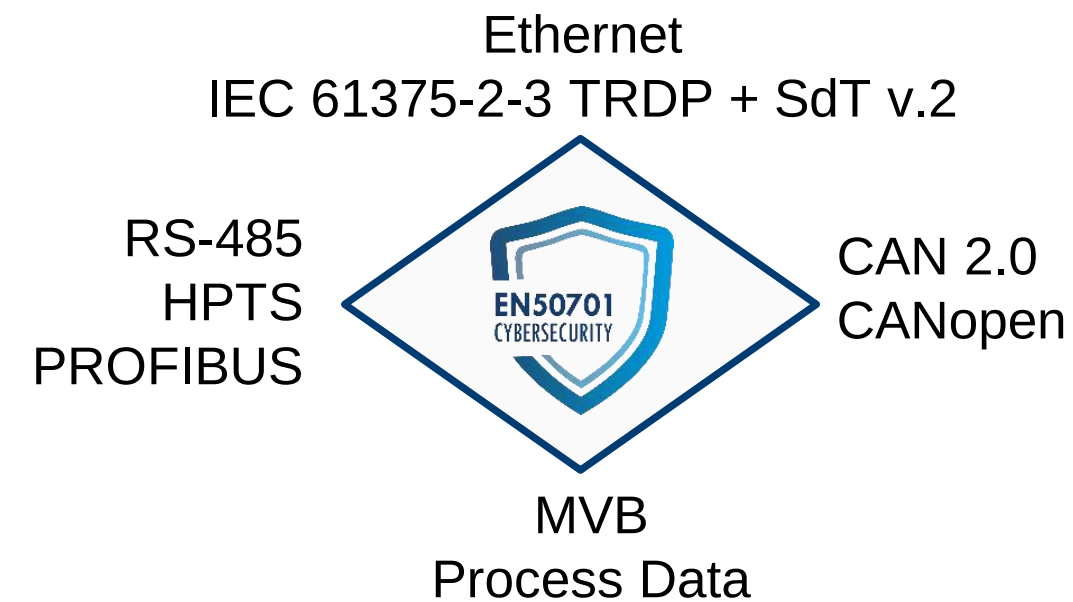


DTD 001 Datadiode

- 24-110Vdc
- Ethernet 10/100
- 2-IP channels (M12-D)
- Dedicated maintenance port

Universal train communication gateways

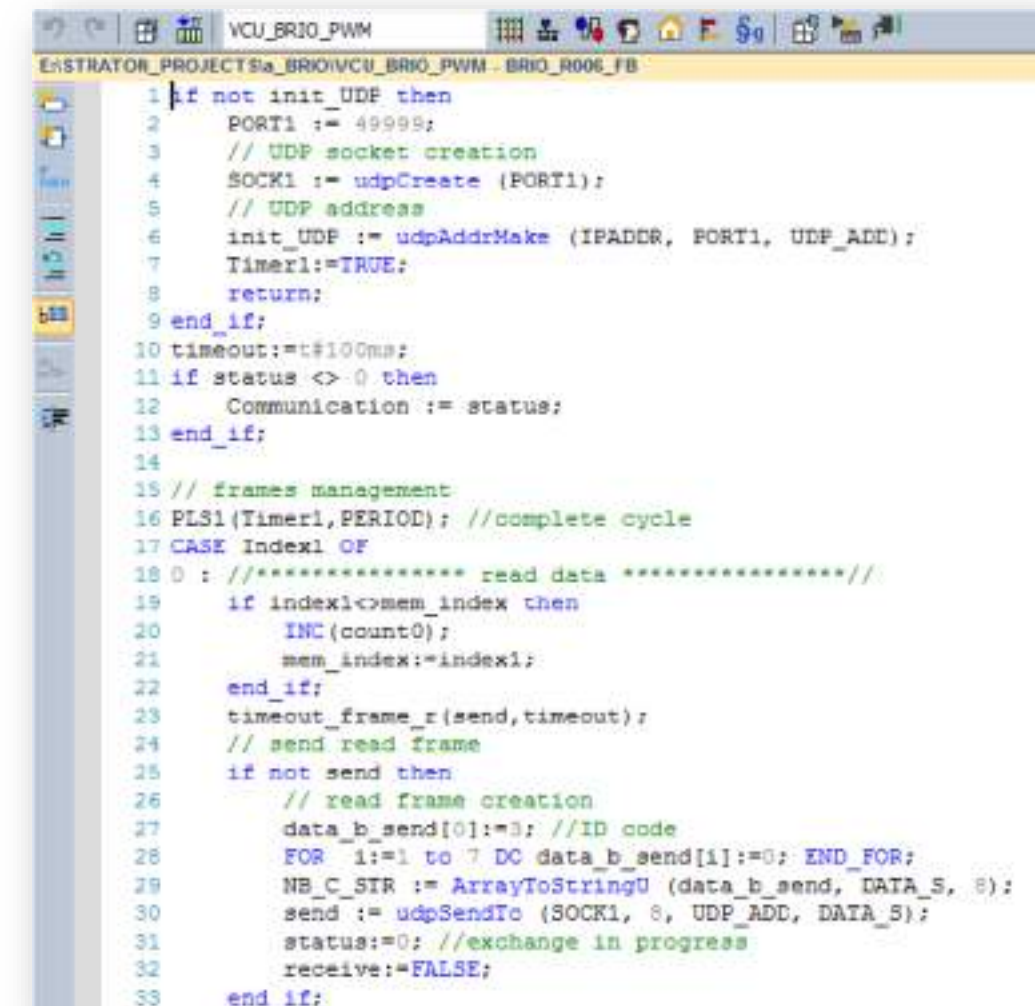
Supported protocols :



Programming :

IEC 61131-3 STRATON

- Integrated automation platform
- Design using SFC, LD, ST and FBD
- Ready-to-use communication protocols
 - MVB
 - IEC 61375-2-3 TRDP
 - MODBUS TCP
- Analysis, off-line tests & simulation
- Integrated commissioning tools



COMMUNICATION GATEWAY PRODUCT LINE



Main characteristics of MPC7010

- Multipurpose peripheral controller
 - Protocol converter, gateway, network sniffer
 - Local control unit, remote I/O module
 - On-board data recorder & analysis

- 2 Ethernet, 1 CAN, 1 MVB, 3 AI, 4DI, 4DO

Main characteristics of MMGW7000

- Multipurpose Mobile Gateway for Train-2-Ground, Condition-Based Maintenance (CBM)

- 2 Ethernet 10/100 Mbps (M12 D-code)
- 1 MVB Full Redundant EMD (optional : ESD up to class 4)
- 1 isolated CAN bus
- 1 isolated RS-232/485/422 serial port (Optional)
- 1 LTE class 4 with 2 SMA connectors (MIMO)
- 1 GNSS/GPS receiver module with SMA connector
- 4 Digital inputs (opto-coupled)
- 4 Digital outputs (solid state relays)
- 3 Analogue inputs (isolated)
- 2 USB 2.0 service interfaces

Options :

- 1 WiFi IEEE 802.11 a/b/g/m (AP – Client – Direct)
- 1 Bluetooth v4.0
- 1 ZigBee IEEE 802.15.4

- 24Vdc (optional : 37.5Vdc, 72Vdc, 110Vdc) or wide range power supply
- Front-panel diagnostic LEDs
- Standalone small form factor



WTB/CAN and WTB/MVB TCN REDUNDANT GATEWAY PRODUCT LINE



Main characteristics of RGWM1000 (IEC 61375 and UIC 556)

- WTB/CAN ;
- WTB/MVB ;
- WTB/MVB Redundant Gateway with SIL2 certification.
- 1 Ethernet 10/100 Base-T Ethernet port (optional : 2nd Ethernet port)
- 1 WTB Full Redundant with fritting function
- 1 MVB Full Redundant EMD (optional : ESD or OGF)
- 1 isolated CAN bus
- 1 isolated RS-232/485/422 serial port (Optional)
- 2 Digital inputs
- 1 Digital output
- 24Vdc (optional : 37.5Vdc, 72Vdc, 110Vdc)
- M12 D-code
- Front-panel diagnostic LEDs
- Size-3U modular form factor

TRAIN ETHERNET SWITCH PRODUCT LINE



Main characteristics of MTES6407

- Ethernet Train Backbone (ETB) switch ;
- Ethernet Consist Network (ECN) switch ;
- Ethernet Repeater.
- 24-110Vdc
- 12 Fast Ethernet (FE) ports :
 - 4x 10/100/1000 Mbps with by-pass relay (optional)
 - 8x 10/100/1000 Mbps with PoE/PoE+ capability (optional)
- M12 D-code or X-code according to port configuration
- 1 USB Type B serial console port
- 1 USB Type A slot for key storage
- Front-panel diagnostic LEDs
- Standalone small form factor

Main characteristics of MTES1048

- 16-port Ethernet Train Backbone (ETB) switch ;
 - 4x 10/100/1000 Mbps with by-pass relay (ETB ports)
 - 8x 10/100/1000 Mbps with PoE/PoE+ capability (ECN ports)
 - 2x 1 Gbit port
- 20-port Ethernet Consist Network (ECN) switch ;
 - 8x 10/100/1000 Mbps with by-pass relay (ECN ports)
 - 8x 10/100/1000 Mbps with PoE capability (ECN ports)
 - 2x 1Gbps (HSR)
 - 2x 2 Gbps ports
- 24-110Vdc
- M12 D-code or X-code according to port configuration
- Front-panel diagnostic LEDs
- Size-3U rack-mount solution

6

PMU Product Line: Modular PLC (EN 50155)

MODULAR I/O RACK-MOUNT SYSTEMS

Compact rackmount

- 19"-rack, size-3U
- Standalone integration

Base configuration

- VCU + add-ons

Ready to customize slot

- Accelerated time to market
- Reduced development costs

Modular platform

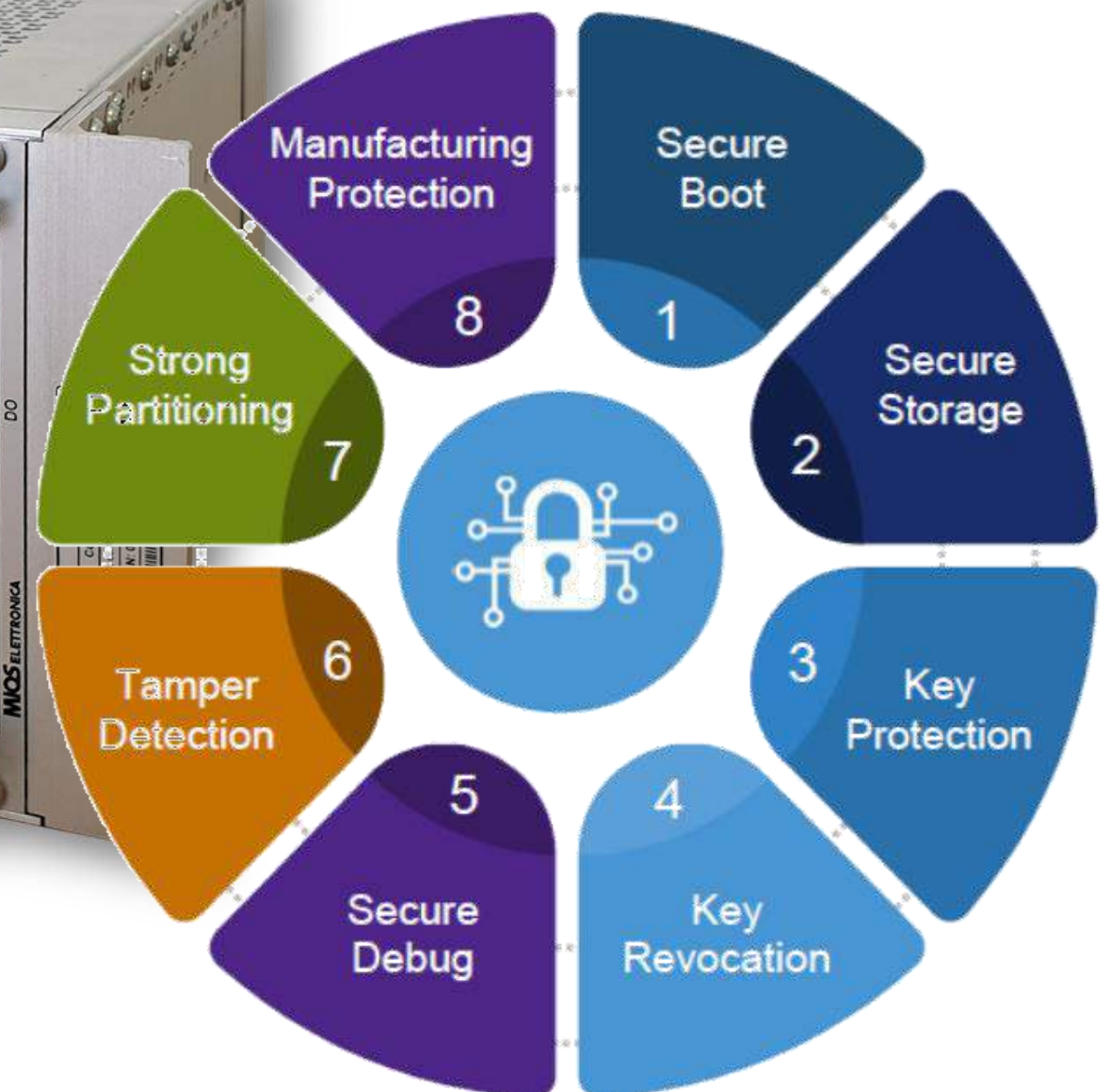
- Dual Ethernet
- MVB Bus
- CAN Bus
- 24-110Vdc PSU slot
- Comms or I/O expansion slot
 - 24 isolated DI board
 - 16 isolated DI board
 - 8 isolated DI & 8 isolated DO board
 - 16 isolated DO & 2 PWM input board
 - 2 Frequency Inputs, 4 AI & 2 Relay Outputs board



- High-performance CPU
- Latest Linux / RTOS / IEC 61131-3
- Predisposed HW Cybersecurity features

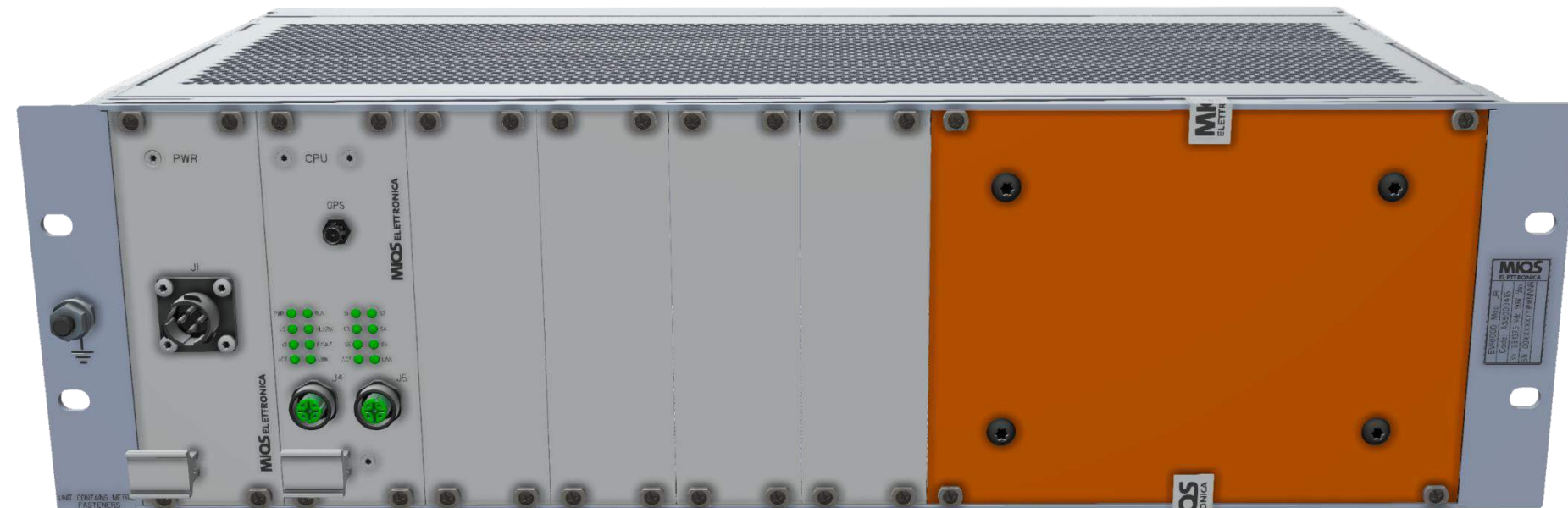
On-demand interface integration

- MVB / LON / CAN / RS-485 / RS-422
- Current Loop / FIP / HDLC / HTTPS
- GPS receiver
- 4G LTE connectivity
- High-capacity NAS...



7 Event Recorder Product Line: Crash-Protected Memory Devices (EN 50155)

EVENT RECORDER & CRASH PROTECTED MEMORY DEVICES PRODUCT LINE



Main characteristics of EVR 1000 & CHMM7000 / CPSM1000

Modular design to support easily project-based customization needs

Compliant with all the main standards worldwide (including US): 49 CFR Part 229 rule - IEEE 1482.1 - IEC 62625-1

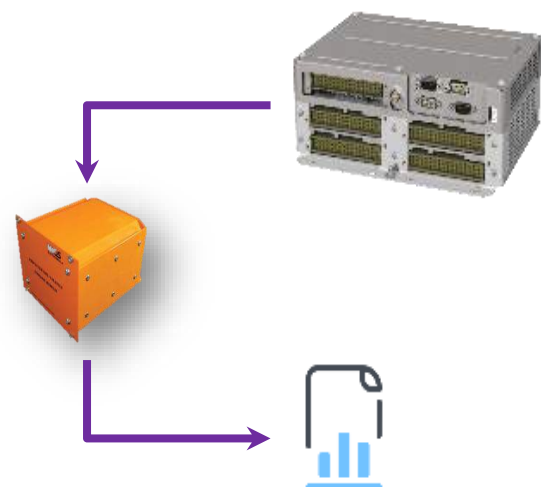
Wide range of hardware interfaces available (Ethernet, CAN, MVB, GPS/GNNS receiver, digital and analogue I/Os, USB, RS232/485/422, etc.)

Wide range of protocols supported (MVB, CANOpen, TRDP, IPTCom, CIP, ModBus, etc.)

- JRU function to record data from ERTMS/ETCS fully compliant with to EU TSI
- Support recording of specific national data from on-board train control system(s)
- Crash Protected Memory Module supporting Ethernet + PoE interface to store data directly from the on-board Ethernet network

8

Third-Party Products : TCMS Components (EN 50155)



CRASH PROTECTED MEMORY DEVICE

Principles

- Network Attached Storage (NAS)
- Server Message Block (SMB) : SAMBA or NFS v. 3 protocol / FTP
- Supervision : webserver for configuration and firmware updating

IP Configuration

- Static IP addressing or DHCP server
- DNS Server

Access

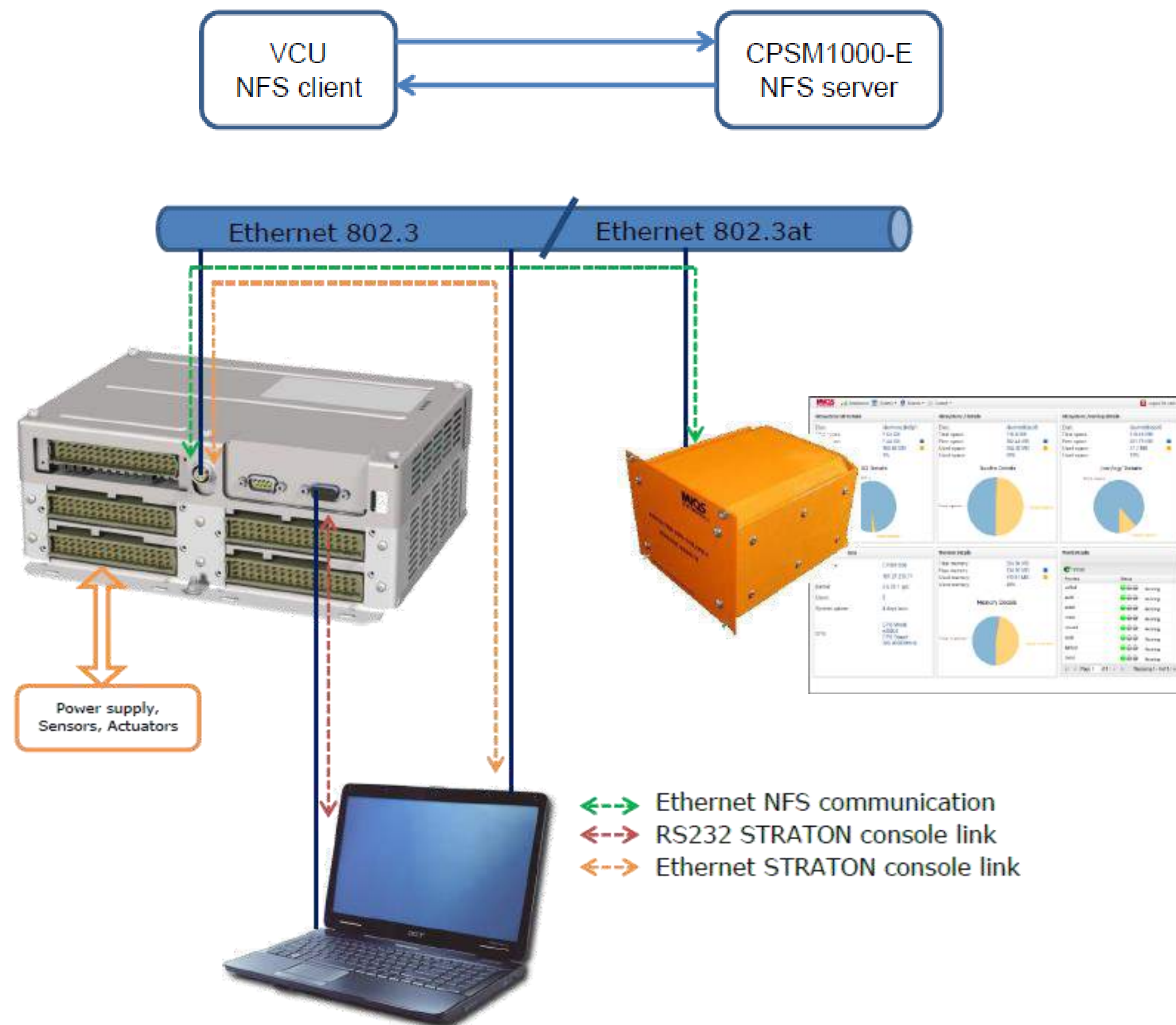
- User management : username, ID, password, disk quota

Standards

- EN 50155 / IEC 60571
- IEEE Std 1482.1:1999
- IEC 62625-1
- Optional : FRA 49 CFR Part 229

Typical applications

- Network attached storage (NAS)
- Train service log maintenance
- Condition-based monitoring
- Crash protected memory device
- Juridical recorder unit



3rd PARTY TRDP EQUIPMENT INTEGRATION

Train communication networks

- Integrated ETB
- Consist switch
- WiFi / 4G LTE / GPS-GNSS



Driver display unit

- 10.4" TFT



TCMS Test bench

- Train communication networks
- TCMS applications
- Subsystems simulation
- Train-level functions



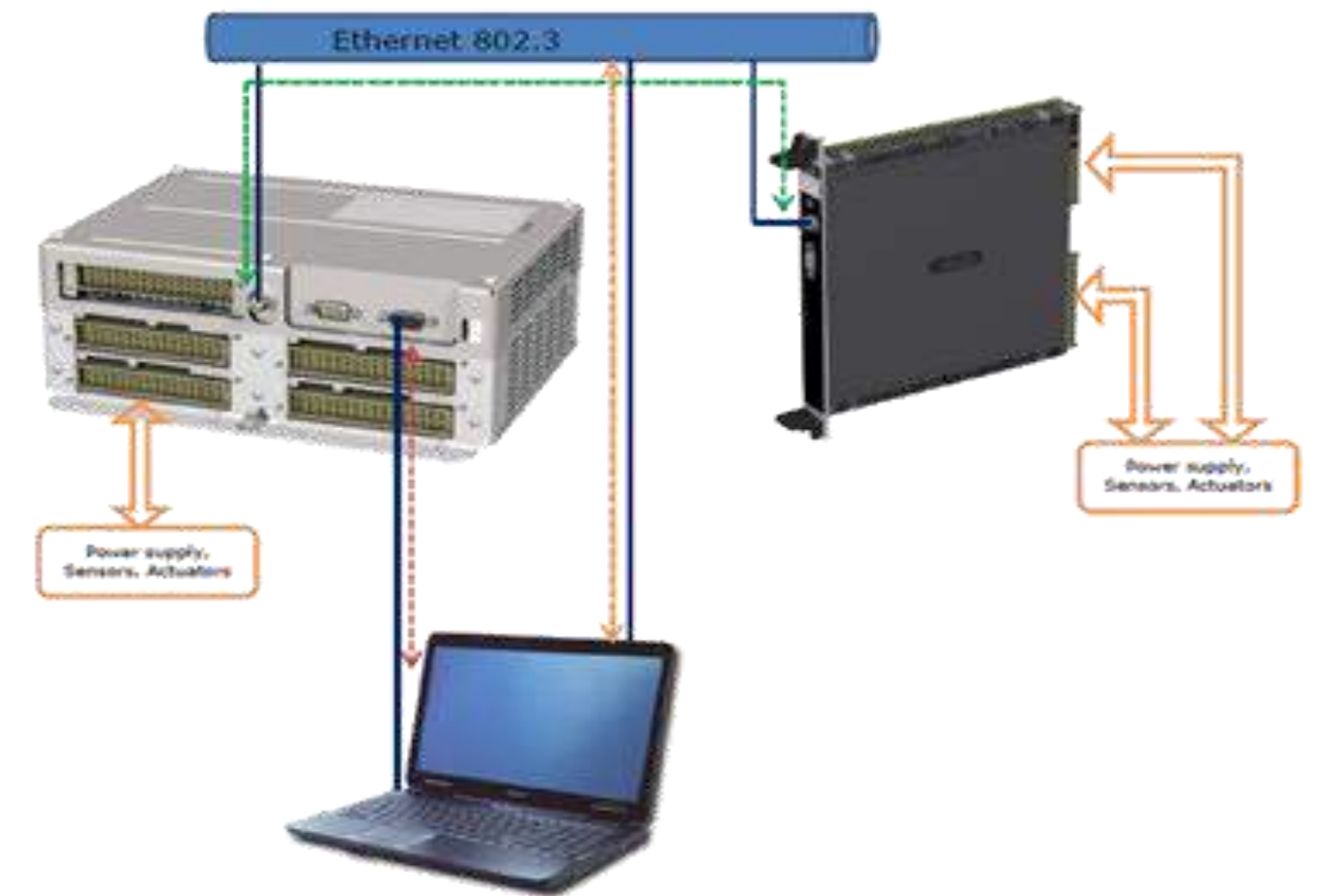
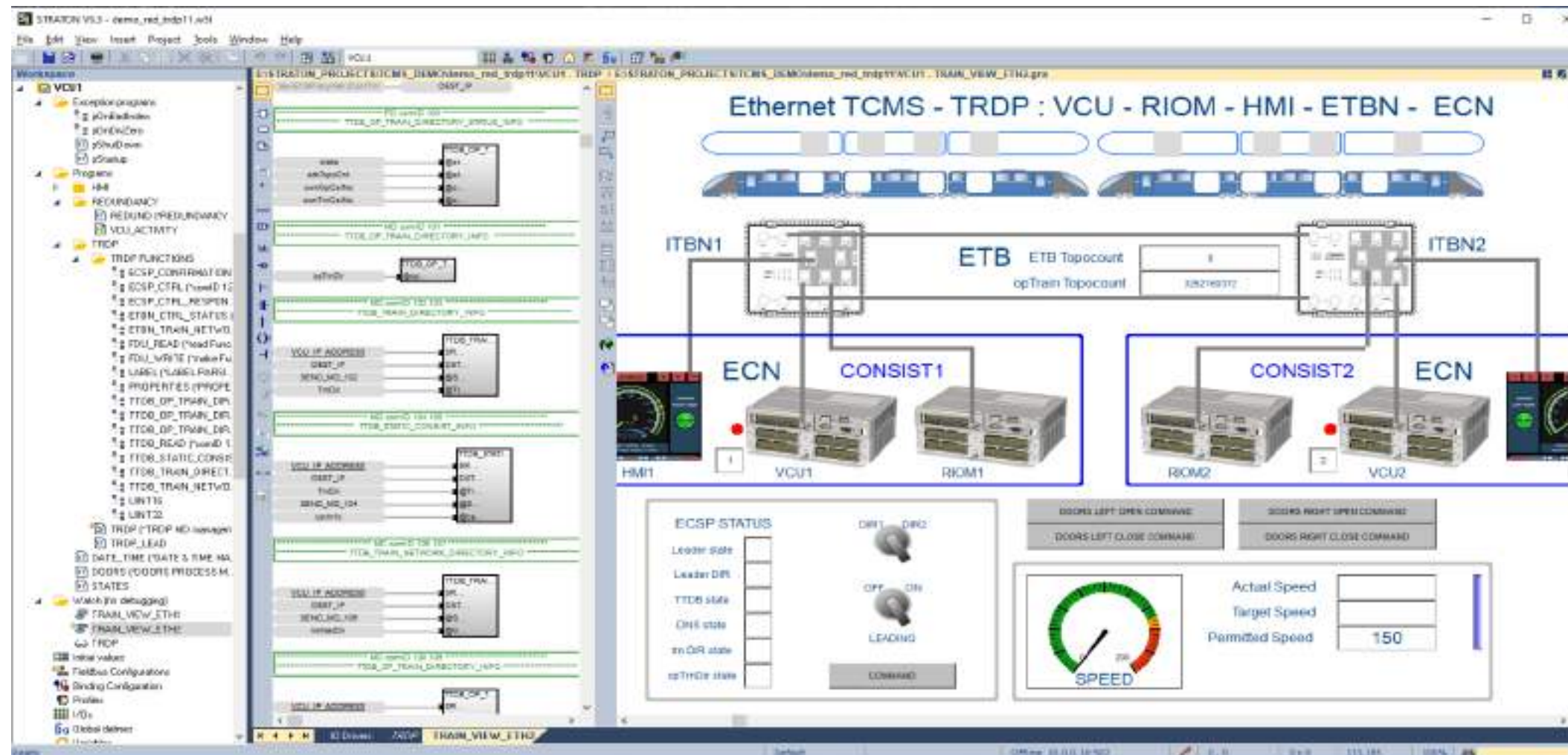
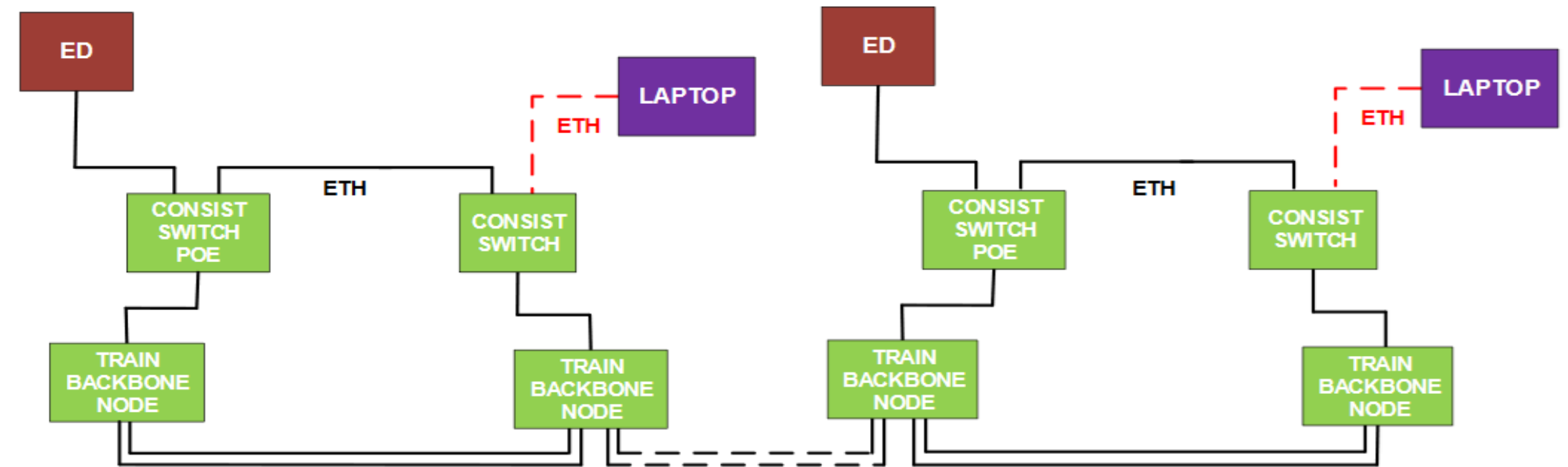
9

IEC61375-2-3 TRDP

IEC 61375-2-3 Train Real-time Data Protocol

TRDP test bench

- Network infrastructure : Integrated ETBN and ETCS
- Evaluation platform :
 - Based on RIOM and BRIO product lines
 - IEC 61131-3 STRATON



10

Cybersecurity

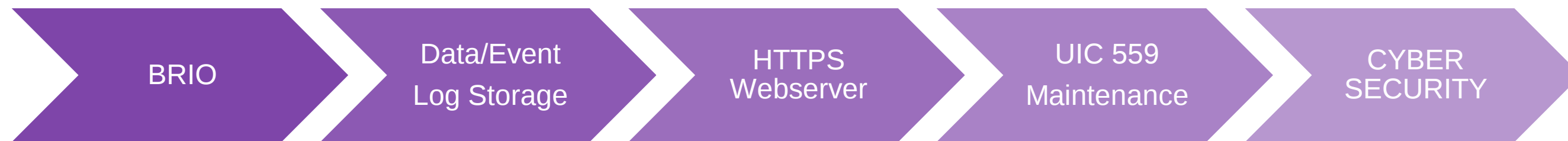
Railway Applications - Cybersecurity

CENELEC TS-50701:2021

Technological expertise : ANSSI certification

Pre-disposed hardware and software features

- On-going evolutions based on IEC 62443
- Crypto-memory : TRNG, AES-256, SHA-256/-512, ECC, RSA
- Compliance with X.509 certificates : HTTPS, TLS, DTLS, sFTP...
- Real-time sensitive network : TSN
- Security Engine, Arm TrustZone and Secure Boot



Maintenance and life-cycle management

- Data/event log collection and failure root cause analysis
- Thermal management profile
- Preventive maintenance : Relays, Sensors, Sub-systems...

Cyber security, UIC 559 compliance and « Big Data »

- Train track data
- Time configuration, Operational mode management
- Firmware and application upload/reboot management

Root of trust management

- Use of crypto element to manage :
 - The provisionning process (Factory setup)
 - Secure Firmware Download
 - Firmware upated in the field
 - Asymmetric authentication
 - Verification of the certificate chain



IEC 62443-4-1

11

Engineering Services

ENGINEERING SERVICES

Electronic Manufacturing Services (« EMS »)

- Rapid PCBA prototyping
- Serial manufacturing
- System integration

After-sales repair and maintenance (« MRO »)

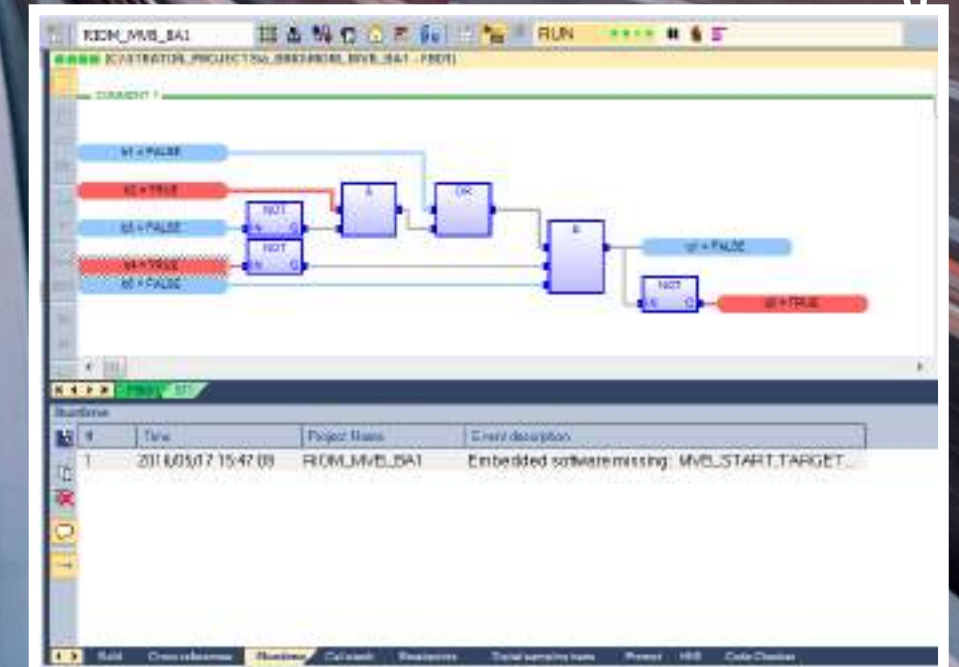
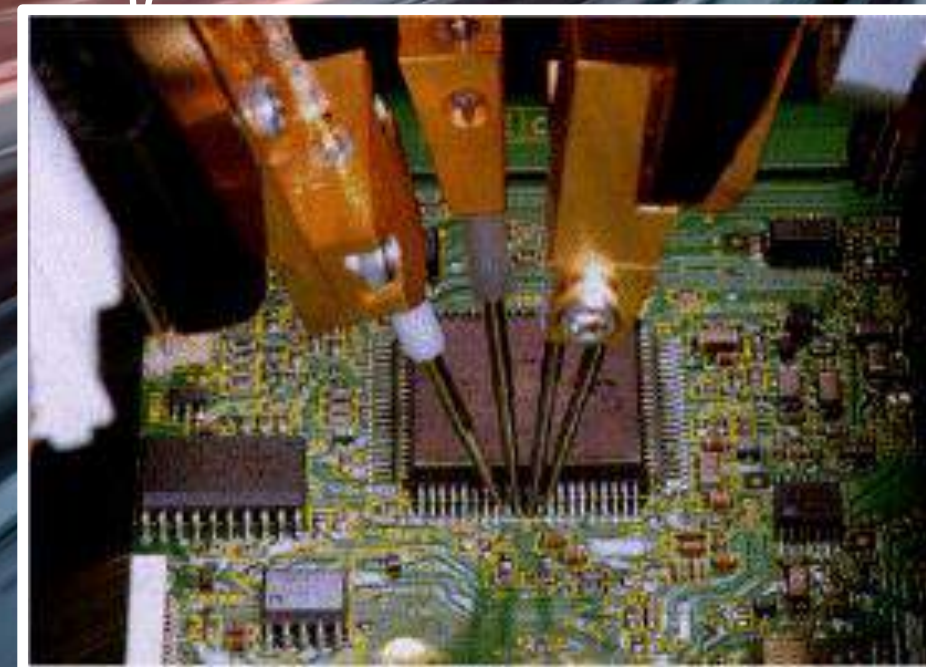
- Obsolescence management
- Electronic board / embedded products

Mechanical system integration

- RIOM in size-3U/-6U rackmount solution
- BRIO in size-1U/-2U rackmount solution

Applicative software engineering

- IEC 61131-3 STRATON
 - Local PLC for subsystems
 - TCMS system applications
- C/C++ Board Support Package for Linux OS
 - Middleware for 3DS ControlBuild
- C/C++ Board Support Package for FreeRTOS



SAFETY ENGINEERING SERVICES

SIL2 Hardware and S.SIL2 development

- EN 50155:2021
- EN 50126:2017
- EN 50128:2011+A2:2020
- EN 50129:2018
- EN 50159:2010+A1:2020

RAMS

- Product-level analysis
- System-level analysis

SIL2 certification

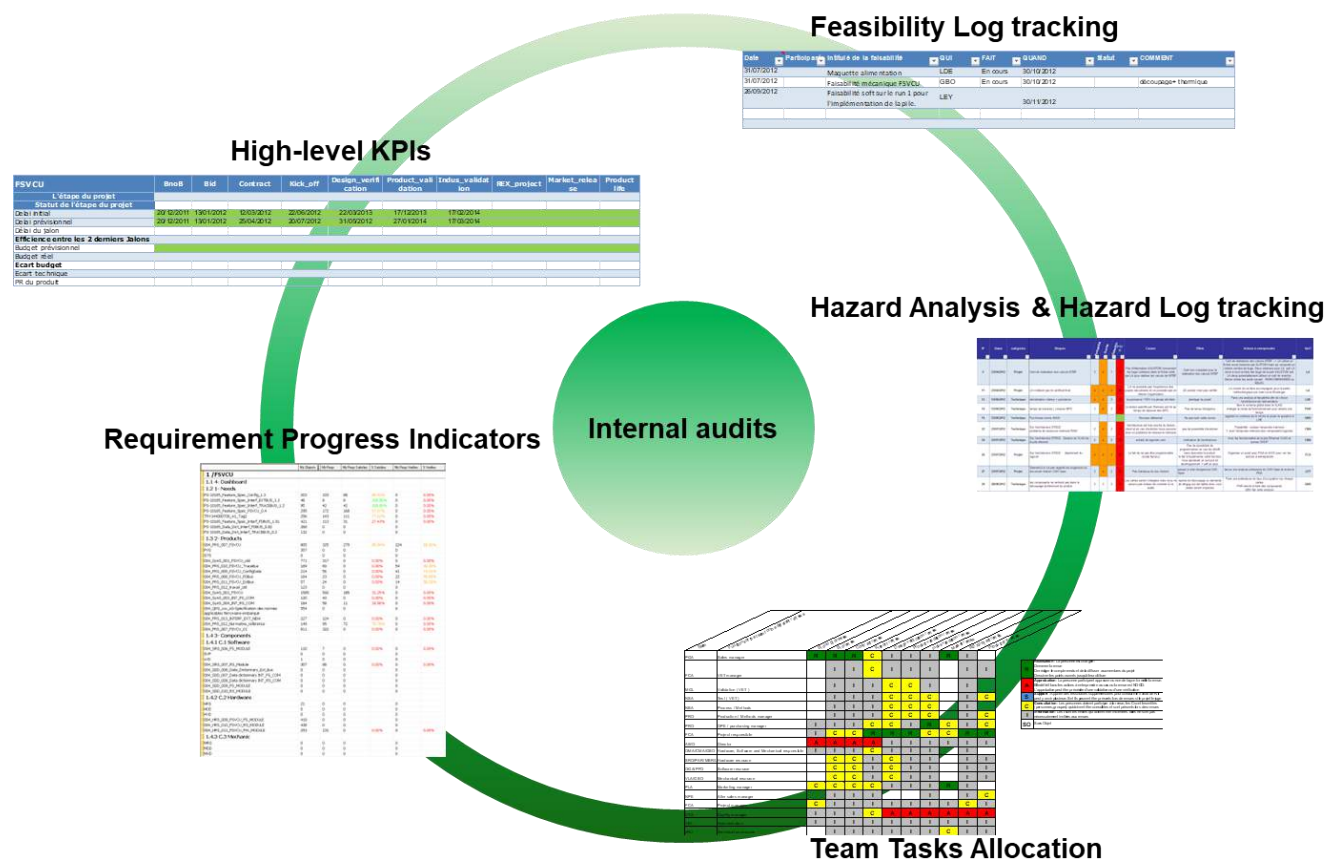
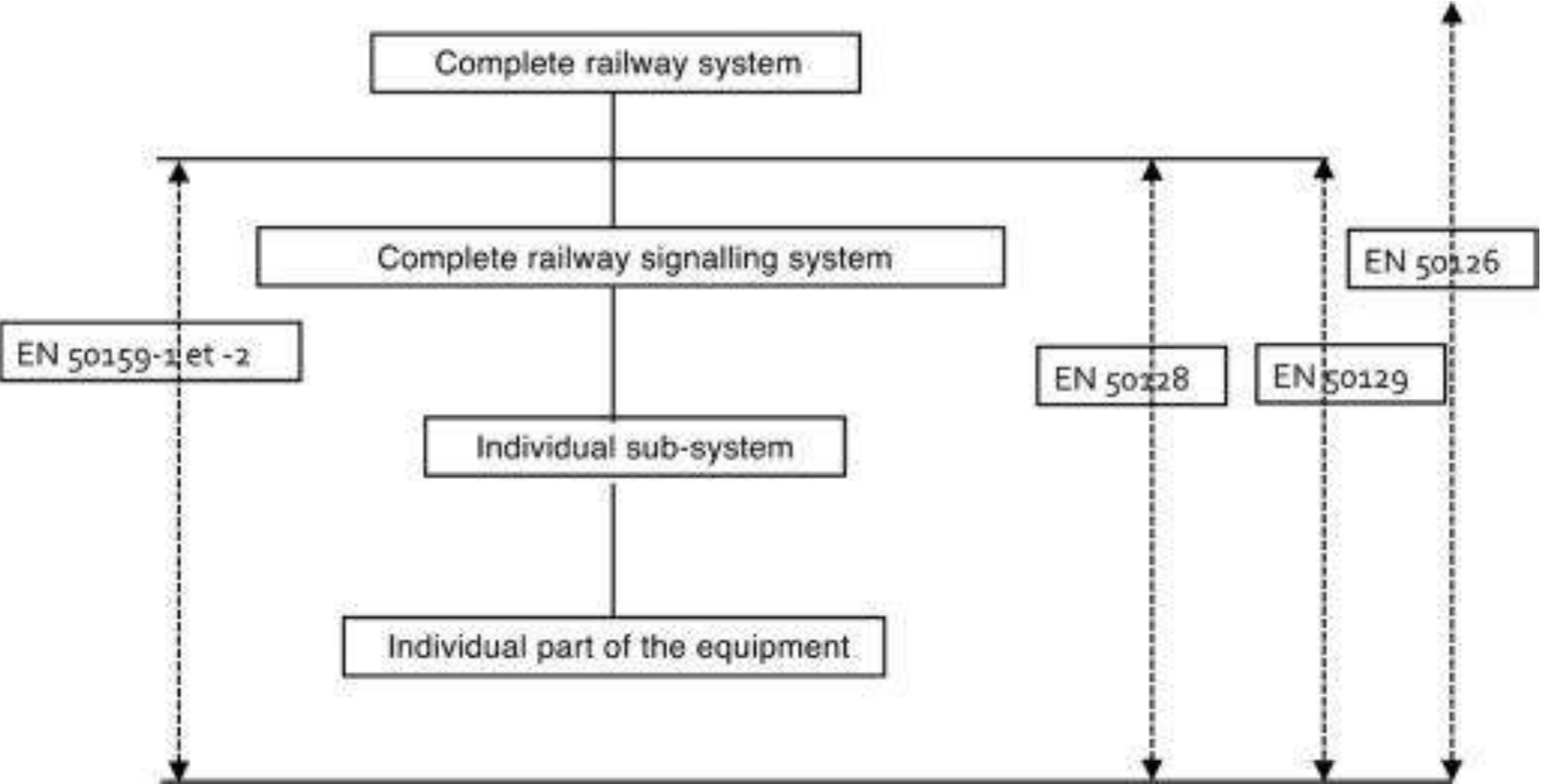
- Safety case evaluation
- ISA : CERTIFER

Applicative software engineering strategy

- C/C++ BSP for Linux OS or FreeRTOS
- Rules of coding

Available option:

- IEC 61131-3 STRATON
 - Based on IEC 61508-3
 - SIL2 « capable » for « SAFE » apps



SAFETY ENGINEERING SERVICES

SIL2 Hardware and S.SIL2 developement

- TCMS subsystem
- Vehicle Control Unit
- Remote I/O Modules

TCMS – SIL2

- Year 2008
- « 1oo2 » and « 2oo2 »

I/O Infrastructure Network – SIL2

- Year 2015
- Mixed SIL0 and SIL2 I/O platform

Vehicle Control Unit – SIL2

- Year 2016
- Fire Detection

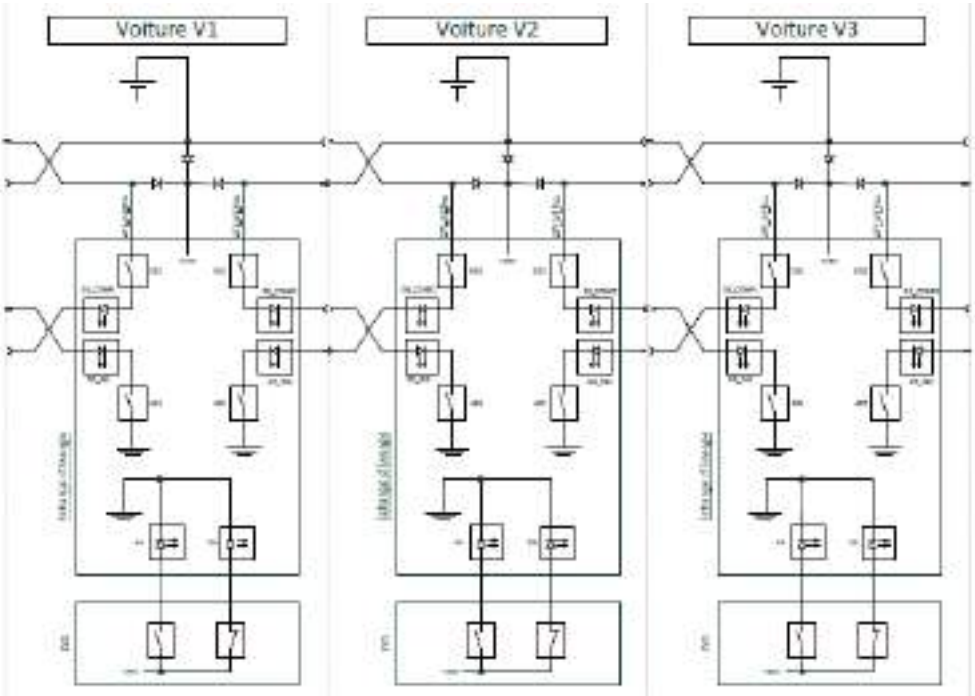
Remote I/O Module – SIL2

- Year 2019
- SIL2 Digital Inputs & Outputs
- Safety Layer



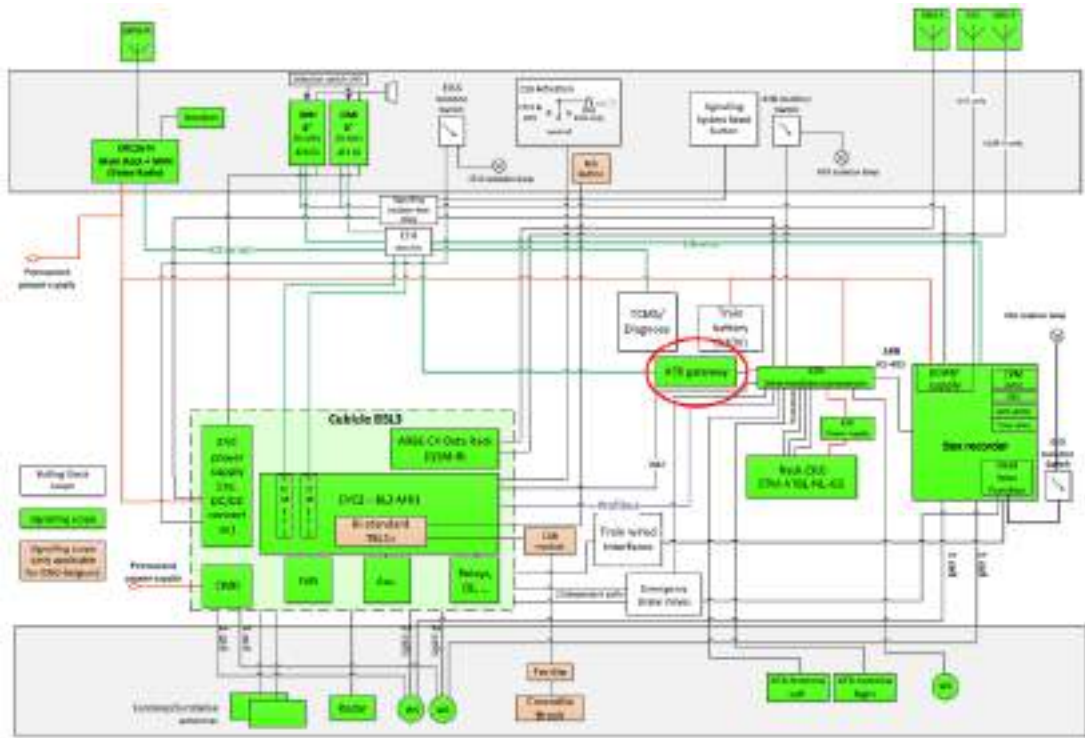
SYSTEM ENGINEERING INTEGRATION

Energy Exchange Controller



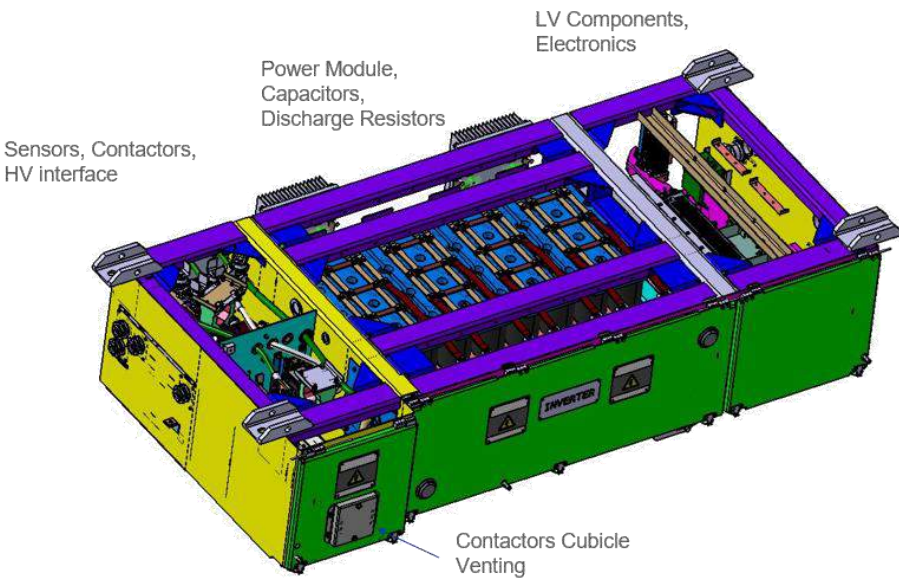
P_CEE_SYS_001

CBTC : ATP – DMI Gateway



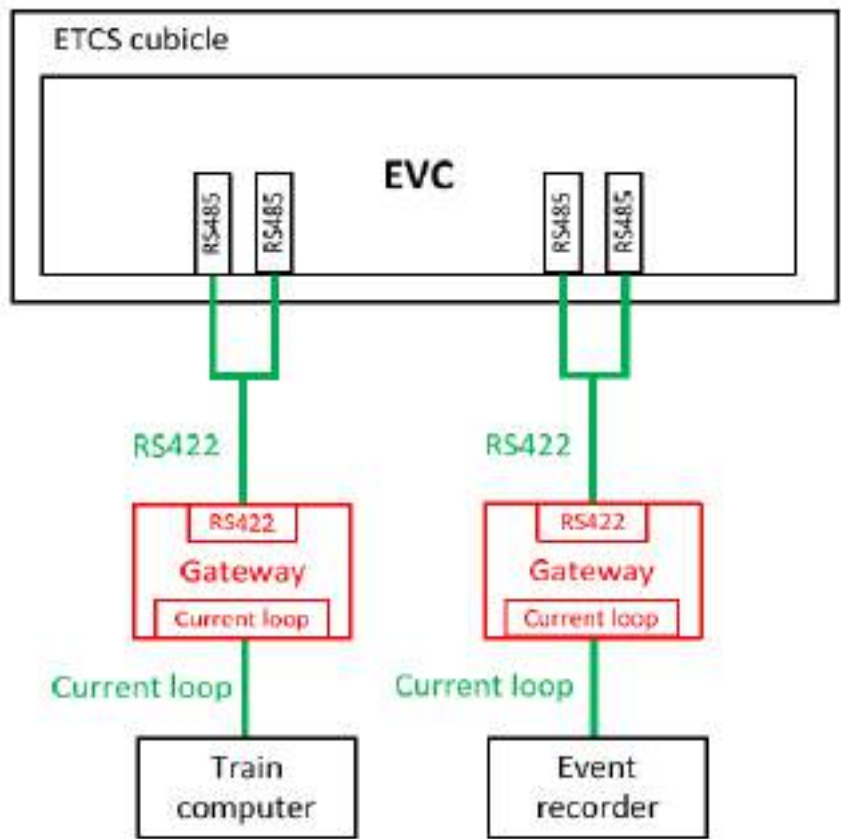
P_BRIO_R102

Traction Inverter
Auxiliary Power Converters



P_BRIO_R107

ETCS : EVC-KVB/EVC-DMI/EVC-ER



P_SLG_003

REFERENCES



ALSTOM

中国中车
CRRC

DB

RATP

EURO
TUNNEL

SNCF

SIEMENS

ABB

TOSHIBA
Leading Innovation >>>

Hankyu

Talgo

DSB

交通部台灣鐵路管理局
Taiwan Railways Administration

JR
JR-WEST

RFI
RETE FERROVIARIA ITALIANA
GRUPPO FERROVIE DELLO STATO ITALIANE

HITACHI
Inspire the Next

STADLER

SVI

KINKI SHARYO

Nabtesco

mermec

gmv
INNOVATING SOLUTIONS

TESMEC

Let's build your future together!

Sebastien MAURY
Business Development Manager

+33 668 535 286

sebastien.maury@leroy-autom.com

www.leroy-automation.com

www.mioselettronica.com

www.agonelectronics.com

#Unlimit your perspectives



MIOSE
ELETTRONICA

leroy
AUTOMATION

A member of
AGON
ELECTRONICS