



SMART
SYSTEMS

CTRL@LOCK 200

CBI for industrial railways



We are TMH Smart Systems

TMH Smart Systems –

Russian engineering group of companies focused on the creation of modern signaling and traffic control solutions



>120

PEOPLE

EMPLOYEES



>50

PEOPLE

ENGINEERS



121

MLN RUB.

REVENUE*



5

COUNTRIES

MARKETS



4

COMPANIES

ASSETS

* in 2019

PART OF ONE BUSINESS ECOSYSTEM



ROLLING STOCK

Freight & Passenger rolling stock



SERVICE

Product Life Cycle Management



TRAFFIC MANAGEMENT

Digital Train Control Systems



TMH Smart Systems

part of the world's largest rolling stock manufacturer and service provider group - TRANSMASHHOLDING



CLOSE TO CUTOMERS ALL OVER THE WORLD



-  **INDUSTRIAL TRANSPORT**
-  **MAINLINE TRANSPORT**
-  **URBAN TRANSPORT**



PVO **TMH** **Московский метрополитен**

Severstal **ROSNEFT** **КУЗБАССРАЗРЕЗУГОЛЬ**

АГМК **UNG Shurtan GKM**

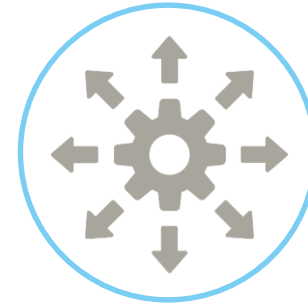
ҚАЗАҚСТАН ТЕМІР ЖОЛЫ

EESTI RAUDTEE

CTRL@LOCK 200

Computer-based interlocking for train traffic control on open lines and stations

In partnership with:



KEY FUNCTIONS

- Station control automation
- End user full monitor and control
- Hot-standby for CBI main components
- Infrastructure diagnostics
- Integration with customer Automated Process Control Systems
- Interface with all installations
- In-house expansion of the system functionality



CUSTOMER BENEFITS

- Package offer
(centralized traffic control, information system, implemented train schedule)
- Independence in hardware components
- Off-the-shelf components
- Easy to replace with any analogue if necessary
- No strict requirements for equipment set-up and placement

APPLICATION SCOPE



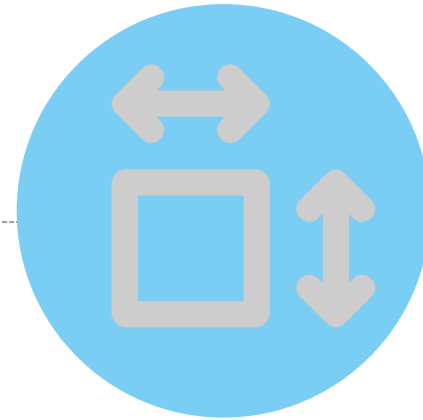
INDUSTRIAL
TRANSPORT

WHAT OUR SOLUTION BRINGS TO YOU?



LOSSES REDUCTION IN TRANSPORTATION PROCESS

- ✓ Traffic capacity growth
- ✓ Emergency situation risks minimization
- ✓ Stations operation even during emergency shutdown of power supplies
- ✓ Traction rolling stock efficiency growth



INDUSTRIAL SPACE REDUCTION

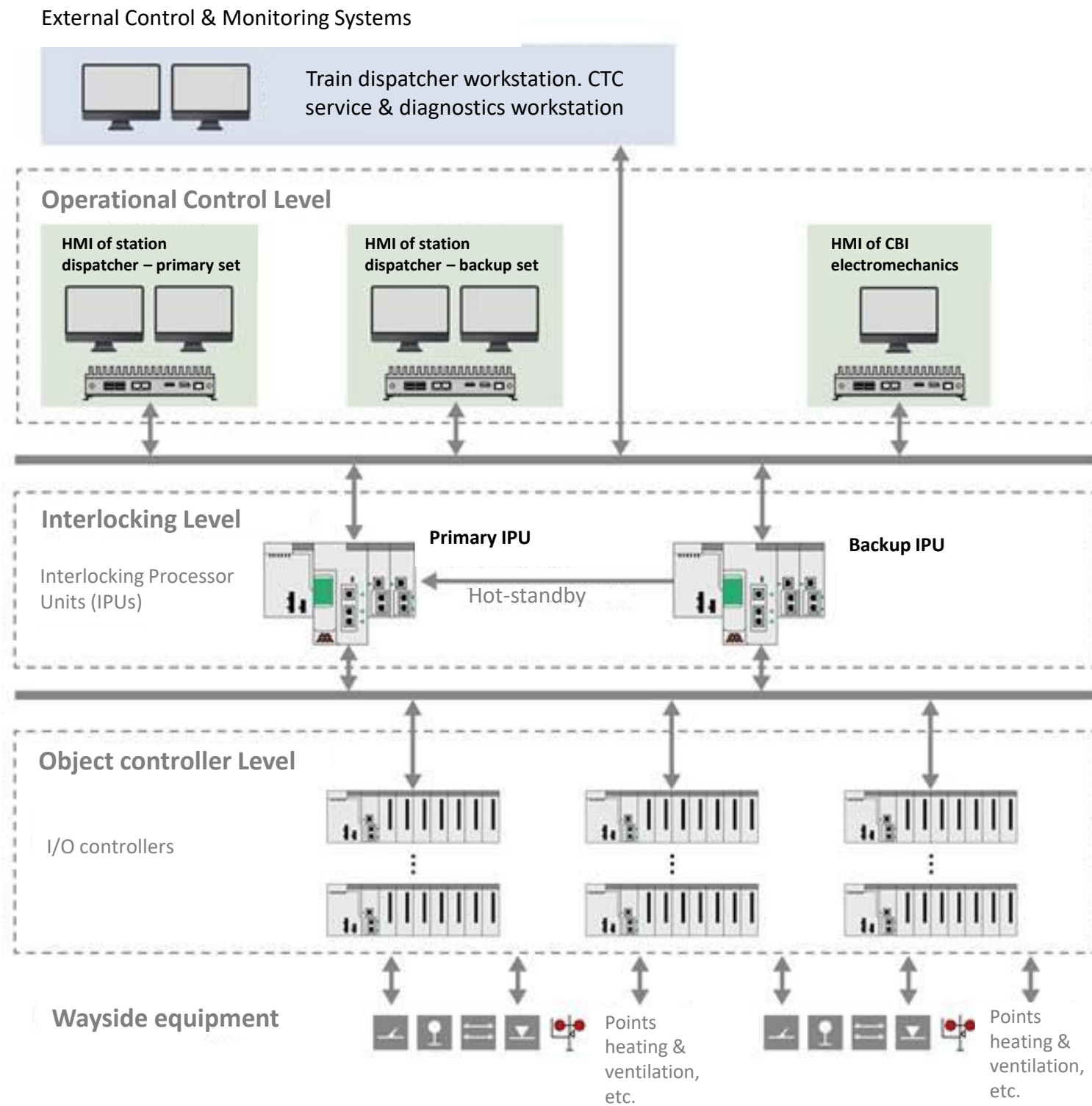
- ✓ Up to 50% of the relay rooms space release



SYSTEM FUNCTIONALY EXPANSION

- ✓ E-journal
- ✓ Telemetry and diagnostics (traction rolling stock downtime reduction)
- ✓ Areas incorporation of several station masters (reduction of attendant personnel)

Multilevel architecture



Design-configurable system - implementation of various architectures

4 Subsystems

Human Machine Interface

- Automated workstation of station dispatcher – primary set
- Automated workstation of station dispatcher – backup set
- Automated workstation of CBI electromechanics
- Primary Database server
- Backup Database server

Transmission system

- Primary Communication switch
- Backup Communication switch
- Full-redundant Transmission network

Interlocking Processor Unit

- Primary Interlocking Processor Unit
- Backup Interlocking Processor Unit
- Hot-standby synchronization network

Object controllers

- I/O object controllers various types
- I/O object controllers network

Workstation subsystem

Automated workstation

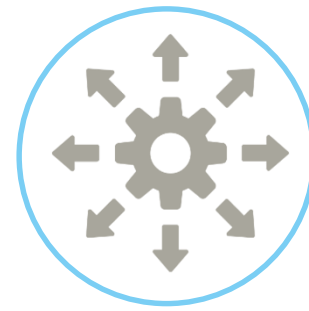
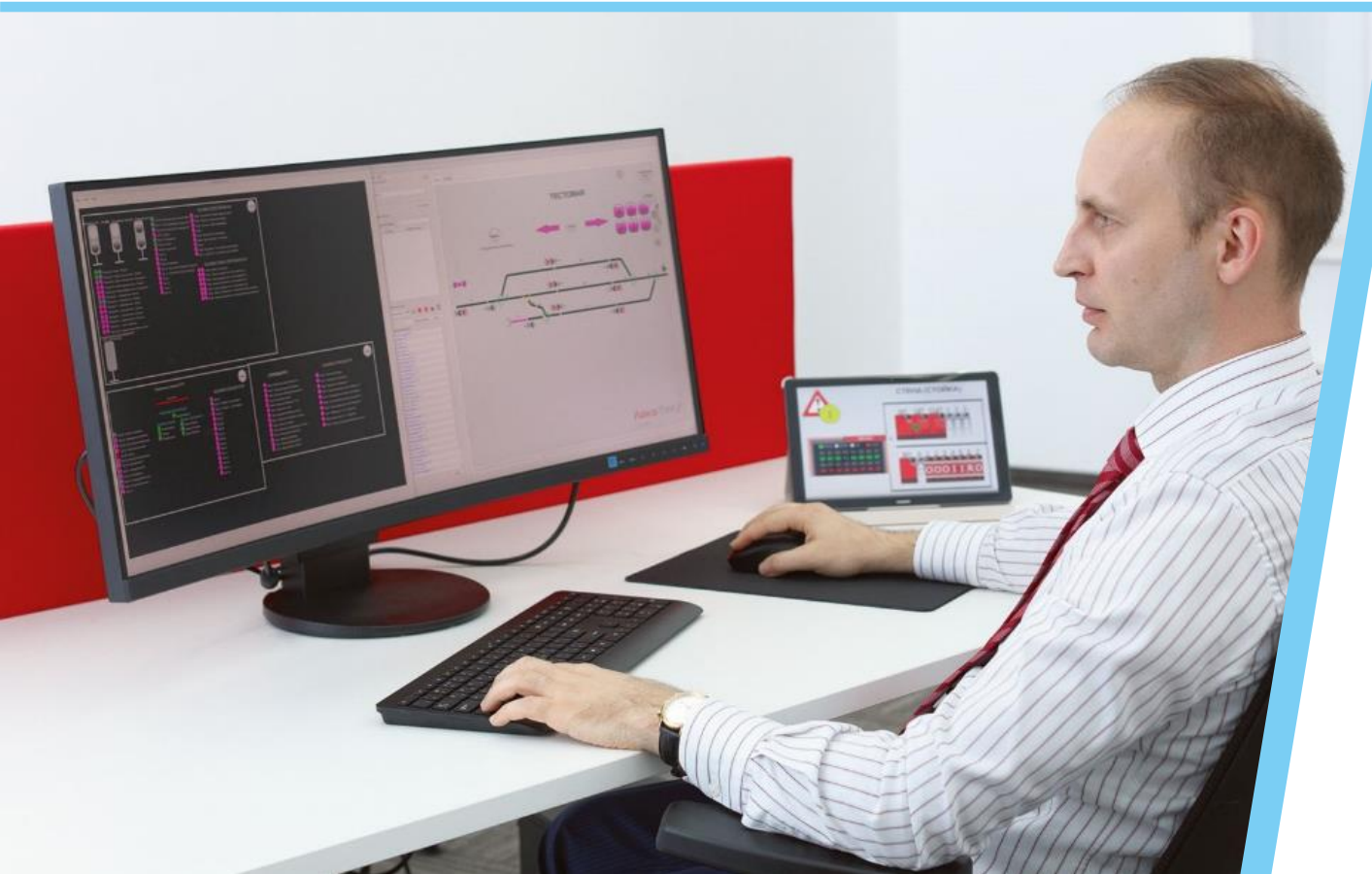
Interface to work with the system and store information

 - Workstation Ctrl@Screen our in-house development

 - Industrial computers are used

compatible with:

Windows, Linux (incl. Astra Linux), Android and Baikal Electronics



KEY FUNCTIONS

- Automated workstation of station dispatcher – controls CBI equipment and shows its state on the display.
- Automated workstation of electromechanic – controls technical parameters of CBI equipment.
- Hot-standby of Workstation subsystem ensures continuous operation.
- Database servers collect, store and archive all information about train situation, state of controlled devices and provide it at the user's request.



TECHNOLOGICAL BENEFITS

- 100% Russian SW
- Flexible hardware requirements
- Scalability across various architectures
- Possible to integrate with higher-level systems (CTC, logistic systems)
- Multilanguage support without restart
- Graphics scalability and adaptability regardless of the size and number of monitors

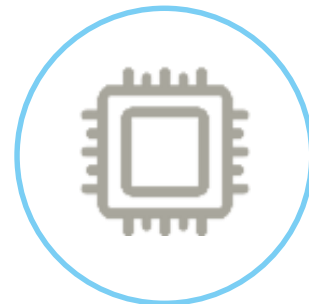
Data transmission network

Exchanges data between CBI Ctrl@Lock200 subsystems



**AUTOMATED
WORKSTATION
SUBNETWORK**

Local data exchange subnets are divided into:



**I/O OBJECT
CONTROLLERS
SUBNETWORK**

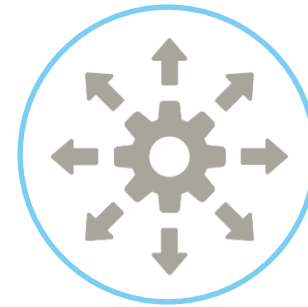


- Exchange data between the Automated Workstations, Database servers and Interlocking Processor Units
- Ethernet network based on star topology
- Communication protocol between Database Servers and Interlocking Processor Units – ModbusTCP
- 100% redundancy of Automated Workstation subnetwork: network HW and communication cables

- Data exchange between Interlocking Processor Units and I/O Object Controllers
- Ethernet/IP communication protocol
- Ethernet network based on ring topology
- RSTP are used to organize redundancy of the subnetwork

Interlocking Processor Unit

Process interlocking logical dependencies on the bases of preprogrammed control algorithms, operator commands and information from object controllers



KEY FUNCTIONS

- Interlocking Processor Units redundancy ensure continuous operation
- Hot-standby synchronization network
- Modicon M580 programmable logical controllers



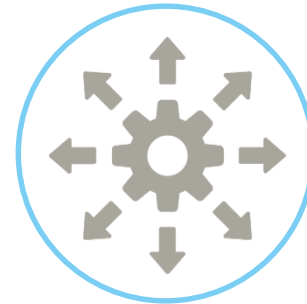
TECHNOLOGICAL BENEFITS

- Each Interlocking Processor Unit contain:
 - Backplane
 - Power supply
 - Central Processor
 - Ethernet communication modules
- Up to 4 Ethernet communication modules can be installed if additional connections to Interlocking Processor Unit are required

I/O Object Controllers

Objects interface device

Receives command from Interlocking Processor Unit, analyzes status of field communications and executes command to control equipment



KEY
FUNCTIONS

- I/O Object Controllers of various types*
- I/O Object Controllers subnetwork
- Information about command execution transmits to Interlocking Processor Unit after I/O Object Controllers for railway equipment fulfill the command



TECHNOLOGICAL
BENEFITS

- Output module:
 - execute commands to interface relays basing on the command from Interlocking Processor Unit
 - serves as interface between Interlocking Processor Unit and relays
- Input module:
 - receives information about relay state
 - transmits information to Interlocking Processor Unit



*project design

LET'S TALK!

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- discover more about
TMH Smart Systems