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MDC-U MICROPROCESSOR CENTRALIZED TRAFFIC CONTROL SYSTEM

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SRPA «Impulse» - the leader of the Ukrainian market of instrumentation and control systems of critical infrastructure facilities

Areas of activity: development, manufacture, supply of railway automation systems; automation and safety systems for NPPs; digital relay protection equipment.

Competences and proposals for railways:

- Microprocessor electrical and traffic control system.

- System of train separation based on digital track circuit and axle counting equipment.

- Locomotive safety system (SLB «ImproTRAIN-250»).

- Rolling stock monitoring equipment: temperature control of axlebox units; means for creating hierarchical centralized structures.

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Certified systems in place for compliance requirements :

- quality management system ISO 9001:2015;
- environmental management ISO 14001:2015;
- occupational health and safety management ISO 45001:2018.

In 2022, the company successfully passed a compliance audit Siemens to suppliers (External Sustainability Audit).

**Obtained the status of an official supplier of Siemens Mobility.**
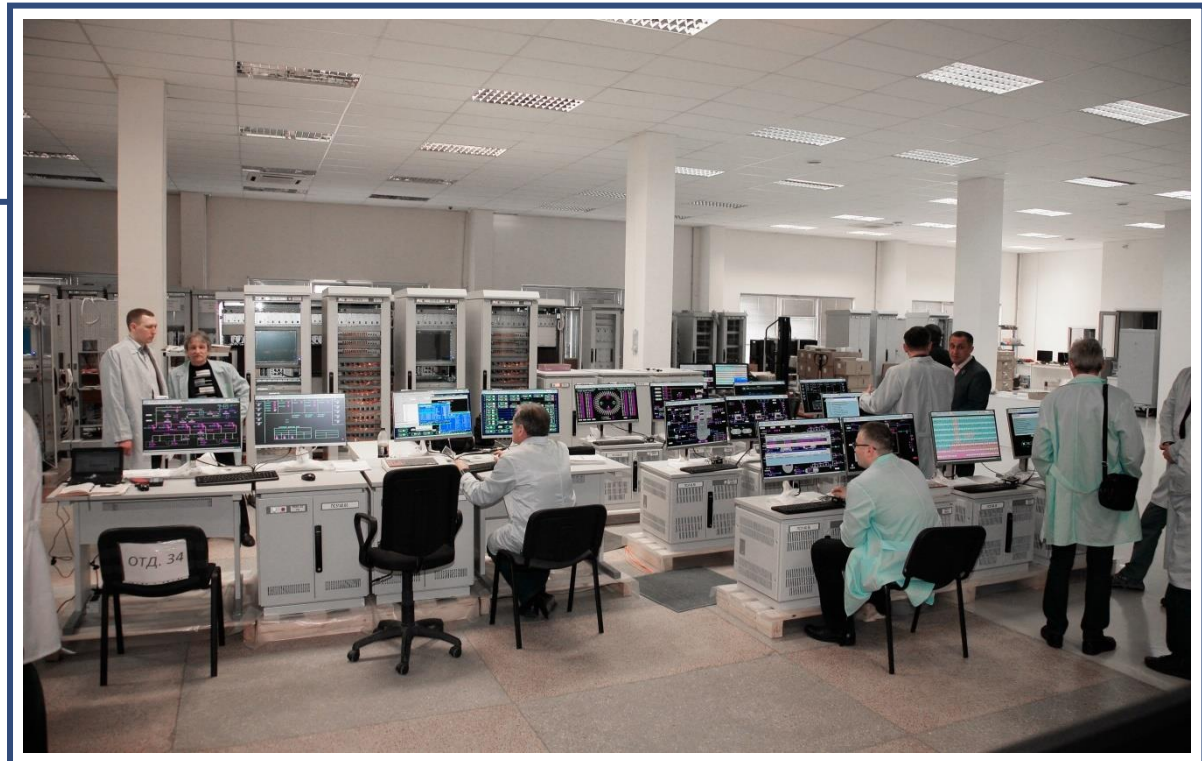
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Gained experience :

• More than 100 systems have been put into operation of railway automation, including in the European Union.

• The railway automation platform developed by SRPA «Impulse» is certified in the EU for SIL4 level (according to CENELEC standards).

Currently, projects for railways are being implemented :

• Equipping the rolling stock of JSC «Lithuanian Railways» sets of ImproTRAIN-250 (186 pcs.).

• Manufacturing and commissioning of microprocessor track circuits (2460 pcs.) for Estonian Railways Ltd under the contract with Siemens.

• Deliveries of 190 sets of hot axle box detection system.

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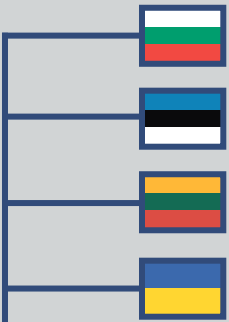
MDC-U - is a complex of technical and software tools intended for creation of dispatch centralisation systems (DC) providing control and management of train traffic.

In 2024, the Contract for the supply of DC to 7 priority railway lines of the Trans-European Transport Network **(TEN-T)** in Ukraine with a total length of more than **1,100 km** was fulfilled.

Implementation of DC on the basis of MDC-U will allow

Control from a single location - the Transportation Control Center (TCC) - train traffic at stations, level crossings and long-distance sections

Automate the traffic schedule maintenance and management process based on the predictive traffic schedule

Provide the TCC personnel with information on the situation in the dispatching section and on the status of Signaling, Centralization, Blocking (SCB) and DC devices

Store archived information for a long period of time with the option to view it in animation mode with adjustable playback speed

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Key features

High system reliability and availability: MDC-U equipment (servers, dispatchers' workstations, communication channels) is redundant, data processing in linear points is implemented according to the 2oo3d scheme

All interfaces are provided for connection with any relay and microprocessor ECs, auto- and semi-automatic blocking systems, which allows the transmission of complete information on train position to higher-level systems

Modularity and flexibility. Easy configurability of DC for any track construction

Integrated functions for generating responsible control commands (SIL4)

**Cyber security.** System protection against cyber attacks from external networks is guaranteed

Efficiency in maintenance. Exclusion of routine maintenance operations due to diagnostics of railway automation devices, monitoring of analogue and discrete signals and automated generation of reporting forms with subsequent analysis and identification of pre-failure states and failures of SCB devices

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Main functions

- Control and monitoring of the train traffic process at the dispatching section by commands of the train dispatcher

- Display of information on the train situation at the dispatcher's section, status of SCB and DC devices on the operating personnel's workstation

- Maintain a schedule of implemented traffic

- Automation of the control process based on the predicted train schedule (function "auto dispatcher")

- Dispatch or station (local) control of linear points

- Control of power supply systems

- Protocol of actions of operating and maintenance personnel, archiving of all received information and generation of necessary protocols and reports
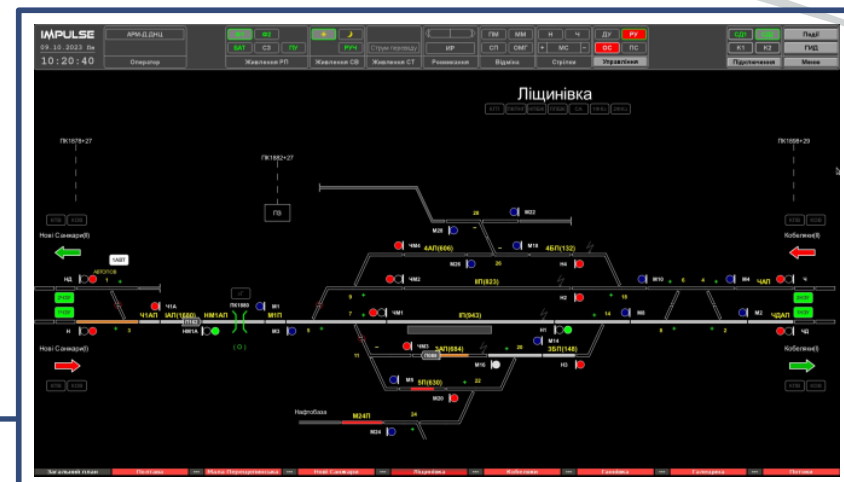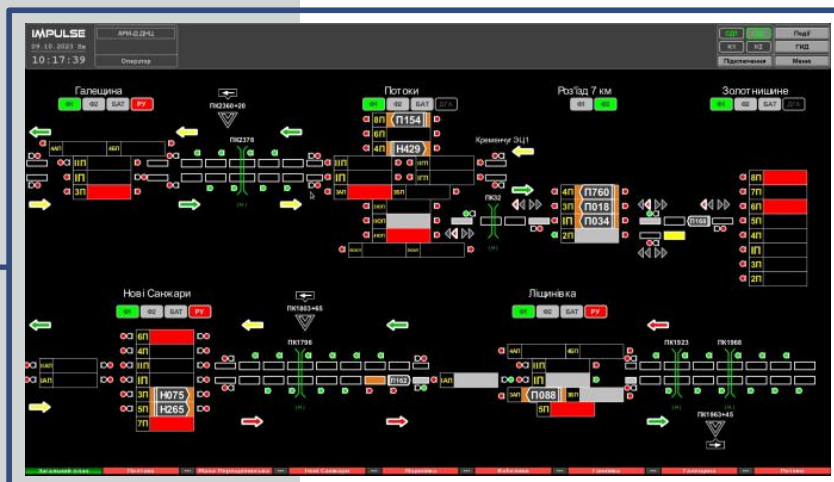
Possibility of extending functionality

The MDC-U integrates the functions of SCB diagnostics systems, which excludes the requirement for additional equipment at separate points when creating regional rolling stock monitoring centres - all information from the archives will be transmitted via existing digital interfaces.

Integration of ACRO-C functions (centralisation system of remote control equipment for rolling stock) into MDC-U will allow remote monitoring of the rolling stock running parts condition.

For spans with coded automatic block signaling, it is available to interconnect the interlocking networks of signal installations and level crossings by means of a specialised controller.

The structure of MDC-U is three-tiered.

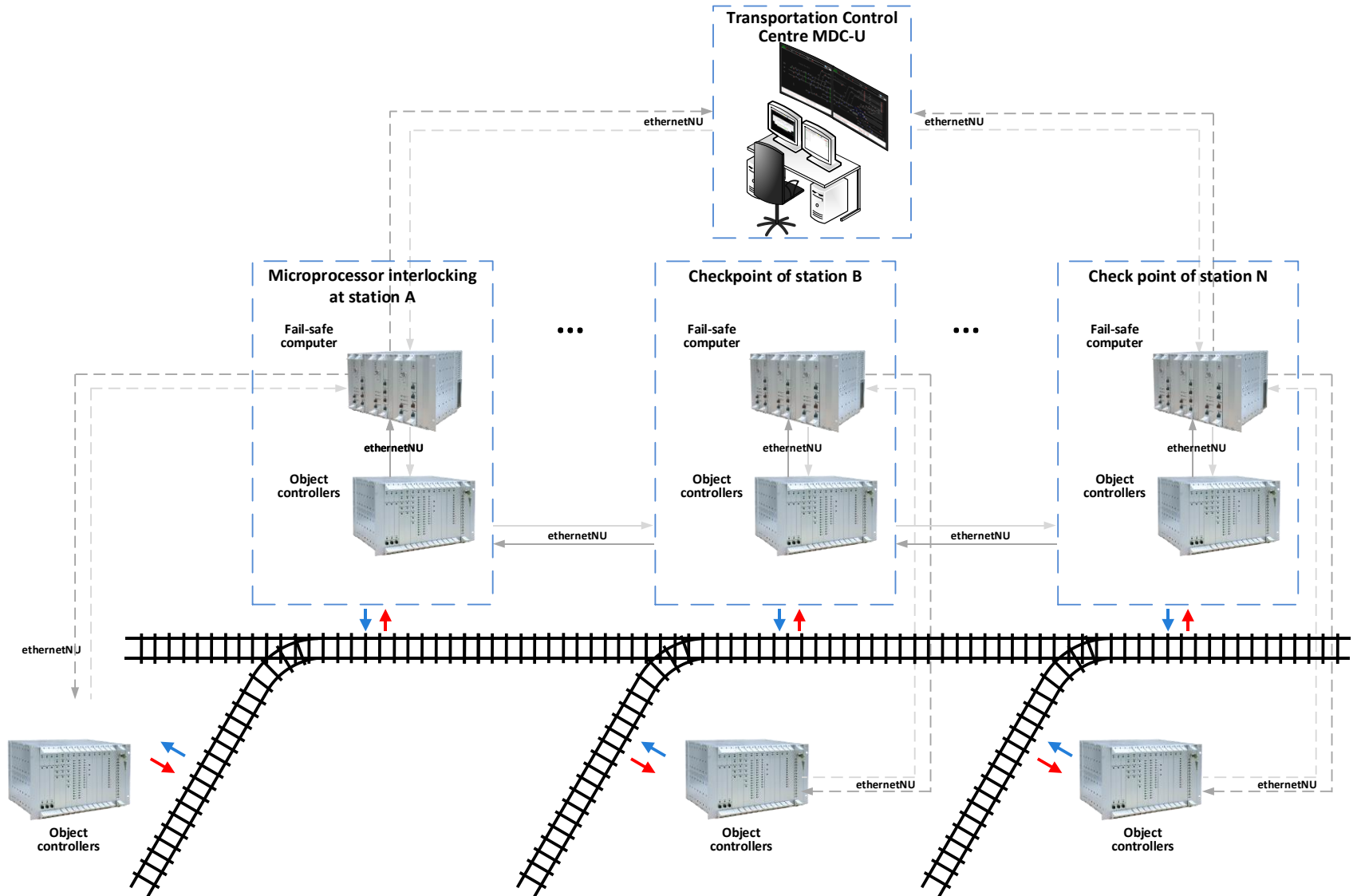Transportation Control Center level:

- redundant data server;
- train dispatcher's workstation;
- SCB engineers workstation;
- specialists workstation.
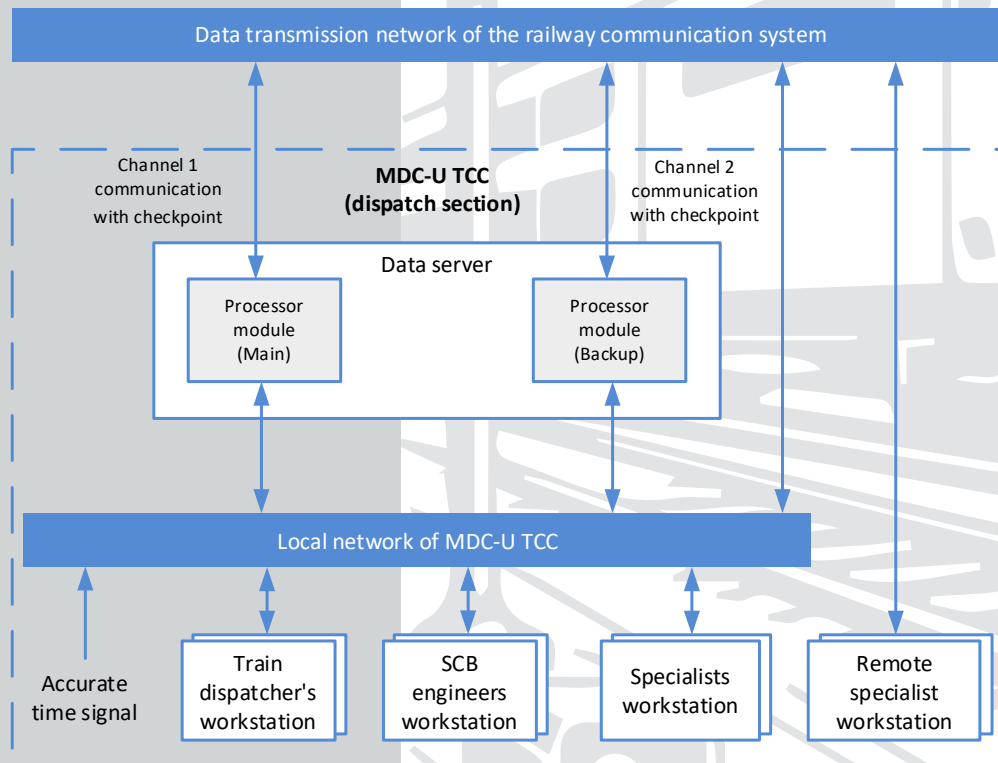
Main functions of TCC:

- control and management of train traffic at the checkpoints of the dispatching section on the commands of the train dispatcher or according to "auto dispatcher" algorithms in accordance with the predicted train sheet;

- maintenance of train sheet;

- protocoling of actions of operating and maintenance personnel, archiving of all received information and formation of necessary protocols and reports;

- functions of integrated systems (if required).

Data transmission network of the railway communication system

Channel 1 communication with checkpoint

MDC-U TCC (dispatch section)

Channel 2 communication with checkpoint

Data server

- Processor module (Main)
- Processor module (Backup)

Local network of MDC-U TCC

Accurate time signal

- Train dispatcher's workstation
- SCB engineers workstation
- Specialists workstation
- Remote specialist workstation

Generalised structure of MDC-U

Transportation Control Centre MDC-U

ethernetNU — ethernetNU

Microprocessor interlocking at station A — **Checkpoint of station B** — **Check point of station N**

Fail-safe computer

Object controllers

ethernetNU

Object controllers

*ethernetNU is a secure data transfer protocol compliant with the 1st category of EN 50159 standard

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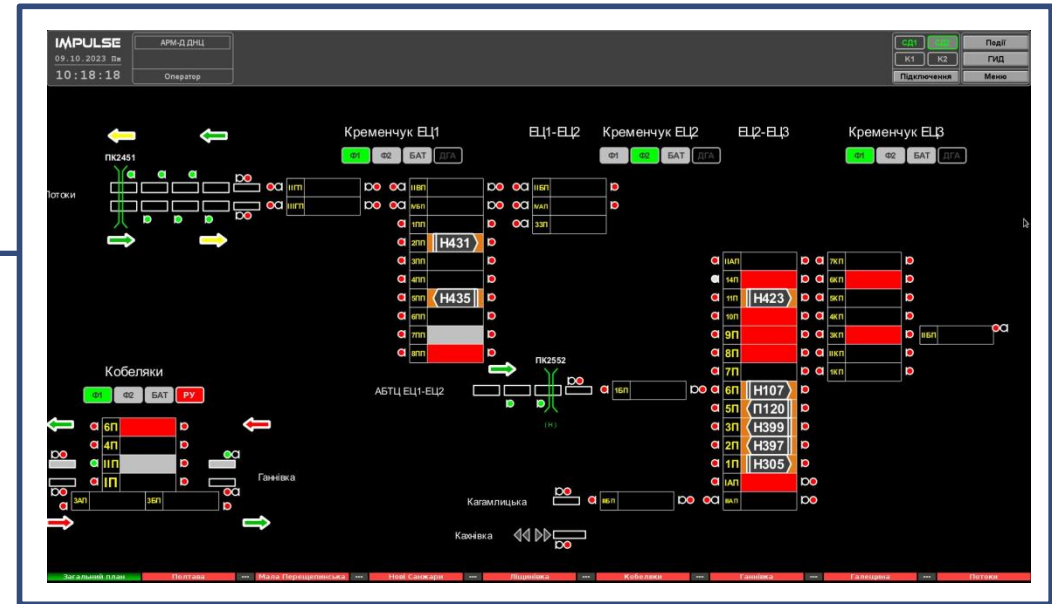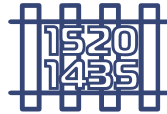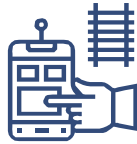
Communication channels level - provides information transfer between TCC levels and checkpoints and implementation of connections with external systems.

Checkpoints level (stations, road blocks, crossroads and spans) intended for collection of information, its preliminary processing, and issuing control actions.

For sites equipped with MPC-U systems, checkpoints are not required and their functions are fulfilled by MPC-U equipment.

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Examples of Projects Implemented

In 2024, a large-scale project was completed for the manufacture and commissioning of dispatch centralisations for JSC «Ukrainian Railways», including:

1148 km of railway lines
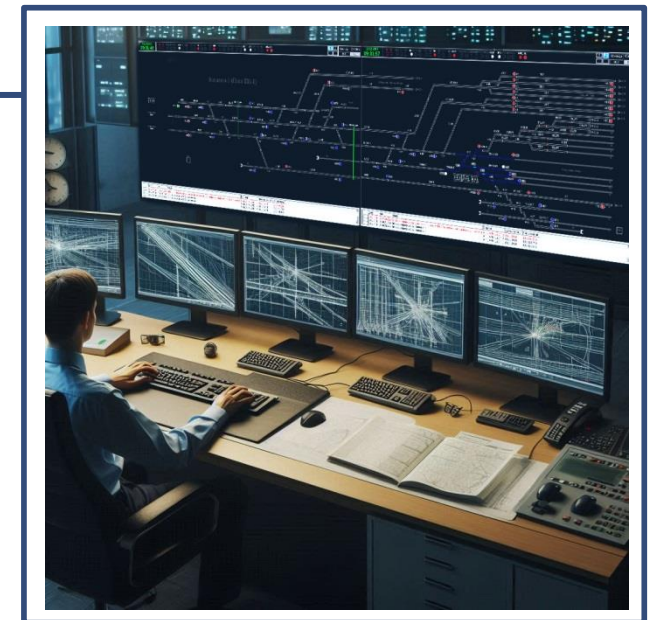
117 stations

265 spans/level crossings

3386 points

4632 traffic lights

4203 rail circuits

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