



SAFETY PERIMETER & ALERTING SYSTEM



GOALS OF SPAS IMPLEMENTATION



Enhancing safety level

- Eliminating the human factor in the signaling function
- Improving the reliability of informing crews about the approach of rolling stock
- Enhancing the quality of notifications



Enhancing economic efficiency

Replacing the human role of a signaler



SPAS SYSTEM **FUNCTIONS**

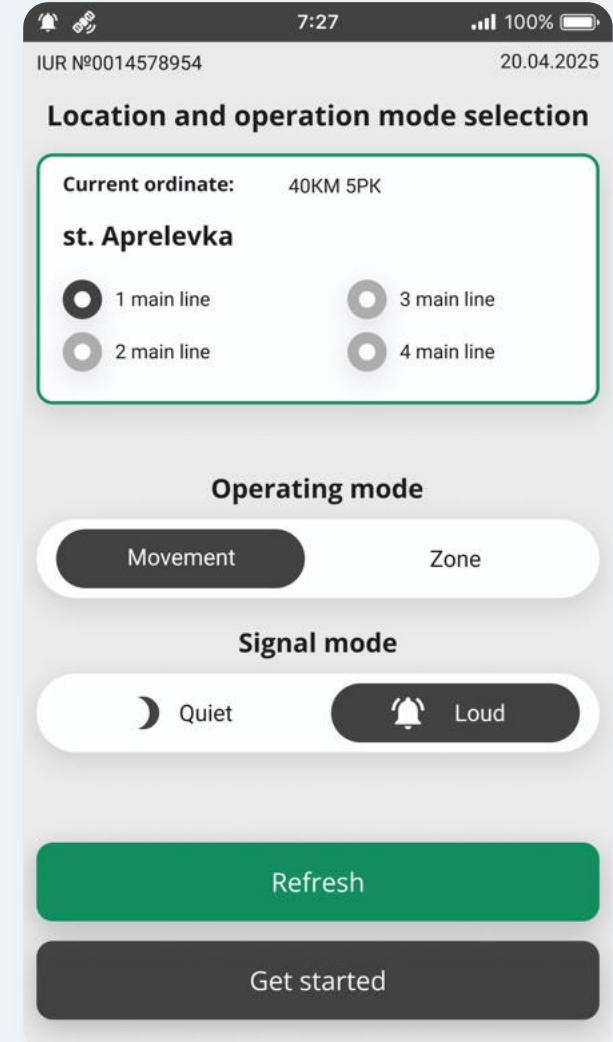


Key functions

- Informing workers about the approach of rolling stock to the worksite
- Alerting operators about obstacles for rolling stock movement

Additional functions

- Controlling the movement of workers during the passage of rolling stock
- Providing individual and collective alerts of workers about the approaching of rolling stock
- Recording the actual time of works execution



SPAS APPLICATION



Areas of application

- Running lines (single and multiple tracks)
- Stations



Type of works

Without track closure
(notification)



Type of crews

- Track maintenance crews
- Diagnostic crews

REQUIREMENTS FOR SPAS OPERATION

1

Availability of technical diagnostics and monitoring systems or other data sources (DC) capable of transmitting information to the SPAS server about the position of switches, the status of track circuits, and signals

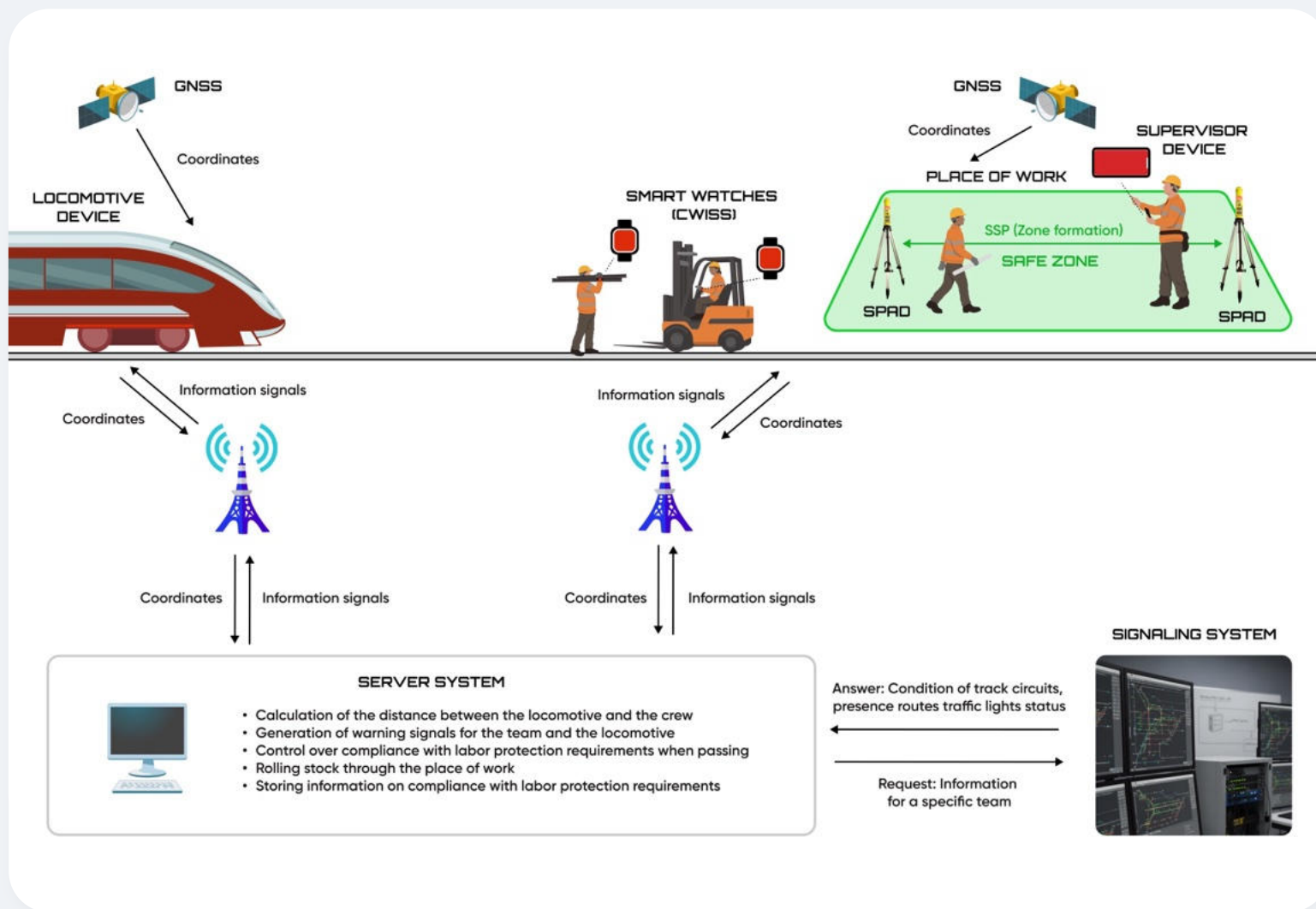


2

Availability of reliable coverage of GSM networks, 3rd generation and above



DATA TRANSMISSION SCHEME



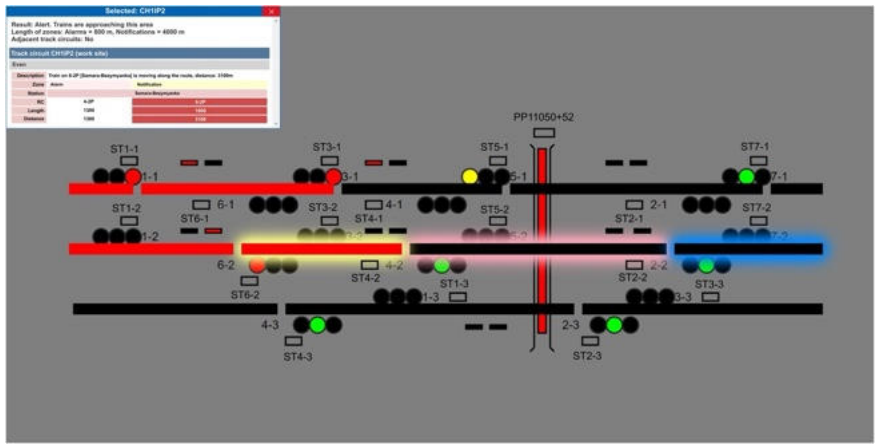
SPAS provides

- Notification of the crew about the track number and the direction of the approaching rolling stock
- Target notification to locomotive crews about the approach to the worksite, including when moving to adjacent tracks
- Monitoring the approach of locomotives and other rolling stock not equipped with locomotive devices
- Using two independent sources of information about the approach of rolling stock (data from signaling system and data on the geographic coordinates of the locomotive module)

SIGNAL FORMATION BASED ON SIGNALING DATA



- Analysis of routes through the worksite
- Analysis of routes through adjacent tracks to the worksite
- Analysis of track circuit occupancy
- Calculation of distance to rolling stock based on the lengths of track circuits included in the routes



EXAMPLE OF NOTIFICATION SIGNAL FORMATION

The figure illustrates the operation of SPAS with the integration of signaling system using a specific example

The worksite is designated as track 1BP
«Alarm» signal, as movement is occurring on an adjacent track
Distances for triggering «Alarm» and «Notification» signals
Adjacent track circuits for which notifications of movement will be issued

Information about movement on each track is displayed separately
The direction of rolling stock movement has been determined
The length of the route is sufficient for timely notification
Track circuits are grouped into alarm and notification zones
Location of track circuits
Names of track circuits included in the alarm and notification zone
Length of track circuits included in the alarm and notification zone
Distance from the worksite to the rolling stock

Information on movement on the adjacent track

Selected: 1BP

Result: Alert. Trains are approaching this area

Length of zones: Alarms = 800 m, Notifications = 4000 m

Adjacent track circuits: 5BP, 69SP, 33/69P, 31-37SP

Track circuit 1BP (work site)

Odd

Description	The route length exceeded 4000m					
Zone	Alarm			Notification		
Station	Bezmyanka			Bezmyanka-Smyshlyaevka		
RC	29SP	23-25SP	NP	N1IP1	3P	5P
Length	75	134	153	1390	2040	1203
Distance	75	209	362	1752	3792	4995

Adjacent track circuit 1AP

Odd

Description	The train is on this section	
Zone	Alarm	
Station	Bezmyanka	
RC	5BP	
Length	896	
Distance		

ctrln.tech

2025

SYSTEM APPLICATION BY MAINTENANCE CREWS

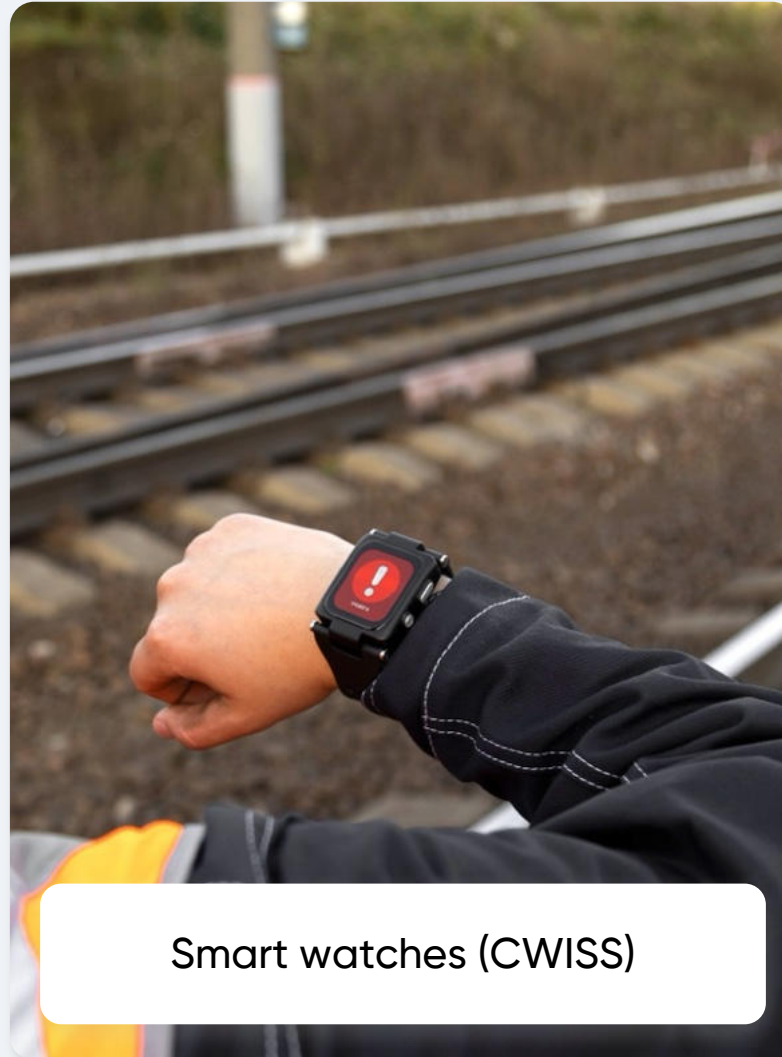


- The crew creates a **virtual safety zone** at the trackside using devices integrated into the System
- The System provides **timely notifications to the crew** about the approach of rolling stock
- The devices monitor the movement of workers **into the safety zone**
- If workers are in the danger zone, the System promptly informs the track maintenance crew and the locomotive crew about **the approaching rolling stock at a critical distance from the worksite**
- In case of an emergency, the supervisor can manually activate **the alarm signal** on the individual devices of each worker and on the locomotive device

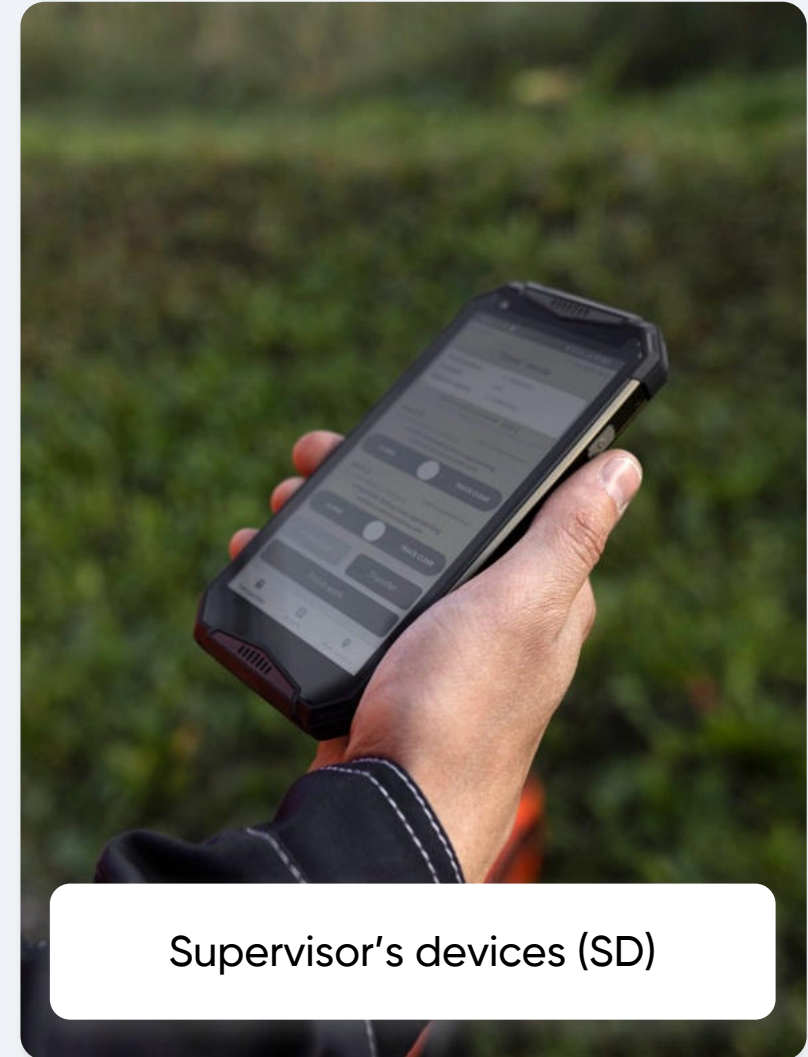
SPAS DEVICES



Safety Perimeter and Alerting Device (SPAD)



Smart watches (CWISS)



Supervisor's devices (SD)

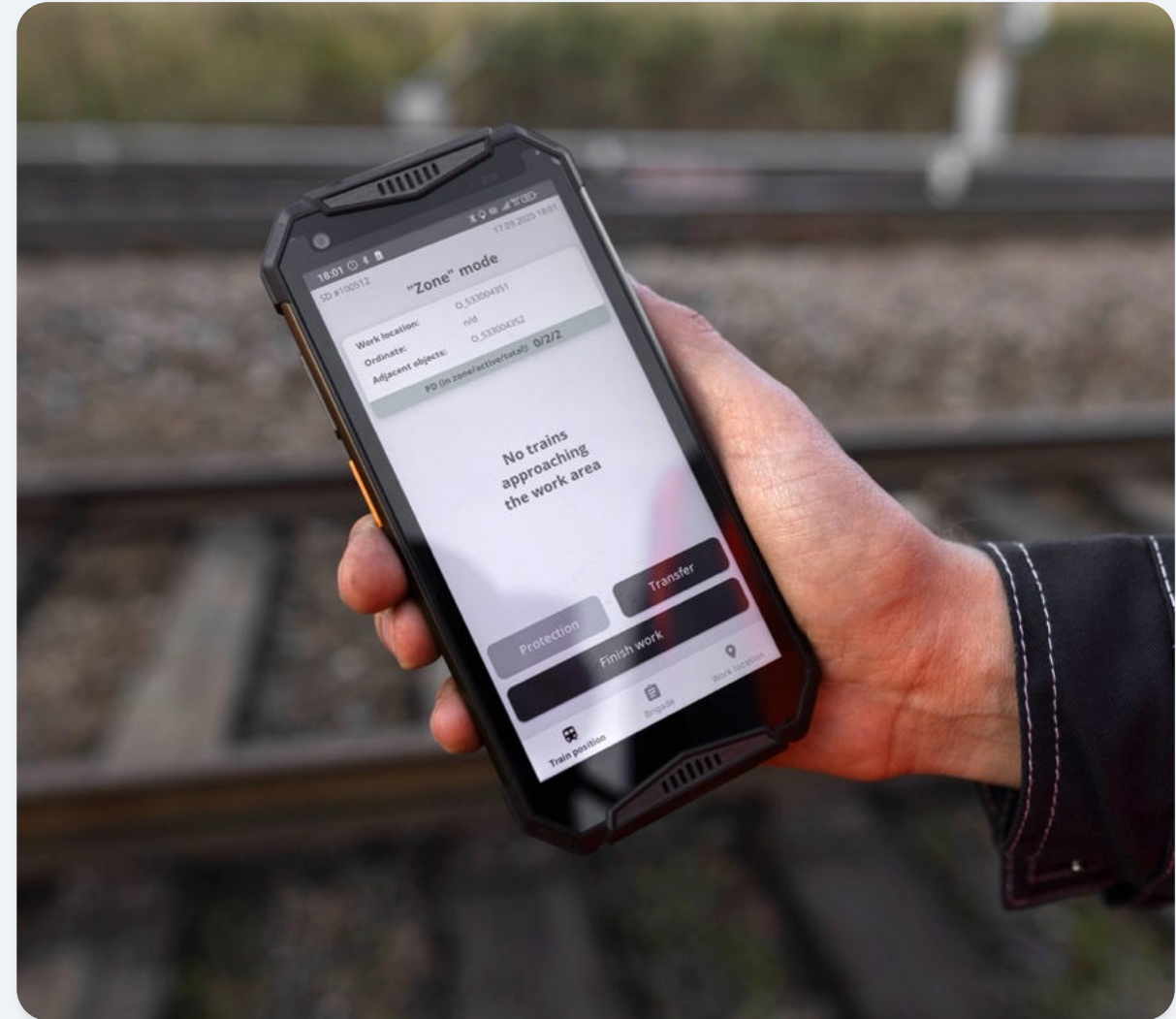
SUPERVISOR'S DEVICES (SD)

Technical Specifications

- Dust and Moisture Protection: IP68/IP69K standard
- Impact Resistance
- Battery Capacity: 10,850 mAh (over 12 hours at $t = -45^{\circ}\text{C}$)
- Support for required communication standards

Functions

- Built-in self-diagnosis
- Crew management
- Selection of work location and mode
- Playback of light and sound alarms
- Monitoring the status of all crew devices
- Displaying information about approaching trains
- Issuing alarm or track occupancy signals to approaching trains
- Verifying compliance of the worksite with actual location



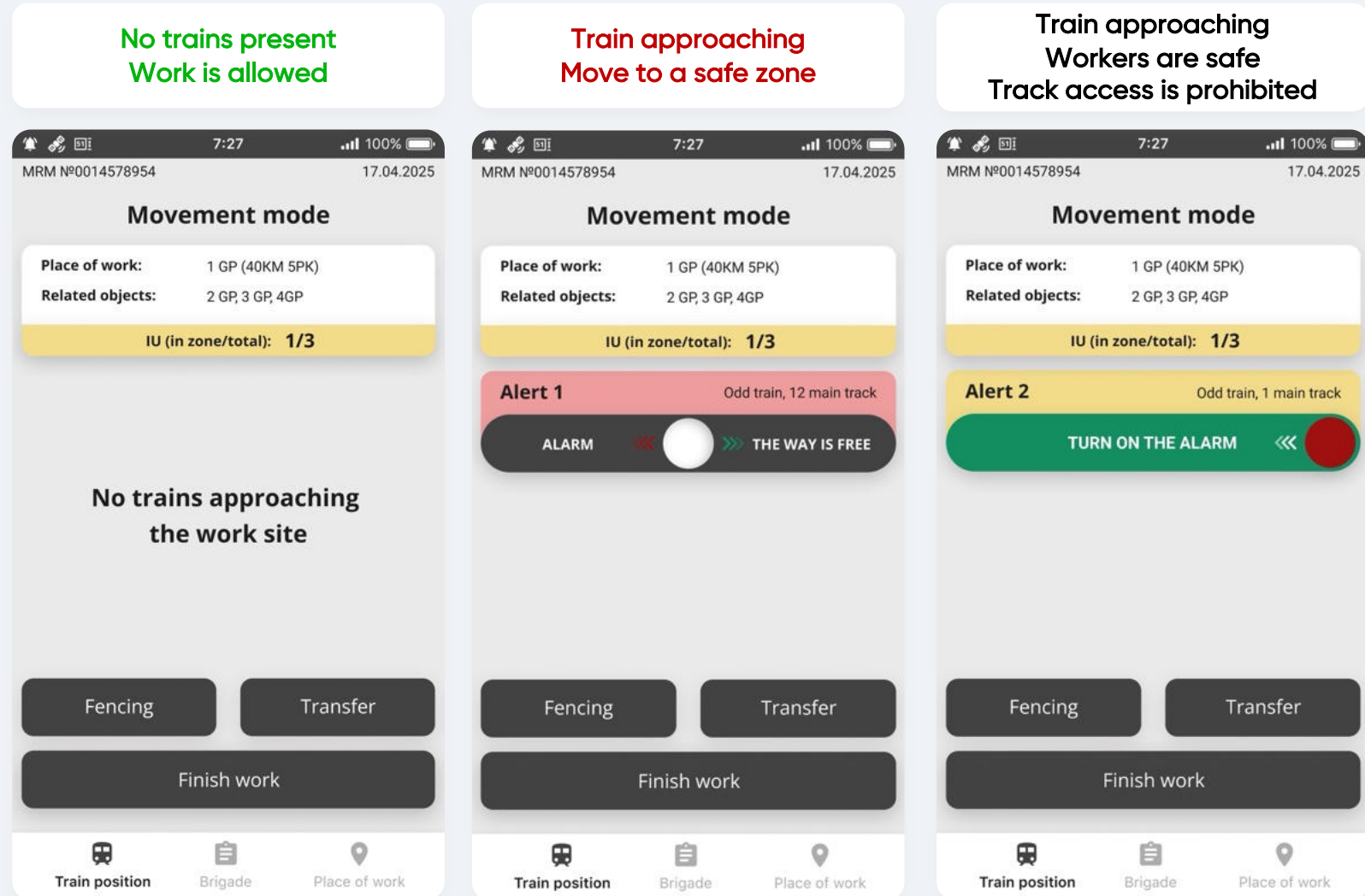
FUNCTIONS OF THE SUPERVISOR'S DEVICES

Displaying information about the approaching train

- Direction of movement (up and down traffic)
- Current location

Functionality

- Playback of sound and vibration alarms
- Issuing alarm or track occupancy signals to the locomotive device



ANCORS (SPAD) AND SMART WATCHES (CWISS)

SPAD functions

- Playback of light and sound alarms (collective notification)
- Displaying Information about the approaching train
- Issuing alarm or track occupancy signals to approaching trains
- Establishing a safety zone and monitoring workers' location



CWISS functions

- Sound signal
- Light signal
- Vibration signal



DESKTOP APP FUNCTIONS



**Tracking
of devices**



**Real-time
monitoring
of maintenance
crew operations**



**Real-time
tracking
of locomotive
devices**



**Formation
of reporting
documentation**

DESKTOP APP FUNCTIONS

Device tracking

- Tracking of devices throughout their lifecycle (operation, maintenance, storage, decommissioning)
- Storage of accompanying documents (handover certificates, defect reports)

DEVICE TRACKING

Device ID

Enter device ID

Device type

Select device type

Road

Select the road

Department

Select department number

Production site

Select production site

Status

Select status

Date of acceptance

Select date of acceptance

Employee number of the person in charge

Select employee number

Search for a device by keywords...

Search

Gilbert N.R.
STP Specialist No. 03001

Logout

Device ID	Type	Status	Condition	Road	Department	Sector	Responsible person
010032	KUOBZ	Operation	Functioning	KBSH	PCH-11	2	11022872
010033	KUOBZ	Operation	Functioning	KBSH	PCH-11	1	11384303
010034	IYP	Written off	Malfunctioning	KBSH	PCH-11	1	12323415
010035	IY	Operation	Functioning	KBSH	PCH-11	3	11232257
010036	KUOBZ	Operation	Functioning	KBSH	PCH-11	4	12323415
010036	KUOBZ	Storage	Functioning	KBSH	PCH-11	4	12323415
010036	KUOBZ	Operation	Functioning	KBSH	PCH-11	4	12323415
010036	KUOBZ	Repair	Malfunctioning	KBSH	PCH-11	4	12323415
010036	KUOBZ	Operation	Functioning	KBSH	PCH-11	4	12323415
010036	KUOBZ	Operation	Functioning	KBSH	PCH-11	4	12323415

+ Add a new device

DESKTOP APP FUNCTIONS

Monitoring the operations of maintenance crews

The system allows real-time monitoring of the following parameters:

- Approach of rolling stock and its direction
- Distance to the rolling stock
- Signaling on devices
- Actions of supervisor and crew members (button presses or workers movement to the safe zone)

The screenshot displays the 'BRIGADE MANAGEMENT' interface. On the left is a dark sidebar with icons for various functions. The main panel is divided into two sections. The top section, titled 'BRIGADE No. 010032', shows a status card for 'In zone/active/total IU 1/2/2' with a green '5' indicator. It includes controls for 'Operating mode' (Off, Zone), 'Signal mode' (Quiet, Loud), 'Fencing' (On, Off), and 'Relocation' (On, Off). Below this is a tabbed interface with 'Brigade membership', 'Place of work' (selected), and 'Signals'. The 'Place of work' tab contains a table with columns: Road, Station/route, Work location coordinates, Object, RC, Related RC, IUR coordinates, and Action. The table lists 'KBSH' at 'Station 1' with coordinates '1121km4pk+10 - 1121km4pk+50'. Below the table is a red warning banner: 'CROSSING THE TRACKS IS PROHIBITED!'. The bottom section shows a table with columns: N°, UIPPS, Direction, Track, Distance to PS, Rail chains, and Signal. It lists two entries: '1' with '03552004' and 'Even' direction, and '2' with an empty UIPPS and 'Odd' direction. At the bottom is a map showing the location of the brigade with a red dot indicating the current position.

BRIGADE MANAGEMENT

Reset all filters

IUR ID
Enter IUR ID

Device
Enter device ID or type

Employee number of the person in charge
Select employee number

Road
Select road

Department
Select department number

Station/route
Select station/route

Start/end date
Select start/end date

BRIGADE No. 010032

Operating mode
Off Zone

Signal mode
Quiet Loud

Fencing
On Off

Relocation
On Off

5 In zone/active/total IU 1/2/2

Brigade membership Place of work Signals

Road	Station/route	Work location coordinates	Object	RC	Related RC	IUR coordinates	Action
KBSH	Station 1	1121km4pk+10 - 1121km4pk+50	Arrow 1	ISP	3SP, NAP	53.195878, 50.100202	

CROSSING THE TRACKS IS PROHIBITED!

N°	UIPPS	Direction	Track	Distance to PS	Rail chains	Signal
1	03552004	Even	Adjacent	APK-DK: 1800, SADR: 1930	Alert: 1PP, 3PP, Alarm: NAP, 1SP	UIPPS: Alert 1, KUOBZ: Alert 1
2	-	Odd	Adjacent	380 (APK-DK), 1340 (SADR)	-	Alert 2 (KUOBZ)

Map showing the location of the brigade (red dot) and surrounding infrastructure.

DESKTOP APP FUNCTIONS

Formation of reporting documentation

The system enables automated generation of reporting documentation, which serves as the basis for mutual settlements for the services provided

Log files for the operations of each crew are also available for export

REPORTING

Report ID
Enter report ID

Report type
Select report type

Date of report generation
Select date

Road
Select road

Directorate/department
Select directorate/department

Department
Select department

Site
Select site

Period
Select period

REPORT ON THE VOLUME OF SERVICES PROVIDED BY THE BRIGADE

Name of the directorate: Kuibyshev Infrastructure Directorate

Type of brigade: Track maintenance crew

Name of the department: PC-11 Samara Railway Division

Period of service provision: 01.01.2023 - 31.01.2023

Full name/employee number of the responsible person: 0192434

N°	DATE	START WORK TIME	END WORK TIME	DURATION OF WORK, HOURS	STATION/ROUTE	VIRTUAL BRIGADE ID (IUR)
1	09.01.2025	09:30	11:45	2,25	Station 1	020038
		13:10	16:40	3,5	Station 5	020038
2	10.01.2025	09:27	12:27	3	Station 1	020038
		13:30	17:15	3,75	Station 1	020065
3	11.01.2025	10:55	12:25	1,5	Station 5	020065
		14:30	17:00	2,5	Station 5	020065
...						
17	31.01.2025	09:27	12:27	3	Station 1	020065
		17:15	17:15	3,75	Station 1	020065

Scope of services provided: 60 hours

Customer: _____

Contractor: _____

«____» _____ 20____ r.

«____» _____ 20____ r.
m.p.

Download the report

SPAS EXTENDED FEATURES

SPAS can be integrated with the enterprise systems such as ERP, WFM, etc.

This solution will enable objective monitoring of work execution through SPAS devices in the following areas:



**Compliance
of the crew
size with the
planned work**



**Adherence
to safety
regulations**



**Monitoring
compliance
of the worksite
location**



**Tracking
work time**

CTRL+ IS A RELIABLE PARTNER ON THE WAY TO MODERN AND SAFE OPERATIONS OF RAIL TRANSPORT



1435 SYSTEMS DMCC

Operations Office – Binary Tower, Dubai, UAE



CTRL N DOO

R&D Lab – Pivljanina Baja 19, Belgrade, Serbia



Phone: +381 64 641 64 39



E-mail: admin@ctrln.tech



LinkedIn: [ctrlnbeograd](https://www.linkedin.com/company/ctrlnbeograd)



Website: ctrln.tech

