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SYSTEMS

AUTOMARSHAL WEIGHBRIDGE

Automation of vehicle weigh station

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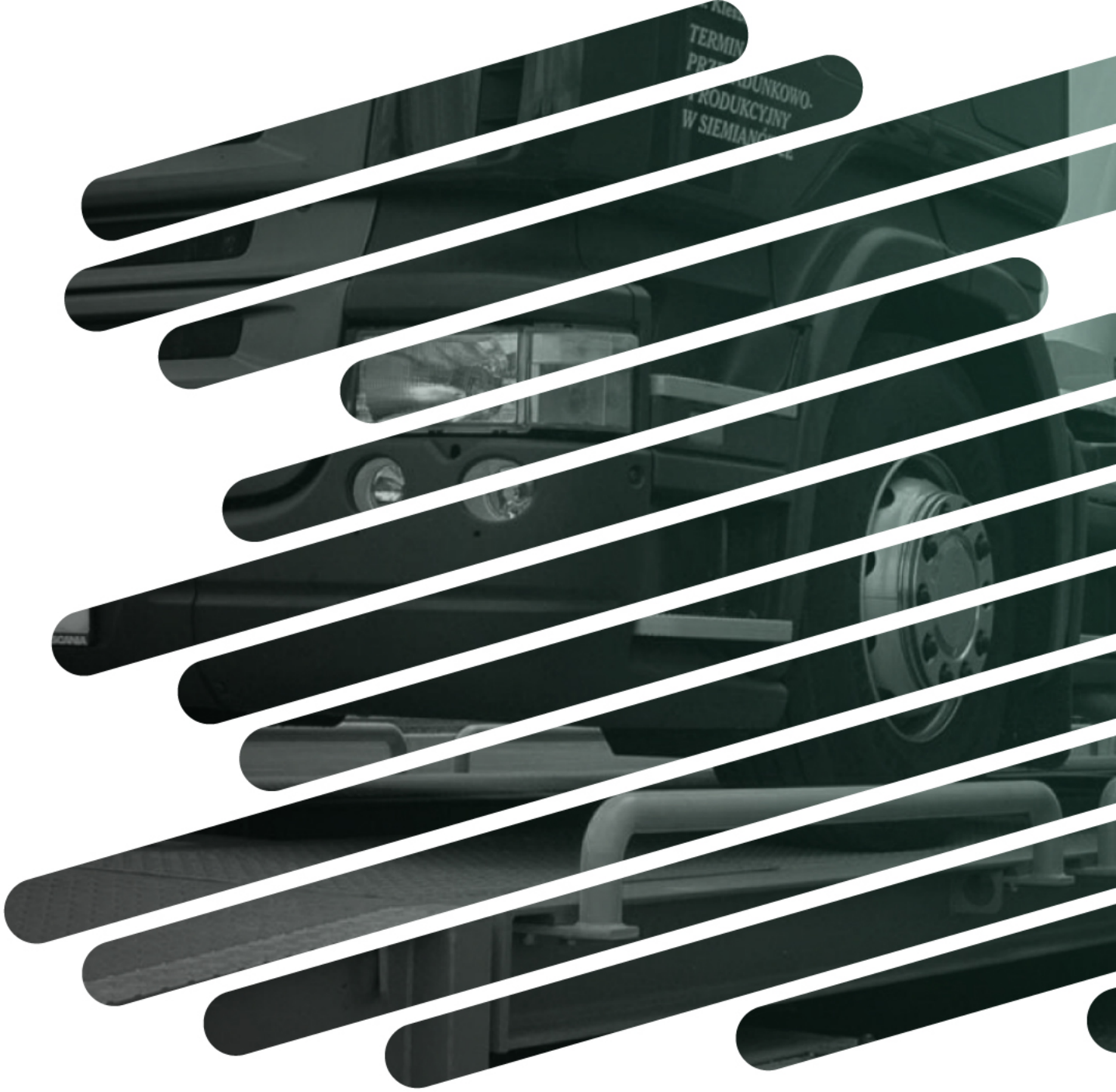
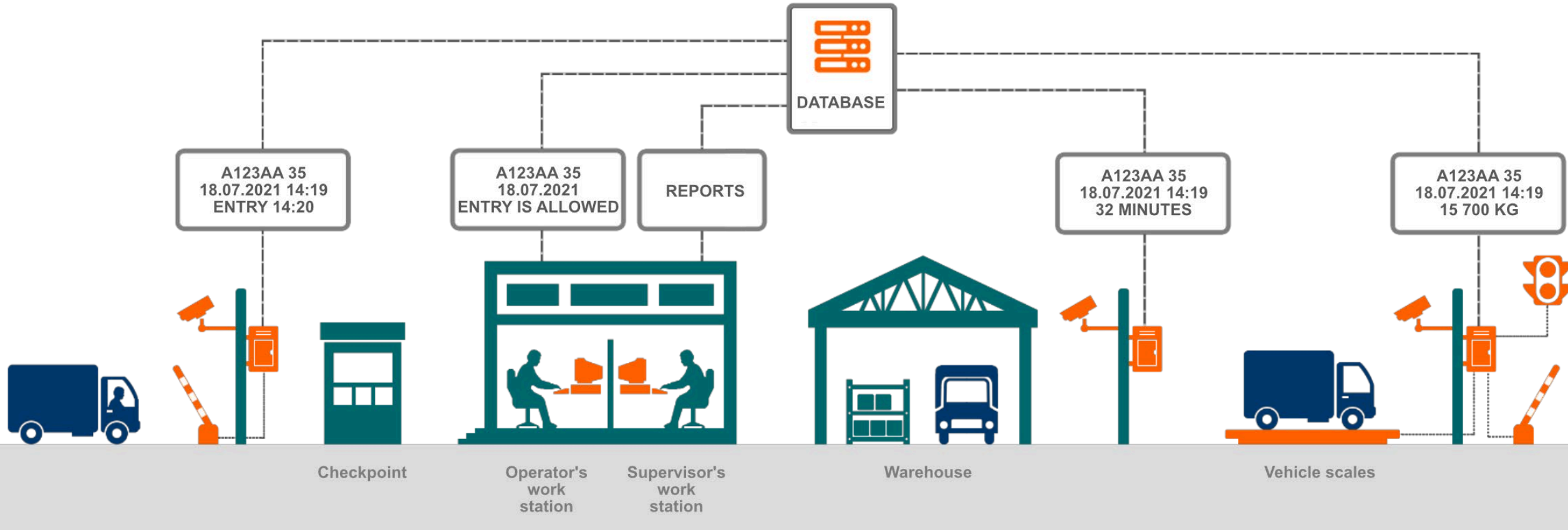
AUTOMARSHAL WEIGHBRIDGE SYSTEM



AUTOMARSHAL HARDWARE-SOFTWARE LINE OF SOLUTIONS

Automarshal hardware-software complex: automation of control and record keeping of vehicle access at the vehicle checkpoints, parking lots, warehouses and weigh stations.

Automarshal hardware-software complex: automation of vehicle weighing, inventory of raw materials and manufactured items transported by a vehicle.



PURPOSE OF AUTOMARSHAL WEIGHBRIDGE HARDWARE-SOFTWARE COMPLEX

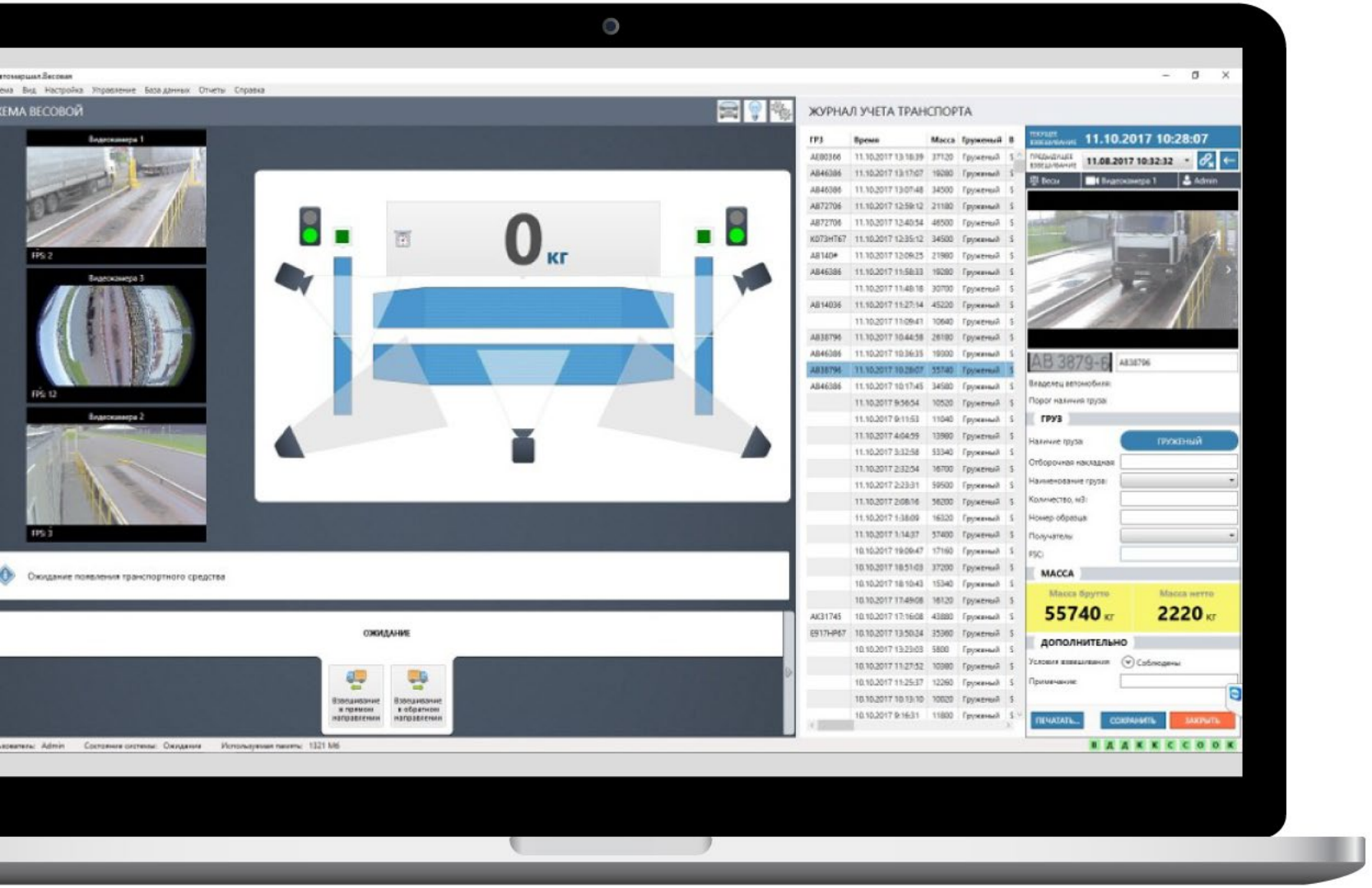
Automation of the control area for vehicle weighing

Primary purpose for weighing automation:

- ✓ Minimisation of human factor
- ✓ Improving of transparency
- ✓ Improving of efficiency at the vehicle checkpoint stations

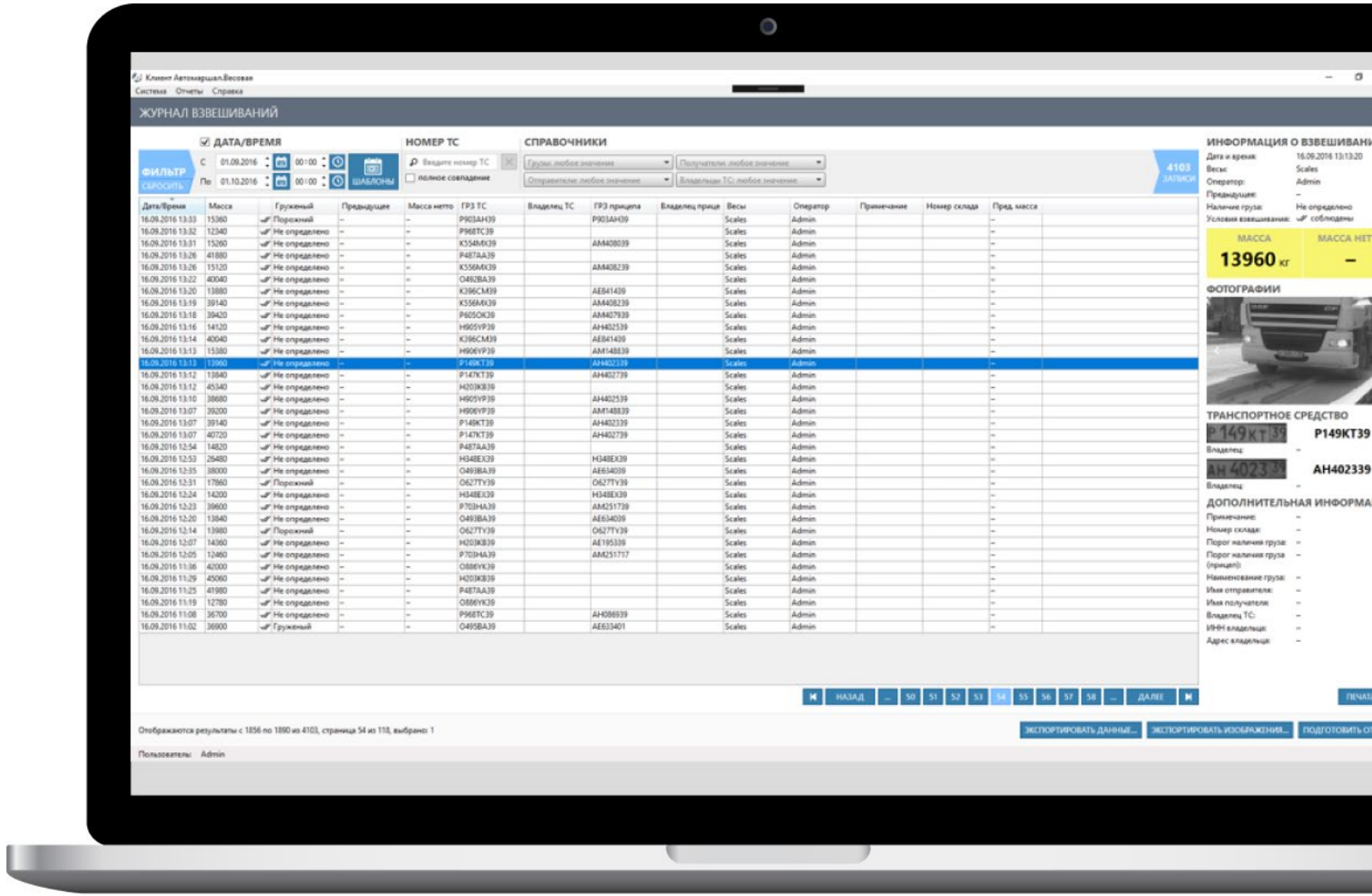
Addressed tasks:

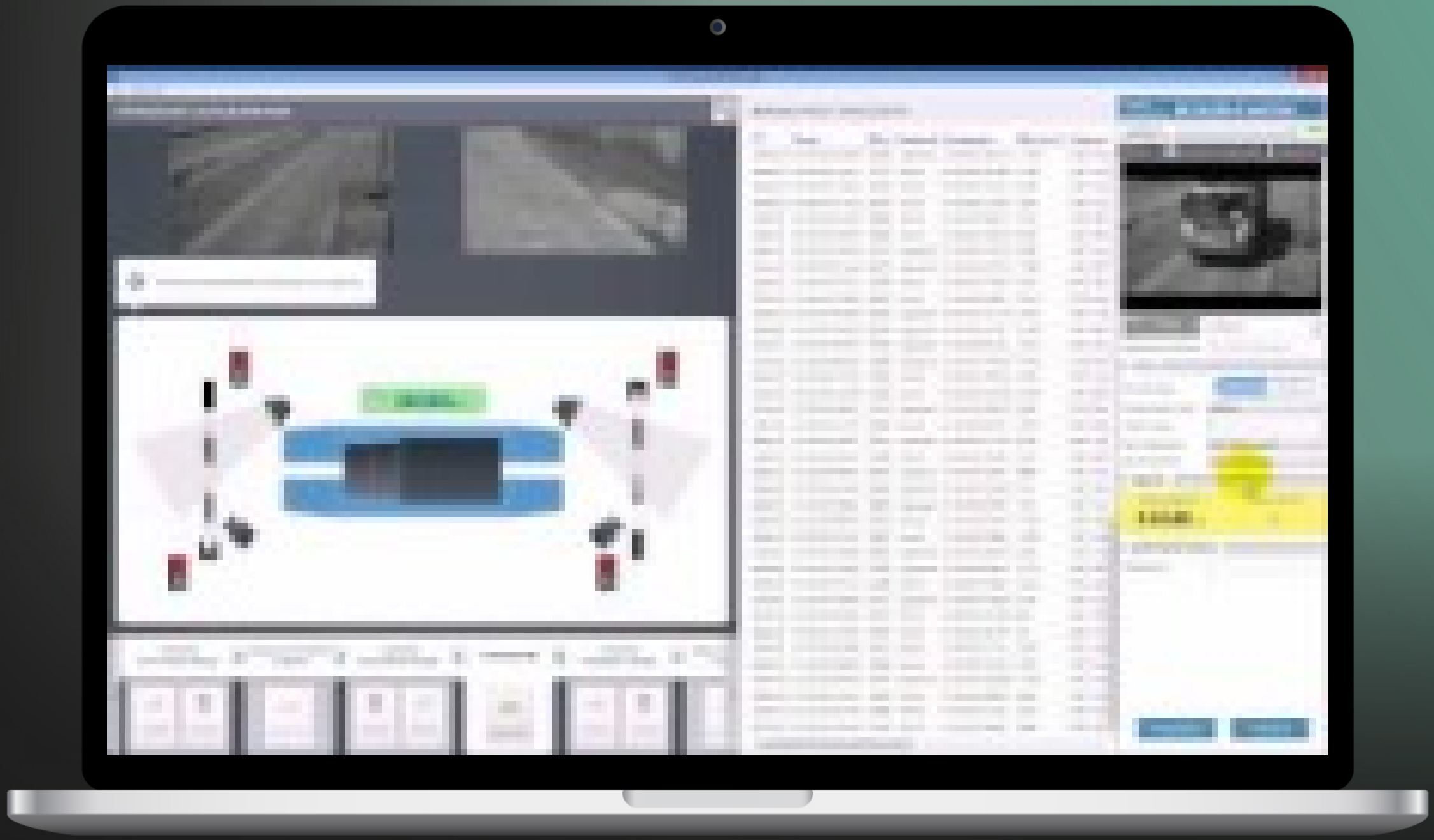
- ✓ Automation of the vehicle weighing procedures by directly managing operations of traffic barriers, traffic lights and other hardware
- ✓ Integration of vehicle identification and weighing results with video surveillance data
- ✓ Export of the data to enterprise recourse planning system
- ✓ Safe and reliable storage of all data and events in case of legal disputes and accident investigation



OPERATOR USER INTERFACE

SUPERVISOR NETWORK CLIENT





ADVANTAGES OF AUTOMARSHAL WEIGHBRIDGE

Inclusive single system that does not require any third-party software components:

- ✓ Ability to perform deep software integration with unique characteristics and demands of the implementation site and client.

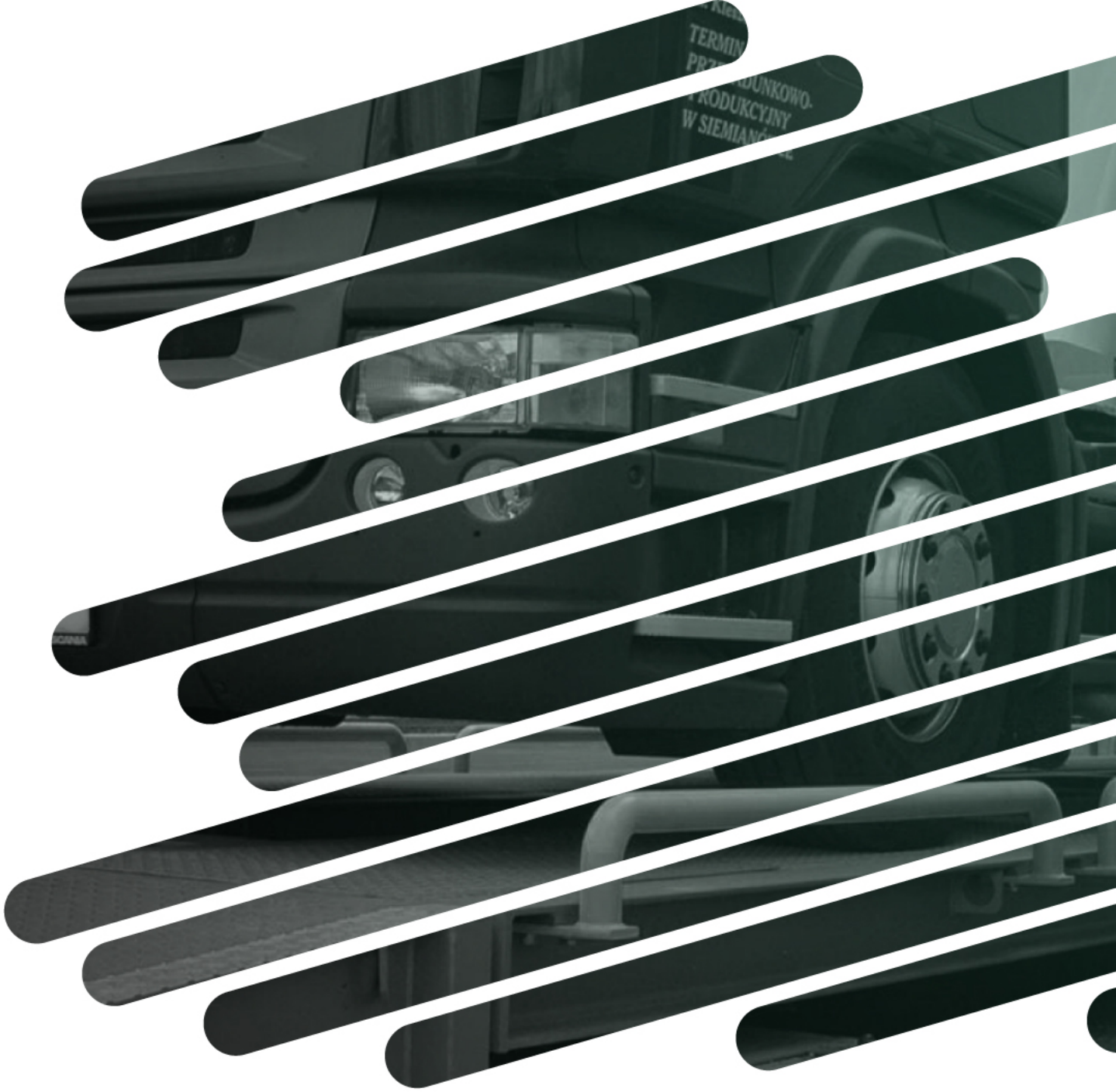
Wide ability to configure software for number of specification options:

- ✓ Ability to configure operation algorithms to almost any hardware specification and operation procedures

Software that is developed for Enterprise-use level:

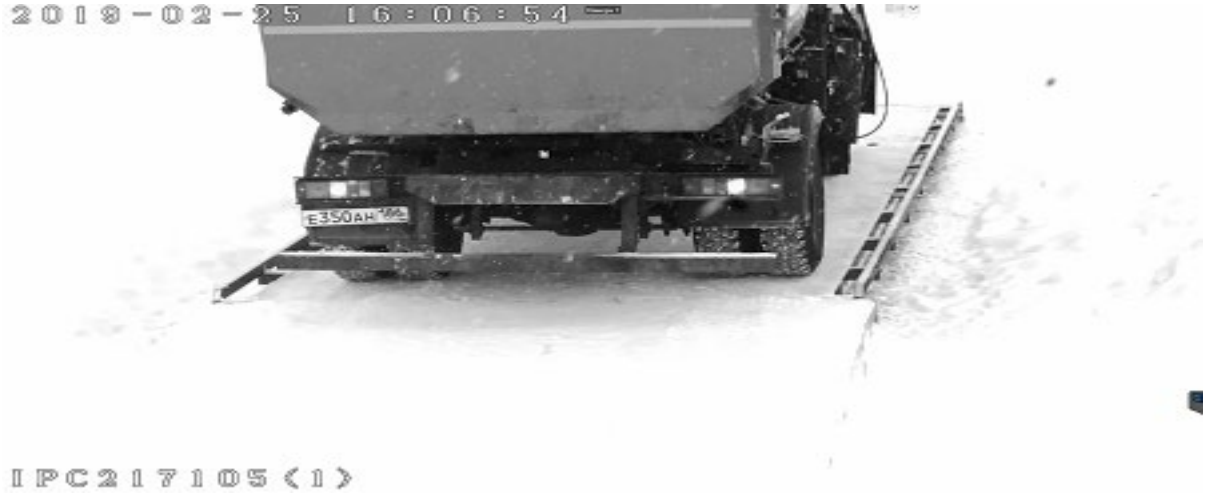
- ✓ Utilisation of Enterprise-level Database Management System
- ✓ Availability of system logging
- ✓ Availability of system self diagnostic
- ✓ Standalone software that does not require any third-party software components or systems for its operation

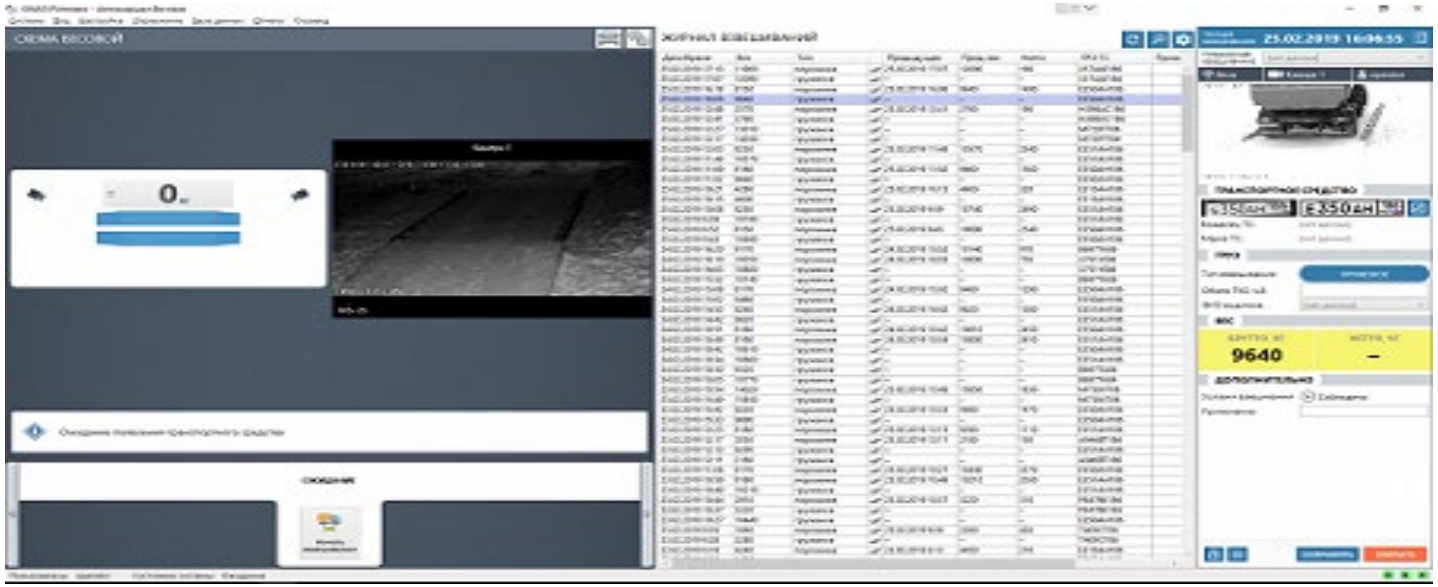
IMPLEMENTATION CASES



IMPLEMENTATION CASE

INDUSCTRIAL YARD





Lite version
that consists only
out of 1 camera

IMPLEMENTATION CASE

REFINERY FACILITY

Fully automated scales for weighing without an operator

RFID tag based identification

IMPLEMENTATION CASE

INDUSTRIAL FACILITY TOBOLSK, RUSSIA

Axial weighing
with display of information
on a screen,

Integration using Modbus

IMPLEMENTATION CASE

INDUSTRIAL FACILITY REVDA, RUSSIA

Hardware composition:
2 composition, 2 traffic light

Recognition of license plates before vehicle entry to scales

IMPLEMENTATION CASE

INDUSTRIAL FACILITY SEROV, RUSSIA

Hardware composition:
2 cameras, 2 traffic lights

Axial weighing

One-way vehicle traffic at the scales

Recording of the trailer license plate

IMPLEMENTATION CASE

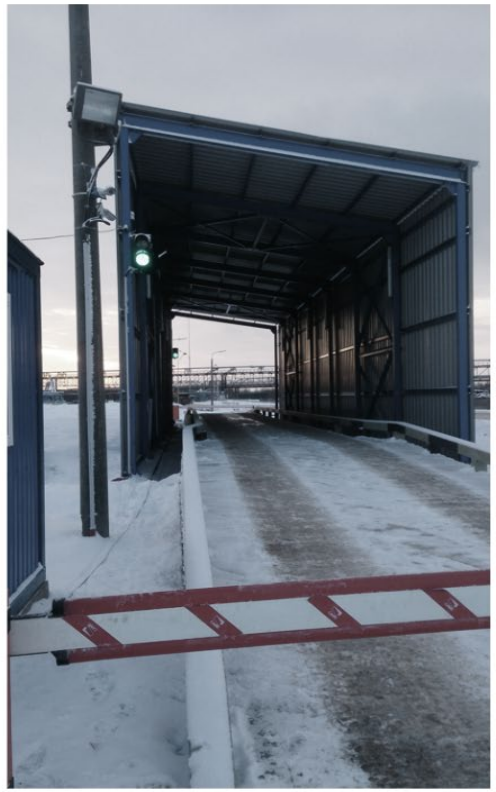
INDUSTRIAL FACILITY IN KIROVSK, RUSSIA

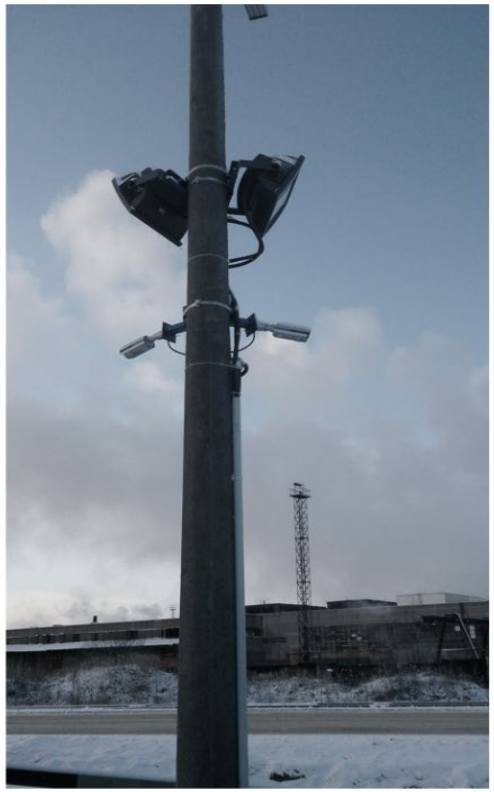
Hardware composition:
4 cameras, 4 traffic lights

Fully autonomous weighing without operator

IMPLEMENTATION CASE

INDUSTRIAL FACILITY CHEREPOVETS, RUSSIA

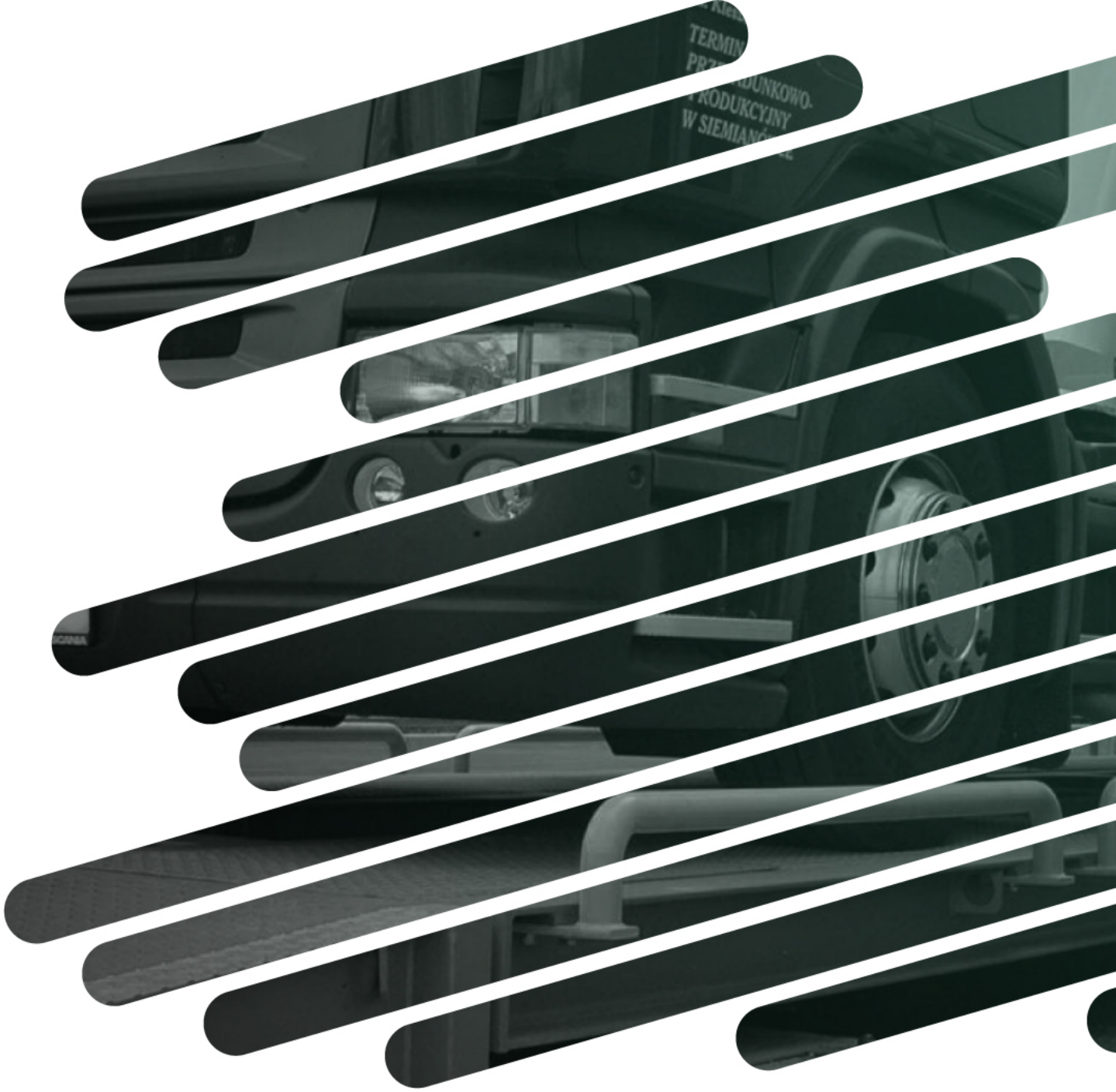


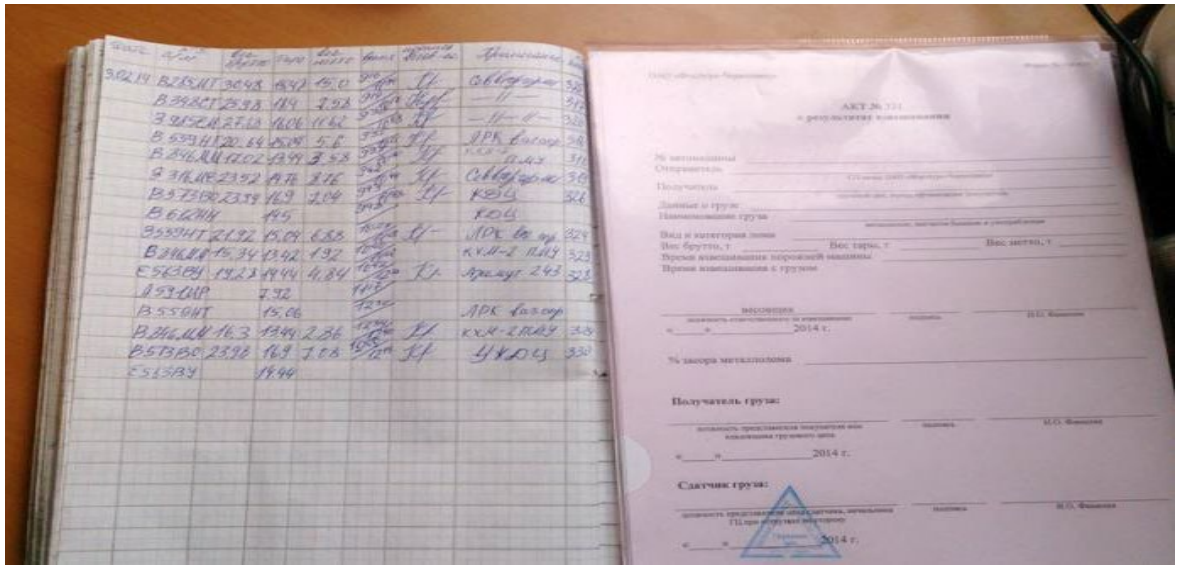


Hardware composition:
5 cameras, 4 traffic lights,
2 traffic barriers

Unique weighing procedure
with conformation of
each step by the operator

SYSTEMATIC APPROACH TO VEHICLE WEIGHING AUTOMATION





DISADVANTAGES OF MANUAL WEIGHING AND RECORD KEEPING

- Typos and other mistakes during manual data entry
- Absence of transparency
- Considerable time required for vehicle weighing and subsequent paperwork
- Possibility for stealing or exceeding the authority
- Absence of data for legal precedent work and disputes
- Uncoordinated use of the scales by vehicles

CASES WHEN AUTOMATION OF VEHICLE SCALES IS REQUIRED

Automation is appropriate when:

- ✓ There is a substantial traffic through vehicle scales
- ✓ There is a need for formalising and structuring the vehicle weighing procedures

Automation is not appropriate when:

- ✓ There is a small vehicle traffic going through vehicle scales
- ✓ The cost of human factor error is not significant
- ✓ The vehicle scales are mobile or stationary axial based
- ✓ Infrequent use of the scales

STEP 1
WEIGHING AUTOMATION

FORMULATION OF THE TASK

Preliminary, it is necessary to have clear understanding of the task by providing answers to the following questions:

1. What type of problems need to be resolved with vehicle weighing automation? (e.g. operator mistakes, queuing of vehicles, risk of theft, automation of the paperwork, lack of transparency, etc.)
2. Who does take part in the vehicle weighing procedure? (e.g. system operator, vehicle driver, security officer, etc.)
3. What does the system need to ensure once it is implemented?

Support from Mallenom Systems: system design questionnaire, most common use cases, technical specification for the most common system type

STEP 2
WEIGHING AUTOMATION

VEICHE WEIGHING SCENARIO

Items that need to be represented in a scenario:

1. Order of performed actions: driver, operator, hardware, trigger events, generation of the documents and reports.
2. Data exchange with external systems (if applicable).
3. List of potential deviations from the weighing scenario.

STEP 3 WEIGHING AUTOMATION

MEANS FOR VEHICLE IDENTIFICATION

Video cameras

- ✓ Applicable for multiple scenarios and suited for majority of implementation sites
- ✓ Do not provide 100% guaranty of the recognition

RFID tags

- ✓ Ensure recognition accuracy close to 100%
- ✓ Cannot be used for identification of untagged vehicles
- ✓ Have use limitations due to wider coverage area, properties of radio waves propagation, limitation for the receiver cable length, etc.

Magnetic access control cards

- ✓ Relatively inexpensive
- ✓ Do not provide comprehensive identification because the system identifies the card rather then object of the monitoring

STEP 4
WEIGHING AUTOMATION

TRAFFIC MANAGEMENT: TRAFFIC LIGHTS AND TRAFIC BARRIERS

Traffic lights are needed for:

- ✓ Providing visual cues to the driver on vehicle entry and exit to and from the scales (when the driver remains in the vehicle during weighing procedure)
- ✓ Managing the traffic flow when single scales are utilised for both direction of traffic
- ✓ Duplicate actions performed by the traffic barrier

Traffic barriers are needed for:

- ✓ Prevent unordered and unauthorised vehicle entry
- ✓ Reduce the vehicle speed when passing through the scales

STEP 5 WEIGHING AUTOMATION

CONTROL FOR VEHICLE POSITIONNING: INFRARED BARRIERS

Infrared barriers are needed to:

- ✓ Control positioning of the vehicle at the scales (i.e. if the beam is disrupted during weighing, the system weighing to take place until vehicle is positioned correctly)
- ✓ Provide logic for complex weighing scenarios when control for the direction of vehicle traffic is required

STEP 6
WEIGHING AUTOMATION

OTHER HARDWARE

Overview camera

- ✓ Inspection of truck’ bed, surrounding area, access roads

Induction loop

- ✓ 100% detection of vehicle in front of traffic barrier without false activations

Display

- ✓ Display of weighing results
- ✓ Display of the actions required to be performed by a driver

STEP 7
WEIGHING AUTOMATION

SELECTION FOR HARDWARE LOCATION

Cameras

- ✓ Prevent overexposure by headlights (i.e. cameras should be installed at a height of 2-4 meters)
- ✓ Minimise perspective distortion and number plate tilt angle in the image (which should not exceed 20 degrees)

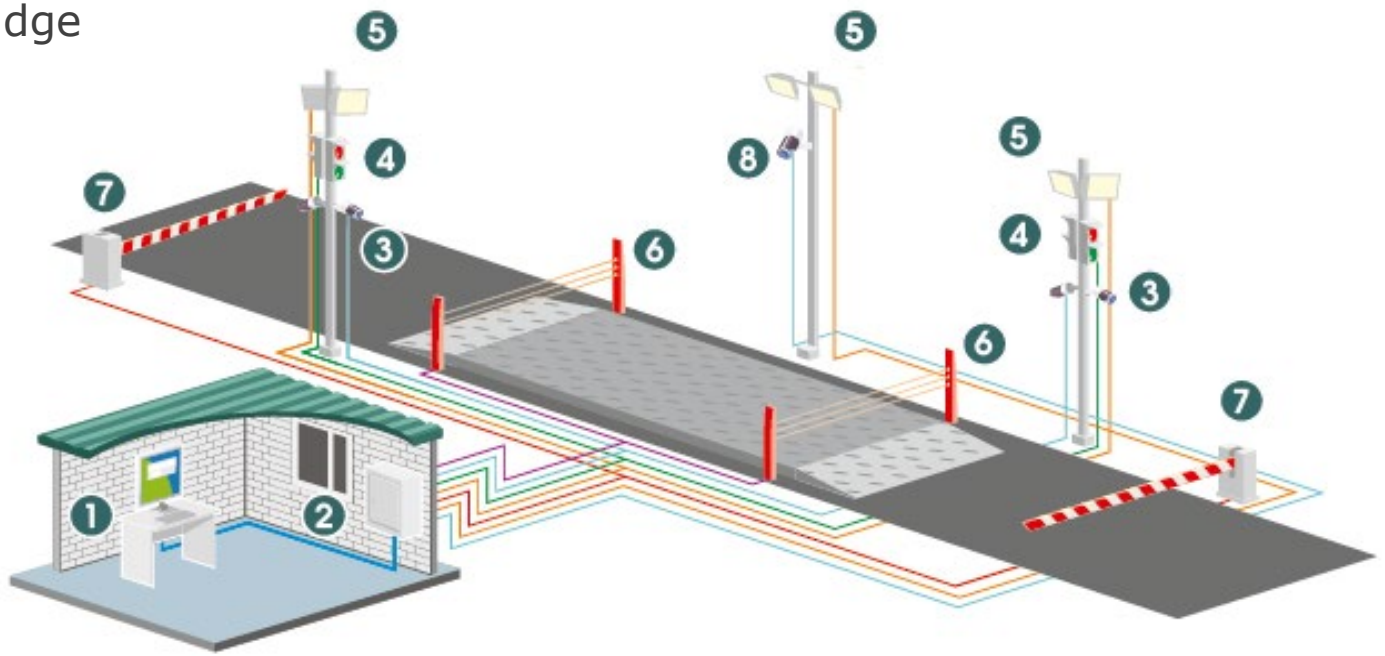
Traffic barriers

- ✓ Minimise obstruction of number plates

Note:

Under certain use cases, traffic barriers can control location of the vehicle on scales instead of infrared barriers, if traffic barriers are aligned with the edge of scales.

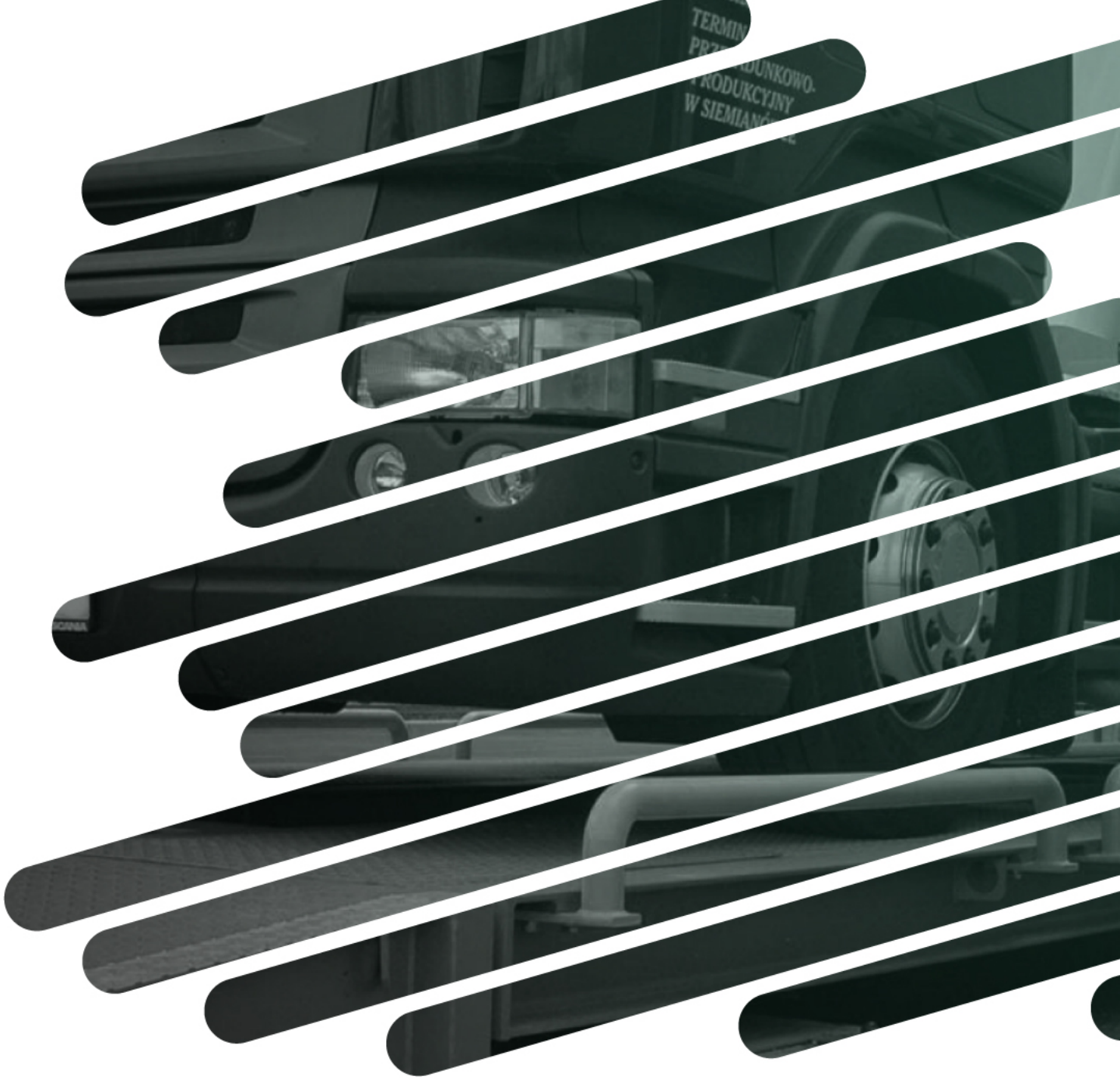
Based on Automarshal.Weighbridge example



RESULT OF VEHICHE WEIGHING SYSTEM CONFIGURATION

1. Workstation with installed Automarshal.Weighbridge software
2. Automarshal.Weighbridge cabinet
3. Video cameras for recognition
4. Traffic lights
5. LED lights
6. Vehicle positioning control sensors on scales
7. Traffic barrier
8. Top overview camera

WHAT TO EXPECT FROM VEHICLE WEIGHING STATION AUTOMATION



PROJECTED RESULT FROM WEIGHBRIDGE AUTOMATION

Eliminating the need for manual operations

- ✓ Manual input of the weighing results.
- ✓ Manual vehicle access control, inventory of arriving and departing cargo, control of time vehicle spends on premises (depending on integration type, data flow, hardware composition, etc.)

Ensuring full transparency of weighing operations

- ✓ Collecting photo and video materials of moving vehicles and during weighing, database log entries, self diagnostic.
- ✓ When necessary, providing additional level of authentication with implementation of RFID tags and ID cards.

Improving personnel efficiency

- ✓ Reducing the time of the overall weighing procedure.
- ✓ Providing the ability to control several weight stations at once.

PROJECTED RESULT FROM WEIGHBRIDGE AUTOMATION

Improving weighbridge and production facility efficiency

- ✓ Improving the traffic capacity of the weighbridge station.
- ✓ Automatic issuing of vehicle checkpoint and departure documentation.
- ✓ Accumulation of data from several weighing stations into a single database.
- ✓ Integration with Enterprise Resource Management System.

PITFALS DURING WEIGHING AUTOMATION

Complete automation (weighing without an operator):

- ✓ Requires strict compliance with the weighing procedures by the drivers (compliance with issued signals by the system – for example, compliance with traffic lights)
- ✓ Caveats: identification type, deviation from defined procedure, degree of the operator involvement

Dynamic and axial weighing:

- ✓ Requires strict compliance with regulations by the driver (характер движения ТС)
- ✓ Caveats: complex vehicle composition, limitations in capacity of scales

Operator located far away from scales:

- ✓ Requires larger number of hardware (e.g. cameras, traffic lights, traffic barriers, display, loud speakers)
- ✓ Less convenient option for an operator

Integrations, adaptation, additional and exclusive development:

- ✓ Requires long and meticulous installation and system launch
- ✓ It is crucial to consider all technical aspects well in advance of beginning any integration, adaptation, development or installation

WHAT SYSTEM COMPONENTS CAN BE CHANGED FOR A CHEAPER ALTERNATIVES OR BE REMOVED COMPLETELY?

Video cameras

Cameras from a cheaper brand can be used if the implementation site has good lighting conditions.

Lights

It is not recommended to remove or swap any exterior lights for a cheaper alternatives even if cameras are equipped with IR lights.

Traffic lights

Instead of using 4 traffic lights the system can be equipped with 2 if the traffic intensity is moderate or traffic is moving only in one direction.

Infrared barriers

Can be removed from the system if there is a system operator and the system takes front and back photos of the vehicle during weighing procedure.

Traffic barriers

Can be removed from the system if the implementation site does not require to have the means for the physical vehicle access control to the weighbridge.

Display

Can be removed from the system if the vehicle driver does not require to view results of weighing during weight inspection.

ABOUT MALLENOM SYSTEMS

2000+ implemented systems
50+ partners
80+ regular clients

MALLENOM SYSTEMS is one of the leading Russian developers of video analytics and industrial control systems based on computer vision and artificial intelligence technologies.

The company has successfully completed more than 100 innovative projects in the fields of transport, mechanical engineering, food, oil and gas, metallurgy, pharmaceutical, diamond mining and other industries.

Experience in weigh station automation:

- ✓ More than 50 automotive weigh stations have been automated
- ✓ More than 50 railway weigh stations have been automated
- ✓ Implementations at LUKOIL, Severstal, Rosneft, etc.

MALENOM SYSTEMS ADVANTAGES

Key advantages and strengths

Unique developer company that performs turnkey projects

- ✓ Information and control system development experience since 1999
- ✓ Complete coordination of the project from system logic to the utilised hardware
- ✓ Individual approach for each implementation site with option to perform further development

Extensive implementation experience

- ✓ System implementation experience since 2005
- ✓ Integration with different scales and dispense systems
- ✓ Taking into account unique industrial requirement (e.g. cargo dispatch, blast proof exterior casing, etc.)

Loyal regular customers

- ✓ LUKOIL PJSC
- ✓ Gazprom Neft PJSC
- ✓ PhosAgro PJSC
- ✓ Severstal PJSC and others

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SYSTEMS

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