

Eocortex

Version 4.2

Admin guide

Part 2

Contents

Video analytics.....	9
Auto zoom	9
Details.....	9
Module setup.....	9
Camera analytics	10
Temperature for recognized faces.....	10
Description.....	10
Setup.....	11
Requirements and recommendations.....	13
Troubleshooting	13
Loud sound detection	13
Details.....	13
Module setup.....	14
Requirements and recommendations.....	15
Fire and Smoke Detection.....	15
Details.....	15
Module setup.....	16
Requirements and recommendations.....	18
Hardware and software	18
Image	19
Video stream.....	19
Lighting and image quality.....	19
Scene and camera position	19
Deployment of the module	19
Face Mask Detection	21
Details.....	21
Module setup.....	21
Requirements and recommendations.....	24
Detection.....	24
Hardware and software	25
Module settings.....	26
Masks.....	26
Video stream.....	27

Lighting and image quality	27
Scene and camera position	28
Examples of non-compliance	28
Recommended camera settings.....	33
Deployment of the module	34
Sabotage Detection.....	35
Capabilities of the module.....	35
Module setup	36
Requirements and recommendations.....	39
Camera requirements.....	39
Aspects of operation	39
Aspects of individual detectors.....	39
Crowd Monitoring.....	40
Capabilities of the module.....	40
Details.....	40
Module setup	40
Requirements and recommendations.....	43
Personnel activity monitoring.....	43
Details.....	43
Module setup	43
Requirements and recommendations.....	46
Uniform Detection	46
Capabilities of the module.....	46
Details.....	47
Module setup	47
Movement in the area	49
Line intersection.....	50
Requirements and recommendations.....	53
Hardware and software	53
Video stream.....	55
Image	55
Scene and camera position	55
Detection.....	56
Examples	56
Deployment of the module	58

Shelf Fullness Check.....	60
Details.....	60
Module setup.....	60
Requirements and recommendations.....	62
Video stream.....	63
Lighting and image quality.....	63
Scene and camera position.....	64
Sample images with violated requirements.....	65
Examples for setting up the contours of the shelves.....	66
Performance.....	68
Face detection.....	68
Details.....	68
Module setup.....	68
Abandoned Objects Detection.....	70
Details.....	70
Module setup.....	70
Requirements and recommendations.....	75
Fall Detection.....	76
Module setup.....	76
Requirements and recommendations.....	79
Hardware and software.....	79
Video stream.....	80
Image.....	80
Scene and camera position.....	81
Deployment of the module.....	81
Emergency Vehicle Detection.....	83
Capabilities of the module.....	83
Details.....	83
Module setup.....	83
Requirements and recommendations.....	87
Hardware and software.....	87
Video stream.....	88
Image.....	88
Scene and camera position.....	88
Deployment of the module.....	89

Counting people in queue	90
Capabilities of the module.....	90
Details.....	90
Module setup.....	90
Requirements and recommendations.....	93
Image	93
Hardware and software	93
Performance.....	94
Object Classification and Counting.....	95
Capabilities of the module.....	95
Details.....	95
Module setup.....	95
Counting objects in area	98
Line intersection.....	99
Requirements and recommendations.....	102
Hardware and software	102
Video stream.....	103
Determination of objects.....	103
Examples	103
Deployment of the module	104
People Counting.....	105
Capabilities of the module.....	105
Details.....	106
Module setup.....	106
Requirements and recommendations.....	117
Search for Objects	117
Capabilities of the module.....	117
Details.....	118
Module setup.....	118
Requirements and recommendations.....	123
Functional limitations.....	123
Hardware and software	124
Video stream.....	125
Image	125
Scene and camera position	126

Module performance quality	126
Deployment of the module	129
Fisheye dewarping module.....	131
Details.....	131
Module setup.....	131
Frame Area Blurring	133
Details.....	133
Module setup.....	133
License Plate Recognition	135
Capability of the module	135
Reports.....	136
Additional information.....	136
Module setup	136
Basic settings	138
Parking spots.....	141
Database.....	143
Barrier gate control	146
Requirements and recommendations.....	148
Hardware requirements	148
Camera installation requirements.....	148
Video stream requirements.....	149
Requirements to the license plate image.....	149
Settings recommendations.....	150
Deployment of the module	150
Licence plate recognition (Complete).....	153
Capabilities of the module.....	153
Details.....	154
Module setup	155
Basic settings	156
Parking spots.....	163
Database.....	165
Barrier gate control	168
Requirements and recommendations.....	171
Requirements to the license plate image.....	171
Recommendations on camera installation.....	172

Recommendations on choosing and setting up a camera and lens.....	180
Module installation and update	190
Installation under Windows OS.....	190
Installation under Linux OS	195
Debian and Ubuntu.....	196
Licensing the module.....	197
Updating the module protection key.....	199
Troubleshooting	201
Work correctness of the HASP protection key driver and module libraries.....	201
Work correctness of the License Plate Recognition module	205
Face recognition	207
Comparison of modules	208
Details.....	209
Module setup.....	210
Main settings.....	211
Detection area.....	214
Database.....	215
Time logging areas	219
Requirements and recommendations.....	221
Deployment of the module	221
Traffic density heat map	223
Capabilities of the module.....	223
Details.....	223
Module setup.....	223
Requirements and recommendations.....	227
Tracking	229
Capabilities of the module.....	229
Details.....	230
Module setup.....	230
Long stay in the zone	234
Movement in the area	234
Line intersection.....	235
Requirements and recommendations.....	238
Hardware and software.....	238
Video stream.....	240

Image	240
Scene and camera position	240
Recognition of vehicles	240
Examples	241
Deployment of the module	242
Unique Visitor Counting	244
Details.....	244

Video analytics

Auto zoom

The **Auto zoom** module serves to display a separate zoomed-in area of the frame with the moving objects in the **Eocortex Client** application.

Details

Warning

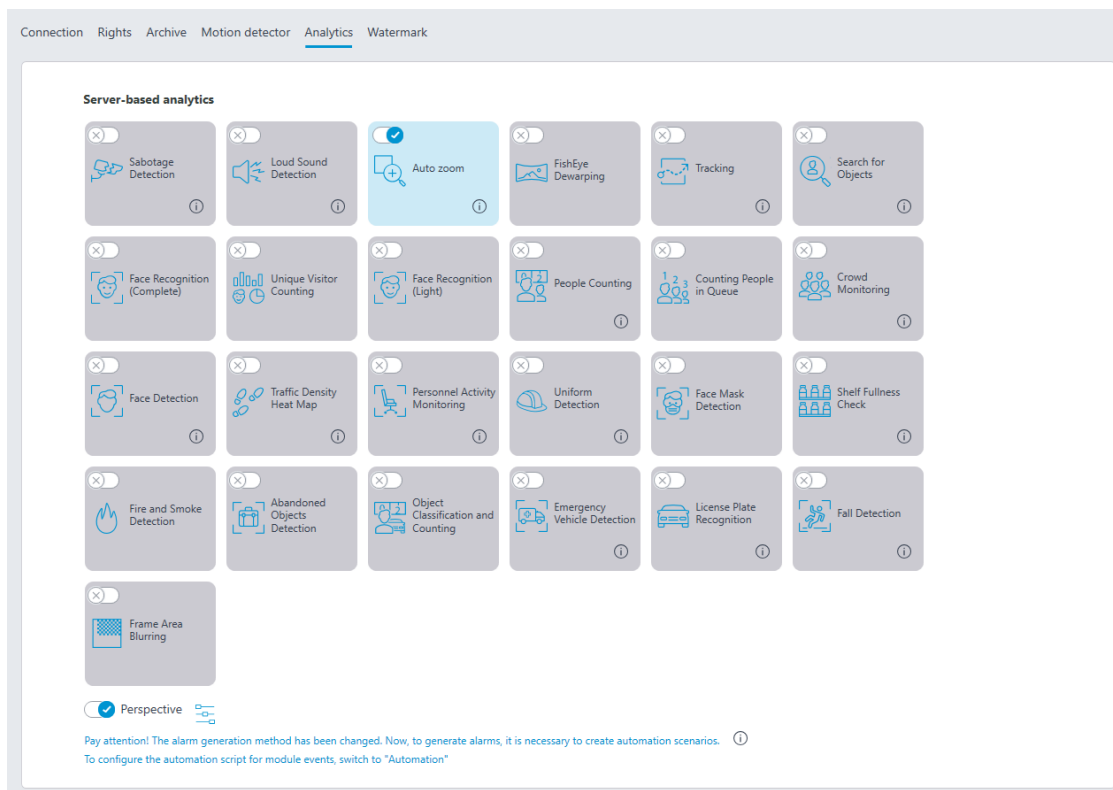
The **Auto zoom**, **Fisheye dewarping module** and **Frame Area Blurring** modules are mutually exclusive, meaning that only one of these modules can be used on a camera at a given moment.

Module setup

To use the module, enable and configure it.

Launch the **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.

Then switch to the **Analytics** tab and enable the module using the  toggle.



Connection Rights Archive Motion detector **Analytics** Watermark

Server-based analytics

- Sabotage Detection
- Loud Sound Detection
- Auto zoom**
- FishEye Dewarping
- Tracking
- Search for Objects
- Face Recognition (Complete)
- Unique Visitor Counting
- Face Recognition (Light)
- People Counting
- Counting People in Queue
- Crowd Monitoring
- Face Detection
- Traffic Density Heat Map
- Personnel Activity Monitoring
- Uniform Detection
- Face Mask Detection
- Shelf Fullness Check
- Fire and Smoke Detection
- Abandoned Objects Detection
- Object Classification and Counting
- Emergency Vehicle Detection
- License Plate Recognition
- Fall Detection
- Frame Area Blurring

Perspective

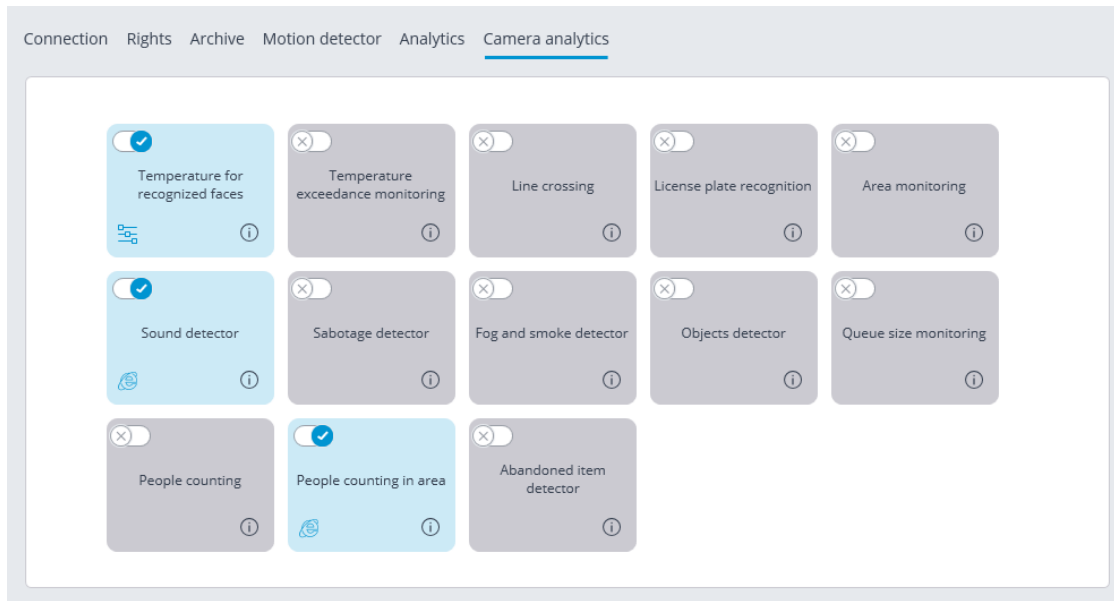
Pay attention! The alarm generation method has been changed. Now, to generate alarms, it is necessary to create automation scenarios. To configure the automation script for module events, switch to "Automation"


Warning


The module will start working only when **the settings are applied**.


Camera analytics


The video analytics built into a camera can be set up in the camera settings on the **Camera analytics** tab of the **Ecortex Configurator** application.



The video analytics can be enabled using the  switch.

The  button opens the prompt for video analytics.

If the analytics must be configured in the **Ecortex Configurator** application, the settings window of this video analytics can be opened upon clicking the  button.

If the analytics must be set up directly on the camera, the camera's web interface can be opened by clicking the  button.


- **Temperature for recognized faces**

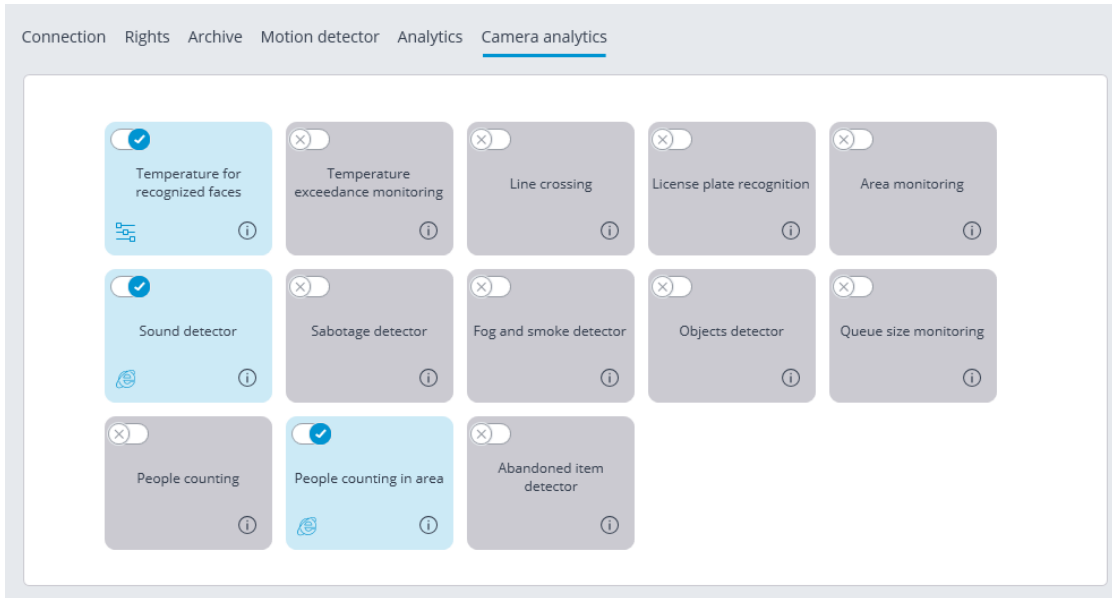
Temperature for recognized faces

Description

The **Ecortex** server receives the temperature of a person from the camera. If the automatic calibration using a black body calibrator has been configured, the resulting temperature is corrected according to the specified settings.

Setup

To enable support of the **Temperature for recognized faces** video analytics used on a thermal camera, it is required to toggle the switch  on the **Camera analytics** tab in the camera settings in the **Eocortex Configurator** application.



To open the analytics settings, it is required to press .

> Settings of thermal capabilities
✕

Alarm temperature, °C

Black body settings

Set black body temperature, °C ⓘ

Measured black body area coordinates, pixels (X, Y, W, H) ⓘ

Measured black body coordinates, pixels (X, Y) 0; 0

Thermal frame resolution, pixels (W x H)

Measured black body temperature, °C

[Update black body settings](#)

OK

Alarm temperature, °C: If this preset temperature threshold is reached or exceeded, an alarm will be triggered.

If a black body calibrator is used to automatically calibrate the thermal camera, it can be configured by enabling the **Black body settings** option and setting the following parameters:

Temperature set on black body.: Set black body temperature, °C.

Measured black body area coordinates, pixels (X, Y, W, H): Optional. Frame area where the search for black body will be performed by the highest temperature. 0,0, __, __ - upper left corner coordinates.

In order to update the black body settings on the server, it is required to click the **Update black body settings** link. In this case, the fields **Measured black body coordinates, pixels (X, Y)**, **Thermal frame resolution, pixels (W x H)** and **Measured black body temperature, °C** will display data transmitted by the camera.

Requirements and recommendations

Ideally, there should be no objects in the frame whose temperature is higher than that of a person.

Since the highest temperature on the face is usually found in the inner corner of the eye, in the cases described below the temperature of a person may be determined as being lower than in reality:

- if the face of a person is tilted and the inner corner of the eye is not visible to the camera;
- if a person is far from the camera and the inner corner of the eye in the frame is too small;
- if a person is wearing glasses, the temperature of the inner corners of their eyes cannot be determined.

If a person is too close to the camera, the thermal camera may pick up hot objects (e.g., incandescent lamps) behind the person since the thermal camera and the video camera are at a distance between them.

The following can be done to improve the accuracy of the measurements:

- make the thermal imaging background for cameras more or less uniform;
- remove any objects with the temperature that exceeds the human temperature from the thermal imaging background (e.g., by bringing the camera closer or moving it);
- move the black body so that it is as close to the detected person as possible.

By changing the value of **Temperature set on black body.**, it is possible to compensate for the temperature detection in the current conditions.

Troubleshooting

If the displayed temperature does not approach the actual temperature on the black body or the coordinates are much displaced, the area should be adjusted (in particular, it will be required to remove all objects whose temperature exceeds the black body temperature) and update the settings.

Loud sound detection


The **Loud sound detection** module allows to register the situations when the sound received by the camera microphone exceeds the preset level. Additionally, it displays the current sound level in the Eocortex Client application.

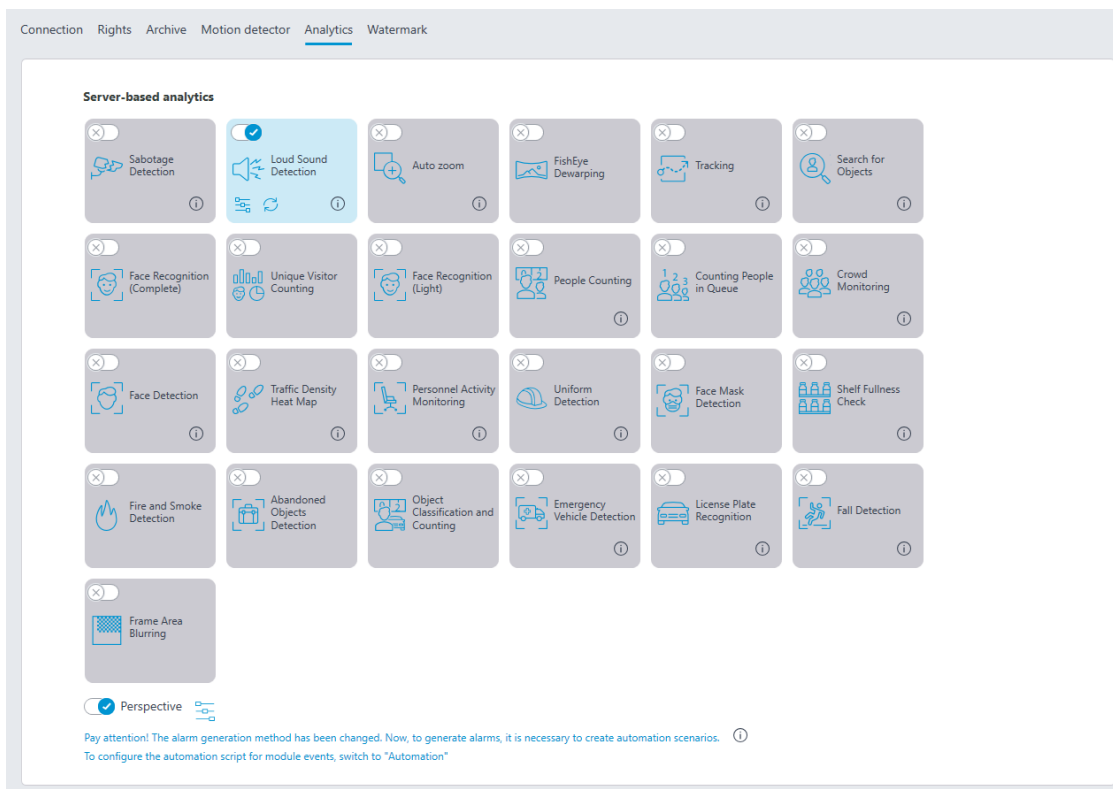
Details

For the proper operation of the module, it is required to correctly aim the microphone and set up the module.

Module setup

To use the module, enable and set it up.

To do that, **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, go to the **Analytics** tab and enable the module using the  switch.




Connection Rights Archive Motion detector **Analytics** Watermark

Server-based analytics

- Sabotage Detection
- Loud Sound Detection**
- Auto zoom
- FishEye Dewarping
- Tracking
- Search for Objects
- Face Recognition (Complete)
- Unique Visitor Counting
- Face Recognition (Light)
- People Counting
- Counting People in Queue
- Crowd Monitoring
- Face Detection
- Traffic Density Heat Map
- Personnel Activity Monitoring
- Uniform Detection
- Face Mask Detection
- Shelf Fullness Check
- Fire and Smoke Detection
- Abandoned Objects Detection
- Object Classification and Counting
- Emergency Vehicle Detection
- License Plate Recognition
- Fall Detection
- Frame Area Blurring

Perspective

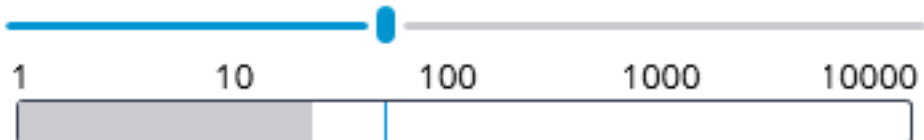
Pay attention! The alarm generation method has been changed. Now, to generate alarms, it is necessary to create automation scenarios. 
To configure the automation script for module events, switch to "Automation"



Loud sound detector



Threshold



Apply

Cancel

The sound level logarithmic scale will appear in the opened setup window, where the sound level entering the camera microphone will be displayed in real-time mode. Using the **Threshold** slider, you will be able to set the sound level that will trigger the detector.



Warning

The module will start working only when **the settings are applied**.



Requirements and recommendations

It is required to take into consideration that the detector reacts only to the level of sound. For the detector, the sounds of various types differ only by their levels. The subjective perception of the sound level by a person and the evaluation of the level of a particular sound among the sounds of the camera's sound stream by the detector may differ; for example, the camera may be more sensitive to the sounds of a particular frequency, or it may subdue sounds according to its own algorithms.

Another adverse factor is the high noise level that leads to the situation when some sounds that require a response (for example, shouts or banging of a door) become poorly perceivable against the sounds in the background, making the triggering of the detector unreliable.

Also, wind gusts perceived by a camera microphone not protected against the wind may lead to the false triggering of the loud sound detector.

The abovementioned factors are required to be taken into consideration at the stage of choosing a camera or a microphone as well as when setting up the detector.

Fire and Smoke Detection

The **Fire and Smoke Detection** module is intended for detecting smoke and open flame in the frame.

Details



Warning

For the **Based on neural networks** operating mode, it is required **install the Eocortex Neural Networks package**; a video card **with the parameters matching the module's requirements** is also necessary.




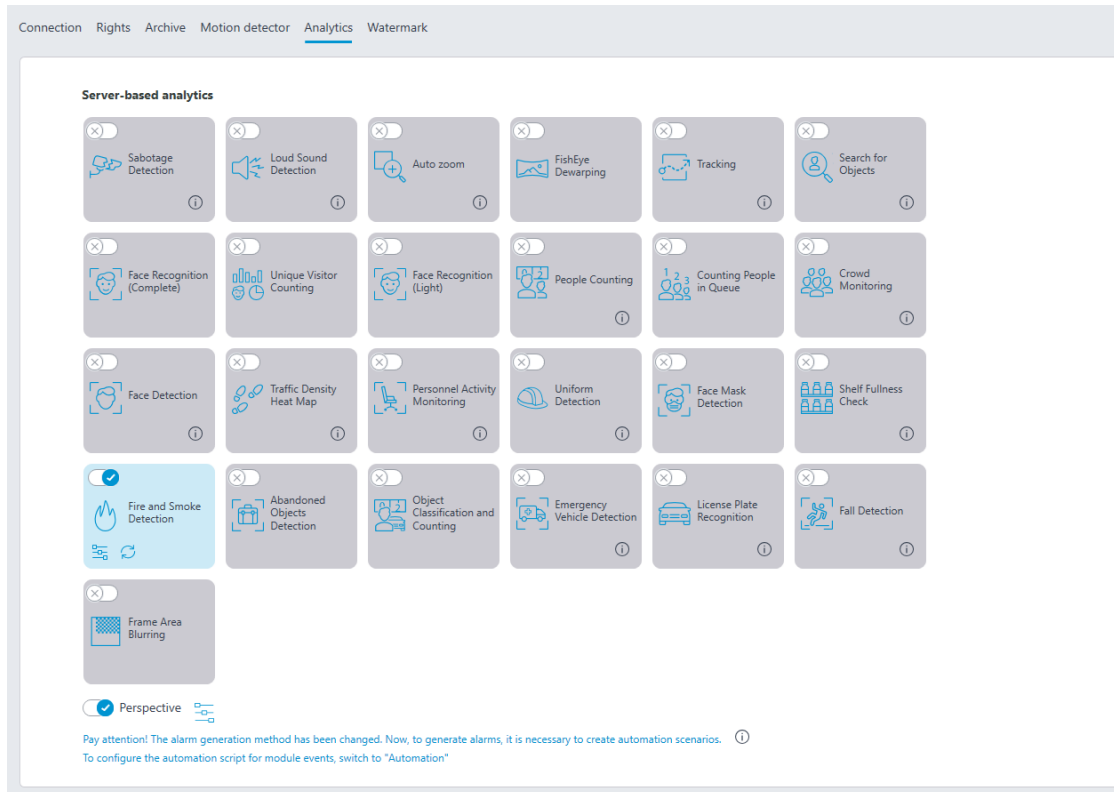
For the correct operation of the module, it is required to properly place and set up the camera, enable and adjust the software motion detector and the module itself.


Module setup

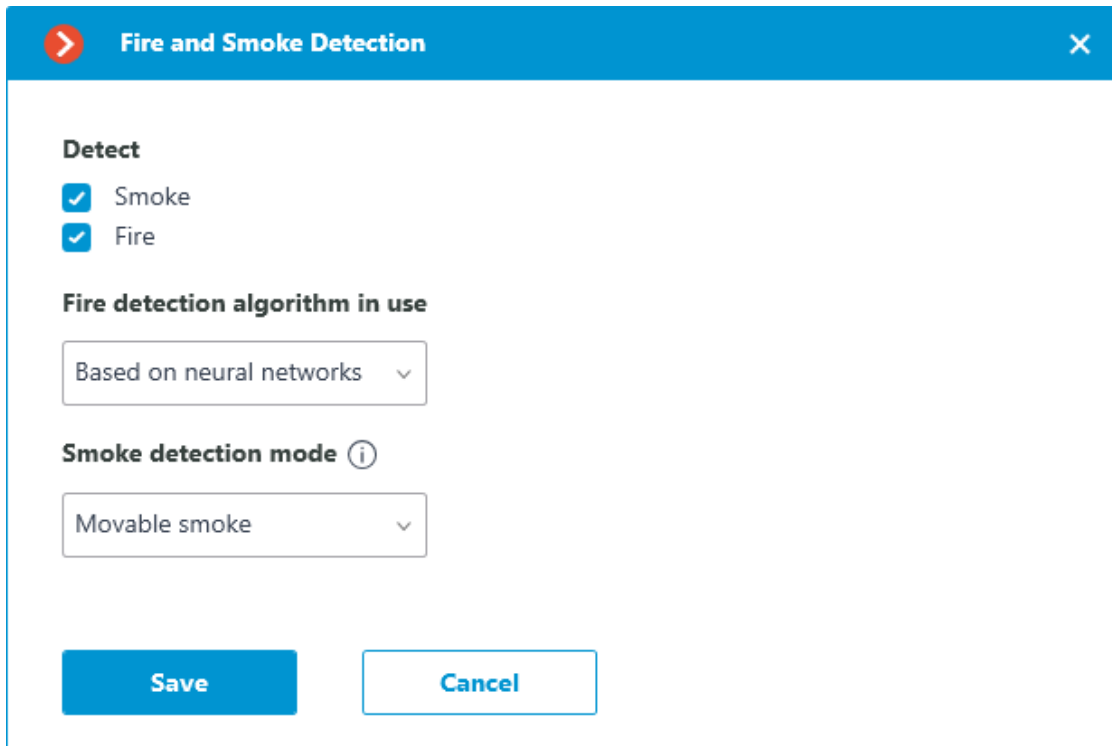
To use the module, enable and configure it.

Launch the **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.

Then switch to the **Analytics** tab and enable the module using the  toggle.



Clicking the  button opens the module setup window.



In the opened settings window, select the needed detection options: **Smoke** and / or **Fire**.

Select detection algorithm:

- **Based on motion detector**
- **Based on neural networks.**

Note

The **Based on neural networks** algorithm provides higher detection accuracy.

Warning

For the **Based on neural networks** operating mode, it is required **install the Eocortex Neural Networks package**; a video card **with the parameters matching the module's requirements** is also necessary.

When smoke is detected, it is necessary to select the mode in which it will be detected:

- **Sedentary smoke:** a mode for the better smoke detection at a great distance from the camera.
- **Movable smoke:** a mode for the better detection of close smoke when the smoke changes rapidly.

Warning

The module will start working only when **the settings are applied**.

Requirements and recommendations

Hardware and software

Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.

For the **Based on neural networks** operating mode, the following are required:

- A processor that supports AVX instructions;
- An **NVIDIA** video card (GPU) with the computation capacity index of at least 6.5 and with at least 4 Gb of memory; the parameters and performance of the video card must be similar or better than those of **NVIDIA GTX 1650 Ti** model;
- Version of the video card driver at least 460;
- Swap file at least half of the total RAM size.

If the package will be installed on a virtual machine, it may additionally be required to:

- Enable support for AVX instructions in the guest machine settings;
- Use GRID drivers for GPU virtualization.

Warning

Eocortex must use video cards selected for running neural networks in monopoly mode. It is not allowed to use such card for other applications or tasks that consume GPU resources, including for displaying video. Simultaneous use of a video card for several tasks may lead to incorrect system operation: from analytics performance degradation to server instability.

Warning

The neural network works with the 64-bit version of **Eocortex** only.

Warning

When upgrading **Eocortex** to another version, it is necessary to also upgrade the **install the Eocortex Neural Networks package** package to the corresponding version.

Image

- Image and background must be static: the camera shall be rigidly fixed, there shall be no constantly moving objects in the frame.

Video stream

- Minimum permissible resolution of the frame is 400x300 pixels.
- Minimum permissible frame rate is 15 and 5 frames per second for fire detection and smoke detection modes respectively.

Lighting and image quality

- The illumination of the detection area must not change drastically (for example, when the light is switched on, when the camera switches to night mode, etc.).
- In the smoke detection mode, it is necessary to ensure minimum required illumination and to avoid that the direct light shines on the lens.

Scene and camera position

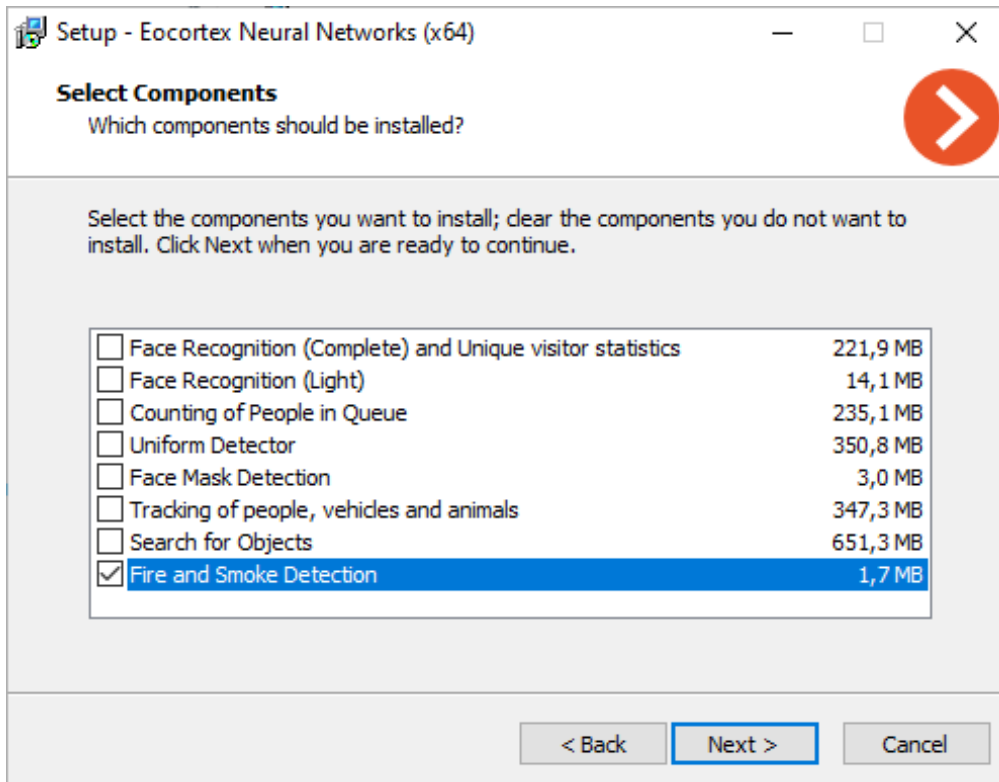
- The camera shall be placed at the angle of 0 — 70 degrees in reference to the level surface.
- The objects of potential hazard must be located in the line of site of the camera. That means that they must not be blocked by other objects.
- In the camera field of view there must be no "benign" sources of smoke and fire, such as furnaces, steam boilers or pipes, welding equipment etc.
- The dimensions of the objects to be detected (smoke and fire areas) must be no less than 10% of each linear measure of the frame.

Deployment of the module

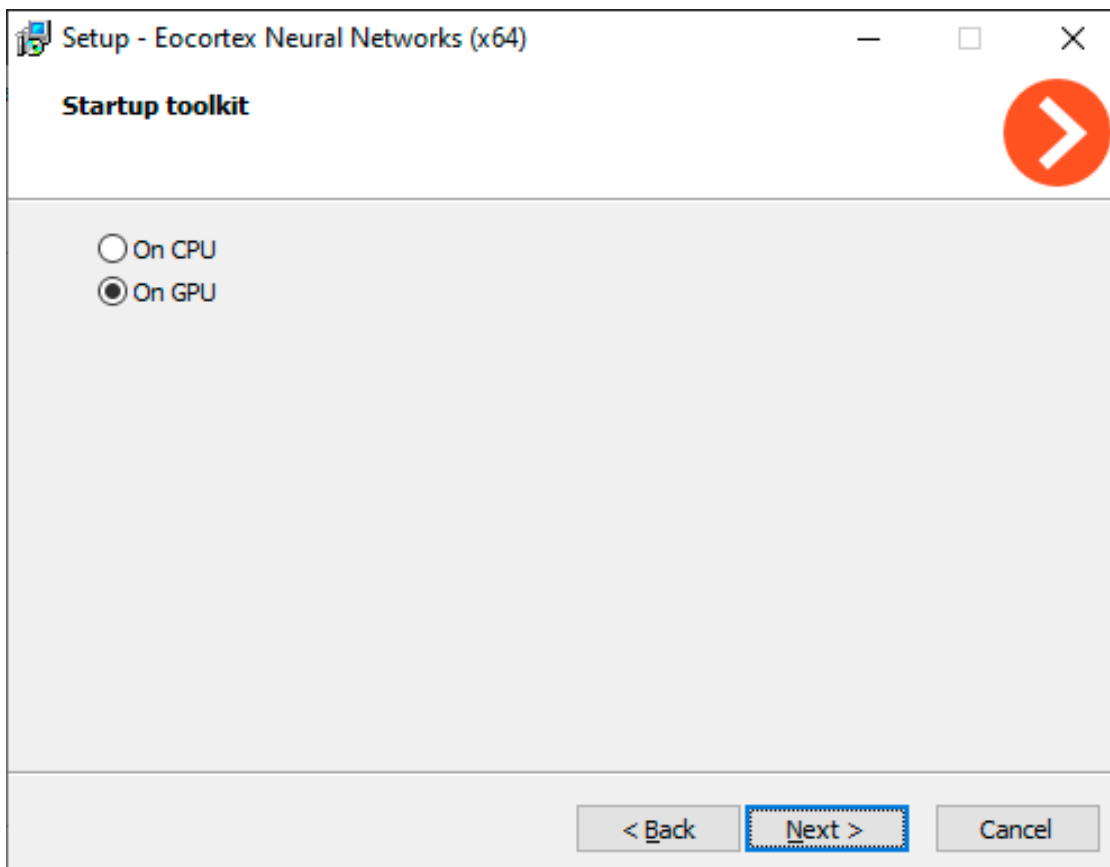
Warning

For the **Based on neural networks** operating mode, it is required **install the Eocortex Neural Networks package**; a video card **with the parameters matching the module's requirements** is also necessary.

While installing the package, select the relevant component.



It is recommended to use graphics card (GPU) to run the module.



Face Mask Detection

The **Face Mask Detection** module is designed to detect people not wearing medical face masks in the frame. When such persons are detected, the module highlights them in the frame with a square in real time and enters the event in the event log.

Details


For the module to work properly, it is necessary to correctly position and configure the camera, install the **Eocortex Neural Networks** package, and enable and configure the module.

Module setup

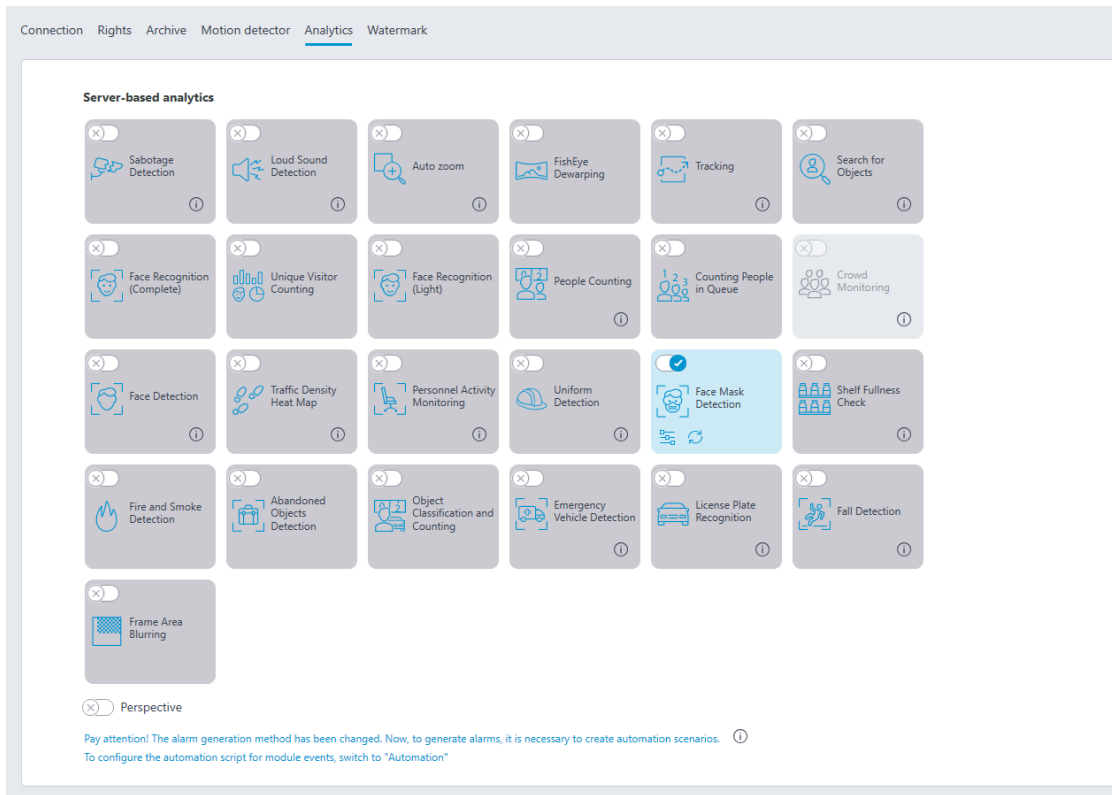
Warning


install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.

To use the module, enable and configure it.

Launch the **launch the Eocortex Configurator application**, go to the  **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.

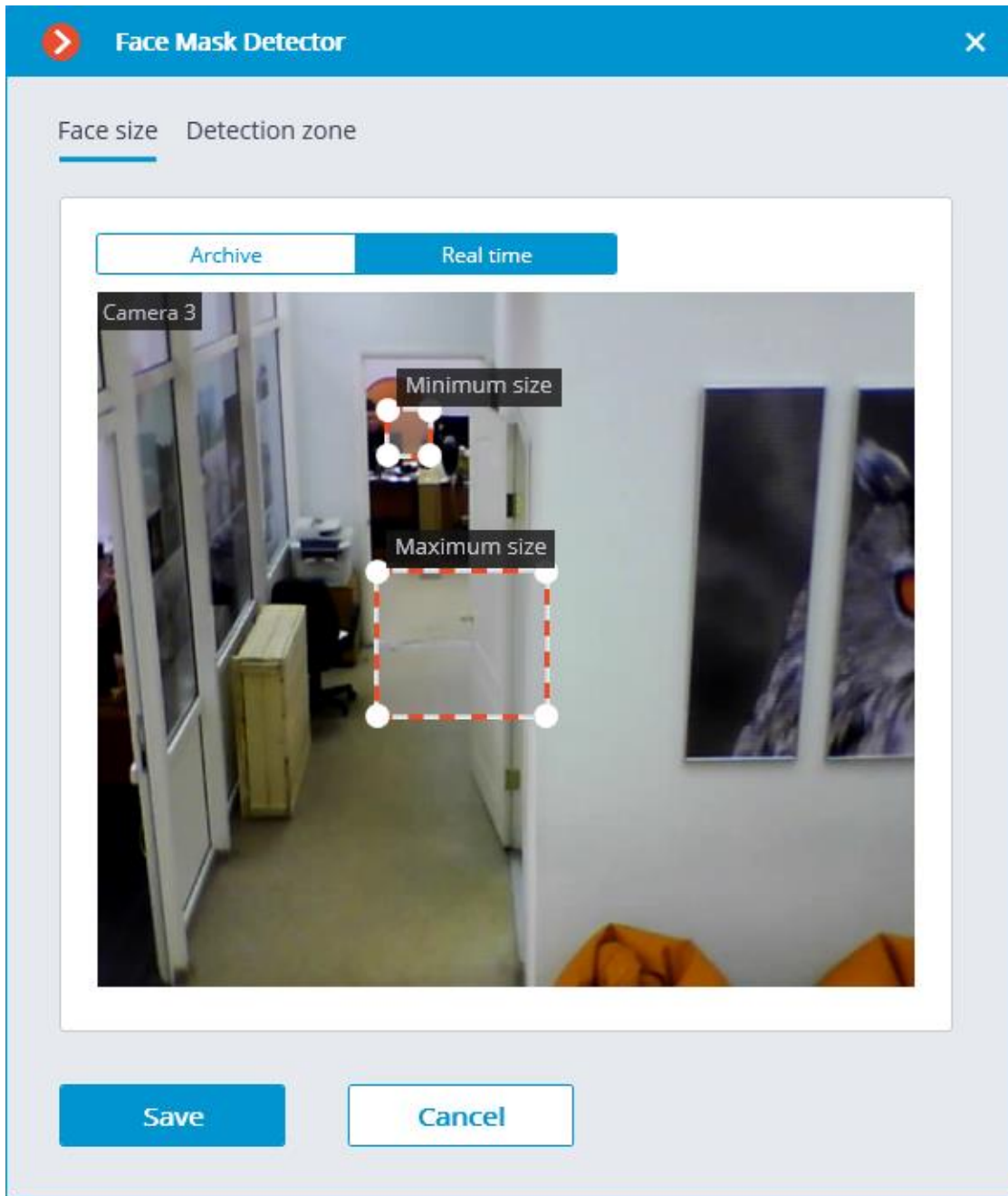
Then switch to the **Analytics** tab and enable the module using the  toggle.



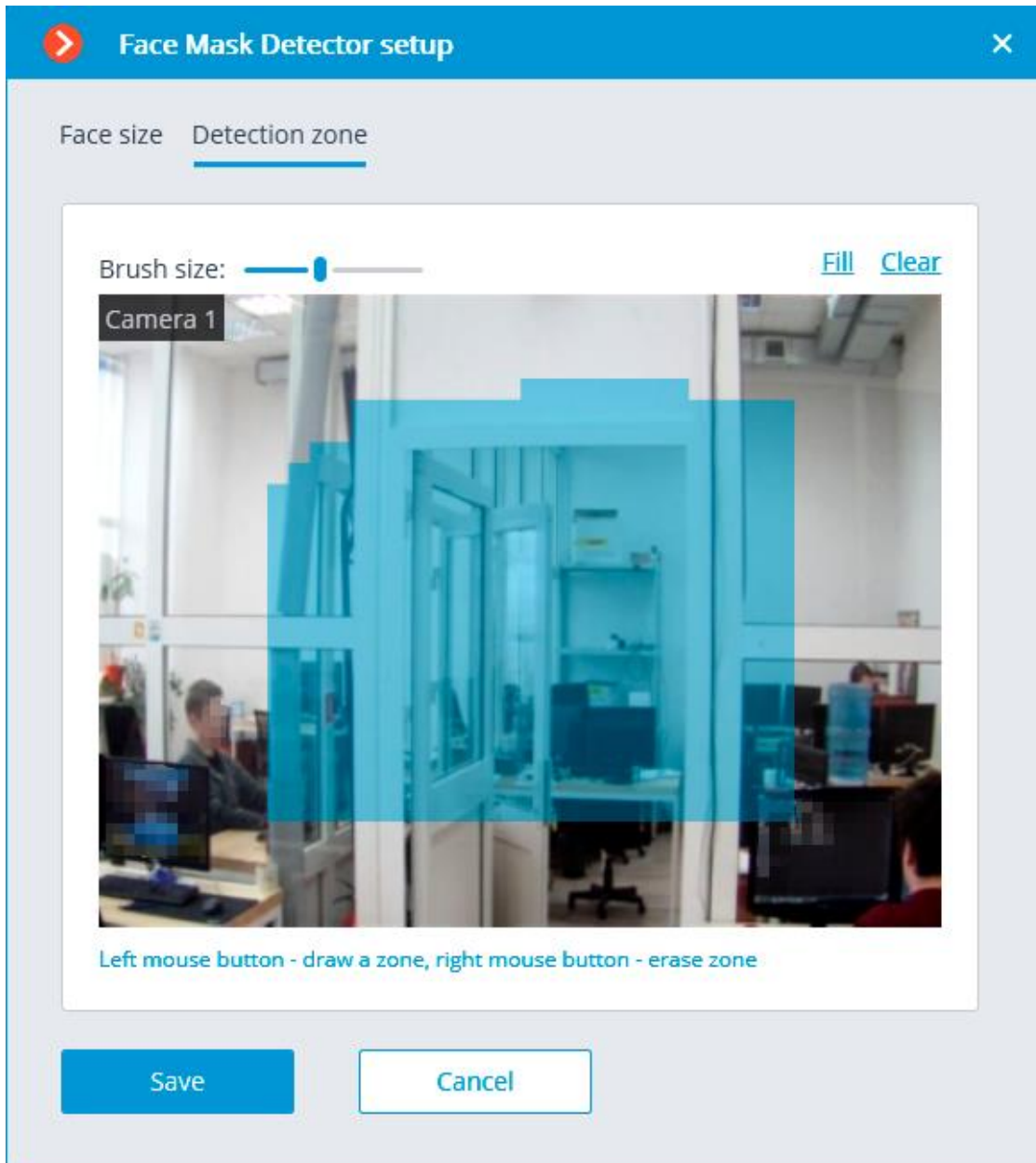
Clicking the  button opens the module setup window.

In the opened window, it is required to make the appropriate settings in the corresponding tabs.

Face size: the minimum and maximum sizes of the faces of the people to be monitored.



Detection zone is the zone of the frame filled with the semitransparent blue fill in the settings window. The mouse is used for modifying the zone: left mouse button serves for filling the zone, and the right one is used for clearing it. With the help of the **Fill** and **Clear** buttons you can fill or clear the whole area of the frame. The corresponding slider is used to modify the **Brush size**.



Warning

The module will start working only when **the settings are applied**.

Requirements and recommendations

Detection

The module can detect up to ten people not wearing face masks in the frame at the same time (if allowed by the computing capacity).

The module does not recognize (identify) faces, it cannot tell one person from the other or compare a person's face with the faces from a database; it only finds people without face masks in the frame.

When an infringement event (no mask) is detected, the module briefly highlights the person's face with a red square in the client application and creates a corresponding event in the event log. The repeated detection of the infringement by the same person will become possible only after the disappearance of this person from the frame for three seconds minimum (e.g. when the person leaves the frame or covers his/her face completely).

Hardware and software



Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.



The following equipment is required to use this neural network-based module:

- A processor that supports AVX instructions;
- An **NVIDIA** video card (GPU) with the computation capacity index of at least 6.5 and with at least 4 Gb of memory; the parameters and performance of the video card must be similar or better than those of **NVIDIA GTX 1650 Ti** model;
- Version of the video card driver at least 460;
- Swap file at least half of the total RAM size.

If the package will be installed on a virtual machine, it may additionally be required to:

- Enable support for AVX instructions in the guest machine settings;
- Use GRID drivers for GPU virtualization.



Warning

Eocortex must use video cards selected for running neural networks in monopoly mode. It is not allowed to use such card for other applications or tasks that consume GPU resources, including for displaying video. Simultaneous use of a video card for several tasks may lead to incorrect system operation: from analytics performance degradation to server instability.



Warning

The neural network works with the 64-bit version of **Eocortex** only.

Warning

When upgrading **Eocortex** to another version, it is necessary to also upgrade the **install the Eocortex Neural Networks package** package to the corresponding version.

Module settings

Setting too small minimum face size may lead to false positives due to low image quality.

The shape of the detection area can be arbitrary.

Masks

The examples of supported face masks:



The supported colors are as follows: white, black, yellow, different tones of green, blue, and red.

The face covered by a hand or a scarf will trigger the detector unless the area of a nose is covered.

Video stream

- Image resolution: no lower than HD (1280x720).
- Framerate: 15 fps or more.

Lighting and image quality

Illumination of faces in the frame must be uniform and constant.

If the camera is installed opposite a bright source of light (sun behind the entrance door, etc.), it is required to adjust the exposure or brightness in such a way that the face in the frame is light. The overexposed background is acceptable.

The image quality must be medium or better. Significant compression artefacts are unacceptable.

No blurring of moving people's faces is allowed.

The image must be in color.

Scene and camera position

Faces must be fully and clearly visible in the frame.

Persistence of reflective surfaces (glass, mirror, other objects giving reflections) in the frame is not allowed.

Strong lateral illumination (e.g. sunlight from the window) resulting in the overexposure of one part of the face is not acceptable.

The camera may be placed above the face level, directly facing the people to be recognized. In such a case, the camera elevation angle must not exceed 35°.

The distance between the pupils of a face to be recognized must be at least 30 pixels.

The camera must directly face the people to be recognized. The camera angle between the face direction and the lens axis must not exceed 30°.

Examples of non-compliance

Covering (overlapping):

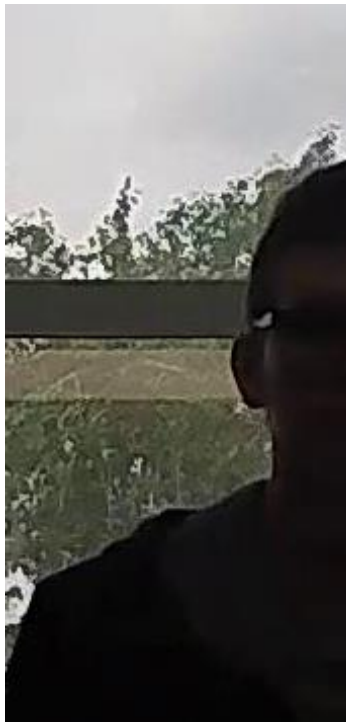


✓

Face illumination:



X



✓

X

X

Blurring of face in motion:



✓

X

Unacceptable distance between pupils:



30 pixels

✓



15 pixels

X

Video stream quality:



✓



X

Camera tilt:



35°

✓



50°

!



70°

X

Lateral light source:



✓



X

Reflecting surfaces:



✓



X

Horizontal turn of camera from face plane:



0°

✓



15°

✓



30°

✓



45°

!



60°

X



90°

X

Black and white image (night mode):



✓



X

Recommended camera settings

Quality: highest.

Bitrate: maximum possible.

Profile: maximum possible.

I-frame interval (GOV): 50.

Stream anti-aliasing: off.

Exposure and brightness: ensuring that the face is clearly seen (if the camera faces the light source, the overexposed background is acceptable).

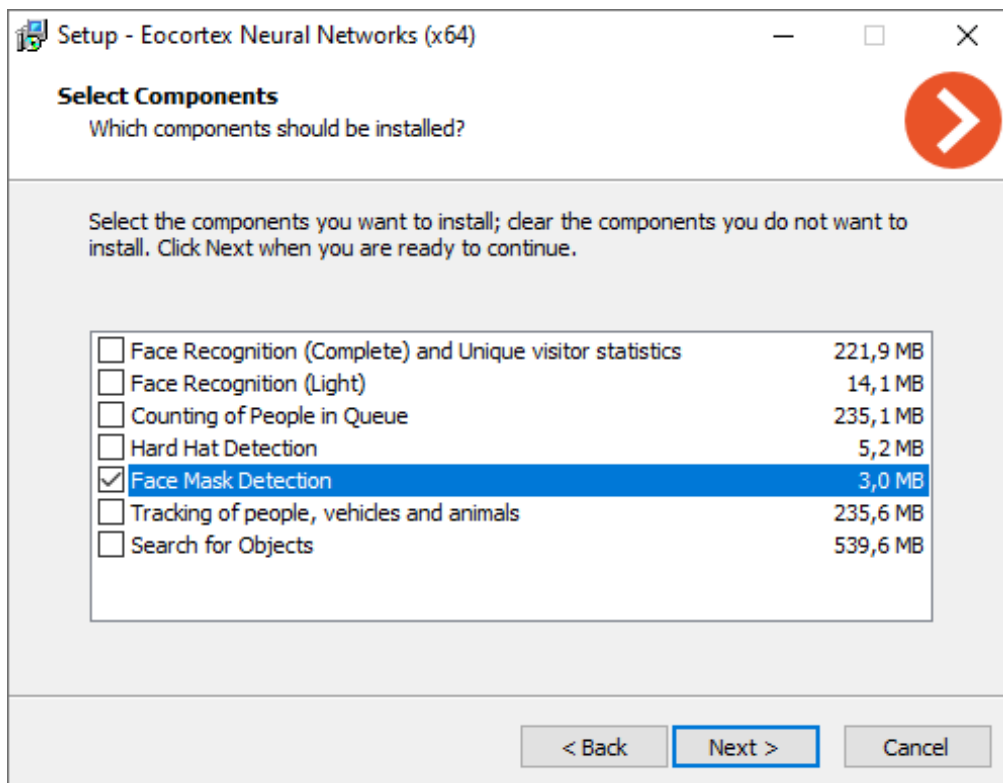
Shutter speed: must not be too low (more than 1/50), because in such a case the blurring of moving objects will occur.

Deployment of the module

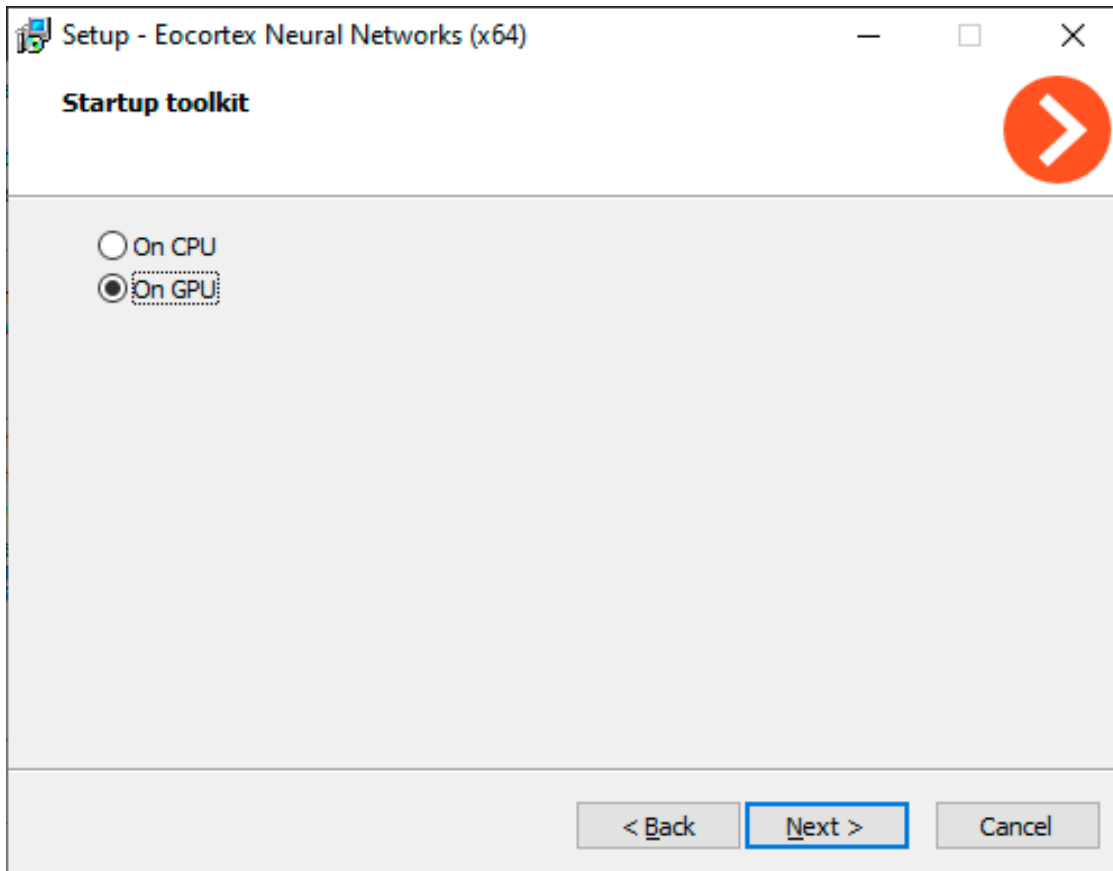
Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.

While installing the package, select the relevant component.



It is recommended to use graphics card (GPU) to run the module.



Sabotage Detection

The **Sabotage Detection** module is designed for detecting the actions deliberately aimed at the disturbance of the normal operation of the CCTV cameras by impairing the image quality or provoking the loss of visual information about the objects under surveillance.

Capabilities of the module




The module allows to detect the following events:

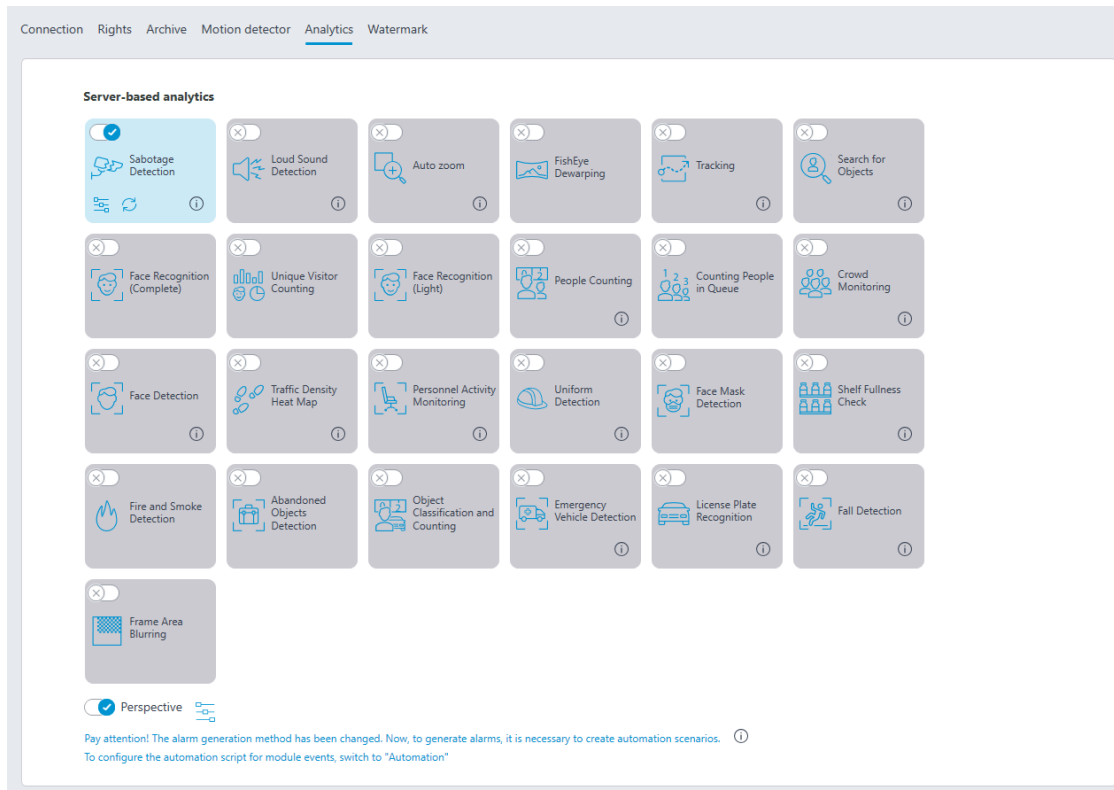
- Camera defocusing.
- Camera turnaway.
- Camera flaring.
- Camera's lens coverage.

Module setup

To use the module, enable and set up the software motion detector, then enable and set up the module itself.

Launch the **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.

Then switch to the **Analytics** tab and enable the module using the  toggle.



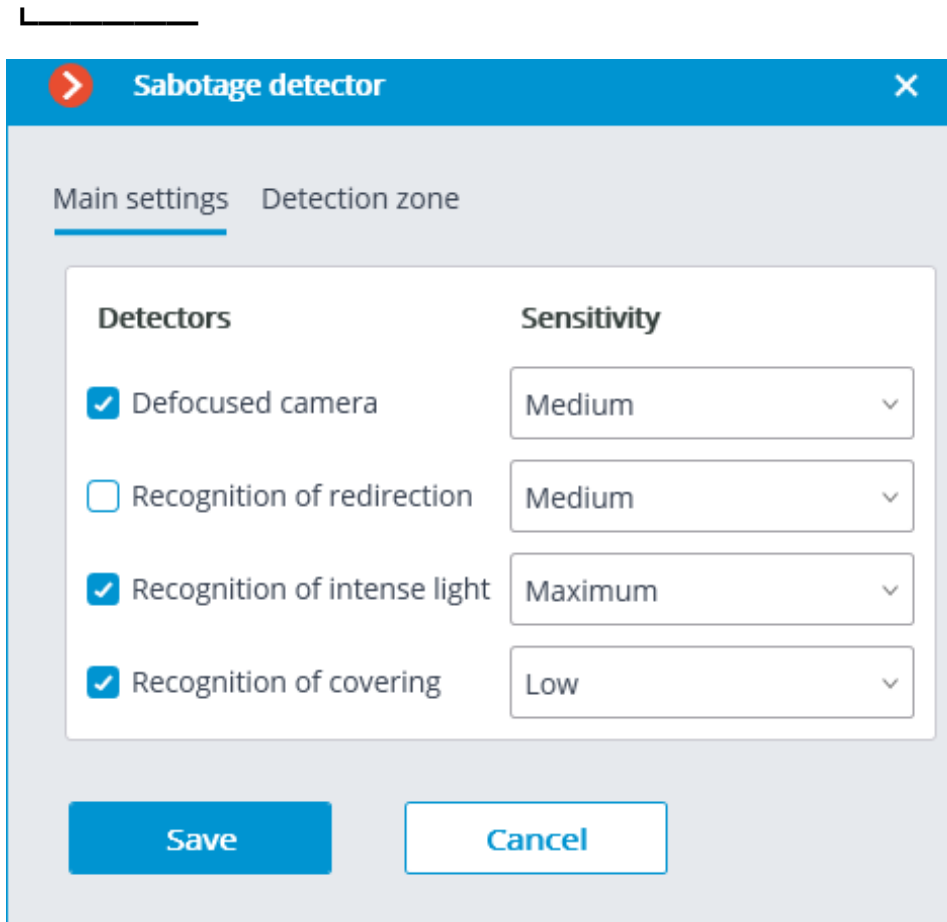
Clicking the  button opens the module setup window.

It is required to make the following settings on the appropriate tabs in the window that opens:

Main settings: enabling detectors and adjusting **Sensitivity** of any of them.

Note

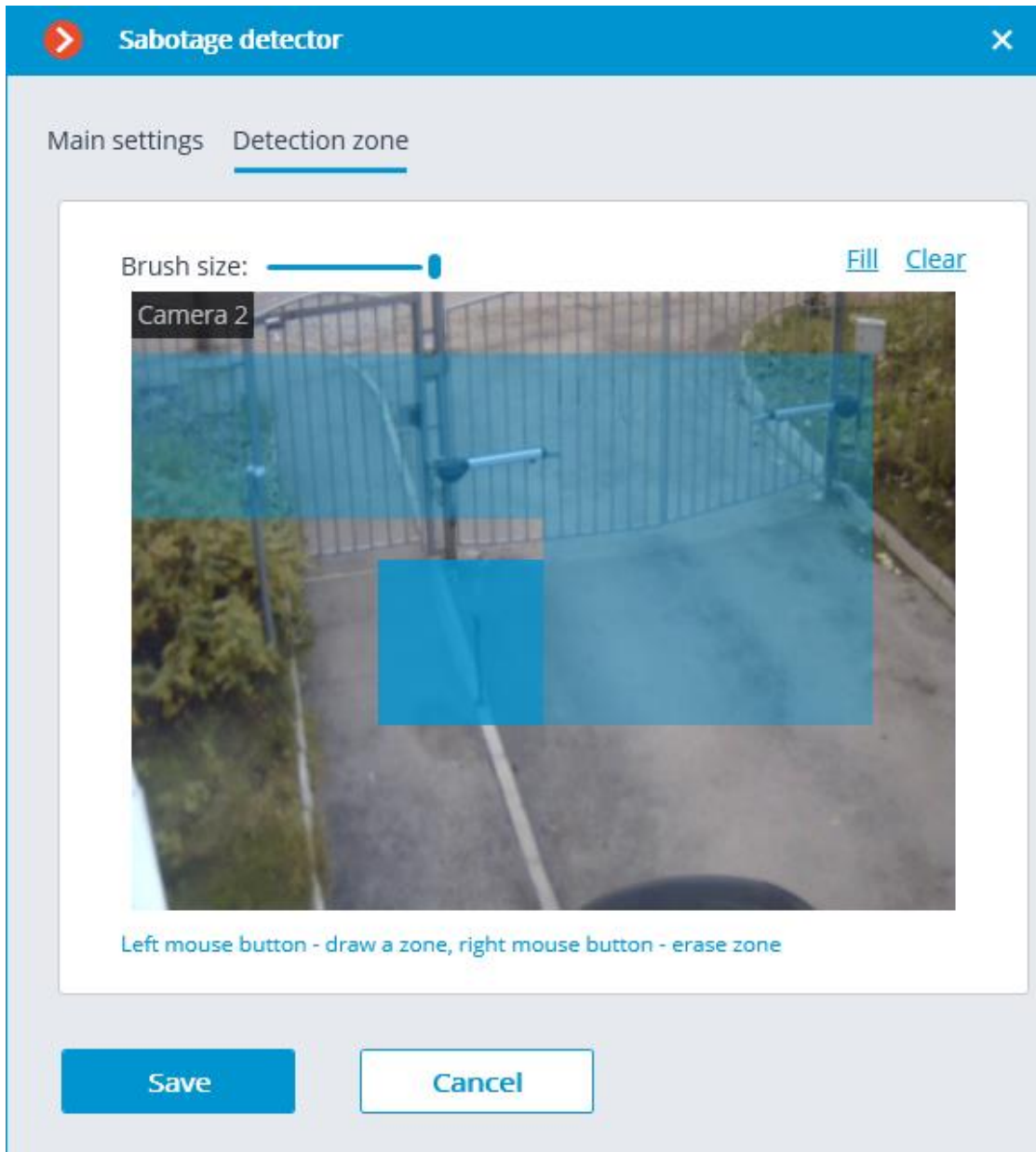
The higher the value of the Sensitivity parameter, the greater the likelihood of detecting a sabotage. If the detector raises false alarms, the value of this parameter needs to be decreased.



Detectors	Sensitivity
<input checked="" type="checkbox"/> Defocused camera	Medium
<input type="checkbox"/> Recognition of redirection	Medium
<input checked="" type="checkbox"/> Recognition of intense light	Maximum
<input checked="" type="checkbox"/> Recognition of covering	Low

Save Cancel

Detection zone is the zone of the frame filled with the semitransparent blue fill in the settings window. The mouse is used for modifying the zone: left mouse button serves for filling the zone, and the right one is used for clearing it. With the help of the **Fill** and **Clear** buttons you can fill or clear the whole area of the frame. The corresponding slider is used to modify the **Brush size**.



Warning

Do not turn on the module on the cameras that are equipped with the automatic focus or focal distance control, and on the PTZ cameras.

Warning

The module will start working only when **the settings are applied**.

Requirements and recommendations

Camera requirements

The video resolution must be at least 0.3 MP; the framerate must be at least 5 frames per second; the image quality must not be reduced significantly by compression, because the high compression rate may negatively affect the work of the defocusing detector.

Aspects of operation

For the detector to trigger, it is required that the changes in the video stream that are indicative of the sabotage of the video surveillance last at least 5 seconds. The detector does not trip in case of brief flashes, darkening, etc. Among other things, this is done to avoid triggering of the detector during the switching of the camera from the day mode to the night mode, because such switching may be accompanied by a significant short-term change of brightness in the frame.

It is allowed to use the detector round-the-clock on the cameras with night mode and on those cameras that switch to such mode. However, the switching to the night mode and back must not take more than 3 – 4 seconds.

The repeated generation of the event cannot happen earlier than in 2 minutes.

After the launch of the module, it is required to wait for 15 seconds for the initial automatic adjustment to be completed.

Aspects of individual detectors

Flaring detector

The camera flaring detector is designed for detecting the attempts of flaring a video camera by directing a bright beam of light (e.g. of a flashlight) at its lens. Normally, a camera tries to compensate for the local flaring by darkening the rest of the image. That leads to the indiscernibility of objects in the whole field of view of the camera. For the detector to trip, the specific brightness and area of the flaring spot are required.

Defocusing detector

This detector is triggered by an attempt to defocus the image.

Overlapping detector

This detector trips when the lens is covered by foreign objects.

The detector triggers with the following area of overlapping:

- 50% of the area of the frame is overlapped by a dark stationary object, or by an object placed very close to the lens;
- 78% of the area of the frame is overlapped by a light moving object, or by an object placed at some distance from the lens.

Forced turning detector

This detector trips when the camera is turned.

It triggers only when the turning angle exceeds 20 degrees and the turning rate is more than 6 degrees per second.

Crowd Monitoring

The **Crowd Monitoring** is intended to count people in crowds and alert the operator in case of the preset limit is exceeded.

Capabilities of the module

- Setting up to six zones in the frame and setting a quantitative criterion for each zone: the maximum acceptable level.
- Counting of the number of people in each zone.
- Alarm generation in case of exceedance of maximum acceptable level in the zone.
- Creation of reports with the number of people in each of the zones.
- Real-time display of the number of people in each zone and the maximum acceptable level.

Note

Estimation of the number of people is performed analytically, with the help of the special algorithms, so the estimated number of people may differ from their actual quantity.

Details

For correct operation of the module, it is imperative to properly place and set up the camera, enable and adjust the software motion detector, perspective, and the module itself.

Module setup


Warning

Before using the module, it is required to **enable and set up the perspective**.

To use the module, enable and configure it.


























Launch the **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.





Then switch to the **Analytics** tab and enable the module using the  toggle.

Connection Rights Archive Motion detector Analytics Watermark


Server-based analytics

 Sabotage Detection	 Loud Sound Detection	 Auto zoom	 FishEye Dewarping	 Tracking	 Search for Objects
 Face Recognition (Complete)	 Unique Visitor Counting	 Face Recognition (Light)	 People Counting	 Counting People in Queue	 Crowd Monitoring
 Face Detection	 Traffic Density Heat Map	 Personnel Activity Monitoring	 Uniform Detection	 Face Mask Detection	 Shelf Fullness Check
 Fire and Smoke Detection	 Abandoned Objects Detection	 Object Classification and Counting	 Emergency Vehicle Detection	 License Plate Recognition	 Fall Detection
 Frame Area Blurring					

Perspective 

Pay attention! The alarm generation method has been changed. Now, to generate alarms, it is necessary to create automation scenarios. 

To configure the automation script for module events, switch to "Automation"

Clicking the  button opens the module setup window.



In the opened window, set and adjust up to six detection zones.

Detection zones are the zones of the frame bounded by a closed polygon. The zone configuration can be changed by dragging the key points at the corners of the polygon. To add a key point, it is required to double-click the left mouse button on the line; to delete — right-click on the key point.

Warning

To avoid counting errors at the zone borders it is recommended, wherever practical, to use the smallest possible number of zones.

It makes sense to use several zones in the following situations:

- If there are an automobile road and a pedestrian zone in the frame. In this case it is required to limit the controlled area to the pedestrian zone.
- If there is a rest area in the frame that is crossed by the pedestrian way with heavy foot traffic. In case it is necessary to prevent people from flocking in the recreational area, the controlled area shall be limited to the rest area.

It is needed to indicate the limit of the number of people for each zone:
Maximum acceptable level.

Warning

The module will start working only when **the settings are applied**.

Requirements and recommendations

When installing the camera, it is recommended to meet the following requirements:

- Heads and shoulders of the people to be counted must be in full view.
- Minimum head size is 1/30 of the largest dimension of the zone. For example, for the 1024x640 zone the size of the head must be no less than $1024/30 = 34$ pixels.

There are no specific requirements regarding the framerate and video stream format.

Personnel activity monitoring


The **Personnel activity monitoring** is designed for monitoring personnel activity at their workplaces. The activity in this context is the movement in the work zone, including minor movements.


Details

For the correct operation of the module, it is required to properly place and set up the camera, enable and adjust the software motion detector and the module itself.

Module setup

To use the module, enable and set up the software motion detector, then enable and set up the module itself.

Launch the **launch the Eocortex Configurator application**, go to the  **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.

Then switch to the **Analytics** tab and enable the module using the  toggle.


Connection Rights Archive Motion detector Analytics Watermark

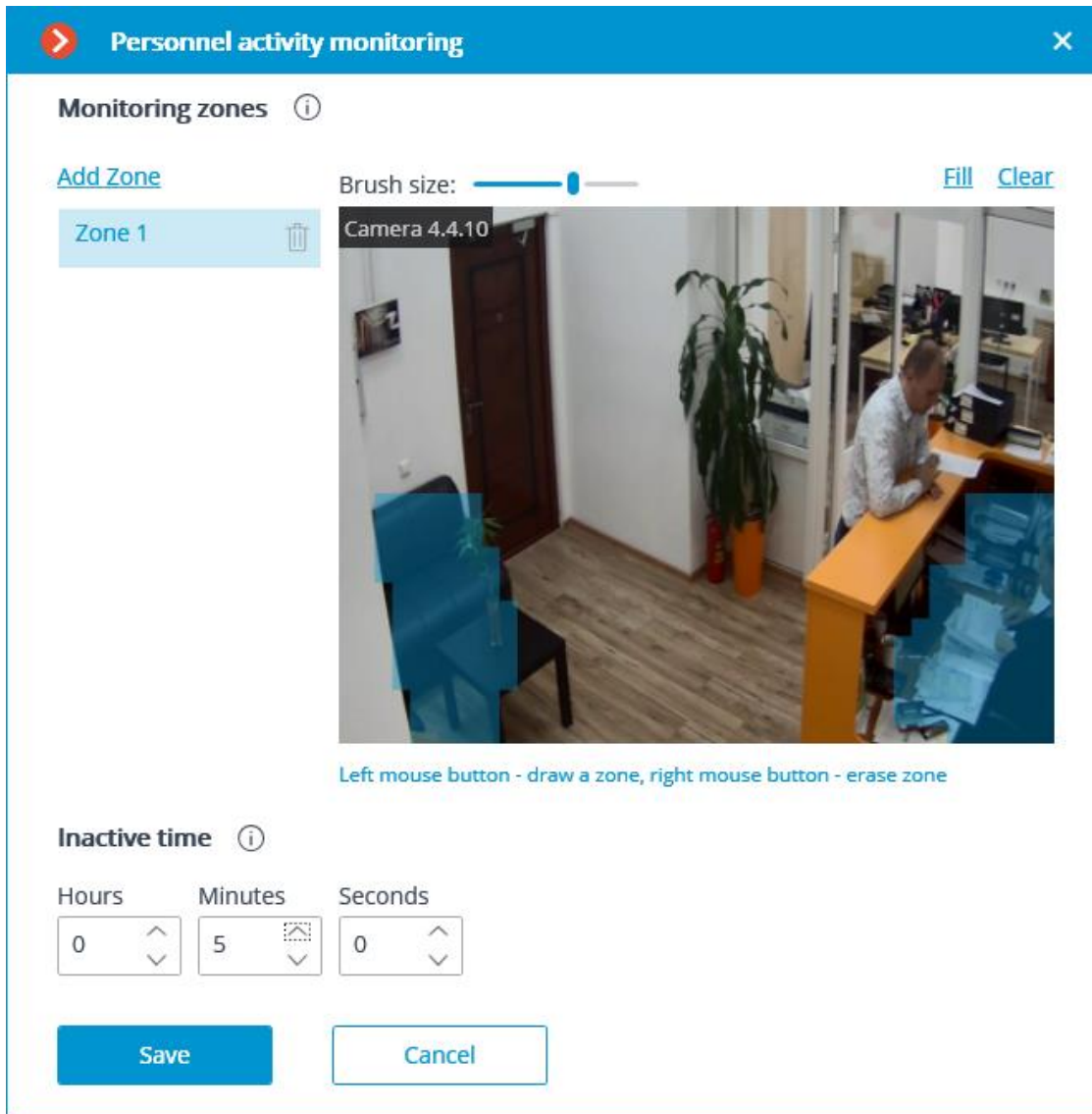
Server-based analytics

Sabotage Detection	Loud Sound Detection	Auto zoom	FishEye Dewarping	Tracking	Search for Objects
Face Recognition (Complete)	Unique Visitor Counting	Face Recognition (Light)	People Counting	Counting People in Queue	Crowd Monitoring
Face Detection	Traffic Density Heat Map	Personnel Activity Monitoring	Uniform Detection	Face Mask Detection	Shelf Fullness Check
Fire and Smoke Detection	Abandoned Objects Detection	Object Classification and Counting	Emergency Vehicle Detection	License Plate Recognition	Fall Detection
Frame Area Blurring					

Perspective

Pay attention! The alarm generation method has been changed. Now, to generate alarms, it is necessary to create automation scenarios. ⓘ
To configure the automation script for module events, switch to "Automation"

Clicking the  button opens the module setup window.



In the opened window it is required to specify up to six detection zones and the inactivity time.

Detection zones are the zones of the frame bounded by a closed polygon. The zone configuration can be changed by dragging the key points at the corners of the polygon. To add a key point, it is required to double-click the left mouse button on the line; to delete — right-click on the key point.

Zone setup requirements:

- The zones must not overlap;
- Only one employee must be present in the zone;
- The small movements of the personnel must be taken into consideration in the zone, such as sitting back, rolling back on the chair etc.;
- The zone must not contain any moving objects not depending on the activity of the personnel: fans, water tanks, moving parts of the equipment etc.;

- No computer displays, instrument panels, clock faces etc. shall be present in the zone.

Inactive time is the time interval upon the expiry of which the Inactive zone event will be generated in case of the absence of activity in the zone. The specified value is extended to all of the zones.

┌

Note

The inactivity in the zone does not mean that no employee is present: for example, a person may stay motionless or be asleep. The presence of the activity in the zone, in its turn, does not necessarily mean that the employee is in his or her workplace – it may be caused by the presence of other persons in the given zone.

┌

┌

Warning

The module will start working only when **the settings are applied**.

┌

Requirements and recommendations

The camera must be fixed. It is preferable to mount the camera on the ceiling facing vertically down in order to isolate the workplace of each employee.

Uniform Detection

The **Uniform Detection** is designed to detect people both in workwear and without it. In live view, such people will be highlighted on the screen with a colored frame, and the incidents will be recorded in the event log.

┌

Note

The alarm event is the event of the absence of workwear, a common one is the presence of workwear. Depending on the event, the detection frame and the corresponding text will be highlighted in red or green.

┌

The main use case for this module is to monitor compliance with occupational safety rules at manufacturing and construction sites.

Capabilities of the module

Depending on the corresponding settings, the module can determine **Presence, Absence** or both values of the following parameters:

- Hard hat;
- Safety vest;

- Uniform.

If the **Uniform** parameter is selected, it is necessary to set a **color** for it.

Details

For the proper functioning of the module it is required to place the camera correctly and to set up the software motion detector and the module itself.

Warning

It is required to **install the Eocortex Neural Networks package** before using the module.

Warning

Starting with version 3.5 of **Eocortex**, the **Tracking, Search for Objects** and **Uniform Detection** modules running on the same camera share the processor and video card resources. This reduces the load on the server.

For the most efficient sharing of resources, it is recommended to set the same operating mode for the camera in the settings of these modules: either using a video card or without using a video card.

Module setup

Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.

To use the module, enable and set up the software motion detector, then enable and set up the module itself.

Launch the **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.




Then switch to the **Analytics** tab and enable the module using the  toggle.

Connection Rights Archive Motion detector Analytics Watermark


Server-based analytics

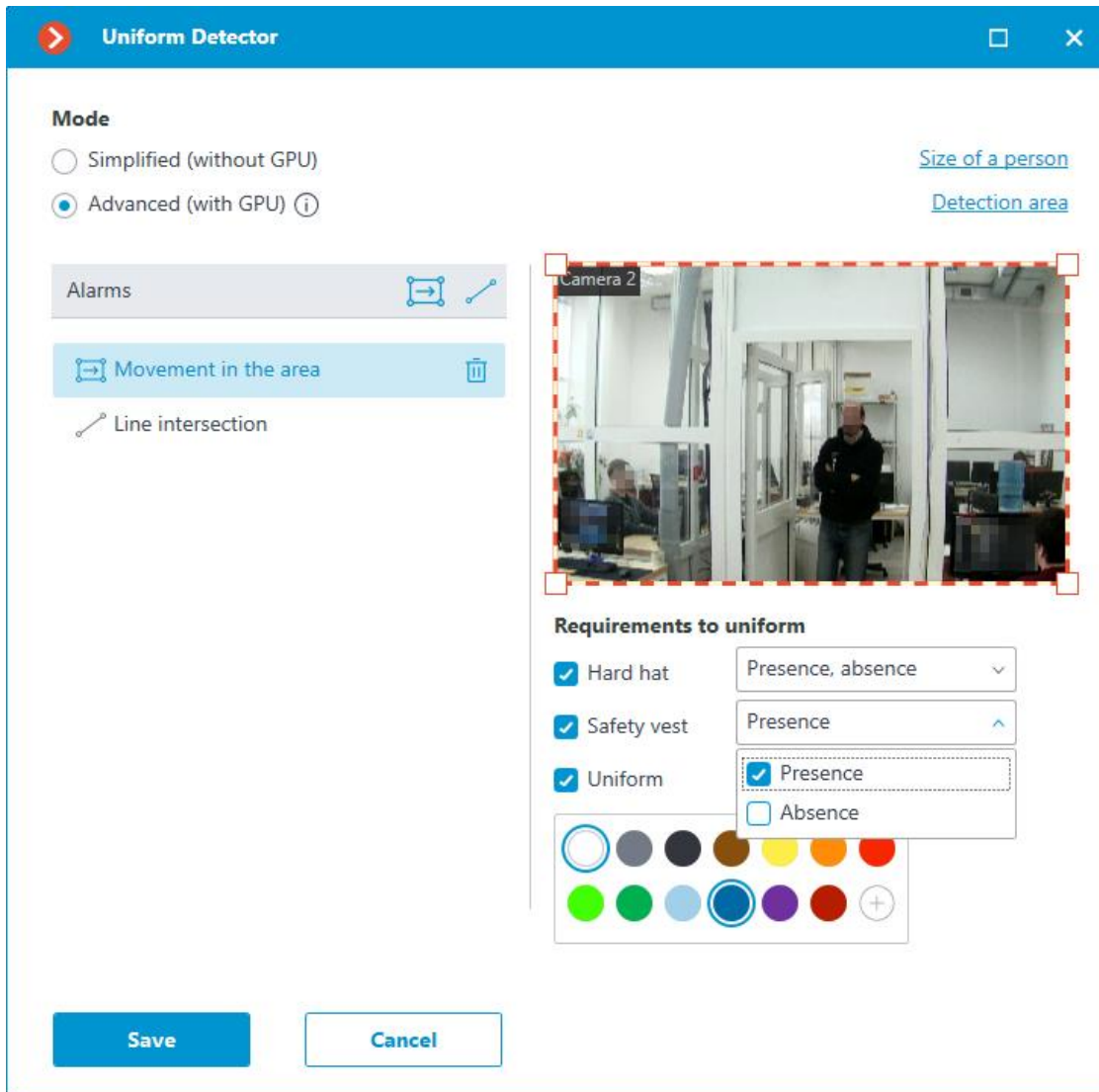
<input type="checkbox"/> Sabotage Detection	<input type="checkbox"/> Loud Sound Detection	<input type="checkbox"/> Auto zoom	<input type="checkbox"/> FishEye Dewarping	<input type="checkbox"/> Tracking	<input type="checkbox"/> Search for Objects
<input type="checkbox"/> Face Recognition (Complete)	<input type="checkbox"/> Unique Visitor Counting	<input type="checkbox"/> Face Recognition (Light)	<input type="checkbox"/> People Counting	<input type="checkbox"/> Counting People in Queue	<input type="checkbox"/> Crowd Monitoring
<input type="checkbox"/> Face Detection	<input type="checkbox"/> Traffic Density Heat Map	<input type="checkbox"/> Personnel Activity Monitoring	<input checked="" type="checkbox"/> Uniform Detection	<input type="checkbox"/> Face Mask Detection	<input type="checkbox"/> Shelf Fullness Check
<input type="checkbox"/> Fire and Smoke Detection	<input type="checkbox"/> Abandoned Objects Detection	<input type="checkbox"/> Object Classification and Counting	<input type="checkbox"/> Emergency Vehicle Detection	<input type="checkbox"/> License Plate Recognition	<input type="checkbox"/> Fall Detection
<input type="checkbox"/> Frame Area Blurring					

Perspective

Pay attention! The alarm generation method has been changed. Now, to generate alarms, it is necessary to create automation scenarios. 

To configure the automation script for module events, switch to "Automation"



Clicking the  button opens the module setup window.




Two operating modes are available in the window that opens:

- **Simplified (without GPU);**
- **Advanced (with GPU):** More precise neural network object detector. Video card required.

In the **Alarms** group of settings, situations are set when the alarms will be generated:

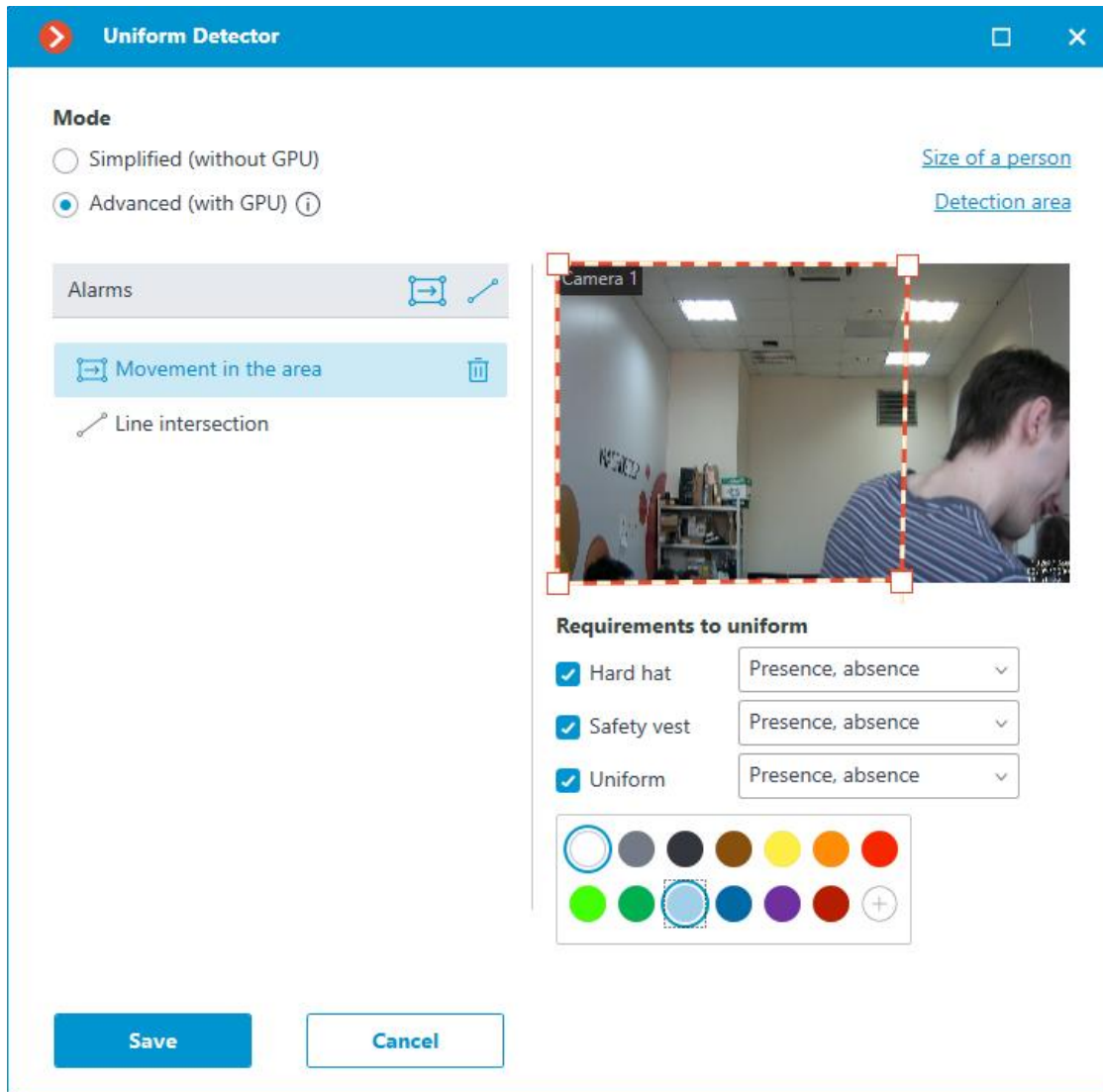
-  upon detection of movement in the zone;
-  when the preset line has been crossed.

Movement in the area

To set the zone, it is required to press the button . A square zone will appear in the preview window.

The zone configuration can be changed by dragging the key points at the corners of the polygon. To add a key point, it is required to double-click the left mouse button on the line; to delete — right-click on the key point.


An alarm will be generated when a person enters the zone without uniform, or in the uniform that does not meet the specified parameters.



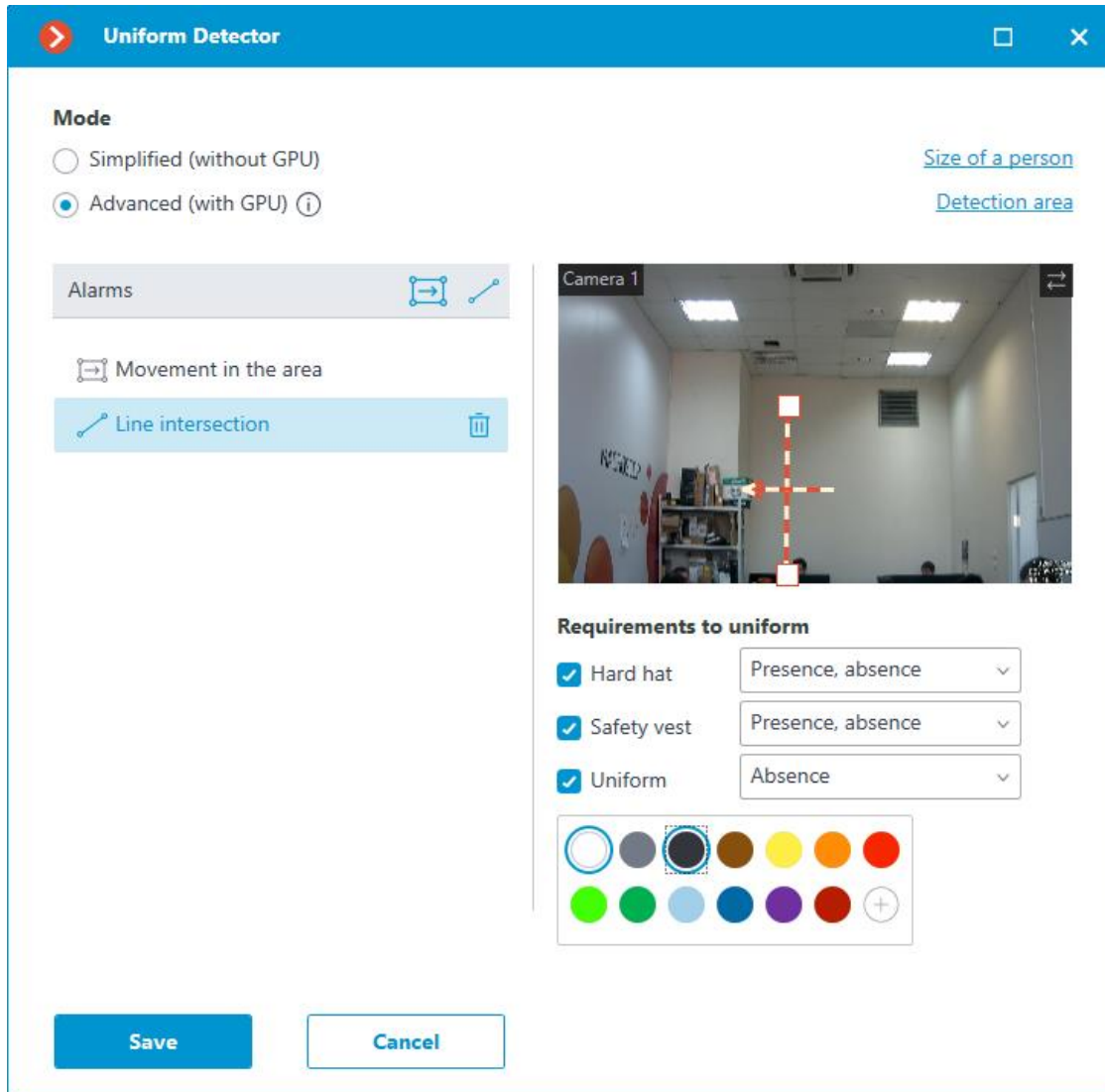
Line intersection

To set the line, press the button . The line will appear in the preview window.

The position of the line can be modified by dragging the key points at its ends.

To indicate the direction of triggering, it is required to click the button  located in the upper right corner of the preview window. If only one direction is selected, an arrow will appear indicating the direction set.


An alarm will be generated when a person without a uniform crosses the line, or when their uniform does not meet the specified parameters. If the direction has been specified, the alarm will be generated only when a person crosses the line in the specified direction.



It is possible to set specific requirements to workwear below the preview window. The following options can be set to **Presence**, **Absence** or both:

- Hard hat;
- Safety vest;
- Uniform.

When selecting **Uniform**, it is possible to choose from 1 to 3 colors that will be considered as workwear colors.

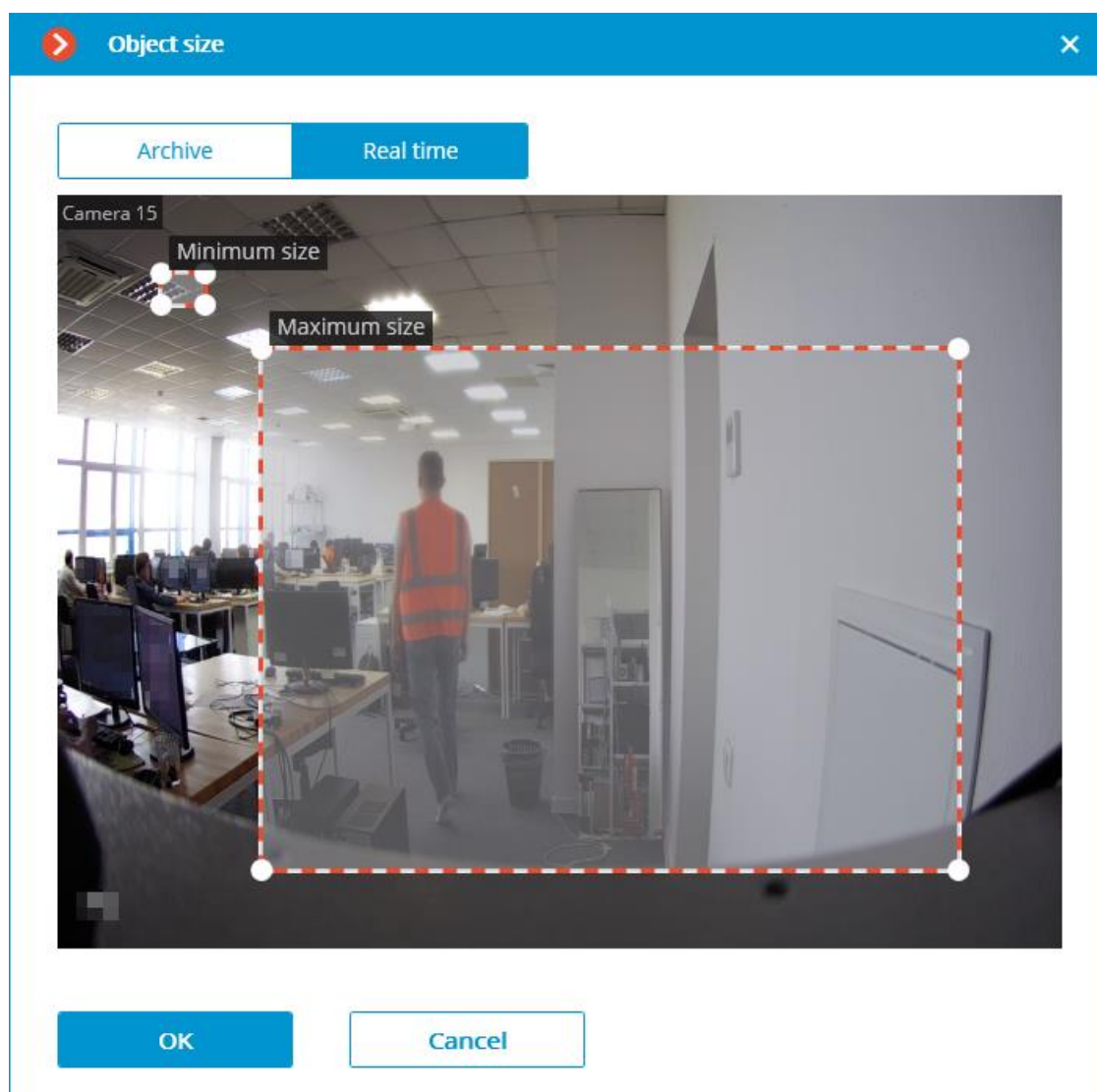
If the desired color is not in the palette, it is possible to add it by opening the color selection window using the button .

Warning

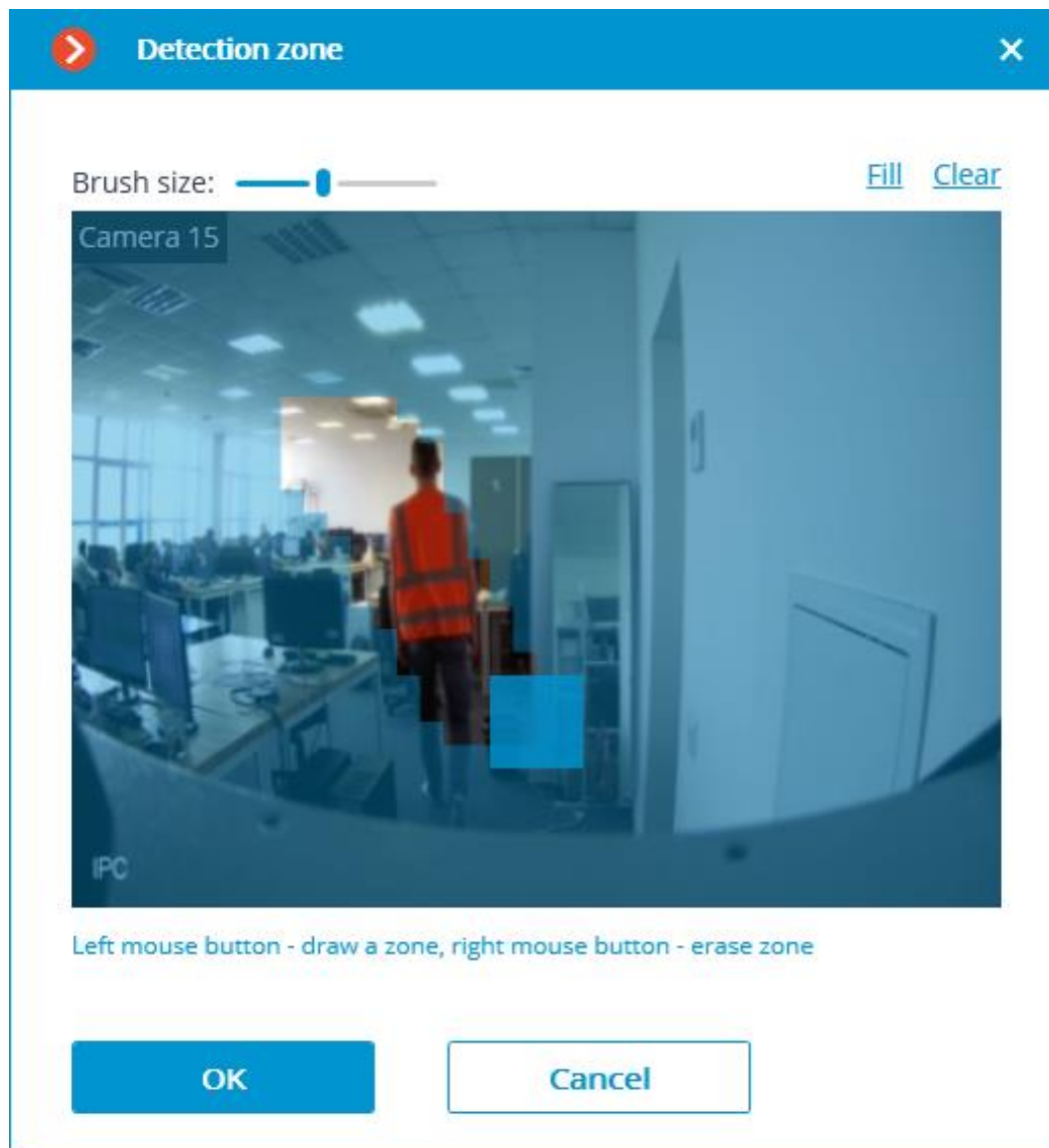
For a more accurate color definition, a slightly darkened shade of colors as compared with those recognized by the human eye when seeing clothes in real life should be set. In this case, possible shadows on the clothes will be compensated.

Also, when adjusting the color, it is required to take into account that when comparing colors, the module tries to compensate for possible changes in the brightness of the illumination. This affects the search for shades of gray to the greatest extent. For example, when 50% gray is selected in the settings, both white and dark gray clothes may appear as matching under certain lighting conditions.

On the **Size of a person** tab, it is possible to set the minimum and maximum sizes of people to be detected.



Detection zone is the zone of the frame filled with the semitransparent blue fill in the settings window. The mouse is used for modifying the zone: left mouse button serves for filling the zone, and the right one is used for clearing it. With the help of the **Fill** and **Clear** buttons you can fill or clear the whole area of the frame. The corresponding slider is used to modify the **Brush size**.



Warning

The module will start working only when **the settings are applied**.

Requirements and recommendations

Hardware and software

Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.

Warning

The neural network works with the 64-bit version of **Eocortex** only.

Warning

When upgrading **Eocortex** to another version, it is necessary to also upgrade the **install the Eocortex Neural Networks package** package to the corresponding version.

The following is required for the **Advanced (with GPU)** mode:

- A processor that supports AVX instructions;
- An **NVIDIA** video card (GPU) with the computation capacity index of at least 6.5 and with at least 4 Gb of memory; the parameters and performance of the video card must be similar or better than those of **NVIDIA GTX 1650 Super** model;
- Version of the video card driver at least 460;
- Swap file at least half of the total RAM size.

If the package will be installed on a virtual machine, it may additionally be required to:

- Enable support for AVX instructions in the guest machine settings;
- Use GRID drivers for GPU virtualization.

Warning

When using a video card, the stable operation of the module is guaranteed on operating systems Windows 10, Windows Server 2016, Ubuntu 20.04, as well as on the newer versions of these operating systems.

Warning

On other operating systems (Windows versions 7 and 8, Windows Server versions 2008 and 2012, CentOS, Debian), issues may arise when trying to use NVIDIA graphics cards. On Windows 8, this is due to the cessation of support for NVIDIA graphics card drivers. On CentOS and Debian, the problem is due to the high complexity of installing workable versions of video card drivers.

Video stream

- Frame frequency: no lower than 10 frames per second;
- Image resolution: no lower than HD (1280x720).

Image

- Lighting in the frame should be uniform and constant.
- If the camera is installed in front of a bright light source (the sun behind the entrance door, etc.), it is necessary to adjust the exposure (or brightness) so that the objects in the frame have a natural color (not overexposed or too dark). In this case, an overexposed background is acceptable.
- The image must be in color.
- Image quality should be at least average. There should be no significant compression artifacts.
- White balance must be adjusted correctly.
- People to be detected must be visible in the frame while standing, full-length, not overlapped by other objects.
- The exposure and contrast must be adjusted on the camera in such a way that the color of the uniform could be unambiguously recognized by the human eye.
- People must not be overexposed.

Scene and camera position

- In the **Simplified (without GPU)** mode, the people to be detected must be visible full-length, not overlapped by other objects.
- In **Advanced (with GPU)**, people may be overlapped by half; however, it may reduce the accuracy of the module.
- Objects less than 40 pixels high are not detected. It is recommended to detect objects that are at least 80 pixels high.
- Strong lateral illumination (e.g., sunlight from a window) is unacceptable as it will overexpose parts of clothing.
- A scene that is too dark is unacceptable, since in this case the color of the clothes will always be close to black.
- The frame must not contain reflective surfaces: glass, mirrors, etc.

- It is permitted to place the camera overhead. In this case, the angle of inclination of the camera in relation to the horizontal must not exceed 35°.

Detection

It is advisable to use one-color uniform.

Uniform (workwear) color detection ensures around 90% accuracy on bright, distinctive colors. The accuracy drops when attempting to detect dark and gray colors. For example, dark blue uniform may appear dark green as well. Clothes in gray shades can also be confused with other shades. Issues can be caused by various non-single-colored clothes, whose color is not always distinguishable, and, as a result, tends to appear darker. The accuracy of defining colors under these conditions, when the color of clothes is not bright, is about 75%.

When detecting hard hats, it is required that the person's head is always above their shoulders in a normal position, with minimal inclinations.

Examples

Below are the examples of angles and shapes of people whose workwear is to be detected.

Correct



Incorrect



Correct

Incorrect



Correct



Incorrect



Deployment of the module

Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.

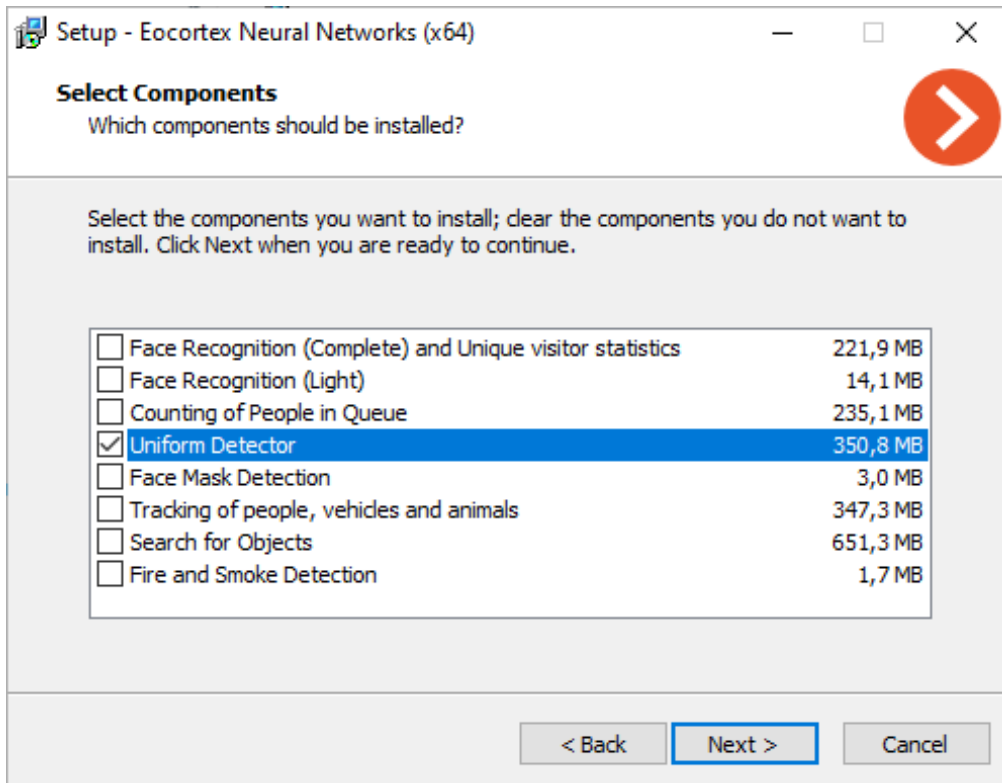
Warning

The neural network works with the 64-bit version of **Eocortex** only.

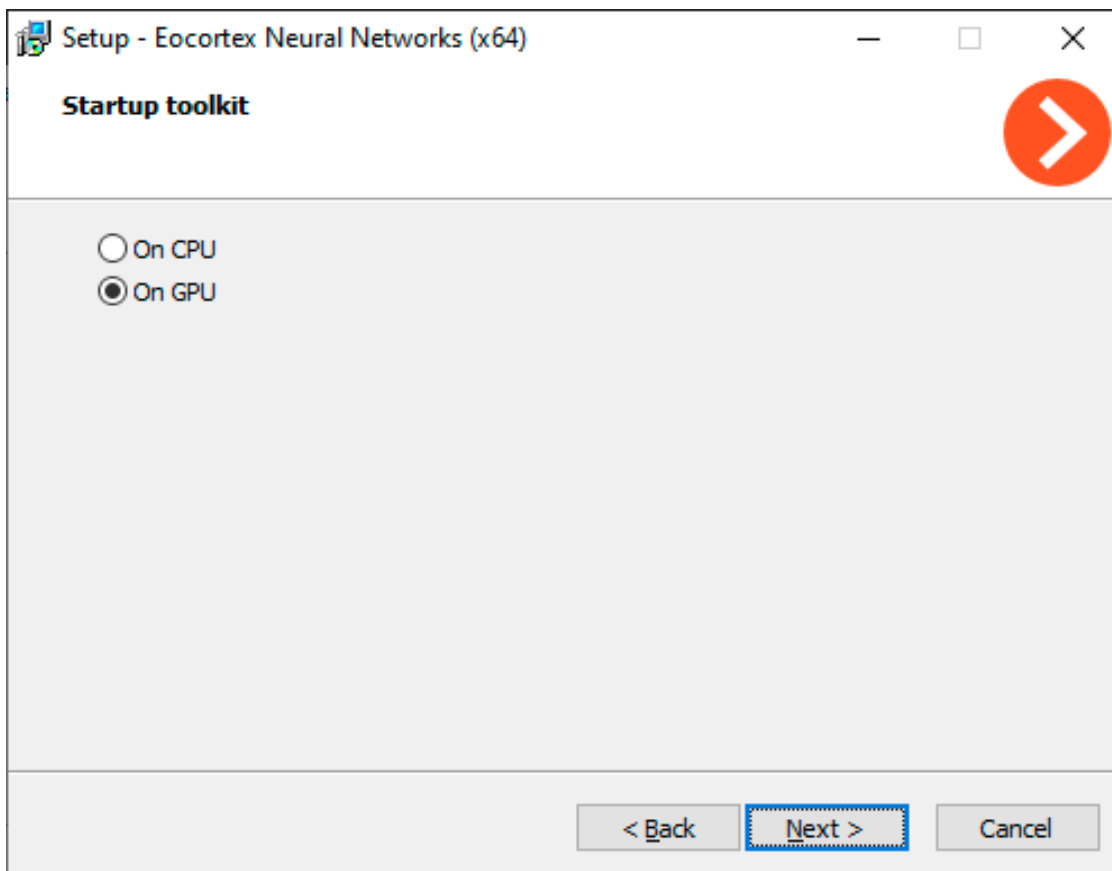
Warning

When upgrading **Eocortex** to another version, it is necessary to also upgrade the **install the Eocortex Neural Networks package** package to the corresponding version.

When installing the **Eocortex Neural Networks** package, it is required to select the appropriate component:



It is recommended to use video cards (GPUs) for the module to operate most efficiently.



Shelf Fullness Check

The **Shelf Fullness Check** module is designed for monitor the fullness of shelves in a store in order to fill them with merchandize in time.


Details

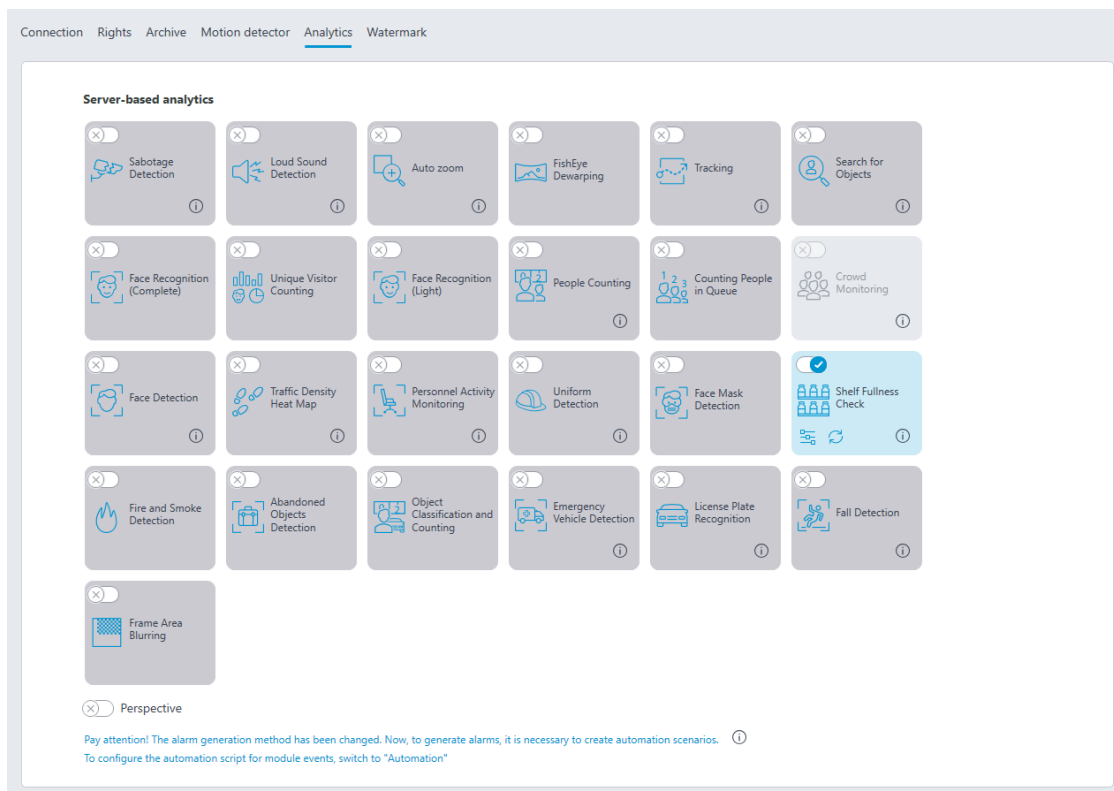
For the correct operation of the module, it is required to properly place and set up the camera, enable and adjust the software motion detector and the module itself.


Module setup

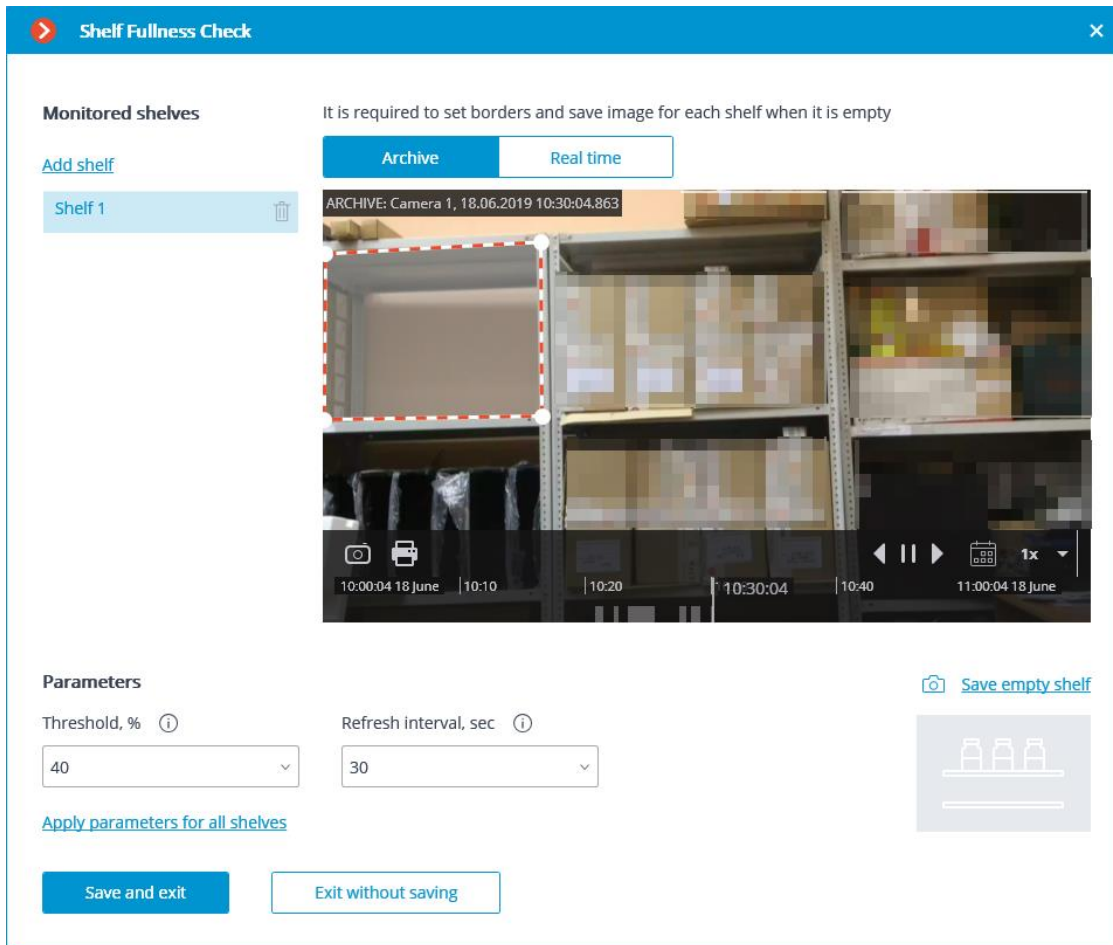
To use the module, enable and set up the software motion detector, then enable and set up the module itself.

Launch the **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.

Then switch to the **Analytics** tab and enable the module using the  toggle.



Clicking the  button opens the module setup window.



The following controls are located in the opened window:

The cell that transmits the video from the camera both in real time and from the archive. The shelf outlines are displayed in the cell. The list of the shelves being monitored is located to the left of the cell.

Warning

You can specify up to 10 shelves for one camera.

Warning

The outline of the shelf must be set in such a way as to fully enframe the zone to be monitored.

Warning



The parameters chosen for the selected shelf are shown in the lower part of the window:

- **Threshold, %:** Shelf fullness percentage below which an alarm will be generated.
- **Refresh interval, sec:** Shelf condition refresh interval. When this value is smaller, the empty shelf will be detected earlier, but the processor load is larger.

Apply parameters for all shelves: Applies the selected parameters for all shelves.

Save empty shelf: An image of empty shelf.

Warning

It is obligatory to save the image of an empty shelf for all the shelves being monitored.

Warning

The module will start working only when **the settings are applied**.

Requirements and recommendations

Warning

Only up to 10 shelves can be set up for a single camera.

Warning

The update of the values is made only within the intervals when there has been no motion within the shelf's boundaries for three seconds.

Video stream

- The recommended optimal resolution of the image for the module to work: HD or FullHD.
- The image must be in color.
- The frame rate of the stream must be no lower than 1 frame per second.
- If different video streams from a camera are used for analysis and display in the Client Application, the aspect ratio of the streams must match.

Lighting and image quality

- The image must be of moderate contrast. The details of the objects must be clearly distinguishable in the image.
- The quality of the image must be moderate to high, without significant compression artefacts. Sample image with compression artifacts:



- Glare and flare should be avoided in the shelf area, as they can obscure small details of the image.

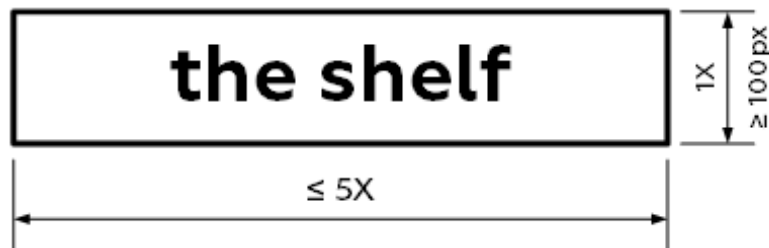
- Lighting conditions and image parameters must remain constant. Flickering of lighting, as well as changes in color reproduction and differences in brightness and contrast over time, should be avoided.
- It is recommended to disable automatic white balance and auto exposure in the camera settings.

Scene and camera position

- The camera angle should be set in such a way that individual goods or packages of goods are clearly visible on the filled shelf. In particular, the shelf must not be at an excessively sharp angle to the camera. The image below shows examples of camera angles in relation to the shelf (highlighted in blue): both good (2, 3, 4) and bad (1).



- The shelf area must not be too stretched. The maximum acceptable height to length ratio is 1/5.
- The shelf image resolution in the smallest measurement must be at



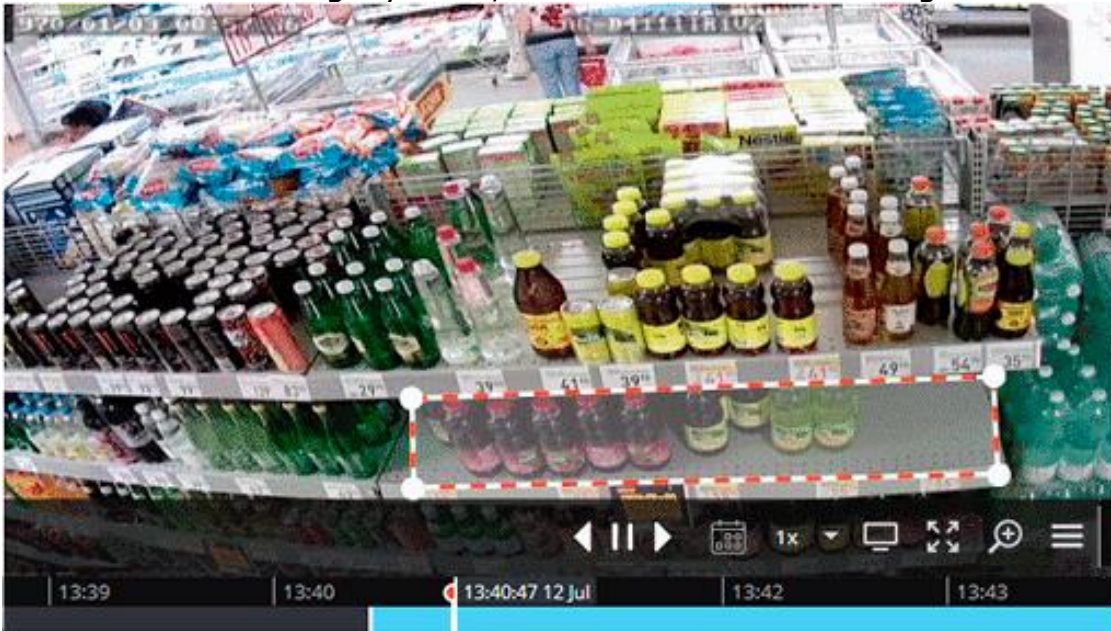
least 100 pixels.

- The color and texture of the goods on the shelf must be visually different from those of the shelf itself. For example, it is not recommended to put goods in blue packaging on a blue shelf.
- To ensure maximum accuracy, the perspective distortion must be kept to the minimum. In particular, the shelf area must not be affected by distortion from the FishEye lens.

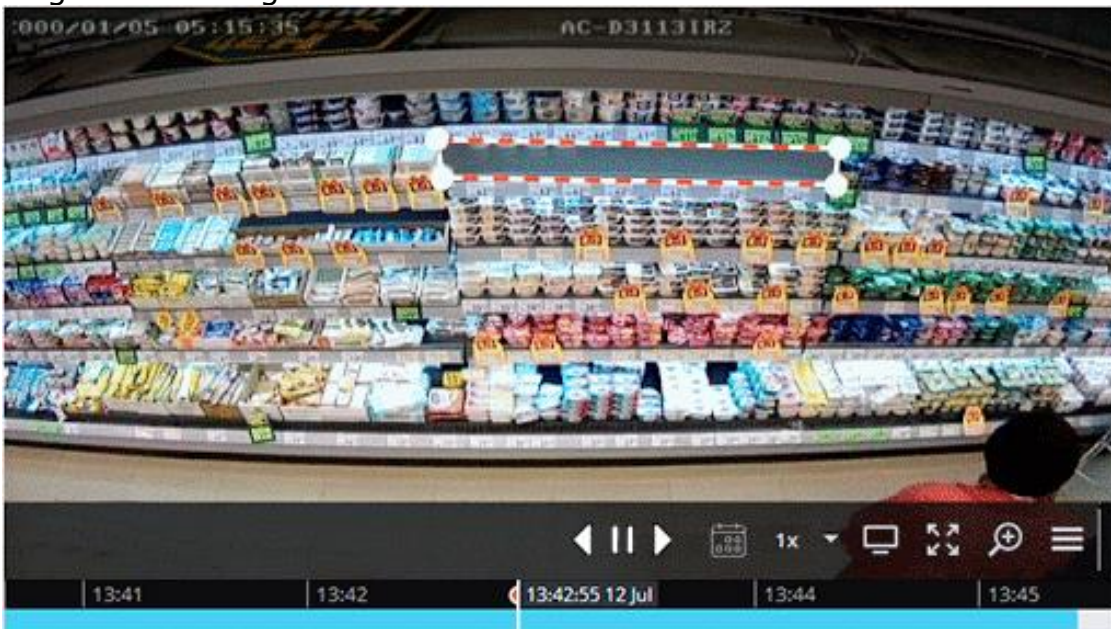
- The shelf on the camera image must remain strictly in the part of the frame where the model image of an empty shelf was set for it in the module settings. This means that the camera must be rigidly fixed, and even a slight shift in the camera's field of view is not allowed. The shelf must not physically change its position in space either.
- Shadows should be avoided in the shelf area.

Sample images with violated requirements

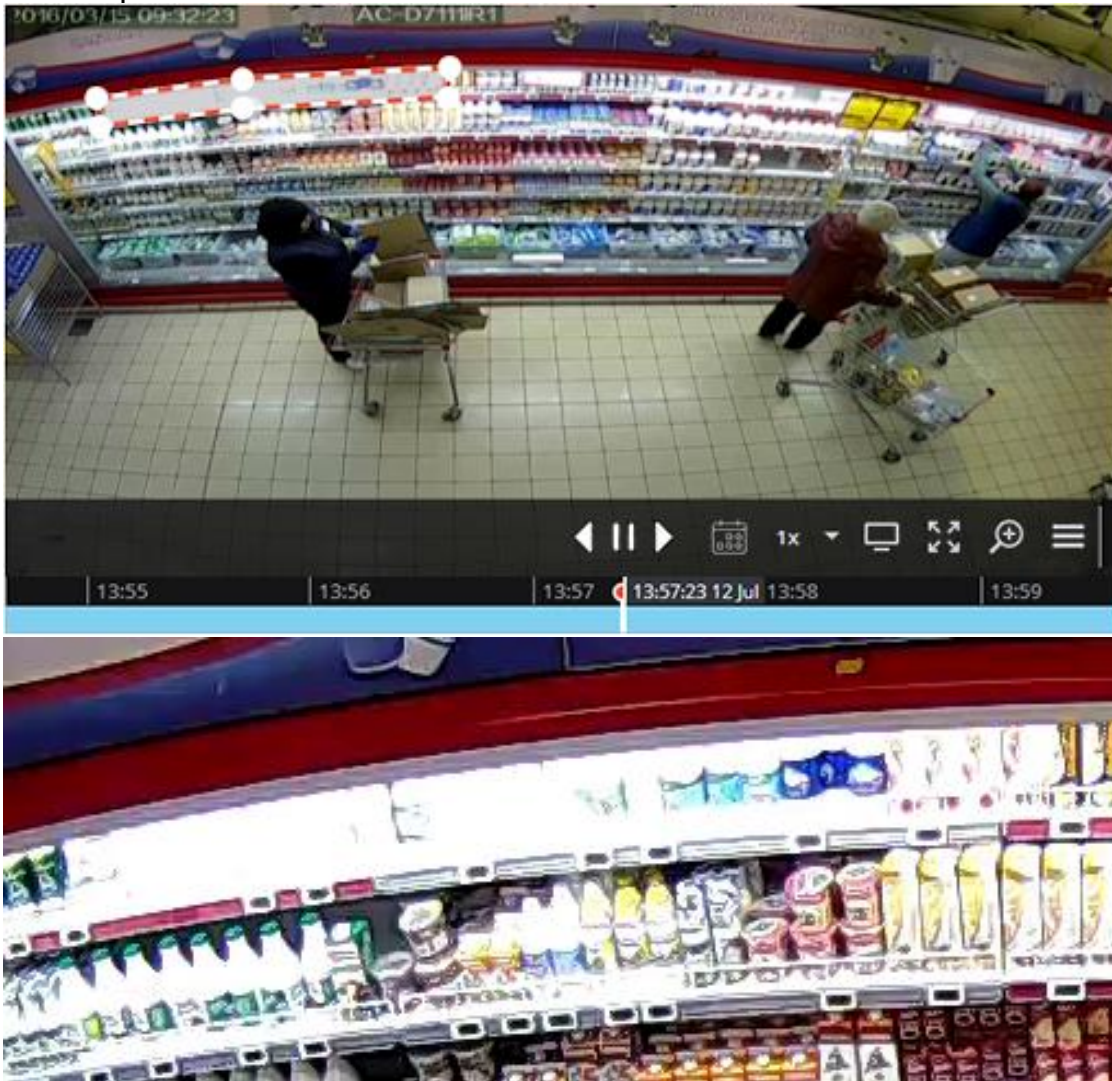
- The camera is not rigidly fixed, the field of view is shifting:



- Brightness changes in the shelf area:



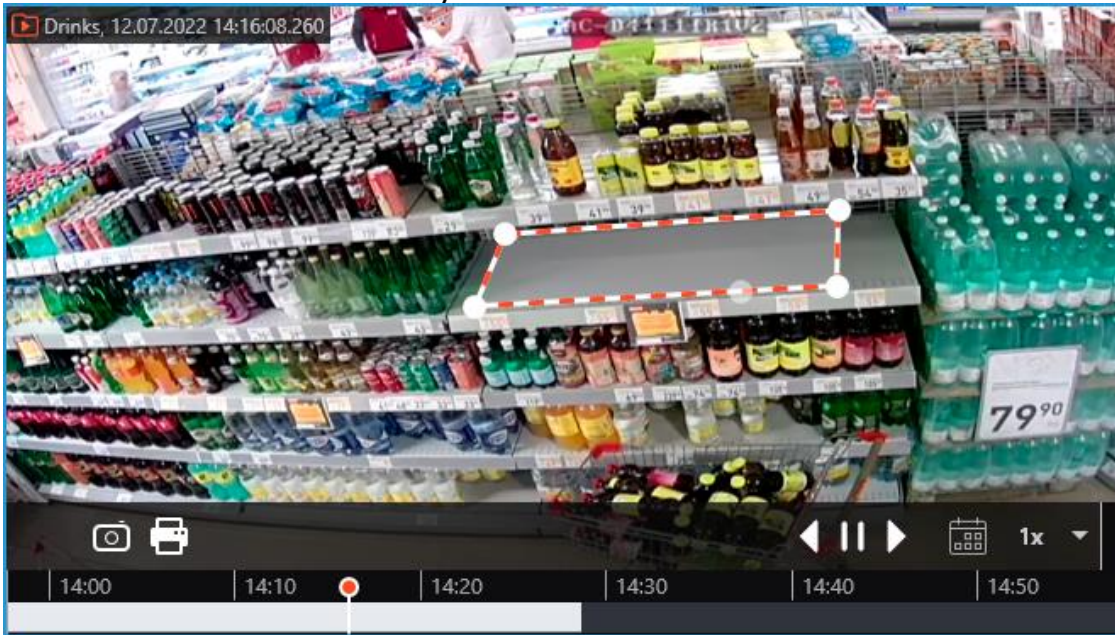
- Overexposure of the shelf area:



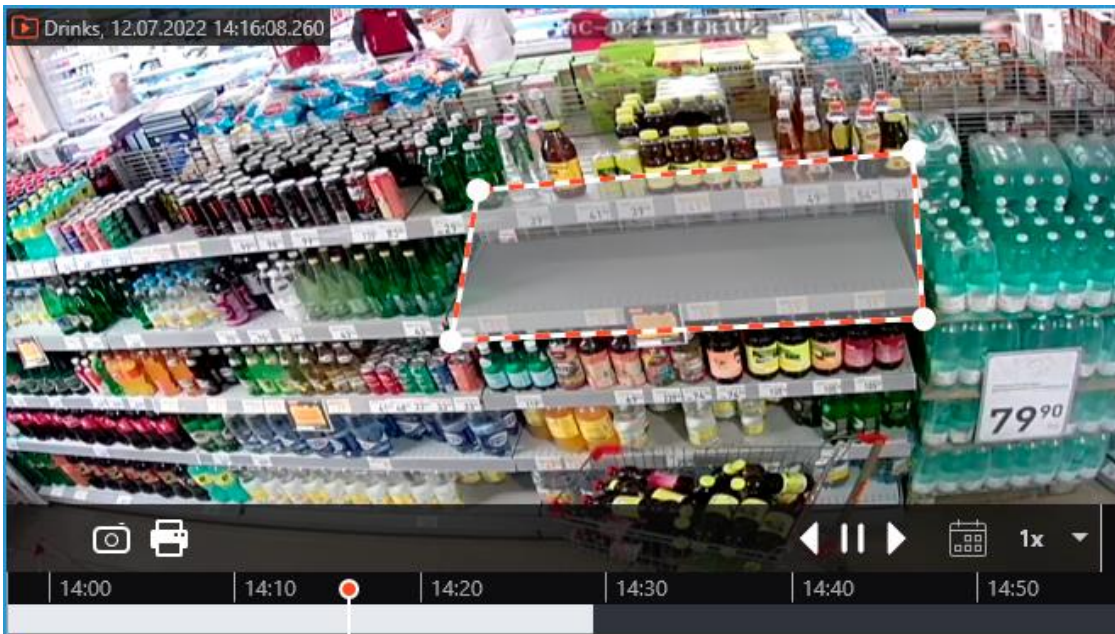
Examples for setting up the contours of the shelves

For the correct work of the module, it is necessary to set the contours of shelves in the module settings. It is important to set the boundaries of each contour so that they cover the area filled with goods as accurately as possible.

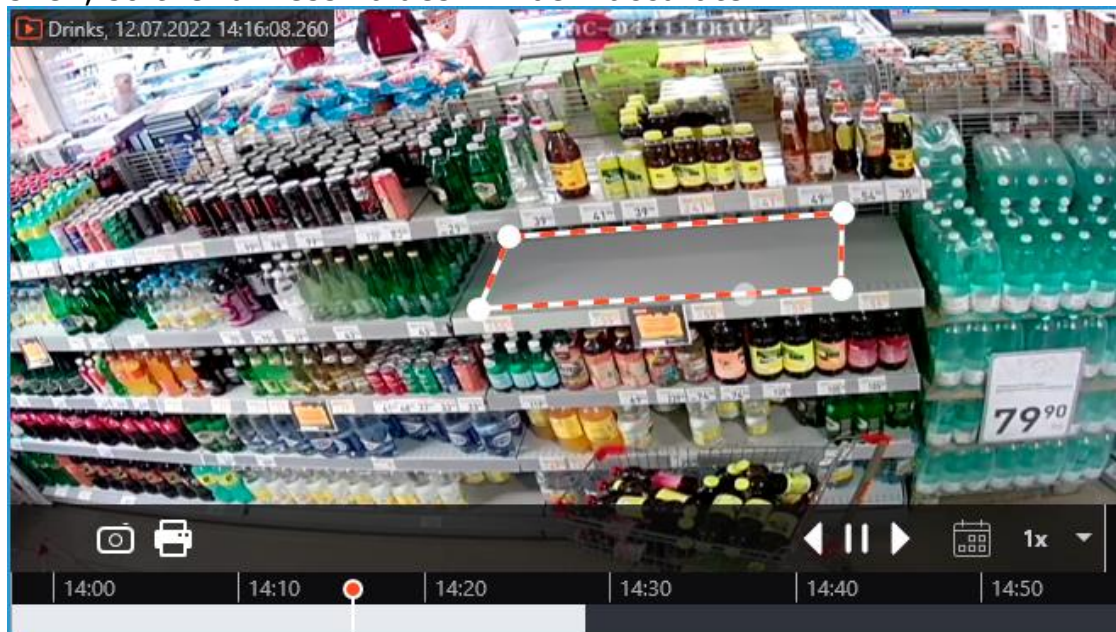
- Boundaries are set correctly:



- Incorrect setting of boundaries – the contour captures excessive areas, so the fullness values will be underestimated:



- Incorrect setting of boundaries – the contour does not cover the entire shelf, so the fullness values will be inaccurate:



Performance

- Since the central processor load becomes higher when the video resolution is increased, it is not recommended to use video with the resolution higher than FullHD.
- Shelf images with a long side of more than 300 pixels will be additionally scaled during the processing. The longest time to process will take a square shelf with high original image resolution.
- During shelf occupancy measurements, peak CPU load spikes may occur. To reduce the overall load on the server, it is recommended to increase the shelf status update intervals, which are set to 30 seconds by default, if possible.

Face detection

The **Face detection** module finds faces in the frame allowing to watch them in the **Eocortex Client** application both in real time and in the archive. It is possible to set the scenarios to be performed by the events of face detection, as well as save the frames with the detected faces to disc or send them by email.


Details

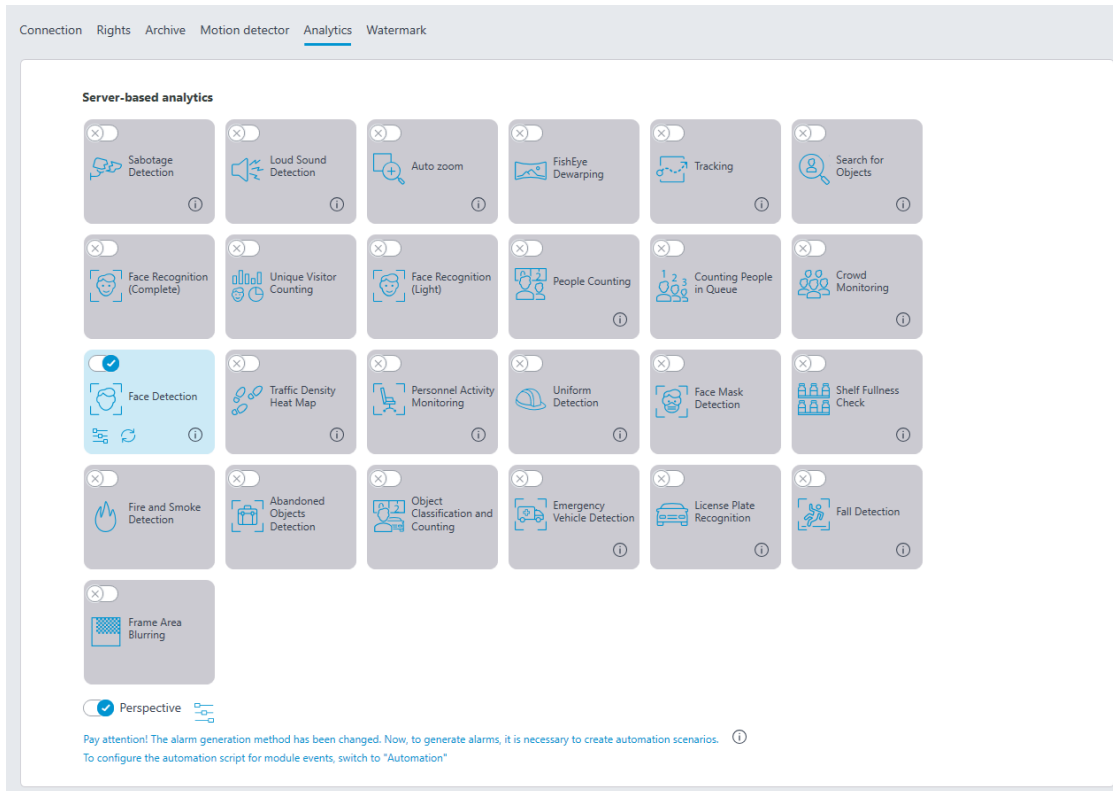
For the correct operation of the module it is required to set up the software motion detector. There are no specific requirements to the image.

Module setup

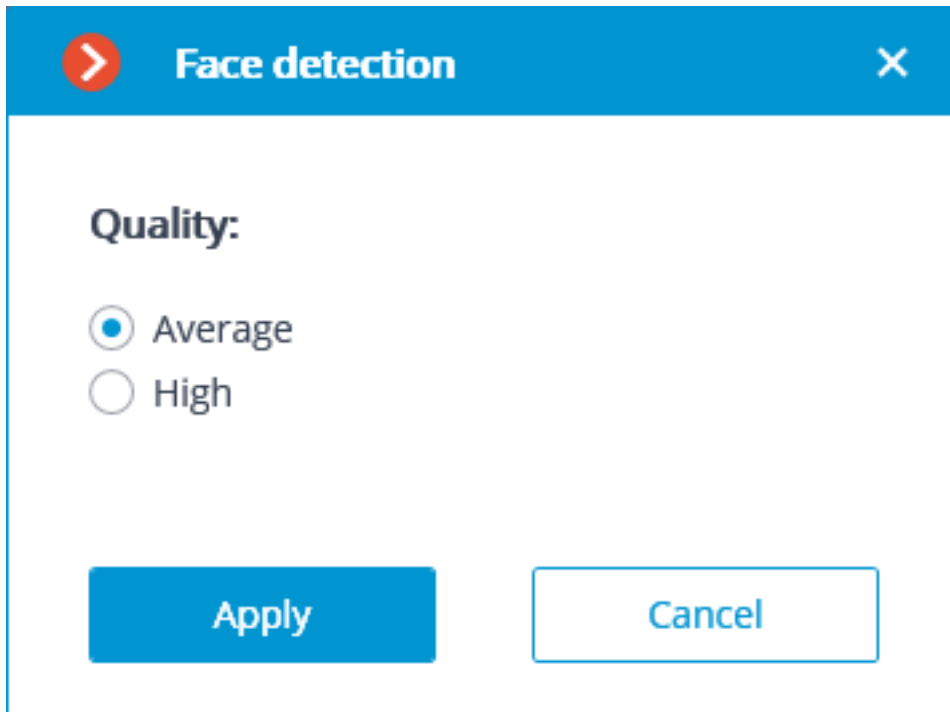
To use the module, enable and configure it.

Launch the **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.

Then switch to the **Analytics** tab and enable the module using the  toggle.



Clicking the  button opens the module setup window.



In the settings window it is required to set the module efficiency. This parameter influences the computer system resources: processor load and RAM usage. High efficiency of the module operation consumes more system resources than the medium efficiency.

Warning

The module will start working only when **the settings are applied**.

Abandoned Objects Detection

The **Abandoned Objects Detection** is intended for finding objects that have stayed in the field of view of the camera without moving for the time that exceeds the preset value.

When an abandoned object is detected, the corresponding alarm is generated and the object becomes highlighted in the frame. It is possible to set a user action scenario for this alarm. Moreover, all the alarms are stored in the event log, allowing to view all the abandoned objects in the video archive.

The module can be used for locating abandoned objects outside or inside.


Details

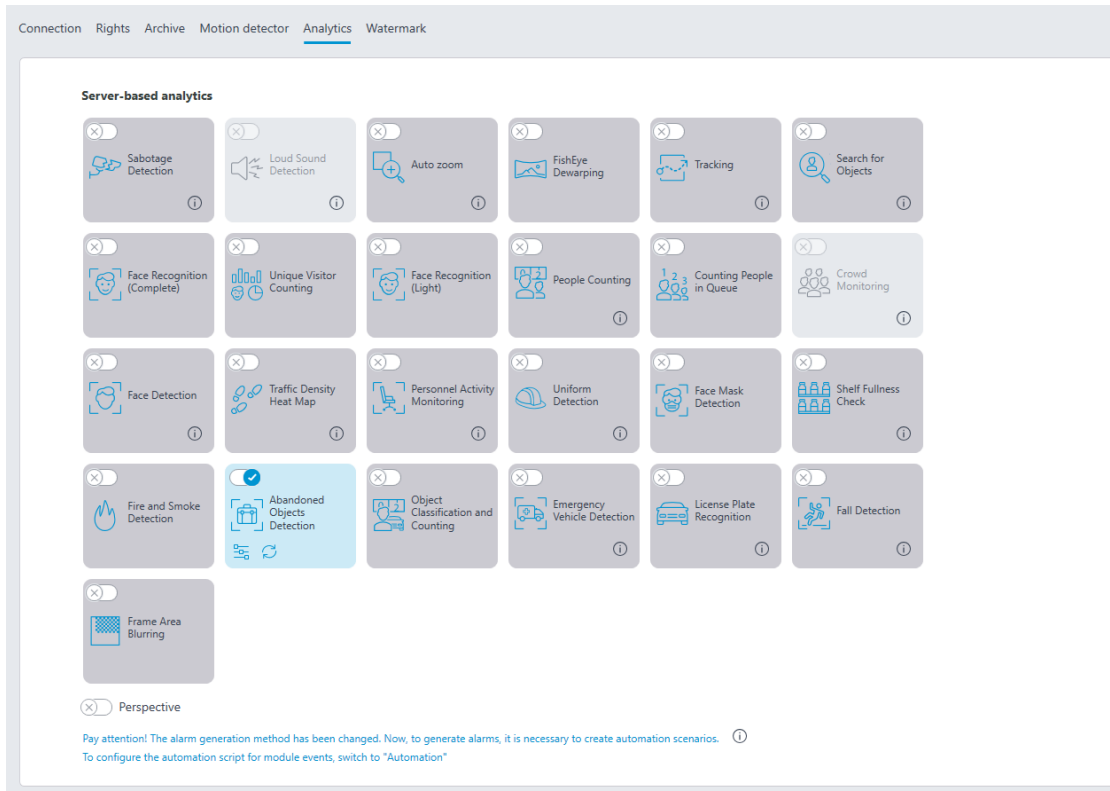
For the correct operation of the module, it is required to properly place and set up the camera, enable and adjust the module.

Module setup

To use the module, enable and configure it.

Launch the **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.

Then switch to the **Analytics** tab and enable the module using the  toggle.



Clicking the  button opens the module setup window.

Abandoned objects detection

Detection parameters

Detection time ⓘ

[Set object size limits](#)

[Set detection zone](#)

Algorithm settings

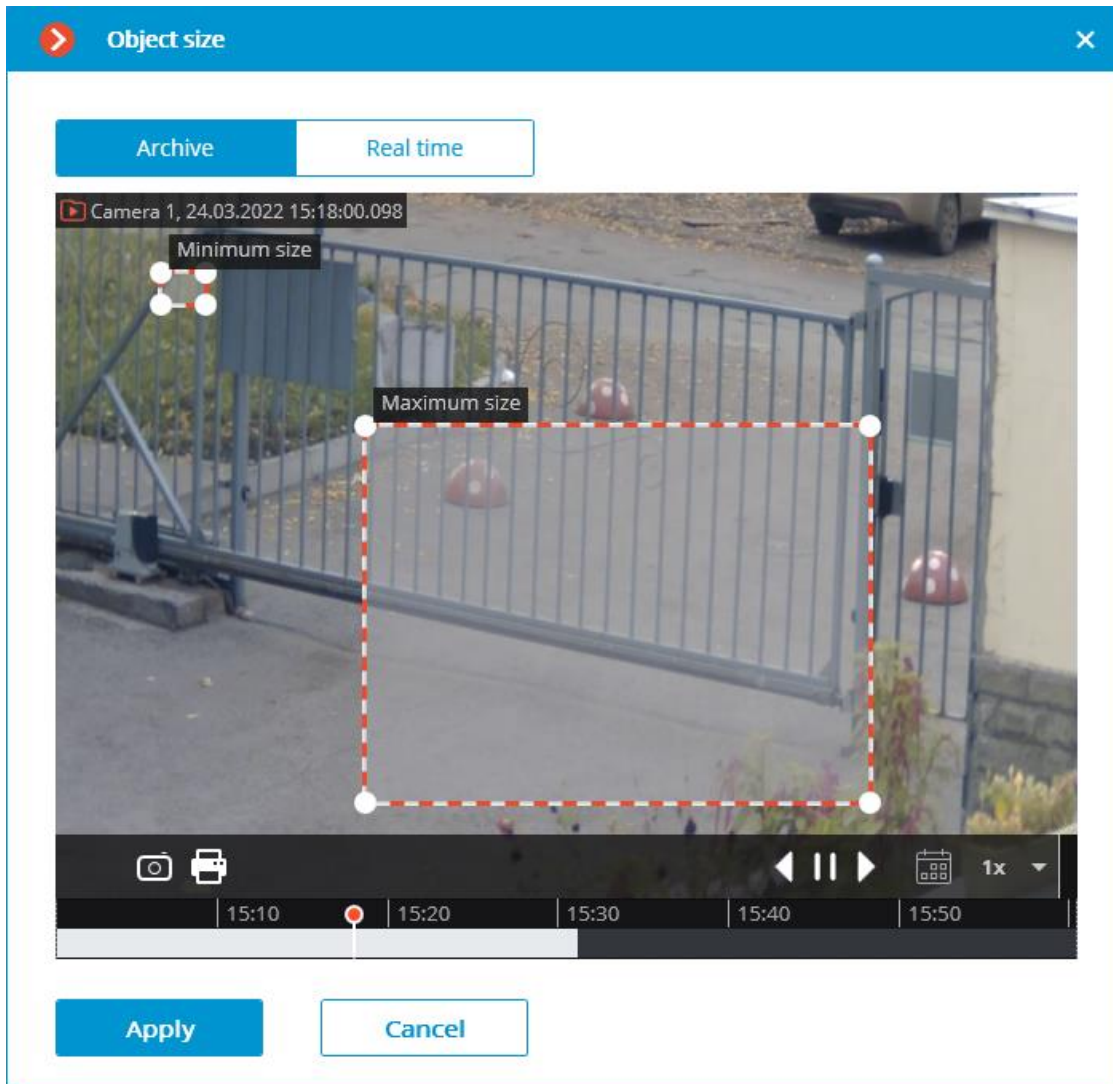
Sensitivity ⓘ

Save **Cancel**

In the opened window the following settings have to be made:

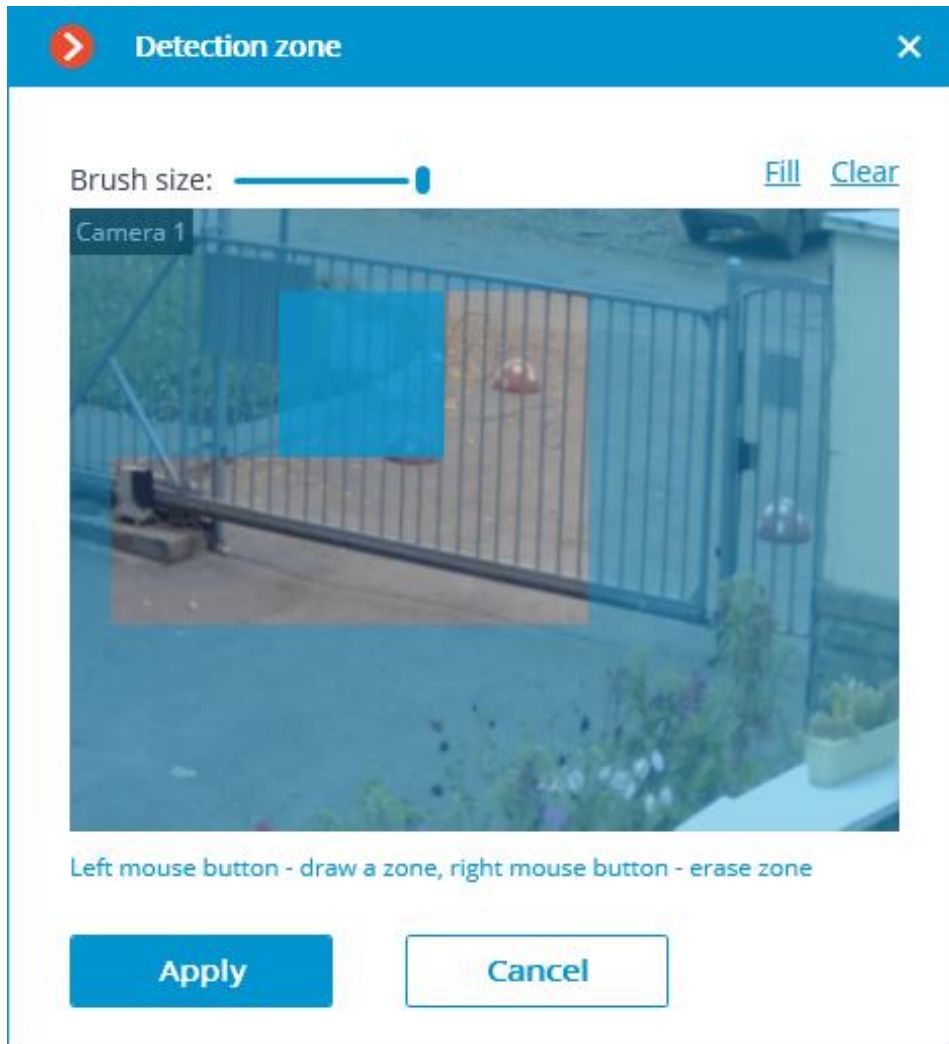
Detection time: the objects that do not move during the time that exceeds the time preset in this window will be considered abandoned. The time from 30 seconds to 10 minutes can be set.

Set object size limits: opens the window where the minimum and maximum sizes of the objects that may be considered abandoned are set.



Set detection zone: opens the window where the abandoned objects detection zone is set.

Detection zones are the zones of the frame bounded by a closed polygon. The zone configuration can be changed by dragging the key points at the corners of the polygon. To add a key point, it is required to double-click the left mouse button on the line; to delete — right-click on the key point.



Warning

The module will start working only when **the settings are applied**.

Warning

After launching or relaunching, the module will need time for learning. During the learning process the objects will not be detected. This period roughly equals the double detection time set in the settings.

Warning

For reducing module learning errors, it is recommended to ensure that during the launch of the video surveillance server there are no moving objects in the frame, and the static background is not blocked by temporary static and slow-moving objects.

Requirements and recommendations

For detecting the abandoned objects, it is required to provide the following conditions:

- Static and reliable camera fixing.
- View from the above, or perspective view from the above.
- Absence of refocusing and changing image sharpness.
- Absence of non-mobile or slow-moving objects in the frame, for example, trees or clerks sitting at their desks. Such objects in the frame may lead to false triggering of the detector. At the same time, the presence of a non-mobile object close to the abandoned object may result in the triggering of the detector since the abandoned object and the non-mobile object may incorporate into one moving area.
- Absence of the light sources slowly changing their position in the frame.

The most favorable conditions are as follows:

- Static background.
- No windows in the frame.
- Small quantity of moving objects.
- Constant lighting; for example, light fixtures in the premises.
- The abandoned objects are not blocked by other objects.
- The abandoned object color differs significantly from the color of the background.
- Absence or small number of the outstanding small-size objects.

Influence of the module's settings:

- Detection zones: if more than a half of the object is in the zone, the object is detected; if not, it is not detected.
- Maximum dimensions: if both dimensions (width and height) are smaller than the set maximum dimensions, the object is detected; if at least one of the dimensions exceeds the set limitations, the object is not detected.
- Minimum dimensions: if both dimensions (width and height) are larger than the set minimum dimensions, the object is detected; if at least one of the dimensions is smaller than the set limitations, the object is not detected.
- If one of the dimensions of the object is close to the set limitations, the probability of the detector's triggering decreases.

Warning

Regardless of the zone size, the size of the object must be at least 3% of the frame height.

Since the current version of the module cannot determine the shifts of the objects (insignificant changes of the object's position), such shifts will result in the triggering of the detector.

There are no more particular requirements to the frame's parameters or the software motion detector's settings.

Fall Detection

The **Fall Detection** module is designed to detect fall of people.

Note

The module does not detect the falling process. It detects a laying down person as a fallen person.

It is possible to enable the frame highlighting of the fall scene, both in live view and archive playback.

When falls are detected, **Fall detected events** are generated and recorded in the Event log.

Note

The module operates on a **neural network** using a video card (GPU).

It is recommended to install the **Eocortex Neural Networks Special** package.

Module setup

Warning

It is required to **install the neural network package** before using the module.

To use the module, enable and set up the software motion detector, then enable and set up the module itself.

Launch the **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.

Then switch to the **Analytics** tab and enable the module using the  toggle.

Connection Rights Archive Motion detector Analytics Watermark


Server-based analytics

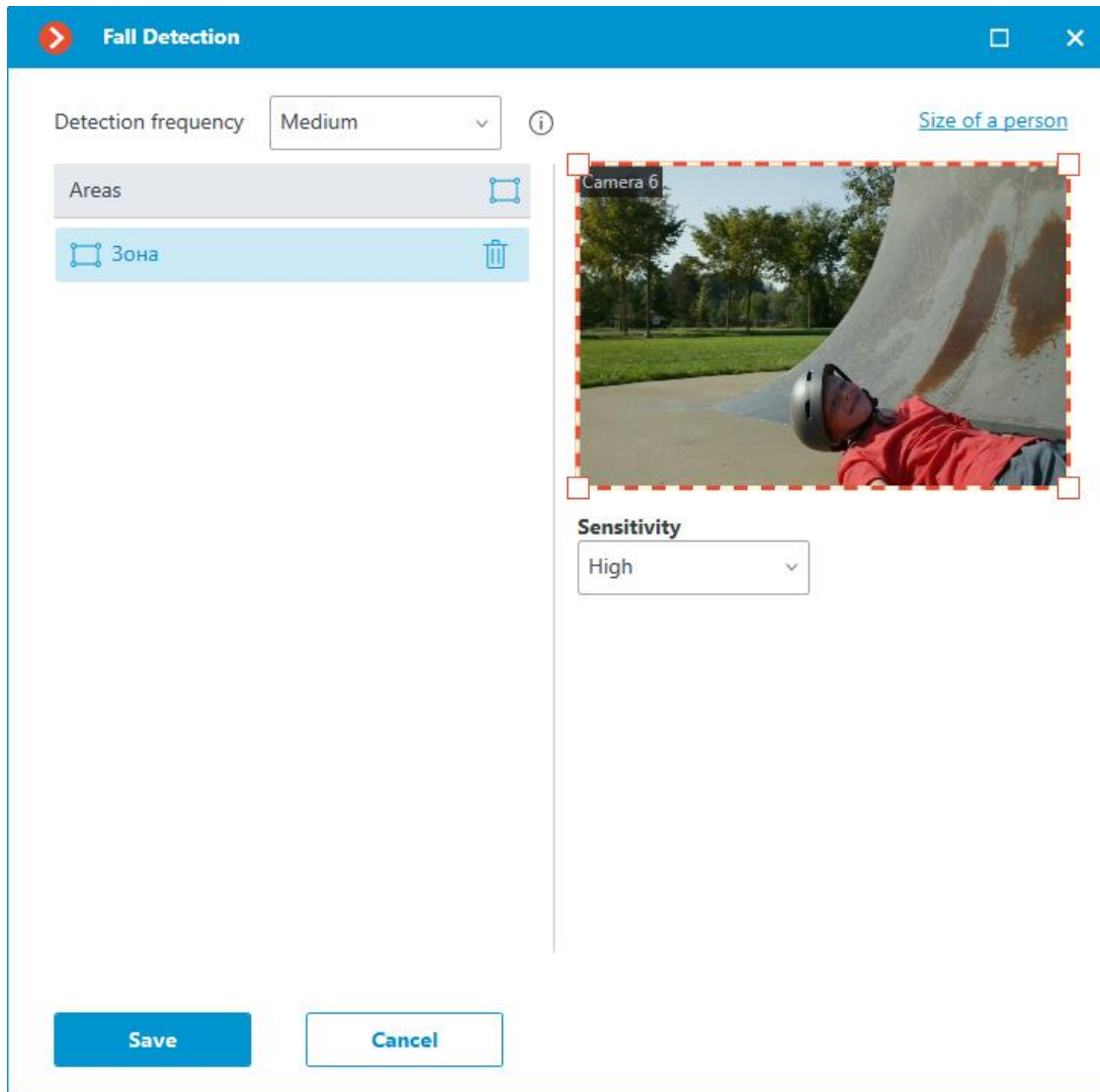
<input type="checkbox"/> Sabotage Detection	<input type="checkbox"/> Loud Sound Detection	<input type="checkbox"/> Auto zoom	<input type="checkbox"/> FishEye Dewarping	<input type="checkbox"/> Tracking	<input type="checkbox"/> Search for Objects
<input type="checkbox"/> Face Recognition (Complete)	<input type="checkbox"/> Unique Visitor Counting	<input type="checkbox"/> Face Recognition (Light)	<input type="checkbox"/> People Counting	<input type="checkbox"/> Counting People in Queue	<input type="checkbox"/> Crowd Monitoring
<input type="checkbox"/> Face Detection	<input type="checkbox"/> Traffic Density Heat Map	<input type="checkbox"/> Personnel Activity Monitoring	<input type="checkbox"/> Uniform Detection	<input type="checkbox"/> Face Mask Detection	<input type="checkbox"/> Shelf Fullness Check
<input type="checkbox"/> Fire and Smoke Detection	<input type="checkbox"/> Abandoned Objects Detection	<input type="checkbox"/> Object Classification and Counting	<input type="checkbox"/> Emergency Vehicle Detection	<input type="checkbox"/> License Plate Recognition	<input checked="" type="checkbox"/> Fall Detection
<input type="checkbox"/> Frame Area Blurring					

Perspective

Pay attention! The alarm generation method has been changed. Now, to generate alarms, it is necessary to create automation scenarios.

To configure the automation script for module events, switch to "Automation"

Clicking the  button opens the module setup window.



When setting up the module, select the detection frequency, the minimum and maximum people dimensions to be detected and set the areas in which falls will be monitored.

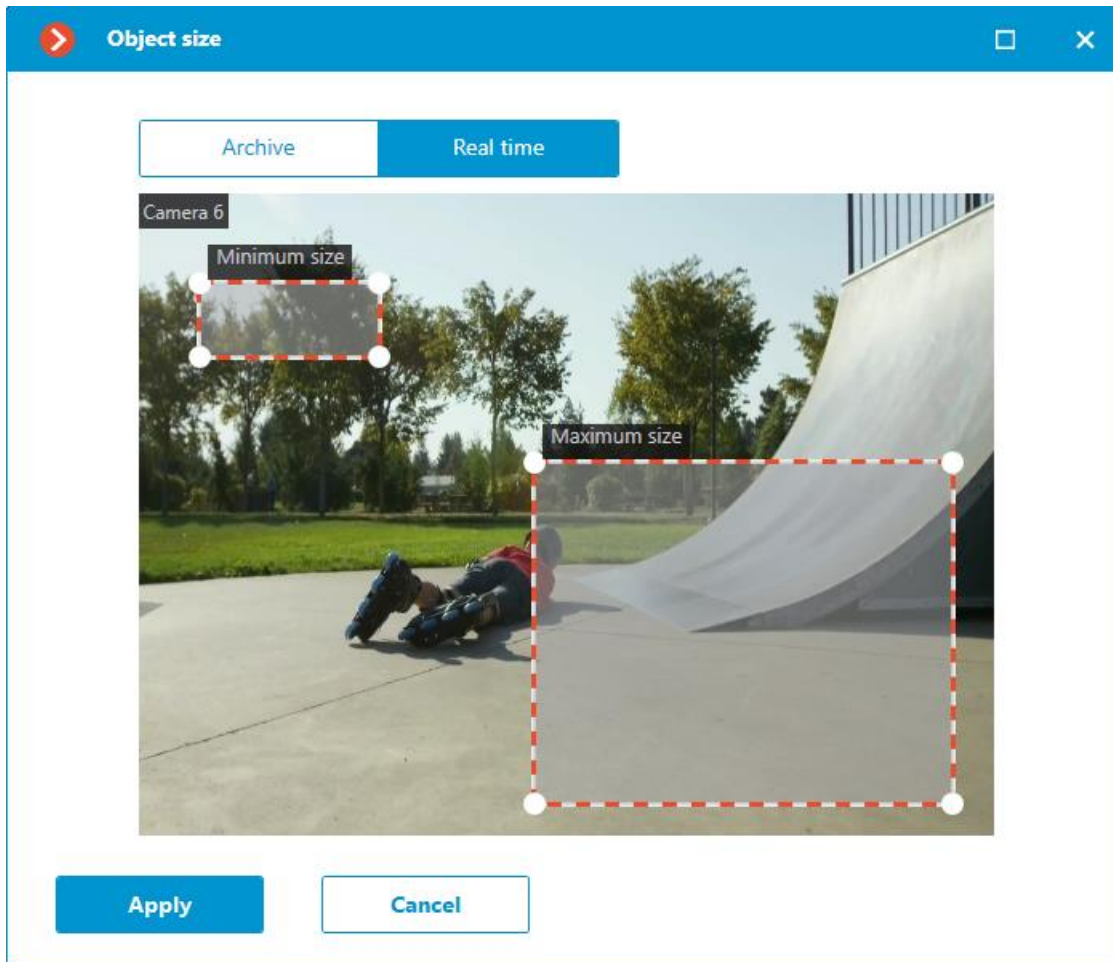
By increasing the detection frequency, falls will be detected faster, including those in which the person immediately stands up. But this will increase the load on the CPU and GPU.

When setting up detection areas, it is important to consider that people whose center of the image is outside the specified areas will not be detected.

Sensitivity is selected for each area:

- When **High** is selected, it increases the chances of detecting falls, but there is also a higher probability of false alarms.
- When **Medium** is selected, it improves resistance to noise, but the fall detection accuracy may decrease.

Setting the size of a person is the same for all areas. Therefore, falls will only be detected in all areas for people who fit within the specified size range.



Warning

The module will start working only when **the settings are applied**.

Requirements and recommendations

Hardware and software

Warning

It is required to **install the neural network package** before using the module.

The following equipment is required to use this neural network-based module:

- A processor that supports AVX instructions;

- An **NVIDIA** video card (GPU) with the computation capacity index of at least 6.5 and with at least 4 Gb of memory; the parameters and performance of the video card must be similar or better than those of **NVIDIA GTX 1650 Ti** model;
- Version of the video card driver at least 460;
- Swap file at least half of the total RAM size.

If the package will be installed on a virtual machine, it may additionally be required to:

- Enable support for AVX instructions in the guest machine settings;
- Use GRID drivers for GPU virtualization.

Warning

Eocortex must use video cards selected for running neural networks in monopoly mode. It is not allowed to use such card for other applications or tasks that consume GPU resources, including for displaying video. Simultaneous use of a video card for several tasks may lead to incorrect system operation: from analytics performance degradation to server instability.

Warning

The neural network works with the 64-bit version of **Eocortex** only.

Warning

When upgrading **Eocortex** to another version, it is necessary to also upgrade the **install the Eocortex Neural Networks package** package to the corresponding version.

Video stream

- Frame frequency: at least 10 frames per second;
- The optimal resolution is HD or FullHD.

Image

- Lighting in the frame should be uniform and constant.

- If the camera is installed in front of a bright light source (the sun behind the entrance door, etc.), it is necessary to adjust the exposure (or brightness) so that the objects in the frame have a natural color (not overexposed or too dark). In this case, an overexposed background is acceptable.
- The image must be in color.
- Image quality should be at least average. There should be no significant compression artifacts.
- White balance must be adjusted correctly.

Scene and camera position

- People to be detected must be visible in the frame while standing, full-length, not overlapped by other objects.
- The dimensions of detected people should be at least 8% of the frame height.
- The frame must not contain reflective surfaces: glass, mirrors, etc.
- The camera may be placed above the face level, directly facing the people to be recognized. In such a case, the camera elevation angle must not exceed 35°.

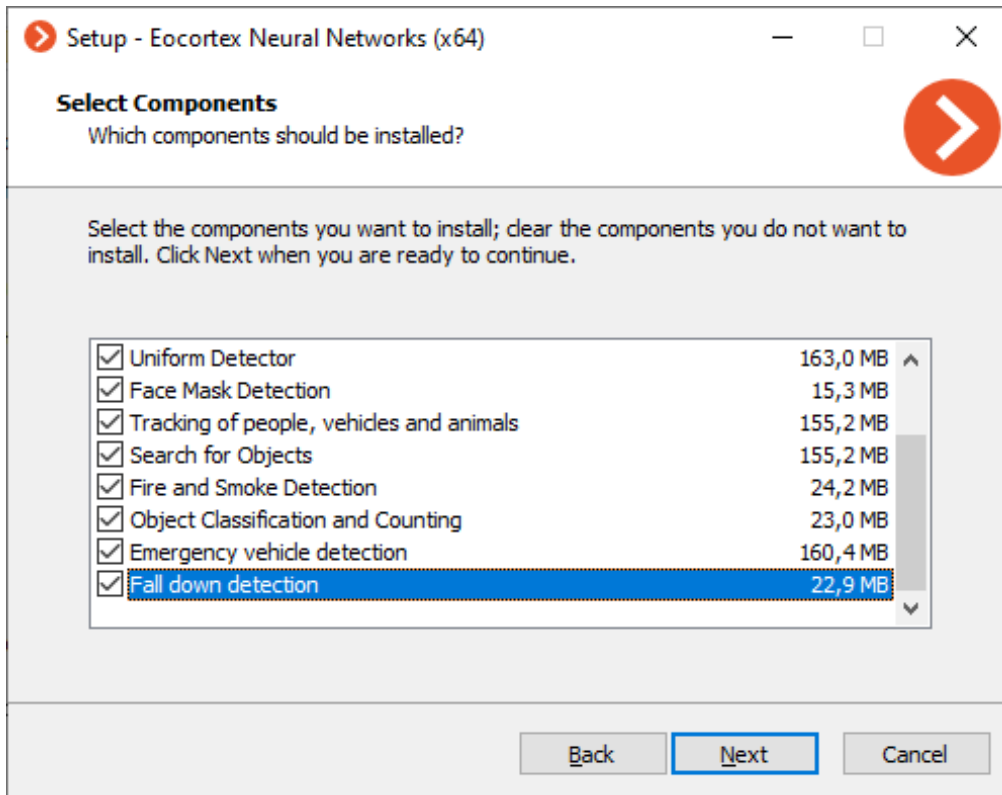
Deployment of the module

┌
Note

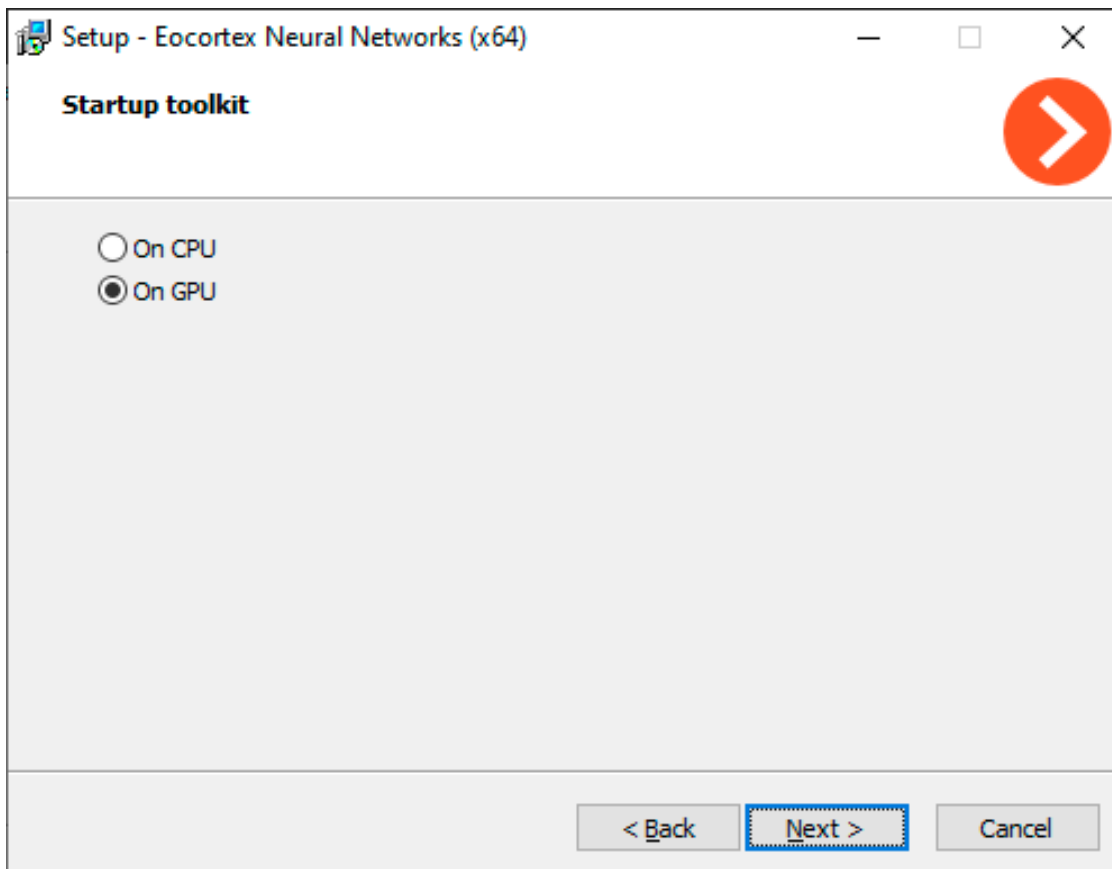
The module operates on a **neural network** using a video card (GPU).

It is recommended to install the **** Eocortex Neural Networks Special**** package.

└
While installing the package, select the relevant component.



It is recommended to use graphics card (GPU) to run the module.



Emergency Vehicle Detection

The **Emergency Vehicle Detection** module allows recognizing fire, ambulance, and police vehicles in the real-time mode. The recognition is available for predefined areas of the frame. To avoid false positives, a minimum time can be set for special vehicles to be in the area. Recognition events can be used in automation scenarios. For example, to automatically open the barrier.

Capabilities of the module

- The following emergency vehicles can be recognized:
 - Ambulance
 - Fire engine
 - Police car
- All the module events will be added to the **Events log**.

Details

Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.


To use the module, enable and set up the software motion detector, then enable and set up the module itself.


Module setup

Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.

To use the module, enable and configure it.

Launch the **launch the Eocortex Configurator application**, go to the  **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.

Then switch to the **Analytics** tab and enable the module using the  toggle.

Connection Rights Archive Motion detector Analytics Watermark


Server-based analytics

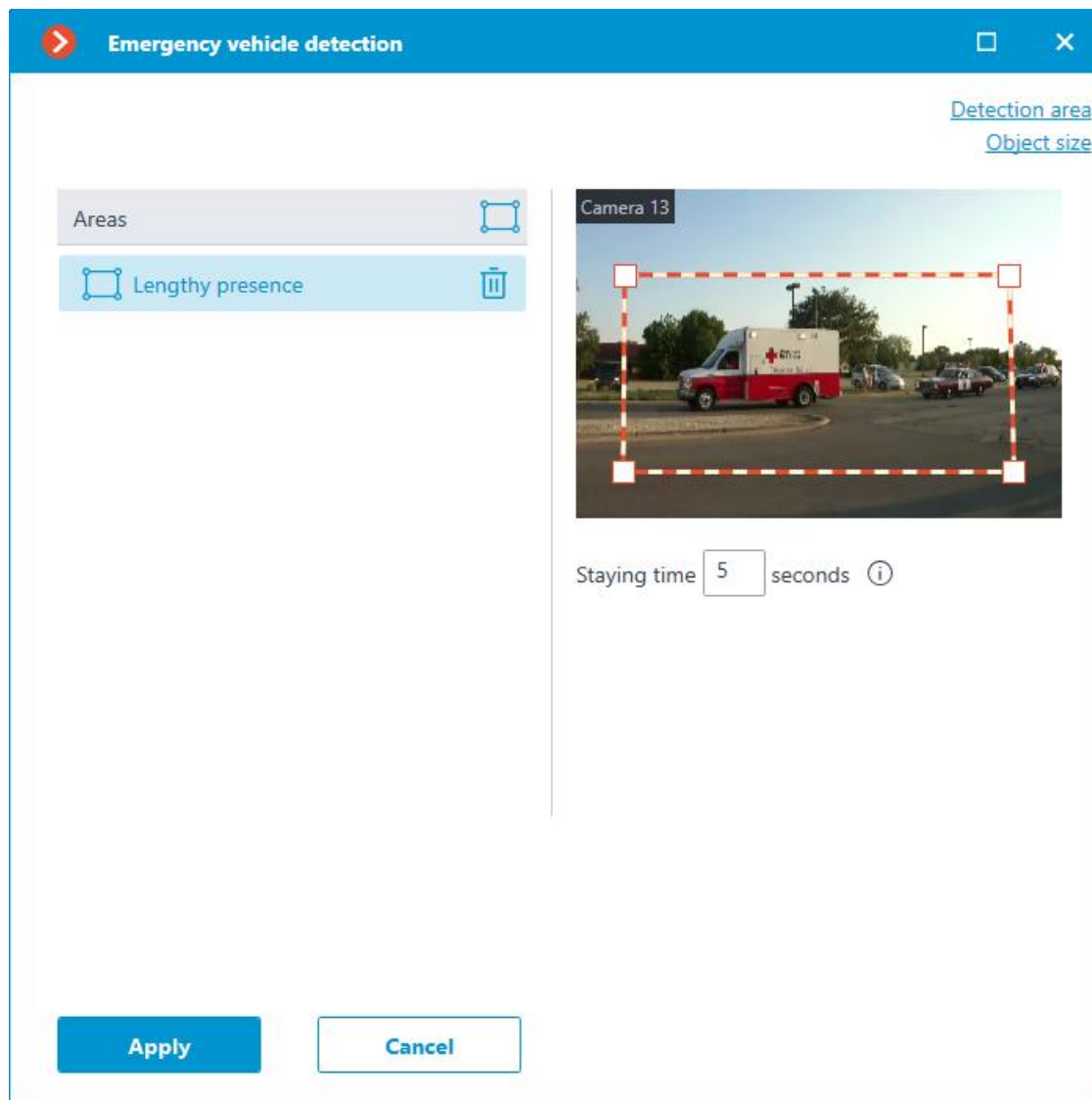
Sabotage Detection	Loud Sound Detection	Auto zoom	FishEye Dewarping	Tracking	Search for Objects
Face Recognition (Complete)	Unique Visitor Counting	Face Recognition (Light)	People Counting	Counting People in Queue	Crowd Monitoring
Face Detection	Traffic Density Heat Map	Personnel Activity Monitoring	Uniform Detection	Face Mask Detection	Shelf Fullness Check
Fire and Smoke Detection	Abandoned Objects Detection	Object Classification and Counting	Emergency Vehicle Detection	License Plate Recognition	Fall Detection
Frame Area Blurring					

Perspective


Pay attention! The alarm generation method has been changed. Now, to generate alarms, it is necessary to create automation scenarios.

To configure the automation script for module events, switch to "Automation"

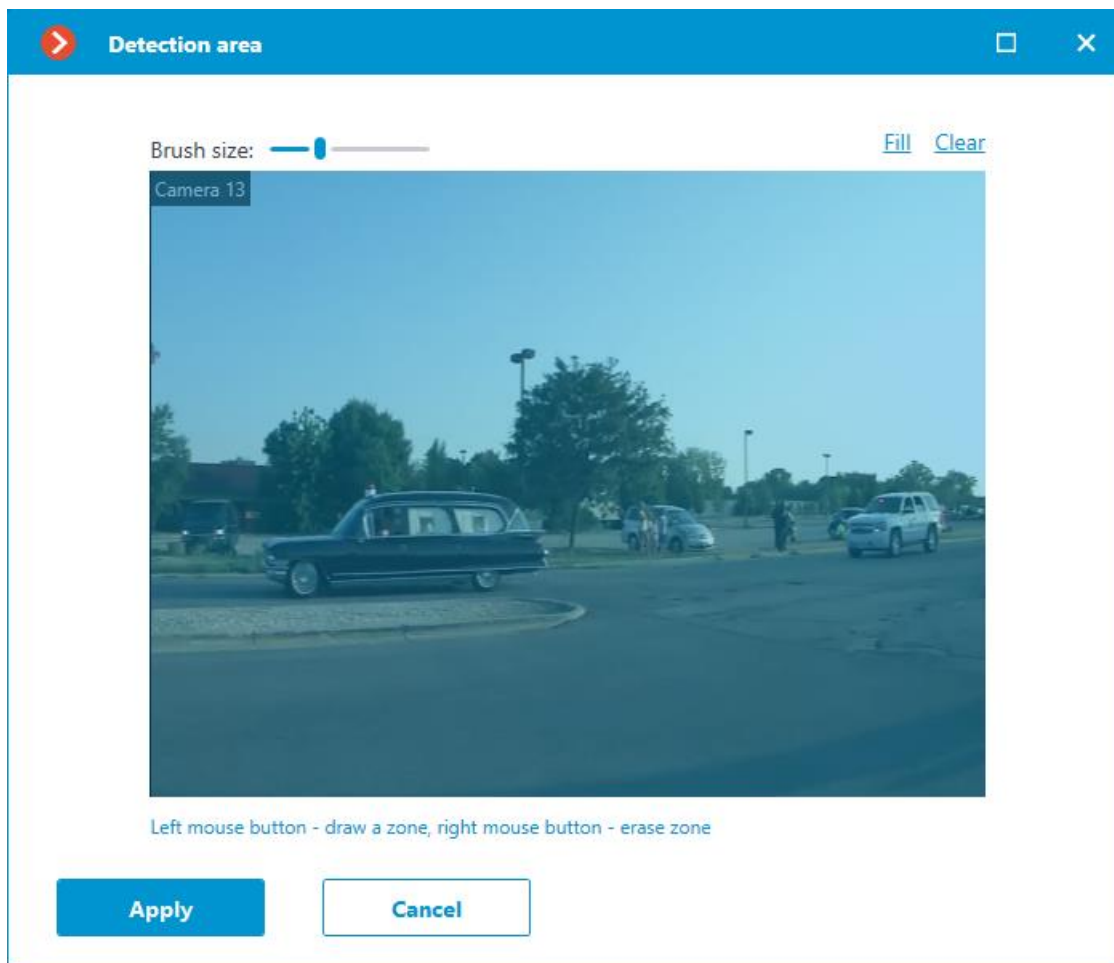
Clicking the  button opens the module setup window.



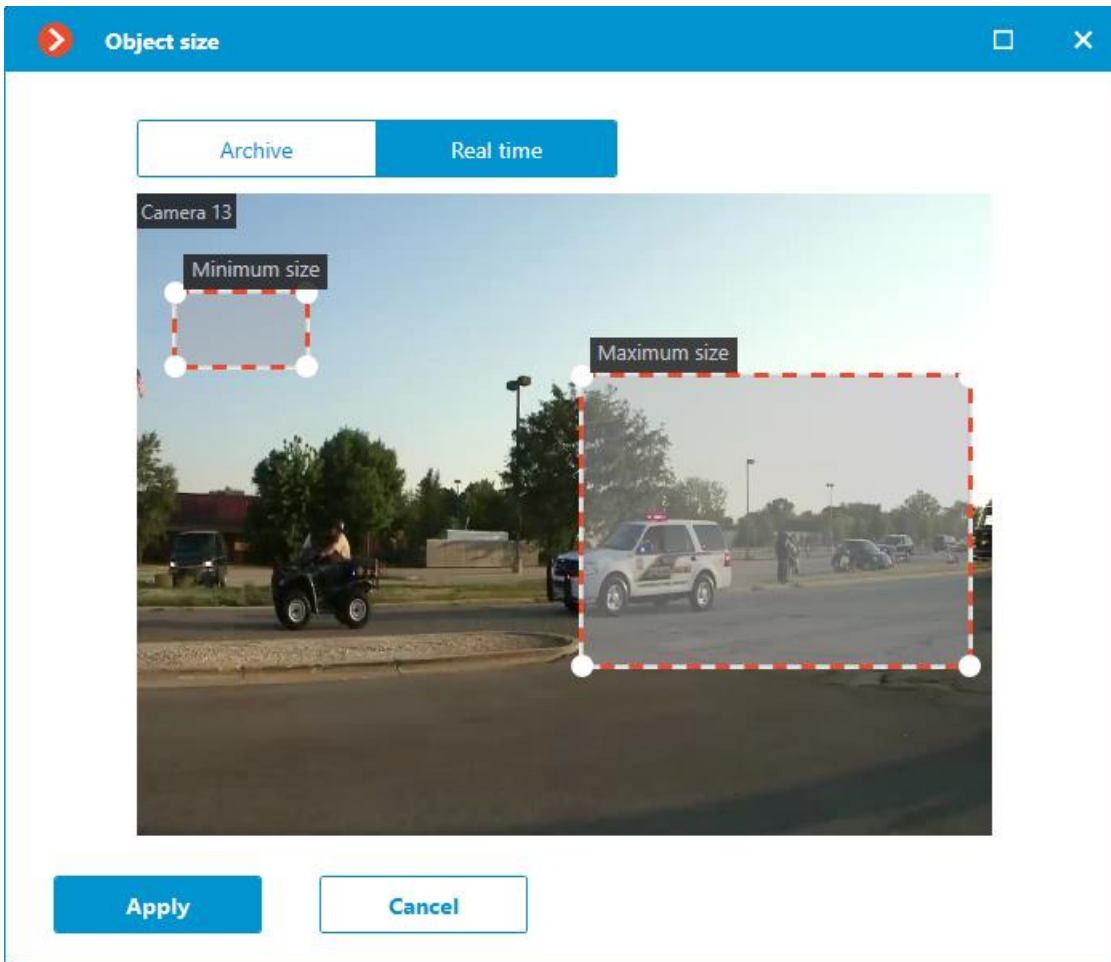
If no zones have been set up before, a standard zone of full frame size will be

created. To add a new zone, click the  button. Each zone can be given its own name, borders, and the time the vehicle can stay in this zone before recognition. The time can be set in the range from 0 to 300 seconds.

Clicking the **Detection area** button opens a window for editing the active zone.



Clicking the **Object size** button opens the window for editing the minimum and maximum size of the detected object.



When an emergency vehicle is recognized, the **Emergency vehicle detected** event will be generated.

Warning

The module will start working only when **the settings are applied**.

Requirements and recommendations

Hardware and software

Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.

The following equipment is required to use this neural network-based module:

- A processor that supports AVX instructions;

- An **NVIDIA** video card (GPU) with the computation capacity index of at least 6.5 and with at least 4 Gb of memory; the parameters and performance of the video card must be similar or better than those of **NVIDIA GTX 1650 Ti** model;
- Version of the video card driver at least 460;
- Swap file at least half of the total RAM size.

If the package will be installed on a virtual machine, it may additionally be required to:

- Enable support for AVX instructions in the guest machine settings;
- Use GRID drivers for GPU virtualization.

Warning

Eocortex must use video cards selected for running neural networks in monopoly mode. It is not allowed to use such card for other applications or tasks that consume GPU resources, including for displaying video. Simultaneous use of a video card for several tasks may lead to incorrect system operation: from analytics performance degradation to server instability.

Warning

The neural network works with the 64-bit version of **Eocortex** only.

Warning

When upgrading **Eocortex** to another version, it is necessary to also upgrade the **install the Eocortex Neural Networks package** package to the corresponding version.

Video stream

- Frame frequency: no lower than 10 frames per second;
- Image resolution: no lower than HD (1280x720).

Image

- The image must be in color.

Scene and camera position

- Emergency vehicle must be fully in the frame;

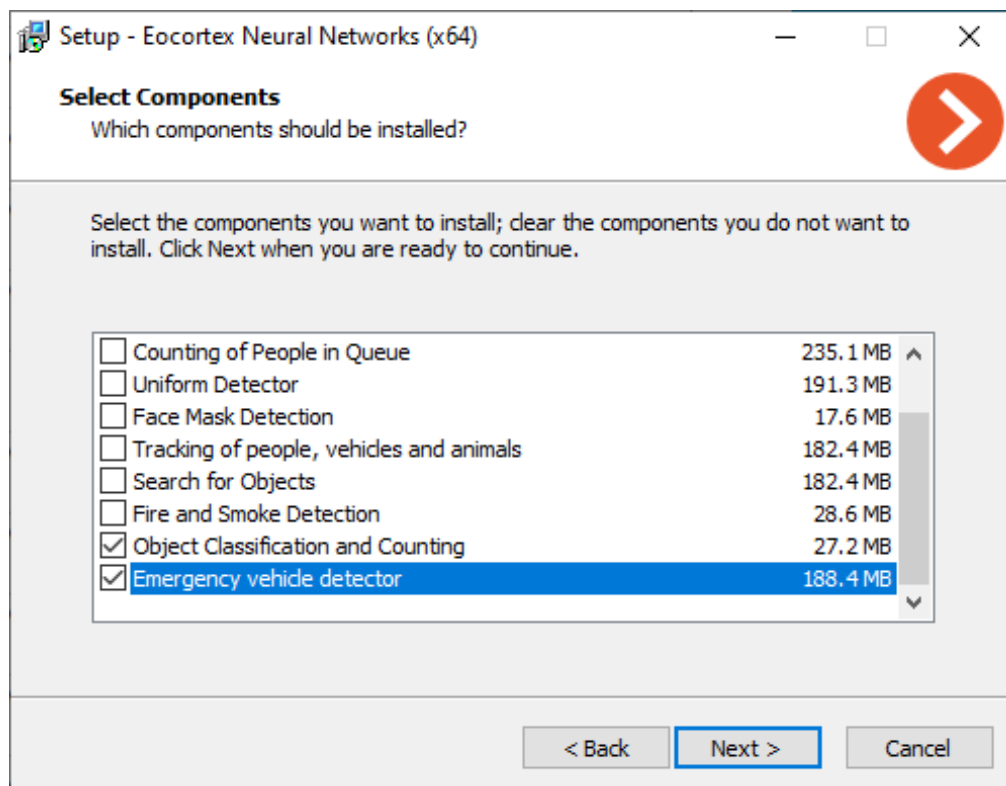
- Objects less than 40 pixels in height will not be detected. Recommended object height is more than 80 pixels;
- The camera angle must be adequate to correctly identify the type of emergency vehicle;
- Emergency vehicle must not be covered by other objects;
- Emergency vehicle must be clearly distinguishable from the background;
- Vehicle should not be overexposed.

Deployment of the module

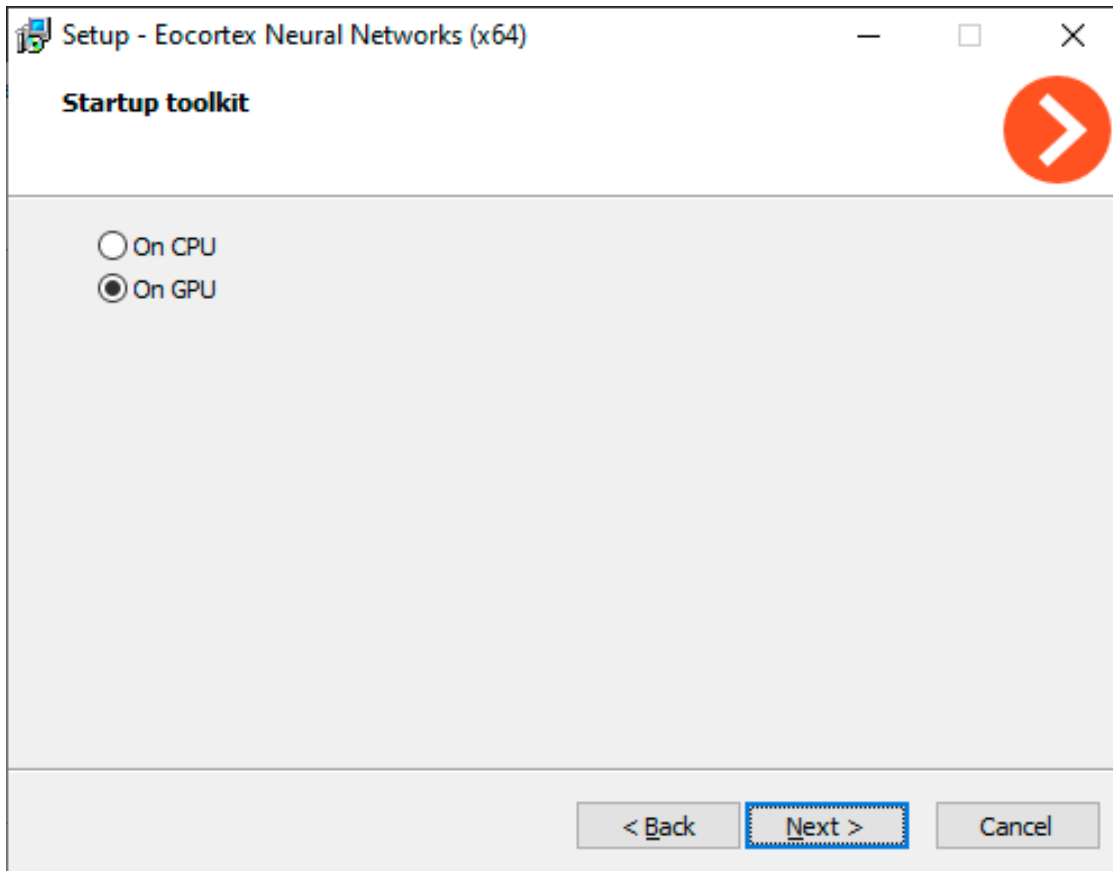
Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.

While installing the package, select the relevant component.



It is recommended to use graphics card (GPU) to run the module.



Counting people in queue

The **Counting People in Queue** module is intended for counting people in lines and warning the operator about the exceedance of the preset threshold.

Capabilities of the module

- Setting of up to six lines (queues) in the frame as the non-intersecting controlled zones.
- Counting people in each of the lines.
- Generation of the alarm when the preset threshold of the number of persons in a line is exceeded.
- Generation of the reports regarding the number of people in each of the lines.
- Real-time display of the quantity of people in each of the lines.

Details

For the module to work properly, it is necessary to correctly position and configure the camera, install the **Eocortex Neural Networks** package, and enable and configure the module.

Module setup

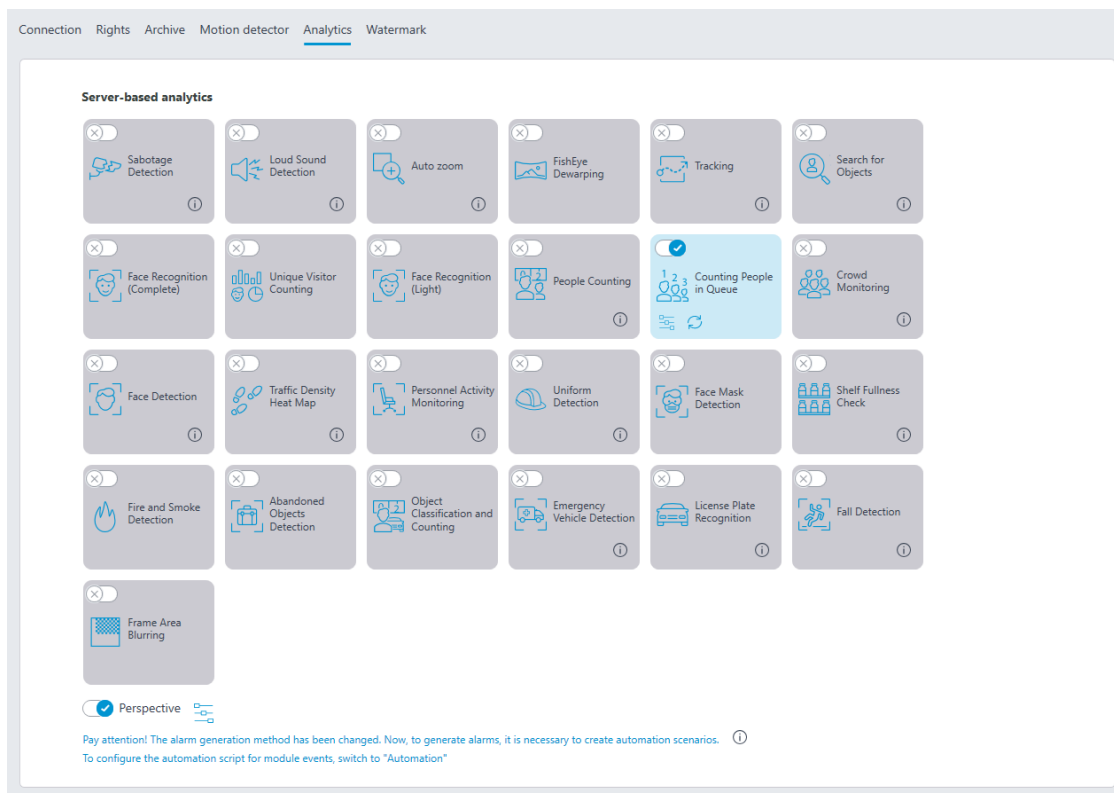
Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.

To use the module, enable and set up the software motion detector, then enable and set up the module itself.

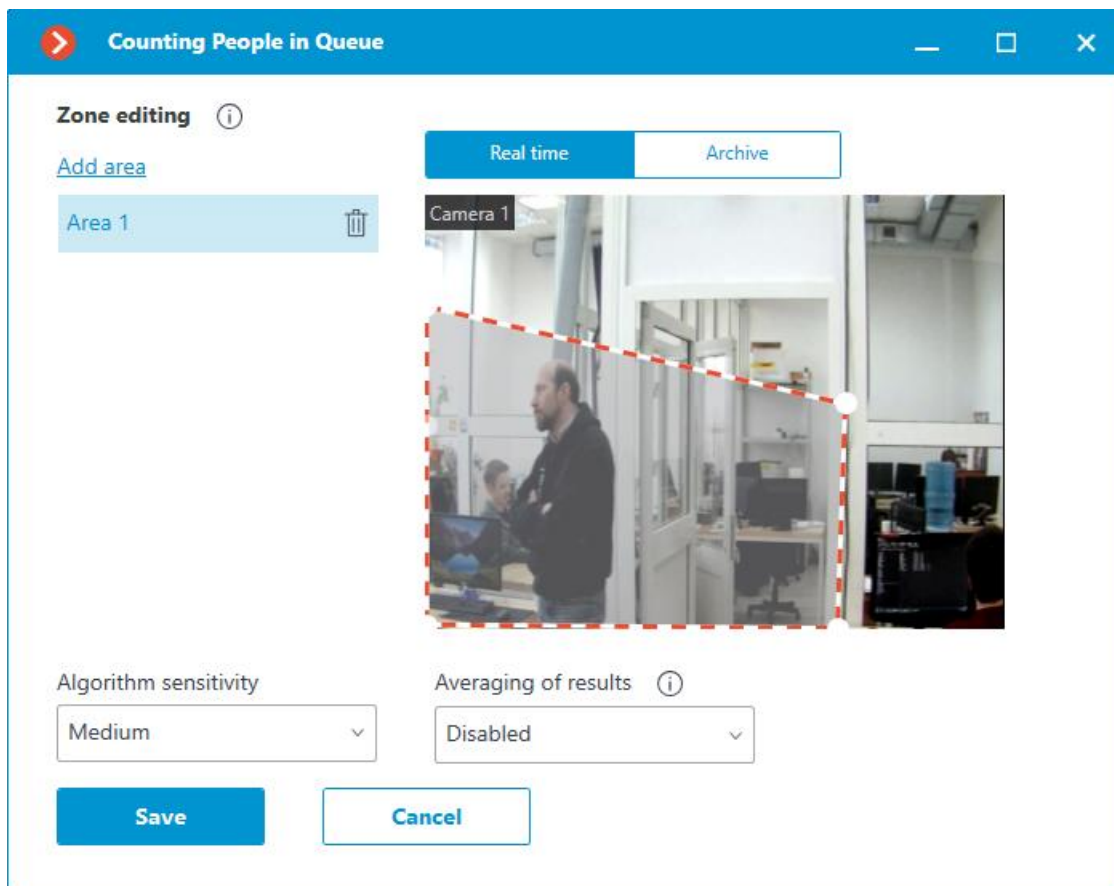
Launch the **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.

Then switch to the **Analytics** tab and enable the module using the  toggle.



Clicking the  button opens the module setup window.

In the opened window, it is required to set the detection zones (up to 6) and set the line parameters for each of the zones.



Detection zones are the zones of the frame bounded by a closed polygon. The zone configuration can be changed by dragging the key points at the corners of the polygon. To add a key point, it is required to double-click the left mouse button on the line; to delete — right-click on the key point.

Algorithm sensitivity is the internal value of the module. If the module fails to correctly detect people in the set zone, it is required to increase the sensitivity; if the module counts the foreign objects as people, it is needed to lower the sensitivity.

Averaging of results allows to make counting more resistant to the sharp changes of the quantity of people in the zone. At the same time, the raise of the averaging interval leads to the lag between the actual change of the number of people in the queue and the reflection of this change in the system. The following averaging periods are available: 10, 15, 30 and 60 seconds; it is also possible to disable the usage of averaged results.

Warning

The module will start working only when **the settings are applied**.

Requirements and recommendations

Image

The camera must be fixed in position.

The camera tilt angle must be between 40 and 70 degrees to the vertical plane.

A person to be counted must have at least 70% of its head visible.

The people may overlap each other but to ensure detection of both the overlapped and the one who overlaps him/her the overlapping in the head and shoulders area shall not exceed 30%.

The head and shoulders of a person must comprise at least 10% of the largest dimension of the counting zone and have a size of at least 30×30 pixels.

The head and shoulders of a person must comprise less than 50% of the largest dimension of the counting zone.

The image must be in color.

The image must have a moderate contrast; the people must be distinguishable from the background.

The people to be detected must not be too blurred.

The image compression rate shall ensure the medium or better image quality; the compression must not create significant artifacts.

The optimal image resolution for ensuring proper operation of the module is HD or FullHD.

Hardware and software



Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.



The following equipment is required to use this neural network-based module:

- A processor that supports AVX instructions is required;
- Swap file at least half of the total RAM size.

It is also possible (optional) to use a video card. In this case, an NVIDIA video card (GPU) with a computing capability index of at least 6.5 and a memory size of at least 4GB is required, and the characteristics and performance of the graphics card must be at least as good as the **NVIDIA GTX 1650 Super**.

If the package will be installed on a virtual machine, it may additionally be required to:

- Enable support for AVX instructions in the guest machine settings;
- Use GRID drivers for GPU virtualization.

Warning

Eocortex must use video cards selected for running neural networks in monopoly mode. It is not allowed to use such card for other applications or tasks that consume GPU resources, including for displaying video. Simultaneous use of a video card for several tasks may lead to incorrect system operation: from analytics performance degradation to server instability.

Warning

The neural network works with the 64-bit version of **Eocortex** only.

Warning

When upgrading **Eocortex** to another version, it is necessary to also upgrade the **install the Eocortex Neural Networks package** package to the corresponding version.

Performance

The time it takes the CPU to process one frame, depending on the CPU used, may be up to 2 seconds.

The time it takes the module to update the data for each camera is in a linear dependence of the number of cameras using the module.

The usage of the GPU permits to lessen the CPU load and reduce the time of processing of one frame.

All the cameras are processed by the same module, so the increase of the number of cameras using the module does not lead to the proportional raise of the computational load; only the decoding time for each additional camera will be longer.

When the module operates on the CPU, its load will always be relatively high, so it is advisable to use the GPU for the module's operation.

The architecture of the module is such that when it is launched on even a single camera, the module immediately allocates a large volume of computing resources for its needs. When the number of cameras using the module is increased later, the load is only moderately increased.

Directly after the launching, the module allocates a significant amount of RAM — around 1,5 Gb. After several minutes the majority of the resources is freed and the usage of RAM by the module becomes low.

Object Classification and Counting

The **Object Classification and Counting** counts objects that are crossing specified lines or contained in predefined areas of arbitrary shape, distinguishing them by categories.

Capabilities of the module

- Counting of objects of a specified category:
 - People
 - Animals
 - Vehicles by type: Passenger cars, Buses, Trucks, Motorcycles.
- Displaying of counter meters in the **Eocortex Client** application.
- Generation of analytical reports.
- Manual and automatic export of analytical reports, as well as automatic reports sending via email.

Details

Warning

For counting objects of specific categories, it is necessary to **install the Eocortex Neural Networks package**. For the best performance it is recommended to use **** Eocortex Neural Networks Special****.

Note

The **Object Classification and Counting** is able to work on the same camera simultaneously only with the **License Plate Recognition** module.


Module setup

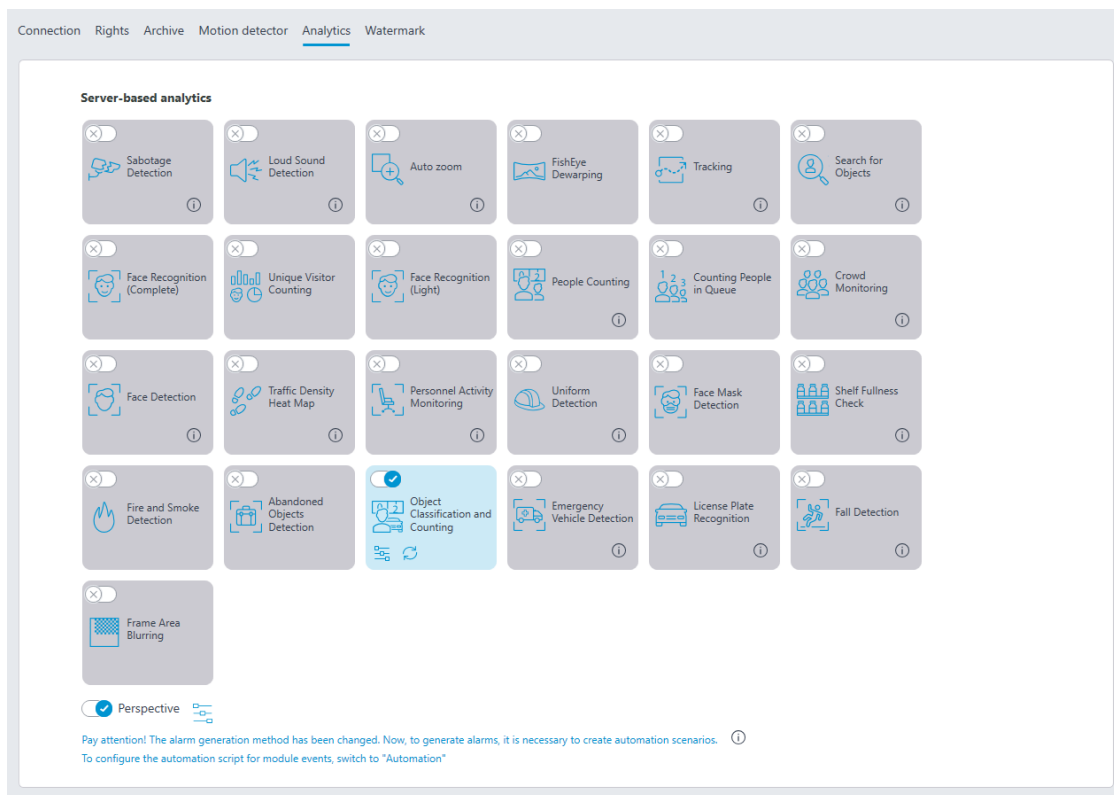
Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.

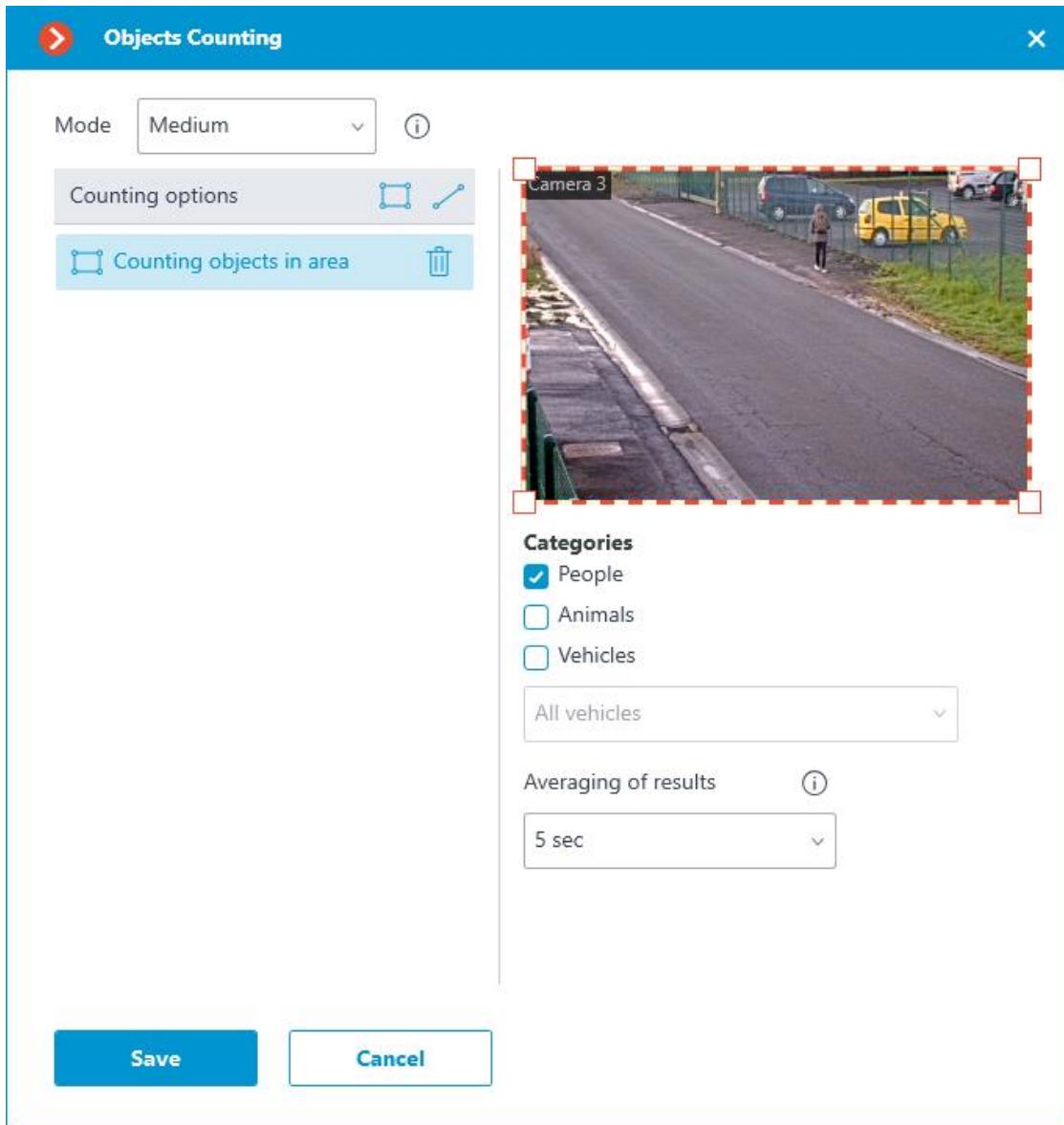
To use the module, enable and set up the software motion detector, then enable and set up the module itself.

Launch the **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.

Then switch to the **Analytics** tab and enable the module using the  toggle.





Clicking the  button opens the module setup window.




When setting up the module, it is necessary to select the operating mode. The following modes are available:

- Slow mode: for standing or slowly moving objects. For example, parking lots, people in line, etc. Shift of objects on the frame in one second should not exceed 1/4 of their size in the direction of movement.
- Medium mode: for objects moving at an average speed. For example, walking people, slow-moving vehicles in a parking lot, etc. Shift of objects on the frame in one second should not exceed their size in the direction of movement.
- Fast mode: for objects that quickly come into the frame and leave the field of view. Vehicles on the highway, people running, etc. Shift of objects on the frame in one second should not exceed 2.5 object's sizes in the direction of movement.

In the **Counting options** list it is possible to set and configure counters. The following counter types are available:

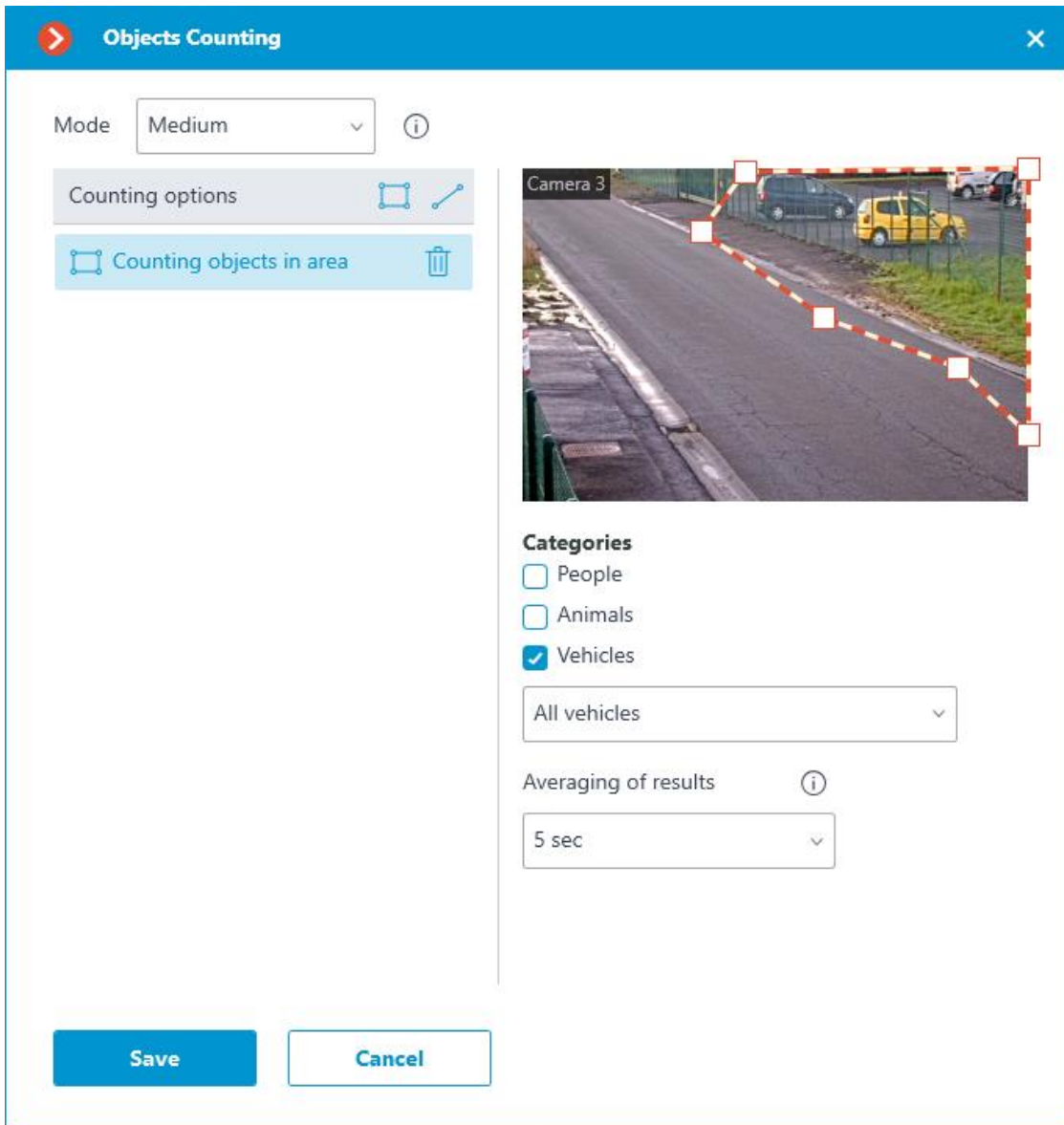
-  **Counting objects in area:** The count of objects within the area.
-  **Line intersection:** The count of objects that crossed the line in a specified direction.

Counting objects in area


To add an area, click . When doing this, a rectangular area will be created in the preview window.

The zone configuration can be changed by dragging the key points at the corners of the polygon. To add a key point, it is required to double-click the left mouse button on the line; to delete — right-click on the key point.


For counting objects in the area, it is necessary to set the interval of averaging results. Averaging makes counting more resistant to sudden changes in the number of objects. The longer the averaging period, the slower the result will change.



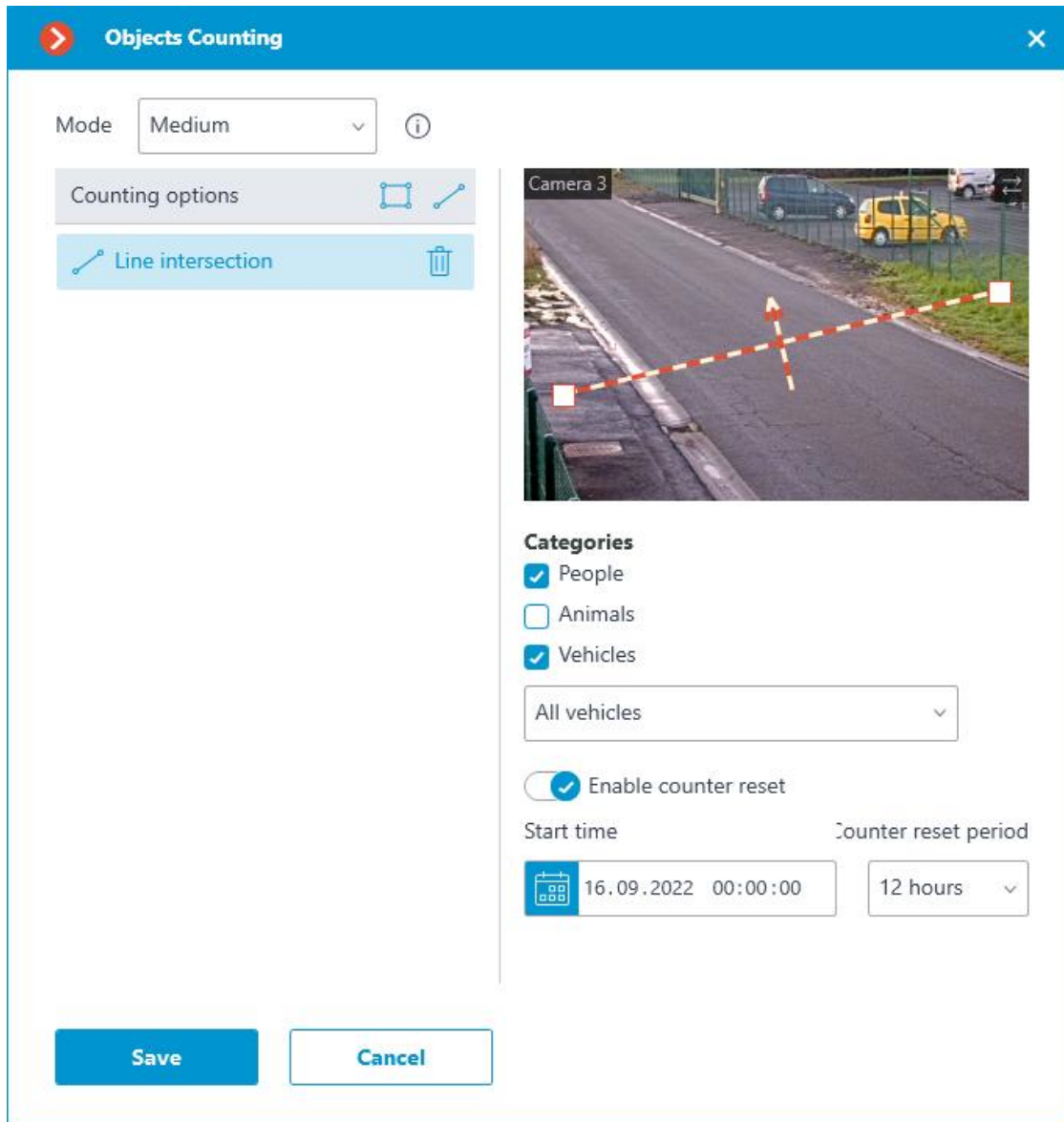
Line intersection

To add a line, click . When doing so, a straight line will be created in the preview window.

Position of the line can be changed by dragging it by the waypoints on the tips.

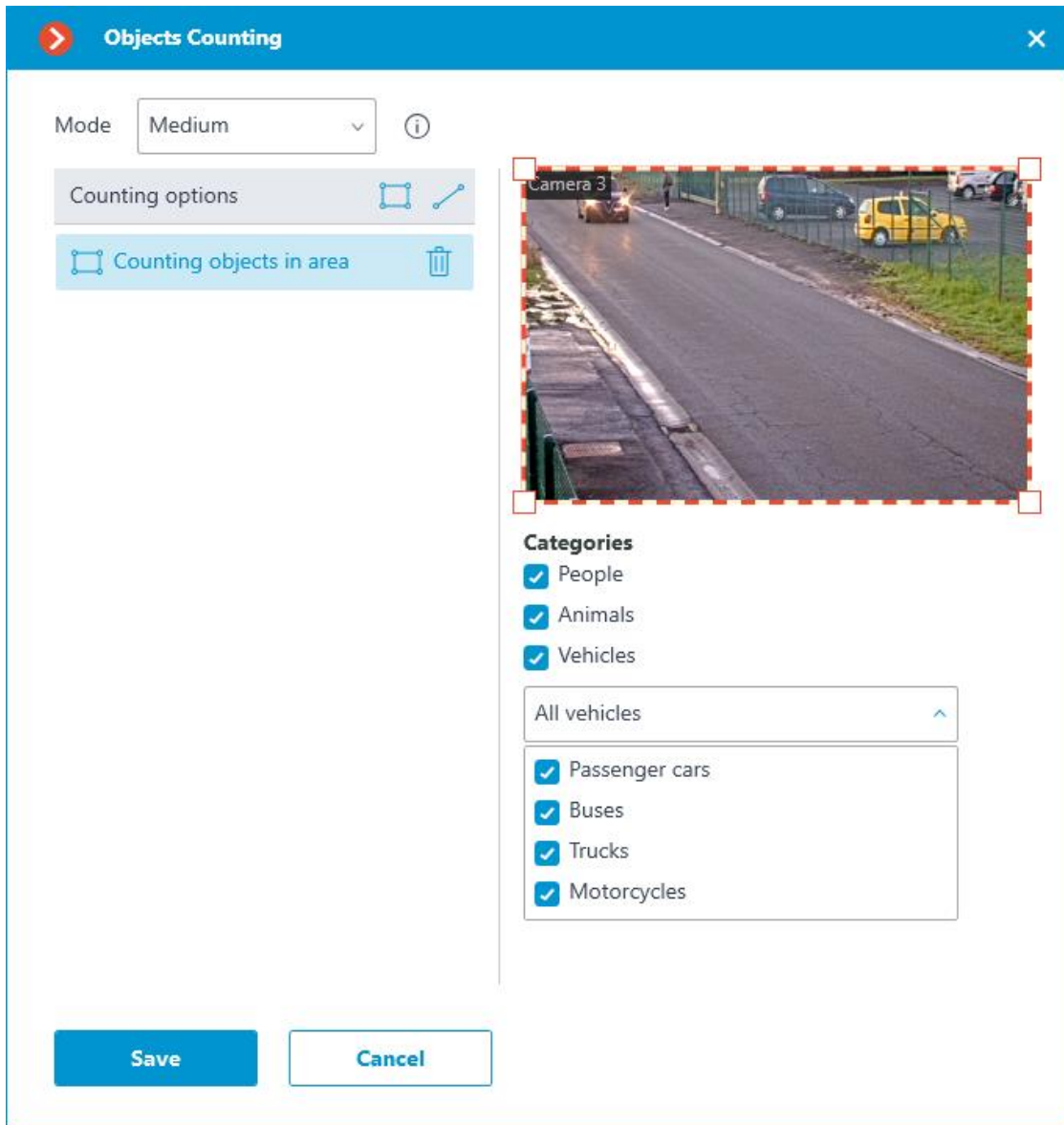
To reverse the direction of counting, click the  button in the upper-right corner of the preview window.

For counting objects crossing the line, resetting the counters can be enabled. It will require configuring the parameters for resetting the counters.



It is also necessary to select objects of which categories will be counted. The following categories are available:

- People
- Animals
- Vehicles by type: Passenger cars, Buses, Trucks, Motorcycles.



Note

The module supports generation of **Automatic reports**.

Note

The module generates **Emergency vehicle detected** events.

Warning

The module will start working only when **the settings are applied**.

Requirements and recommendations

Hardware and software

Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.

The following equipment is required to use this neural network-based module:

- A processor that supports AVX instructions is required;
- Swap file at least half of the total RAM size.

It is also possible (optional) to use a video card. In this case, an NVIDIA video card (GPU) with a computing capability index of at least 6.5 and a memory size of at least 4GB is required, and the characteristics and performance of the graphics card must be at least as good as the **NVIDIA GTX 1650 Super**.

If the package will be installed on a virtual machine, it may additionally be required to:

- Enable support for AVX instructions in the guest machine settings;
- Use GRID drivers for GPU virtualization.

Warning

Eocortex must use video cards selected for running neural networks in monopoly mode. It is not allowed to use such card for other applications or tasks that consume GPU resources, including for displaying video. Simultaneous use of a video card for several tasks may lead to incorrect system operation: from analytics performance degradation to server instability.

Warning

The neural network works with the 64-bit version of **Eocortex** only.

Warning

When upgrading **Eocortex** to another version, it is necessary to also upgrade the **install the Eocortex Neural Networks package** package to the corresponding version.

Video stream

- Frame frequency: no lower than 10 frames per second;

Determination of objects

- The object should be clearly visible on the frame, not overlapped by other objects and not blend into the background.
- The object should not be blurred.
- Frame resolution should not be lower than HD (1280×720 px).
- The minimum size of object: 40 pixels in height. Recommended: 80 pixels.

Counting by line crossing:

- The greatest side of the object should not exceed $\frac{1}{4}$ of the size of the whole frame.
- Movement speed of the object should be such that in $\frac{1}{10}$ seconds the object moves in frame by no more than $\frac{1}{4}$ of its size.

Examples

The following are examples of camera angles for the proper module operation.

Correct



Incorrect



Correct



Incorrect

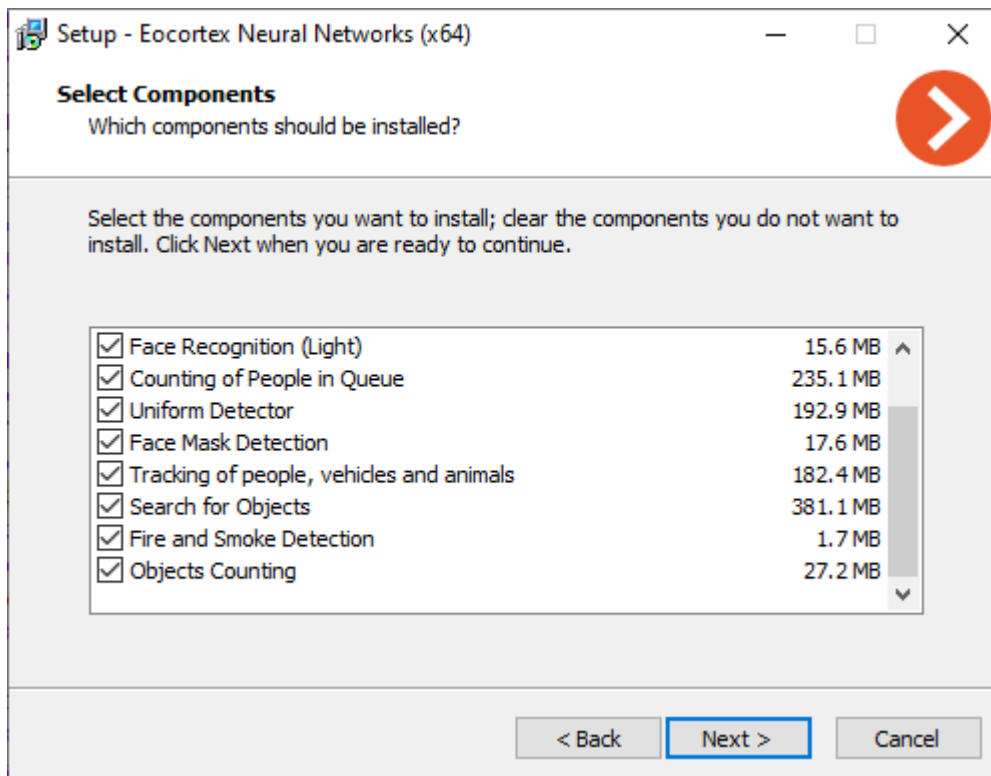


Deployment of the module

Warning

For counting people, vehicles and animals it is necessary to install the **install the Eocortex Neural Networks package** package.

To install the module, select the corresponding item when installing the **Eocortex Neural Networks** package:



Note

It is recommended to run the module on video cards (GPUs).

People Counting

The **People Counting** is designed for counting people in the frame who cross a preset line, taking into account the direction of crossing.

Capabilities of the module

- Real-time counting of the entering and exiting visitors at one or more entrances (using several cameras).
- Displaying the readings of the counters in the **Eocortex Client** application.
- Creating the reports of the number of visitors who entered, exited and remain in the premises for different periods of time, and for one or several cameras.
- Automatic and manual download of the reports and the automatic sending of the reports by email.
- Automatic update and reset of the counters.

Additionally, the module allows to set the counting zones and, subsequently, determine the number of people in the zones in real time, providing the following capabilities:

- Setting several counting zones each of which can include an unlimited number of cameras with the active module, assigned to the same server.
- Displaying in real time the information regarding the current number of people in each zone where the camera being viewed is included.
- A possibility to set the current value of the number of people in a zone manually.
- Generating alarm events in case of the maximum allowable number of people in a zone is exceeded as well as in case of the return of this number to the allowable value.

Warning

The number of people in the zones comes into account only when the server is functioning. When the server is restarted, the values of the counters will be set to zero; in such a case, the values can be set manually.


Details

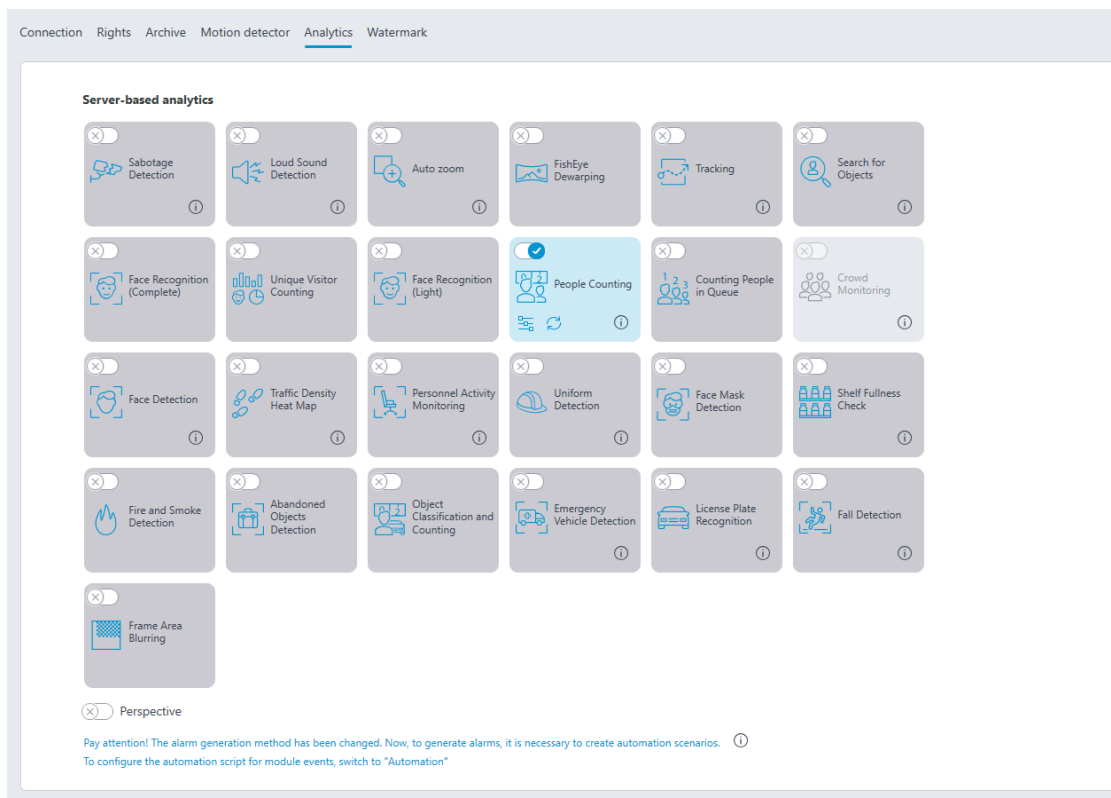
For the correct operation of the module, it is required to properly place and set up the camera, enable and adjust the software motion detector and the module itself.


Module setup

To use the module, enable and set up the software motion detector, then enable and set up the module itself.

Launch the **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.

Then switch to the **Analytics** tab and enable the module using the  toggle.



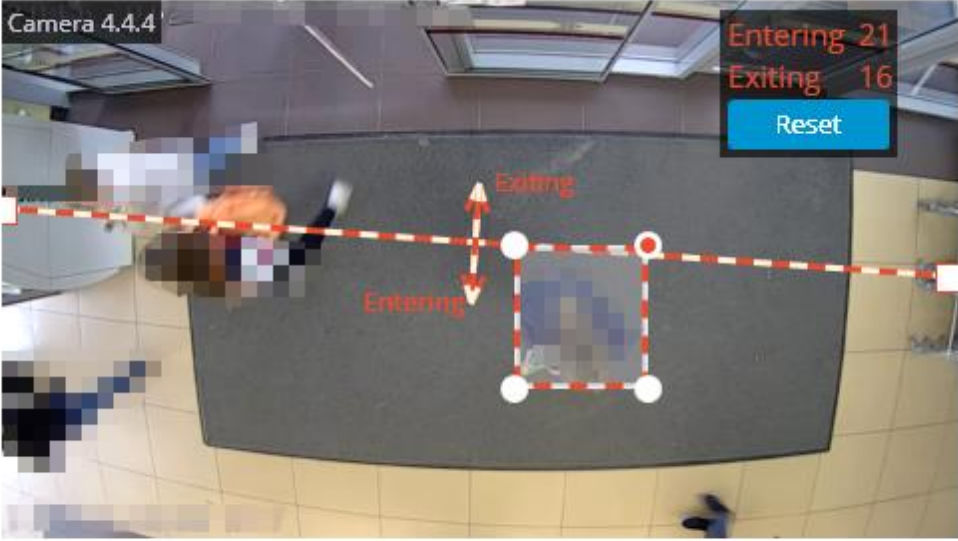
Clicking the  button opens the module setup window.

Visitor counting ✕

[Main settings](#) [Additional settings](#)

Counting parameters i

Real time Archive



Camera 4.4.4

Entering 21
Exiting 16
Reset

Entering
Exiting

[Change movement direction](#)

Counting method
Several people in a frame ▼

Show the suggested size of the object

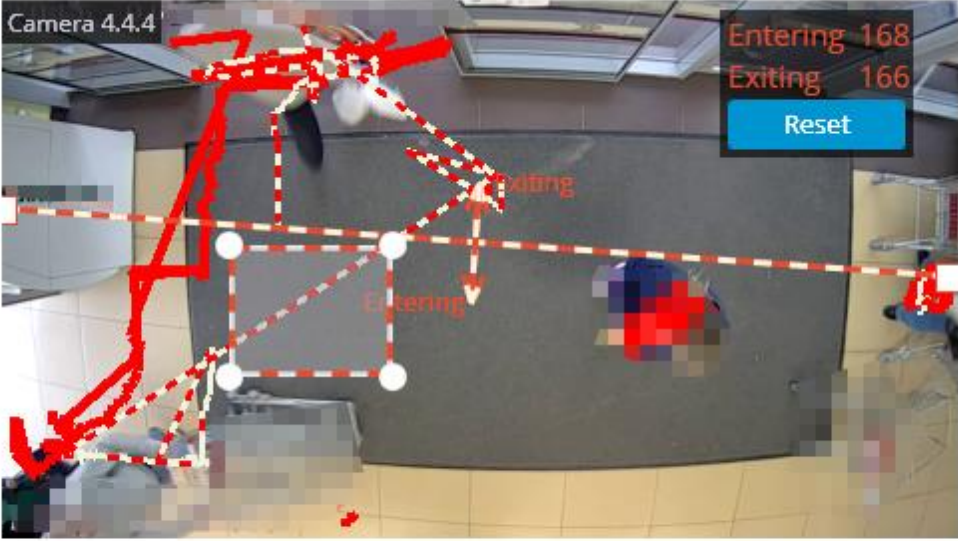
Save and exit Exit without saving

Visitor counting

Main settings Additional settings

Counting parameters ⓘ

Real time Archive



Camera 4.4.4

Entering 168
Exiting 166
Reset

Change movement direction

Counting method

Separately moving people in a frame ▾

Show the trajectory of the movement

Save and exit Exit without saving

The module settings are described below.

The **Real time** and **Archive** buttons permit to select the source of video for the preview window.


> Visitor counting
✕

Main settings Additional settings

Counting parameters ⓘ

Real time
Archive

ARCHIVE: Camera 4.4.4, 07.02.2019 13:44:09.281



[Change movement direction](#)

Counting method

Separately moving people in a frame
▼

Save and exit

Exit without saving

It is required to specify the crossline in the preview window by dragging the ends of the line with the mouse. This line must be crossed by all the entering and exiting visitors in order for the counting to be performed.

Warning

It is not recommended to place the crossline in the immediate proximity of doors or other moving objects.



Additionally, in the preview window, it is required to set up the average object size by dragging the corners of the rectangular frame with the mouse. The dimensions of the frame must enclose the counted object of the average size in the confluence with the line. This dimension is taken into account when counting: if the line is crossed by the object significantly bigger than the frame dimensions, it will be counted as several objects (for example, if the object is three times larger than the frame, it will be counted as three separate objects).



Note

It is recommended to use the video from the archive for the convenience of setting up the average size.



Note

The rectangle of setting the average size may be located in any part of the frame, i.e. it is not required to place it on the crossline.



The **Change movement direction** link permits to change the direction in which the entering people will be counted. To designate the direction of entrance and exit, the ends of the arrows perpendicular to the counting line are provided with the corresponding legends.

The **Counting method** dropdown list allows to select the way of counting in accordance with the conditions of the module's operation. The following options are available:

- **Several people in frame** ensures the counting of both separately moving people and groups of people. This method is recommended to be used in the majority of cases when the conditions of the module operation are met.
- **Separately moving people in frame:** this method is recommended to be used only when it is not possible to provide all the conditions of the module's operation (for example, if the camera is installed in a low position, or when it is not installed vertically) and more than one moving person rarely enters the field of view of the camera.

The following settings are available on the **Additional settings** tab:

> Visitor counting
✕

Main settings Additional settings Counting in the premises

Counting options ⓘ

Entering and exiting ▾

Algorithm accuracy ⓘ

Sensitivity Full frame analysis

Average ▾

Automatically save data to csv-files ⓘ

People counting data period: Minute ▾

Unload data every: Minute ▾

Path to files:

[Select folder](#)

Counter reset ⓘ

For specific camera ⓘ

Start time

Counter reset period

Save and exit

Exit without saving

Counting options is used to select the value that will be calculated, stored in the archive, and displayed in the client application.

Sensitivity : high sensitivity increases the chances of detecting objects but the probability of false triggering also increases; low sensitivity reduces the instances of false triggering but the counting accuracy may suffer.

Full frame analysis : activation of this option allows to increase the counting accuracy at the cost of the increased processor load.

Automatically save data to csv files enables automatic data saving to disc.

People counting data period sets the interval for which the counter data of one report line are summed up.

Unload data every determines the interval of the creation and saving of the report.

Path to files allows to set the folder on the server where the report files will be stored.

Warning

The folder on the server to which the camera being set up is bound is specified for automatic saving.

The **Select folder** button may be used only when the **Eocortex Configurator** application is launched on the server to which the camera is bound.

Note

The CSV filename format is as follows: **Counters_CameraName_DDMMYYYY#hhmm.csv**. For example, for the **Hour** period of autosaving for **Camera 1** camera the following files will be saved:

Counters_Camera 3_02022017#10.csv

Counters_Camera 3_02022017#11.csv

Counters_Camera 3_02022017#12.csv

The example of the CSV file contents:

time;in;out;inside;

02/02/2017 12:00:00;6;4;2;

02/02/2017 12:01:00;6;11;-5;

02/02/2017 12:02:00;10;6;4;

where **time** is the date/time of the beginning of the single counting interval; **in / out / inside** is the quantity of the people who, correspondingly, entered, exited and remain inside for the given period of time.

Counter reset determines the reset to zero parameters of the counters in the **Eocortex Client** application.

Start time sets the date and time the reset intervals will be counted from.

Counter reset period sets the counter reset interval.

The switch **For specific camera** sets the counter reset settings for an individual camera or for all cameras.

Note

If this switch is off, the counter reset settings will be applied to all cameras whose switches are off as well.

When the switch is on, the counter reset settings are set for an individual camera and do not change the counter reset settings for other cameras.

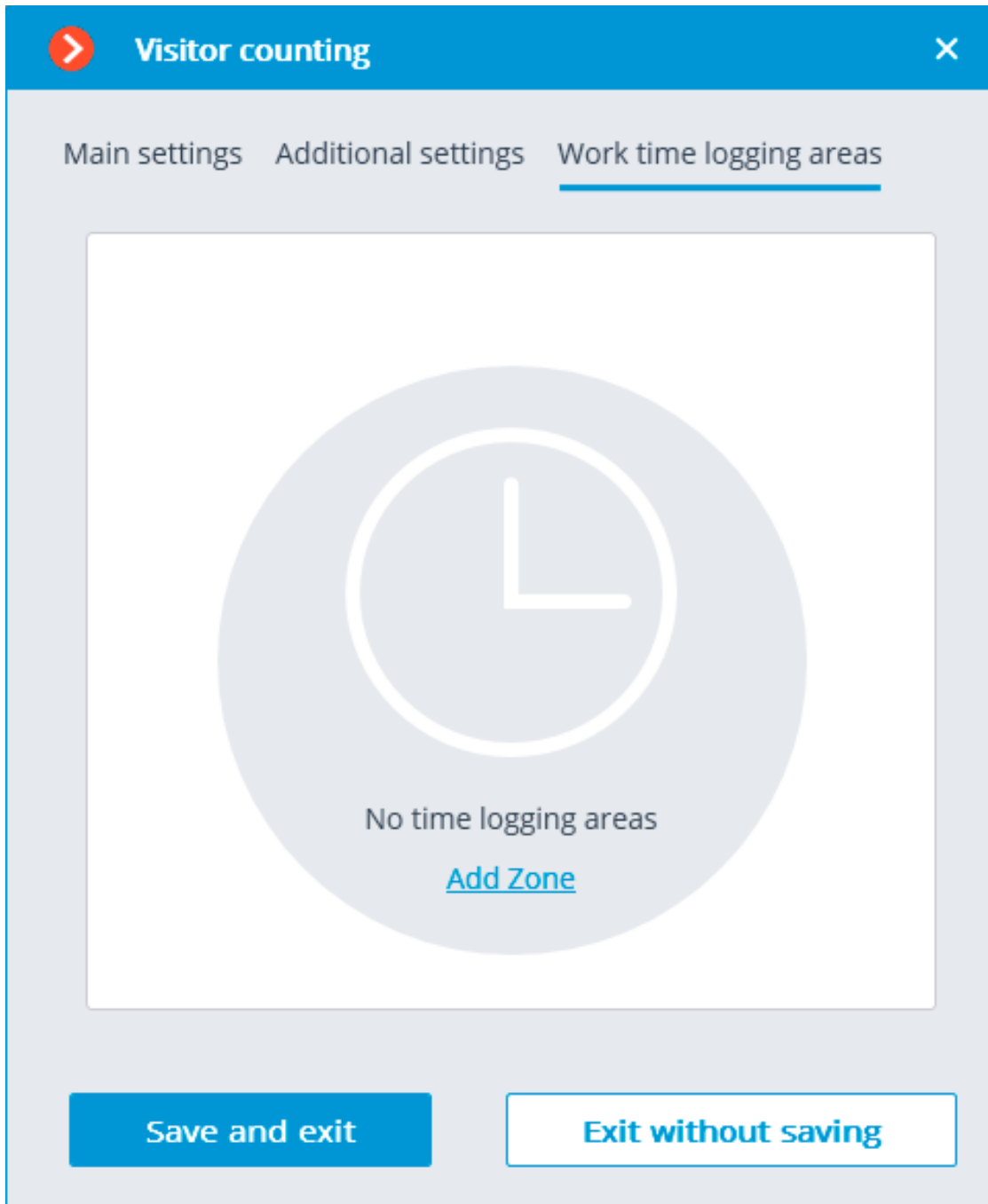
If the switch for an individual camera is off and the changes are made, the selected settings will be applied to all other cameras with the switch off upon saving the settings.

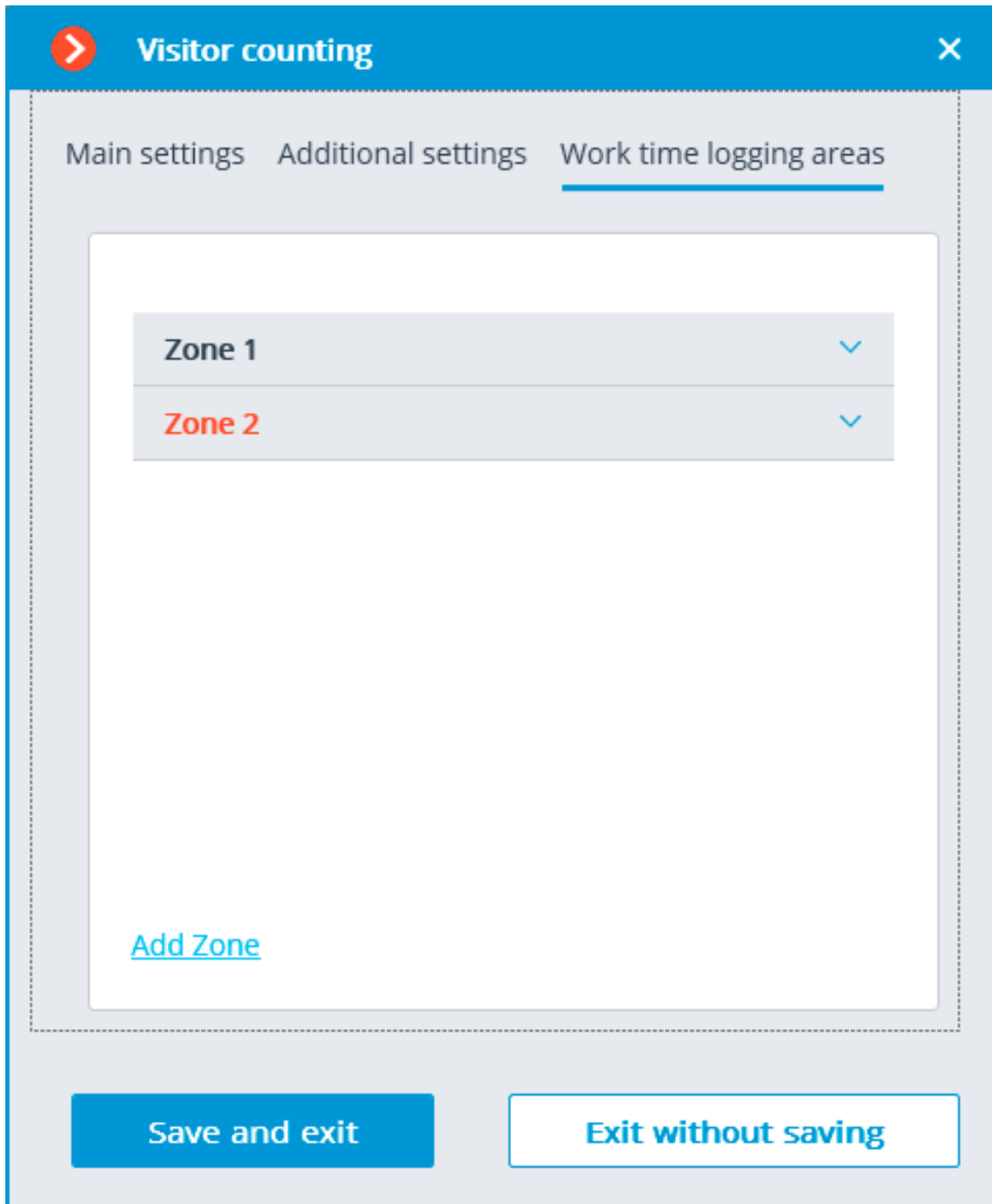
When the switch mode is changed, the following settings are made automatically:

- When switching to general settings: general settings
- When switching to unique settings: the most recent (saved) unique settings.

By default, the switch is off.

On the **Time logging areas** tab, it is possible to set the zones that will be used for counting visitors in the premises.





In order to set the maximum allowable quantity of visitors and to include the cameras into the zone, it is required to open the settings of the corresponding zone.

The screenshot shows a window titled "Visitor counting" with a close button (X) in the top right corner. Below the title bar are three tabs: "Main settings", "Additional settings", and "Work time logging areas", with the last one being the active tab. The main content area is a form for configuring "Zone 1". It includes a header bar with the zone name and edit, delete, and expand icons. Below this, there is a text input for "Maximum allowed number of people" (set to 10) and another text input for "Camera 1, Camera 2". A search bar with the placeholder "Search by camera name" is located below the camera list. At the bottom of the form area are two buttons: "Expand all" and "Collapse all". Below the form is a list of camera objects: "All cameras" (unchecked), "Object 1" (checked), "Camera 1" (checked), "Camera 2" (checked), and "Camera 3" (unchecked). At the bottom of the window are two large buttons: "Save and exit" and "Exit without saving".

Warning

The module will start working only when **the settings are applied**.

Note

Within 10 to 15 seconds after the application of the settings the module will be in the process of "learning"; during this time the counting results will not be accurate.

Since during “learning” the registering of the permanent background is performed, it is recommended to use this setting when there is a minimal number of moving and foreign objects in the frame in order to ensure the more accurate counting.

Requirements and recommendations

For the proper operation of the module, it is recommended to ensure that the following conditions are met:

The camera must be installed vertically. A different way of camera installation may adversely affect the counting accuracy.

The recommended minimum camera installation height is 3 meters above the ground.

The camera must be fixed.

Depending on the operation conditions, the framerate must be as follows:

- **Several people in frame:** at least 10 fps;
- **Separately moving people in frame:** at least 5 fps.

For reducing false triggering due to the changes of the background and lighting, it is required to ensure uniform illumination without flicker and sharp changes of brightness. The presence of moving foreign objects in the camera field of view is to be avoided because such objects may also be counted.

If the **Separately moving people in frame** option is used and there are moving foreign objects in the frame, including such objects as doors, escalators etc., it is recommended to specify the detection zone that does not include these objects in the software motion detector settings.

Search for Objects

The **Search for Objects** module allows to quickly find people and other objects in the archive.

Capabilities of the module

Search in the archive for

- any moving objects:
 - in a set rectangular area;
 - crossing a set line.
- people:
 - any people;
 - by the color of clothes;
 - by samples from the archive or an image file.
- vehicles:

- by category: passenger cars and trucks, buses, two-wheel transport;
- by color;
- by samples from the video archive or an image file.
- hazardous items (firearms and baseball bats).
- animals (terrestrial animals and birds).
- bags (luggage, suitcases and backpacks).

Cross-camera tracking:

- chronologically connected search among several cameras for the person found before using the interactive search;
- generating a video clip of the fragments found;
- displaying a trajectory on the plans (if the cameras with the found fragments were placed on the plans).

Details



Warning

Starting with version 3.5 of **Eocortex**, the **Tracking, Search for Objects** and **Uniform Detection** modules running on the same camera share the processor and video card resources. This reduces the load on the server.

For the most efficient sharing of resources, it is recommended to set the same operating mode for the camera in the settings of these modules: either using a video card or without using a video card.



For the correct operation of the module, it is required to properly place and set up the camera, enable and adjust the software motion detector and the module itself.

Module setup

To use the module, enable and set up the software motion detector, then enable and set up the module itself.

Launch the **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.



Then switch to the **Analytics** tab and enable the module using the  toggle.


Connection Rights Archive Motion detector **Analytics** Watermark

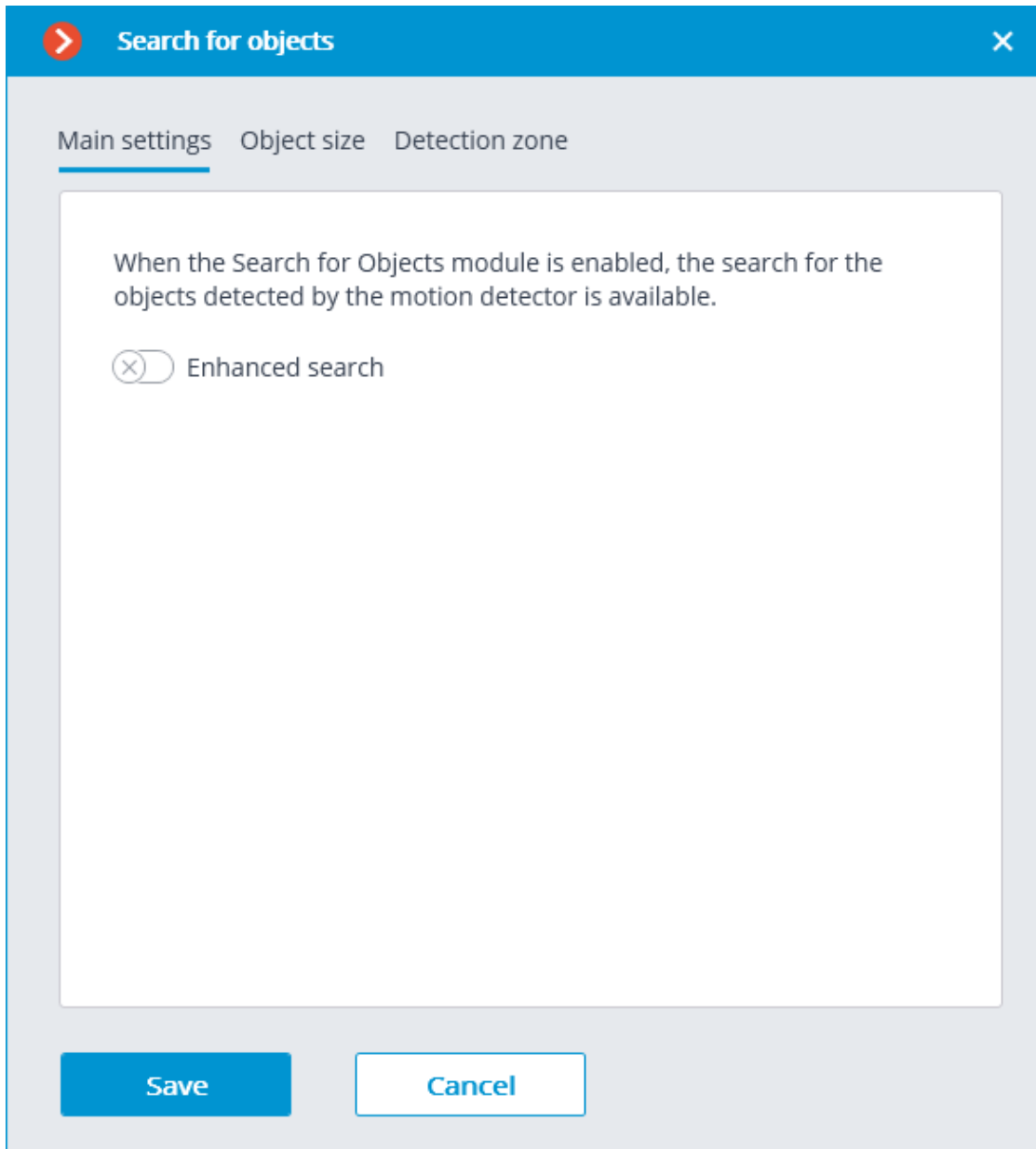
Server-based analytics


<input type="checkbox"/> Sabotage Detection	<input type="checkbox"/> Loud Sound Detection	<input type="checkbox"/> Auto zoom	<input type="checkbox"/> FishEye Dewarping	<input type="checkbox"/> Tracking	<input checked="" type="checkbox"/> Search for Objects
<input type="checkbox"/> Face Recognition (Complete)	<input type="checkbox"/> Unique Visitor Counting	<input type="checkbox"/> Face Recognition (Light)	<input type="checkbox"/> People Counting	<input type="checkbox"/> Counting People in Queue	<input type="checkbox"/> Crowd Monitoring
<input type="checkbox"/> Face Detection	<input type="checkbox"/> Traffic Density Heat Map	<input type="checkbox"/> Personnel Activity Monitoring	<input type="checkbox"/> Uniform Detection	<input type="checkbox"/> Face Mask Detection	<input type="checkbox"/> Shelf Fullness Check
<input type="checkbox"/> Fire and Smoke Detection	<input type="checkbox"/> Abandoned Objects Detection	<input type="checkbox"/> Object Classification and Counting	<input type="checkbox"/> Emergency Vehicle Detection	<input type="checkbox"/> License Plate Recognition	<input type="checkbox"/> Fall Detection
<input type="checkbox"/> Frame Area Blurring					

Perspective

Pay attention! The alarm generation method has been changed. Now, to generate alarms, it is necessary to create automation scenarios. ⓘ
To configure the automation script for module events, switch to "Automation"

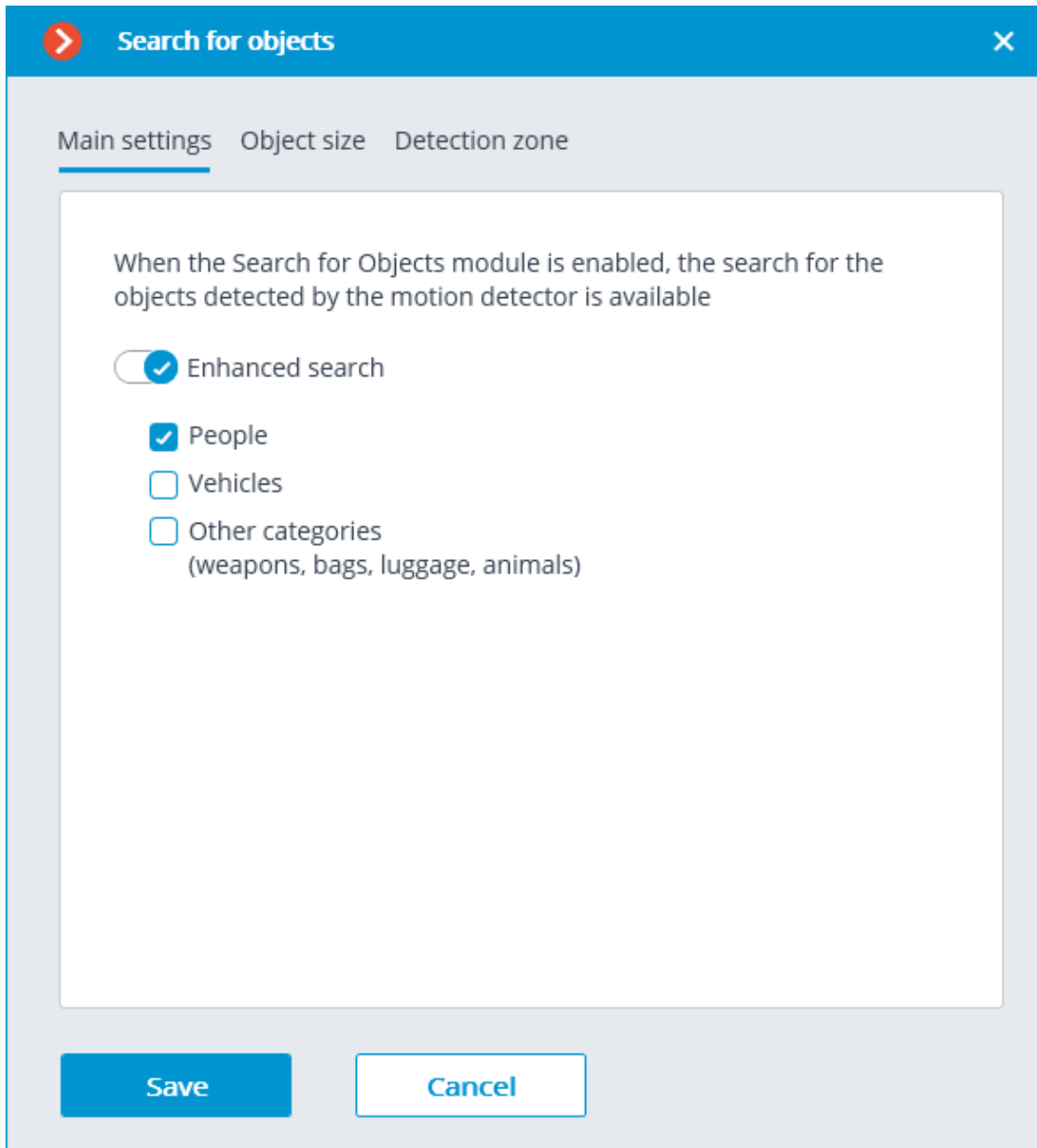
Clicking the  button opens the module setup window.



When the **Search for Objects** module is enabled on the camera for the first time, the search for moving objects only mode is enabled. This mode corresponds to the disabled **Enhanced search** switch .





The **Enhanced search** mode, when enabled, allows searching for objects of the following categories:

- People;
- Vehicles;
- Other categories.



Later, when receiving search results, objects from **Vehicles** and **Other categories** can be filtered by object type.

The **Vehicles** category includes objects of the following types:

-  Passenger cars;
-  Trucks;
-  Buses;
-  Two-wheelers.

The **Other categories** includes objects of the following types:

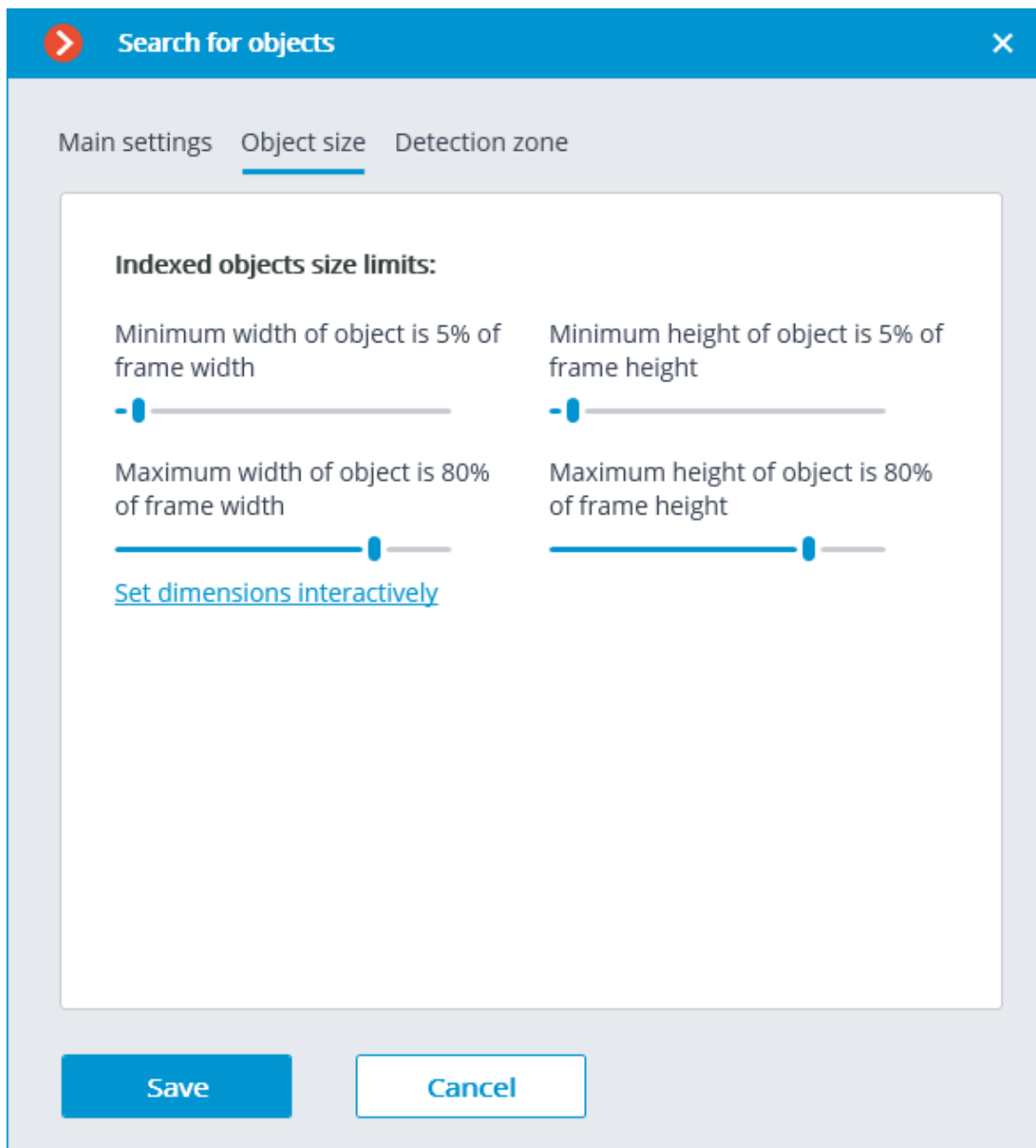
- Animals (terrestrial animals and birds);

- Bags (luggage, suitcases and backpacks);
- Hazardous items (firearms and baseball bats).

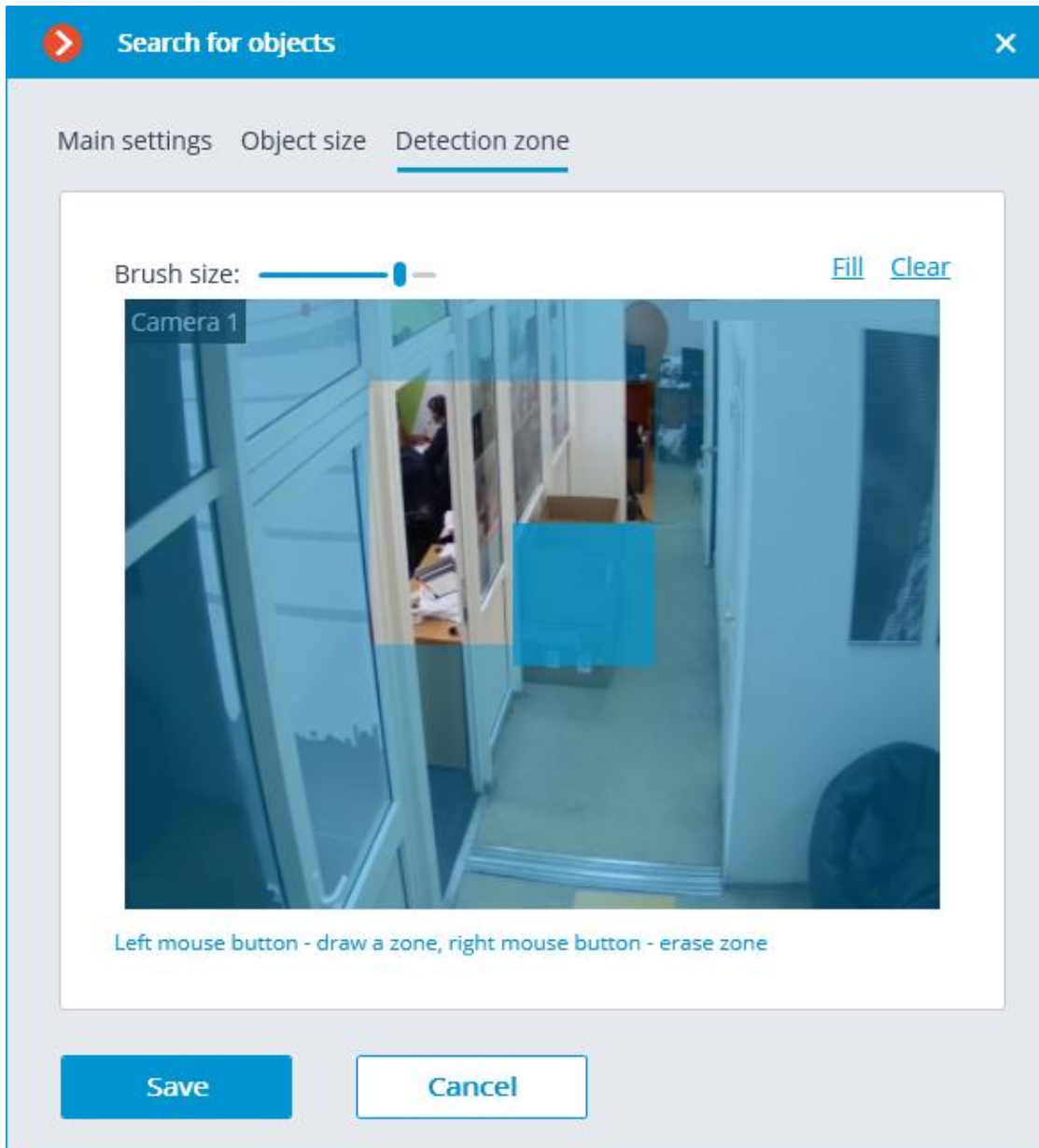
Note

When searching for objects from the **Other categories**, the consumption of server resources increases significantly.

The **Object size** tab sets the minimum and maximum sizes of the detected objects.



Detection zone is the zone of the frame filled with the semitransparent blue fill in the settings window. The mouse is used for modifying the zone: left mouse button serves for filling the zone, and the right one is used for clearing it. With the help of the **Fill** and **Clear** buttons you can fill or clear the whole area of the frame. The corresponding slider is used to modify the **Brush size**.



Warning

The module will start working only when **the settings are applied**.

Requirements and recommendations

Functional limitations

Warning

After updating **Eocortex** from version 3.3 and lower to version 3.3 and higher, the **Search for Objects** module will not be able to search for objects for the period preceding the update. This is due to the database change in version 3.4.

Hardware and software

Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.

The following equipment is required to use this neural network-based module:

- A processor that supports AVX instructions;
- An **NVIDIA** video card (GPU) with the computation capacity index of at least 6.5 and with at least 4 Gb of memory; the parameters and performance of the video card must be similar or better than those of **NVIDIA GTX 1650 Ti** model;
- Version of the video card driver at least 460;
- Swap file at least half of the total RAM size.

If the package will be installed on a virtual machine, it may additionally be required to:

- Enable support for AVX instructions in the guest machine settings;
- Use GRID drivers for GPU virtualization.

Warning

Eocortex must use video cards selected for running neural networks in monopoly mode. It is not allowed to use such card for other applications or tasks that consume GPU resources, including for displaying video. Simultaneous use of a video card for several tasks may lead to incorrect system operation: from analytics performance degradation to server instability.

Warning

Simultaneous execution of tasks of video displaying and analysis with the **Face Recognition (Complete)** or **Unique Visitor Counting** modules working on the **** Eocortex Neural Networks Standard**** package can cause significant lags of face recognition processes when using graphics cards of **GTX 10XX** and **GTX 16XX** series with 4 GB of video memory or less. It is recommended to use dedicated graphics cards for these tasks.

Warning

The neural network works with the 64-bit version of **Eocortex** only.

Warning

When upgrading **Eocortex** to another version, it is necessary to also upgrade the **install the Eocortex Neural Networks package** package to the corresponding version.

Video stream

- The frame rate must not be lower than 10 frames per second;
- The optimal resolution is HD or FullHD.

Image

- Lighting in the frame should be uniform and constant.
- If the camera is installed in front of a bright light source (the sun behind an entrance door, etc.), it is required to adjust the exposure (or brightness) to ensure that the objects in the frame have a natural color (not overexposed or darkened). In this case, it is permissible for the background to be overexposed.
- The image must be in color.
- There must be no significant compression artefacts.
- The compression quality must not be lower than average.
- The object must be seen from a suitable angle, at which it will be clearly distinguishable from the background and plainly visible when observed by the human eye.

For searching for people:

- A strong lateral light source (sunlight from a window) is not permitted because in this case one half of the person will be overexposed and the other half will be too dark.

Scene and camera position

- The frame must not contain mirrored surfaces that give reflections: glasses, mirrors, etc.
- It is allowed to place the camera overhead. The tilt angle of the camera should not exceed 45 ° from the horizontal line.

For searching for people:

- People must be visible at full height.

For searching for vehicles:

- Installing the camera at an angle to the axis of movement of the vehicles provides the most advantageous perspective.

Module performance quality

Minimum requirements for searching vehicles by color:

- The vehicle must be of single color, without multicolored stickers or the like.
- The vehicle must be captured during daylight hours and in good weather.
- The exposure and contrast on the camera must be adjusted in such a way that the color of the subject can be unambiguously determined by the human eye.
- The body of the vehicle must not be light-struck by headlights or other reflections of light, including sunlight.
- The angle at which the vehicle was captured must allow to correctly determine the dominant color of the object (for example, if the car is seen from behind, the bumper is painted in a dark color and the rear window is tinted, the color of the car may be detected as black).

Below are the examples of favorable and unfavorable angles for determining the type of vehicle. The better the perspective, the higher the accuracy of determining the type of a passing vehicle. On average, under good conditions, the accuracy of determining the type of vehicle is about 80%.

Favorable perspective

Unfavorable
perspective

Favorable perspective

Unfavorable perspective



Favorable perspective



Unfavorable perspective



The accuracy of searching for other objects significantly depends on the quality of the image, on the size of the object in the frame, as well as on the perspective from which this object is seen. Under suitable conditions, the accuracy of searching for other objects can reach 40% to 60%, depending on the degree of visibility of the object in the frame and its size (for example, a partially hidden weapon or a suitcase hidden behind a corner will be much less likely to be detected than clearly distinguishable objects of the same type). Moreover, this category of objects is characterized by a greater number of false triggerings than others.

Below are the examples of favorable and unfavorable angles for searching for other objects.

Favorable perspective

Unfavorable perspective

Favorable perspective



Unfavorable perspective



Deployment of the module

Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.

Warning

The neural network works with the 64-bit version of **Eocortex** only.

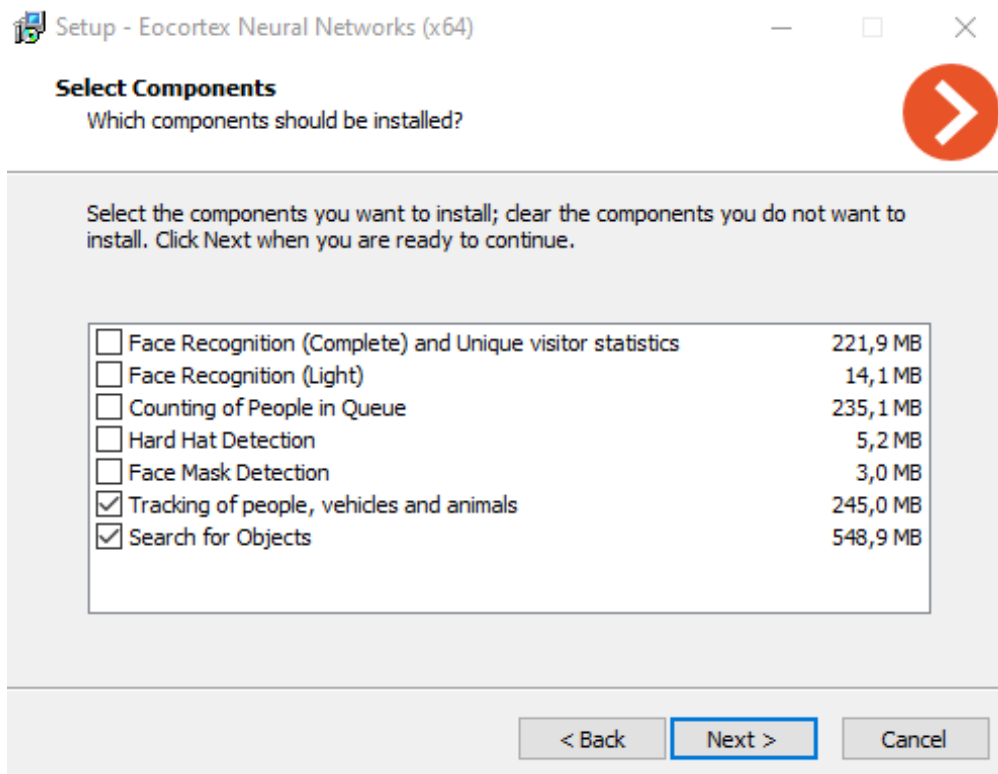
Warning

When upgrading **Eocortex** to another version, it is necessary to also upgrade the **install the Eocortex Neural Networks package** package to the corresponding version.

Warning

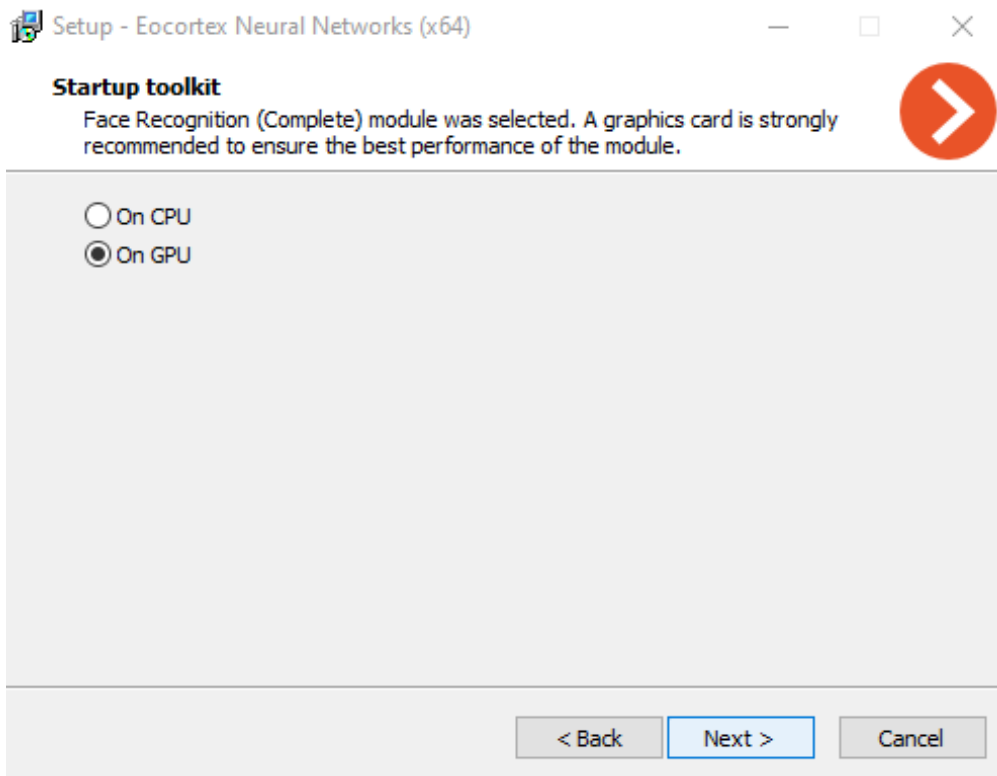
Starting with version 3.4 of **Eocortex**, the **Search for Objects** module uses version 11 or higher of PostgreSQL. In this respect, before installing version 3.4 and higher (as well as when upgrading from version 3.3 and lower to version 3.4 and higher), it is required to review the **PostgreSQL installation information**.

When installing the **Eocortex Neural Networks** package, it is required to select the appropriate component.



For neural network-based search, at the stage of picking tools for launching, it is necessary to select the **On GPU** option.

For searching only moving objects and people, the video card is not used.



Fisheye dewarping module

The **Fisheye dewarping module** is designed to perform software dewarping (converting) the images obtained from the panoramic cameras.


Details

Warning

The **Auto zoom**, **Fisheye dewarping module** and **Frame Area Blurring** modules are mutually exclusive, meaning that only one of these modules can be used on a camera at a given moment.

Module setup

To use the module, enable and set it up.

To do that, **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, go to the **Analytics** tab and enable the module using the  switch.


Connection Rights Archive Motion detector **Analytics** Watermark

Server-based analytics

<input type="checkbox"/> Sabotage Detection	<input type="checkbox"/> Loud Sound Detection	<input type="checkbox"/> Auto zoom	<input checked="" type="checkbox"/> FishEye Dewarping	<input type="checkbox"/> Tracking	<input type="checkbox"/> Search for Objects
<input type="checkbox"/> Face Recognition (Complete)	<input type="checkbox"/> Unique Visitor Counting	<input type="checkbox"/> Face Recognition (Light)	<input type="checkbox"/> People Counting	<input type="checkbox"/> Counting People in Queue	<input type="checkbox"/> Crowd Monitoring
<input type="checkbox"/> Face Detection	<input type="checkbox"/> Traffic Density Heat Map	<input type="checkbox"/> Personnel Activity Monitoring	<input type="checkbox"/> Uniform Detection	<input type="checkbox"/> Face Mask Detection	<input type="checkbox"/> Shelf Fullness Check
<input type="checkbox"/> Fire and Smoke Detection	<input type="checkbox"/> Abandoned Objects Detection	<input type="checkbox"/> Object Classification and Counting	<input type="checkbox"/> Emergency Vehicle Detection	<input type="checkbox"/> License Plate Recognition	<input type="checkbox"/> Fall Detection
<input type="checkbox"/> Frame Area Blurring					

Perspective

Pay attention! The alarm generation method has been changed. Now, to generate alarms, it is necessary to create automation scenarios. To configure the automation script for module events, switch to "Automation"

Clicking the  button opens the module setup window.

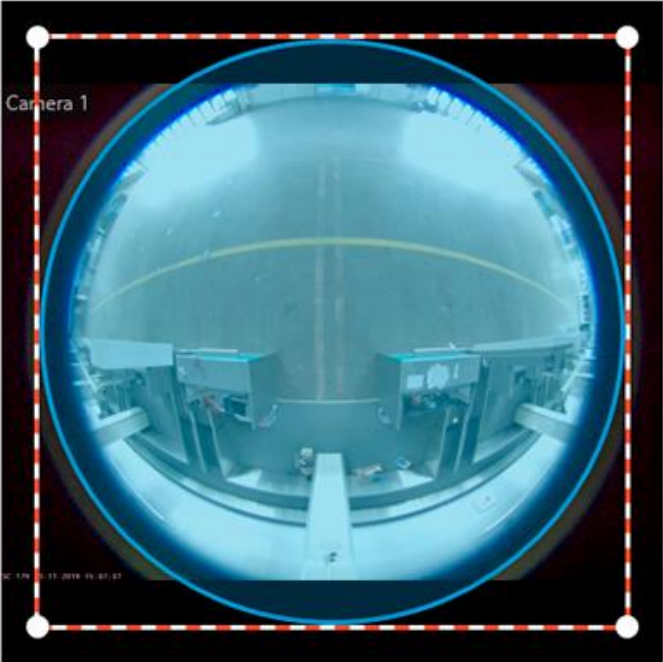
Fisheye dewarping

Camera placement

- Ceiling-mounted
- Floor-mounted
- Wall-mounted

Set the circumference by image size

[Initial position](#)



Save **Cancel**

In the settings it is required to set the image radius by dragging the image boundary: the circle must coincide with the camera image boundary. If needed, it is also possible to drag the center of the circle using the mouse.

Warning

The module will start working only when **the settings are applied**.

Frame Area Blurring

The **Frame Area Blurring** module is designed to blur the specified areas of the frame on a real-time and archived video.



Details

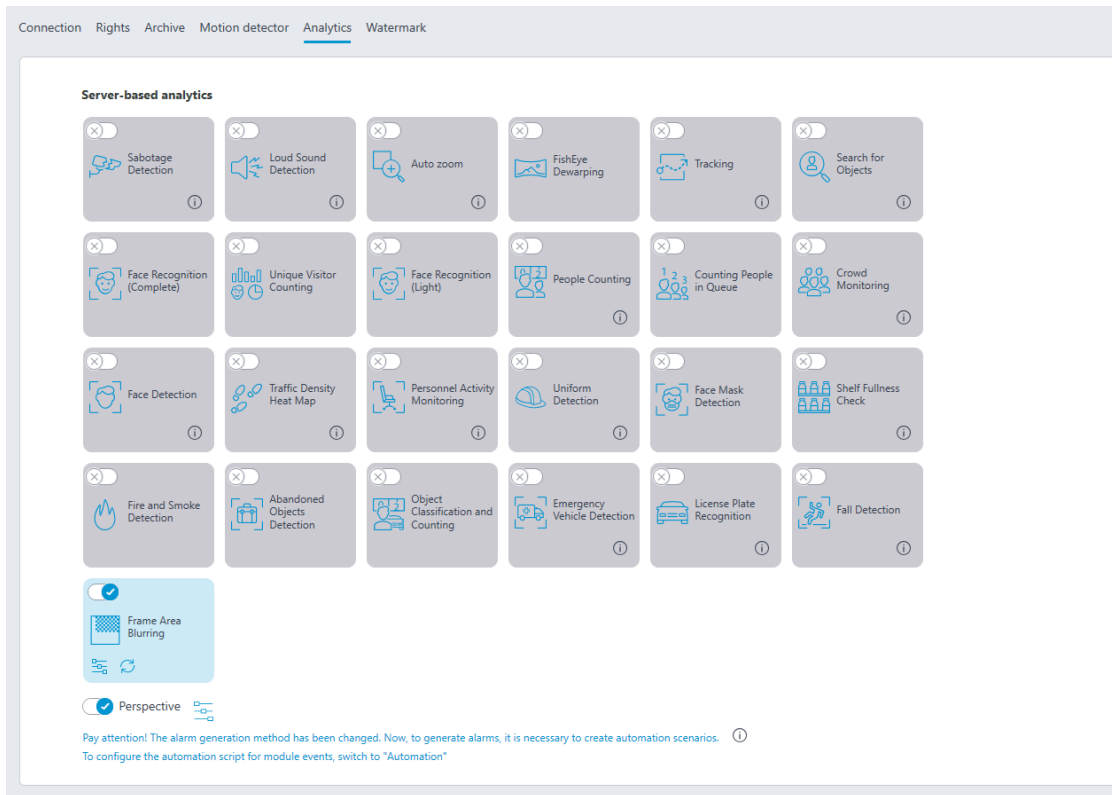
Warning


The **Auto zoom**, **Fisheye dewarping module** and **Frame Area Blurring** modules are mutually exclusive, meaning that only one of these modules can be used on a camera at a given moment.

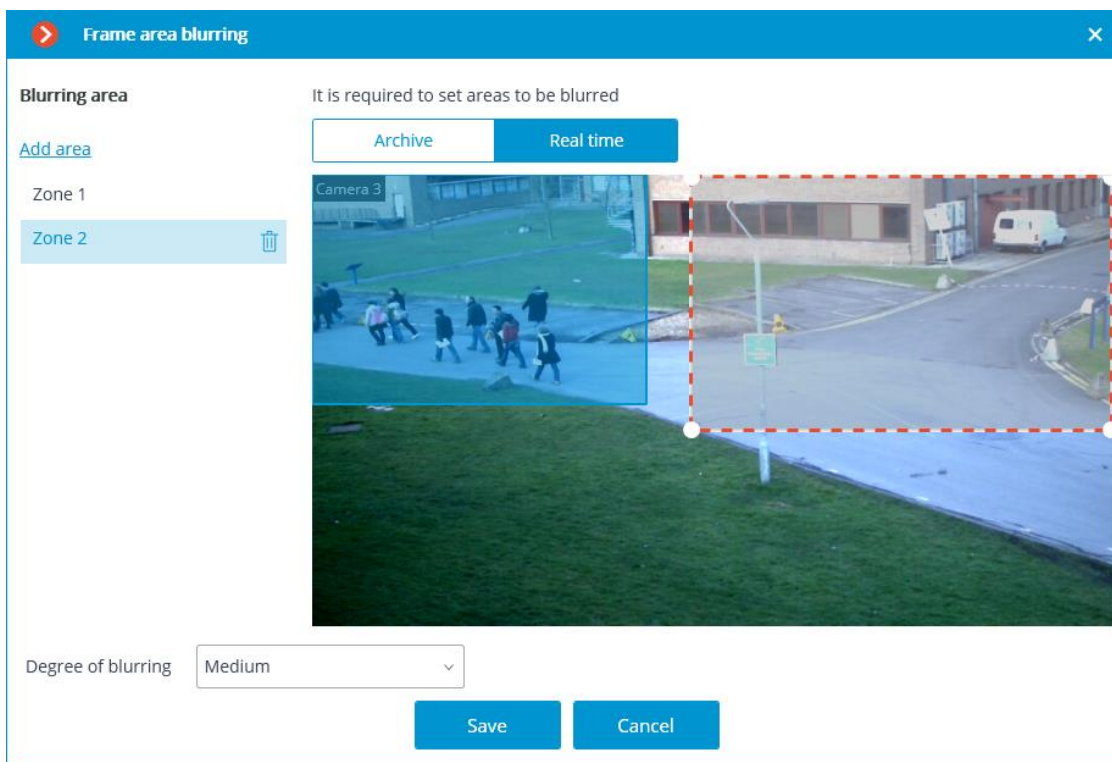
Module setup

To use the module, enable and set it up.

To do that, **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, go to the **Analytics** tab and enable the module using the  switch. 



Clicking the  button opens the module setup window.



In the window that opens, it is required to specify one or more rectangular blurring zones, as well as the degree of blurring.

In total, it is possible to add up to 10 blurring zones. All the zones will have the same degree of blurring.

Note

Frame area blurring works when viewing live and archived video in the **Eocortex Client** application.

Warning

Frame area blurring does not directly affect the video received from the camera and recorded to the archive. Thus, blurring does not work when exporting archive video and saving frames.

Warning

The module will start working only when **the settings are applied**.

License Plate Recognition

Module **License Plate Recognition** is intended for recognition of moving cars state license plates with saving information about the time and date of recognition, the license plate of the car, as well as links to the corresponding video frame in the archive.

The module usage in the application **Eocortex Client**.

Capability of the module

Recognition of license plate with the following information:

- Vehicle registration number
- Country code
- The color of the license plate

License plate recognition for the countries listed below:

Azerbaijan (AZ), Armenia (AM), Belarus (BY), Great Britain (GB), India (IN), Indonesia (ID), Kazakhstan (KZ), Russia (RU), Uzbekistan (UZ).

Warning

Recognition of license plates from other countries is not guaranteed.

Recognition of license plate numbers for vehicles moving at speeds not exceeding 120 km/h

When recognizing a license plate, the following is generated: **event Recognized license plates.**

Reports

The reports are available in the module as well as **Automatic reports:**

- License Plate Recognition
- Entry/exit time recording
- Vehicle counting

Additional information

To automate the extraction of recognized license plate lists, you can utilize the capabilities of: **Eocortex API.**

Interaction with barriers can be implemented through signal outputs of IP cameras or other network devices supported by: **Eocortex.**

Warning

The country code is not displayed in reports and the camera cell; it can only be obtained through: **Eocortex API.** At the same time, the country code can be utilized in automation scenarios under the conditions.

Events Recognized license plates.

Note

When transitioning to this module from other license plate recognition modules, previously recorded events will be preserved.

Note

The license plate database is the common for all license plate recognition modules.



The module can operate on various GPUs, including both NVIDIA and AMD video cards.

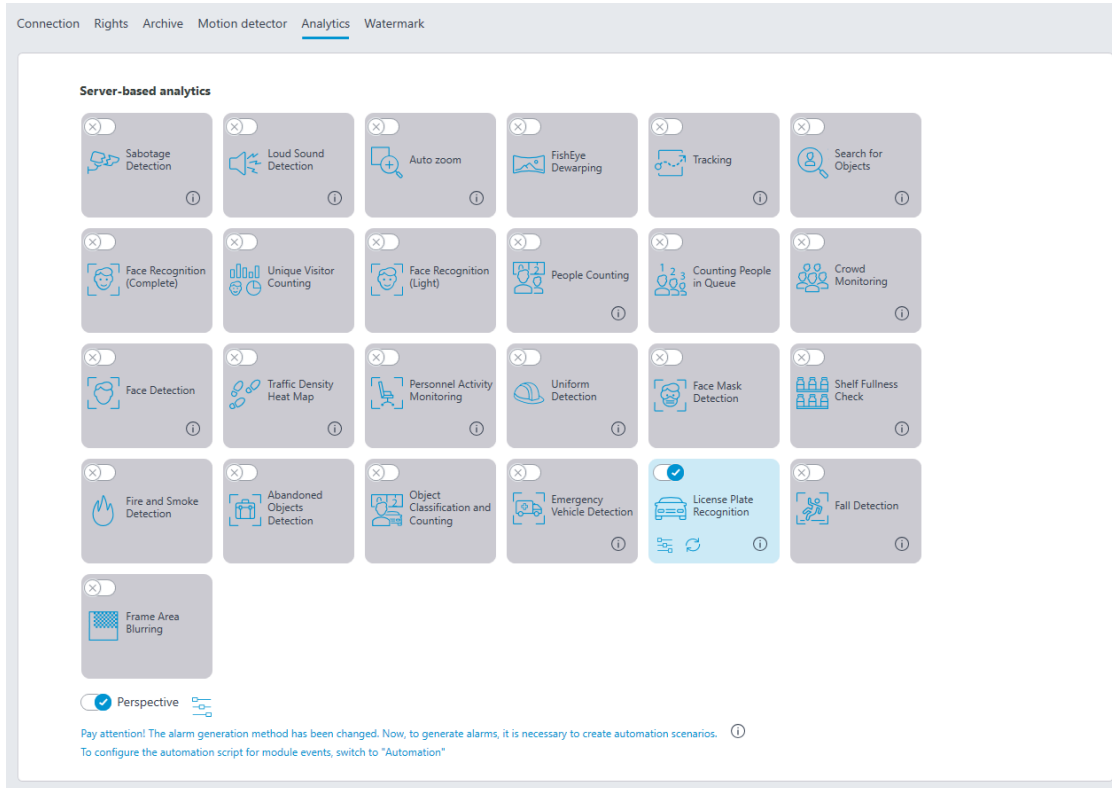
- **Module setup**
- **Requirements and recommendations**
- **Deployment of the module**


Module setup

To use the module, enable and configure it.

To do that, launch the **launch the Eocortex Configurator application**

application, go to the  **Cameras** tab, select a camera in the list located on the left side of the page, then go to the **Analytics** tab on the right side of the page, and enable the module using the  switch.



Clicking the  button opens the module setup window.

License Plate Recognition
□ ×

Basic settings
Parking spots
Database
Barrier gate control

Necessary configuration

[Set the size range of a license plate](#) [License plate search zone](#)

Additional settings

Mode
 ⓘ

Determine the movement direction

Moving the plate from top to bottom

Do not consider car plates

Detect two-line plates

Number of license plate frames required for recognition ⓘ

Plate color

Save
Cancel

The module settings description is provided below.

Basic settings

License Plate Recognition
□ ×

Basic settings
Parking spots
Database
Barrier gate control

Necessary configuration

[Set the size range of a license plate](#) [License plate search zone](#)

Additional settings

Mode
 ⓘ

Determine the movement direction

Moving the plate from top to bottom

Do not consider car plates

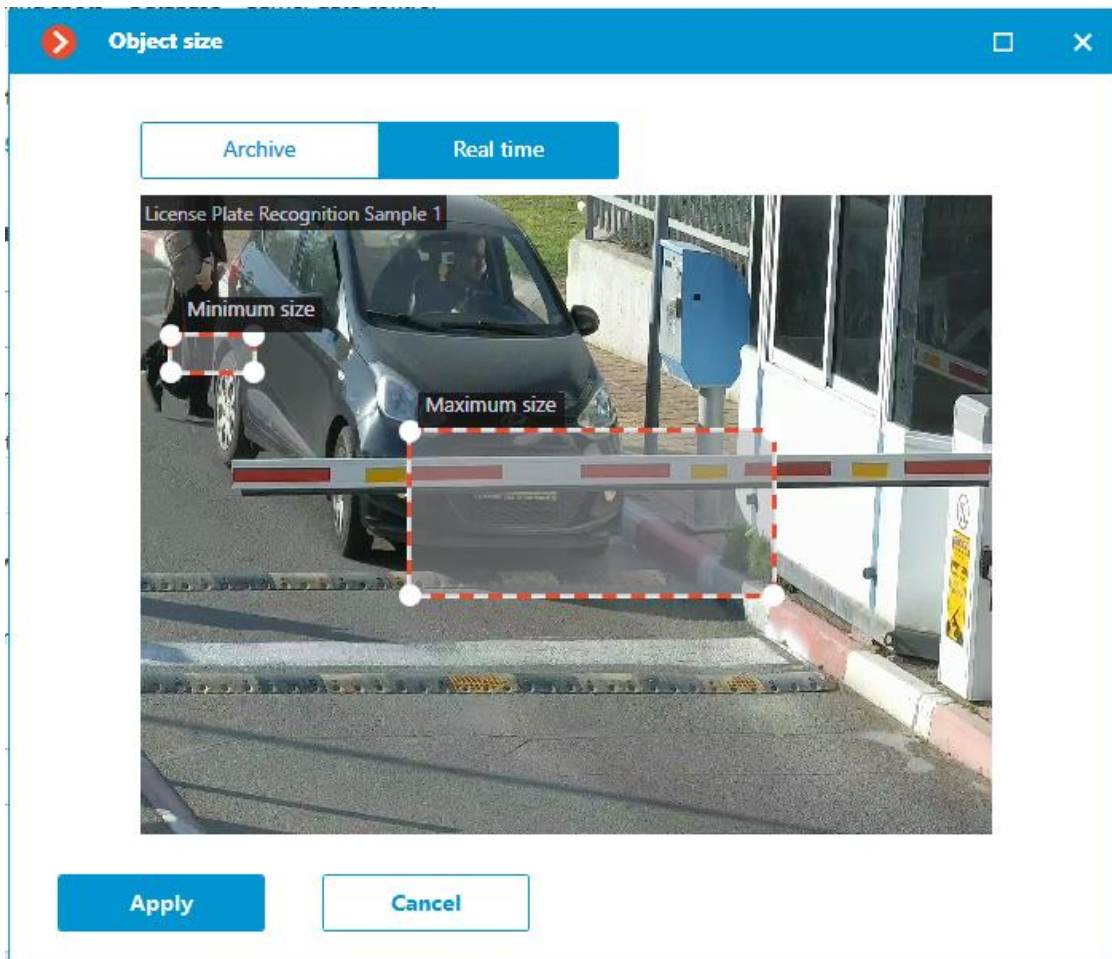
Detect two-line plates

Number of license plate frames required for recognition ⓘ

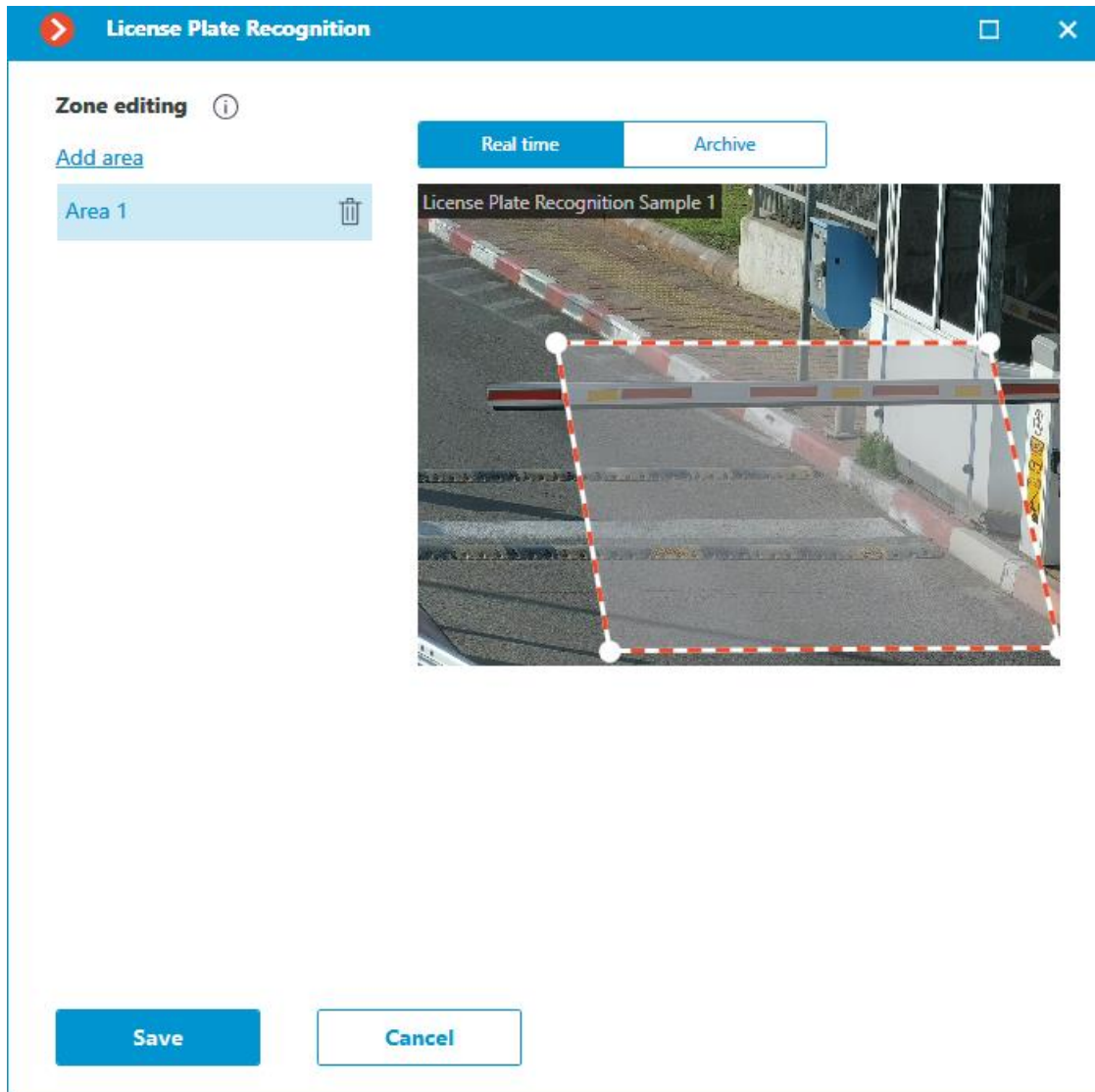
Plate color

Save
Cancel

Set the size range of a license plate: Opens the settings window for the minimum and maximum width of recognized license plates.



License plate search zone: Opens the zones settings window in which license plates will be recognized.



Mode: Selecting the license plate detection mode based on the speed of vehicle movement.

Mode options:

- **Slow:** for stationary or slow-moving objects. For example, for parking lots. The distance the object shifts in the movement direction in one second should not be more than 1/4 of its size.
- **Medium:** For objects moving at an average speed. For example, for slow moving cars in a parking lot. The distance the object shifts in the movement direction in one second should not be more than its size.
- **Fast:** For objects that come in and out of the frame quickly. For example, for cars on a highway. The distance the object shifts in the movement direction in one second should not be more than 2.5 times of its size.

Determine the movement direction: Enabling this option allows you to specify which direction of vehicle movement will be considered as entry and which as exit.

You can also configure a parameter that will not consider certain vehicle license plates:

- Upon entry
- Upon exit
- For undetermined direction.

Detect two-line plates: Enabling this option allows the detection of two-line license plates.

Number of license plate frames required for recognition: The module accuracy settings. The License Plate Recognition event will be created only when the license plate is recognized on the specified number of frames. A larger value reduces the number of false recognitions, but may lead to the recognition failure of license plates moving fast in the frame.

Plate color: Selecting the color of the license plate for detection.

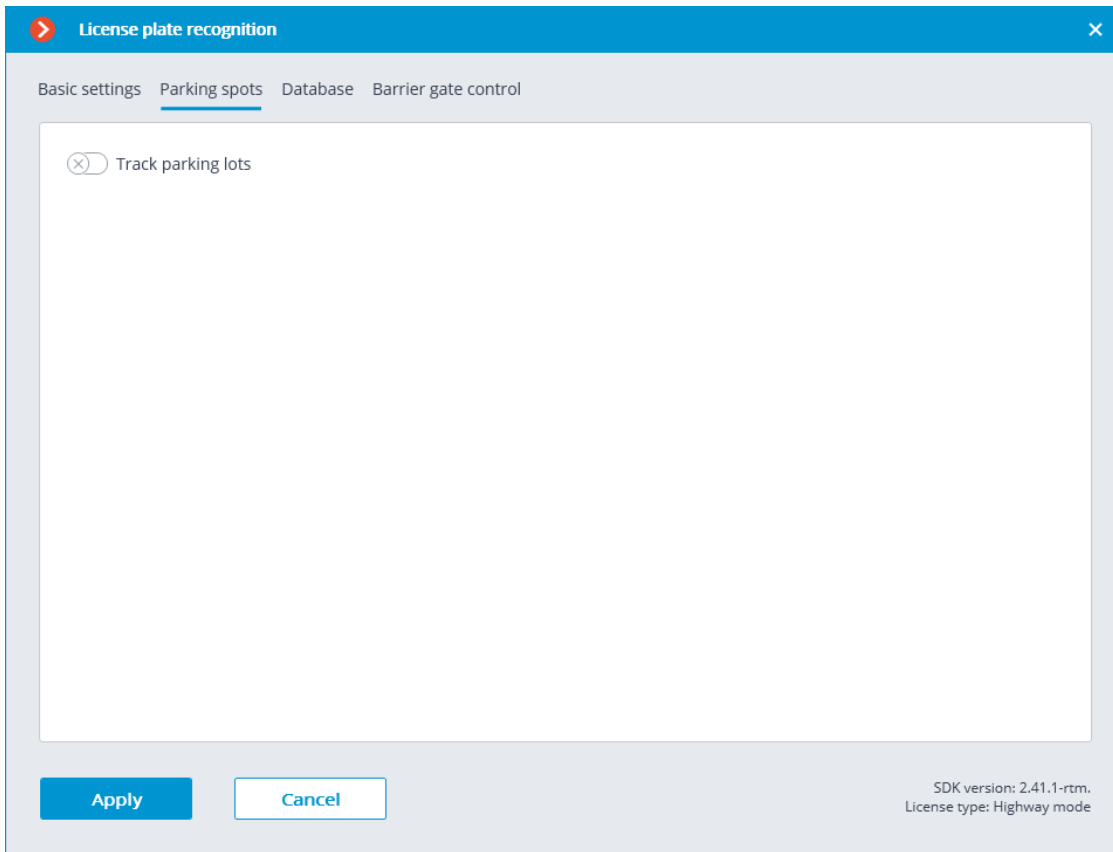
Available colors:

- White
- Black
- Blue
- Orange

Configuration recommendations.

Parking spots

On the **Parking spots** tab, settings for parking lots can be made.



To access the settings for parking lots, turn on the **Track parking lots** slider.

Note

Parking lot settings are set for the entire system.

The following actions can be performed in the settings window:

- create a new parking lot;
- edit or delete an existing parking lot.

The following settings can be set for a parking lot:

- name;
- one or more cameras working as entry and exit points;
- permissible parking time;
- number of parking spots;
- period and time of resetting the counter.

License plate recognition

Basic settings **Parking spots** Database Barrier gate control

Zone [edit] [delete] [refresh]

In : Camera 2 Out : Camera 3

Search by camera name

Expand all Collapse all

- All cameras
 - Camera 1
 - Camera 2
 - Camera 3

Updating the counters ⓘ

Start time: 24.03.2022 09:39:40

Counter reset period: Never

Allowable parking time, min.: 60

Number of parking spots: 50

Apply Cancel

SDK version: 2.41.1-rtm. License type: Highway mode

The following **events** were added to the **Tasks by event** tab of the Automation section:

- Parking vehicle counter has been changed
- Parking event
- Parking lot occupancy has changed

A new **user right**, **Adjusting the number of occupied parking spots**, has been added to the Users section. This right allows the user to change the value of the occupied parking spots counter in the **Eocortex Client** application. By default, this right is enabled.

Database

The access to the license plate database can be set on the **Database** tab.

License plate recognition

Basic settings Parking spots Database Barrier gate control

Local
 Remote

Address: 127.0.0.1
 Port: 3050

User name: SYSDBA
 Password: ●●●●●●

Type:
 Windows
 Linux

[Connection check](#)

Apply Cancel

SDK version: 2.41.1-rtm.
License type: Highway mode

Two database deployment options are available: **Local** or **Remote**.

If the recognition process runs on only one server, it is recommended deploying the database on this server by selecting **Local**.

If the recognition process is running on several servers, the database should still be hosted only on one of them. For this purpose, select the **Remote** option for all cameras and specify the database connection parameters: server address, name and password of the database administrator. The same applies when the database of the module is deployed on one server, and the camera with the module enabled is attached to another one.

Note

Eocortex version 3.6 and lower uses **Firebird** DBMS with the following default values:

- **Port:** 3050
- **Username:** SYSDBA
- **Password:** masterkey

Note

Starting from version **Eocortex** 4.0, the module's database is handed over to the **PostgreSQL DBMS** with the following default values:

- **Port:** 5432
- **Username:**
 - For Windows: postgres
 - For Linux: eocortex
- **Password:** masterkey

Warning

Remote access to databases is not allowed by default in PostgreSQL and must be additionally configured if remote databases are used for analytics. All settings must be done for the server where the database is stored. Settings are slightly different for **Windows** and **Linux** operating systems.

When the server is running for the first time after upgrading **Eocortex** to version 4.0 or higher, the existing module database will be automatically transformed to be compatible with **PostgreSQL**.

Warning

If connecting to a **Remote** database, use the DBMS **Username** and **Password** that are valid for the server storing the database.

Warning

Independent of the database location, the recognition events (date and time of recognition, coordinates of the object in the frame, binding of the recognized object to the database) will always be stored on the server to which the camera with the corresponding events is bound.

Warning

Synchronization with the database located on a remote server can take some time

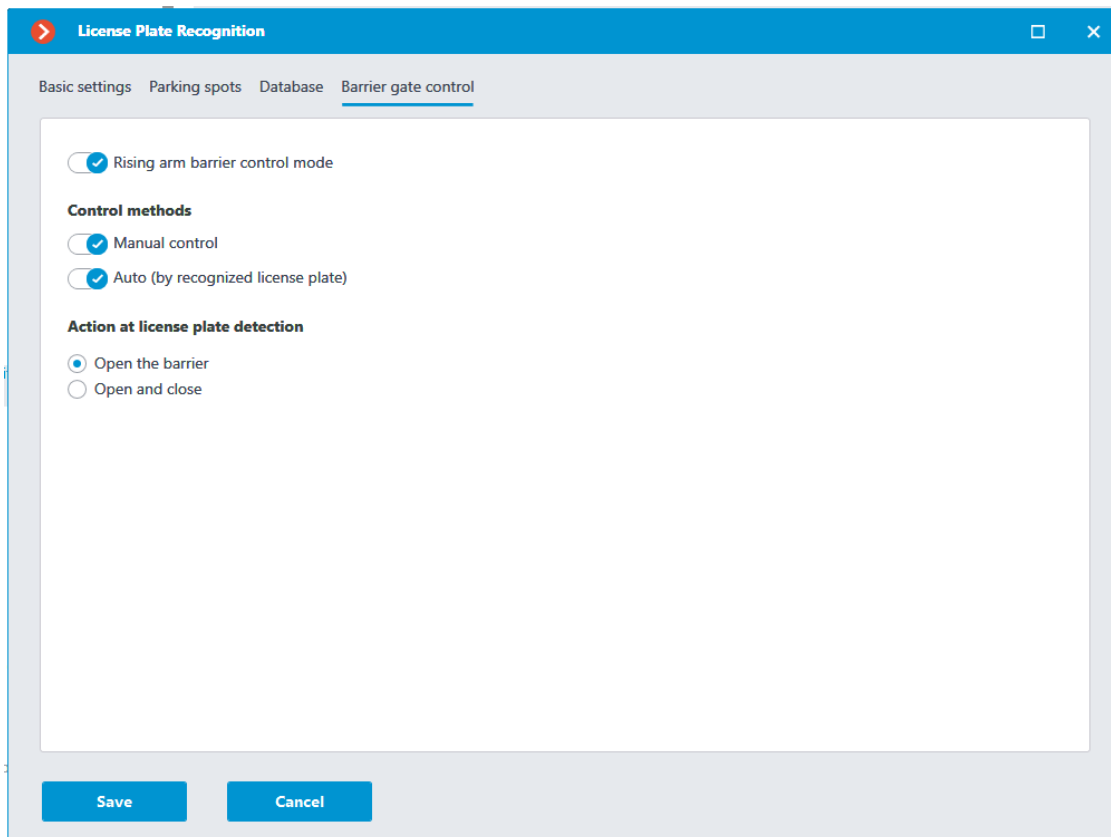
Note

When using a remote database, the **remote database replication mechanism** will be applied.

It is possible to check the availability of the database clicking the **Connection check** link. If the server is unavailable, the corresponding message will be displayed.

Barrier gate control

The settings of the module's interaction with a rising arm barrier can be made on the **Barrier gate control** tab.



The **Rising arm barrier control mode** must be activated to access the settings of the module's interaction with a rising arm barrier.

Note

To use the module only for controlling a rising arm barrier, the **Licence plate recognition (Complete)** module license or protection key is not required. However, for ensuring the abovementioned functionality, it is necessary to have the **Licence plate recognition (Complete)** module support indicated in the **Eocortex** license file or software key for the corresponding quantity of cameras.

When the rising arm barrier control mode is activated, the following capabilities are available:

Control methods:

- **Manual control:** allows the operator to open and close the barrier using the **Eocortex Client** application.
- **Auto (by recognized license plate):** allows to open the rising arm barrier automatically if the recognized number is in the white list, i.e. is included in the group of vehicles for which the automatic opening of the barrier is envisioned.

In case the automatic rising arm barrier control is activated, the following options are available:

- **Open the barrier:** if the recognized number is in the white list, the **Eocortex** server generates a command to open the barrier.
- **Open and close:** if the recognized number is in the white list, the Eocortex server generates a command to open the barrier; then, in a number of seconds set in the **Close after opening in (sec)** field, a command for closing the barrier is generated.

Note

Most of the modern rising arm barriers automatically close after the passing of one vehicle. For such barriers, the **Open the barrier** option shall be selected.

Warning

When the **Open and close** option is selected, it is imperative that the barrier itself has a feature of preventing its closing when a car is below the rising arm. It means that after generating the closing command the barrier's automatics must check if there is a vehicle or a person on the line of closing, and proceed with the closing only in the absence of the above.

Note

Both in manual and in automatic barrier control mode, the opening or closing command is understood as the generation of the **Request to open rising arm barrier** or **Request to close rising arm barrier** event, correspondingly. To control the rising arm barrier, it is required to set the actions for these events depending on the control wiring diagram of the particular barrier.

Warning

The module will start working only when **the settings are applied**.

Requirements and recommendations

Hardware requirements

It requires the **Intel CORE I3-10100** or higher processor (CPU) to use the module on a surveillance server.

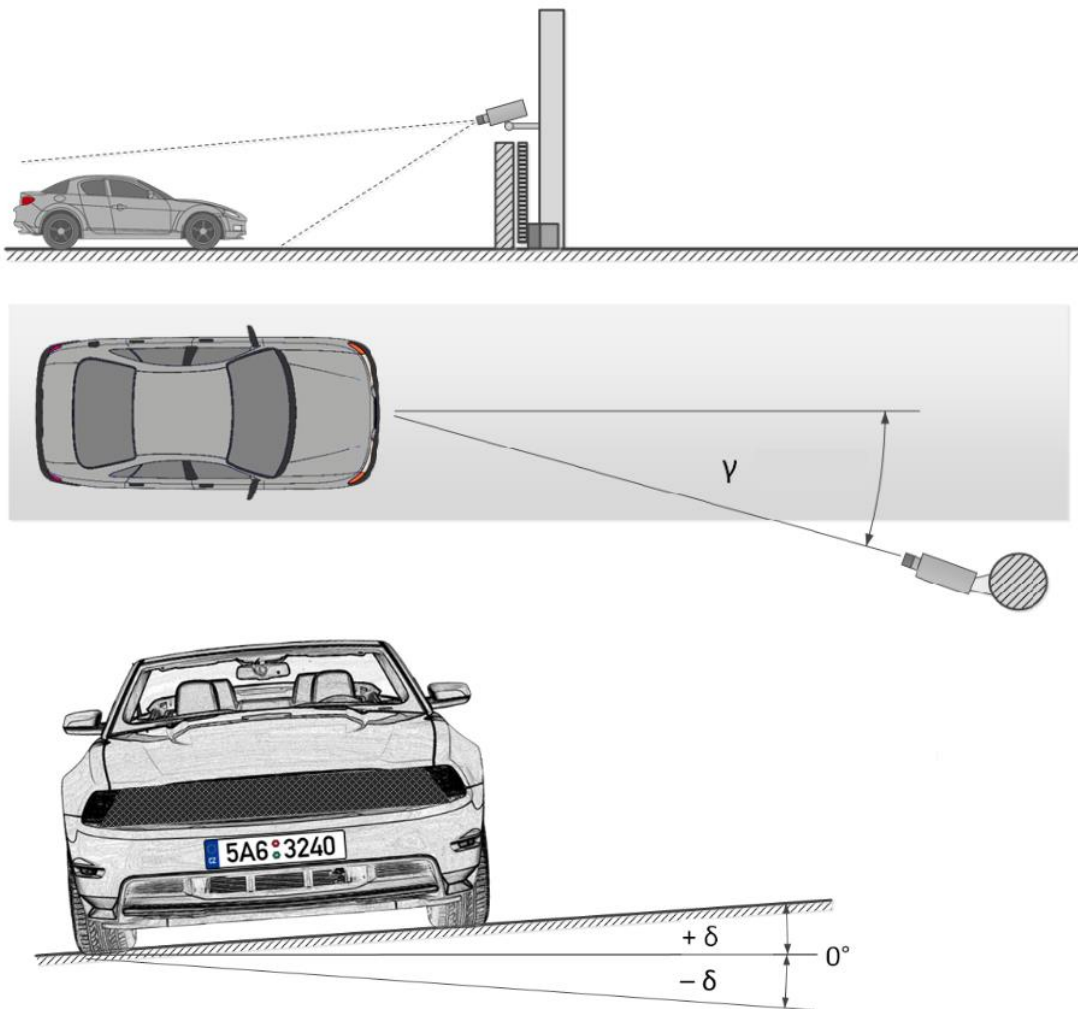
The module can run without a video card.

When the module runs in graphics card mode, it requires a **NVIDIA** graphics card (GPU) with features and performance not lower than the **NVIDIA GTX 1650** model.

Camera installation requirements

Maximum allowable tilt and rotation angles for the camera:

- Maximum allowable vertical tilt angle: 35°.
- Maximum allowable horizontal tilt angle: 35°.
- Maximum allowable rotation angle of the license plate's horizontal axis relative to the camera's axis: 35°.



Video stream requirements

- Resolution: not less than 1280×720 (HD) (provided that the character size requirements of the license plate are met).
- Frame rate:
 - not less than 20 frames per second for the fast mode
 - not less than 10 frames per second for the medium and slow modes

Requirements to the license plate image

The license plate can be detected, and the registration number on it can be recognized under the following conditions:

- The license plate is fully visible in the frame (not obscured by other objects and does not extend beyond the frame boundaries).
- The minimum height of the recognizable characters should be no less than 15 pixels (country code characters are not considered recognizable characters).



- The image of the license plate and its characters should be high-contrast, free from noise, and not blurred.

The license plate text is correctly recognized both in color and black-and-white images.

The color of the license plate is recognized only in color images.

Settings recommendations

It is recommended to adjust and install the camera in such a way that the license plate of passing vehicles can be detected and recognized in the frame at least $3 \times N$ times, where N is the chosen value for the setting **Number of license plate frames required for recognition**. It should be noted that the setting **Mode** controls the frame processing frequency within the module. Thus, depending on the selected mode, the actual frame rate within the module will be:

- Fast: 10 frames per second
- Medium: 5 frames per second
- Slow: 2.5 frames per second

Example: A car passes by in a manner that its license plate satisfies recognition conditions for 1.4 seconds. If the fast mode is selected, the module will see it approximately in $1.4 \times 10 = 14$ frames. Based on this, the maximum value for the setting **Number of license plate frames required for recognition** will be $N = 14/3 = 4$ (dividing without remainder). In the medium mode, the maximum value for this setting will be $1.4 \times 5/3 = 2$, as the module in this mode processes frames only at a frequency of 5 FPS. When choosing higher values for the setting **Number of license plate frames required for recognition** or more economical values for the setting **Mode** the sensitivity of license plate detection will decrease.

Deployment of the module

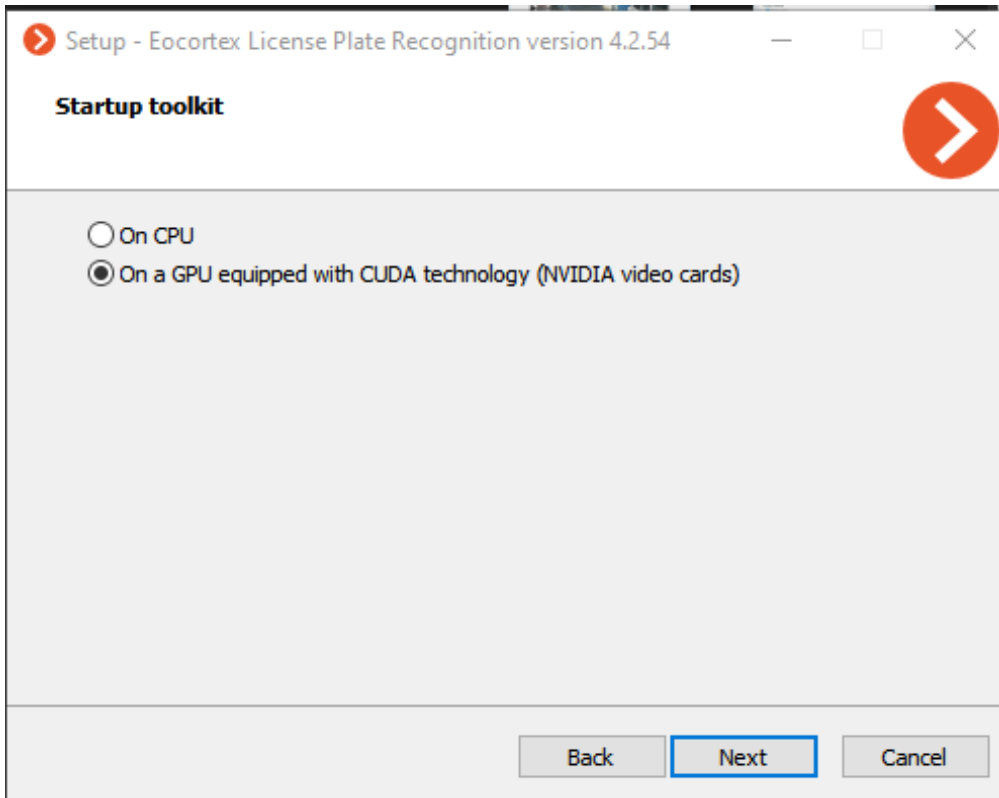
The module utilizes a neural network, so an additional package needs to be installed. You can choose an installation option that ensures the module functions in one of the following ways:

- On a CPU
- On a GPU equipped with CUDA technology (NVIDIA video cards)

The neural network package installation procedures for various operating systems are provided below:

Windows

1. Stop and close all applications and services **Eocortex**.
2. Run the installation package **EocortexLPR Installer**.
3. During the installation, select the required set of tools for execution.



Linux

Different packages are used for installing neural networks that operate on CPU and GPU.

Internet acces installation

For Ubuntu, Debian and Astra Linux:

- On the CPU


```
┌
│ sudo apt install eocortex-lpr-cpu
└
```
- On the CUDA supported video card


```
┌
│ sudo apt install eocortex-lpr-gpu
└
```

For CentOS:

- On the CPU

```

┌───────────
sudo yum install eocortex-lpr-cpu
└───────────

```

- On the CUDA supported video card

```

┌───────────
sudo yum install eocortex-lpr-gpu
└───────────

```

Installation without Internet acces

For Ubuntu, Debian and Astra Linux:

Download the package for the corresponding installation option from the repository:

- for CPU is
<https://packages.eocortex.com/deb/public/pool/main/m/eocortex-lpr-cpu/>
- for GPU is
<https://packages.eocortex.com/deb/public/pool/main/m/eocortex-lpr-gpu/>

Install the package:

- On the CPU

```

┌───────────
sudo dpkg -i eocortex-lpr-cpu_4.*.deb
└───────────

```

- On the CUDA supported video card

```

┌───────────
sudo dpkg -i eocortex-lpr-gpu_4.*.deb
└───────────

```

For CentOS:

Download the package for the corresponding installation option from the repository:

<http://packages.eocortex.com/rpm/>

Install the package:

- On the CPU

```

┌───────────
sudo yum install eocortex-lpr-cpu-4.*.rpm
└───────────

```


- On the CUDA supported video card

```
sudo yum install eocortex-lpr-gpu-4.*.rpm
```

Licence plate recognition (Complete)

The **Licence plate recognition (Complete)** module is intended for recognizing the license plates of the moving vehicles and saving the information regarding the time and date of recognition, the license plate number and the reference to the corresponding video frame.

Capabilities of the module

- Real-time recognition of the license plate numbers of moving vehicles.
- Recognition of the license plate numbers of the vehicles of 195 countries: Abhasia, Accord Dangereuses Route, Albania, Algeria, Andorra, Angola, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Belarus, Belgium, Bolivarian Republic of Venezuela, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Cameroon, Canada, Chile, China, Colombia, Costa Rica, Croatia, Cuba, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Estonia, Ethiopia, Finland, France, Georgia, Germany, Gibraltar, Greece, Grenada, Guatemala, Holy See (Vatican City State), Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Ireland, Islamic Republic of Iran, Israel, Italy, Japan, Jordan, Kazakhstan, Kenya, Kosovo, Kuwait, Kyrgyzstan, Latvia, Liechtenstein, Lithuania, Luxembourg, Madagascar, Malaysia, Malta, Mexico, Monaco, Mongolia, Montenegro, Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Oman, Ossetia, Panama, Paraguay, Peru, Philippines, Plurinational State of Bolivia, Poland, Portugal, Pridnestrovian Moldavian Republic, Puerto Rico, Qatar, Republic of Korea, Republic of Moldova, Republic of North Macedonia, Romania, Russian Federation, Saudi Arabia, Serbia, Seychelles, Singapore, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Tajikistan, Tunisia, Turkey, Turkmenistan, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, USSR, Uzbekistan, Vietnam, Zambia.
- Recognition of the license plate numbers of vehicles travelling with the following velocities:
 - up to 250 km/h for the **Highway** license
 - up to 20 km/h for the **Parking** license.
- Recognition of up to 10 license plates in the frame.
- Saving the recognized license plate number in the archive, including the date and time of recognition and the link to the corresponding video frame.

- Real-time comparison of the recognized license plate numbers with the license plate number database and generation of the alarm if the recognized number is in the list of the vehicles to be intercepted.
- Working with the integrated database of automobile license plate numbers: adding and editing of numbers, providing additional information regarding the vehicles, such as color, owner, etc.
- Possibility to import the license plate numbers into the database from a CSV file.
- Creating the groups of license plate numbers for interception, automatic opening of a rising arm barrier etc.; adding a number to one or more groups.
- Searching for the recognized numbers in the archive by time, by date and by additional information from the database.
- Downloading of the recognized license plate numbers to Microsoft Excel or CSV format.
- Automatic sending of the lists of recognized license plate numbers by email.
- Rising arm barrier control.
- Counting the number of vehicles in parking lots.
- Counting the time spent by vehicle in the parking lot.

Details

Warning

This module uses additional libraries that are not included in the basic Eocortex distribution package. Before configuring and using the module, it is necessary to install these libraries on the server to which the cameras selected for recognition are connected. After installation, an additional license key must be activated on this server to license the module.

Warning

The module is intended for recognizing the license plates of moving vehicles only. Recognition of parked vehicles' numbers is not intended.

Note

It is possible to use the capabilities of the **Eocortex API** for the automation of the downloading of the recognized license plate lists.

Note

Interaction with the rising arm barriers is performed via signal outputs of the IP cameras.

Module setup

Warning

This module uses additional libraries that are not included in the basic Eocortex distribution package. Before configuring and using the module, it is necessary to install these libraries on the server to which the cameras selected for recognition are connected. After installation, an additional license key must be activated on this server to license the module.

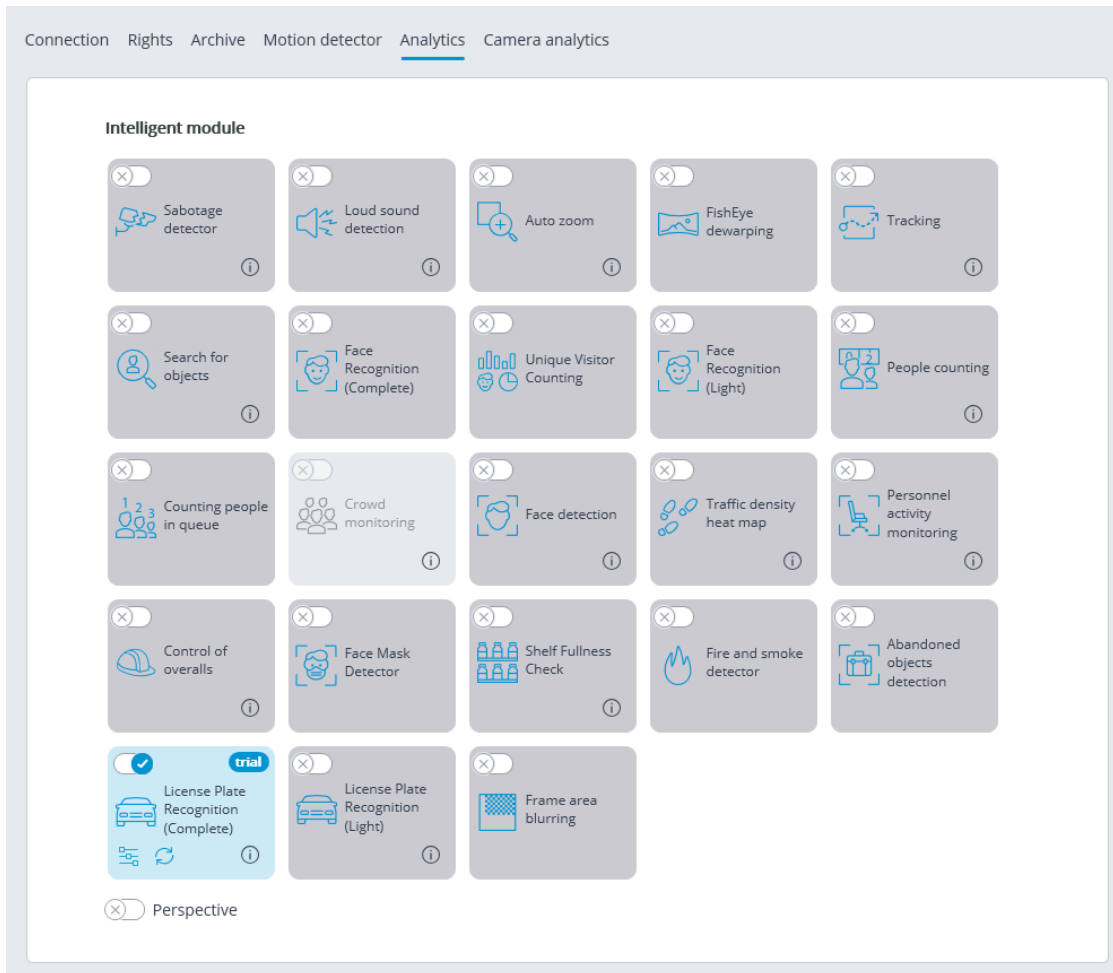
Warning

Only one of the License Plate Recognition modules can be installed on the same server: either **License Plate Recognition (Complete)** or **License Plate Recognition (Light)**.

To use the module, enable and configure it.

Launch the **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.

Then switch to the **Analytics** tab and enable the module using the  toggle.



Clicking the  button opens the module setup window.

Warning

In the software motion detector settings, the minimum width and height of the object must be smaller than the dimensions of a vehicle.

Additionally, it is recommended to set the whole frame as the detection area for the software motion detector to ensure reliable recognition.

The right bottom corner of the module settings window contains the version of the SDK libraries used by the License plate recognition module.

The module settings are described below.

Basic settings

The settings of the license plate recognition can be set on the **Basic settings** tab.

License plate recognition
✕

Basic settings Parking spots Database Barrier gate control

Necessary configuration

[Specify countries](#) [Set the size range of a license plate](#) [License plate search zone](#)

Additional settings

Quality of recognition Average

Acceptable number of unrecognized characters 2

Use neural network for searching for license plate numbers ⓘ

Use neural network for recognizing license plate numbers ⓘ

Enable in-depth analysis ⓘ

Enable license plate recognition taking perspective into account

Enable more thorough search in the specified range of sizes ⓘ

Limit the license plate re-recognition time, sec. 0

Direction of movement [Entrance direction](#)

Additional Save frames to disc

Save

Cancel

Specify countries: opens a window where license plates and countries that should be recognized can be selected.

Available Countries
✕

Choose countries Choose license plate number samples

- Argentina
- Armenia
- Austria
- Azerbaijan
- Bahrain
- Belarus
- Belgium
- Bolivia
- Bosnia and Herzegovina
- Botswana
- Brazil
- Brunei Darussalam
- Bulgaria
- Cameroon
- Chile
- China

- DZE 184
- 101 HCC 112
- 00188HI
- AB 123 CD
- A12
3BCD
- ARGENTINA
040
AXG
- CD-1383
- HVH7779

Apply

Cancel

In the window that opens, mark the countries whose license plates should be recognized and select license plate templates for each selected country. Unmarked countries and templates will not be recognized.

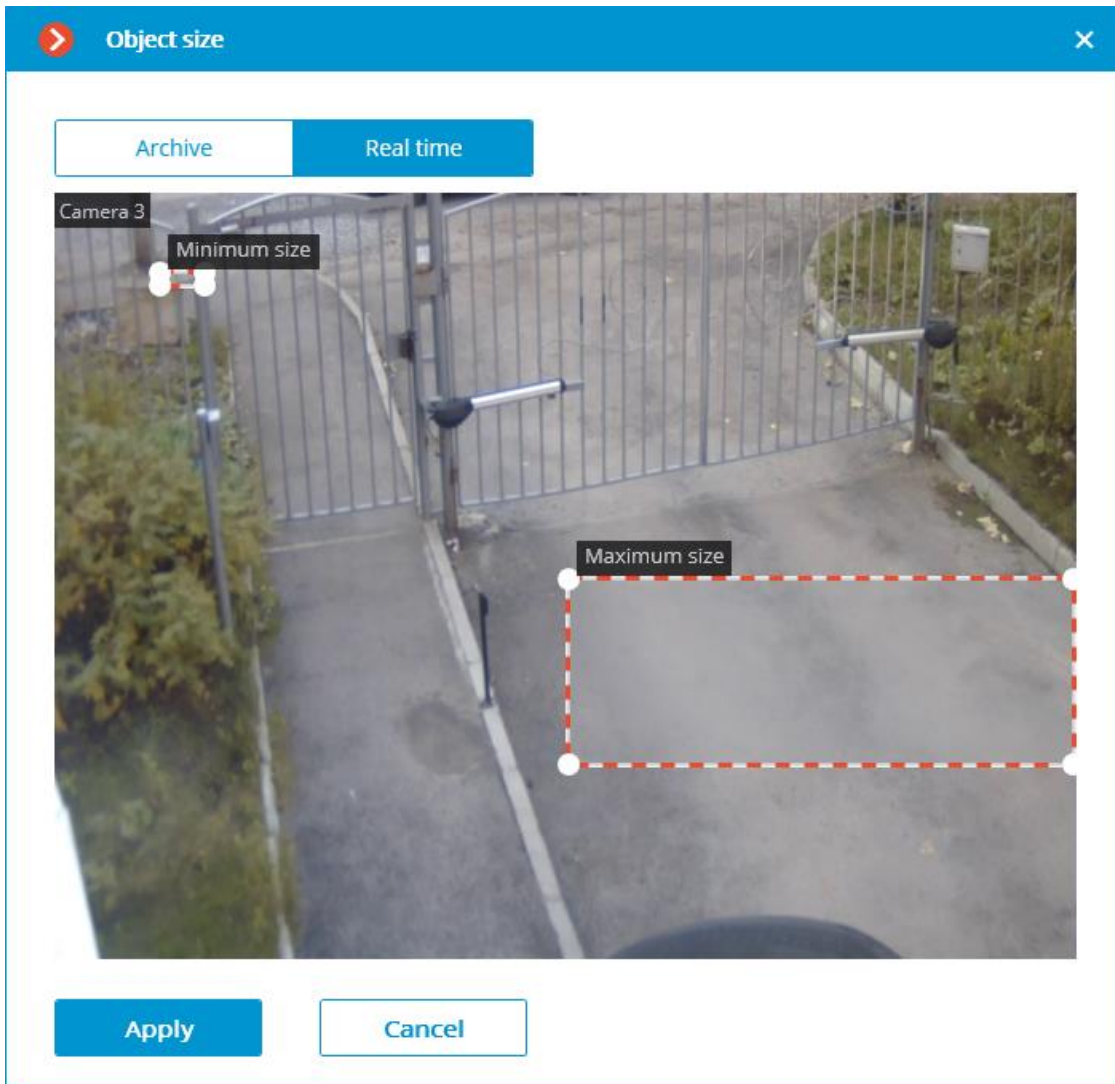
Warning

The empty list of countries means that the Licence plate recognition (Complete) module is not installed, or that errors occurred during its installation, or that there is no protection key, or its activation encountered problems.

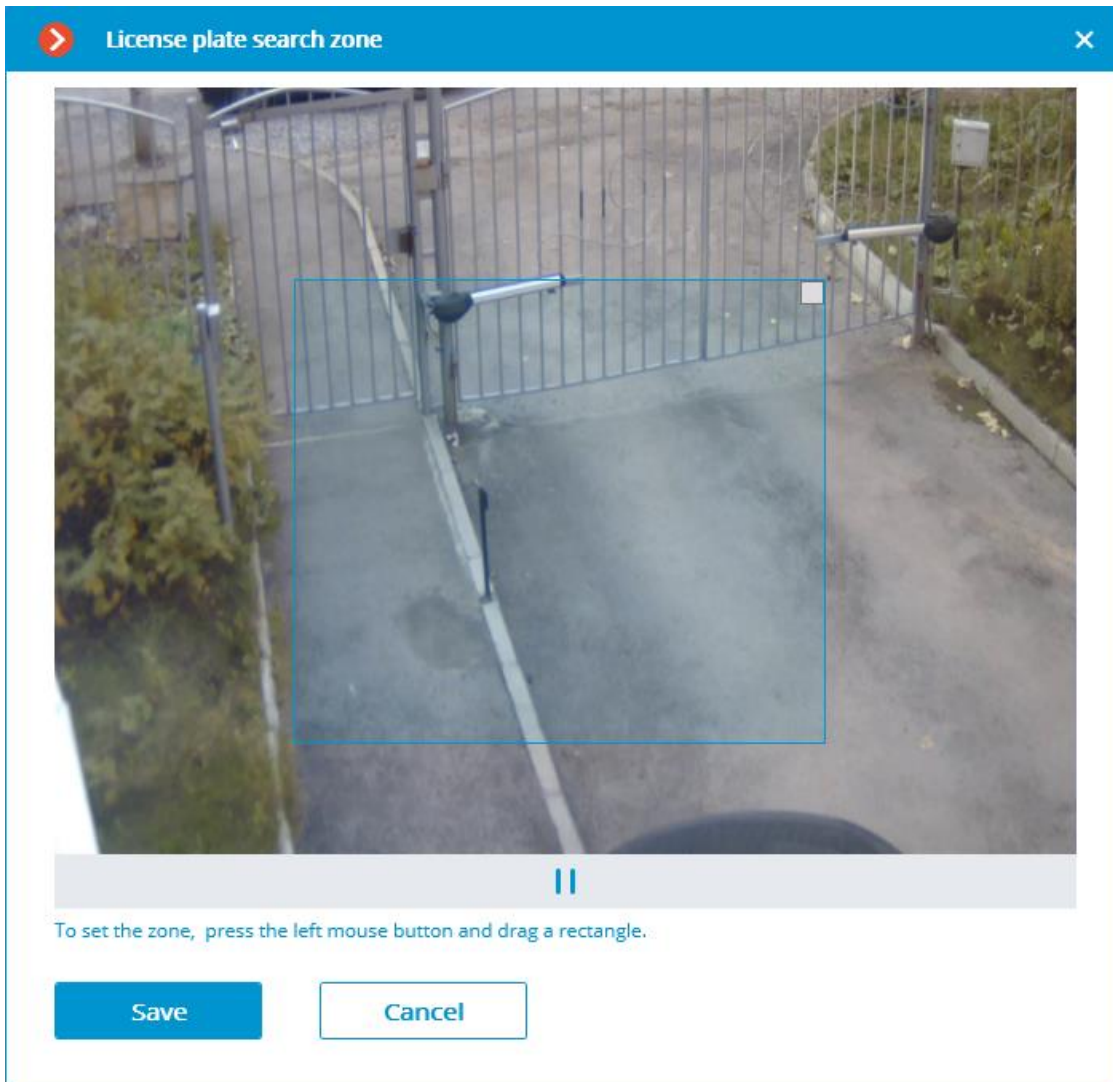
Warning

The more countries and samples have been selected for recognition, the higher the computing load on the server. When the processor load exceeds 80%, the recognition quality may drop significantly.

Set the size range of a license plate opens the window of setting the minimum and maximum width of the license plates to be recognized.



License plate search zone opens the window of setting up the zones of the frame where the license plate numbers to be recognized will appear.



For creating a new zone, it is required to press the left mouse button and, holding it, select a rectangular area. The total area uniting all the set zones will be used for recognition. To delete the zone, click on the close icon in the upper right corner of the zone.

Quality of recognition is the internal parameter of the module's operation. It sets the filtering by the quality of recognition, meaning that the license plates the reliability of whose recognition is lower than a preset value will be automatically discarded. The value of this parameter shall be selected tentatively: when it is higher, the reliability of the recognized numbers will be higher, but the total quantity of the recognized numbers will be smaller; when it is lower, the quantity of the recognized numbers will be larger, but the number of recognition mistakes will increase.

The **Acceptable number of unrecognized characters** setting filters the license plate numbers by the quantity of the unrecognized symbols: the plates where the number of unrecognized symbols is bigger than the preset value will be automatically discarded.

Use neural network for searching for license plate numbers:

Enabling this option allows to increase accuracy of searching for number plates. However, this will increase the load on server CPU.

Use neural network for recognizing license plate numbers:

Enabling this option will increase accuracy of license plate symbols' recognition. However, this will increase the load on server CPU.

Enable in-depth analysis: Enabling this option allows to improve License Plate Recognition accuracy under unfavorable conditions, e.g. when the camera's parameters are not in complete conformance with the relevant requirements, or when the weather conditions are poor. Using this option leads to the increase of the frame processing time of 20 to 30%. Under normal conditions, this parameter has no effect on the recognition quality.

Enable license plate recognition taking perspective into account: allows to make allowance for a perspective distortion.

Enable more thorough search in the specified range of sizes:

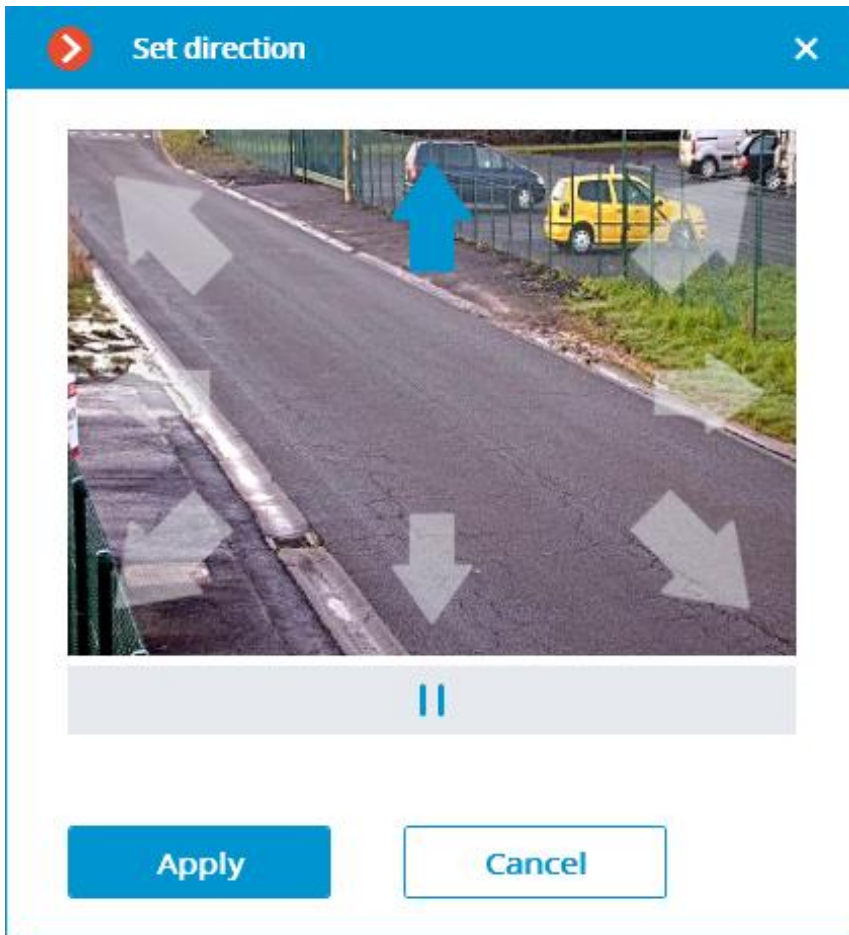
Enabling this option allows to improve recognition accuracy in a case when the difference between the minimum and the maximum dimensions of the license plate number is very big (more that three times). In this case, the load on the server from the given camera will increase 30% approx.

Limit the license plate re-recognition time, sec.: allows to set the period of time from the initial recognition of the plate number, during which no attempts will be made to recognize the same number.

Note

This setting may be useful, for example, for the situations involving the automatic opening of a rising arm barrier, when the vehicle stops before the barrier and the module may attempt to recognize its license plate one more time after the vehicle starts to move again. Such repeated recognition may also happen when the license plate was temporarily blocked by some object.

Determine the movement direction: enabling this option allows to configure the definition of the movement direction of the plate on the camera frame. After enabling this option, it is needed to set the entry direction by clicking the **Entrance direction** link and selecting the arrow in the window that opens. At the same time, vehicles moving in the opposite direction will be considered as driving out.



Additional: Allows importing and exporting settings of the license plate recognition module.

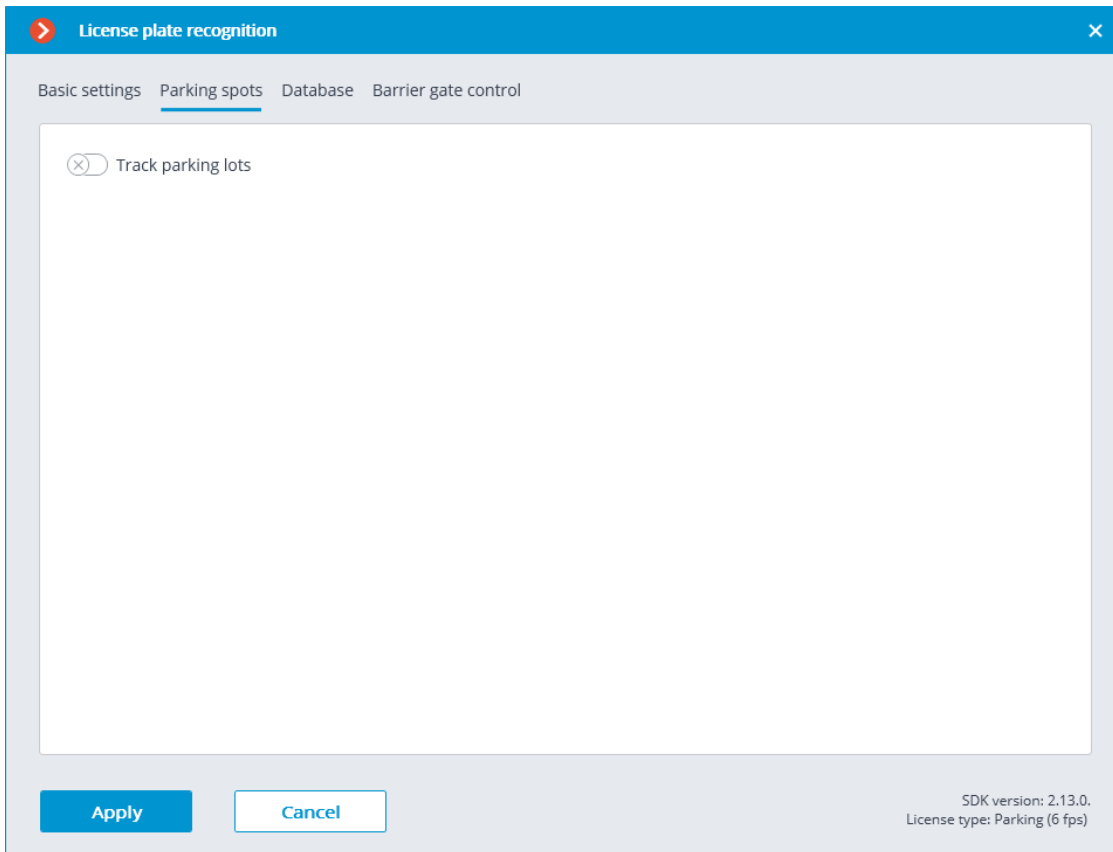
Save frames to disc: Allows saving frames with detected license plates to a folder on the server.

The option must be configured after enabling by clicking the **Adjust saving** link.

In the window that opens, specify the path to the directory where the frames should be stored, as well as its maximum size.

Parking spots

On the **Parking spots** tab, settings for parking lots can be made.



To access the settings for parking lots, turn on the **Track parking lots** slider.

Note

Parking lot settings are set for the entire system.

The following actions can be performed in the settings window:

- create a new parking lot;
- edit or delete an existing parking lot.

The following settings can be set for a parking lot:

- name;
- one or more cameras working as entry and exit points;
- permissible parking time;
- number of parking spots;
- period and time of resetting the counter.

The screenshot shows the 'License plate recognition' configuration window with the 'Parking spots' tab selected. The window has a blue header with a close button. Below the header are tabs for 'Basic settings', 'Parking spots', 'Database', and 'Barrier gate control'. The main content area is titled 'Zone' and contains the following elements:

- In : Camera 1** and **Out : Camera 2** labels.
- Search fields for 'Search by camera name' on both sides.
- 'Expand all' and 'Collapse all' links for both camera lists.
- Camera selection lists:
 - Left list: 'All cameras' (unchecked), 'Camera 1' (checked), 'Camera 2' (unchecked).
 - Right list: 'All cameras' (unchecked), 'Camera 1' (unchecked), 'Camera 2' (checked).
- 'Updating the counters' section with an info icon:
 - 'Start time' field: 24.03.2022 13:16:02.
 - 'Counter reset period' dropdown: 'Never'.
 - 'Allowable parking time, min.' field: 60.
 - 'Number of parking spots' field: 50.
- 'Apply' and 'Cancel' buttons at the bottom left.
- SDK version: 2.13.0 and License type: Parking (6 fps) at the bottom right.

The following **events** were added to the **Tasks by event** tab of the Automation section:

- Parking vehicle counter has been changed
- Parking event
- Parking lot occupancy has changed

A new **user right**, **Adjusting the number of occupied parking spots**, has been added to the Users section. This right allows the user to change the value of the occupied parking spots counter in the **Eocortex Client** application. By default, this right is enabled.

Database

The access to the license plate database can be set on the **Database** tab.

License plate recognition

Basic settings Parking spots **Database** Barrier gate control

Local
 Remote

Address: 127.0.0.1 Port: 3050
 User name: SYSDBA Password: ●●●●●●●●

Type:
 Windows
 Linux

[Connection check](#)

Database identifier: 123

Apply Cancel

SDK version: 2.13.0
License type: Parking (6 fps)

Two database deployment options are available: **Local** or **Remote**.

If the recognition process runs on only one server, it is recommended deploying the database on this server by selecting **Local**.

If the recognition process is running on several servers, the database should still be hosted only on one of them. For this purpose, select the **Remote** option for all cameras and specify the database connection parameters: server address, name and password of the database administrator. The same applies when the database of the module is deployed on one server, and the camera with the module enabled is attached to another one.

Note

Eocortex version 3.6 and lower uses **Firebird** DBMS with the following default values:

- **Port:** 3050
- **Username:** SYSDBA
- **Password:** masterkey

Note

Starting from version **Eocortex** 4.0, the module's database is handed over to the **PostgreSQL DBMS** with the following default values:

- **Port:** 5432
- **Username:**
 - For Windows: postgres
 - For Linux: eocortex
- **Password:** masterkey

Warning

Remote access to databases is not allowed by default in PostgreSQL and must be additionally configured if remote databases are used for analytics. All settings must be done for the server where the database is stored. Settings are slightly different for **Windows** and **Linux** operating systems.

When the server is running for the first time after upgrading **Eocortex** to version 4.0 or higher, the existing module database will be automatically transformed to be compatible with **PostgreSQL**.

Warning

If connecting to a **Remote** database, use the DBMS **Username** and **Password** that are valid for the server storing the database.

Warning

Independent of the database location, the recognition events (date and time of recognition, coordinates of the object in the frame, binding of the recognized object to the database) will always be stored on the server to which the camera with the corresponding events is bound.

Warning

Synchronization with the database located on a remote server can take some time

Note

When using a remote database, the **remote database replication mechanism** will be applied.

It is possible to check the availability of the database clicking the **Connection check** link. If the server is unavailable, the corresponding message will be displayed.

The **Database identifier** field sets its **own license plate database** for an individual camera or groups of cameras.

Warning

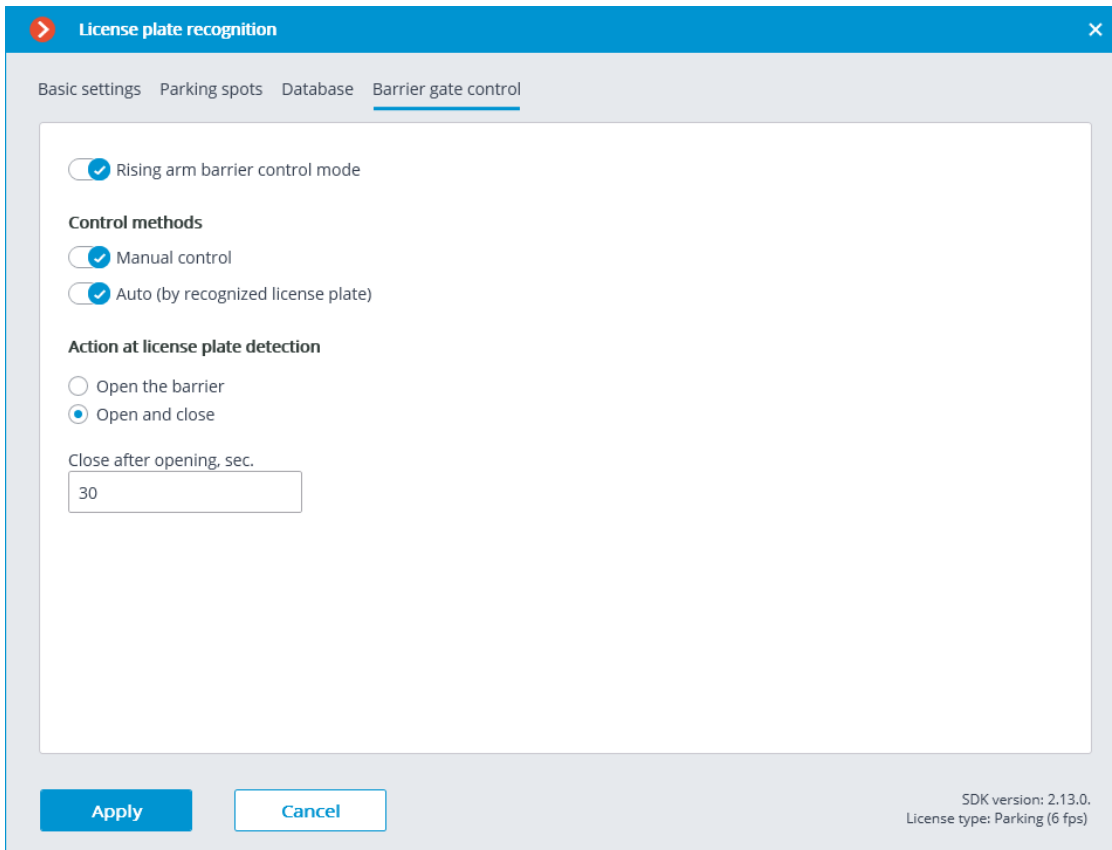
The field Database identifier is not initially displayed at the launch of the module.

Note

To use this capability, it is required to set Database identifier via REST API.

Barrier gate control

The settings of the module's interaction with a rising arm barrier can be made on the **Barrier gate control** tab.



The **Rising arm barrier control mode** must be activated to access the settings of the module's interaction with a rising arm barrier.

Note

To use the module only for controlling a rising arm barrier, the **License plate recognition (Complete)** module license or protection key is not required. However, for ensuring the abovementioned functionality, it is necessary to have the **License plate recognition (Complete)** module support indicated in the **Eocortex** license file or software key for the corresponding quantity of cameras.

When the rising arm barrier control mode is activated, the following capabilities are available:

Control methods:

- **Manual control:** allows the operator to open and close the barrier using the **Eocortex Client** application.
- **Auto (by recognized license plate):** allows to open the rising arm barrier automatically if the recognized number is in the white list, i.e. is included in the group of vehicles for which the automatic opening of the barrier is envisioned.

In case the automatic rising arm barrier control is activated, the following options are available:

- **Open the barrier:** if the recognized number is in the white list, the **Eocortex** server generates a command to open the barrier.
- **Open and close:** if the recognized number is in the white list, the Eocortex server generates a command to open the barrier; then, in a number of seconds set in the **Close after opening in (sec)** field, a command for closing the barrier is generated.

Note

Most of the modern rising arm barriers automatically close after the passing of one vehicle. For such barriers, the **Open the barrier** option shall be selected.

Warning

When the **Open and close** option is selected, it is imperative that the barrier itself has a feature of preventing its closing when a car is below the rising arm. It means that after generating the closing command the barrier's automatics must check if there is a vehicle or a person on the line of closing, and proceed with the closing only in the absence of the above.

Note

Both in manual and in automatic barrier control mode, the opening or closing command is understood as the generation of the **Request to open rising arm barrier** or **Request to close rising arm barrier** event, correspondingly. To control the rising arm barrier, it is required to set the actions for these events depending on the control wiring diagram of the particular barrier.

Note

For the **License Plate Recognition (Complete)** module, the following types of **Automatic reports** can be configured: **License plate recognition, Entry/exit time recording, Vehicle counting.**

Warning

The module will start working only when **the settings are applied**.

Requirements and recommendations

Warning

The module works only with 64-bit version of **Eocortex**.

For the proper operation of the module, it is imperative to correctly select, place and set up the camera, adjust the software motion detector and the module itself. When choosing the camera, it is recommended to consider the image quality requirements, control zone particularities, and the conditions of the camera installation and operation.

Requirements to the license plate image

It is assumed that the license plates of the vehicles to be recognized correspond to the requirements of the Vienna Convention on Road Traffic (Part I: Convention on Road Traffic – Attachment 2), in particular:

“2. The registration number shall be so composed and displayed as to be legible in normal daylight at a distance of at least 40 m by an observer placed on the axis of the vehicle, the vehicle being stationary ...”

“3. When the registration number is displayed on a special plate, this plate shall be flat and fixed in a vertical or nearly vertical position and at right angles to the vehicle's median longitudinal plane”.

The license plate number will be recognized only if its image is rich in contrast and fits entirely in the frame.

Additionally, there is a requirement regarding the minimum height of a symbol on the image of the license plate in the frame (i.e. the height at which it is still possible to provide recognition): 30 pixels. This limitation is illustrated on the picture below. You can also see the minimum permissible dimensions for the license plate of Ukraine and Russia (the overall width is given for reference because it may help when calculating the focal length).



Note

When the camera is installed outside, the natural noise pollution of the video image may happen due to the unfavorable weather conditions (rain, snow). In order to improve recognition in such circumstances, it is advisable to increase the size of the license plates in the frame.

Recommendations on camera installation

In this section you will find the recommendations on camera installation that need to be followed in order to ensure the reliable recognition of license plates in the control zone. Each installation location has its individual characteristics. This section contains the typical camera installation diagrams. They are to be taken into consideration at the stage of designing the traffic video surveillance systems with due account for the specific parameters of the site.

The correctly performed installation must ensure the following:

- The license plate image in the frame must correspond with the requirements specified in the previous section;
- The maximum duration of presence of the license plate in the frame.

It is also necessary to fulfill the following requirements listed below (both for highway and checkpoint installation locations).

To minimize the occurrence of false triggering in the process of recognition, it is imperative to install the camera in such a way as to avoid the presence of the high-contrast objects in the frame, for example, billboards, trees, grille fences etc.

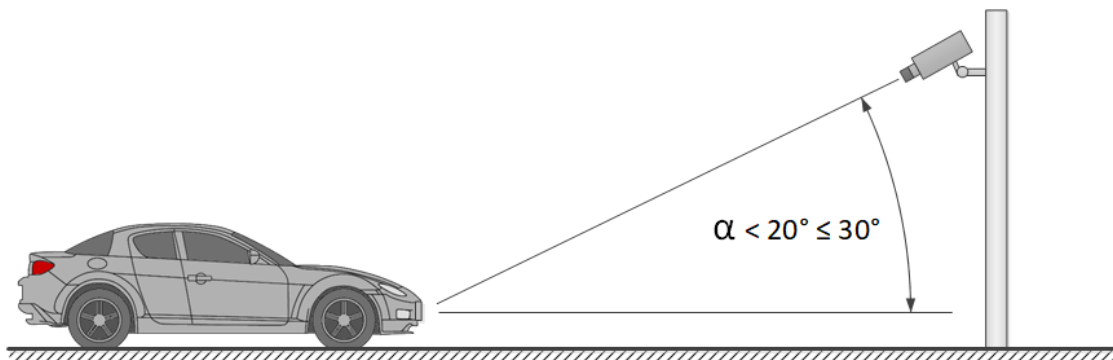
In order to avoid camera flaring, it shall not be directed at the light sources (the Sun, streetlamps) and at the highly reflective objects.

To prevent the distortion of the symbols on the license plate image, it is advisable to ensure the optimal camera installation angles. When performing the surveillance on descending or ascending vehicles, the road inclination angle must also be taken into consideration.

Vertical camera angle

Recommended: up to 18–20°

Maximum permissible: 30°



Horizontal camera angle

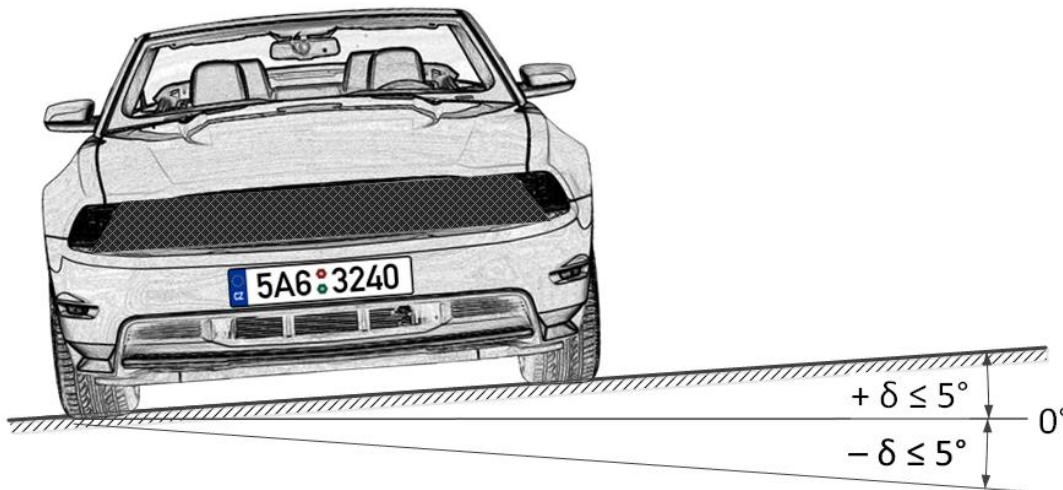
Recommended: up to 5–10°

Maximum permissible: 20°



Permissible banking angle

In the course of the installation, it is required to ensure that the tilt of the license plate on the image in relation to the horizontal plane of the camera does not exceed 5° both clockwise and counterclockwise. When recognizing the single line numbers with no more than six symbols it is possible to check the appropriateness of the selected camera tilt angle using the "single line rule": the imaginary horizontal line must cross the first and the last symbols of the license plate.



The distance from the camera installation location to the beginning of the viewing zone is determined by the focal length of the lens. And conversely, if the distance from the camera installation location to the center of the control zone is known, it is required to ensure the appropriate focal length of the lens.

When using the separate IR illuminator, the angle of the infrared light must correspond to the camera viewing angle. The correspondence of the IR illuminator beam angle and the camera lens viewing angle is especially important at the large distances, when the camera operates at the limit of its sensitivity.

The typical camera installation diagrams for license plate recognition are given below.

Camera on a checkpoint

When performing video surveillance of the entrances and exits of the protected areas, the speed of the vehicles normally do not exceed 20 km/h, meaning that it is possible to use the license plate recognition module in the Parking mode. In this case, the camera is normally installed at the edge of the lane.

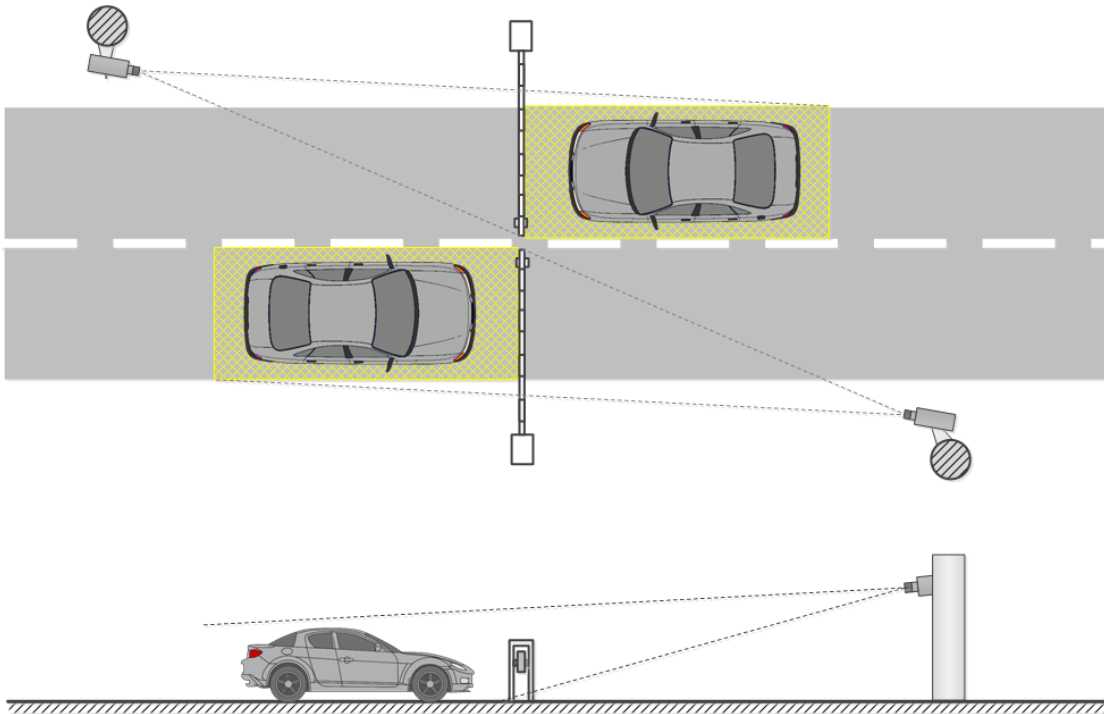
- The camera installation height shall be above the level of the headlights of the vehicles.
- The distance between the place of installation and the focus area must be at least 3 meters.

The installation of the camera in close proximity to the prospected license plate detection area and the usage of the short focus lenses lead to the depth of field reduction and the distortion of the image at the edges. Both must be avoided to ensure reliable recognition.

For the separate control of the exits and entrances, it is recommended to install separate cameras, one on the entrance and the other on the exit. When only one camera is used, the vehicles travelling in the opposite directions may block one another. Moreover, it is advisable to separate the traffic lanes not only with road marking, but also with a barrier, where the width of the road allows it.

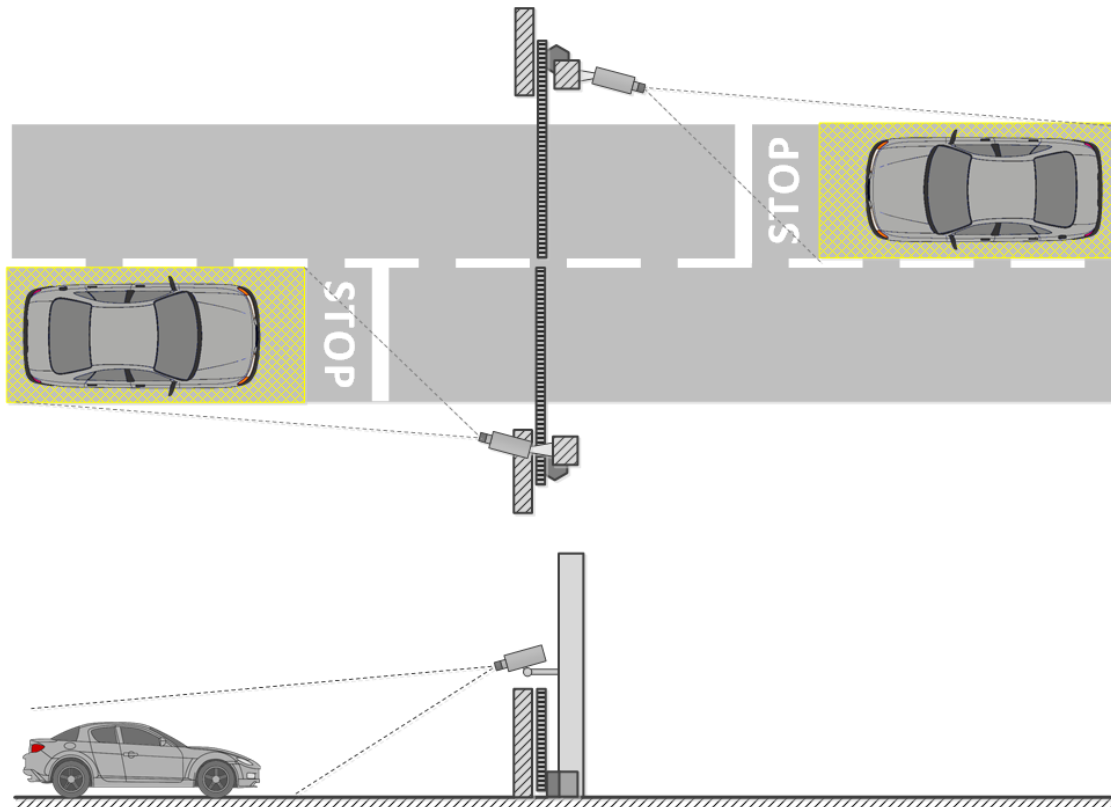
When using the rising arm barrier, the controlled area may start immediately before it. In this case the camera is to be installed at a distance from the barrier line.

Controlled areas with separate lanes and a rising arm barrier



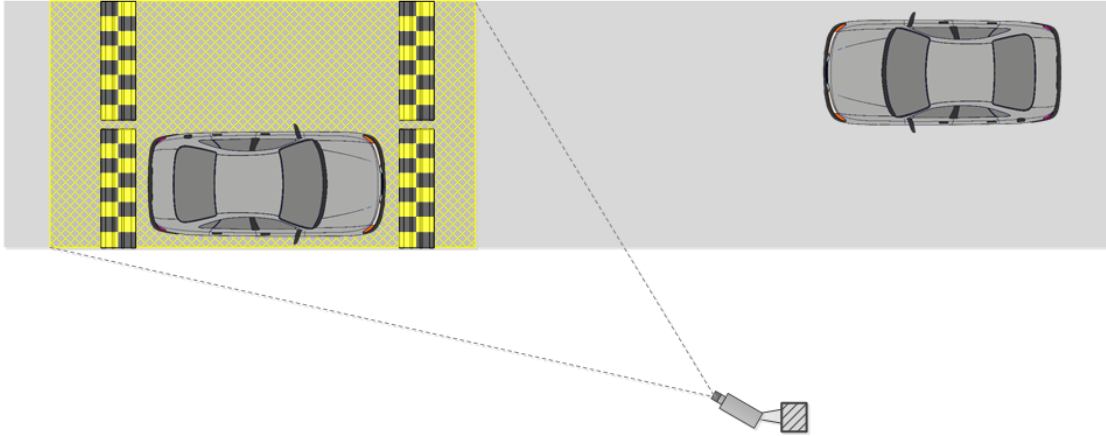
When using the gates, the controlled area must not start immediately before the gates, because the camera is usually installed at the level of the gates. In such a case a stop line, a mandatory stop sign or a traffic light is used for stopping the vehicle in the controlled area.

Controlled areas with separate lanes and gates



At the unregulated crossing points it is required to use speed bumps (road humps) to make the drivers reduce speed to ensure successful recognition; it is also advisable to use additional means such as the speed limit signs (up to 5 km/h), mandatory stop signs, stop lines etc.

Open controlled area with two-way traffic



The suggested camera installation parameters for surveillance of exits and entrances calculated for the cameras with the sensor size of 1/3" are shown in the following table. These parameters allow to provide the minimum distance between the camera installation location and the controlled area of the given width. It is also required to be guided by the quality of the license plate image in the focusing area in the course of the installation.

Sensor size: 1/3"

Installation height (m)	1		2		4	
	1	5	2	5	3	4
Area width: 3 m						
Vertical angle, °	18	25	30	30	30	30
Focal distance (mm)	5	5	6	7	8	11
Near zone (m)	1.3	1.6	1.9	2.6	3.5	5
Focal zone (m)	3.1	3.4	3.5	4.3	5	7

Sensor size: 1/3"

Installation height (m)	1	1 5	2	2 5	3	4
Area width: 3 m						
Far zone (m)	∞	2 0	8 5	9	9 6	1 0
Area width: 6 m						
Vertical angle, °	9	1 4	1 9	2 3	2 8	3 0
Focal distance (mm)	5	5	5	5	5	6
Near zone (m)	1 7	2 2	2 5	2 7	2 7	4
Focal zone (m)	5 7	6	5 8	5 9	5 6	7
Far zone (m)	∞	∞	∞	4 4	2 1	1 7

Note

The parameters shown in the above table are indicative. It is strongly recommended to calculate the camera installation parameters individually, using the CCTV calculator, with due regard for the design and operational characteristics of the particular cameras and their working environment.

Camera on a highway

When organizing the surveillance on a highway, the camera is normally installed on an L-shaped pole at the edge of the lane or on the arch support above the center of the lane.

The standard installation height is 4 to 6 (maximum 20) meters.

The vertical camera tilt angle is regulated by the basic guidelines.

The distance to the controlled area and, correspondingly, the focal length of the lens are determined based on the camera installation height, tilt angle and width of capture.

The higher the camera is installed, the higher is the probability that the license plates of the vehicles moving at a small distance from one another (for example, in case of a traffic jam) will get into the frame. But it needs to be noted that the increase of height leads to the higher distortion of the license plate images, and the symbol size may be close to the permissible minimum (or may even be unacceptable). In such cases it is possible to shift the region of interest to the higher distance by reducing the camera vertical tilt angle and changing the focal length in order to ensure reliable recognition.

The modern IP cameras are capable of covering several (up to 4) traffic lanes. Thus, it is possible to reduce the quantity of cameras to be installed in the controlled area. But in this case it is required to choose the installation height, tilt angle, and focal length in such a way as to minimize the optical image distortion (for example, the short focus lenses give significant image distortion on the periphery of the frame).

In the table below you will find the approximate parameters of camera installation for performing video surveillance on a highway. The camera parameters used for the calculation are as follows: 1/3" sensor and 5-50 mm varifocal lens. The values shown in the table allow to provide the minimum distance from the camera installation location to the controlled zone of the specified width. In the course of the installation it is imperative to ensure the quality of the license plate image to be obtained by the camera in the focal zone.

Sensor size: 1/3"

Inst allat ion heig ht (m)	4	6	10	15	20
Area width: 3 m					
Vert	30	30	30	30	30

Sensor size: 1/3"

Inst allat ion heig ht (m)	4	6	10	15	20
Area width: 3 m					
ical angl e, °					
Foc al dist anc e (m m)	11	17	28	42	(56)*
Nea r zon e (m)	5	8,2	15	23, 6	
Foc al zon e (m)	7	10, 4	17	26	(34, 6)
Far zon e (m)	10	13, 5	20	29	(37, 4)
Area width: 6 m					
Vertic al angle, °	3 0	30	3 0	30	30
Focal distanc	6	8	1 4	21	28

Area width: 6 m

e (mm)

Near zone (m)	4	6,5	1 3	21, 5	30
Focal zone (m)	7	10, 4	1 7	26	34, 6
Far zone (m)	1 7	19, 2	2 4	32	40, 4

Note

The table above contains the indicative values. It is strongly advised to perform calculations of camera installation parameters individually, using the CCTV calculator, with due consideration to the design and operational characteristics of the particular cameras and their working environment.

Recommendations on choosing and setting up a camera and lens

When choosing a camera for the license plate recognition purposes, be guided by the above requirements for the received image and recommendations for the camera mounting, as well as the following recommendations for the stream generation settings. Note that some features and settings may be not presented in the description and/or design of specific cameras.

General settings

Frame resolution: This parameter must be calculated individually for each camera setup, as depends on the requirements for the minimum allowable size of the license plate on the frame, the distance from the camera to the license plate, the characteristics of the camera lens, and other parameters.

Frame rate (fps): Depends on the requirements, settings, and mode of operation of the module.

Camera color mode: Monochromatic (black and white) image is a recommended option. **Colored** image is allowed if necessary but a camera must have a full-fledged Day/Night mode with a retractable IR-cut filter.

Codec: MJPEG, MPEG-4, H.264 or H.265.

When choosing a codec and video stream compression settings, it is necessary to ensure the maximum possible preservation of fine details and the absence of any artifacts on the frame.

Bitrate type: When choosing the type of bitrate between constant (**CBR**) and variable (**VBR**), **VBR** is preferred.

Image sensor and signal processing

Sensor type: Both Complementary Metal-Oxide Sensor (**CMOS**) and Charged Coupled Device (**CCD**) sensors are suitable for the recognition of license plates.

CCDs have slightly better light sensitivity and less noise than CMOS sensors. Higher light sensitivity provides better image in low light conditions. But CCDs are more expensive and can consume up to 100 times more power than CMOS, and sometimes when using a CCD sensor, a smearing effect may occur that interferes with the plate recognition process:



Nowadays, CMOS sensors are very close in terms of image quality to CCDs. At the same time, CMOS sensors reduce the overall cost of the camera because they contain all the necessary logic to build the camera and provide more integration capabilities and features than CCDs.

Sensor size: 1/3" or bigger (pixel size is more important).

Pixel size: 3.75 μm (micron) or bigger

Increasing the pixel size increases the image quality in low light conditions.

The size of a single pixel (x_1) can be calculated by dividing the sensor width in mm by the sensor width in pixels:

$$x_1 = w/W$$

Where:

- **w** is a sensor width in millimeters.
- **W** is a sensor width in pixels.

Typical sensor sizes in mm are shown in the table below. It should be taken into account that the dimensions of specific sensors may differ from typical ones.

Sensor size	Sensor dimensions (Width × Height), mm
4/3"	17,3 × 13,0
1"	12,8 × 9,6
2/3"	8,8 × 6,6
1/1,8"	7,2 × 5,3
1/2"	6,4 × 4,8
1/2,3"	6,16 × 4,62
1/2,5"	5,8 × 4,3
1/2,7"	5,4 × 4,0
1/3"	4,8 × 3,6
1/3,2"	4,54 × 3,42
1/3,6"	4 × 3
1/4"	3,6 × 2,7

As an example, the calculation of the pixel size for a 1/3" sensor with a resolution of 1024x768:

$$x_1 = 4.8/1024 = 0.00468 \text{ mm} = 4.68 \text{ } \mu\text{m}$$

Light sensitivity: 0.1 — 0.01 lux (in combination with a high-aperture lens).

Caution should be exercised with a camera with a claimed sensitivity below 0.003 lux, as this level of sensitivity requires additional signal processing. This significantly degrades the image quality and causes fast moving objects to blur, which as a result interferes with the recognition process.

IR Light Sensitivity: Availability of the Day/Night mode is recommended for round-the-clock recognition of license plates.

Dynamic Range: minimum 60 dB (an approximate contrast ratio is 1:1000).

Wide Dynamic Range (WDR): Activation of WDR is recommended. WDR significantly improves the image quality in high-contrast lighting conditions, which allows to capture details both in dark and bright parts of the field of view.

Lens

If the camera is designed to allow lens interchangeability, it is very important to choose the right one. A lens designed to work with a 1/2" sensor is compatible with 1/2", 1/3" and 1/4" sensors, but it would not work with a 2/3" sensor.

If the lens is designed to work with a sensor smaller than the one installed in the camera, then the image will have black borders. If the lens is designed to work with a sensor larger than the camera's, then the field of view will be smaller than the capabilities of the lens, and part of the image will be left outside the sensor, creating a telephoto effect when the image looks enlarged.

Nowadays, cameras with the three most common types of lenses can be found:

- **Fixed lens:** A lens with a constant focal length and therefore only one field of view available.
- **Varifocal lens:** A lens with the configurable focal length that allows to get multiple fields of view. The field of view can be manually adjusted, but users then have to manually refocus the lens.
- **Afocal system (Zoom lens):** Similar to a varifocal lens, afocal lens has a range of focal lengths and fields of view. However, the lens does not need to be manually refocused if the field of view is changed. Focus is maintained over the entire focal length range (for example, 6 to 48 mm). Moving the lens can be carried out manually or mechanized (with remote control). If the lens has the ability to zoom, then the magnification factor (multiplicity) corresponds to the ratio of the maximum focal length of the lens to the minimum.

Lens type: It is recommended to use lenses with configurable focal length (including afocal system) for the recognition of license plates.

Resolving power: The number of line pairs per millimeter must correspond to the physical resolution of the sensor.

When getting acquainted with the characteristics of a lens that can potentially be used for the recognition of license plates, it is necessary to take into account the number of line pairs per mm (LP/mm) that it is capable to project onto the sensor. For example, 5 dark and 5 light lines per mm form a resolution of 10 lines per mm, i.e. 5 pairs of lines per millimeter.

To calculate the exact number of pairs of lines per millimeter that the lens must provide visual distinction with a known sensor size, divide the sensor width in pixels by the sensor size in millimeter, then divide the result by two. Such a calculation can be represented as the formula below:

$$L_{\text{mm}} = (W / w) / 2 = (1 / x_1) / 2$$

Where:

- L_{mm} is the number of pairs of lines per millimeter
- W is the sensor width in pixels
- w is the sensor width in millimeters
- x_1 is the size of a single pixel in millimeters

As an example, the calculation of LP/mm number for a 1/3" sensor with a resolution of 1024x768:

$$L_{\text{mm}} = (1024 / 4,8) / 2 \approx 107 \text{ pairs of lines per mm.}$$

It should be taken into account that the resolving power may be affected by other factors. In particular, resolution may vary depending on different f-stop values (resolution is at its minimum when the iris is completely open). Minimum resolution value is provided in lens specifications. As the iris is closing, the resolution becomes higher (residual optical-system aberrations are reduced). It's important to keep in mind that focusing mistakes may reduce resolving power as well.

It's important to keep in mind that focusing mistakes may reduce resolving power as well.

Focal length range: Recommended ranges are 5-50 mm, 7-70 mm.

Aperture (f) number: 1.0, 1.2, 1.3, 1.4, 1.8.

Aperture control

P-Iris. The recommended option, especially in non-constant lighting conditions. It allows avoiding diffraction (blurring of the image) effect and increasing the sharpness of the image, allowing video surveillance in a wide range of lighting conditions and distances — both in parking lots and on highways. This is achieved by automatically limiting aperture narrowing in strong light conditions. The limits for automatic control of the aperture additionally can be configured through the user interface of the camera.



For some cameras with P-iris, the user interface allows to configure the aperture opening on an index scale — from maximum to minimum. With this function, the iris position, which is set by auto adjustment for most lighting conditions, can be adjusted to the desired position.

DC-Iris. The allowed option. Comparing with P-iris, it only manages the exposure of the sensor. When DC-iris is opened, the sharpness is affected and auto-tuning of this image quality is not available.

Fixed or manual aperture. This option can only be used for surveillance under constant lighting conditions (e.g. indoor parking) when there is no need for constant aperture adjustment. The exposure in this case is set by adjusting shutter speed and AGC that is not as flexible as dynamic aperture tuning. A fixed aperture is set constructively during the manufacture of the lens, a manual aperture is set during lens adjustment and is not automatically adjusted during operation.

IR correction. Required to avoid overexposure if IR projector is used. Lenses of the kind usually have IR index in their marking.

Focal length

To select a proper lens for a camera, it is needed to know the following values: sensor size, distance between the camera and the object and width of the object. Those three values are enough to calculate focal length of the lens in mm (or, if the focal length is available, calculate the width of field of view at set distance) using various CCTV and Lens Calculators.

Such calculators are available online (for example, on camera/lens manufacturers' websites).

Moreover, approximate focal length may be calculated using the following formula:

$$f = d * w / W$$

Where:

f is a focal length in millimeters.

d is a distance between the camera and the object in meters.

w is a width of the sensor in millimeters.

W is a width of the object in meters.

Camera's angle of view is determined by focal length value. When calculating the angle of view, the following points must be borne in mind:

- The shorter the focal length, the larger the angle of view, and vice versa.
- The smaller the sensor size, the smaller the angle of view (for a lens with the same focal length).

The following table represents the correlation between angle of view and sensor size as well as focal distance of the lens. A standard CCTV Calculator was used for calculations.

Distance to the object (m)	Object width (m)	Sensor size	Focal length (mm)	Field of view (°)
3	4	1/3	4	85
3	4	1/2	5	65
3	3	1/3	5	65
3	3	1/2	6	55
7	4	1/3	8	40
7	4	1/2	10	35
7	3	1/3	10	35
7	3	1/2	12	25
11	4	1/3	13	28
11	4	1/2	18	22
11	3	1/3	18	22
11	3	1/2	23	16
15	4	1/3	18	22
15	4	1/2	23	16
15	3	1/3	23	16
15	3	1/2	30	12

Depth of field

Depth of field refers to the distance in front of and behind the focus point within which objects are sharp. The depth of field is an important value when recognizing license plates.

Depth of field is affected by the following three factors: focal length, aperture opening and distance from the camera to the object. A long focal length, long aperture opening or a short distance between the camera and the subject limiting the depth of field.

Many modern surveillance lenses are designed to provide a great depth of field over a wide range of focal lengths.

For some lenses it may be needed to adjust the depth of field manually. In this case, set the focal length first and only then configure the back focus. Adjust the back focus either in natural low light (evening or night) or artificially reduced daylight using an external neutral density filter (the ND filter usually places in front of the lens). Adjusting the back focus in bright daylight may cause an out-of-focus image at night. Adjust the back focus when the aperture is fully open (the maximum aperture is needed to reduce the depth of field to make back focus adjustment easier and more accurate). Sometimes it is difficult to precisely adjust the back focus, in which case it is recommended to set the focus to infinity.

Note that if the depth of field is shallow, the license plate number may not be recognized correctly or not at all. This is due to the fact that the application uses several adjacent frames received during the movement of the vehicle through the controlled area for recognition. With a shallow depth of field, the license plate can not be clearly recognized only in one sharp image, while in the rest of the frames it will be blurred.

Lenses with automatic iris (fixed and adjustable focal length) can have two settings:

- **Automatic** or **Auto Light Control (ALC)**, which controls the sensitivity of the automatic iris control circuitry to changes in light levels.
- **Level**, which allows setting the average value of the iris.

For such lenses, it is recommended to set the medium value for the **Automatic** adjustment and configure the **Level** as follows: set the maximum value and point the camera so that the maximum amount of light enters the lens (it is strictly forbidden to point the lens directly to the sun as it will lead to sensor malfunction) and then cover the camera lens for 5 seconds. After opening the lens, the image should reappear. If this does not happen — repeat the adjustment.

Shutter speed

Shutter speed (Exposure) is one of the critical parameters when recognizing license plates. It is highly recommended to use cameras with manual shutter speed control for license plate recognition.

It is important to keep in mind that too slow shutter speed result in the blurring effect of the license plate characters on the image. Moreover, while watching a video, they may seem clear, but when viewed frame-by-frame, distortions are clearly visible.

For each movement speed mode there is a range of recommended values which should be set for shutter speed depending on the maximum speed of vehicles in the control area.

Maximum vehicle speed in the control area (kmph)	Shutter speed (sec)
17	1/200
20	1/250
90	1/1000
130	1/1500
180	1/2000

In addition, if the horizontal camera rotation angle to the license plate plane exceeds 10° , it is recommended to halve the shutter speed, since the license plate image in this situation is blurring along several axes.

Infrared illumination

To provide round-the-clock recognition in the area with changing lighting conditions, an infrared illumination (by means of either embedded or standalone IR projector) is required. In this case, it is necessary to select a camera with an infrared-sensitive sensor (so called day/night camera). The camera must be equipped with a lens with infrared correction (IR compensation). Marking of such lenses usually contains the "IR" index. As a result, an informative monochromatic image will be provided even for a poorly illuminated areas.

IR illumination range: Recommended value for license plate recognition is **850–880 nm**. It has sufficient recognition distance and generates a comparatively low amount of visible illumination.

IR illumination mode: It is recommended to use IR projector in impulse mode when the illumination impulse is synchronized with global shutter operating mode. This provides more rational use of projector's energy resources, prolonging its service life and saving electricity.

Angle of illumination (if standalone IR projector is used): Should be the same as the camera angle of view. If illumination angle of IR projector is lower than camera angle of view, an exterior light source or well-lit object may get captured in the field of view making the shutter work under the average frame lighting value and thus lower the exposure (equal to forced decreasing of the camera sensitivity). Balancing illumination angle of IR projector and angle of view of the camera is especially important for long-distance surveillance when the camera works at the limit of its sensitivity.

Back focus and depth of field with IR lighting: Since IR light has a longer wavelength and lower refractive index than conventional light, the plane of the focused image is positioned slightly behind the plane of the image sensor.

ND filters

When surveillance is carried out under changing lighting conditions (usually, outdoors), an overexposure may occur. In such cases, a required f-stop is achieved by combining the features of mechanic iris and a neutral density (ND) filter. This type of filter is also useful for minimizing the depth of field when adjusting the back focus or adjusting the auto iris level during the day.

There are built-in and external ND filters. It should be noted that the optical accuracy of ND filters is very important, because as the f-number increases, the resolving power of the lens must be maintained, which theoretically is at its maximum in the middle of the mechanical aperture setting range and decreases as the f-number increases/decreases (this is different from the depth-of-field effect). The possibility of the neutral-gray filter reducing the resolution of the lens has to be taken into account.

Filter properties may be specified in different ways:

- **ND*** and ***X** indicate light blocking by how many times the filter attenuates the light.
- ***.* ND** indicates the optical density number of the filter.
- **f-stop reduction** value indicates the number of exposure compensation steps (aperture steps, f-number).

Light blocking		Density	f-stop reduction
ND2	2X	0.3 ND	1
ND4	4X	0.6 ND	2
ND8	8X	0.9 ND	3
ND16	16X	1.2 ND	4

Light blocking		Density	f-stop reduction
ND32	32X	1.5 ND	5
ND64	64X	1.8 ND	6
ND100	100X	2.0 ND	6 $\frac{2}{3}$
ND256	256X	2.4 ND	8
ND400	400X	2.6 ND	8 $\frac{2}{3}$
ND500	500X	2.7 ND	9
ND1000	~1,000X	3.0 ND	10
ND10000	~10,000X	4.0 ND	13
ND100000	~1,000,000X	6.0 ND	20

Filters can be combined to achieve the desired degree of light attenuation. For example, combining the ND8 and ND100 results in a filter with attenuation of 800 times.

Module installation and update

Warning

Only one of the License Plate Recognition modules can be installed on the same server: either **License Plate Recognition (Complete)** or **License Plate Recognition (Light)**.

Warning

Warning

The module works only with 64-bit version of **Eocortex**.

Warning

Installation under Windows OS

This module is external; it is not included in the basic **Eocortex** distribution package and requires individual installation.

Note

The module must be only installed on the computer with **Eocortex Server** or **Eocortex Standalone** application, to which the license plate recognition cameras are bound. The computers with just **Eocortex Client** application installed do not require installation of the module.

Warning

The module's version must match the version of **Eocortex** software installed on a particular computer.

Warning

The installation files must be run under the administrator's account.

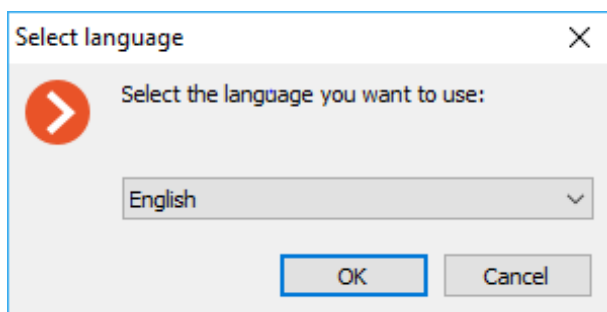
Note

To update the module, it is required to perform the same steps as for the initial installation of the module. After selecting the installation language but prior to launching the installation wizard, the windows offering to uninstall the previous version will appear. It is required to confirm the uninstall. After the uninstall is complete, the module installation wizard will appear.

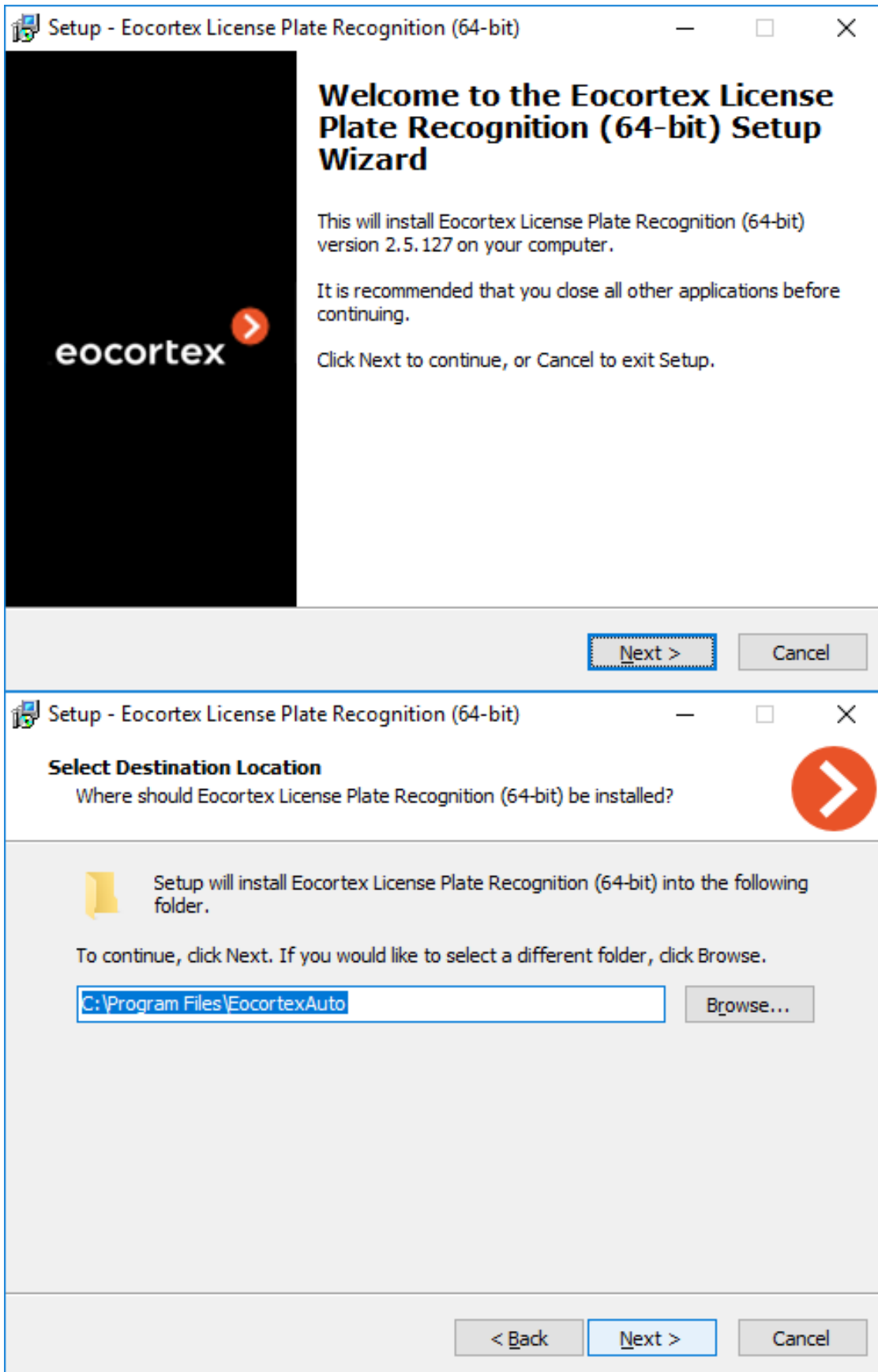
Before installing the module, it is required to stop all the **Eocortex** applications running on the computer, and to insert the module protection key in the USB port.

To install the module, it is required to run **EocortexAuto Installer_x64.exe** file.

It is required to choose the installation language in the opened **Select language** window.

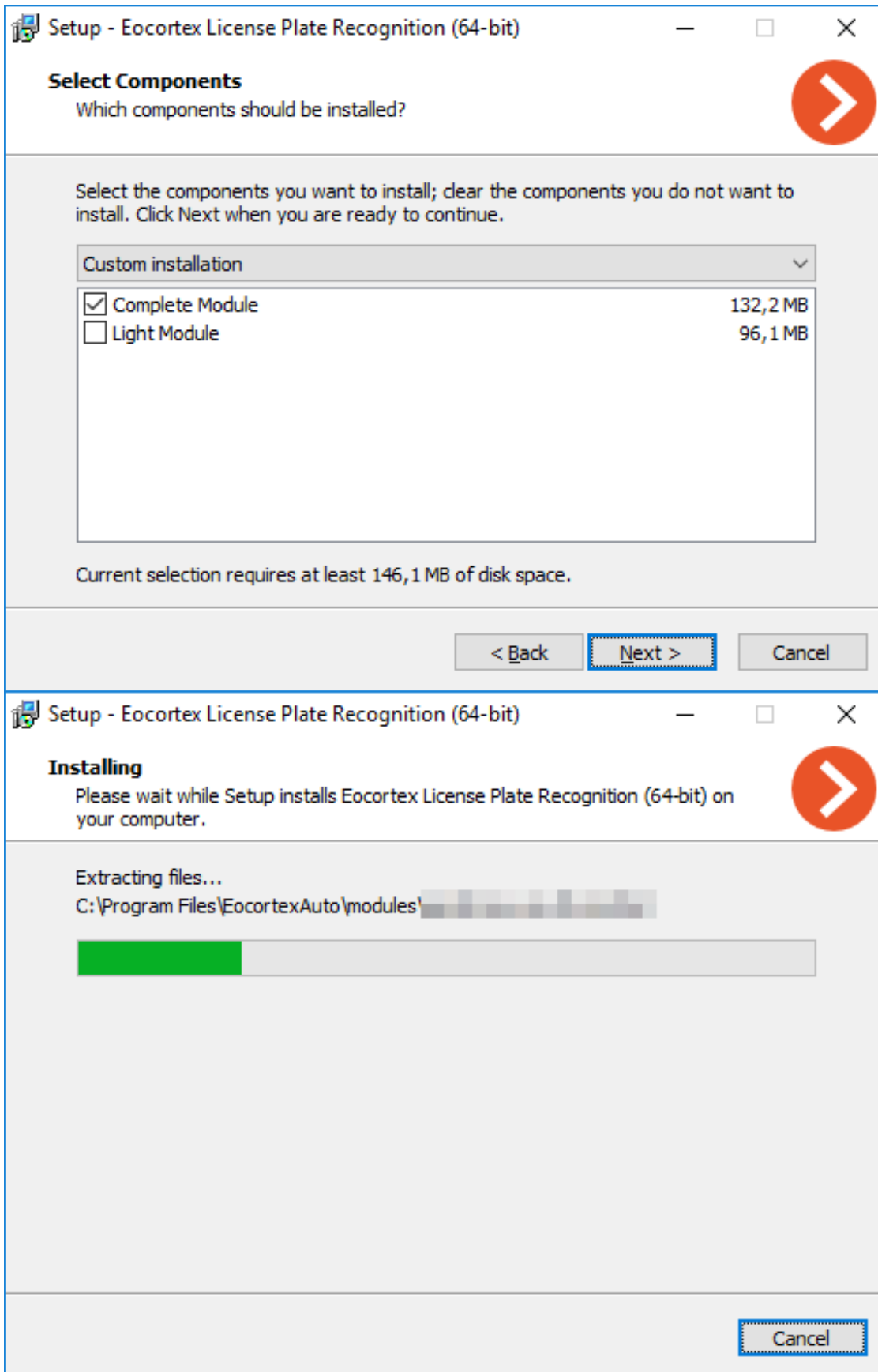


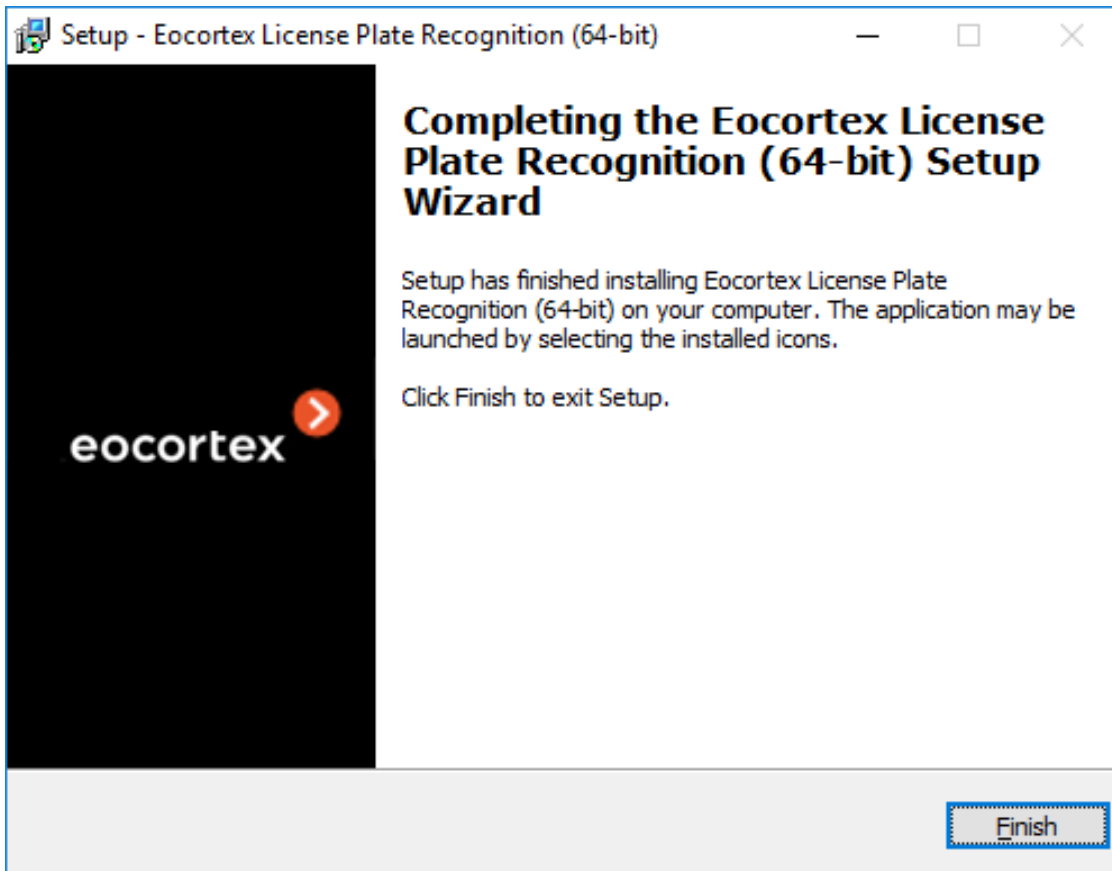
Then it is necessary to follow the steps of the installation wizard.



Warning

At the **Select component** step, choose the **Licence plate recognition (Complete)** option.





Note

By default, the module will be installed to **C:Program FilesEocortexAuto** folder.

Installation under Linux OS

This module is external, meaning that it is not a part of the main distribution kit of **Eocortex** and needs to be installed separately.

Note

It is required to install the module exclusively on a computer that already has the **Eocortex Server** application installed; this computer must have the cameras for license plate recognition bound to it.

Warning

The module's version has to be the same as the version of **Eocortex** installed on the given computer.

Compatible Linux distributions:

- Debian 10
- Ubuntu 20.04

Warning

Operability on other Linux distributions is not guaranteed.

To enhance the accuracy of license plate recognition the module provides a few features based on neural network technologies. Due to the necessity to install additional libraries to support these features, and their use increases the load on the server, the module has two types of distribution packages:

- **ecocortex-plate**: complete installation package containing all the additional libraries needed for neural network features.
- **ecocortex-plate-non-dnn**: installation package without support for neural network features.

Regardless of the selected package, the module installs in the standard way from the repository.

Debian and Ubuntu

Online installation of the module with neural network features

Run in Terminal:

```
sudo apt-get install ecocortex-plate
```

Online installation of the module without neural network features

Run in Terminal:

```
sudo apt-get install ecocortex-plate-non-dnn
```

Offline installation of the module with neural network features

Download the ecocortex-plate package matching the server version from the repository:

<http://packages.ecocortex.com/deb/public/pool/main/m/ecocortex-plate/>

Transfer it to the server using USB flash drive or by any other way and run the command in Terminal:

```
sudo dpkg -i ecocortex-plate*
```

Offline installation of the module without neural network features

Download the ecocortex-plate-non-dnn package matching the server version from the repository:

<http://packages.ecocortex.com/deb/public/pool/main/m/ecocortex-plate-non-dnn/>

Transfer it to the server using USB flash drive or by any other way and run the command in Terminal:

```
sudo dpkg -i eocortex-plate-non-dnn*
```

Licensing the module

Since the module uses libraries developed by a third party and requires separate licensing, two elements are used for its licensing protection: the **Licence plate recognition (Complete)** module's hardware protection key and the license, bound to the **Eocortex** protection key.

Note

The need to use two elements of the license protection at the same time is only a technical feature: upon purchase, only one license is paid for each server, which indicates the type of module — **Highway** or **Parking** — and the number of cameras for plate recognition on this server.

The module's hardware protection key is a HASP USB dongle:



The Eocortex protection key can be either hardware or software.

The module is licensed according to the type of license, groups of recognizable countries and the number of recognition channels.

Types of license:

- **Highway:** Recognition of license plates moving with the speed up to 250 kmph. Stream analysis is performed either with the actual frame rate received from the camera or according to the analysis rate specified in the settings of the software motion detector.
- **Parking:** Recognition of license plates moving with the speed up to 20 kmph. Stream analysis is performed at a frequency of no more than 6 frames per second, regardless of the actual frame rate received from the camera.

Below is the list of currently supported countries:

Abhasia, Accord Dangereuses Route, Albania, Algeria, Andorra, Angola, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Belarus, Belgium, Bolivarian Republic of Venezuela, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Cameroon, Canada, Chile, China, Colombia, Costa Rica, Croatia, Cuba, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Estonia, Ethiopia, Finland, France, Georgia, Germany, Gibraltar, Greece, Grenada, Guatemala, Holy See (Vatican City State), Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Ireland, Islamic Republic of Iran, Israel, Italy, Japan, Jordan, Kazakhstan, Kenya, Kosovo, Kuwait, Kyrgyzstan, Latvia, Liechtenstein, Lithuania, Luxembourg, Madagascar, Malaysia, Malta, Mexico, Monaco, Mongolia, Montenegro, Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Oman, Ossetia, Panama, Paraguay, Peru, Philippines, Plurinational State of Bolivia, Poland, Portugal, Pridnestrovian Moldavian Republic, Puerto Rico, Qatar, Republic of Korea, Republic of Moldova, Republic of North Macedonia, Romania, Russian Federation, Saudi Arabia, Serbia, Seychelles, Singapore, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Tajikistan, Tunisia, Turkey, Turkmenistan, Ukraine, United Arab Emirates, United Kingdom, United States, Uruguay, USSR, Uzbekistan, Vietnam, Zambia.

The **Eocortex** server that handles license plate recognition cameras must have the module's own protection key plugged in. In addition, this server must have a **Eocortex** license with the **Licence plate recognition (Complete)** module usage supported.

Warning

One **Eocortex** server can have only one **Licence plate recognition (Complete)** module protection key.

Warning

Only one speed mode can be used on the same **Eocortex** server at the time: **Highway** or **Parking**.

The number of cameras recognizing license plates on the server can be increased. To do this, purchase the license update for the module, **update the Eocortex license** on the server and then **update the module protection key**.

License type of the module can be changed, but only from the **Parking** to **Highway** speed mode. To do this, purchase the license update for the module and **update the module protection key**. It is not necessary to update **Eocortex** license if the number of plate recognition cameras is not changed.

In a multiserver system, the license plate recognition module can be applied to cameras connected to different **Eocortex** servers, with the following conditions:

- Each server must use its own separate module protection key and installed **Eocortex** licenses with the appropriate number of cameras that recognize license plates.
- All cameras in the system will use the same license plate database and archive of recognized plates.

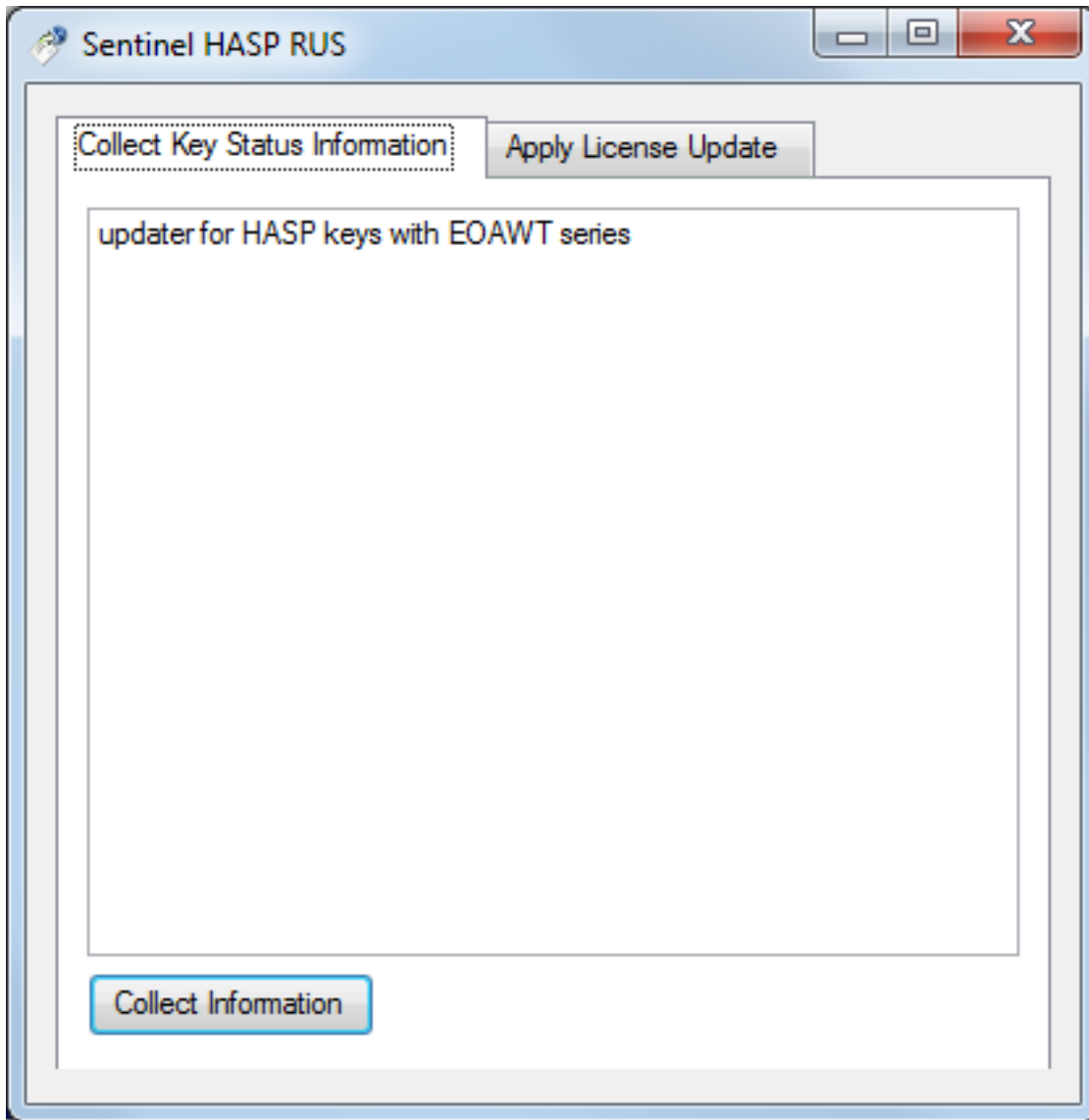
Warning

If any other software that use **HASP** license protection keys is installed on the same computer with the **Eocortex** server, then the **Licence plate recognition (Complete)** module may operate unstable.

Updating the module protection key

There may be a situation when it is necessary to change the license parameters of the module protection key. To do this, follow these steps:

- With the **Licence plate recognition (Complete)** module protection key plugged into the computer's USB port, open the HASP driver web interface in any browser on the **Sentinel Keys** page: **http://127.0.0.1:1947/_int_/devices.html**. Copy the values of the **Key ID** and **Vendor** fields and tell them to the company where the **Eocortex** license was purchased.
- A utility (hasp_update.exe) to take a snapshot of the key will be sent in response. Each **Vendor** uses its own utility, but they have the same user interface.
- With the **Licence plate recognition (Complete)** module protection key plugged into the computer's USB port, run the utility and go to the **Collect Key Status Information** tab. Press the **Collect Information** button and save the resulting c2v-file. It is recommended to use the **Key ID** value as the file name.



- Send the c2v-file to the company where the **Eocortex** was purchased.
- An update file (with *.v2c extension) will be sent in response. Save this file.
- With the **Licence plate recognition (Complete)** module protection key plugged into the computer's USB port, open the HASP driver web interface in any browser on the **Update/Attach** page:
http://127.0.0.1:1947/_int_/checkin.html. Click the **Select file** button and find the v2c-file. Click the **Apply file** button to apply the key update, which takes a few seconds to complete.
- After updating the key, the **Eocortex** server must be restarted for the changes to take effect.

Sentinel Admin Control Center

Update/Attach License Host Name: [REDACTED]

Select File: Select File...

File Format: V2C, V2CP, H2R, R2H, H2H or ID file

Apply File Cancel

Sentinel Keys

Products

Features

Sessions

Update/Attach

Access Log

Configuration

Diagnostics

Troubleshooting

If the **Licence plate recognition (Complete)** module does not work correctly, or does not work at all, the following diagnostics should be performed:

Work correctness of the HASP protection key driver and module libraries

To check the correctness of HASP protection key driver installation, try to open the **http://127.0.0.1:1947/_int_/devices.html** page in any browser on the server. The module protection key must be plugged into the server.

Warning

The address above must be entered completely, including the **http://** prefix.

If as a result, the browser displays a page similar to the one shown below, then the HASP driver is installed correctly. The **Key ID** line should contain the identifier of the protection key. It is recommended to provide this identifier to the technical support specialists in case of issues with the module. The License Plate Recognition module protection key must have one of two possible values in the **Vendor** line: 106763 (AAOTB) or 107392 (EOAWT).

The screenshot shows the Sentinel Admin Control Center interface. At the top, there is a dark blue header with the text "Sentinel Admin Control Center" and a "Help" icon. Below the header, there is a search bar labeled "Sentinel Keys Host Name". The main content area displays a table with the following columns: Location, Vendor, Key ID, Key Type, Configuration, Version, Sessions, and Actions. The table contains one row of data:

Location	Vendor	Key ID	Key Type	Configuration	Version	Sessions	Actions
Local	0 (107392)	0 1337470423	HASP HL Time	Midi	3.25		Products Features Sessions Link on

On the left side of the interface, there is a vertical navigation menu with the following items: Sentinel Keys, Products, Features, Sessions, Update/Attach, Access Log, Configuration, and Diagnostics.

If the HASP driver page does not open, try to open it in another browser.

If other browsers also fail to open the HASP driver page, then the HASP driver is most likely installed incorrectly or not installed at all.

Case 1

HASP driver is not installed or installed incorrectly.

Possible causes and solutions

Cause 1.1

Installation is not finished.

Solution 1.1

Restart the computer. Sometimes the installation process of the driver may require rebooting the server machine.

If the driver page does not open after reboot, reinstall **Eocortex** Server / Standalone — the HASP driver is installed as a component of the system during the main installation process. Restart the computer again after reinstalling **Eocortex** Server / Standalone.

Cause 1.2

Installation is blocked by antivirus software.

Solution 1.2

Stop AV software if any installed on the server and reinstall **Eocortex** Server / Standalone.

Note

It is not recommended to use AV software on **Eocortex** servers, but if security policies require it, make sure that all **Eocortex** components are whitelisted and excluded from scanning.

Warning

All installation files must be run as administrator.

If the **Eocortex** Server / Standalone is running and at least one camera has the License Plate Recognition module configured, then the **Session** line must have a non-zero value, which indicates that the License Plate Recognition module is currently running.

Case 2

Sentinel Admin Control Center												
Features Host Name: Sentinel												
Vendor	Key ID	Product	Feature	Location	Access	Counting	Logins	Concurrency	Detached	Restrictions	Sessions	Action
Products	104213	7790679696	0	View Details	Loc-Net Display	Station	=			Perpetual		
Features	104213	1045374565	0	View Details	Loc-Net Display	Station	=			Perpetual		
	104213	4338979612	0	View Details	Loc-Net Display	Station	=			Perpetual		
Sessions	104213	89199448644	0	View Details	Loc-Net Display	Station	=			Perpetual		
Update/Attach	104213	19675046969	0	View Details	Loc-Net Display	Station	=			Perpetual		
Access Log	104213	29901163866	0	View Details	Loc-Net Display	Station	=			Perpetual		
Configuration	71538089556		0	View Details	Loc-Net Display	Station	=			Perpetual		
Diagnostics	71538089556	2000 VMS base	64	View Details	Loc-Net Display	Login		100		Expired		
	71538089556	2000 VMS base	63	View Details	Loc-Net Display	Login		100		Expired		
	71538089556	2000 VMS base	61	View Details	Loc-Net Display	Login		100		Expired		
	71538089556	2000 VMS base	59	View Details	Loc-Net Display	Login		1		Expired		

The License Plate Recognition module is not working and the **Session** line is empty or have a dash as its value.

Possible causes and solutions

Cause 2.1

The License Plate Recognition module is not activated for any camera on the server. The server configuration was not applied after module activation. **Eocortex** Server / Standalone was not restarted after applying the configuration.

Solution 2.1

Activate the License Plate Recognition module at least for one camera on the server. Apply the configuration after activating the module. Stop and start again **Eocortex** Server / Standalone manually.

Cause 2.2

The license on the key has expired.

Solution 2.2

In some cases, the user may be provided with a time-limited test key for the License Plate Recognition module. If the license has expired, then in the **Restrictions** field on the **Features** tab of the key on the HASP driver page will be the **Expired** value.

Cause 2.3

Protection keys conflict. The License Plate Recognition module key conflicts with another HASP protection key installed on **Eocortex** Server / Standalone.

Solution 2.3

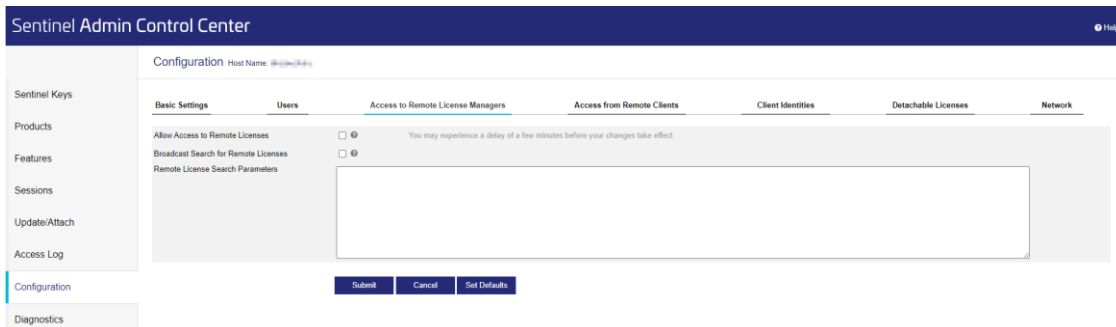
Warning

It is not recommended to install **Eocortex** Server / Standalone on a computer that has other software that uses HASP protection keys installed.

Note

The **Eocortex** license can also be provided as a HASP protection key with Vendor ID 104213. It does not conflict with the protection key of the License Plate Recognition module.

To ensure that no HASP protection keys (including those required by third-party software) other than needed for the License Plate Recognition module are installed on the same computer with **Eocortex** Server / Standalone , open the HASP driver web-interface, go to the **Configuration** page and switch to the **Access to Remote License Managers** page (or simply open the link: **http://127.0.0.1:1947/_int_/config_to.html**) where disable all checkboxes.



The next step is to open the **Sentinel Keys** page (**http://127.0.0.1:1947/_int_/devices.html**) and make sure that there are no other HASP protection keys available on this computer.

If other HASP protection keys except the License Plate Recognition protection key (**Vendor** ID: **106763** or **107392**) and optional **Eocortex** protection key (**Vendor** ID: 104213) are installed on the computer, unplug them and restart **Eocortex** Server / Standalone . Check if the module is working.

If the License Plate Recognition module is working after extracting third-party keys (the **Session** line contains a non-zero value), then either third-party software protected with HASP keys or **Eocortex** Server / Standalone needs to be transferred to another computer.

Work correctness of the License Plate Recognition module

Below are typical issues that may be encountered when using the License Plate Recognition module, as well as recommendations on how to fix them.

Case 1

None of the license plates are recognized. Specific types of license plates or license plates of the specific country are not recognized. Most of the plates visible on the frame are not recognized.

Solution 1.1

Make sure that the desired country and all the needed templates are selected in the module settings. Note that in addition to the Country checkbox, the checkboxes for all desired templates must also be enabled.

Solution 1.2

The minimum and maximum sizes of the license plate in the module settings do not match the actual size of the license plate on the frame. Set the sizes so that the license plate on the frame will be in the range between the minimum and maximum sizes.

Solution 1.3

The search area may be configured incorrectly in the module settings. Set the search area so that the license plates are included in this area. If multiple separate search areas are used for plate recognition, make sure that there are no uncovered spaces between them. A simple search area consisting of a single rectangle is more preferable to a complex one consisting of multiple parts.

Solution 1.4

The software motion detection may not be activated or configured. Activate and configure the software motion detector.

Solution 1.5

The image received from the camera may not be suitable for plate recognition (image is blurry, noisy, contains artifacts or distortions). Run the **Eocortex Client**, open the video archive of the camera with the license plate recognition module activated and find the frame with license plate that must be recognized. Save the frame in TIFF or BMP format (resolution of the saved frame must match the resolution of the frame received from the camera) and open it in any graphics editor. Set the scale to 1:1 and make sure the license plate image is clear and legible. If the image is blurry or noisy, adjust the camera to get a clearer image (additional lens focus and codec compression changes may be required).

Solution 1.6

The camera position or field of view may not match the recommendations provided on the **Requirements and recommendations** page. Adjust the camera position and field of view to meet the requirements to the license plate image.

Solution 1.7

The low-resolution stream may be selected for plate recognition. Run the **Eocortex Configurator** and open the camera settings. If **more than one stream** is activated in the **Video streams** section of the **Connection** tab, make sure that the **Main** stream or the stream with the most suitable resolution is selected in the **Video stream for analysis** section of the **Motion detection** tab.

Case 2

Not all license plates on the frame are recognized. Some license plates of the same type and size are not recognized on the same part of the frame.

Solution 2.1

See solutions 1.5 – 1.7 above.

Solution 2.2

Reduce the requirements for recognition quality in the module settings: decrease the level of the **Quality of recognition** parameter, increase the value of the **Acceptable number of unrecognized characters** parameter.

Solution 2.3

If the **Parking** license type is used for licensing the module, then unsuccessful recognitions can be caused by vehicle speed close to or greater than 20 kmph. In such case, if it is necessary to improve recognition accuracy and there is no way to limit the movement speed in the control area, then it is recommended to change the module license type from **Parking** to **Highway**. Note that recognition with the **Highway** license type processes more frames to get an accurate result, which significantly increases CPU usage.

Case 3

Too many license plates are recognized incorrectly or not completely (Asterisks * instead of symbols in the recognition result)

Solution 3

Amplify the requirements for recognition quality in the module settings: increase the level of the **Quality of recognition** parameter, decrease the value of the **Acceptable number of unrecognized characters** parameter.

Face recognition

Eocortex allows to use several modules that perform face recognition using a database: **Face Recognition (Complete)**, **Face Recognition (Light)** and **Unique Visitor Counting**.

However, it is not possible to use **Face Recognition (Light)** module with other face recognition modules on one camera at the same time.

The modules ensure high recognition accuracy and can be used together with access control systems at the facilities with high security requirements, for example, at banks or restricted access facilities. Another important use of the modules can be automatic identification of the hotel guests, restaurant customers, and the visitors of other similar enterprises.

Comparison of modules

Capabilities	Versions		
	Face Recognition (Light)	Face Recognition (Complete)	Unique Visitor Counting
Identification of faces contained in a database	√	√	-
Identification of people wearing sunglasses, headgear, etc.	-	√	√
Relative recognition accuracy	Medium	High	-
Number of people in database	Up to 500	Unlimited	-
Determination of sex and age	-	√	√
Recognition of emotions	-	√	√
Recognition of faces in archive	-	√	-
Reports regarding faces	√	√	Detection only
Reports regarding unique visitors	-	-	√
Usage of high-performance video card (GPU)	+	√	√
Usage of several video	-	√	√

	Versions		
	Face Recognition (Light)	Face Recognition (Complete)	Unique Visitor Counting
Capabilities			
cards (GPUs)			
✓	Yes		
-	No		
+	Optionally		

Details

Face Recognition (Complete) and **Unique Visitor Counting** modules use all the suitable video cards installed on the server. Every camera with the recognition module enabled is assigned to one of the cards.

When the number of cameras with the recognition modules enabled exceeds the quantity of video cards used, the cameras will be uniformly distributed among the video cards, as applicable, without considering the characteristics of the video streams coming from the cameras and the performance of the video cards (i.e. an equal number of cameras will be assigned to each video card, wherever possible).

Unique Visitor Counting module is intended for generating unique visitor counting reports based on detecting and recognizing faces. It is possible to exclude faces pertaining to certain groups from the counting, for example, to avoid counting employees.

The **Face Recognition (Complete)**, **Face Recognition (Light)** and **Unique Visitor Counting** modules determine the uniqueness of a face on the basis of the set of features jointly called the "index". The modules do not use individual points (dots) of faces when determining the index; instead, the image with the size of 100x100 pixels (using the "points" terminology, a face is recognized using approximately 10 thousand points). For each face located, an entry is created in the archive of the server where this face was found, even if the face has not been explicitly entered into the database. Subsequently, these events will be available for viewing in the event archive. These modules are capable of recognizing several faces present in the frame at the same time (10 or more, if the computing capacity allows it).

The **Face Recognition (Complete)** module can identify masked faces with high accuracy; provided that the database contains samples of these persons without a mask. Also, this module can recognize turned faces; despite the fact that only images of faces looking directly into the camera are entered into the database.

The face database may be located on the same server where the recognition is being performed, or, alternatively, on another server of a unified multiserver video surveillance system.

Each entry in the face database contains the following:

- One or more images (screenshots and/or photographs) of a person's face;
- Surname, first name, patronymic of a person that are entered manually and are optional;
- Additional information (optional text box);
- Group affiliation (optional parameter).

The uniqueness of the entries of the database is determined by the face index. Thus, the database can contain several entries with the coincident surname, first name and patronymic (including the empty field).

It is possible to work with the face database from the **Eocortex Client** application, or using the API.



Module setup

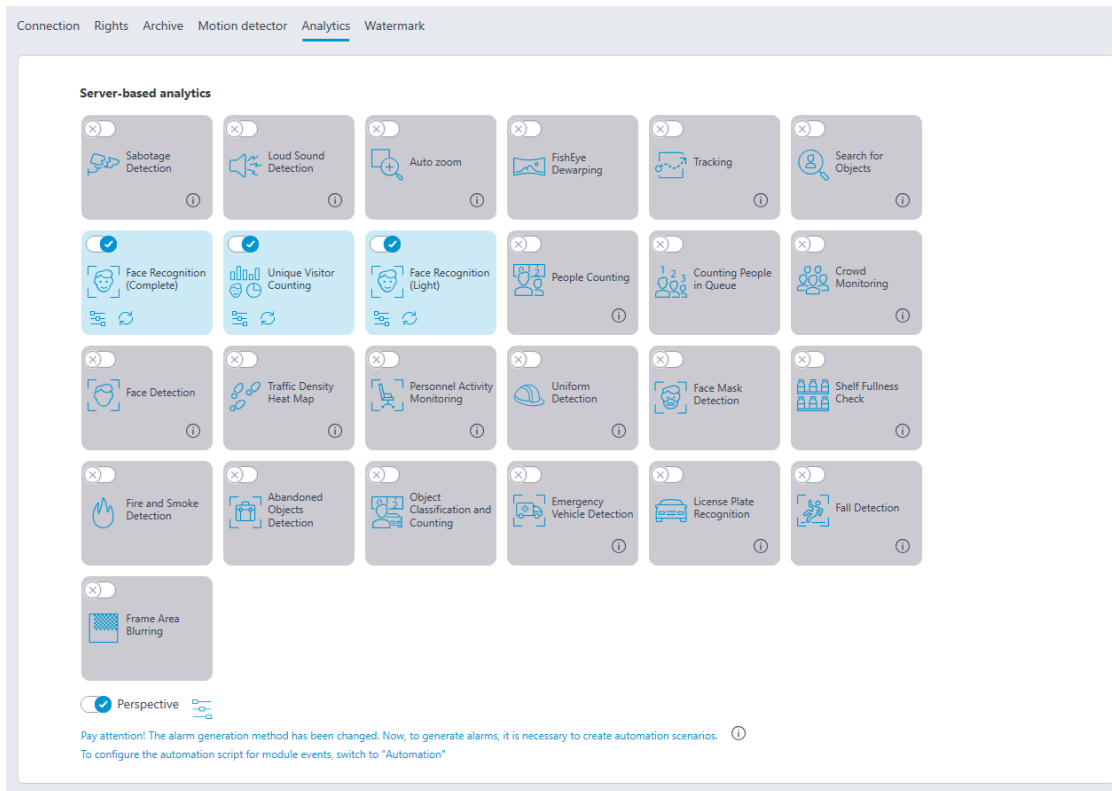
Warning

Before using the face recognition or unique visitor counting modules, it is required **to install the additional components on the server.**

To use the module, enable and configure it.

To do that, launch the **launch the Eocortex Configurator application**

application, go to the  **Cameras** tab, select a camera in the list located on the left side of the page, then go to the **Analytics** tab on the right side of the page, and enable the module using the  switch.



Warning

It is possible to simultaneously enable on the same camera only those modules that are based on the face recognition technology: **Face Recognition (Complete)** and **Unique Visitor Counting**. No other face recognition modules can be enabled simultaneously on the same camera.

Note

The minimum width and height of an object in the software motion detector settings must be smaller than the size of a face.

Some settings of the modules are the same; others are unique for each one. The module settings are described below.

Main settings

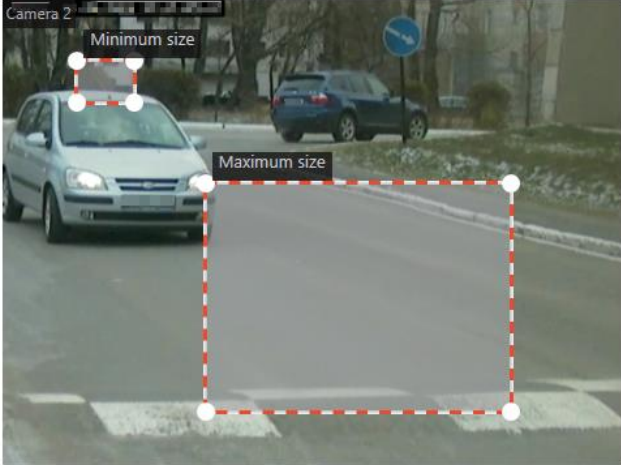
The **Main settings** tab is used to set the general settings for recognition.

Face Recognition (Light)

Main settings | Detection area | Database "Light"

Face size

Archive | **Real time**



Parameters

Minimum recognition positiveness: 80 % (i)

Minimum number of frames for recognition 2 (i)

Detection sensitivity: Medium (i)

Limit time for repeated recognitions: 5 seconds (i)

Short delay mode (i)


Save **Cancel**

Face Recognition (Complete)

Main settings | Detection area | Database "Complete" | Time logging areas

Face size

Archive | **Real time**



Parameters

Minimum recognition positiveness: 85 % (i)

Detection sensitivity: Medium (i)

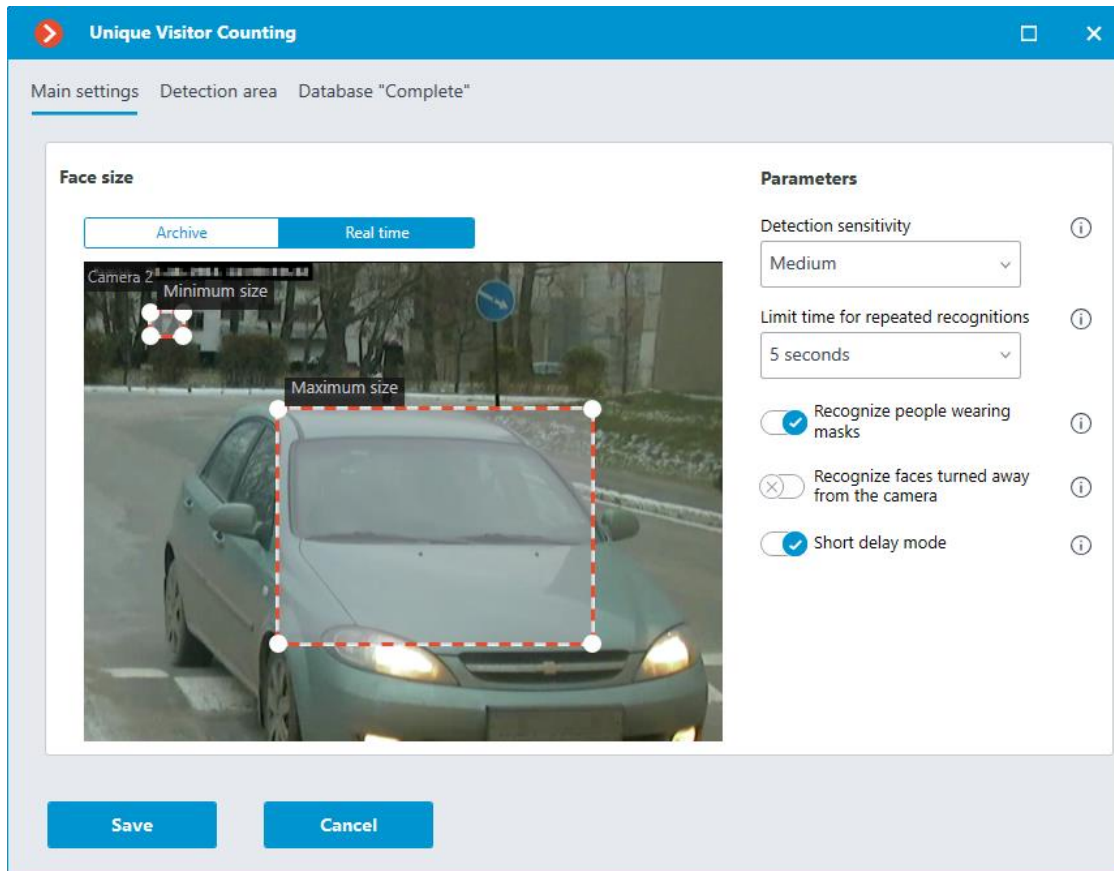
Limit time for repeated recognitions: 5 seconds (i)

Recognize people wearing masks (i)

Recognize faces turned away from the camera (i)

Short delay mode (i)

Save **Cancel**



Minimum size and **Maximum size**: Allow to set, using frames, the minimum and the maximum size of a face to be detected. The minimum size that is too small may lead to false detections due to the low quality of small images of the faces.

Minimum recognition positiveness:: the cases of recognition with the similarity value lower than the specified threshold will not count. Lowering the value will allow to better recognize people wearing sunglasses, with partially covered faces, etc., but, at the same time, may lead to false recognitions. The available range of values is 70–100%; default value: 80%.

Detection sensitivity: The higher the sensitivity, the lower the minimum acceptable quality of the images of the faces required for recognition. The higher value can help in case of low light conditions, but may also result in erroneous detections and in detecting bad quality images of the faces. The lower value reduces the module's capability to detect faces turned away from the camera. The allowable range of values is as follows: **Minimum, Low, Medium, High** and **Maximum**; the default value is **Medium**.

Limit time for repeated recognitions: the minimum time between detections of a face of the same person. It prevents occurrence of the identical entries in case of the successive appearances of the same person in the frame. The allowable range of values: **Not to limit, 5 seconds, 30 seconds, 1 minute**; the default value is **Not to limit**.

Minimum number of frames for recognition: if a person was detected in the camera field of view less than a specified number of times, no recognition will be performed. The available range of values is 1-5; the default value is 2.

Recognize people wearing masks and **Recognize faces turned away from the camera:** allow more flexible configuration of the module: if these parameters are disabled, this will reduce the number of potentially false triggerings, and if they are enabled, the module will detect and recognize faces more accurately.

Short delay mode: reduces the time between the camera detecting a face and displaying the corresponding frame in the feed. The requirement of minimum number of face detections to generate an event is removed, now one detection is enough.

Warning

A larger number of repeated faces can be detected in the feed.

Note

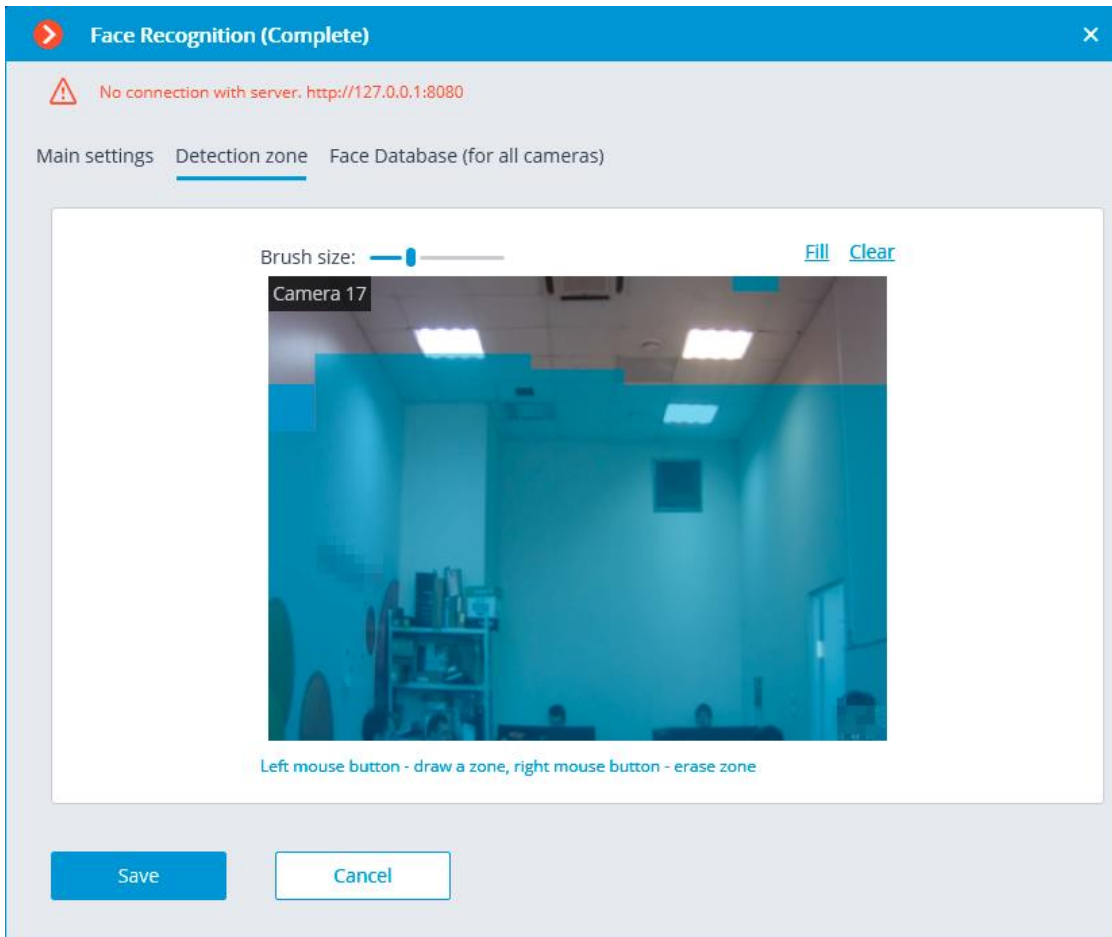
These parameters only affect the ability to identify masked and turned away faces, detection will be performed in any case.

Note

In **Tasks by event**, it is possible to set **scenarios** based on the presence or absence of a mask on a person's face, as well as by the attribute of whether a person's face is turned away from the camera.

Detection area

On the **Detection area** tab, the user can specify the area where the system will search for faces. By default, the detection zone occupies the whole frame.



Database

On the **Database** tab, the parameters of connection to the face database are set.

Two database deployment options are available: **Local** or **Remote**.

If the recognition process runs on only one server, it is recommended deploying the database on this server by selecting **Local**.

If the recognition process is running on several servers, the database should still be hosted only on one of them. For this purpose, select the **Remote** option for all cameras and specify the database connection parameters: server address, name and password of the database administrator. The same applies when the database of the module is deployed on one server, and the camera with the module enabled is attached to another one.

Note

Eocortex version 3.6 and lower uses **Firebird** DBMS with the following default values:

- **Port:** 3050
- **Username:** SYSDBA
- **Password:** masterkey

Note

Starting from version **Eocortex** 4.0, the module's database is handed over to the **PostgreSQL DBMS** with the following default values:

- **Port:** 5432
- **Username:**
 - For Windows: postgres
 - For Linux: eocortex
- **Password:** masterkey

Warning

Remote access to databases is not allowed by default in PostgreSQL and must be additionally configured if remote databases are used for analytics. All settings must be done for the server where the database is stored. Settings are slightly different for **Windows** and **Linux** operating systems.

When the server is running for the first time after upgrading **Eocortex** to version 4.0 or higher, the existing module database will be automatically transformed to be compatible with **PostgreSQL**.

Warning

If connecting to a **Remote** database, use the DBMS **Username** and **Password** that are valid for the server storing the database.

Warning

Independent of the database location, the recognition events (date and time of recognition, coordinates of the object in the frame, binding of the recognized object to the database) will always be stored on the server to which the camera with the corresponding events is bound.

Warning

Synchronization with the database located on a remote server can take some time

Note

When using a remote database, the **remote database replication mechanism** will be applied.

It is possible to check the availability of the database clicking the **Connection check** link. If the server is unavailable, the corresponding message will be displayed.

It is possible to set the **own face database** for the **Face Database Complete** for an individual camera of a group of cameras using the field **Database identifier**.

Warning

The field Database identifier is not initially displayed at the launch of the module.

Note

To use this capability, it is required to set Database identifier via REST API.

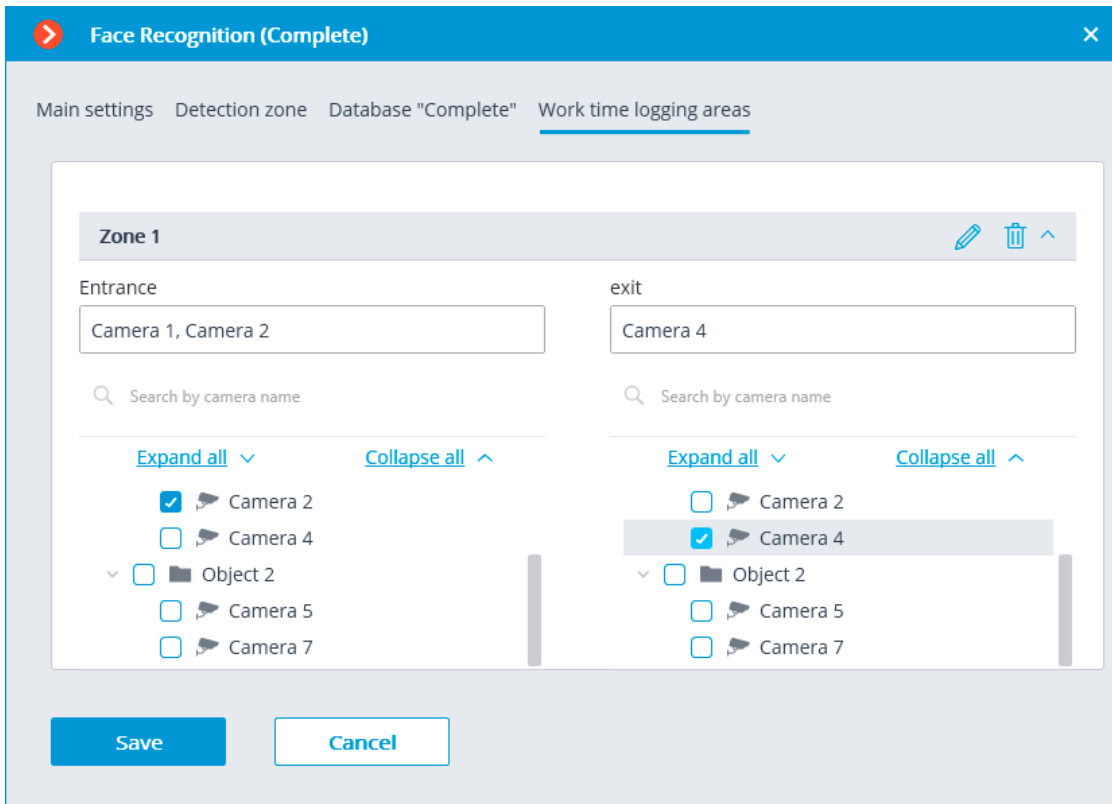
The screenshot shows a software window titled "Face Recognition (Complete)" with a close button in the top right. Below the title bar, there are four tabs: "Main settings", "Detection zone", "Database \"Complete\"", and "Time logging areas". The "Database \"Complete\"" tab is selected and underlined. Inside this tab, there are two radio buttons: "Local" (unselected) and "Remote" (selected). Below these are four input fields: "Address" (192.168.200.228), "Port" (3050), "Name" (SYSDBA), and "Password" (masked with dots and an eye icon). To the right of the "Port" field is a "Type" section with two radio buttons: "Windows" (selected) and "Linux" (unselected). Below the "Password" field is a blue link labeled "Connection check". At the bottom of the tab is a "Database identifier" input field containing "Db1". At the very bottom of the window are two buttons: "Save" (blue) and "Cancel" (white with blue border).

Time logging areas

Warning

This tab is only available in the settings of the **Face Recognition (Complete)** module.

The parameters to be used for creating **Work time logging (Complete)** report are set on the **Time logging areas** tab.



Work time logging (Complete) report is formed by areas (zones). An area is a territory where it is required to monitor the presence of persons. The people's faces must be recognized at the entrance to and the exit from the area by the **Face Recognition (Complete)** module. Several cameras may be used for a single area both at the entrance and at the exit.

Note

If a face was recognized at the exit of the zone, but was not recognized at the entrance, the person's time in the zone will be counted from 00:00.

For each area, it is possible to open the settings and set the cameras for performing face recognition on the entrance and exit. Only the cameras with the **Face Recognition (Complete)** module enabled will be shown in the hierarchical list.

Warning

The module will start working only when **the settings are applied**.

Requirements and recommendations

- **Face Recognition (Complete)**
- **Face Recognition (Light)**
- **Unique Visitor Counting**

Deployment of the module

Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.

Warning

The neural network works with the 64-bit version of **Eocortex** only.

Warning

When upgrading **Eocortex** to another version, it is necessary to also upgrade the **install the Eocortex Neural Networks package** package to the corresponding version.

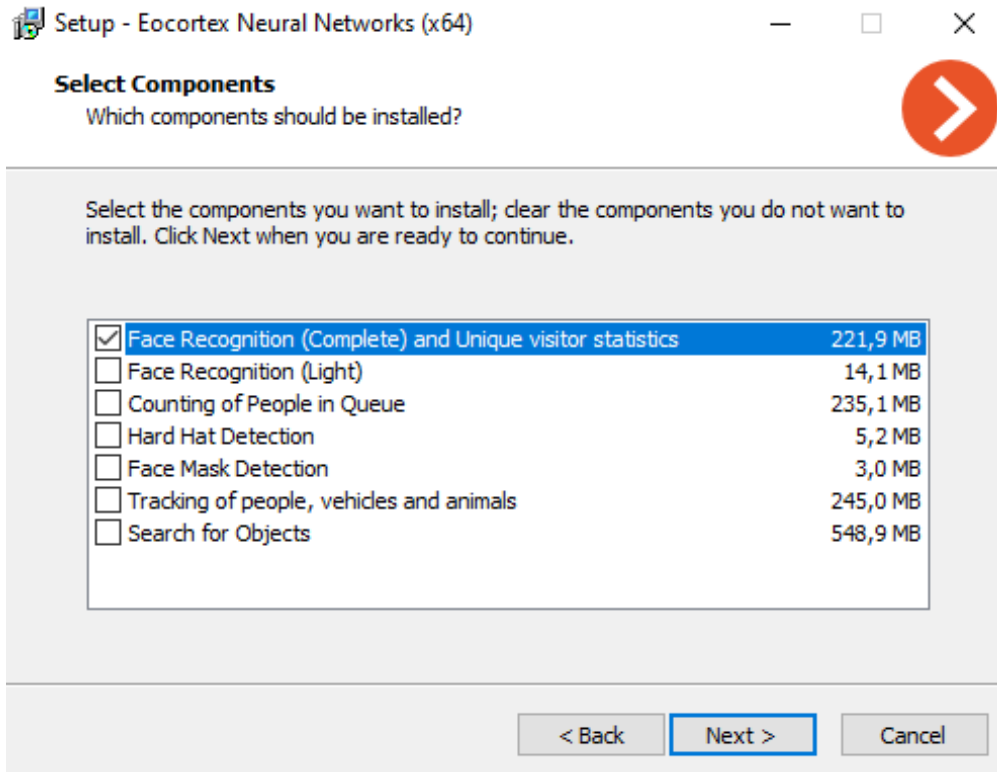
Warning

If the **Face Recognition (Complete)** module is used, the face databases will be automatically updated at the first start after updating **Eocortex** and the **Eocortex Neural Networks** package from version 3.3 or lower to version 3.4 or higher. It will take some time.

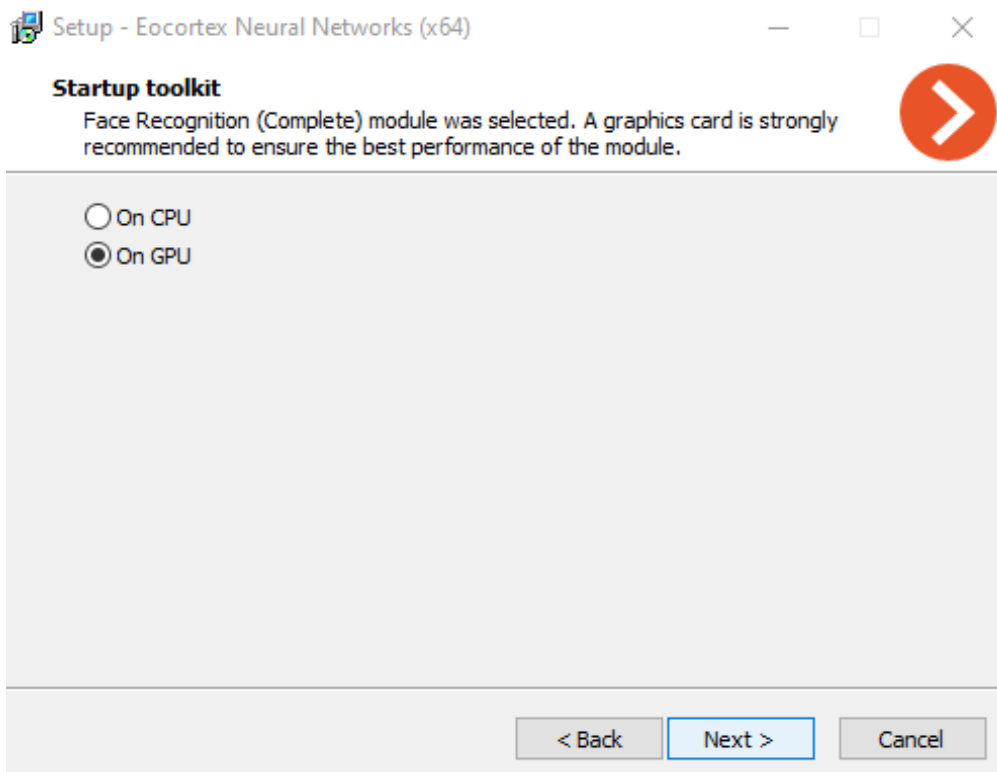
Warning

Simultaneous execution of tasks of video displaying and analysis with the **Face Recognition (Complete)** or **Unique Visitor Counting** modules working on the **** Eocortex Neural Networks Standard**** package can cause significant lags of face recognition processes when using graphics cards of **GTX 10XX** and **GTX 16XX** series with 4 GB of video memory or less. It is recommended to use dedicated graphics cards for these tasks.

In the process of installation of **Eocortex Neural Networks** it is required to select the corresponding components.



For the **Face Recognition (Complete)** and the **Unique Visitor Counting** modules, it is required to select the **On GPU** option at the **Startup toolkit** settings screen. For the **Face Recognition (Light)** module, selecting this option is preferable but not obligatory.



Traffic density heat map

The **Traffic density heat map** is designed for the visualization of the traffic intensity in the different areas of the frame. The heat map is generated by the way of summing up the time during which the movement is observed in the selected point. As a result, the areas where the objects are staying during the longest period of time are highlighted.

Capabilities of the module

For the visualization, the color scale is used: the color areas hued depending on the intensity of traffic are superimposed on the video image as a semitransparent layer. For example, when using the four-color scale, the area with high traffic density is colored red, with low traffic density – blue; the green and yellow areas are transitional.

The module can be used for determining the popularity of various locations in the shopping mall, to visualize the preferred routes of visitors or vehicles on the premises, for analyzing statistics of visits to various facilities etc.

There are three ways of using the heat maps:

- real time mode;
- report;
- superimposition of the heat map on the camera field of view on the facility plan.

In the real time mode, the areas of the frame where movement has been registered in the course of the last 10 minutes are displayed. In the report, the time interval is set during which the information regarding movement intensity in the frame will be analyzed. The heat map superimposition mode allows to generate the heat map not only in the frame, but also on the facility plan.

Details

For the correct operation of the module, it is required to properly place and set up the camera, enable and adjust the software motion detector and the module itself.

Module setup

To use the module, enable and configure it.

Launch the **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.

Then switch to the **Analytics** tab and enable the module using the  toggle.

Connection Rights Archive Motion detector **Analytics** Watermark

Server-based analytics

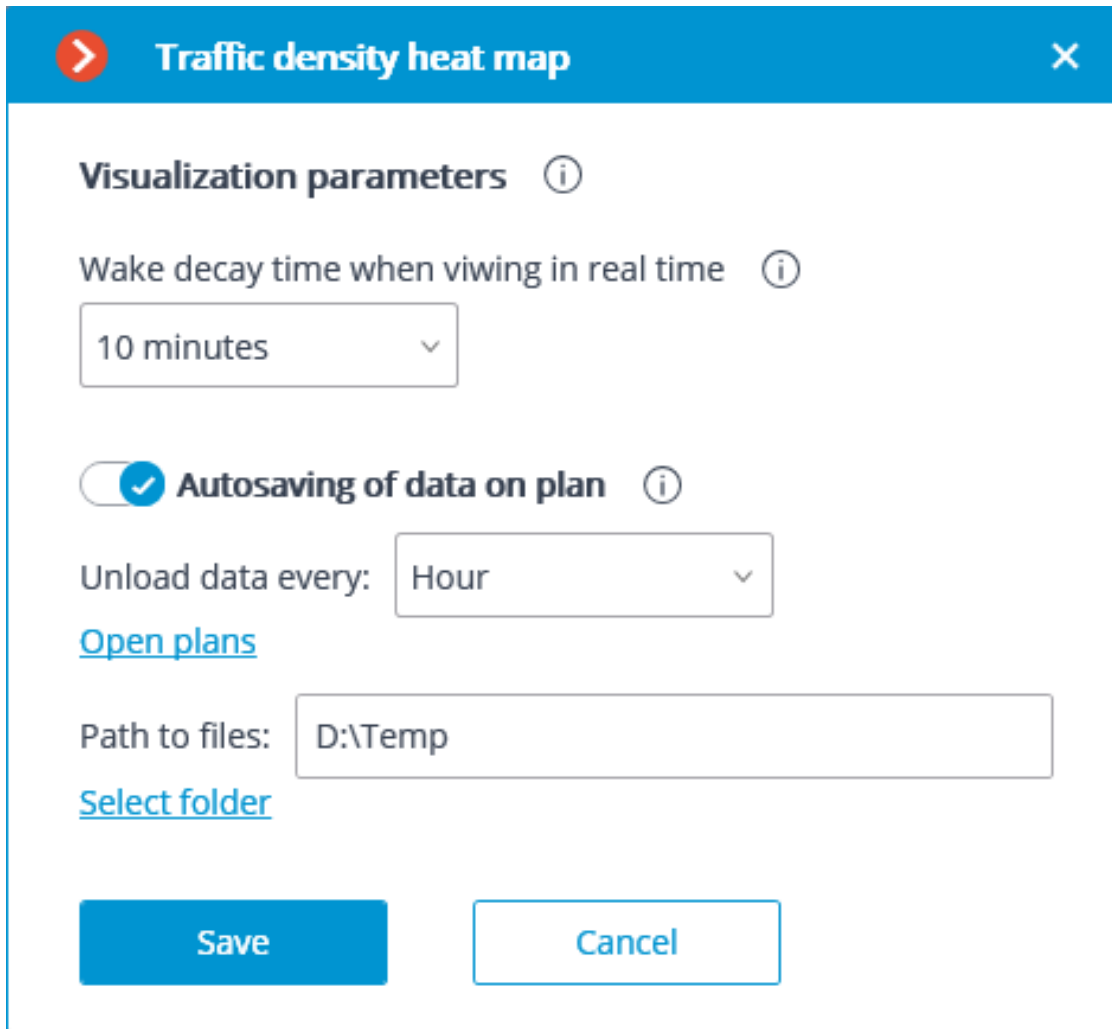
Sabotage Detection	Loud Sound Detection	Auto zoom	FishEye Dewarping	Tracking	Search for Objects
Face Recognition (Complete)	Unique Visitor Counting	Face Recognition (Light)	People Counting	Counting People in Queue	Crowd Monitoring
Face Detection	Traffic Density Heat Map	Personnel Activity Monitoring	Uniform Detection	Face Mask Detection	Shelf Fullness Check
Fire and Smoke Detection	Abandoned Objects Detection	Object Classification and Counting	Emergency Vehicle Detection	License Plate Recognition	Fall Detection
Frame Area Blurring					

Perspective

Pay attention! The alarm generation method has been changed. Now, to generate alarms, it is necessary to create automation scenarios.

To configure the automation script for module events, switch to "Automation"

Clicking the button opens the module setup window.



Visualization parameters ⓘ

Wake decay time when viwing in real time ⓘ

10 minutes ▾

Autosaving of data on plan ⓘ

Unload data every: Hour ▾

[Open plans](#)

Path to files: D:\Temp

[Select folder](#)

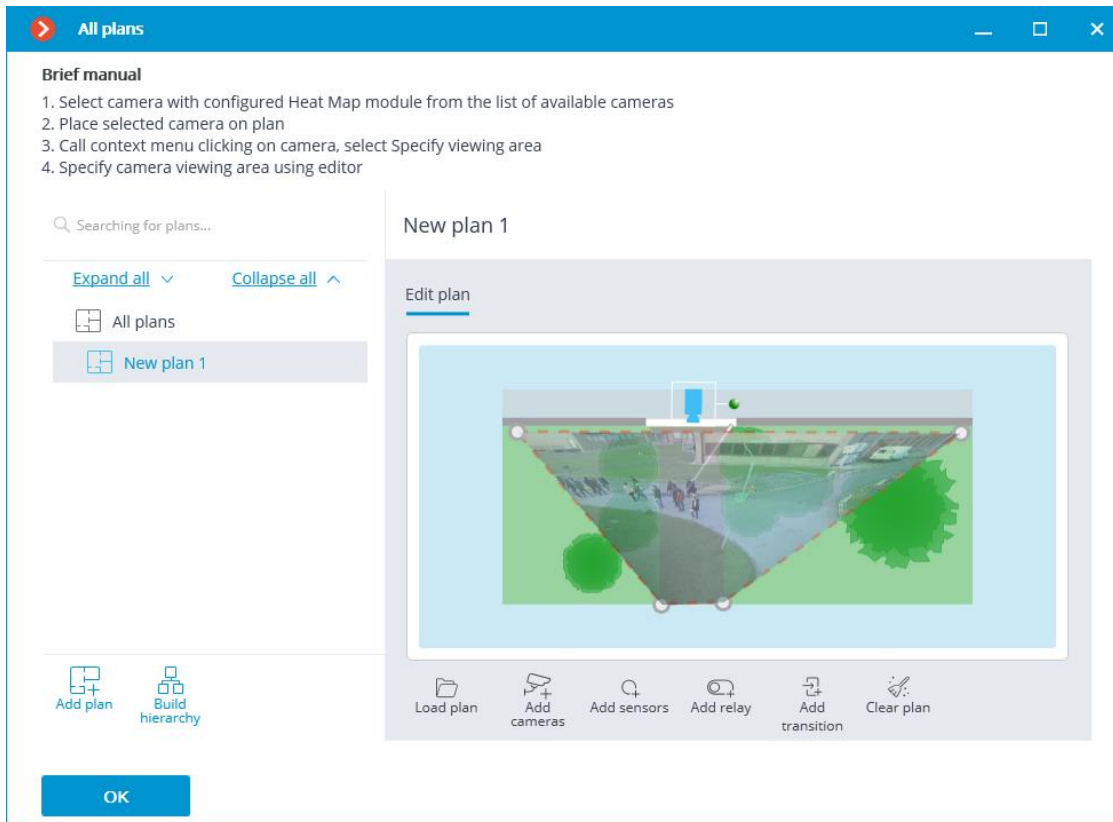
Save **Cancel**

The following settings must be made in the opened window:

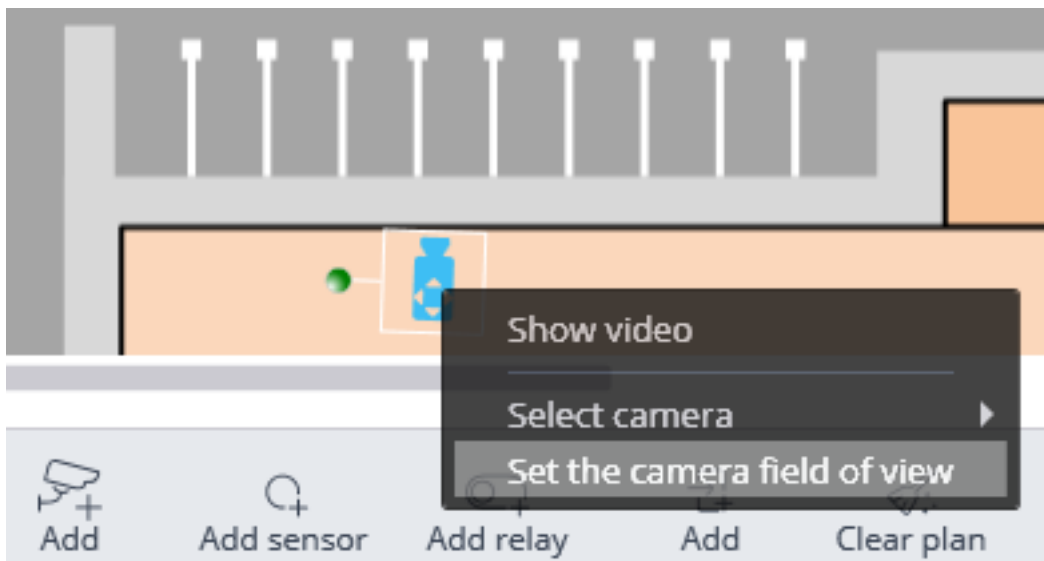
Wake decay time when viewing in real time: sets the time during which the wake of the moving object in the frame disappears completely.

Autosaving of data on plan: when this option is enabled, the server, with the indicated regularity, will save the plan images with the superimposed heat maps for the specified period. This option will work only if the camera being set up and its field of view are placed on the plan.

Clicking on the **Open plans** link will open the plan setup window.



For setting up the field of view, it is required to load the plan, place the camera on it, select the **Set the camera field of view** item in the context menu, then stretch the field of view by the corners to make the image correspond with the plan, then save the field of view settings by pressing **OK**.



For interactive selection of a folder on the drive, click on the **Select folder** link.

Warning

It is only advisable to select the folder interactively if the **Eocortex Configurator** application is launched directly on the server, because in case of performing remote setup, the file explorer of a local computer used for making adjustments will be opened when selecting a folder. Consequently, when performing adjustments from the remote computer, the path shall be entered as text, thereupon the folder must already exist on the server.

Warning

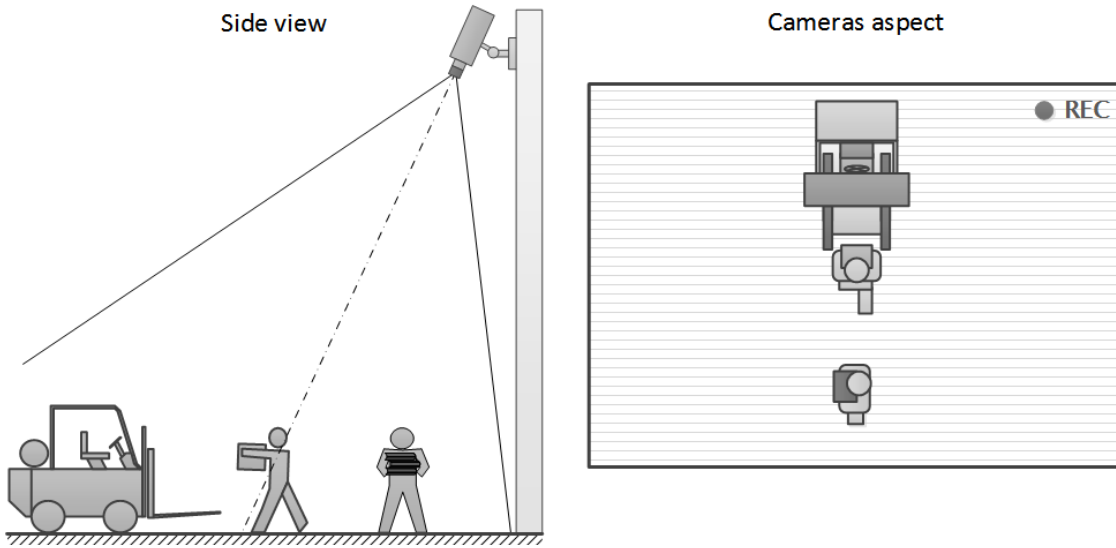
The module will start working only when **the settings are applied**.

Requirements and recommendations

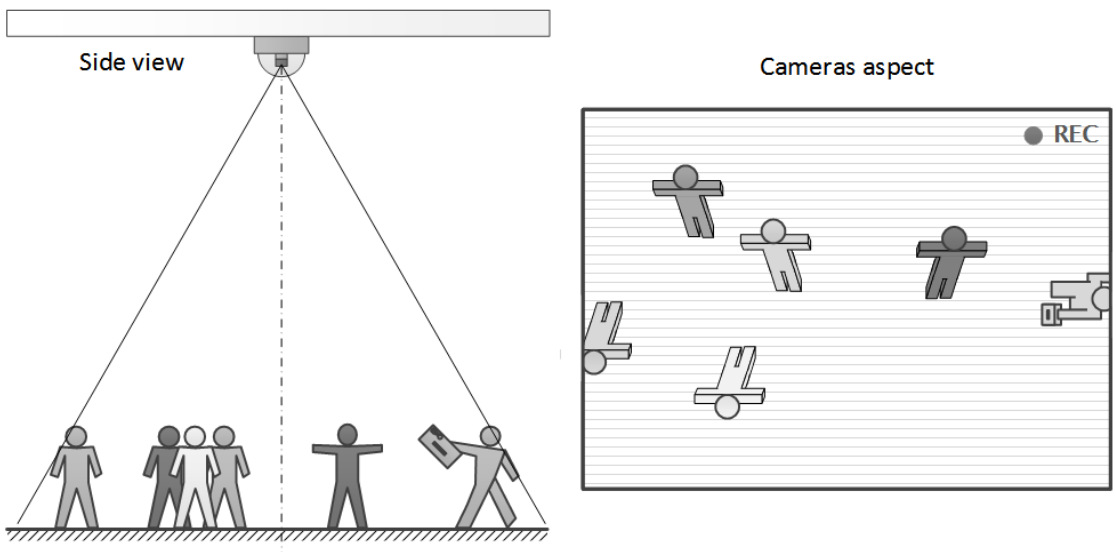
For the proper operation of the module, it is required to install the camera as high as possible to minimize the influence of the perspective and avoid the superimposing of the objects of the foreground on the remote areas. The ideal position of the camera is from above, at right angle to the horizontal plane.

There are no specific requirements regarding framerate, resolution and video stream format.

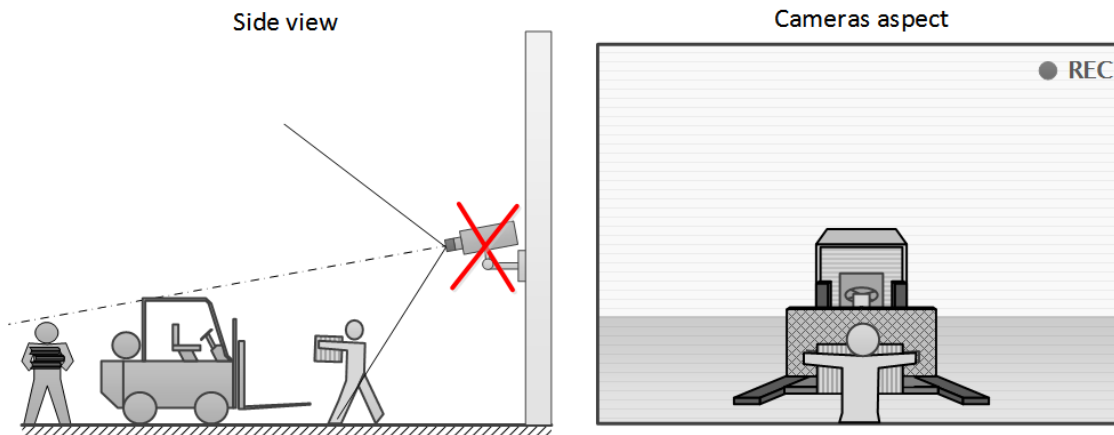
Correct installation



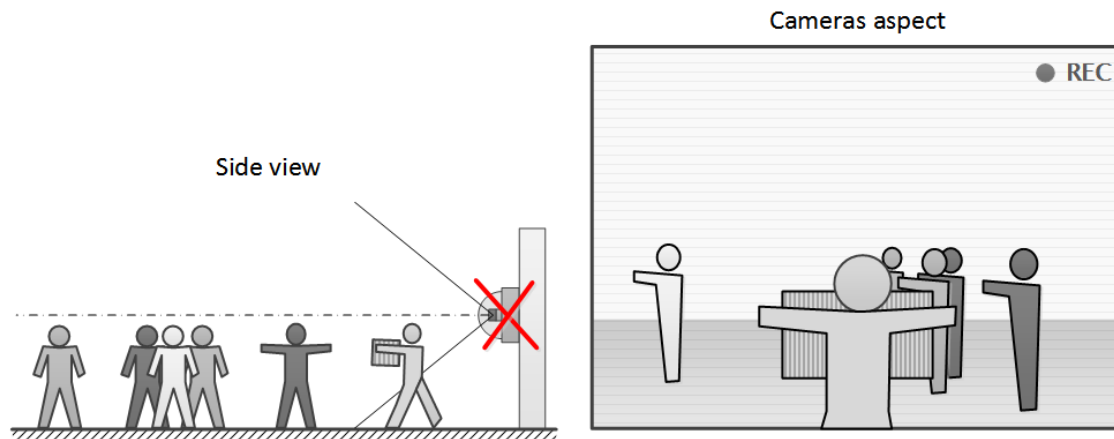
Correct installation



Wrong installation



Wrong installation



Tracking

The **Tracking** module allows to build trajectories of the objects that move in the fields of view of the cameras, track the crossing of lines by these objects in one or both directions, monitor the presence of the objects in the zones of arbitrarily set shapes, and also filter alarm events by object type. At that, the monitored lines and zones as well as the objects' trajectories can be shown on the screen in real time, and the objects themselves can be highlighted by the rectangles of various colors. All the events of the module are recorded in the event log.

Capabilities of the module

Depending on the settings, the module can track:

- any moving objects;
- objects of certain categories:
 - People
 - Animals
 - Vehicles by type: Passenger cars, Buses, Trucks, Motorcycles.

Moreover, it is possible to set up the tracking of objects of a certain range of dimensions.

Details

Warning

Starting with version 3.5 of **Eocortex**, the **Tracking, Search for Objects** and **Uniform Detection** modules running on the same camera share the processor and video card resources. This reduces the load on the server.

For the most efficient sharing of resources, it is recommended to set the same operating mode for the camera in the settings of these modules: either using a video card or without using a video card.

Warning

To track people, vehicles and animals, it is required **install the Eocortex Neural Networks package**; a video card **with the parameters matching the module's requirements** is also necessary.


The approximate accuracy of determining the types of transport:

- Passenger cars ~95%;
- Buses ~80%;
- Trucks ~70%;
- Motorcycles ~90%.

Module setup

To use the module, enable and set up the software motion detector, then enable and set up the module itself.

Launch the **launch the Eocortex Configurator application**, go to the **Cameras** tab, select a camera in the list located on the left side of the page, and set up the motion detector on the **Motion detector** tab on the right side of the page.

Then switch to the **Analytics** tab and enable the module using the  toggle.


Connection Rights Archive Motion detector Analytics Watermark

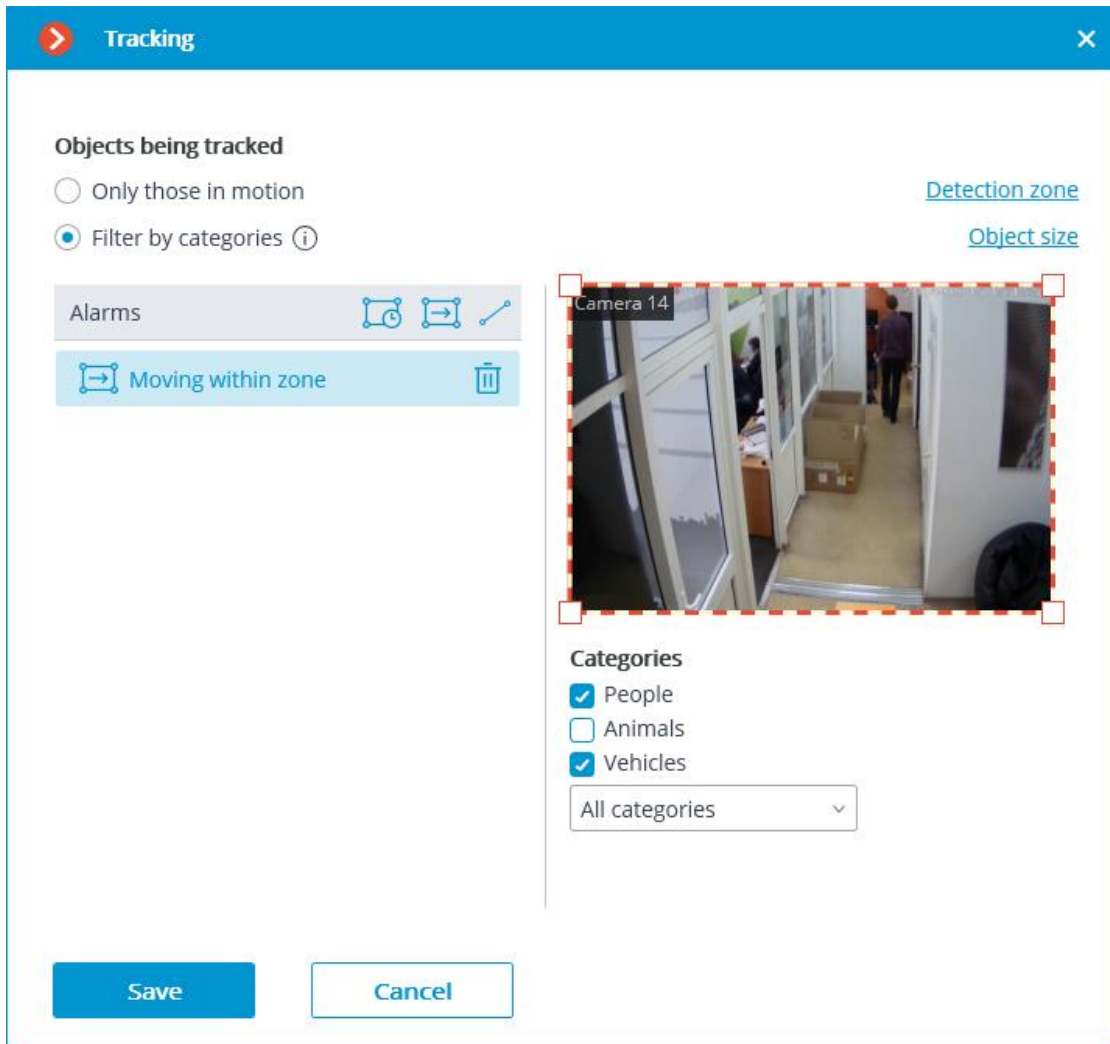
Server-based analytics

<input type="checkbox"/> Sabotage Detection	<input type="checkbox"/> Loud Sound Detection	<input type="checkbox"/> Auto zoom	<input type="checkbox"/> FishEye Dewarping	<input checked="" type="checkbox"/> Tracking	<input type="checkbox"/> Search for Objects
<input type="checkbox"/> Face Recognition (Complete)	<input type="checkbox"/> Unique Visitor Counting	<input type="checkbox"/> Face Recognition (Light)	<input type="checkbox"/> People Counting	<input type="checkbox"/> Counting People in Queue	<input type="checkbox"/> Crowd Monitoring
<input type="checkbox"/> Face Detection	<input type="checkbox"/> Traffic Density Heat Map	<input type="checkbox"/> Personnel Activity Monitoring	<input type="checkbox"/> Uniform Detection	<input type="checkbox"/> Face Mask Detection	<input type="checkbox"/> Shelf Fullness Check
<input type="checkbox"/> Fire and Smoke Detection	<input type="checkbox"/> Abandoned Objects Detection	<input type="checkbox"/> Object Classification and Counting	<input type="checkbox"/> Emergency Vehicle Detection	<input type="checkbox"/> License Plate Recognition	<input type="checkbox"/> Fall Detection
<input type="checkbox"/> Frame Area Blurring					

Perspective

Pay attention! The alarm generation method has been changed. Now, to generate alarms, it is necessary to create automation scenarios. [?](#)
To configure the automation script for module events, switch to "Automation"

Clicking the  button opens the module setup window.



In the **Objects being tracked** group of settings, the user can choose which objects to track: all the objects, or people, vehicles and animals only. At that, in case of selecting **Filter by categories**, it is possible to select, optionally, which types of objects exactly will be tracked.

In the **Objects being tracked** group of settings, it is possible to select which objects will be tracked: either all moving objects or only objects of a specified category.

Selecting **Filter by categories** it is possible to optionally select which object categories will be tracked:

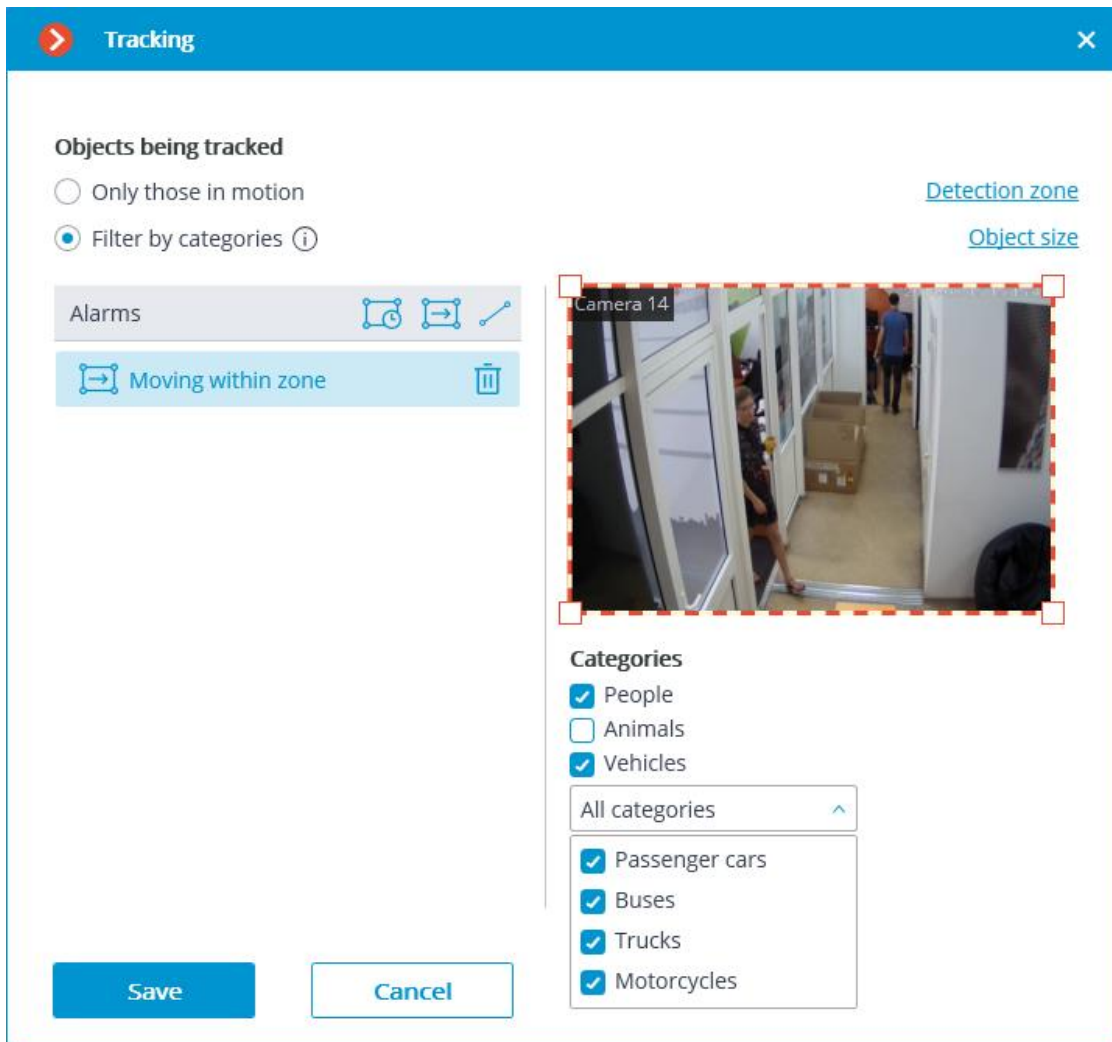
- People
- Animals
- Vehicles by type: Passenger cars, Buses, Trucks, Motorcycles.

Note




By default, **People** and **Vehicles** of all modes of transportation are selected.

Warning


To track people, vehicles and animals, it is required **install the Eocortex Neural Networks package**; a video card **with the parameters matching the module's requirements** is also necessary.



In the **Alarms** group of settings, it is possible to set the situations that will trigger alarms:

-  Long stay of an object in a preset area;
-  An object entering a preset area;
-  Crossing of a preset line.

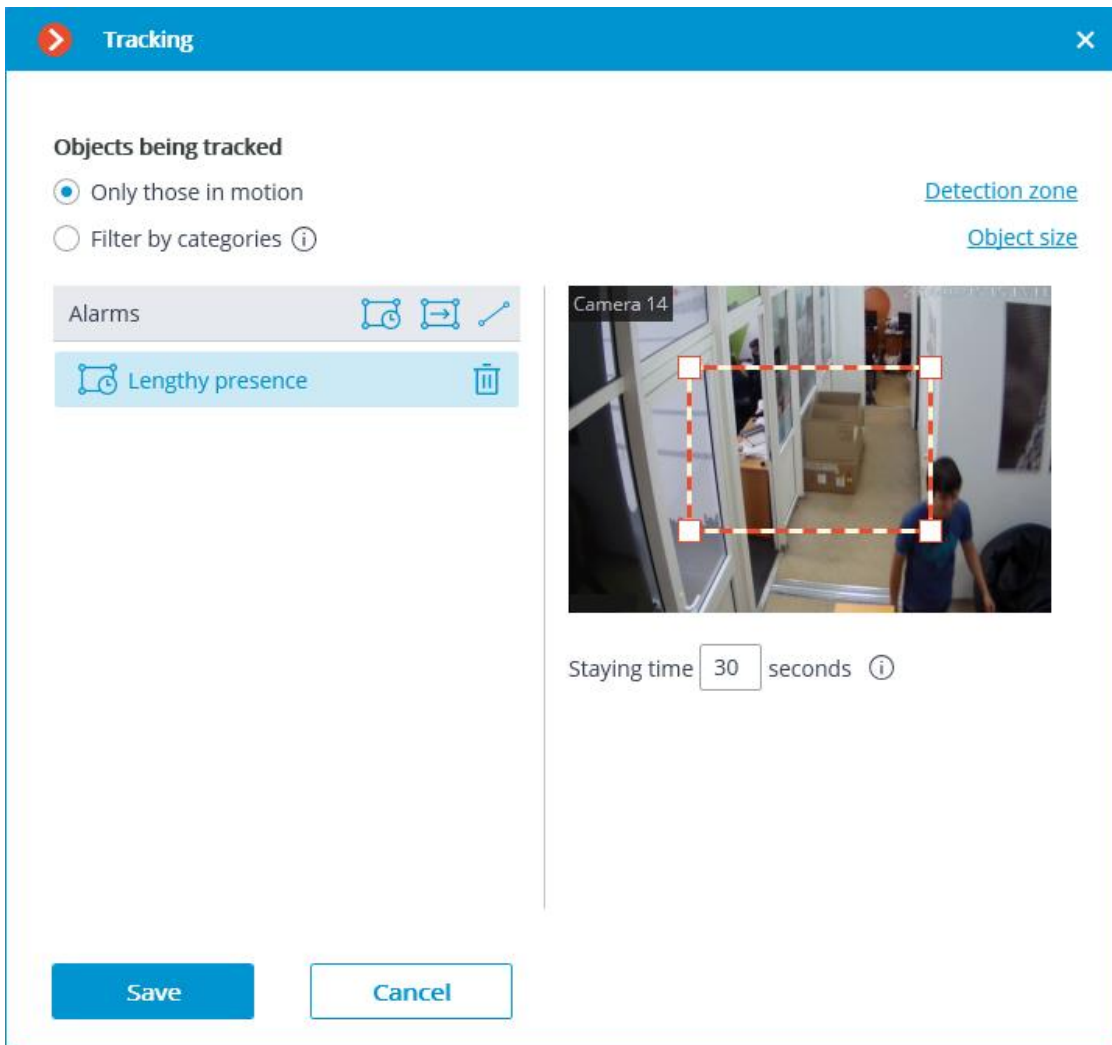
Long stay in the zone

To set the control zone, it is required to press the  button. A rectangular zone will appear in the preview window.

The zone configuration can be changed by dragging the key points at the corners of the polygon. To add a key point, it is required to double-click the left mouse button on the line; to delete — right-click on the key point.


For the **Long stay in the zone** alarm, the allowable duration of stay must be set. The default setting is 30 seconds. The maximum permissible value is 300 seconds.

Alarm will be generated only when the object has stayed in the zone for longer than the allowed time. The object may be out of the zone for a short time, but no more than 5 seconds.



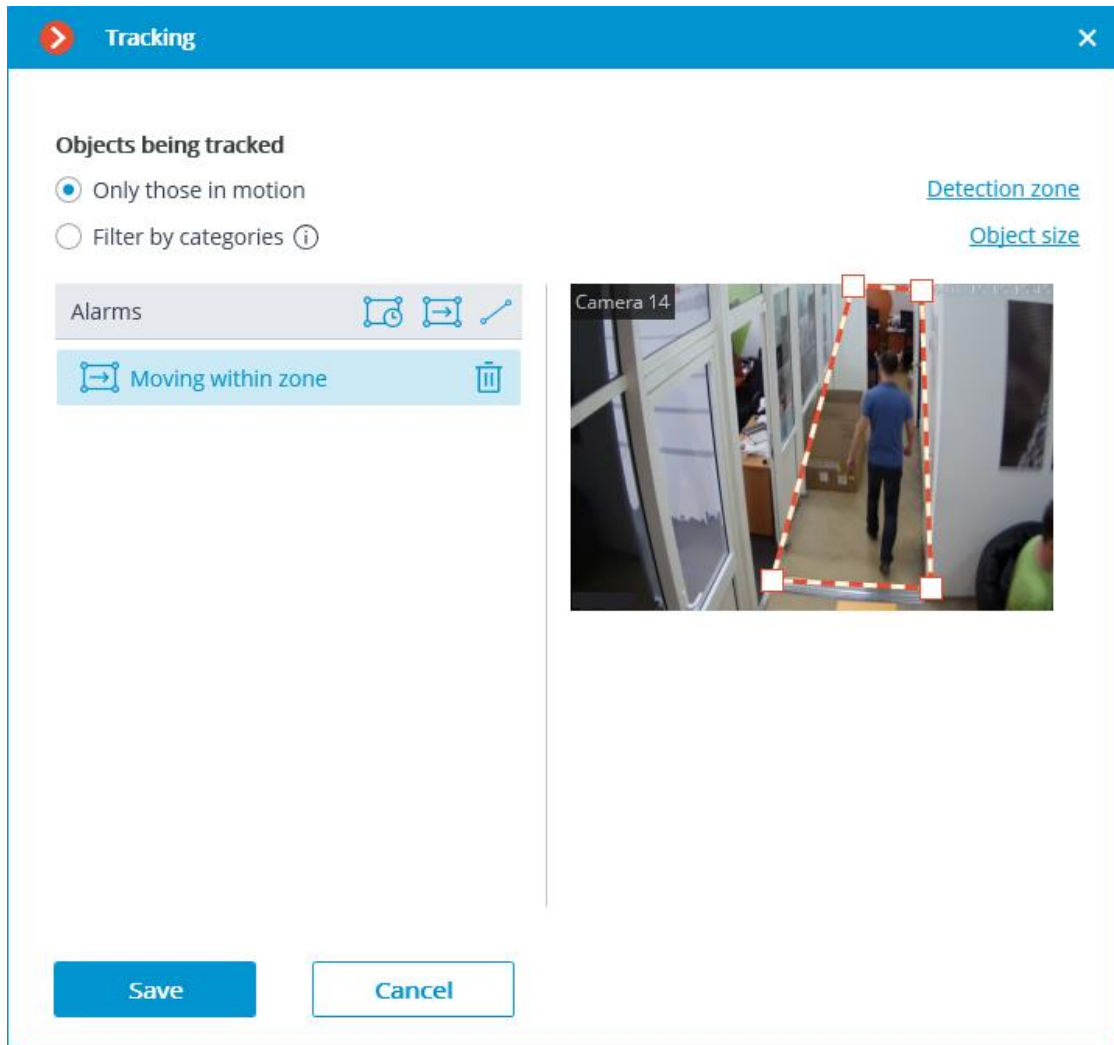
The screenshot shows a 'Tracking' configuration window. On the left, under 'Objects being tracked', the 'Only those in motion' option is selected. Below this, the 'Alarms' list shows 'Lengthy presence' selected. On the right, there are links for 'Detection zone' and 'Object size'. The central preview window, labeled 'Camera 14', shows a person in a hallway with a red dashed rectangular detection zone overlaid. Below the preview, the 'Staying time' is set to '30 seconds'. At the bottom, there are 'Save' and 'Cancel' buttons.

Movement in the area

To set the control zone, it is required to press the  button. A rectangular zone will appear in the preview window.

The zone configuration can be changed by dragging the key points at the corners of the polygon. To add a key point, it is required to double-click the left mouse button on the line; to delete — right-click on the key point.


The alarm will be generated when any object with the preset parameters enters the zone.




Line intersection

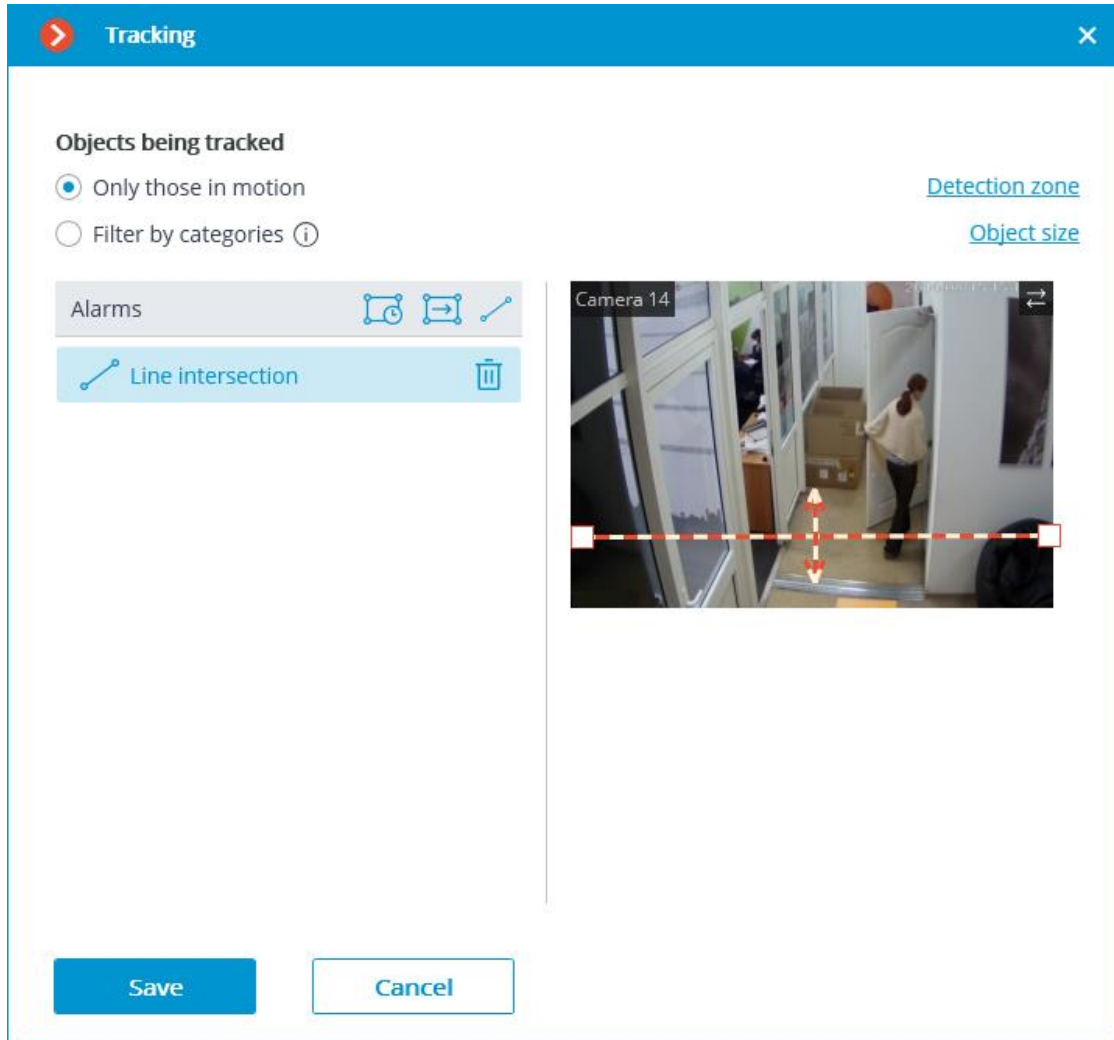
The position of the line can be changed by dragging the key points on its ends.

In order to indicate the direction of triggering, it is required to select the corresponding value in the **Moving direction** dropdown list. When only one direction is selected, an arrow showing the set direction will appear perpendicular to the line. In this case, an alarm will be generated only when the line is crossed in the preset direction.

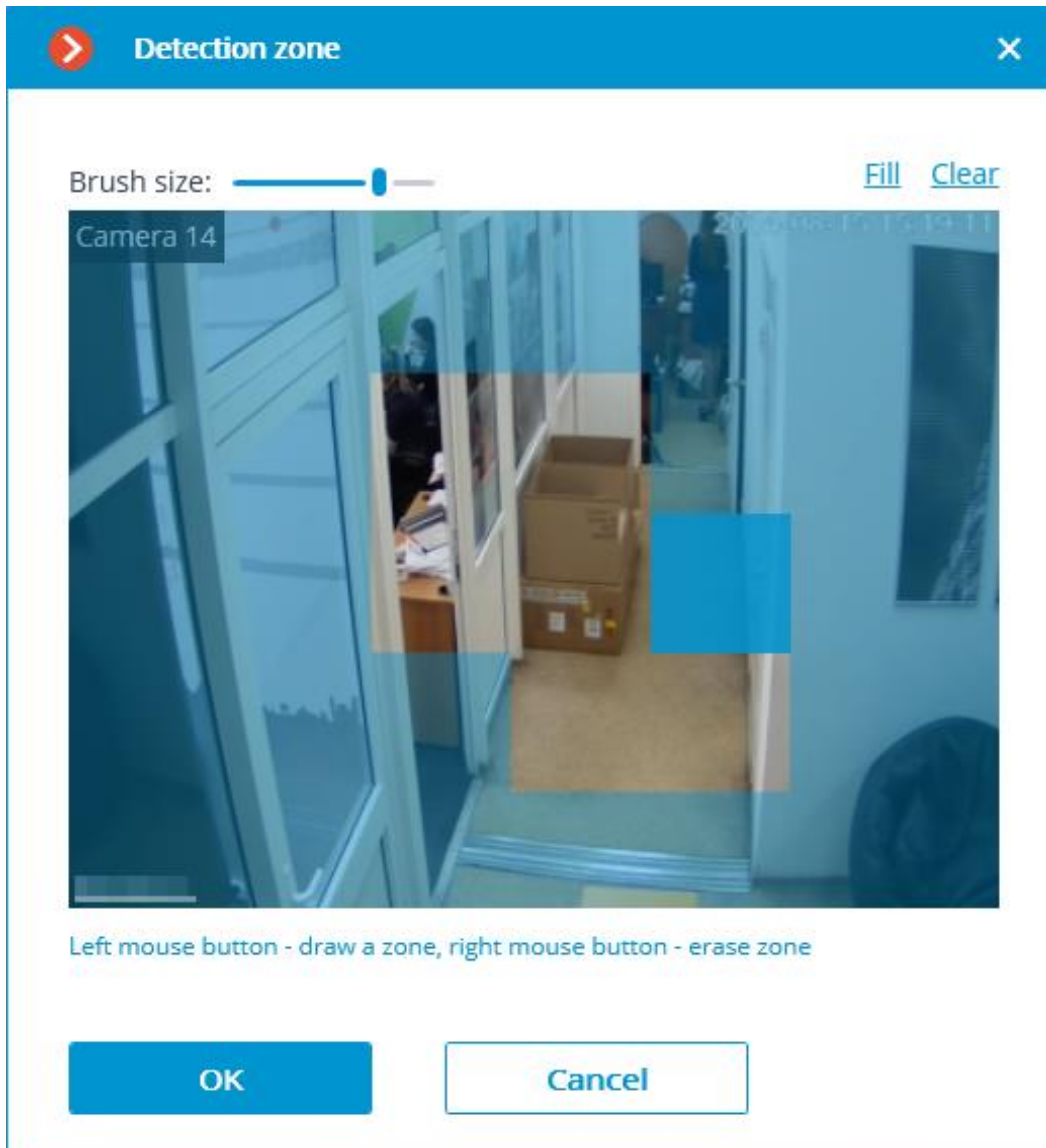
To set an intersection line, it is required to press the  button. A line will appear in the preview window.

The position of the line can be changed by dragging the key points on its ends.

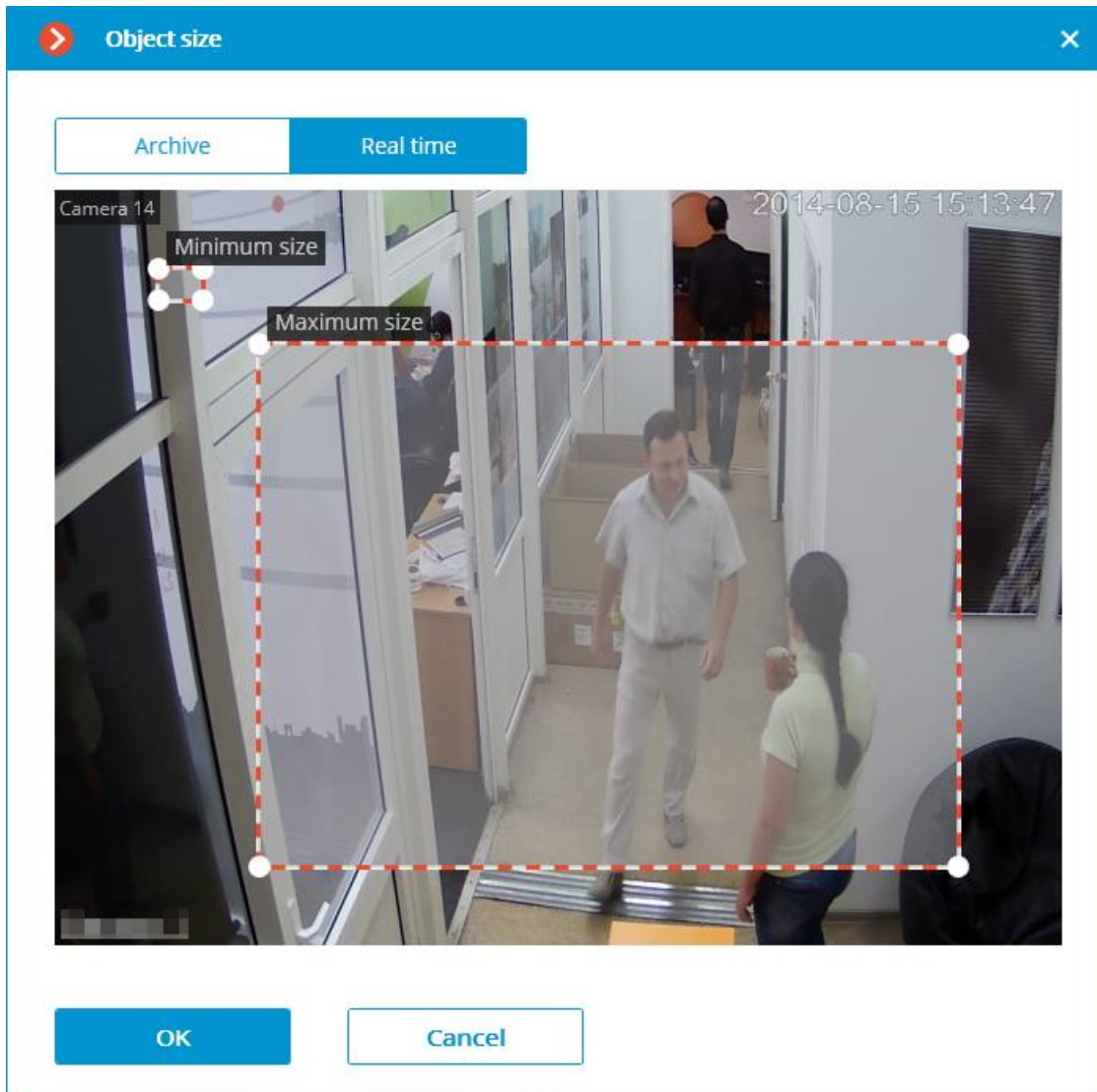
To indicate the direction of operation, click the button  located in the upper right corner of the preview window. If only one direction is selected, an arrow will be displayed to indicate the direction you set. In this case, the alarm will be generated only when the objects cross the line in the given direction.



Detection zone is the zone of the frame filled with the semitransparent blue fill in the settings window. The mouse is used for modifying the zone: left mouse button serves for filling the zone, and the right one is used for clearing it. With the help of the **Fill** and **Clear** buttons you can fill or clear the whole area of the frame. The corresponding slider is used to modify the **Brush size**.



The minimum and maximum sizes of the objects to be detected are set on the **Object size** tab.



Warning

The module will start working only when **the settings are applied**.

Requirements and recommendations

Hardware and software

It is required to install a **neural-networks** to track people, vehicles, and animals (if **Filter by categories** is enabled). In this case, the following equipment is required:

Warning

install the Eocortex Neural Networks package package must be installed before it will be possible to use neural networks-based features of the module.

The following equipment is required to use this neural network-based module:

- A processor that supports AVX instructions is required;
- Swap file at least half of the total RAM size.

It is also possible (optional) to use a video card. In this case, an NVIDIA video card (GPU) with a computing capability index of at least 6.5 and a memory size of at least 4GB is required, and the characteristics and performance of the graphics card must be at least as good as the **NVIDIA GTX 1650 Super**.

If the package will be installed on a virtual machine, it may additionally be required to:

- Enable support for AVX instructions in the guest machine settings;
- Use GRID drivers for GPU virtualization.

Warning

Eocortex must use video cards selected for running neural networks in monopoly mode. It is not allowed to use such card for other applications or tasks that consume GPU resources, including for displaying video. Simultaneous use of a video card for several tasks may lead to incorrect system operation: from analytics performance degradation to server instability.

Warning

The neural network works with the 64-bit version of **Eocortex** only.

Warning

When upgrading **Eocortex** to another version, it is necessary to also upgrade the **install the Eocortex Neural Networks package** package to the corresponding version.

Warning

When using a video card, the stable operation of the module is guaranteed on operating systems Windows 10, Windows Server 2016, Ubuntu 20.04, as well as on the newer versions of these operating systems.

Warning

On other operating systems (Windows versions 7 and 8, Windows Server versions 2008 and 2012, CentOS, Debian), issues may arise when trying to use NVIDIA graphics cards. On Windows 8, this is due to the cessation of support for NVIDIA graphics card drivers. On CentOS and Debian, the problem is due to the high complexity of installing workable versions of video card drivers.

Video stream

- Frame frequency: no lower than 10 frames per second;
- Image resolution: no lower than HD (1280x720).

Image

- Lighting in the frame should be uniform and constant.
- If the camera is installed in front of a bright light source (the sun behind the entrance door, etc.), it is necessary to adjust the exposure (or brightness) so that the objects in the frame have a natural color (not overexposed or too dark). In this case, an overexposed background is acceptable.
- The image must be in color.
- Image quality should be at least average. There should be no significant compression artifacts.

Scene and camera position

- The object should be seen from a suitable angle so that it is positively distinguishable from the background and clearly visible to the human eye.
- The frame must not contain reflective surfaces: glass, mirrors, etc.
- It is permitted to place the camera overhead. In this case, the angle of inclination of the camera in relation to the horizontal must not exceed 45°.

Recognition of vehicles

Minimum requirements to ensure the identification of vehicles are as follows:

- The resolution must be at least HD (1280x720).

- Detection of vehicles must be performed during daylight hours in good weather.
- Exposure and contrast on the camera must be set so that the color of the object can be unambiguously detected by the human eye.
- The body of a vehicle must not be light-struck by headlights or other light sources. There must not be any bright glare on the body.
- The angle of view must provide correct identification of the type of vehicle (e.g., it is sometimes difficult to distinguish a bus from a truck when viewed from behind).
- Installing the camera at an angle to the axis of movement of vehicles provides the most favorable perspective.

Examples

Below are the examples of angles for determining the mode of transport.

Correct



Incorrect



Correct



Incorrect

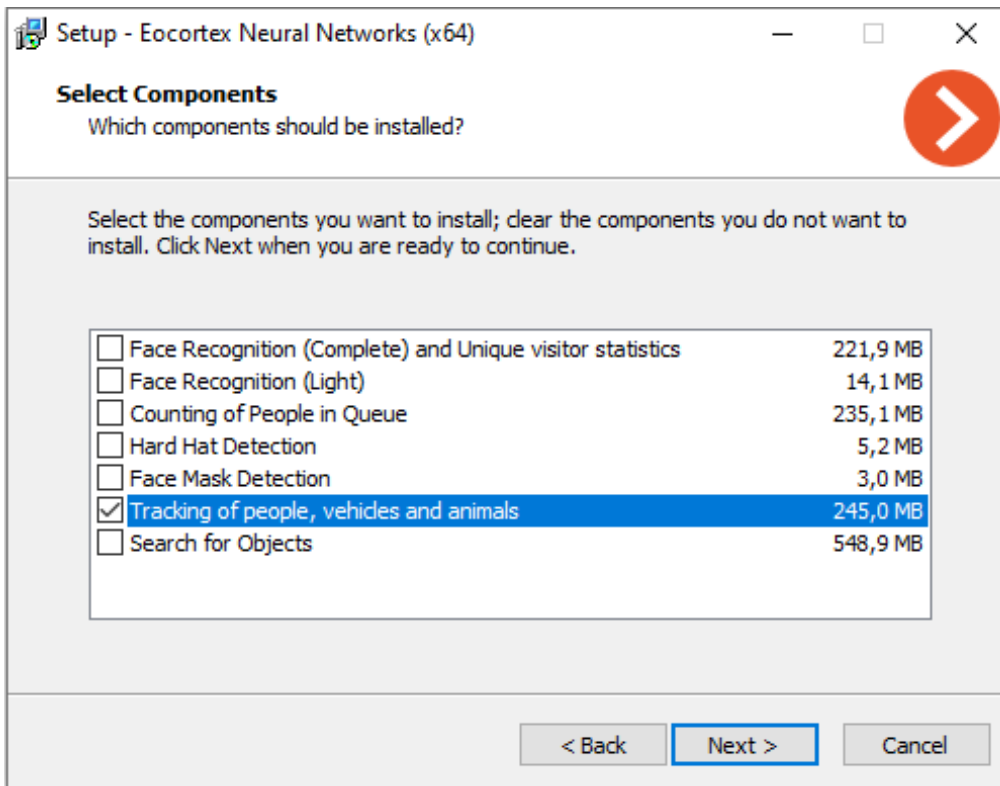


Deployment of the module

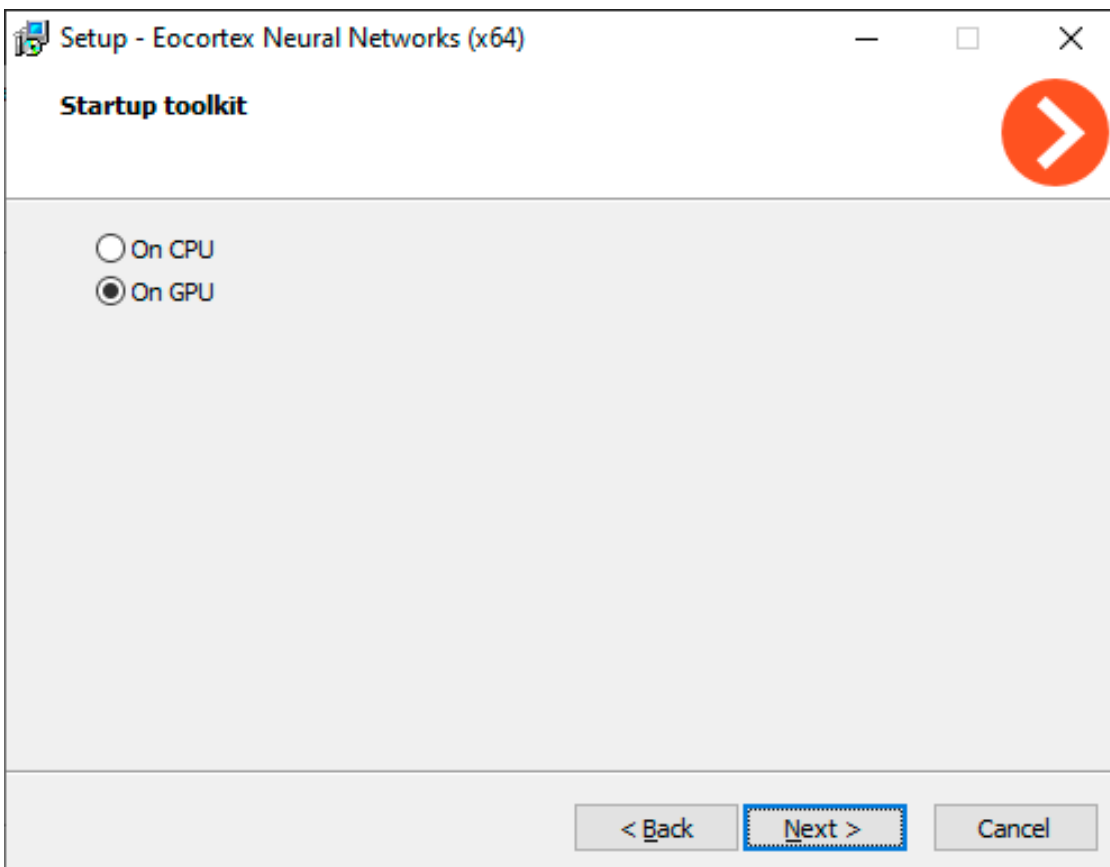
Warning

To track people, vehicles and animals, it is required **install the Eocortex Neural Networks package**; a video card **with the parameters matching the module's requirements** is also necessary.

In the process of installation of **Eocortex Neural Networks**, it is required to select the **Tracking of people, vehicles and animals** component.



The module's operation requires a video card (GPU).



Unique Visitor Counting

Unique Visitor Counting module is intended for generating unique visitor counting reports based on detecting and recognizing faces. It is possible to exclude faces pertaining to certain groups from the counting, for example, to avoid counting employees.

Details

See **Face recognition**.