USER MANUAL

«Lesnoy Dozor»

version 3.2

UPDATED 28.10.2015
Link to last update: http://www.lesdozor.com/presentations/usermanual.pdf

Content

Ground based systems of forest protection using optical sensors and video cameras

1. Forest monitoring methods:

Satellite

– large territories, very big delay in updating data.

Aviation

– large territories, very expensive, not regular.

Ground based

– Vehicle patrol and fire-watch towers.

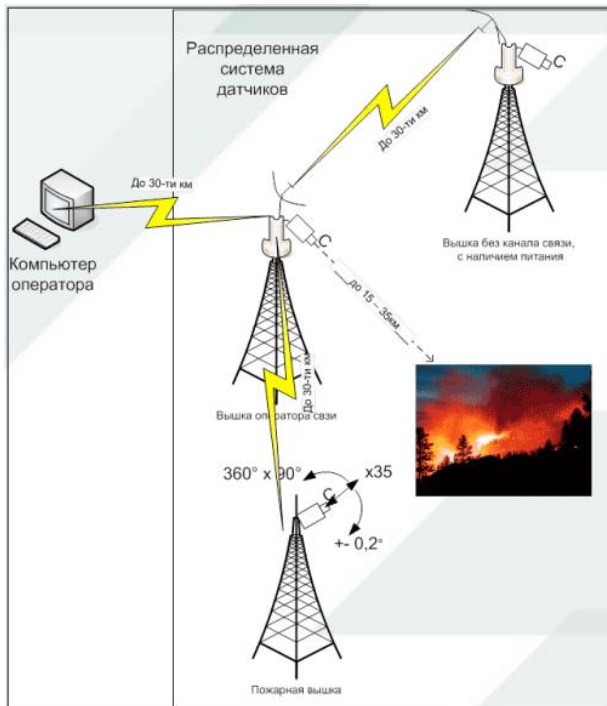## 2. Making a system of distributed video surveillance:

- video cameras are installed on high rise objects;

- all cameras are merged into a single network;

- all cameras are connected to world wide web;

- users connect to internet with a PC and work with numerous cameras;

- several users can work with cameras being in different locations. The only thing needed is available internet connection.

3. Basic characteristic – detection range.

Detection range depends on several factors.
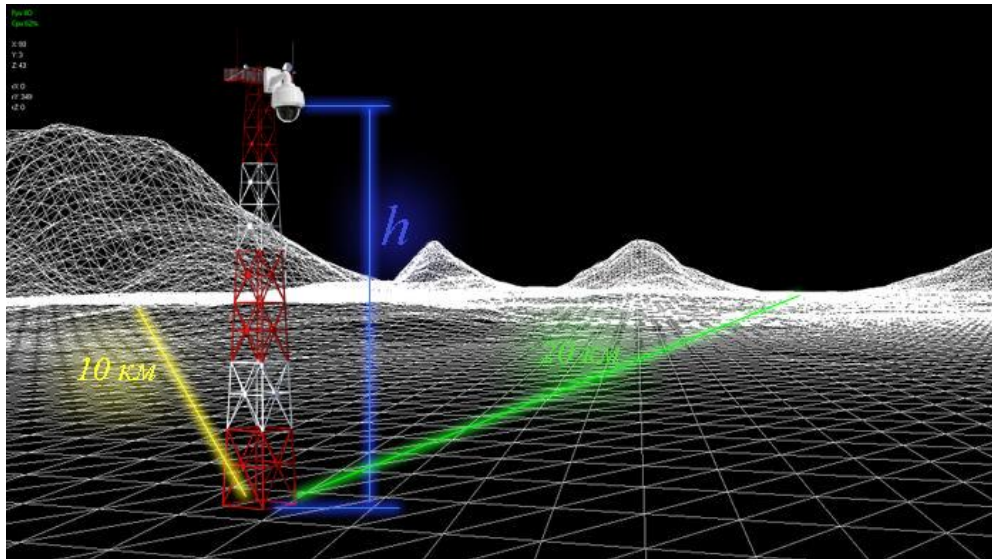
3.1 The height of a tower, landscape profile.

Chart 1. Dependency of straight visibility distance to height of a tower on a plain landscape. (height of average tree is 15 m)

Tower height, m		30 (standard fire watch tower)	60	70	90	110 (TV-Towers)
Distance of straight visibility, km	*Smoke height 20 m*	22	32	34	39	43
	Smoke height 40 m	32	42	44	49	53

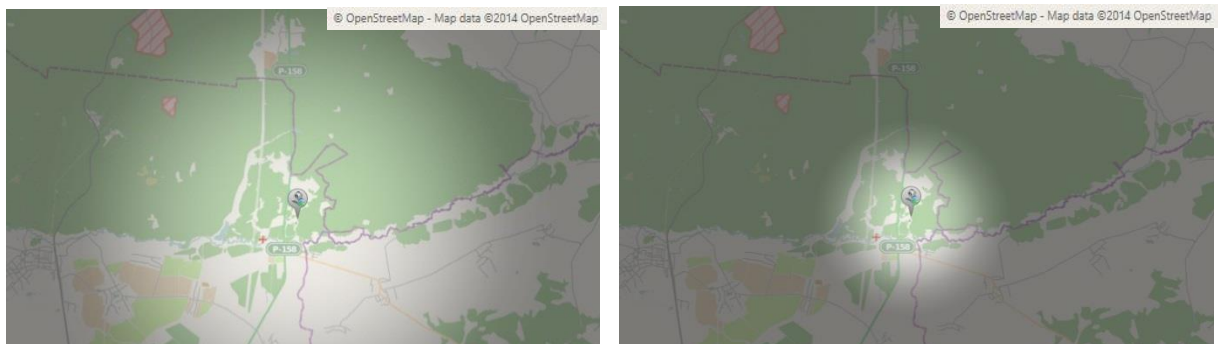## 3.2 Atmosphere transparency.

Chart 2. Distance of detection possibility in relation with different atmosphere transparency.

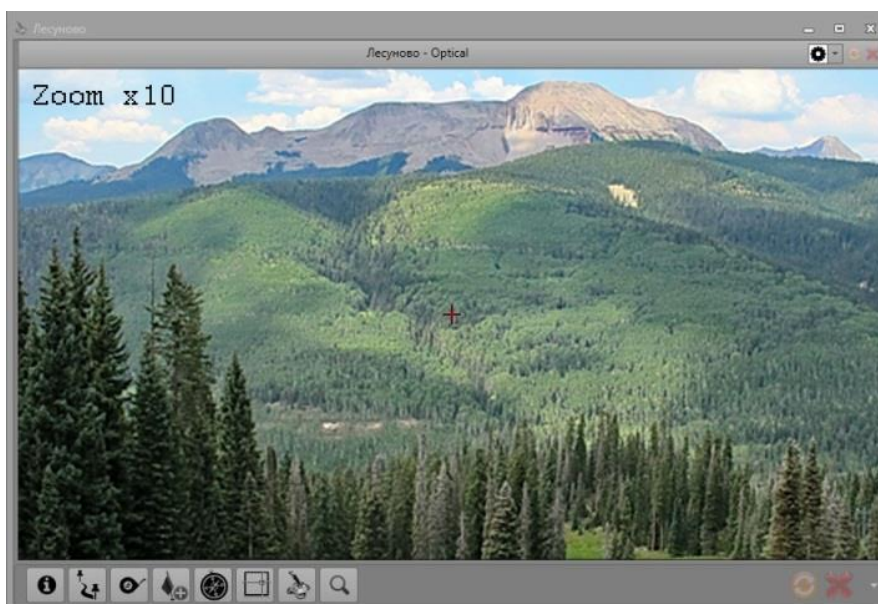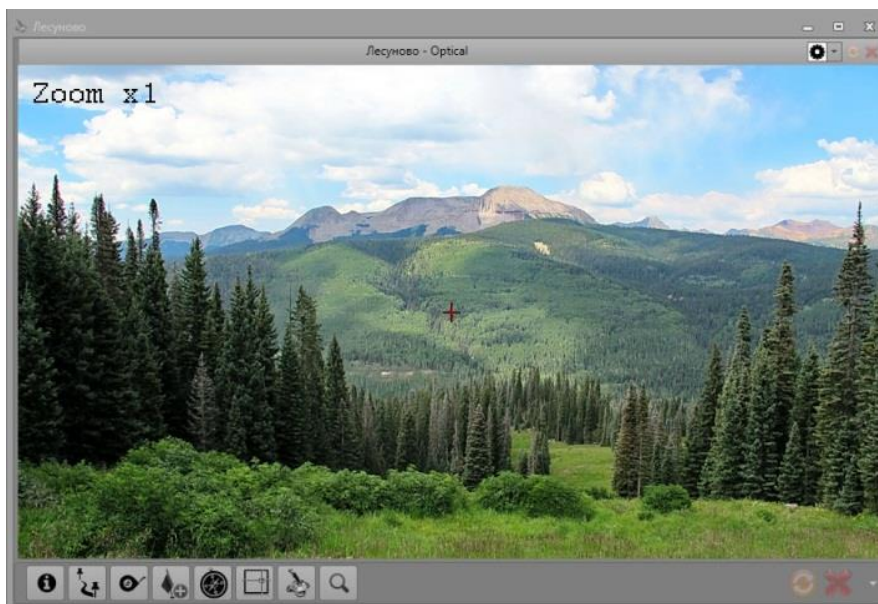| Atmosphere transparency, km	5	10	20	30	50	100
Detection range, km	3,3	6,6	13,2	19,8	33	66

3.3.Camera zoom.

Chart 3. Maximum range of detection in dependence of camera zoom (standard camera with standard resolution):

Zoom, x		1x	10x	20x	30x	35x макс
Detection range, km	Size of smoke 10 м	0,2	1,9	3,7	5,6	6,5
	Size of smoke 50 м	0,9	9,3	18,7	28,0	32,7
	Size of smoke 100 м	1,9	18,7	37,3	56,0	65,4

Chart 4. Maximum range of detection in dependence of camera zoom (standard camera with HD sensor):

Zoom, x		1x	5x	10x	20x макс
Detection range, km	Size of smoke 10 м	0,5	2,6	5,3	10,6
	Size of smoke 50 м	2,6	13,2	26,4	52,9
	Size of smoke 100 м	5,3	26,4	52,9	105,8

4. Less personnel needed to control automated monitoring process.
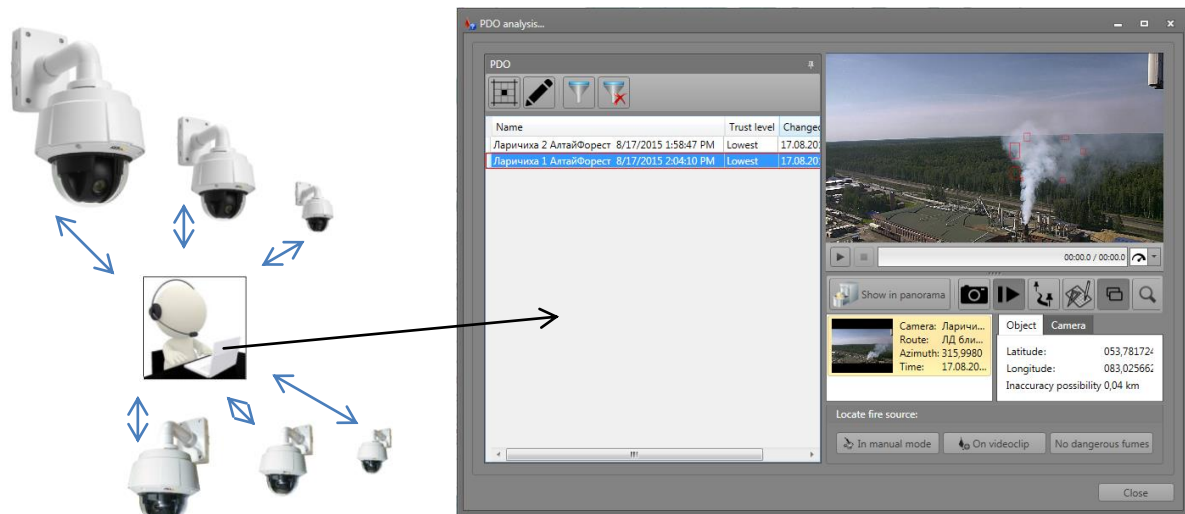
Chart 5. Detection time dependency with different amount of operating users and cameras in the system for "manual" and "automated" detection with detection range of _20_ km and smoke size 50x50m.

	1 cam.	_3 cam._	_5 cam._	_10 cam._	_20 cam._	_50 cam._	_100 cam._
1 operating user	30 min	1,5 hours	2,5 hours	5 hours	10 hours	25 hours	50 hours
User+automation	30 min	30 min	30 min	30 min	30 min	30 min	1 hour
2 operating users	30 min	45 min	1,2 hours	2,5 hours	5 hours	12,5 hours	25 hours
User+automation	30 min	30 min	30 min	30 min	30 min	30 min	30 min
5 operating users	30 min	30 min	30 min	1 hour	2 hours	5 hours	10 hours
User+automation	30 min	30 min	30 min	30 min	30 min	30 min	30 min
10 operating users	30 min	30 min	30 min	30 min	1 hour	2,5 hours	5 hours
User+automation	30 min	30 min	30 min	30 min	30 min	30 min	30 min
20 operating users	30 min	30 min	30 min	30 min	30 min	1,25 hours	2,5 hours
User+automation	30 min	30 min	30 min	30 min	30 min	30 min	30 min

Chart 5.1. Detection time dependency with different amount of operating users and cameras in the system for "manual" and "automated" detection with detection range of _10_ km and smoke size 50x50m.

	1 cam.	_3 cam._	_5 cam._	_10 cam._	_20 cam._	_50 cam._	_100 cam._
1 operating user	15 min	45 min	1,25 hours	2,5 hours	5 hours	12,5 hours	25 hours
User+automation	15 min	15 min	15 min	15 min	15 min	15 min	30 min
2 operating users	15 min	22 min	35 min	1,2 hours	2,5 hours	6,25 hours	12,5 hours
User+automation	15 min	15 min	15 min	15 min	15 min	15 min	15 min
5 operating users	15 min	15 min	15 min	30 min	1 hour	2,5 hours	5 hours
User+automation	15 min	15 min	15 min	15 min	15 min	15 min	15 min
10 operating users	15 min	15 min	15 min	15 min	30 min	1,25 hours	2,5 hours
User+automation	15 min	15 min	15 min	15 min	15 min	15 min	15 min
20 operating users	15 min	15 min	15 min	15 min	15 min	35 min	1,25 hours
User+automation	15 min	15 min	15 min	15 min	15 min	15 min	15 min

Chart 5.2. Detection time dependency with different amount of operating users and cameras in the system for "manual" and "automated" detection with detection range of _5_ km and smoke size 50x50m.

	1 cam.	3 cam.	5 cam.	10 cam.	20 cam.	50 cam.	100 cam.
1 operating user	8 min	22 min	35 min	1,25 hours	2,5 hours	6,25 hours	12,5 hours
User+automation	8 min	8 min	8 min	8 min	8 min	8 min	15 min
2 operating users	8 min	11 min	18 min	35 min	1,25 hours	3,12 hours	6,25 hours
User+automation	8 min	8 min	8 min	8 min	8 min	8 min	8 min
5 operating users	8 min	8 min	8 min	15 min	30 min	1,25 hours	2,5 hours
User+automation	8 min	8 min	8 min	8 min	8 min	8 min	8 min
10 operating users	8 min	8 min	8 min	8 min	15 min	35 min	1,25 hours
User+automation	8 min	8 min	8 min	8 min	8 min	8 min	8 min
20 operating users	8 min	8 min	8 min	8 min	8 min	18 min	35 min
User+automation	8 min	8 min	8 min	8 min	8 min	8 min	8 min

5. Costs and pricing.

Chart 6. Basic components of the system and costs (month/year) if fire hazard season - 6 months.

Components, system elements, labor	One-time costs	Recurring costs
Video surveillance equipment (+ additional)	3800 €	-
Installation and setting up	1500 €	-
Technical maintenance		40 – 100 €/240 – 600 €
Coverage modelling for optimal towers positioning	-	-
Software	-	80 – 160 €/360 – 960 €
Towers rent	-	10 – 60 €/70 – 360 €
Internet channels	-	20 – 240 €/120 – 1440 €

Chart 7. Internet channel pricing

Internet channel speed, Mbit/s	0,5	1	2	4	10
Cost per month , €	20	40	60	120	160
Cost per fire hazard season, €	120	240	360	720	960

6. Coverage modelling.

Preliminary modelling of system coverage will give larger territory under monitoring with fewer cameras. The quality of coverage depends on several factors: height of tower, landscape, atmosphere transparency, chosen hardware, etc.
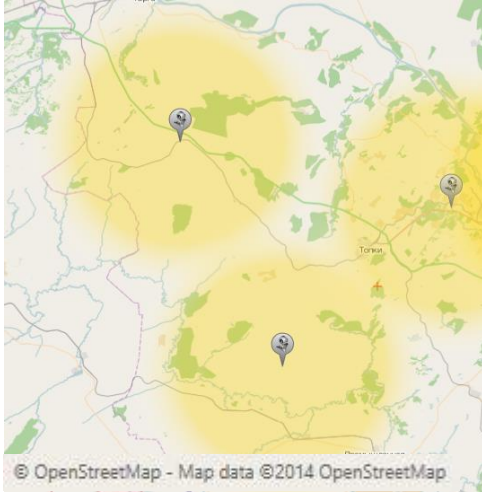
Without considering those factors might happen a situation, when the efficiency of real system is much lower than expected efficiency of project. Innovative modelling technologies can get a predictable result. The modelling can make emphasis on: forests in general, easy burning tree species, fires statistics for several years. All of that will help to reach the best economical effect on implementing the system.
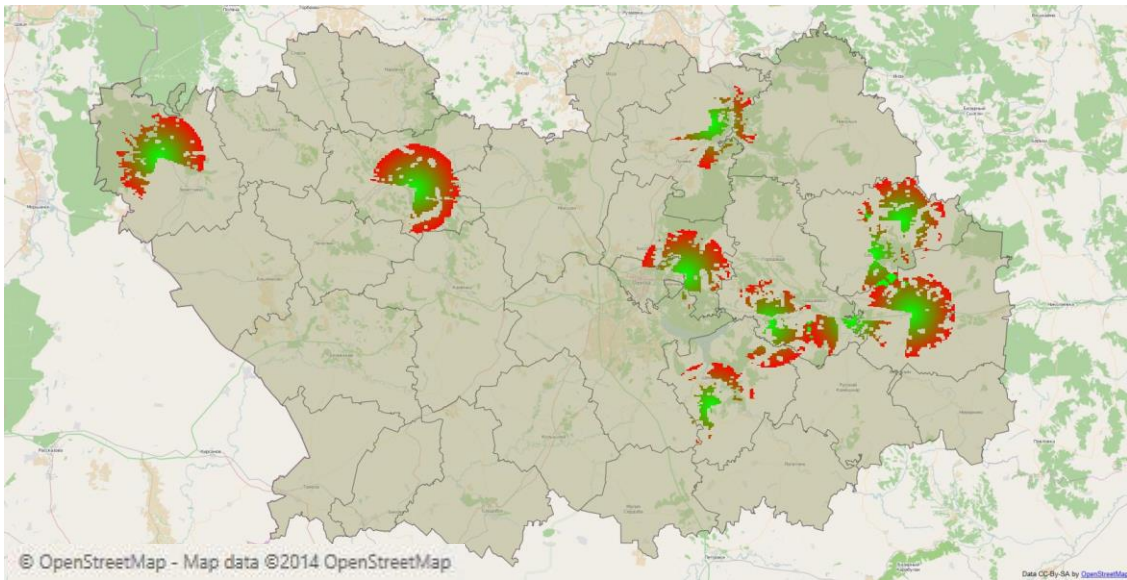
Important information!

Link to latest update of this user manual: **lesdozor.ru/help**

Tech support phone number: **8 800 555 18 59**

If during the operation is noticed that smoke was not being detected, please, inform tech support. Give camera`s name, azimuth and exact time of recording video clip. Send this data on email *support@lesdozor.ru*.

Lesnoy Dozor has integrated module of remote control "Team Viewer". With its help you can temporary give access to tech support specialist for fixing desktop problems.

Recommendations:

- **Don`t capture cameras for a long time!** Notice, in real time mode camera doesn`t follow the route and detection algorithm stop working, which can lead to fire source miss.

- **Always install available update!**

- Notice, that when detecting fire from **single** camera could be significant miss by distance. Use the Tool "Measure distance" to get more precise coordinates. Also keep in mind while using command "Mark smoke source" fire source is actually lower then visible smoke.

- If you cannot enter the system, first check if you have internet access (are you able to open web pages in browser?)

General information

"Lesnoy Dozor" is a hardware-software information system for forest monitoring and detection of forest fires at an early stage.

The system binds PTZ video cameras into network, connect them to powerful computers–servers, that connected to clients computers through world wide web. Clients` application "Lesnoy Dozor" – is special software. With its help you work with system, get fire coordinates, alarms, etc.

System consists of following elements:

1. Distributed network of cameras
2. Internet channels
3. System servers
4. Server software "Lesnoy Dozor"
5. Clients` computers
6. Client`s application "Lesnoy Dozor".

Server

System server functions:

- Storage and analysis of media data;
- Camera control;
- Smoke detection;
- Alarming on detection.

Installation and basic setup

Installation

Before installation of new version please delete the old one (if it was installed).
Clients` application "Lesnoy Dozor" are compatible with operations systems Windows Vista,
Windows 7, Windows 8.

Windows XP and older operating systems are not supported.

Open web browser to begin installation and go to:

http://lesdozor.ru/a

This page will show up:
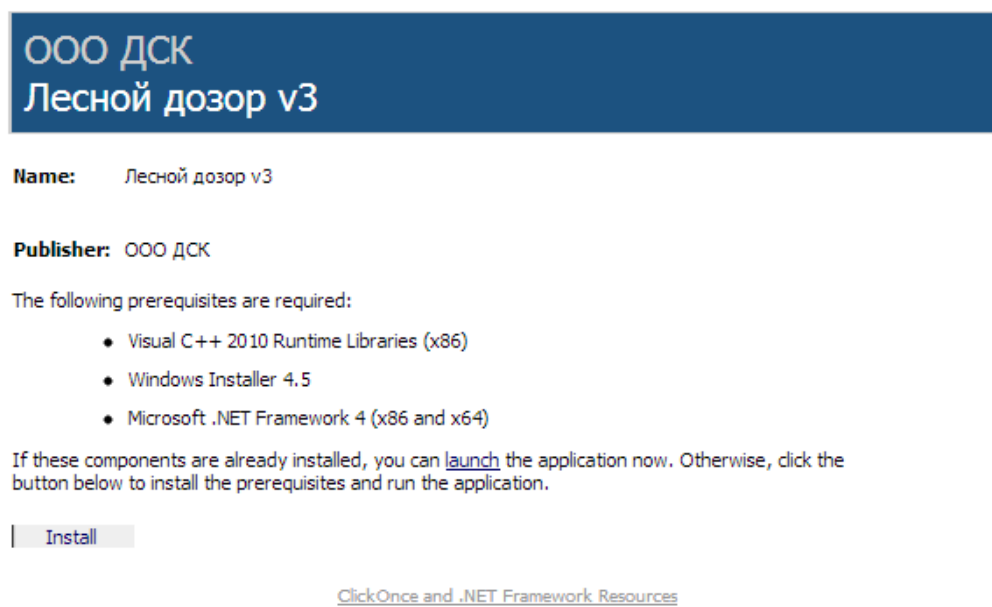
Press button «Install». Doubleclick downloaded file. Press "Run" in warning window.
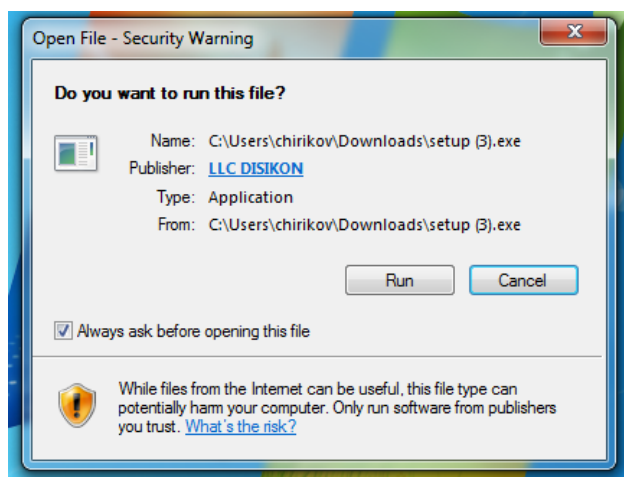
Press "Install".
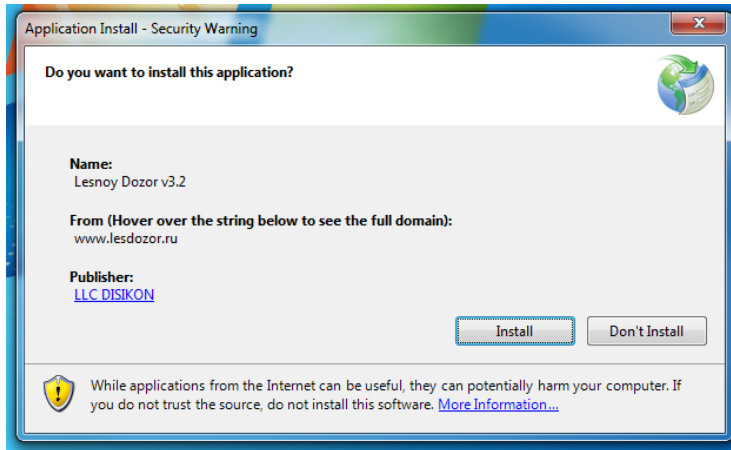
Then, you will see a progress bar.
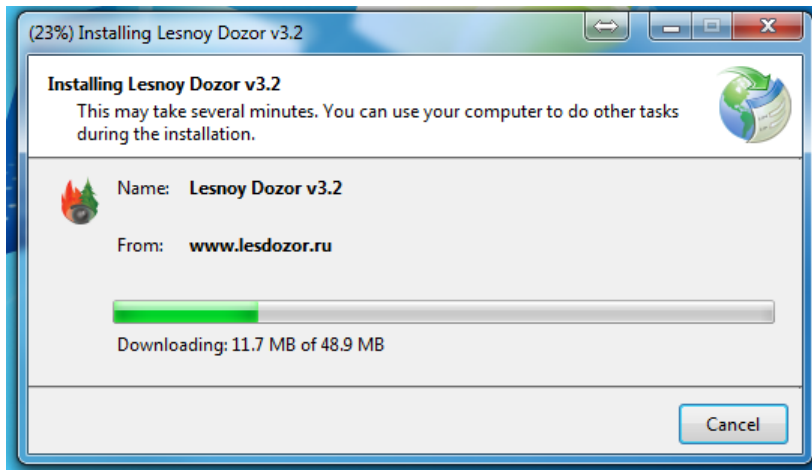
Installation should finish automatically.

After that you should see this form:
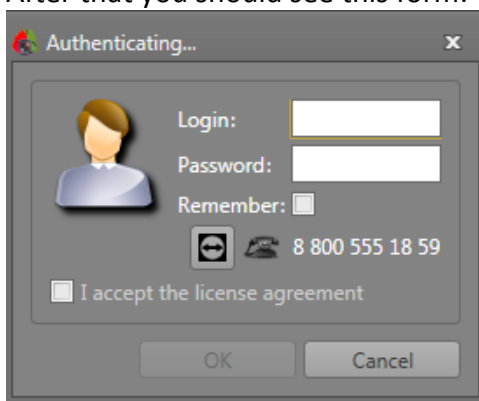
READ LICENSE AGREEMENT!
If you agree, check "I agree", then enter you login and password.

To save your credentials check "Remember" box.
To launch for the first time press "Ok".

Launching Application

1. Double click the icon on a desktop to start application.

Lesnoy Dozor
v3.2
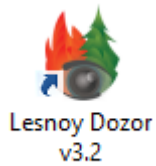
Then, you will see this window. Application is trying to connect server.
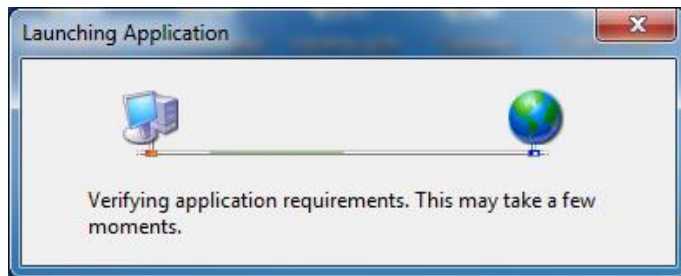
If there is updates, you will be offered to download them.
Always accept updates!

2. Then, enter the system with your credentials as described above.
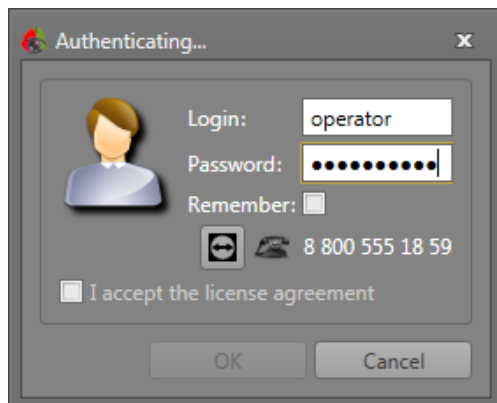
3. Press "ok".

Deleting application

To delete "Lesnoy Dozor" use standard Windows tools of Control Panel.
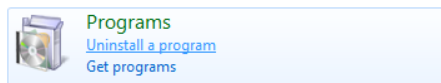
Find the application in the list of installed programms and press Uninstall/Change.

Choose «*Remove the application from this computer*»:
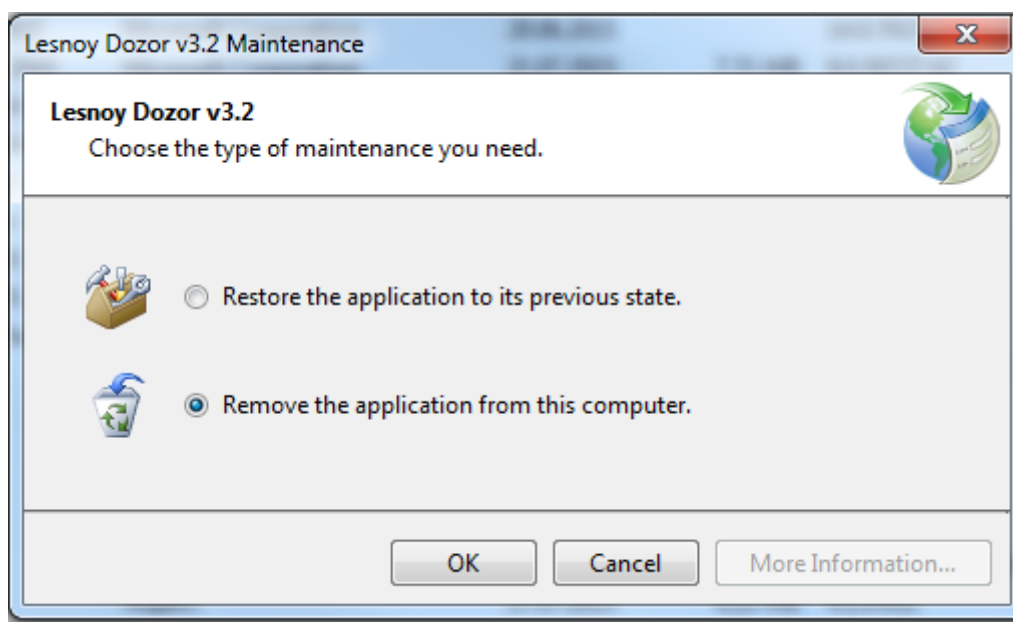
Press "Ok". Application has been deleted now.

User interface

Users

User interface configuration depends on user type.

The user can be:

- **Spectator** – can observe monitoring routes.
- **Validator** – same as previous plus right to confirm or decline PDOs.
- **Operator** – same as previous plus right to control cameras in real time.
- **Administrator** – same as previous plus right to manage users of region and edit routes.

This user manual describes functions, that are open to **operators**.

Objects and tabs

There are several types of objects:
- cameras
- fires
- users
- routes
- towers
- landmarks

To work with object you need press one of those buttons:

Different objects shown on the map:
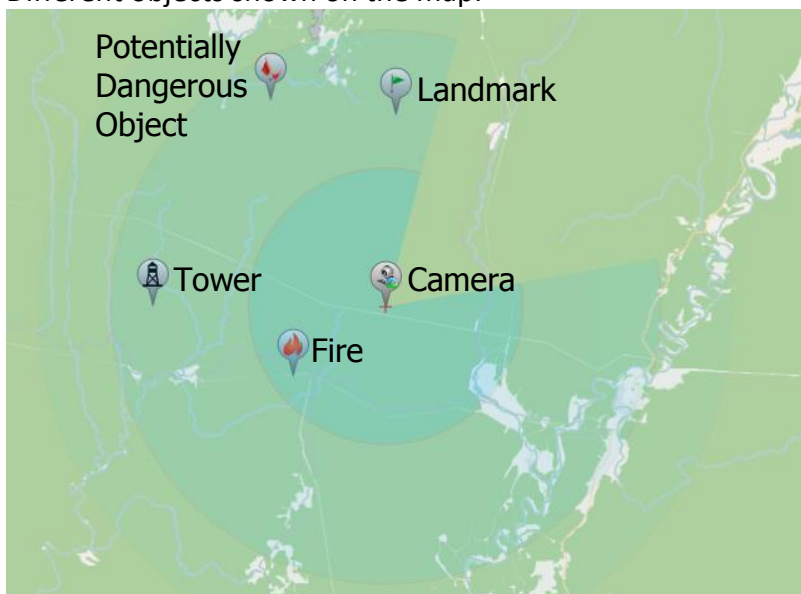
In the upper right corner of navigation window located buttons: "flat list", plus – "expand", minus – «minimize»:
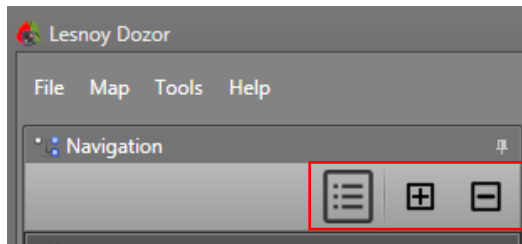
Button "flat list".

Camera status icons

What mean different camera icons in tree of objects.

Green – ok, camera recording the route.

Red – could indicate that camera is busy with service procedure. But if this indicates for 10 minutes and more, this could be an error. Ask for assistance "Lesnoy Dozor" tech support.

Icon and letters are grey – camera is off, probably no electricity or internet channel. Ask for assistance maintenance organization of your region or tower owner. Could be temporary service and camera will be available again.

Icon without additional marks – camera is available and ready for work, but the routes are off or not created yet.

Yellow icon – camera is captured in real time mode by user or service procedure utility. At this moment routes are off, algorithm doesn`t work.

Main menu

In the upper left corner you can see four buttons: *«File», «Map», «Tools»* and «*Help*».

Menu *«File» contains buttons «Export», «Import», «External data», «Settings» и «Exit»*:
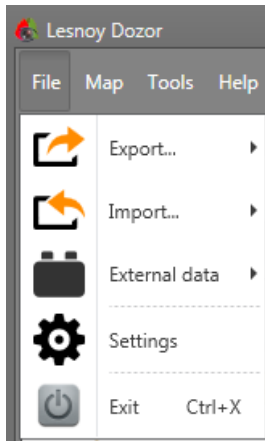
Option «Export» allows to extract data about fires, PDOs, routes in *.csv* format*.*
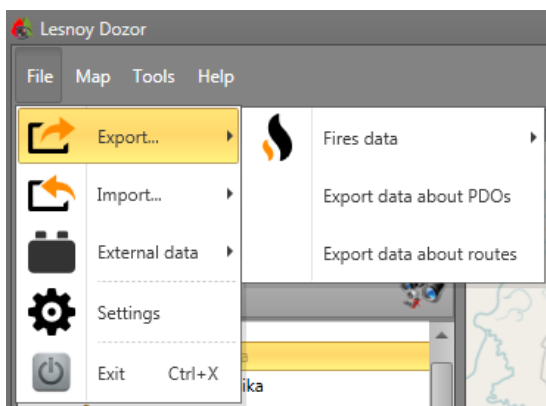
Option «External data» allows to switch on functions like satellite fires data or cars` GPS coordinates, if you have this option in your region.
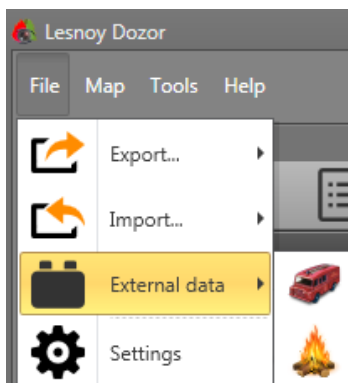
«Settings» window:
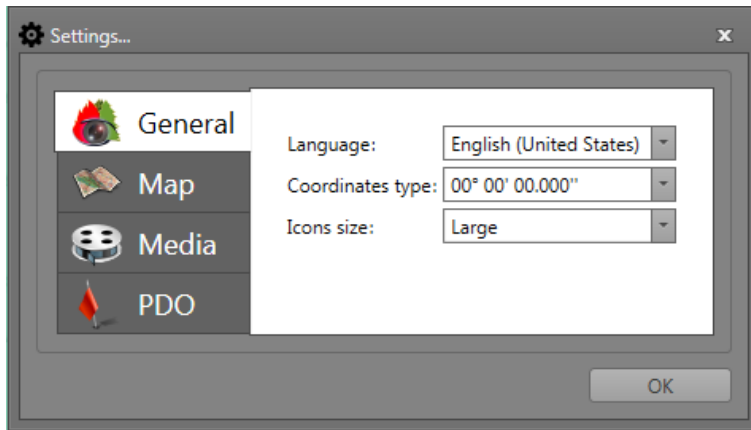
«General». Here you can choose interface language, coordinates format and icon size.

«Map». Choose a background map here.
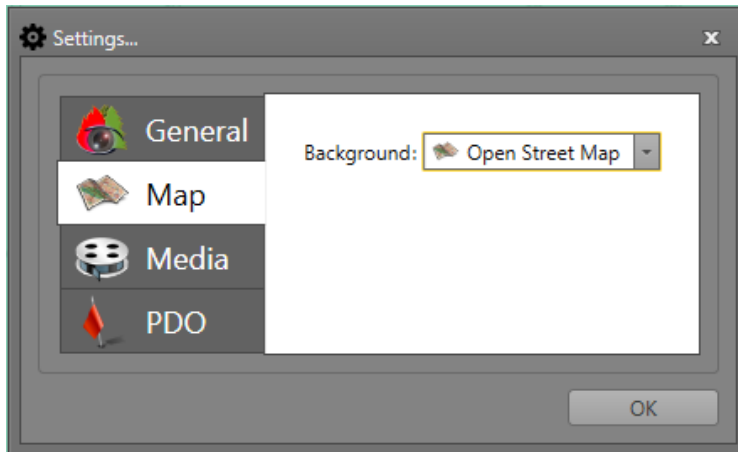
«Media».
Choose type of image enhancer here.
To let reduce costs on internet channels, the image processing was moved from camera into client`s application. It is recommended to use Enhanced sharpness.
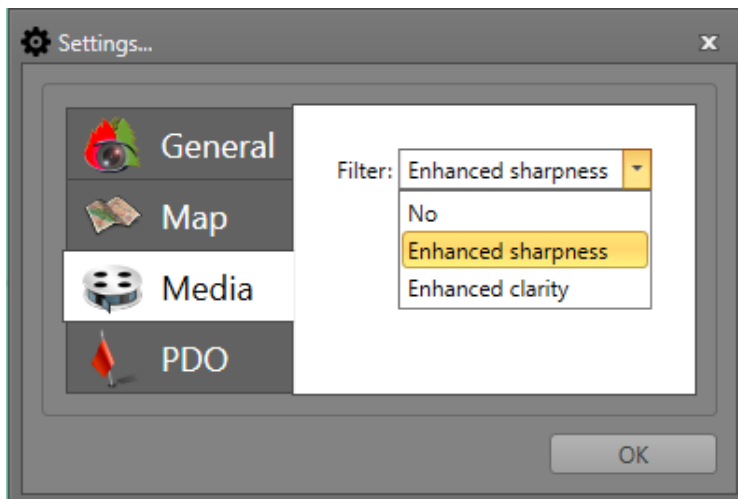
"PDO"
Turn on or off alarm signal on PDO detection.
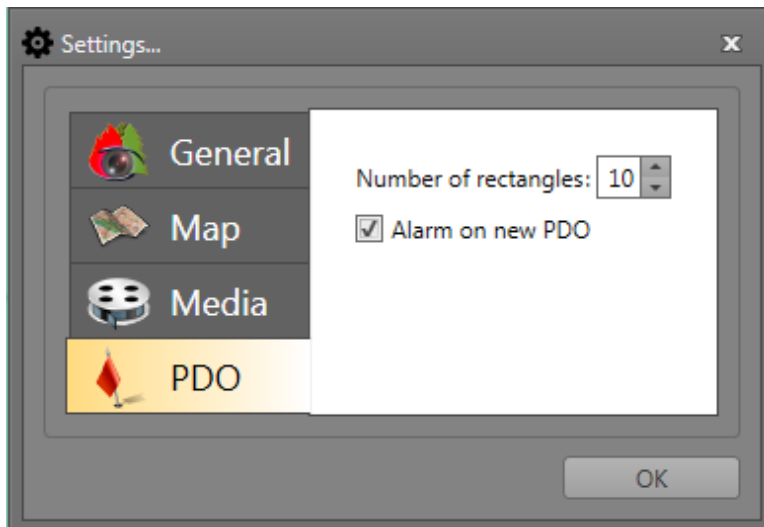
Menu Map

This menu helps mainly to switch on and off visibility of objects on the map.
If you don`t see any objects that you need to see (confirmed/non confirmed PDOs, towers, cameras) go here in Map menu and turn them on.

For cameras there are parameters:
- location
- real time mode sector
- coverage
- monitoring route sector
- PDO sector
- orientation
- point of view
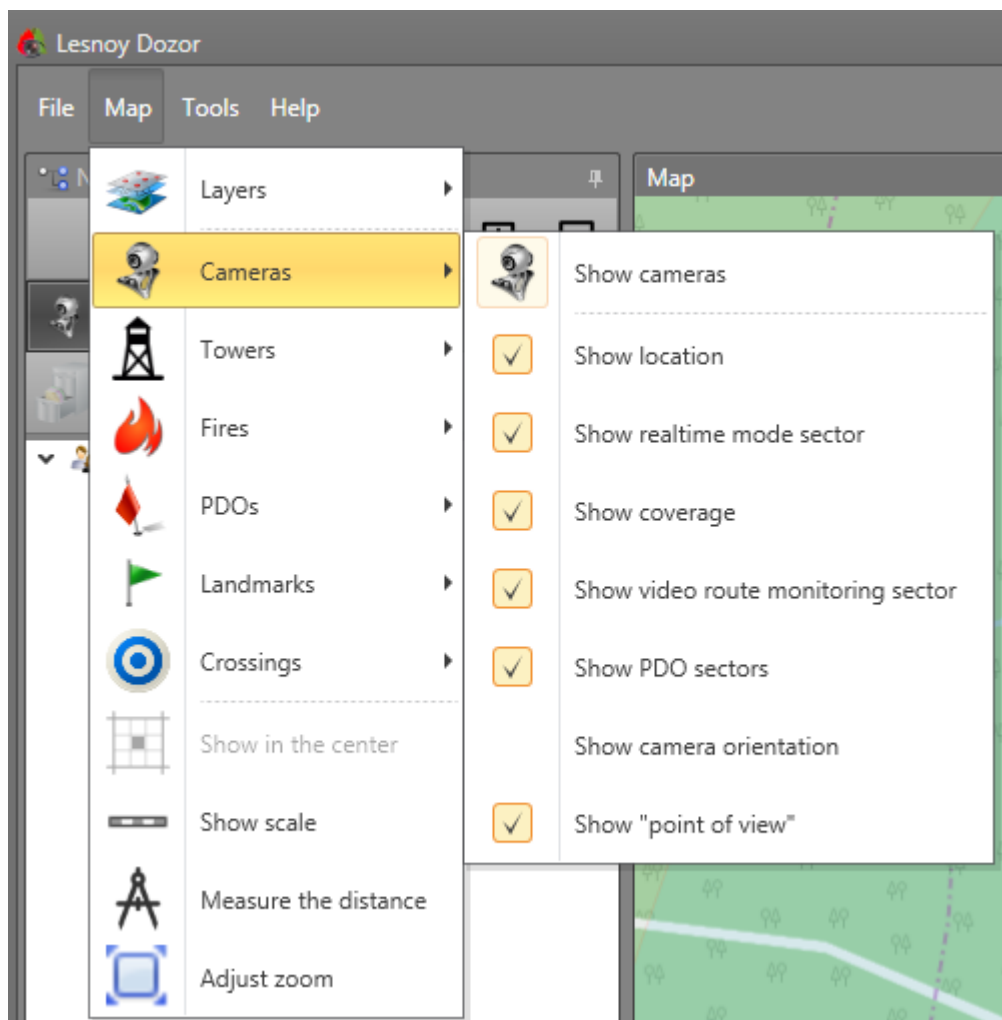
Just like that parameters for other objects turn on and off:
Towers, Fires, PDOs and Landmarks.

Menu Map -> Layers

Here you can switch on additional layers such as topography of forest map and others.
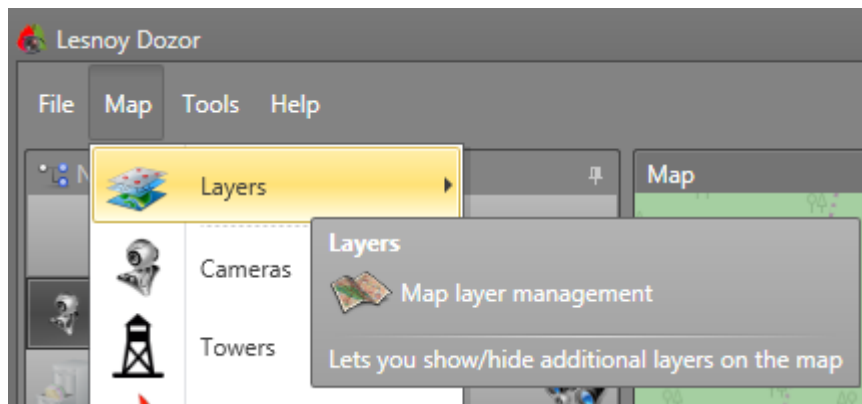
In this menu you can turn on scale.
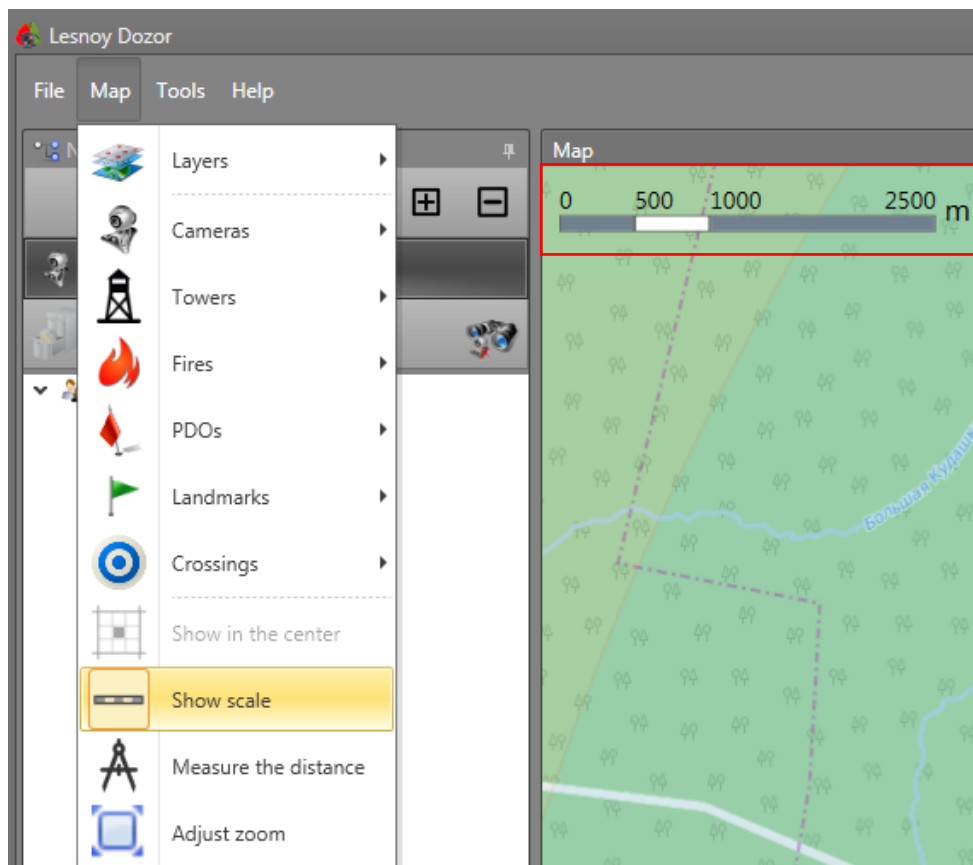
Tool «Measure the distance»
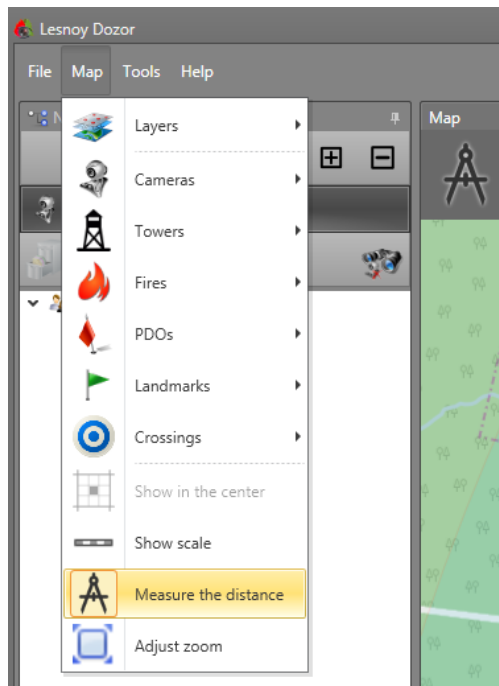
This tool works like a ruler. You can measure the distance between camera and PDO for example. Also you get and angle.
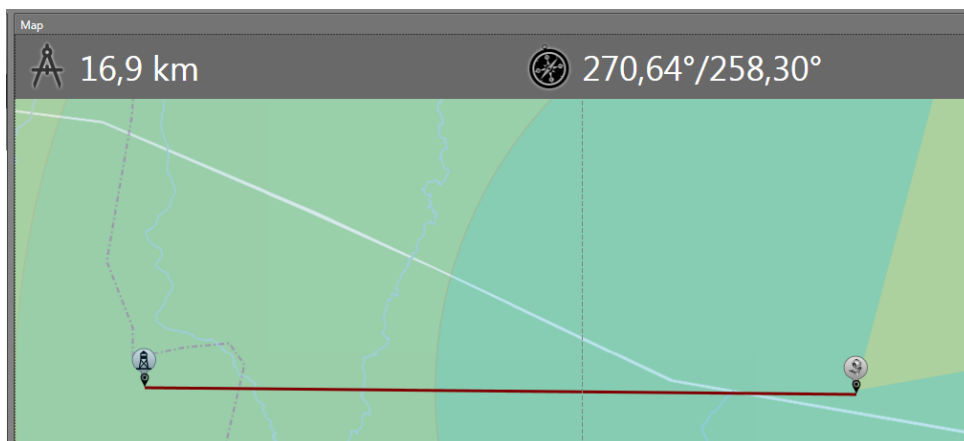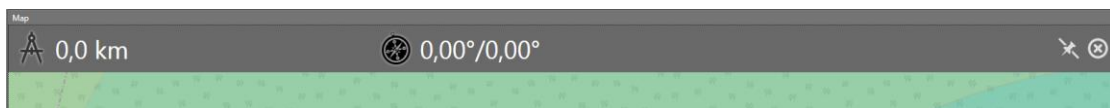
To reset for new measirement press .

To deactivate tool press .

Status line

In lower right corner the current number of unconfirmed/confirmed PDOs and fires in the system are displayed. As well as current time.
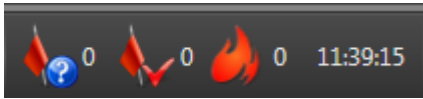
If you hover mouse over those buttons (without clicking) you will see this:

If you click the button with unconfirmed PDOs the "PDO analysis" window will appear.
If you click the button with number of confirmed PDO and fires "Fire analysis" window will appear.

Tools and contacts of tech support

In upper right corner you can find contacts of technical support service: phone number (free for Russian phones), e-mail and skype.
Also, here you can find the button "Remote help via TeamViewer" the calls the module of remote control.
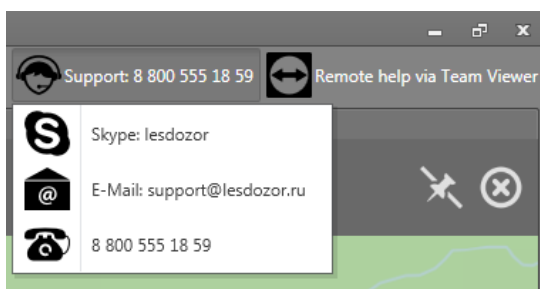
Checking the list of automatically found objects

Before starting the explanation of the window itself and the workflow, it is needed to understand, that:

- The cameras in the system move according to programmed monitoring routes.
- The cameras record point by point, forming video archive and panorama.
- Each movie clip is analyzed by detection algorithm.

When there is no smoke and no potentially dangerous movements on video, the movie clip just goes to archive without warning the user.

But is there is smoke, or something that looks like smoke, the movie clip goes into PDO analysis window followed by the warning sound (unless turned off) and you will see an increased number in a counter of status bar.
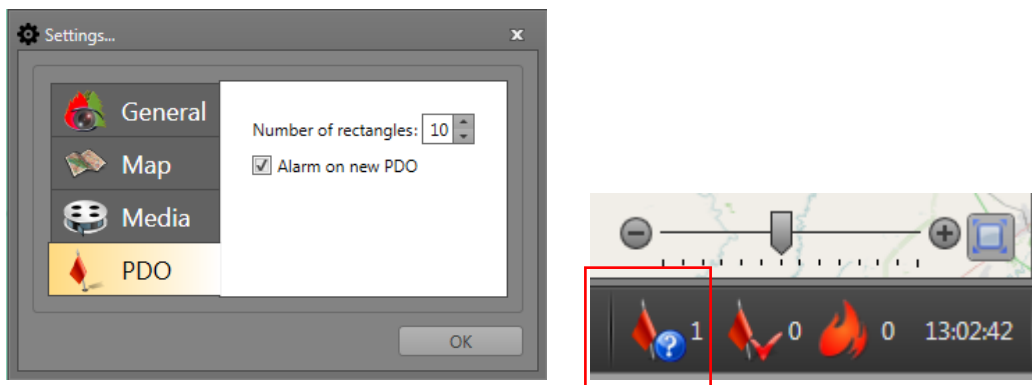
And now it`s time to open PDO Analysis window (Analysis of potentially Dangerous Objects).

Press Tools – PDO analysis:
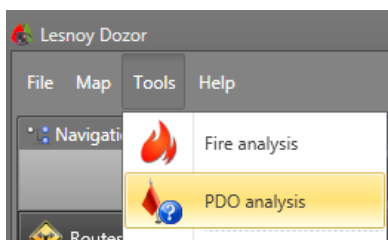
Or Counter button itself:
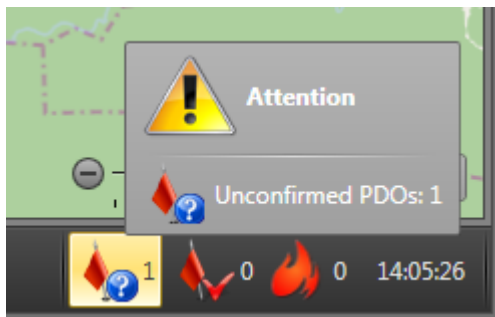
After that you will see this window:
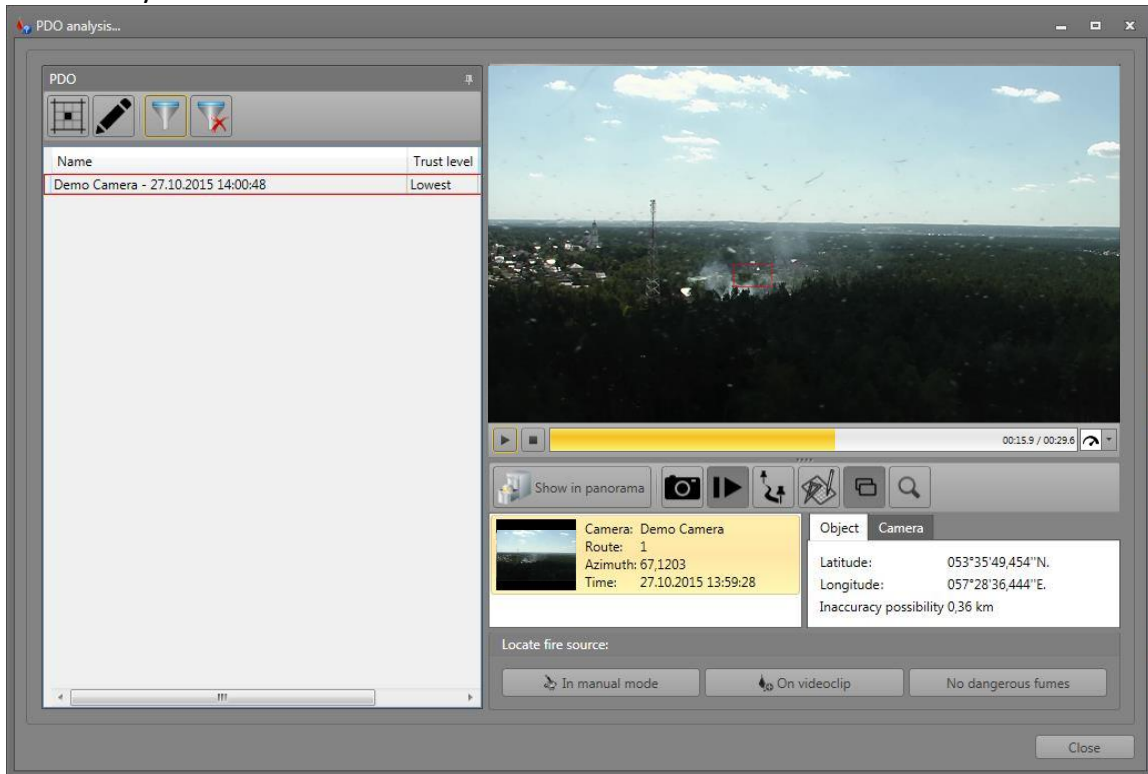
If you just have started work, on the left you will see the list of potentially dangerous objects, collected for **last 2 hours**. Objects that are older than 2 hours will be automatically deleted.

On the right side you will see the movie clip of selected PDO, where smoke was detected. Smoke (or false alarms as well) is marked with red rectangles.

Under the playback area there is a toolbar with buttons:
- Show in panorama (opens routes window with selected clip)
- Show preview only (for slow internet, shows images instead of video)
- Play selected clip
- Show objects on video (objects like PDOs, towers, landmarks, etc.)
- Show detected smoke sources (show or hide rectangles)
- Magnifier

Underneath the tool bar there are information panels.

On the yellow background you can see information about movie clip:

- Camera
- Route
- Azimuth of frame`s center
- Time of detection
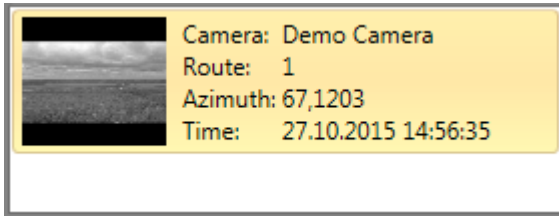
On the right we can see an area with two tabs: Object and Camera.
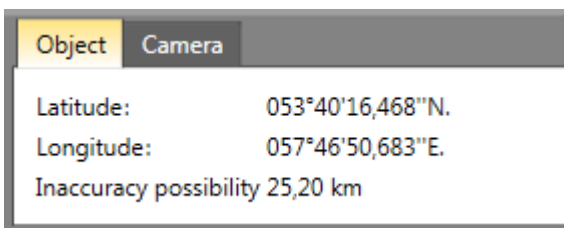
Object tab contains object coordinates and estimated Inaccuracy possibility.
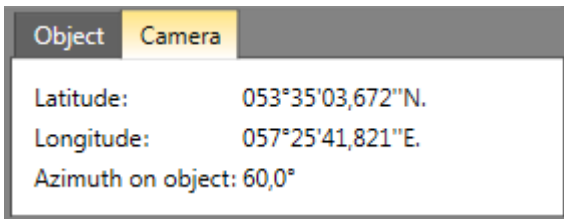
Camera tab contains camera coordinates and azimuth on object.
And finally, in the PDO analisys window you can see three large buttons:
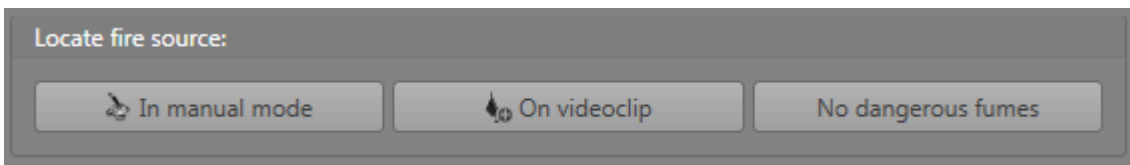
With a help of them the user deletes PDO (by pressing *No dangerous fumes*) or confirmes PDO with recalculatating coordinates in one of two ways (*In manual mode* or right in the same window *On videoclip*).
But before having a closer look at them, let`s see, how software calculates coordinates from single camera.

When smoke is detected, the system, knowing the height of camera, projects the point on the image into digital terrain map.
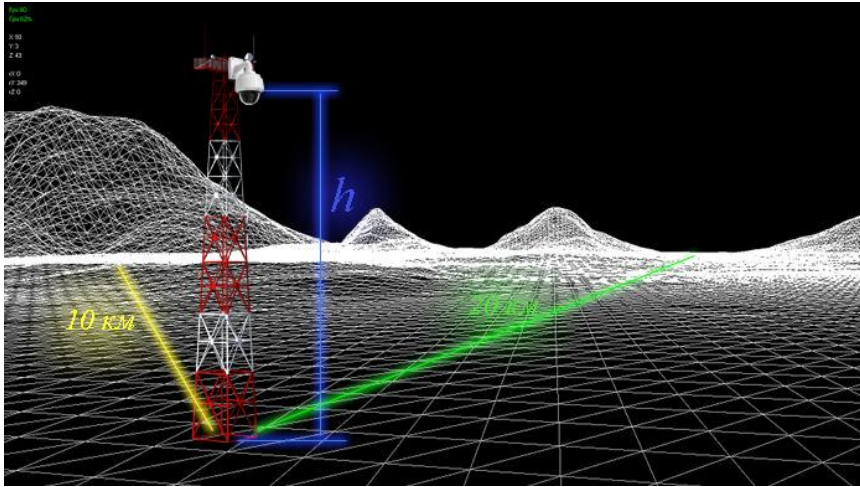
But very often the visible smoke is much higher that actuall smoke source. (Tree height for example.) Or there could be a situation like that:
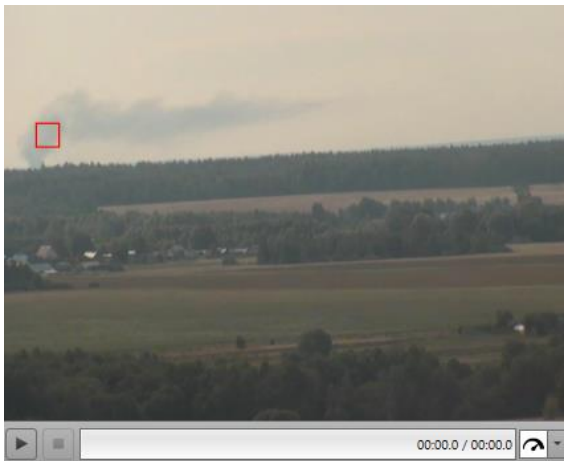
As you can see, there is no intersection of projection with earth. And the marker goes on the edge of sector.
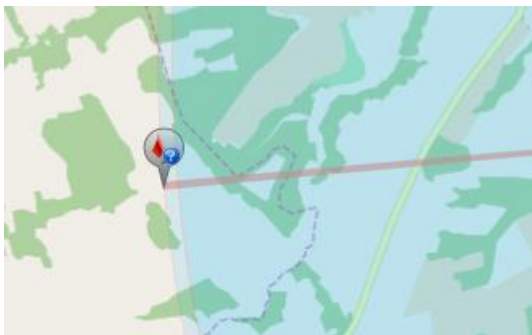
This coordinates are obviously wrong, that is why the user should mark smoke source manually. And for that we have two buttons, as was told before: "In manual mode" and "On videoclip". First, let`s have a look at defining smoke on videoclip, because it is easier and you don`t need to open other windows.

Coordinates refinement "On videoclip".

Imagine, you went through the list of PDOs and saw a movie clip with smoke. Then you pressed button Locate fire source: *On videoclip.*
Right after that you will see in the center of the image a message: select the proposed area of PDO.
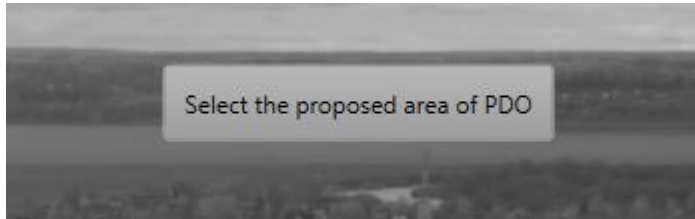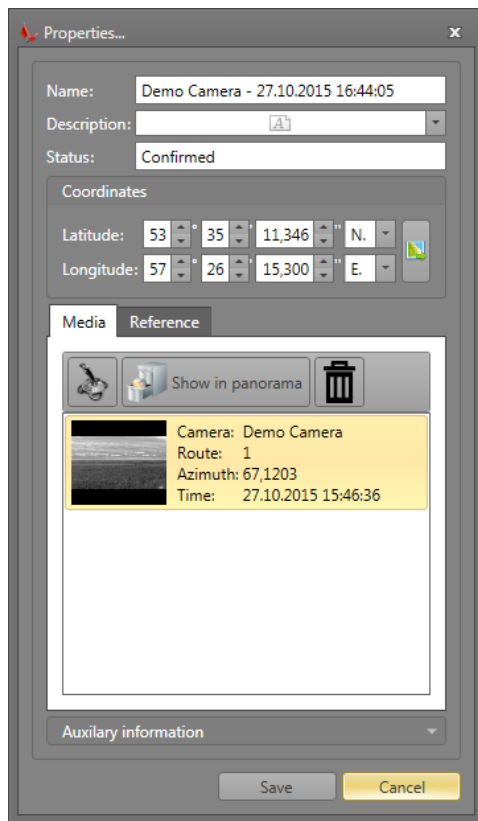
Then, you hover your cursor over the image, press and hold left button of mouse.
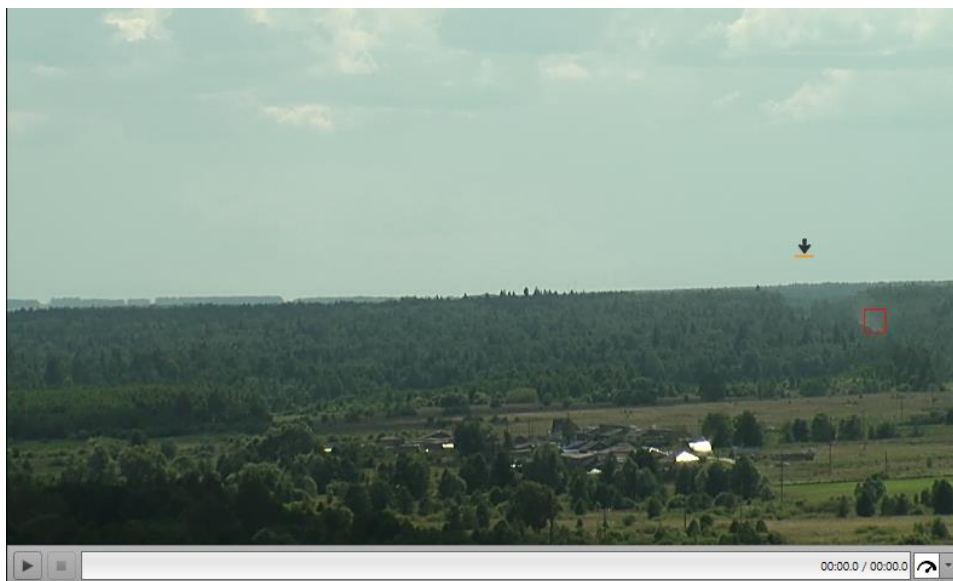
Then, you move cursor, that now looks likepointed down arrow, to the smoke source location. And only after that release the left mouse button.

Right after that the system will recalculate coordinates and open new PDO Property window:

Press Save to confirm this PDO and send it to Fire Analysis window. Also you will see on the

map the marker of confirmed PDO:

This complicated at first sight procedure helps to avoid accidental misses.

Coordinates refinement "In manual mode".

Capture control on the camera by pressing the button "In manual mode".
Zoom as close as possible on the smoke and fire source. (The closer, the better precision of coordinates calculation).
Then, in real time mode window find the button: *Mark smoke source* (the largest button).
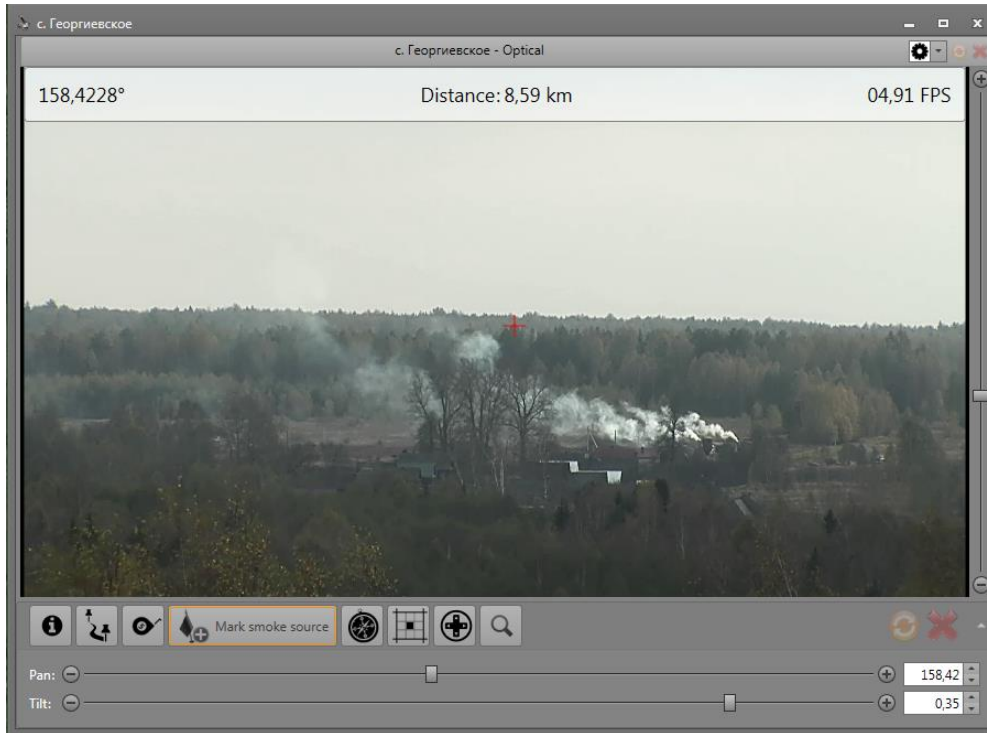
Then, as in previous method, you will see in the center of the image a message: select the proposed area of PDO:
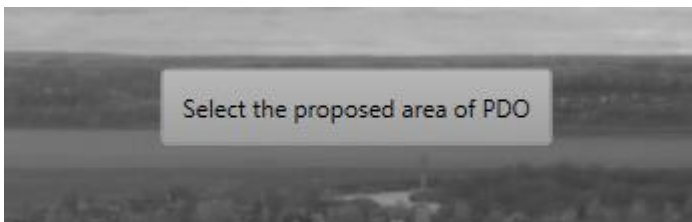
Everything else is as it was described above:
Press mouse button, hold, locate source, release. After that you will get the same confirmed PDO property window with new, more precise coordinates.

How to see PDO marker on the map

In upper left corner of the PDO analysis window there is a button "Show on the map":
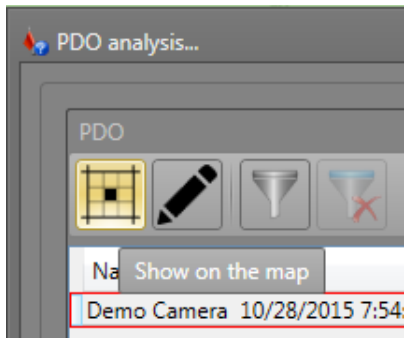
When it is pressed, choosing a PDO in the list moves the map automatically to show this certain PDO in its center. All the other objects, except this PDO and camera, becomes almost transparent.
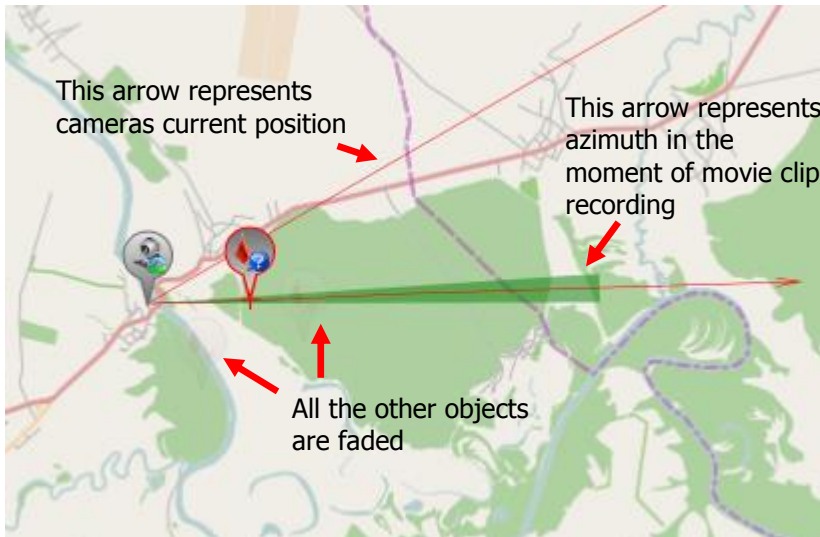
Real time mode camera control

Real time mode should be used mainly for more accurate definition of fire source and also for more precise coordinate's calculation.

Real time mode SHOULDN`T be using constantly!

It is obvious but important to understand that in real time mode camera stops analysing the rest of the route what can lead to fire miss.

Also important to know that if one user has captured control, no one else can capture this camera. That is why the mode is DEFINING but not BASIC.

You can capture camera control by several methods:

1. Pick one in the tree or on the map, right click it and choose "Capture control":

или
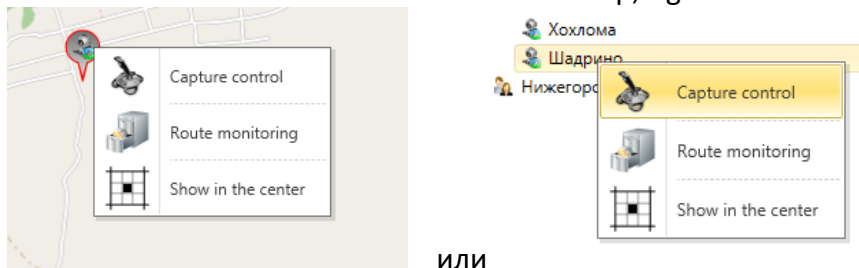
2. Press button capture control in "View routes" window:
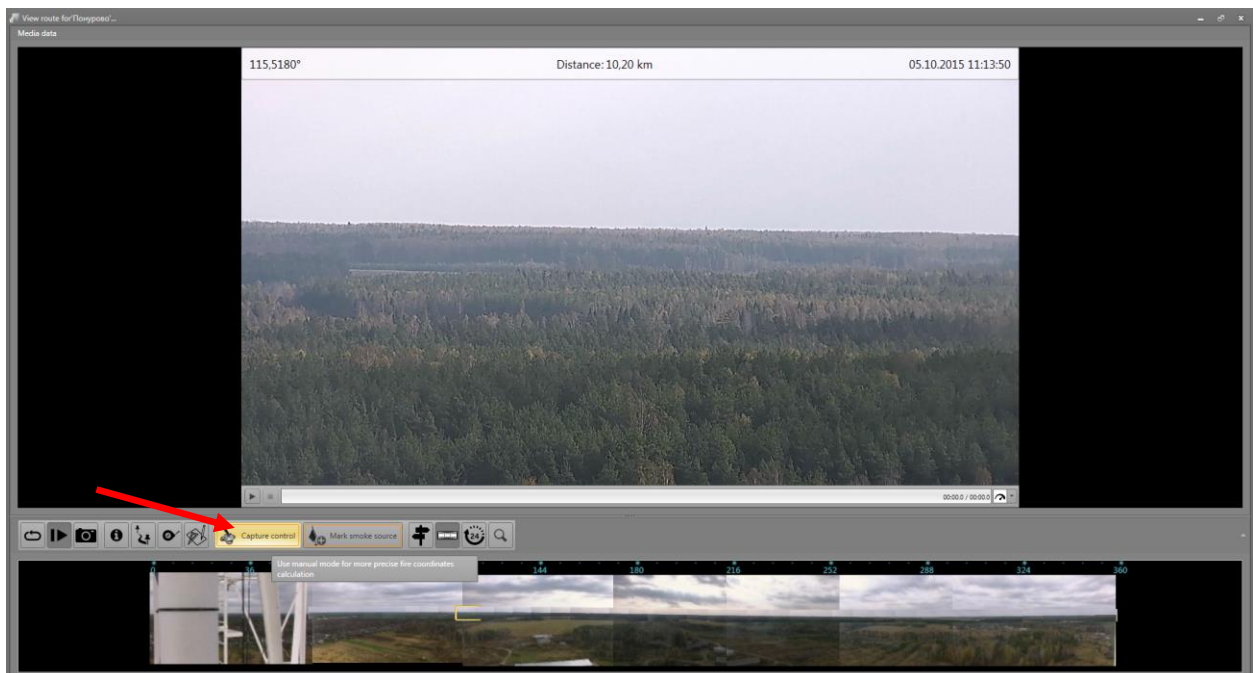
Notice, camera opens in same point of view as selected monitoring point.

3. From PDO analysis window:
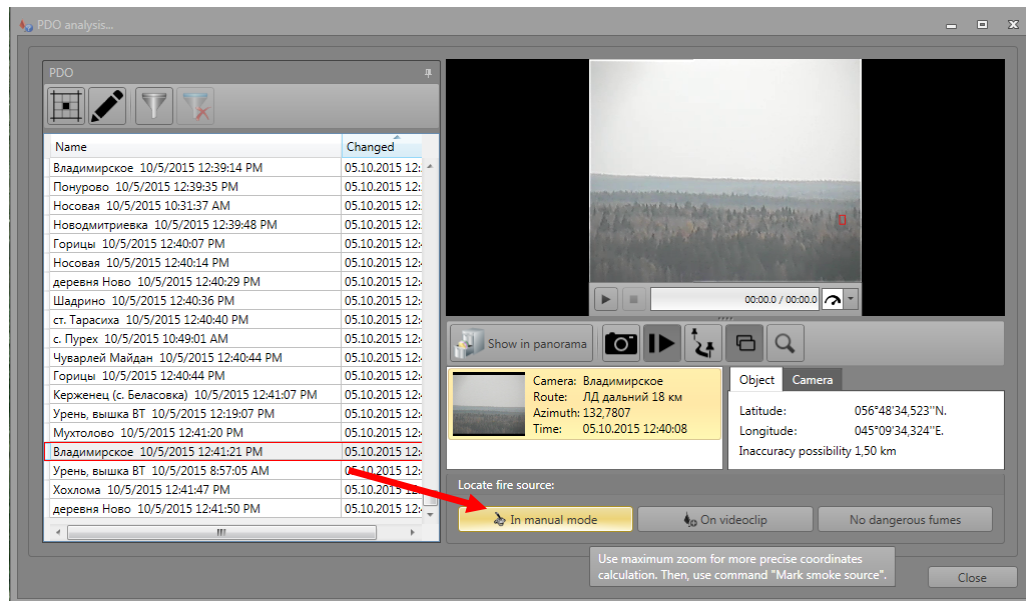
4. From Fire analysis window:
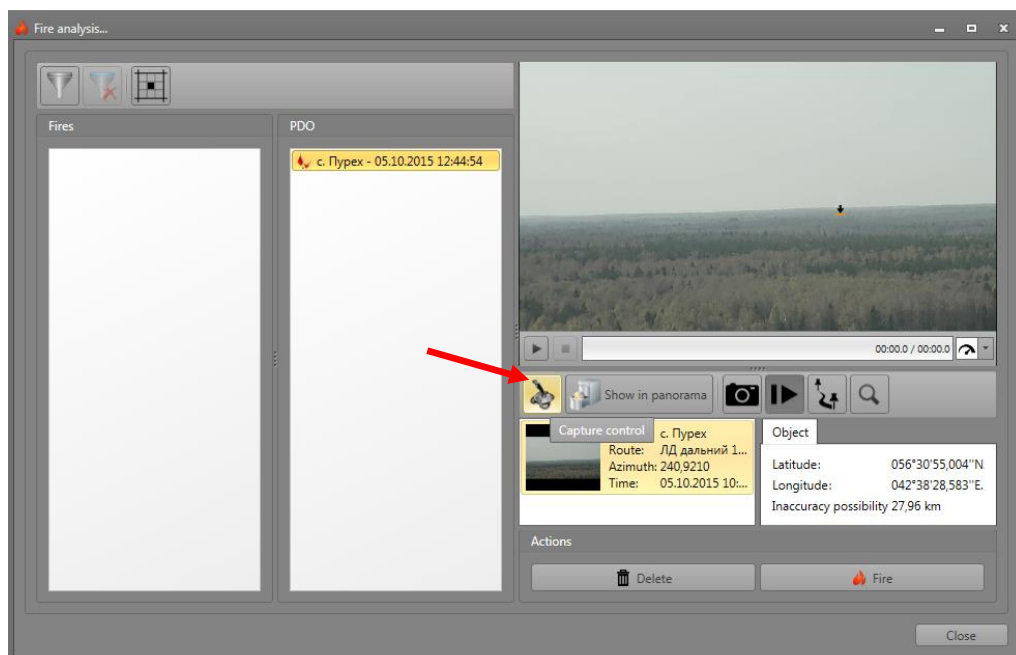
Now have a look at real time window elements.

Image quality selector

Mark smoke source

Measure distance

Show objects on video

Request indicator

Show additional information

Show/hide control panel

Camera positioning by double click on map

Show camera in the center of map

Joystick mode

Magnifier

с. Георгиевское

с. Георгиевское - Optical

158,4228°   Distance: 8,59 km   04,91 FPS

Mark smoke source

Pan: 158,42

Tilt: 0,35

1. *«Quality»*.

Here you can select image quality. Always use best unless you have slow internet.
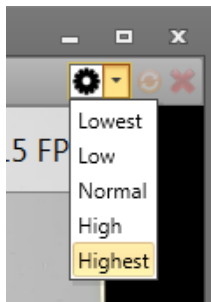
2. *«i» – information.*

Current size of window

Quality

Azimuth

Zoom

FPS

Angles of view

Min/max detection range.
<u>Initial</u>: depends on resolution and zoom.
<u>Current</u>:
depends on window size.

Information display

Distance – is a characteristic the shows estimately the possibility of fire detection of certain size on certain amount of kilometers.

Initial distance depends on zoom and sensor definition, current distance depends on physical size of the window.

3. *«Show objects on video»*

Turns on objects` bubbles inside of the window as they are displayed on the map.

Here is an example of tower object marker on video:
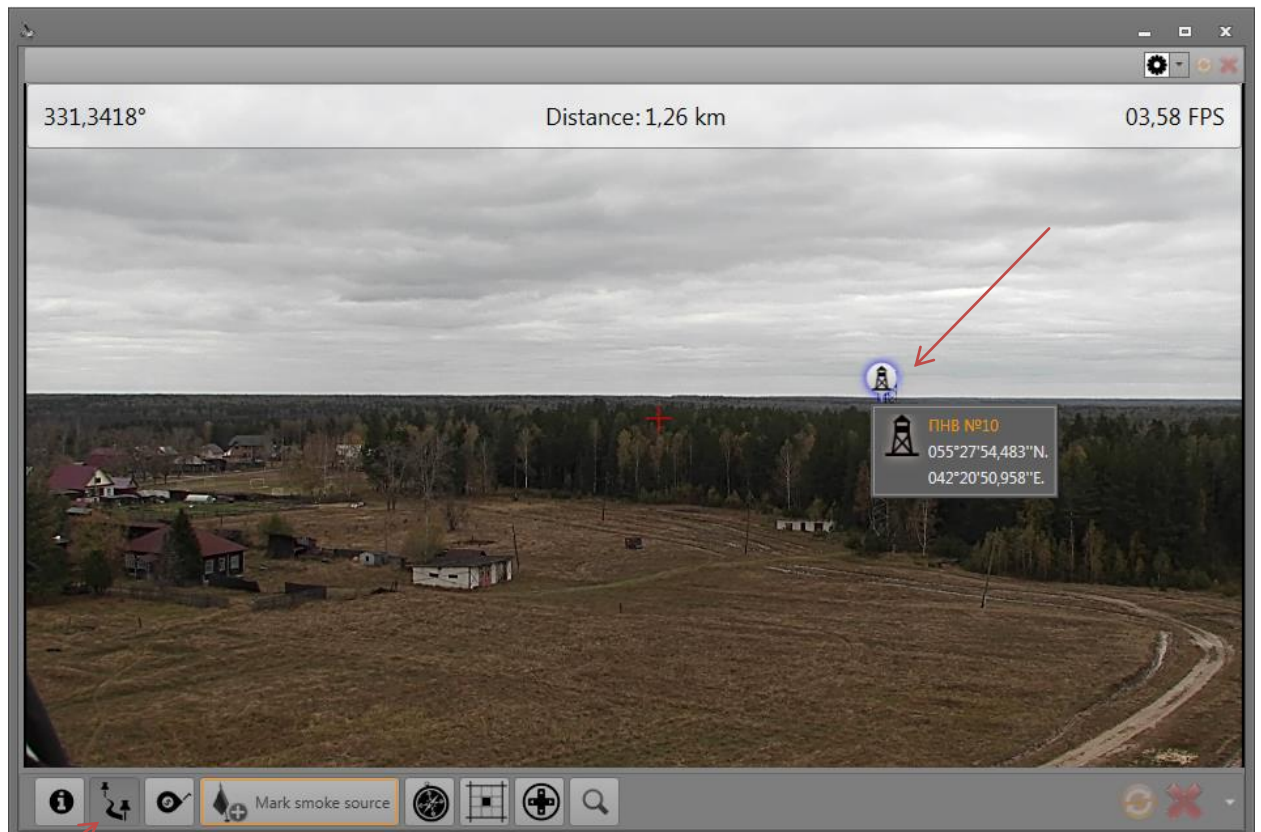
4. «*Measure distance*»

You can calculate distance to certain object if you know or can estimate it`s size. The "measure distance" tool helps with that. Make an interval between start and end point and enter size in meters. After that you get distance to object.
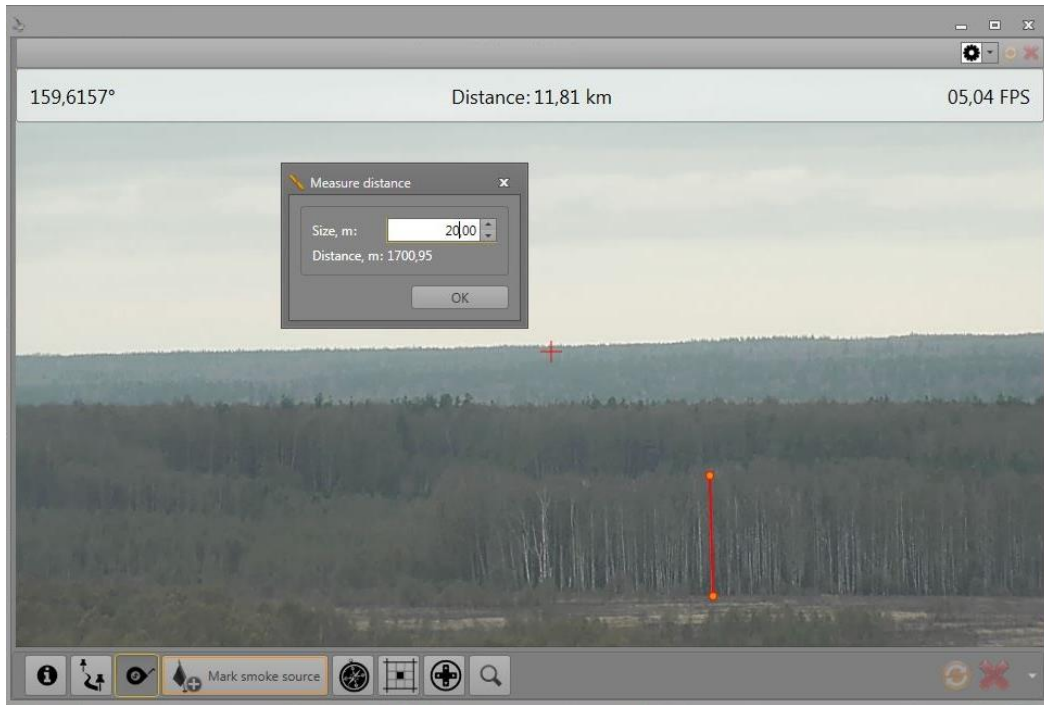
5. «*Follow double clicks on map*»

One of the ways to control camera is double clicking on the map in the point of interest. Press the button shown above to activate this function.

6. «*Show in the center*»

Press this button to place camera marker in the center of the map.

7. *«Joystick mode»*

In this mode camera is controlled by dragging the little arrow around center. Camera follows the arrow.
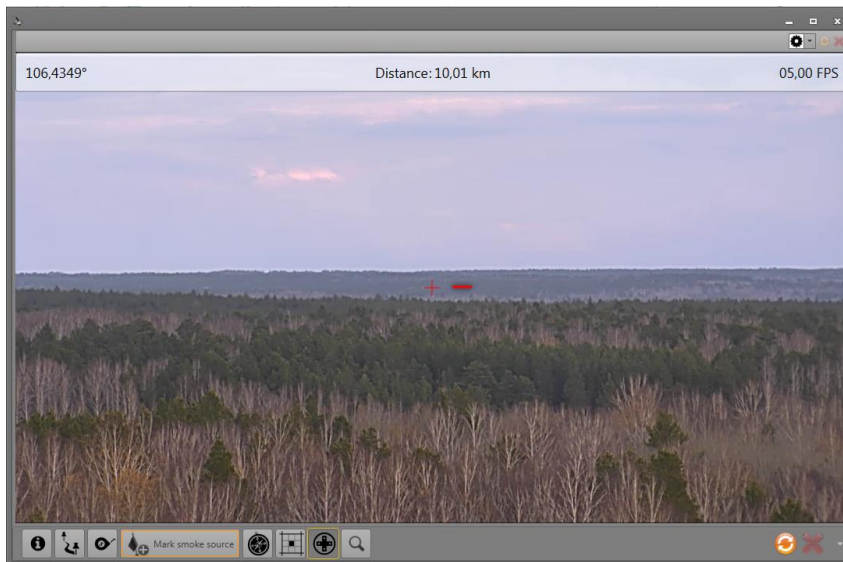
8. *«Magnifier»*

Tool magnifies circlular region on the video with selectable strength.
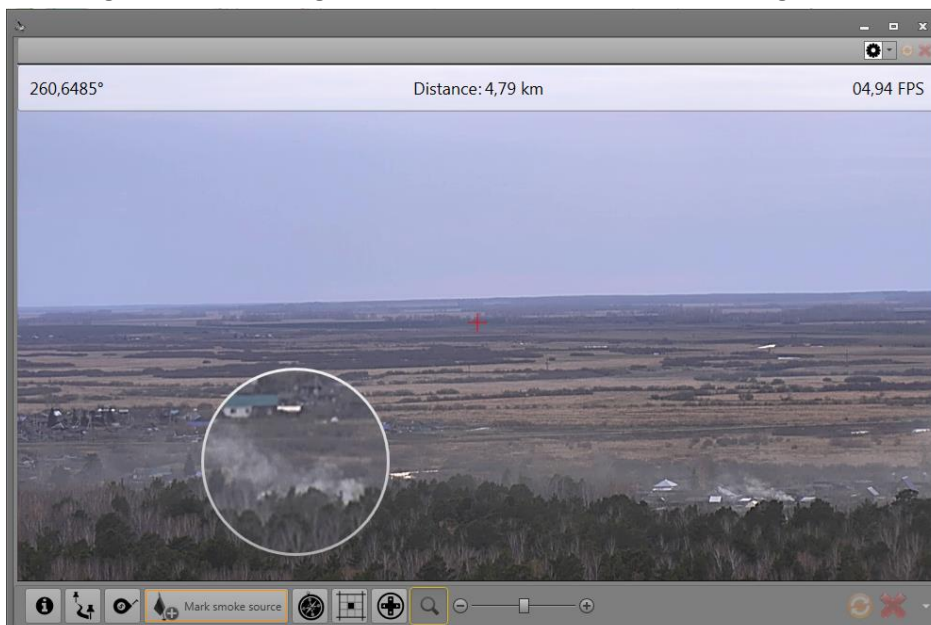
9. *«Show/hide control panel»*

You can expand the panel or hide faders by clicking little arrow in lower right corner. Shown faders control camera`s pan, tilt and zoom.
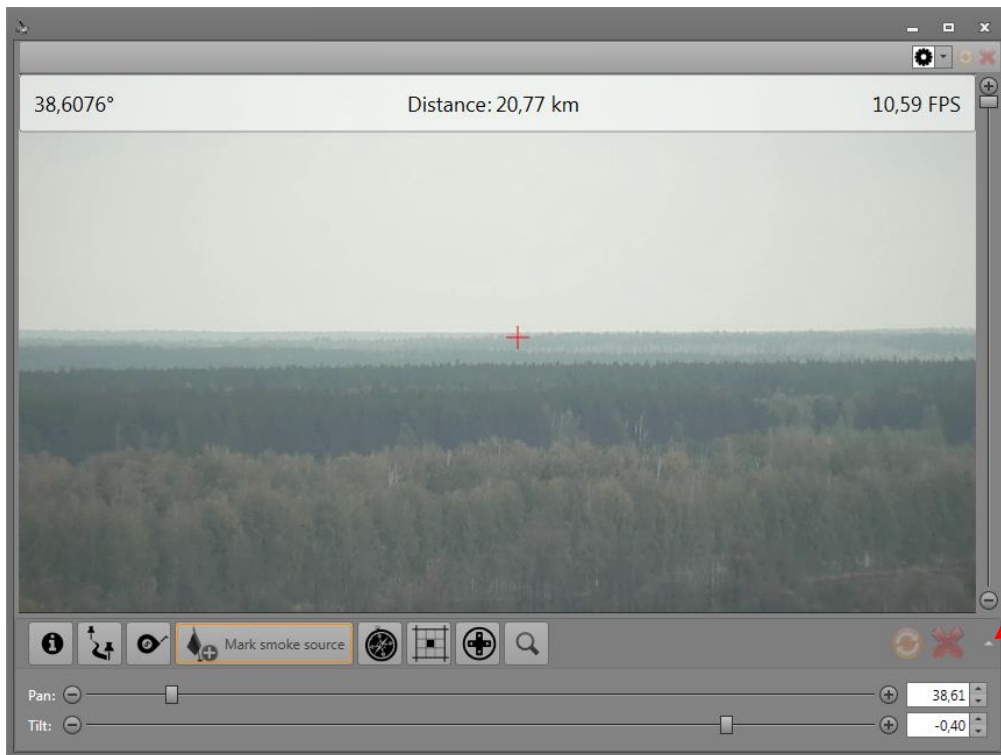
10. «*Mark smoke source*»

This command is applicable when you see smoke on video and need to calculate coordinates and create confirmed PDO. Notice, that fire source is usually lower than visible smoke. Also, use high zoom for precision.
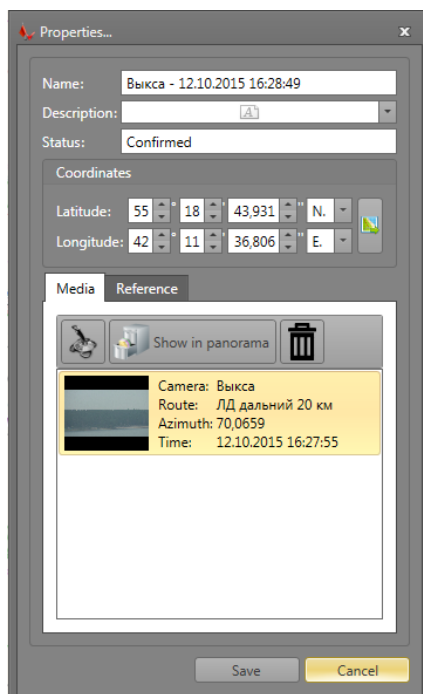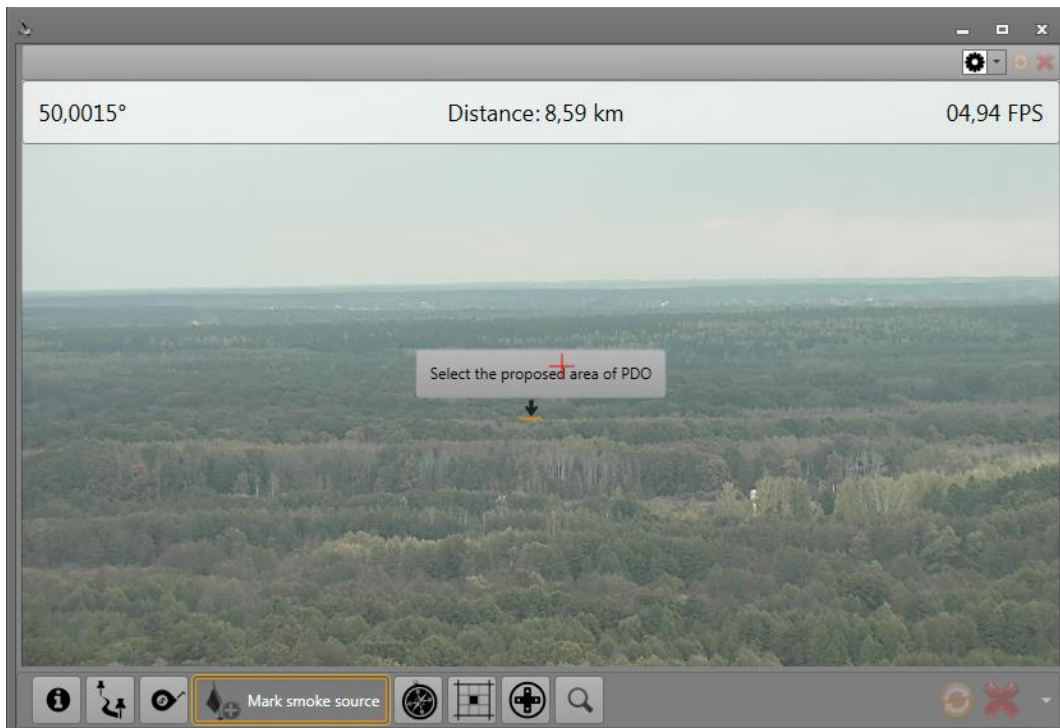
After you marked the spot the properties window will appear. After pressing "Ok", the PDO marker will appear on the map.

Important!
Coordinates, calculated for unconfirmed PDO has lower precision than has PDO created from real time mode.

View routes window

View route window serves for visual monitoring of territory without capturing camera control, therefore without interrupting routes and automatic analysis. This window also shows have the route where configured, how ban zones where drawn and so on.

To open this window, right click camera`s marker or camera`s name in tree of objects, then choose monitoring route. Or just double click on camera.
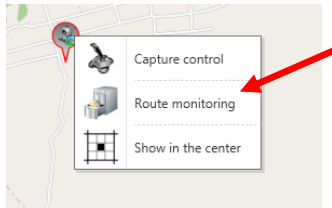
The window will open:

Those tree buttons open additional sections of the window, routes, panorama and timeline:
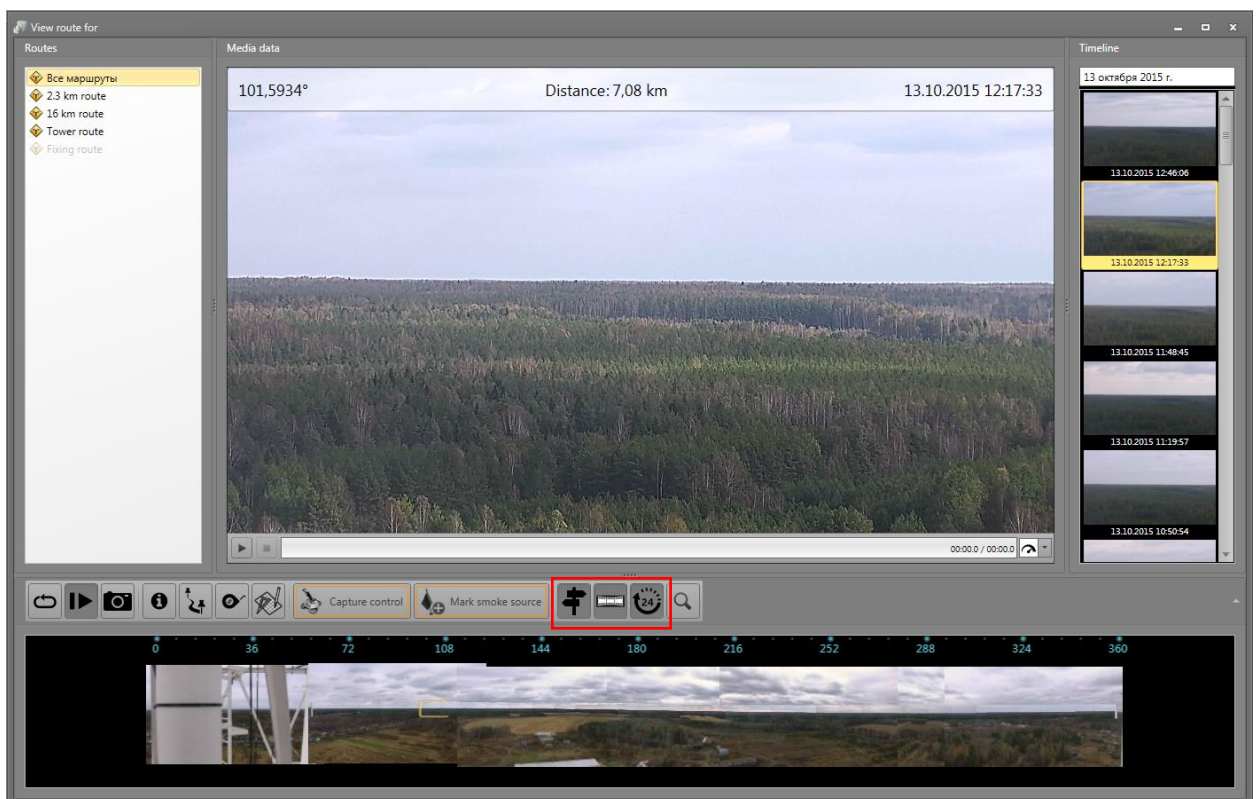
On the bottom section you can see panorama with azimuth ruler, marked from 0 to 360 degrees.

On routes section on the left you will see created routes for chosen camera.
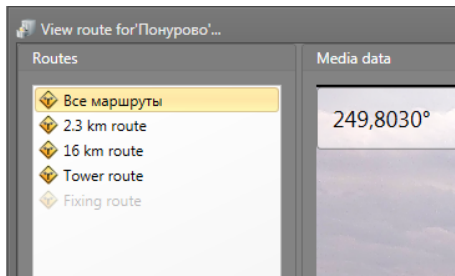
Choose the route if you want to look at it separately from others.

Now let`s have a closer look at panorama. You can see an array of recording points. These are last recorded movie clips.
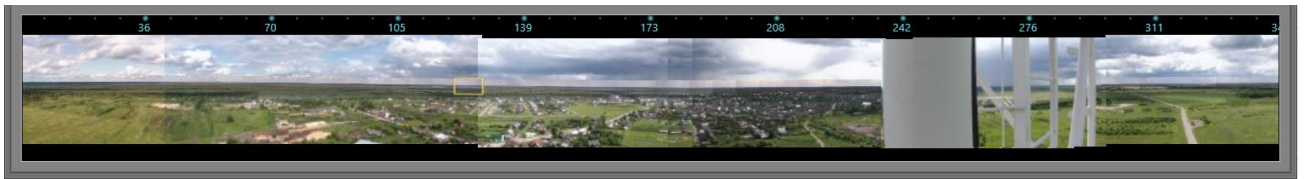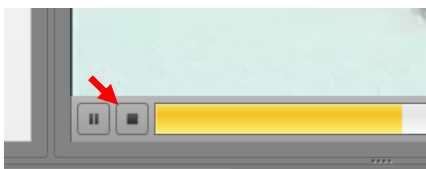

Click on any of them and the playback will start. If button "Play selected clip" pressed the playback will be starting immediately.
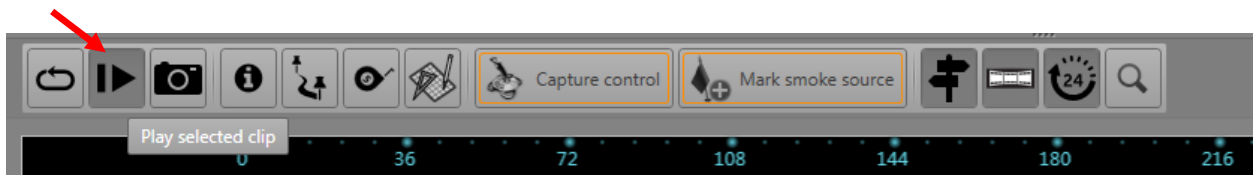

Left button on the panel is "Play the route". Press it if you want to watch all lately recorded clip one by one in cycle.
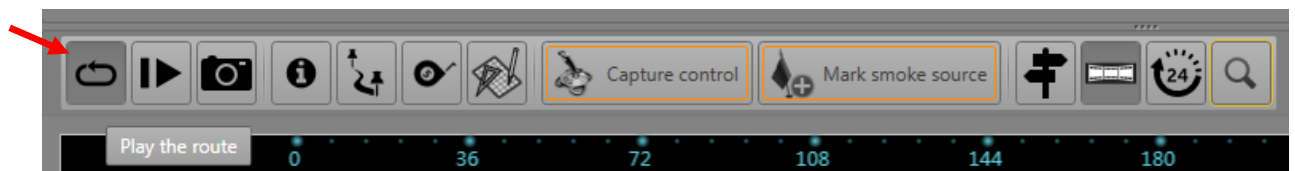
You can play and stop video with these buttons:

Selected camera will be highlighted on the map with red tracing , and violet sector will show up. It is oriented exactly like when camera was looking while recording this particular movie clip. So it is not camera`s actual position.
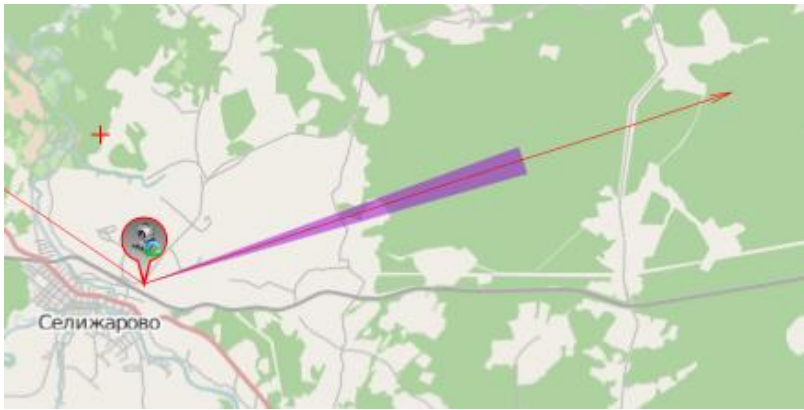
Sector of view for "far" route.
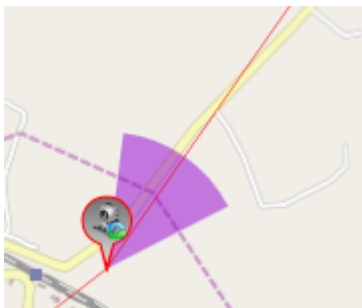
Sector of view for "close" route.

Notice, how the sector changes while draging window size. The bigger the image, the longer the sector.

Coordinates calculation with two cameras

When smoke is detected, watch if you can see it from another camera. This will help to calculate coordinates more precisely.
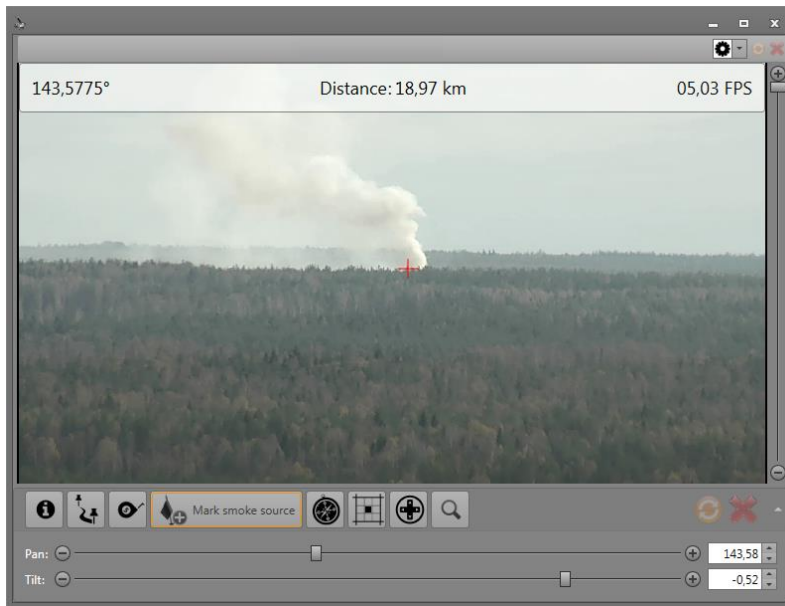First, open camera, that detected the smoke. You can open from PDO analysis window by pressing "In manual mode" button.
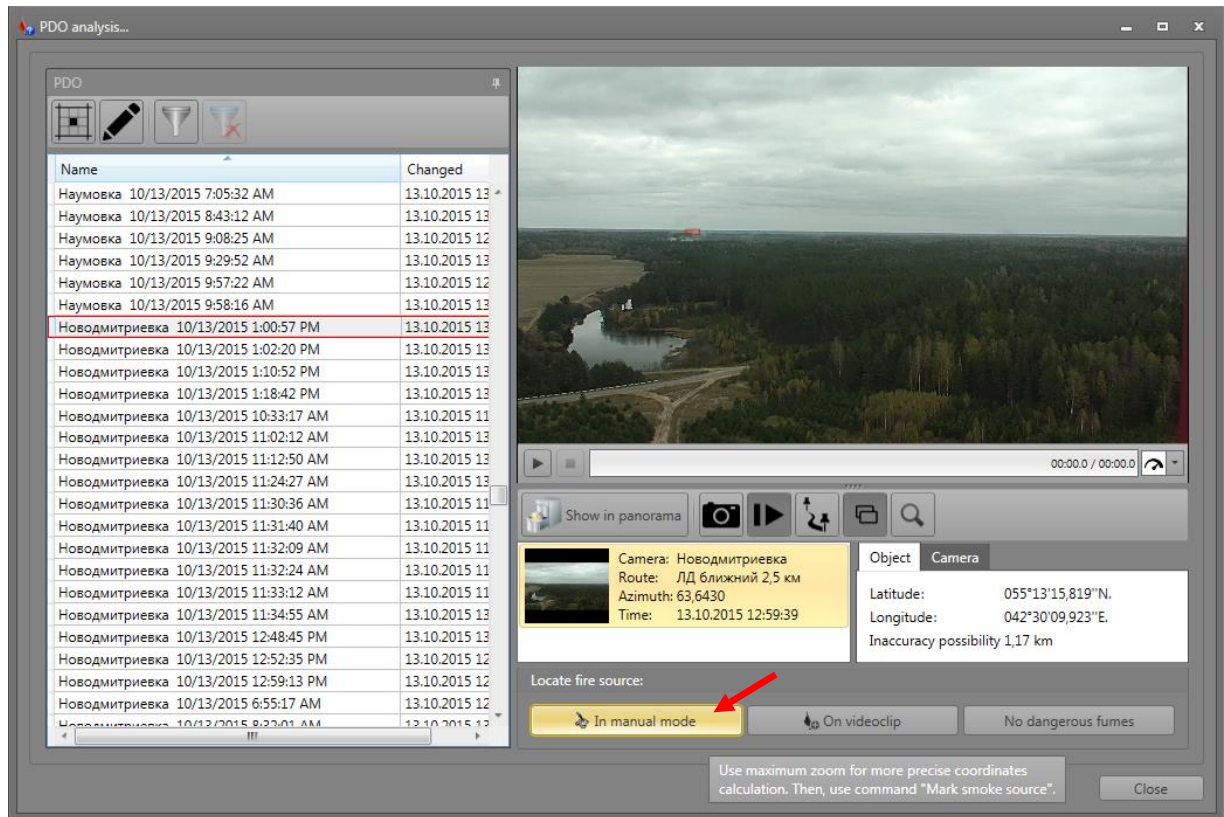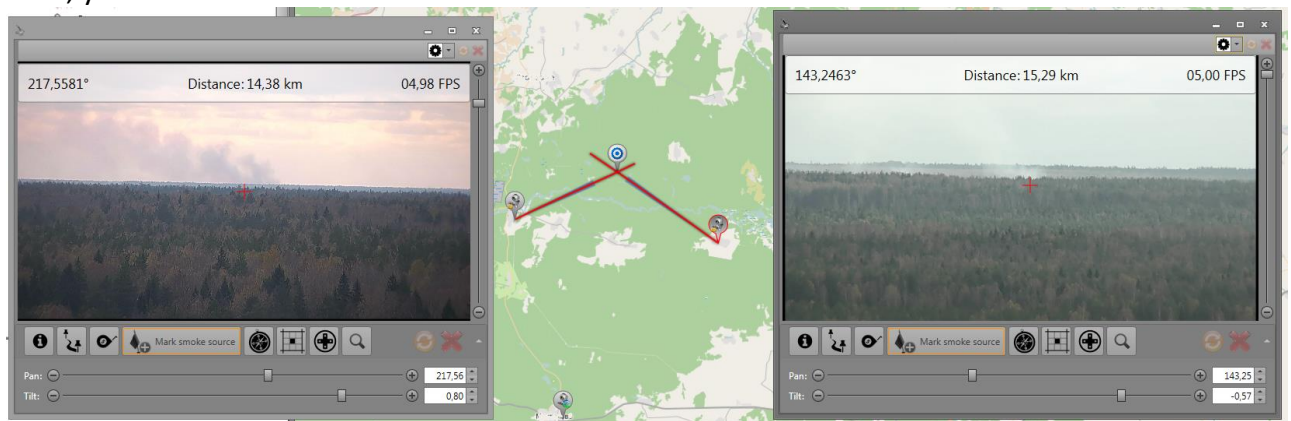

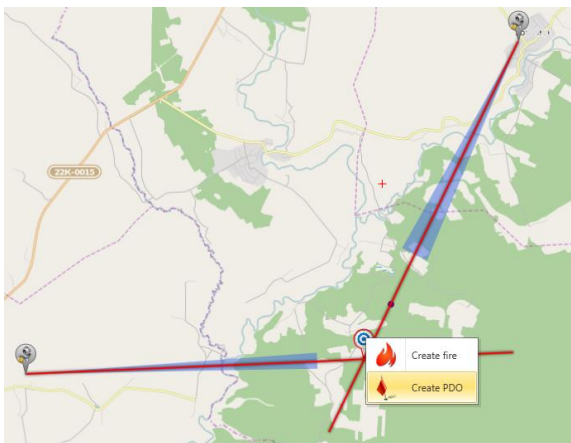Then, position camera on the smoke and zoom as close as it is possible.
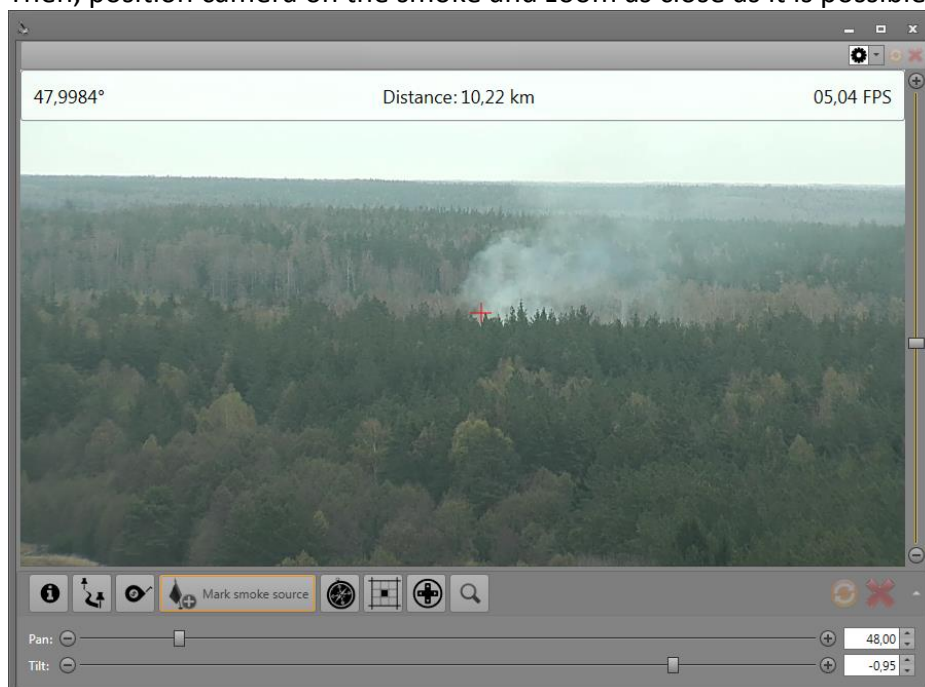
Do the same with second camera.

Now, you can see smoke on two cameras.

Now, look on the map. You should see a marker of intersection.
Right click on it and choose new confirmed PDO of New Fire.

After that the properties window of new PDO will appear with calculated coordinates. Press "Ok" to finish and send object into Fire Analysis window.

## Using fire watch tower azimuth for coordinates calculation

Instead of second camera you can use information from fire watch tower – azimuth on smoke. Object tower in "Lesnoy Dozor" has an azimuth arrow. Right click on tower marker on the map, choose "Set azimuth".
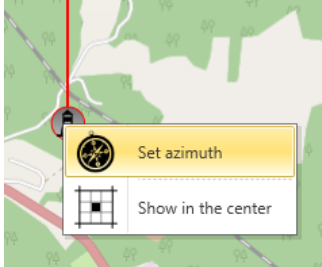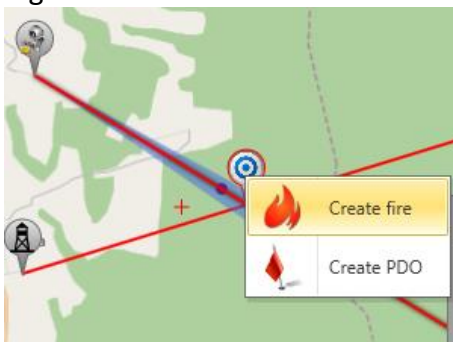

Then, enter a value or move fader. Notice, how the arrow moves.
When this azimuth arrow cross camera`s direction line, you will see marker of intersection.

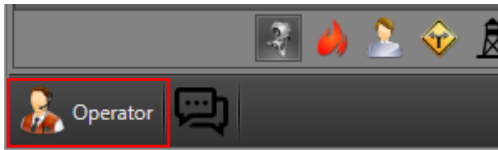*Attention! If azimuth is defined with compass, enter data in «Magnetic azimuth» section.*
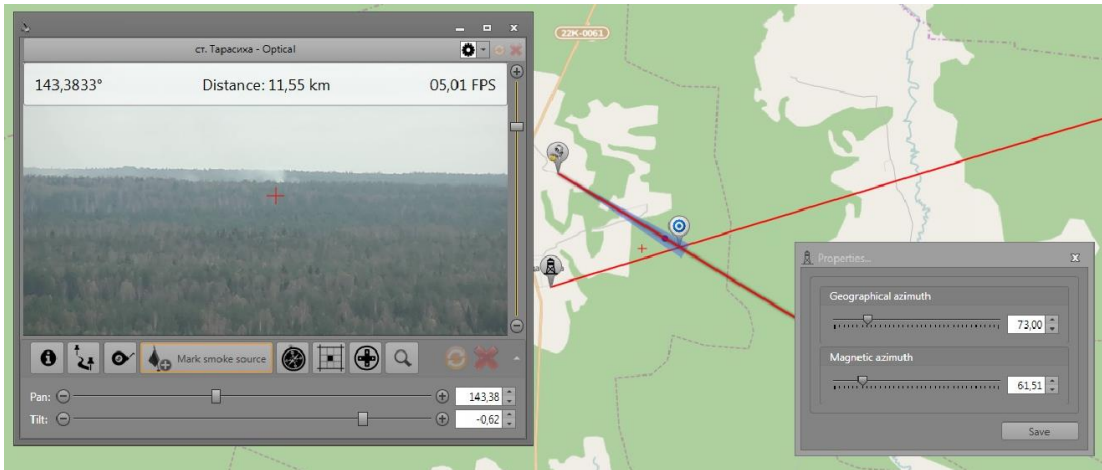
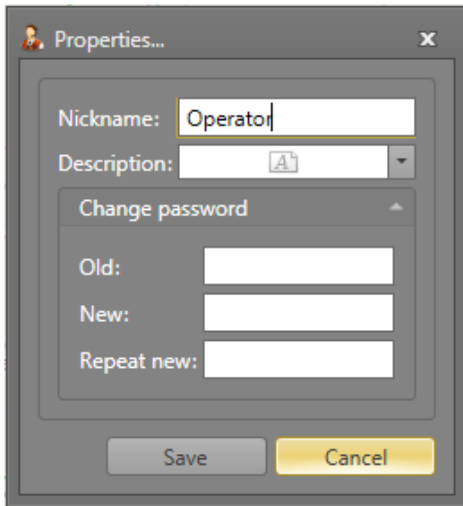Right click on marker and choose "Create PDO" or "Create Fire".

Changing password

Every user can change and must change password from time to time.
To do that, you need to press your system name in lower left corner of main window.

Credentials window will appear.

Enter old password.
Enter new one. Repeat new in the next line.
Press "Ok".

Notice!
Password should contain capitals, figures and special signs. For example: *forestR123#@*

Remote help via Team Viewer

Software "Lesnoy Dozor" has integrated module of remote help Team Viewer.
With its help you can give temporary access to support specialist to solve problems.
You can run the module from authorization window with this button:

,
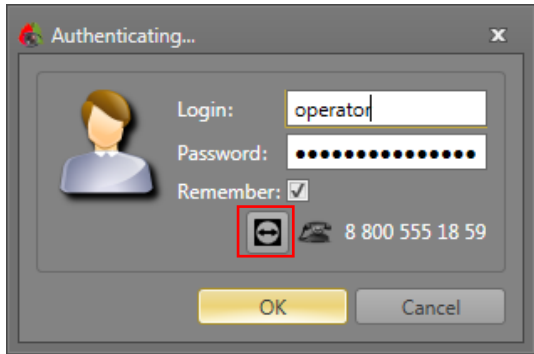
or by pressing the button in upper right corner of main window:
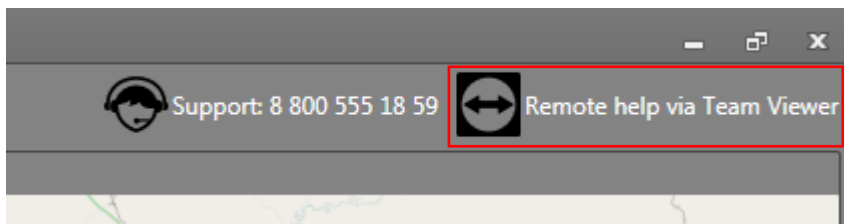
After pressing on of those you will see TeamViewer window:
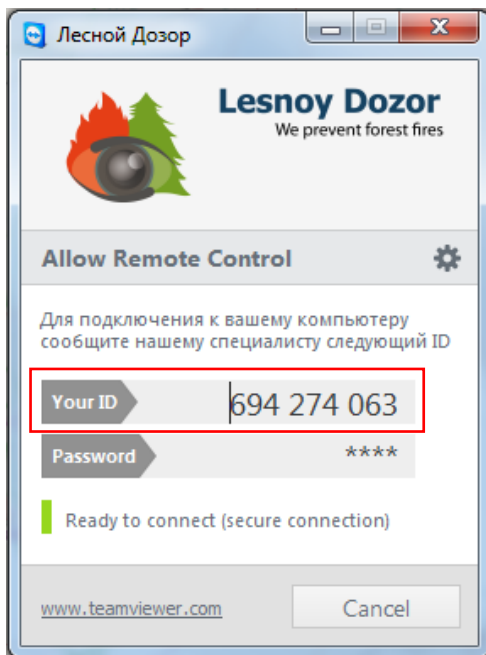
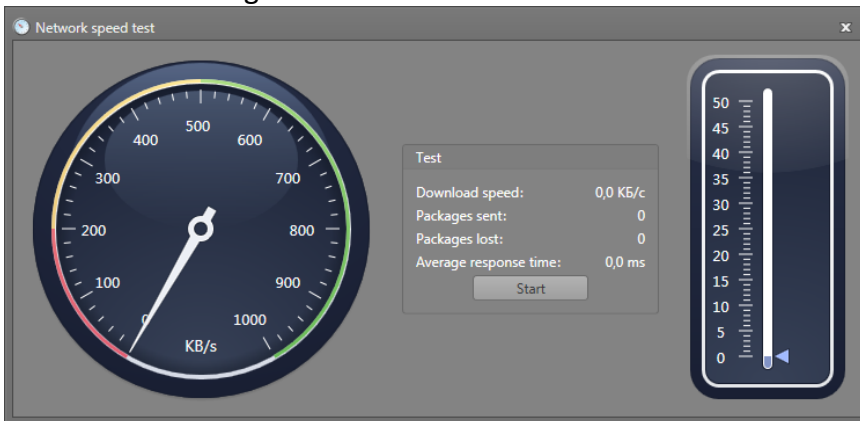Tell support specialist 9 numbers of your ID and wait for connection.
Please, don`t use computer while support manager is connected unless you were asked.
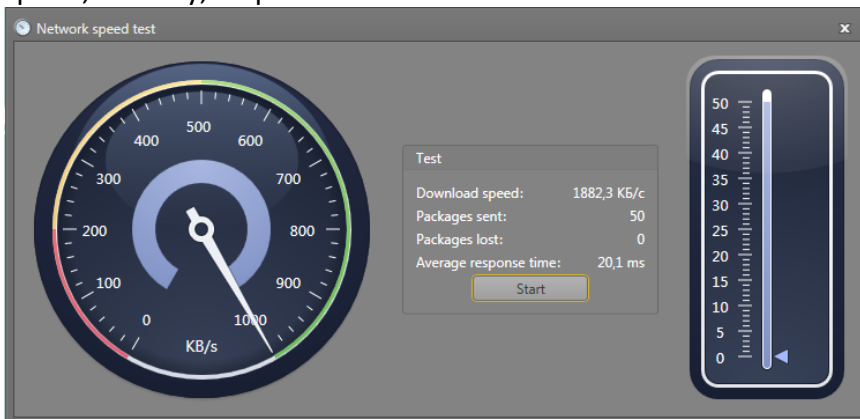
Network speed test

If the software works slowly or incorrectly, you can test your internet channel right from Lesnoy Dozor interface with build in utility. You can find it in Tools menu:
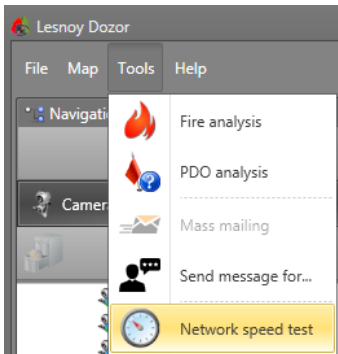
Press "Start" to begin:

After a little while you will get characteristics of key parameters:
speed, stability, response time.

Compare the results with this chart:

Parameter	Bad	Ok	Perfect
Download speed, KB/s	less than 200	200 – 500	more than 500
Packages lost	more than 5	1 – 5	0
Ср. время отклика, ms	more than 100	40 – 100	less than 40

If one or several parameters are "Bad", contact your internet provider support.