Lesnoy Dozor
defends forests from fire

by LLC “DSC”
Nizhniy Novgorod, Russian Federation
2010 was a disaster
More than 4000 people in Russia lost their homes.
Fire destroyed an area of 1.2 million acres.
The mortality caused by heart and lungs diseases in 2010 has doubled.
The territory around our hometown Nizhny Novgorod was worst affected.

And we offered something to solve the problem of early forest fire detection.
The Idea
We came up with an idea:

to develop a **smoke detection algorithm**;
which would **analyze video stream** from the network of variety PTZ ip video cameras and infrared sensors;
which could be inexpensively installed on existing infrastructure – widely spread nowadays **cell phone towers**.
We had a clear vision how to develop the way of calculating fire coordinates, using **digital terrain** model and **computer vision** technology.
How to calculate **cameras positioning** for optimum **coverage** on certain terrain, certain number of towers for certain region and its climate conditions.

And we did all of that in our system.
Implementation
Client – server architecture

Cameras ↔ Servers ↔ Client App

Essential **server** functions:

- Directing cameras along patrol routes
- Video analysis and smoke detection
- Media data storage
- GIS data and analytics
Client – server architecture

Client`s app as a front end tool

Benefits:

• Unlimited number of users
• Registered user can install and use application on any PC
• 24/7 access (server works independently)
• Direct access for camera live view
• User management (hierarchy of rights, supervisory, continuous statistics collecting)
The Application
There is a **fundamental principle** beyond all the functionality:

In most cases there is no need to watch all the cameras, they follow their routes by themselves, analyzing forest areas frame by frame, searching for smoke. The user`s duty is **validating** automatically generated PDOs – Potentially Dangerous Objects. Filtering them.
In the application it looks this way:

New PDOs appears in the list. User validates PDO by pressing one of those buttons.

Here we can see what was the reason for an alarm.

Playback control.
This principle allows to control up to 30 cameras by single one operator.

Monitoring of the same area in a traditional way would require 30 foresters.

It is not difficult to calculate how much money would be spent from salary budget to afford 30 foresters.
The Interface
Basic modes

1. Validating PDOs:
   • PDO analysis window
   • Fire analysis window

2. Routes monitoring:
   • View routes window

3. Live view mode:
   • Capture control window
PDO Analysis Window
Fire Analysis Window
View Routes Window

Routes

Panorama

Timeline for chosen orientation
Live View Window

Auxiliary functions

Pan
Tilt
Zoom
PDOs, both manually or automatically generated, appears with calculated coordinates and with a marker on a map.
Plotting coordinates

If you can see smoke from two cameras, coordinates could be calculated with even more precision.
Data integration

Loading on the fly assets:

- Detailed custom clients` maps
Data integration

Loading on the fly assets:

- Detailed custom clients` maps
- Fire – hazard class maps
Data integration

Loading on the fly assets:

- Detailed custom clients` maps
- Fire – hazard class maps
- Satellite Data
Data integration

Loading on the fly assets:

- Detailed custom clients` maps
- Fire – hazard class maps
- Satellite Data
- Forest maps
Data integration

Loading on the fly assets:

• Detailed custom clients' maps
• Fire – hazard class maps
• Satellite Data
• Forest maps
• Atmosphere transparency, clouds and weather maps (beta)
Diagnostics and Statistics Window

Cameras, routes, users, servers diagnostics and statistics can be easily exported.
Statistics that could be exported in details:

- Total time when user was logged in
- Total estimated number of recorded video clips
- Total number of created objects “Fire”
- Total number of detected PDOs
- PDOs validated as “No dangerous fumes”
- Amount of not validated PDOs
- Amount of not validated confirmed PDOs
More than 300 cameras in the system and approx. 70 million acres of forest under protection at the time.
24/7 Tech Support
Monitoring methods comparison

**Traditional**

The easiest way. Low one-off costs if existing towers are using.

Human factor – hard to stay concentrated for long time. Needs a lot of people for monitoring big areas.

**Aircraft**

Good for monitoring distant areas. Good fire coordinates precision.

Expensive. Can’t be used continuously. Takes long time to educate pilots.

**Satellite**

Good for monitoring distant areas, that can’t be reached the other way.

Data updates rarely (several times a day). Fire must be big enough to be detected. Unable to monitor areas under clouds.
Monitoring methods comparison

Multi-positional passive optical location method of Lesnoy Dozor

**Automatic monitoring.**
Real-time data streaming.
Up to 30 cameras per one operator.
Coordinates calculation.
A lot cheaper than aircraft monitoring.
Third-party sources data integration, including satellite, weather, etc.
Unlimited number of users and control centers.

Needs electricity and internet connection on towers.
Less precise coordinates calculation than an aircraft gives.
Pricing

One-off (launch) costs:
• Coverage modelling
• Cameras & server(s)
• Network equipment
• Installation

Operating costs (monthly):
• Towers rent
• Internet connection for each camera
• Software License
• Maintenance

To calculate the costs or get more information, please contact us by phone: +7 (831) 411 55 97 or e-mail: info@lesdozor.ru
Our Customers: Regions

**Under control:** 318 sensors

1. the Altay Territory
2. the Vladimir Region (NP Meschera)
3. the Vologda Region
4. the Voronezh Region
5. the Irkutsk Region
6. the Kaliningrad Region
7. the Kaluga Region
8. the Kemerovo Region
9. the Kostroma Region
10. the Kurgan Region
11. the Kursk Region
12. the Lipetsk Region
13. the Nizhniy Novgorod Region
14. the Novosibirsk Region
15. the Omsk Region
16. the Oryol Region
17. the Penza Region
18. the Perm Territory
19. Republic Komi
20. Republic Mariy El
21. Republic Mordovia
22. Republic Karelia
23. the Rostov Region
24. the Ryazan Region
25. the Samara Region
26. the Sverdlovsk Region
27. the Smolensk Region
28. the Tambov Region
29. the Tver Region
30. the Tomsk Region
31. The Tula Region
32. the Tyumen region
33. the Chelyabinsk region

http://www.lesdozor.ru/en
Limited Liability Company **DSC** was founded in the city of Nizhny Novgorod in 2008. The company is a resident of Skolkovo Innovation Centre and IT-park Ankudinovka. The team develop, sell and implement the early warning system for forest fires **Lesnoy Dozor** (“Forest/Wood Watch” – transl.).

**Ivan Shishalov** – Managing Director and the architect of the project. Graduated Lobachevsky State University of Nizhny Novgorod with honors. Gained professional experience in *Intel, Wireless Net Lab* and *Video City*. Underwent a training in Intel Labs Berkeley. A patent holder for 4 inventions and an author of more than 20 scientific publications.

**Yaroslav Solovyov** – Technical Director. Graduated Lobachevsky State University of Nizhny Novgorod (Radiophysical Department). Obtained experience in *Encotes, Video City* and *Tele-M* as Developer and then as Project Manager.

**Andrey Filimonov** – Director of Software Engineering. PhD in the field of applied mathematics. A scientific associate at Lobachevsky National Research University of Nizhny Novgorod. Worked in international companies *Teleca* and *Telma* more than 8 years as Developer, SW engineer and Senior Project Manager.

**Dmitry Bulgatov** – Commercial Director. Has working experience on managing positions in companies: *PepsiCo, Mobile TeleSystems, A’Lemar, NCC, SMARTS*. More than 8 years in telecommunication business.

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