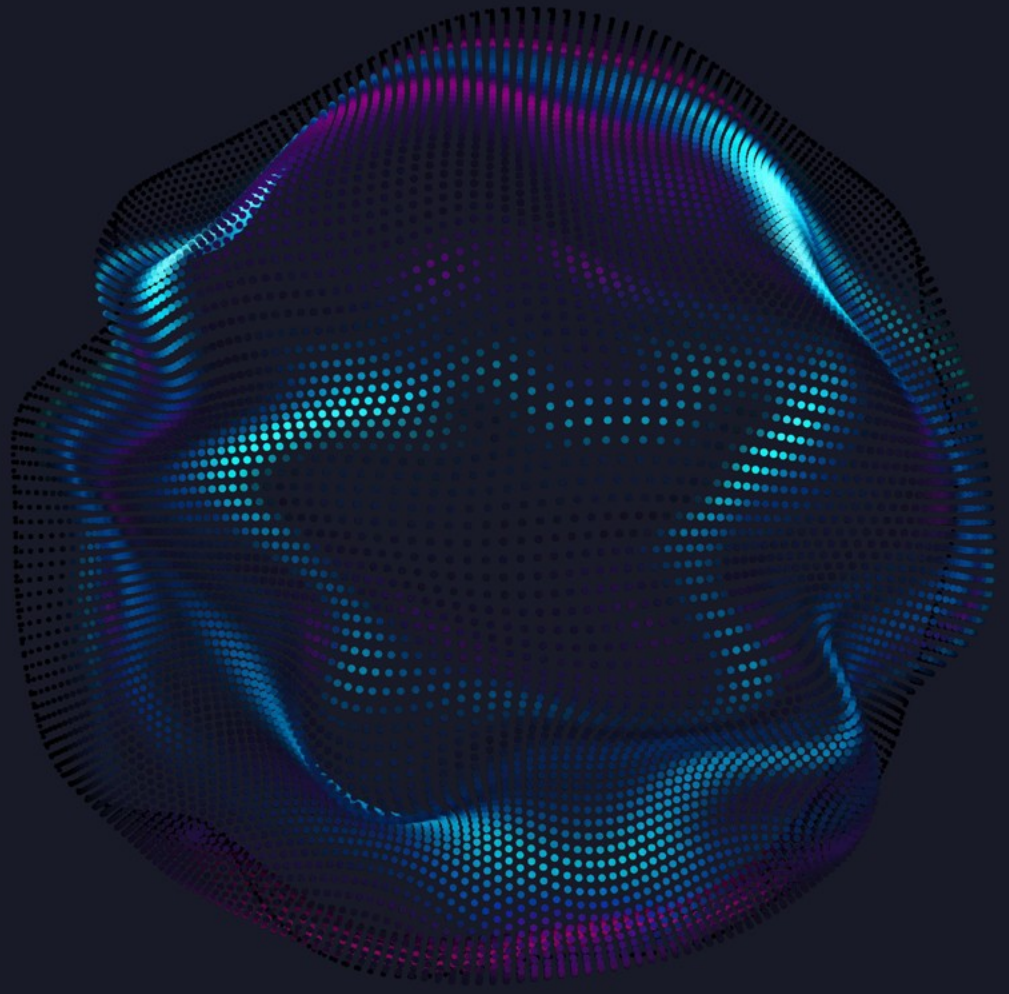
OMNI Platform

A scalable platform for face, body and situation recognition that processes images and videos, collects the event history and sends real-time notifications on detected events



Trusted by

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Architecture

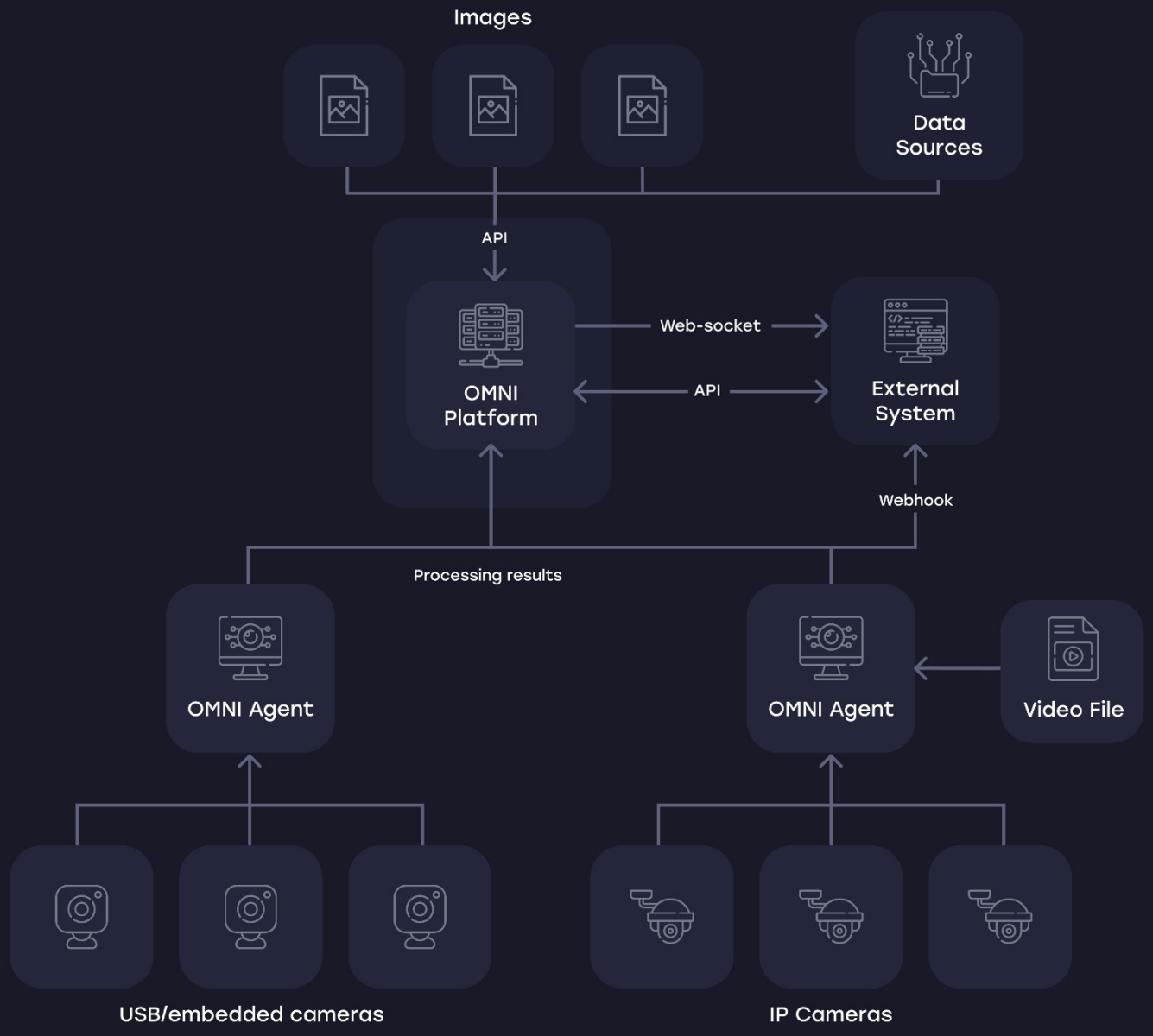
Features

- Microservice architecture
- Automatic scalability and load balancing
- Video stream processing both at the network edge and on the central server

Components

OMNI Platform is the central management and biometric processing server that contains people database, detection and identification events, as well as metadata about people's activities on the cameras.

OMNI Agent is a client for local processing of video streams and video files



Key Features

- Face detection in images, video streams, and video files. Extraction of biometric templates.
- Segmentation of people database into watchlists (employees, clients, wanted persons, etc.).
- Identification (1:N matching) and verification (1:1 matching) of faces against the database and watchlists, providing a match score.

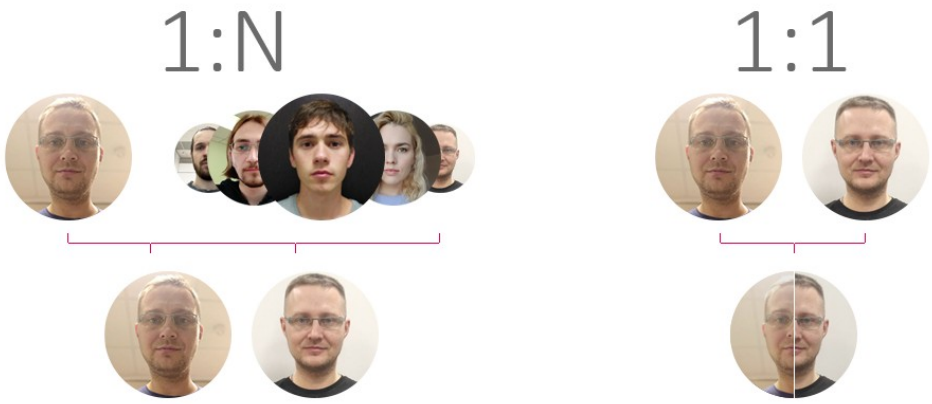
- Estimation of facial attributes (gender, age, emotions, medical masks) and facial properties (gaze direction, head rotation angles).
- Face presentation attack detection (PAD) with the ability to detect printed photos, masks, or mobile device screens.
- Image quality assessment (QAA) to minimize false identifications based on low-quality images.

- Human body detection with assigned unique IDs. People tracking within a premises layout.
- Human action recognition (fights, falls). Detection of people crossing the virtual lines or entering the regions of interest within a camera’s field of view.

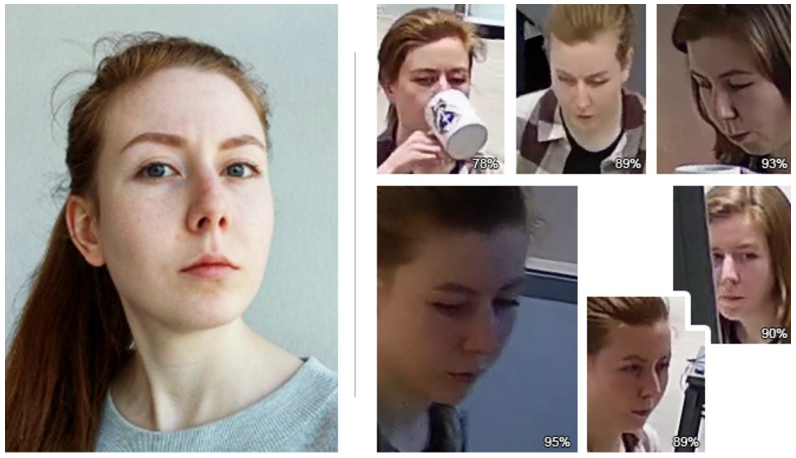
- Accumulation of metadata on faces and activities of people in video streams. Search based on accumulated data.
- Registration of identification and non-identification events, fights, falls and virtual line crossing in video streams, followed by sending via websocket and webhook.

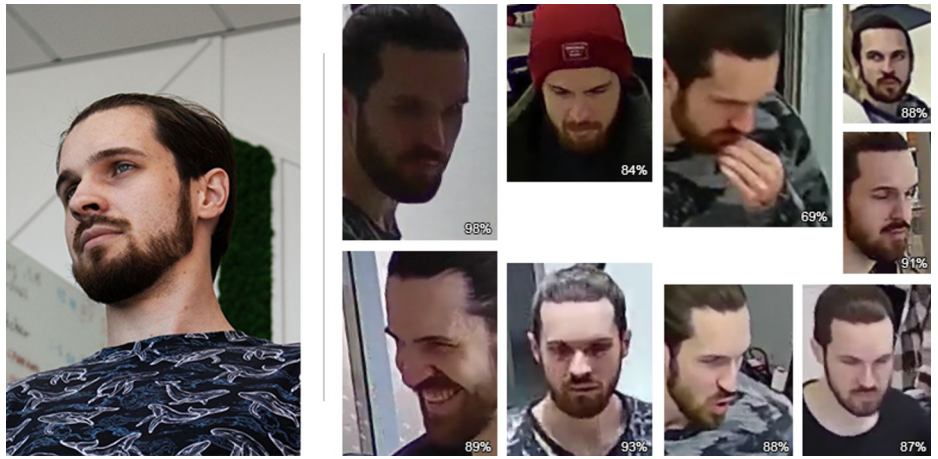
Key Features

Identification (1:N matching) and verification (1:1 matching) of faces.



Examples of identification “on the edge”: exceeding the permissible tilt angles of 20° and with a minimum distance between the pupils of 20 pixels.





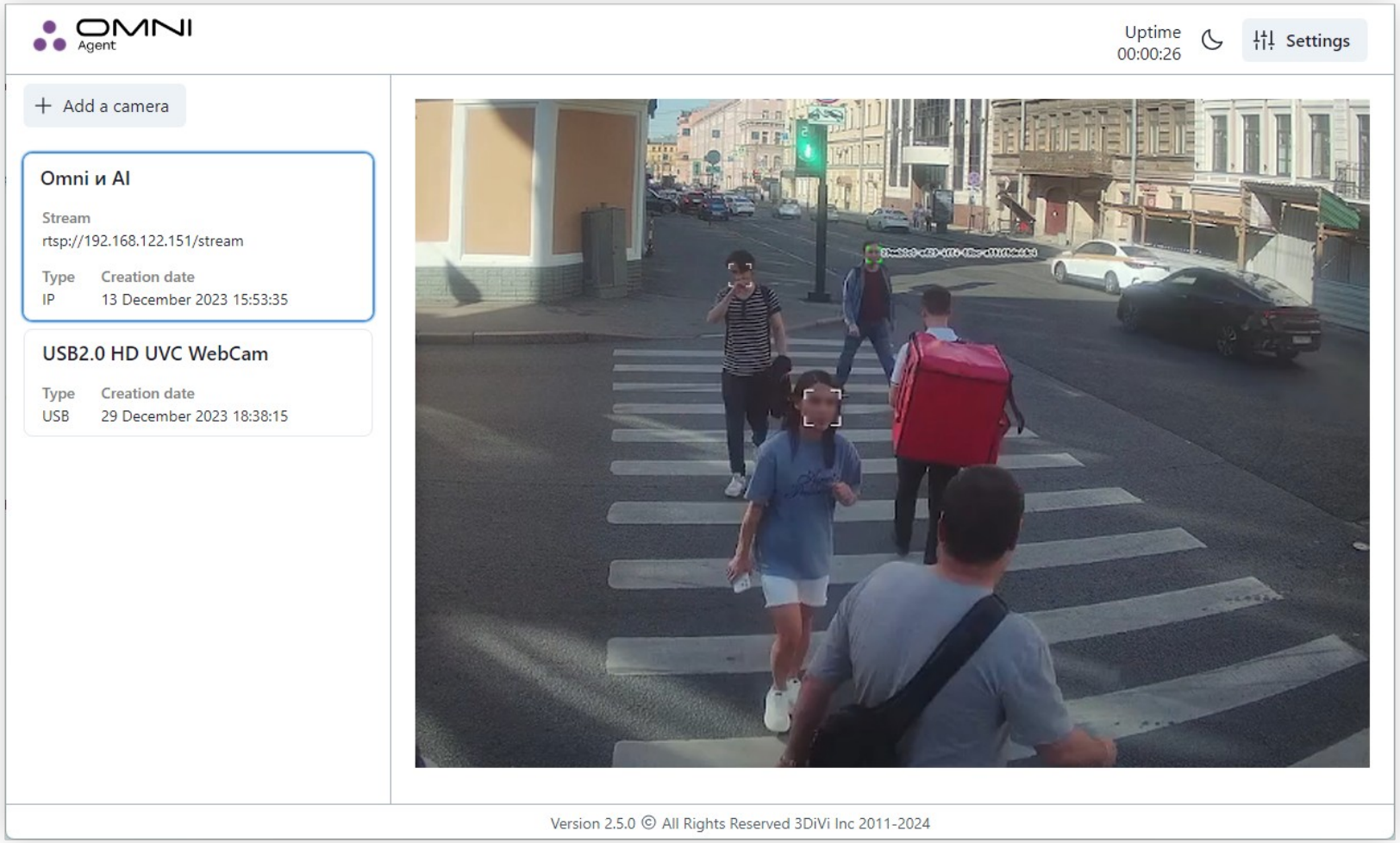
3DiVi

Key Features

Face detection:

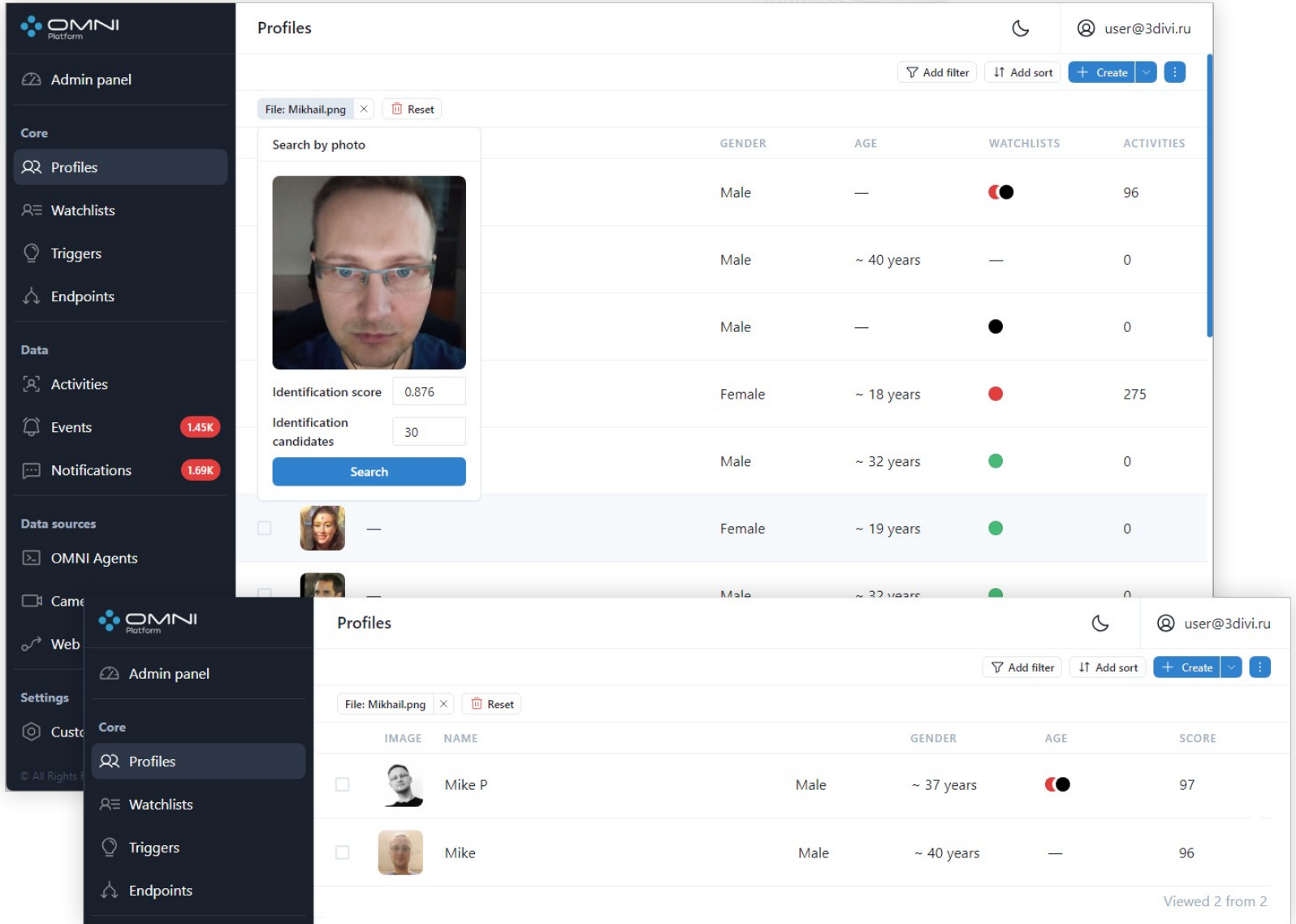
- in images
- video streams
- video files

Extraction
of biometric templates



Key Features

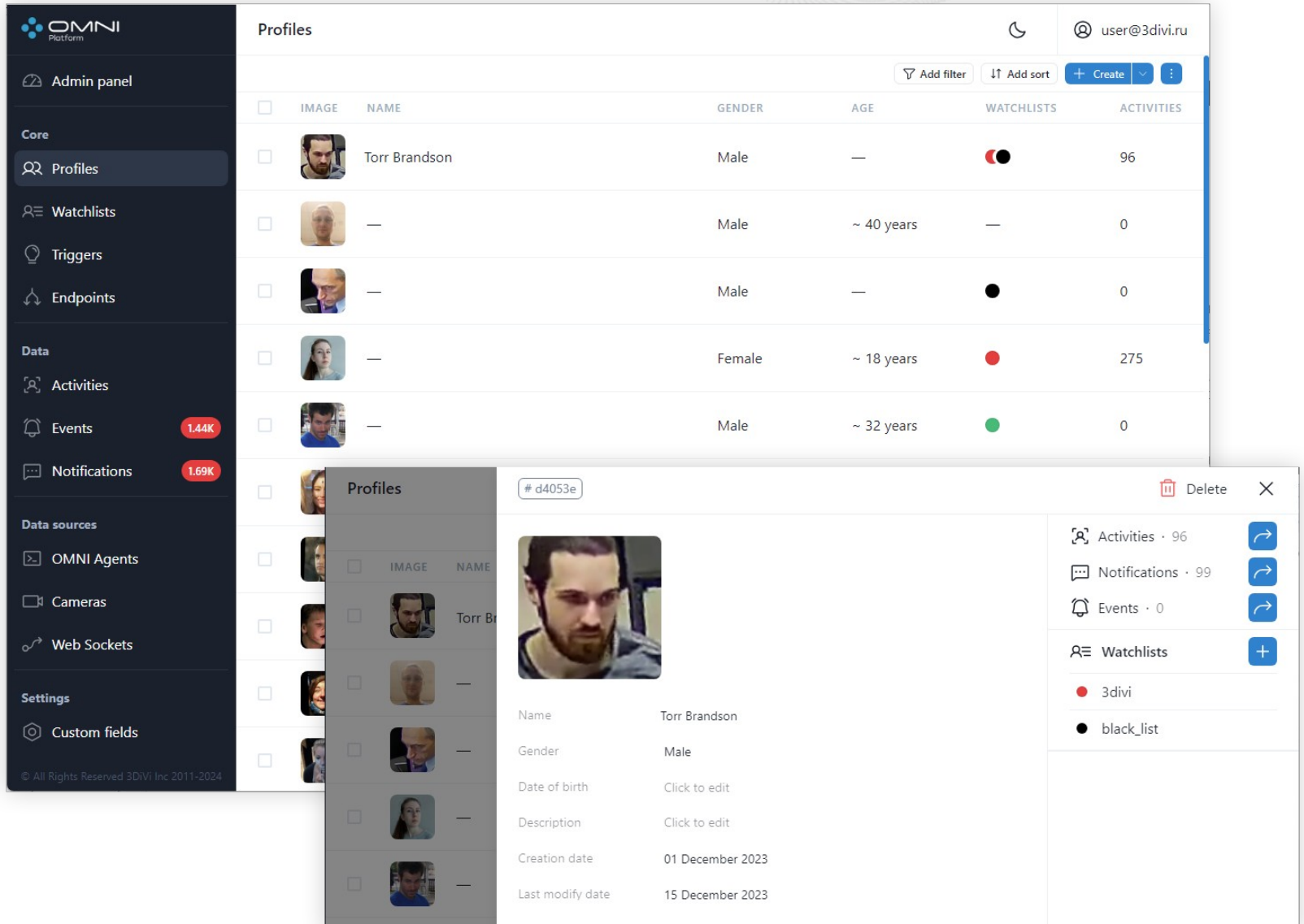
Identification of faces against the database and watchlists, providing a match score.



Key Features

Segmentation of people database into watchlists:

- Employees
- Clients
- Wanted persons
- Etc.



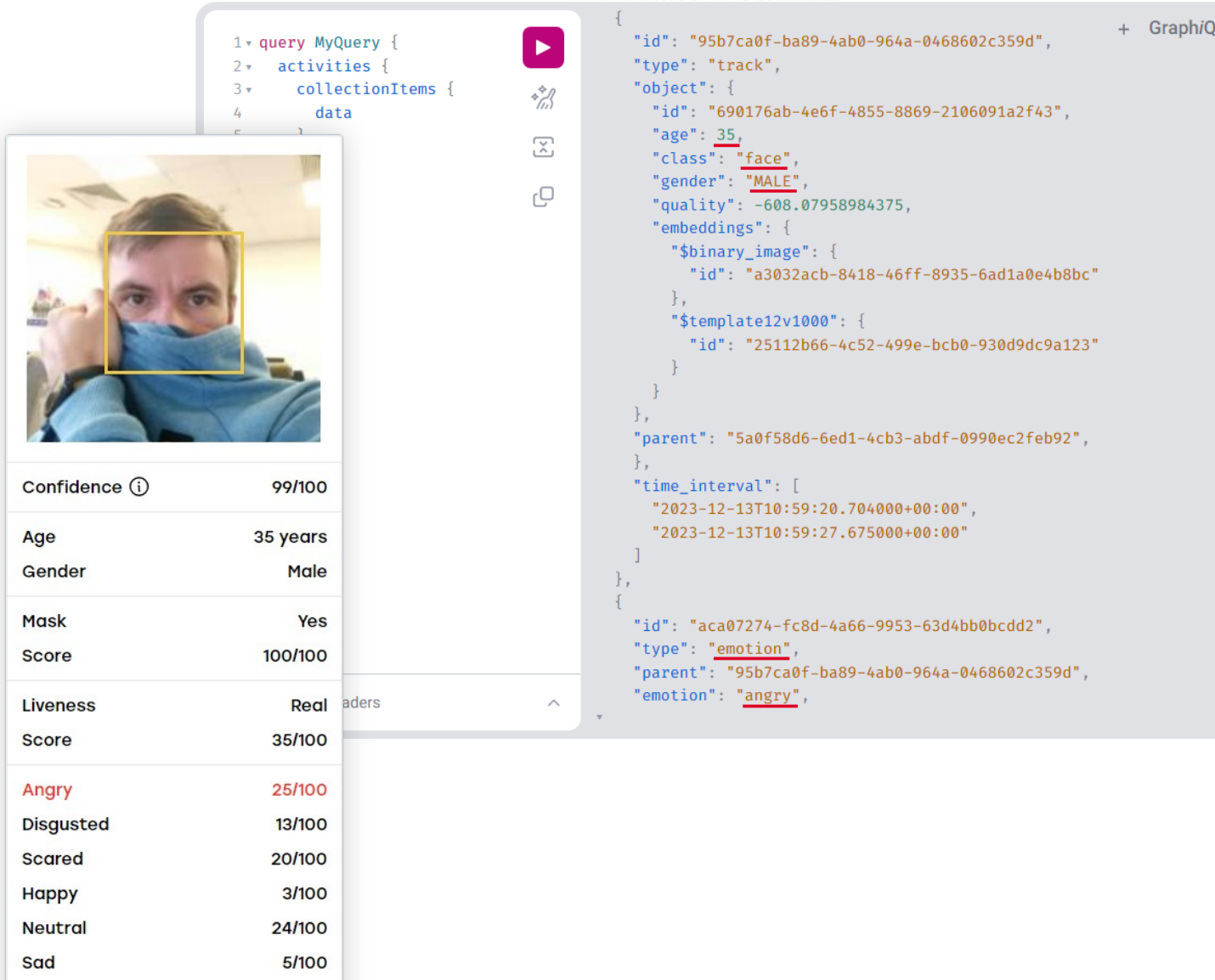
Key Features

Estimation of facial attributes:

- Gender
- Age
- Emotions

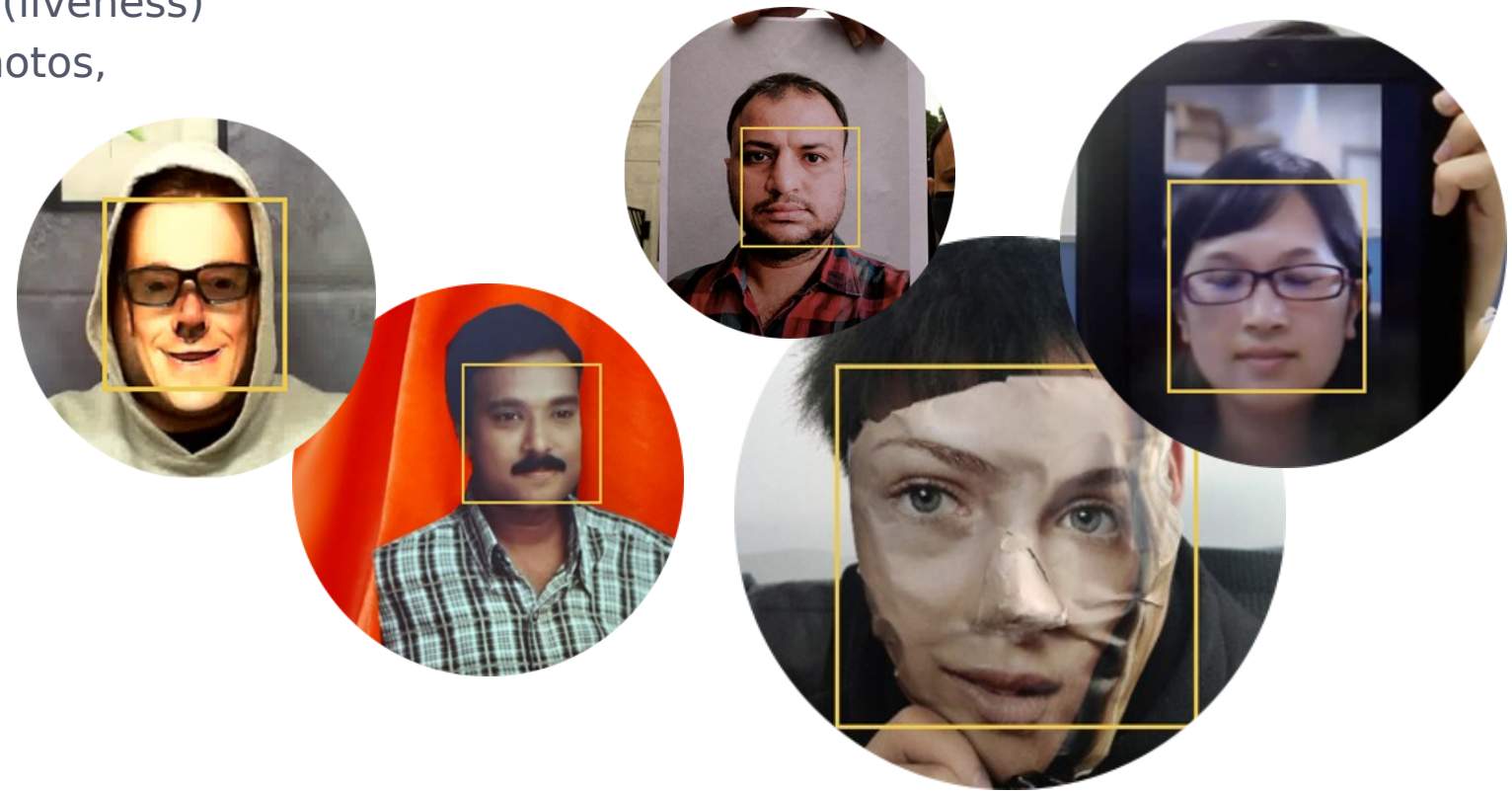
Estimation of facial properties:

- gaze direction
- head rotation angles



Key Features

Face presentation attack detection (liveness) with the ability to detect printed photos, masks, or mobile device screens.

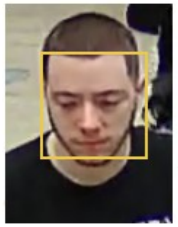


3DiVi

Key Features

Built-in quality assessment (QAA) of photos will provide recommendations for improving photo quality when creating people database and guarantee reliable identification on a large database.

The assessment is based on 19 characteristics (brightness, glare, rotation angles, closed eyes, darkness, uneven lighting, blurriness, etc.)



Total score 8/100

Clarity?	No
Noise?	No
Even illumination?	Yes
Flash?	No
Left eye open?	No
Right eye open?	No
Acceptable rotation?	Yes
Max rotation deviation	0°
Without a mask?	Yes
Neutral emotion?	Yes

Total score 35/100

Clarity?	Yes
Noise?	No
Even illumination?	Yes
Flash?	Yes
Left eye open?	Yes
Right eye open?	Yes
Acceptable rotation?	No
Max rotation deviation	24°
Without a mask?	Yes
Neutral emotion?	Yes

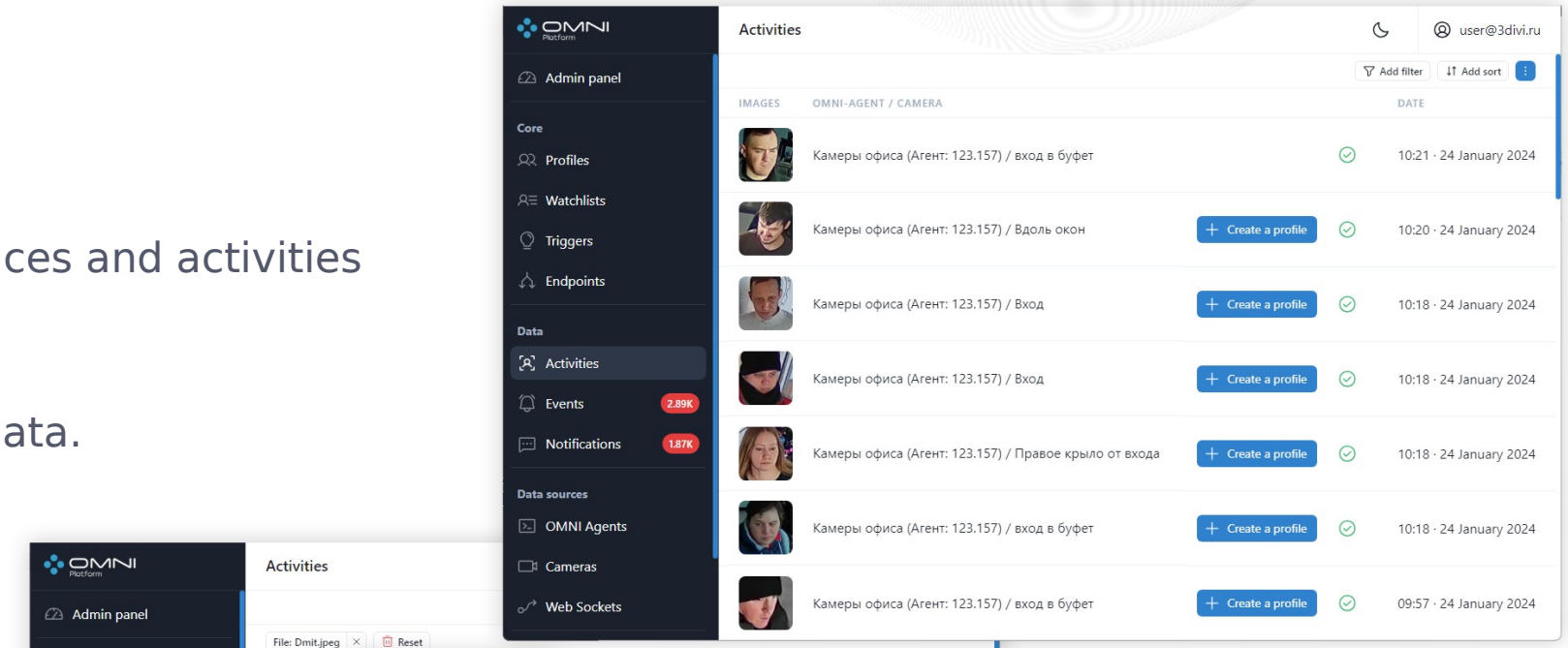
Total score 90/100

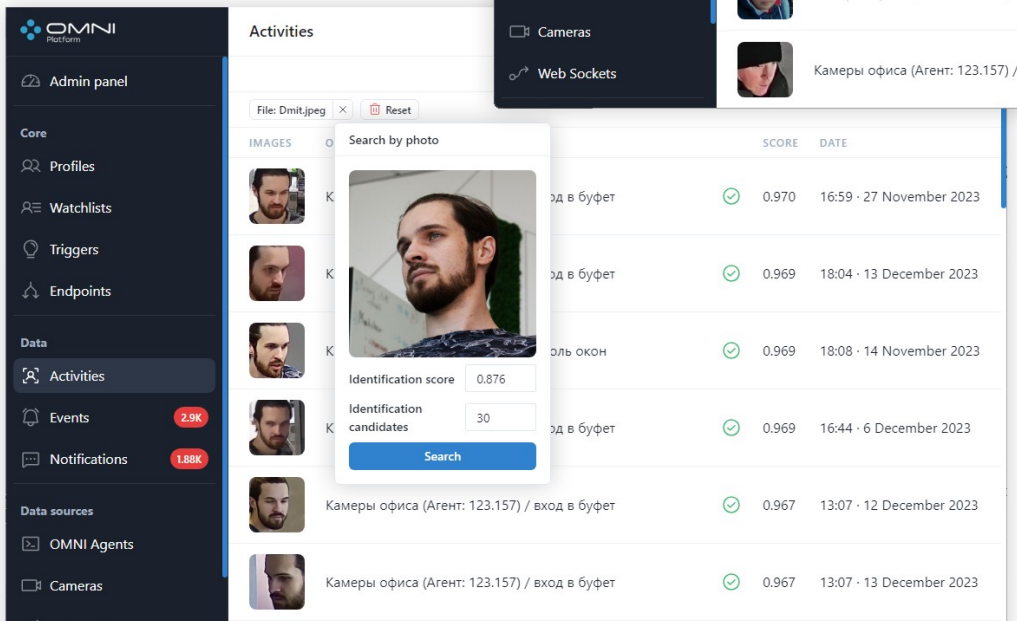
Clarity?	Yes
Noise?	No
Even illumination?	Yes
Flash?	No
Left eye open?	Yes
Right eye open?	Yes
Acceptable rotation?	Yes
Max rotation deviation	-6°
Without a mask?	Yes
Neutral emotion?	Yes

Key Features

Accumulation of metadata on faces and activities of people in video streams.

Search based on accumulated data.

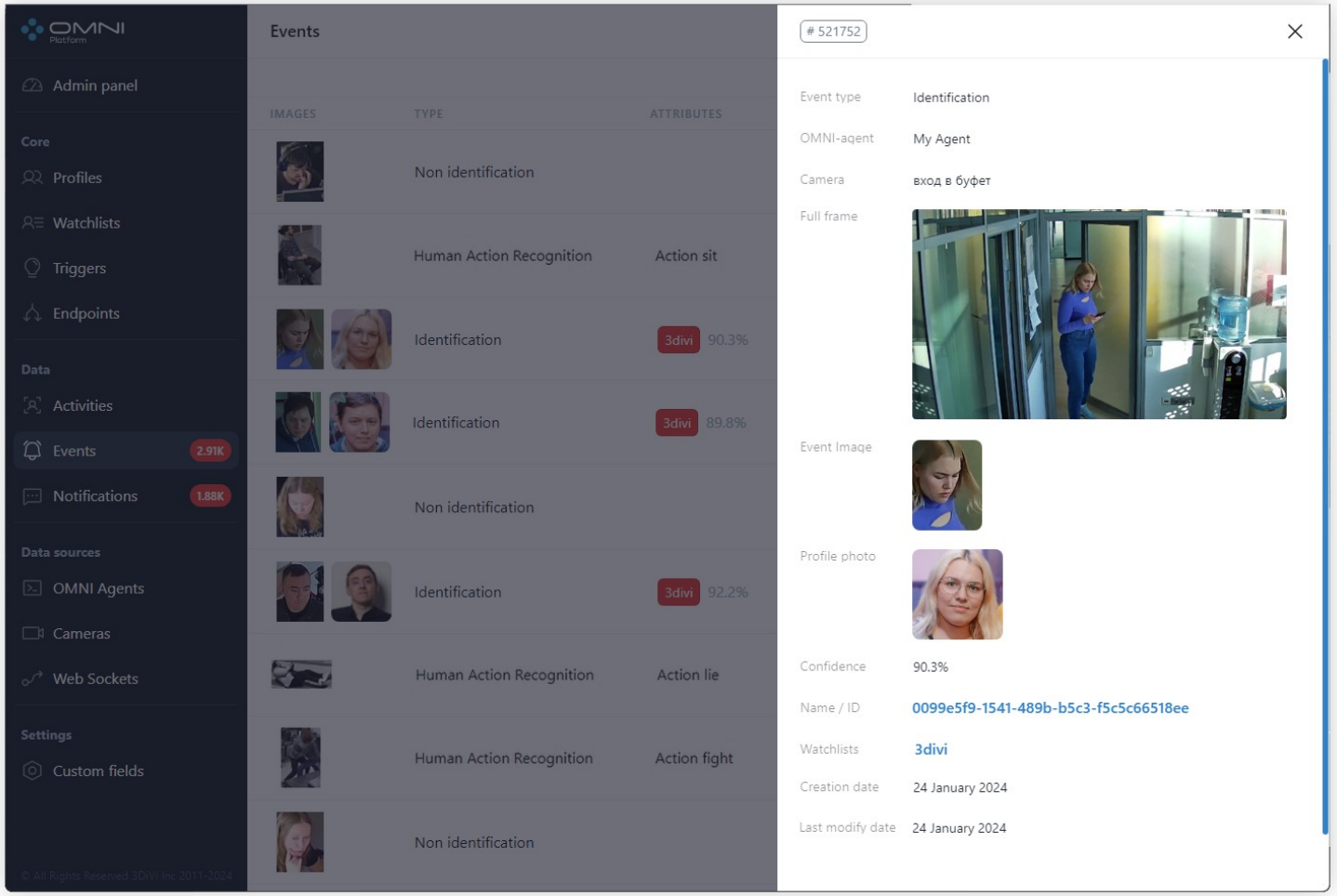




3DiVi

Key Features

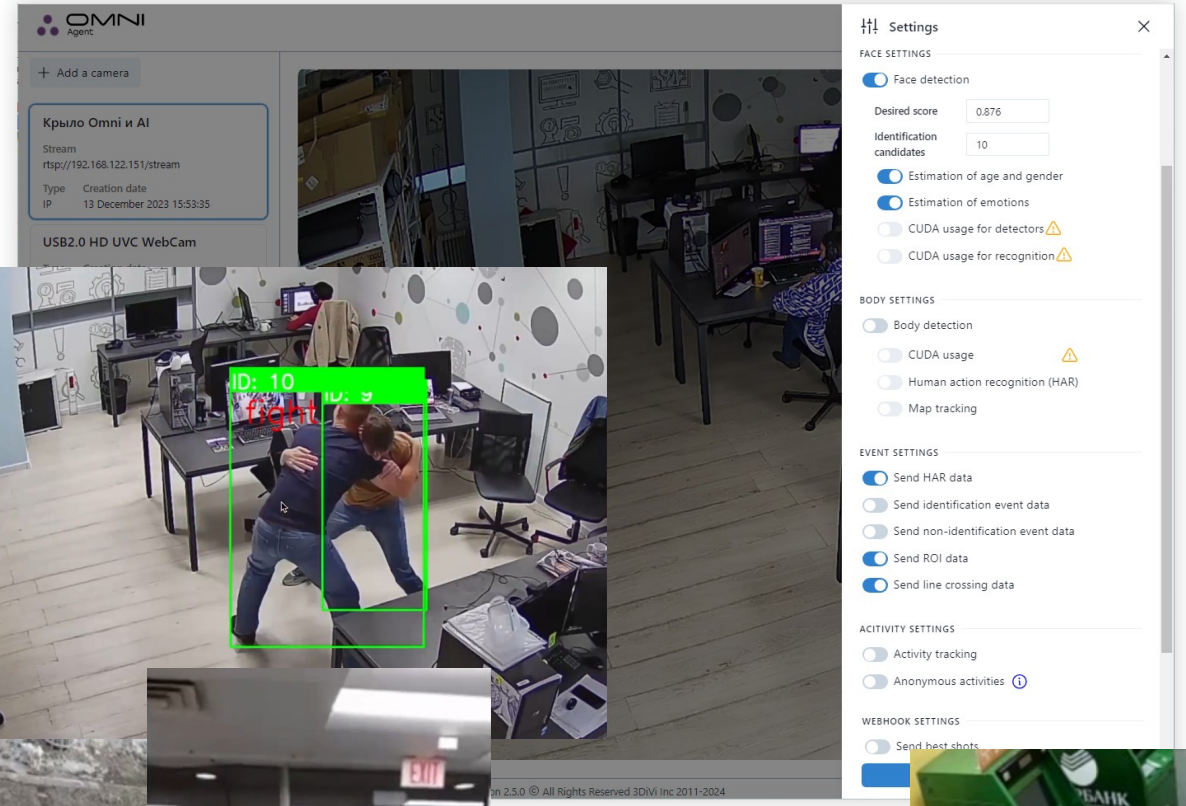
Registration of identification and non-identification events, fights, falls and virtual line crossing in video streams, followed by sending via websocket and webhook.



Key Features

Human action recognition (fights, falls).

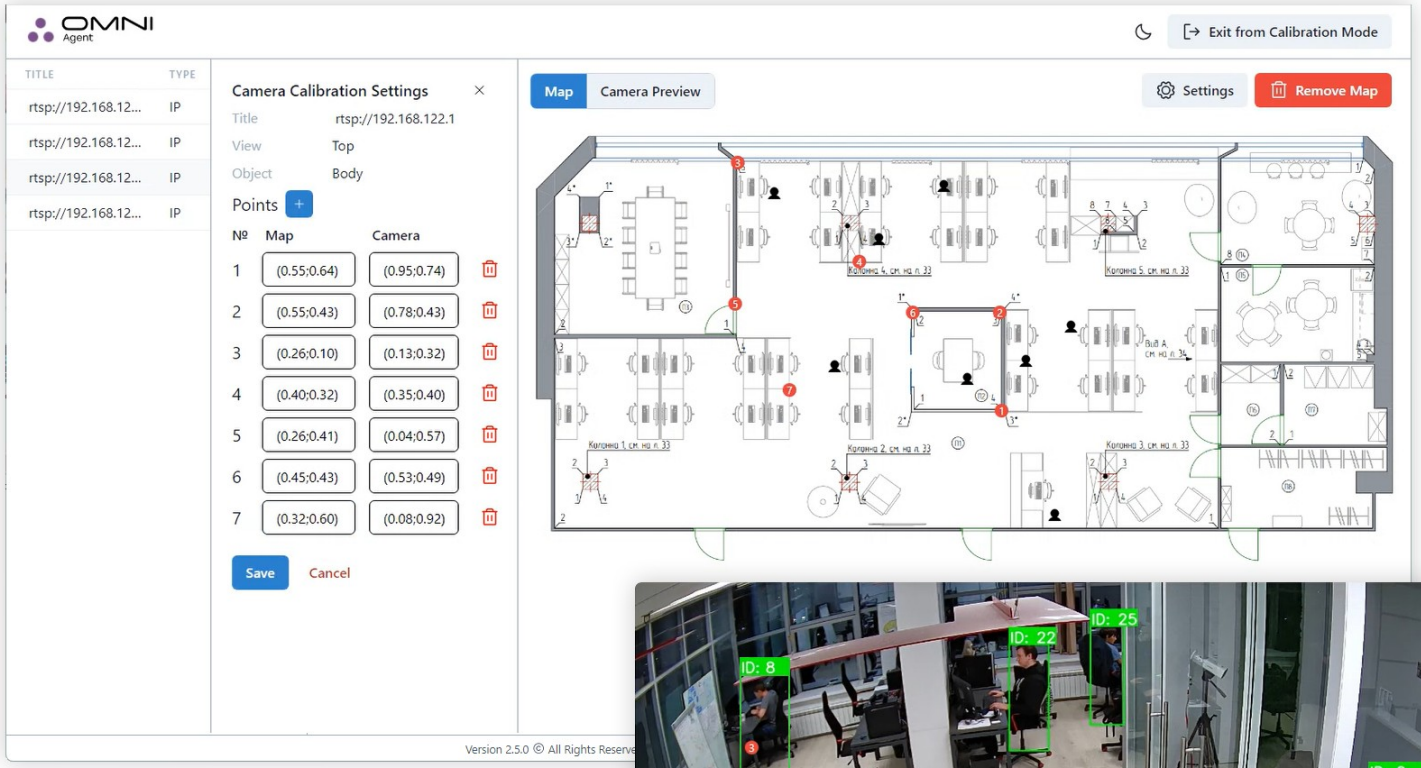
Detection of people crossing the virtual lines or entering the regions of interest within a camera’s field of view.

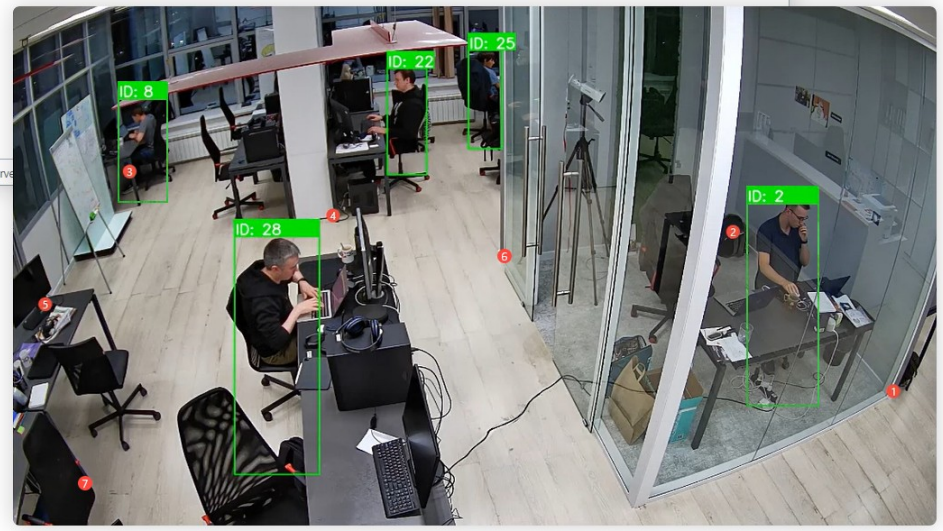


Key Features

Human body detection with assigned unique IDs.

People tracking within a premises layout.





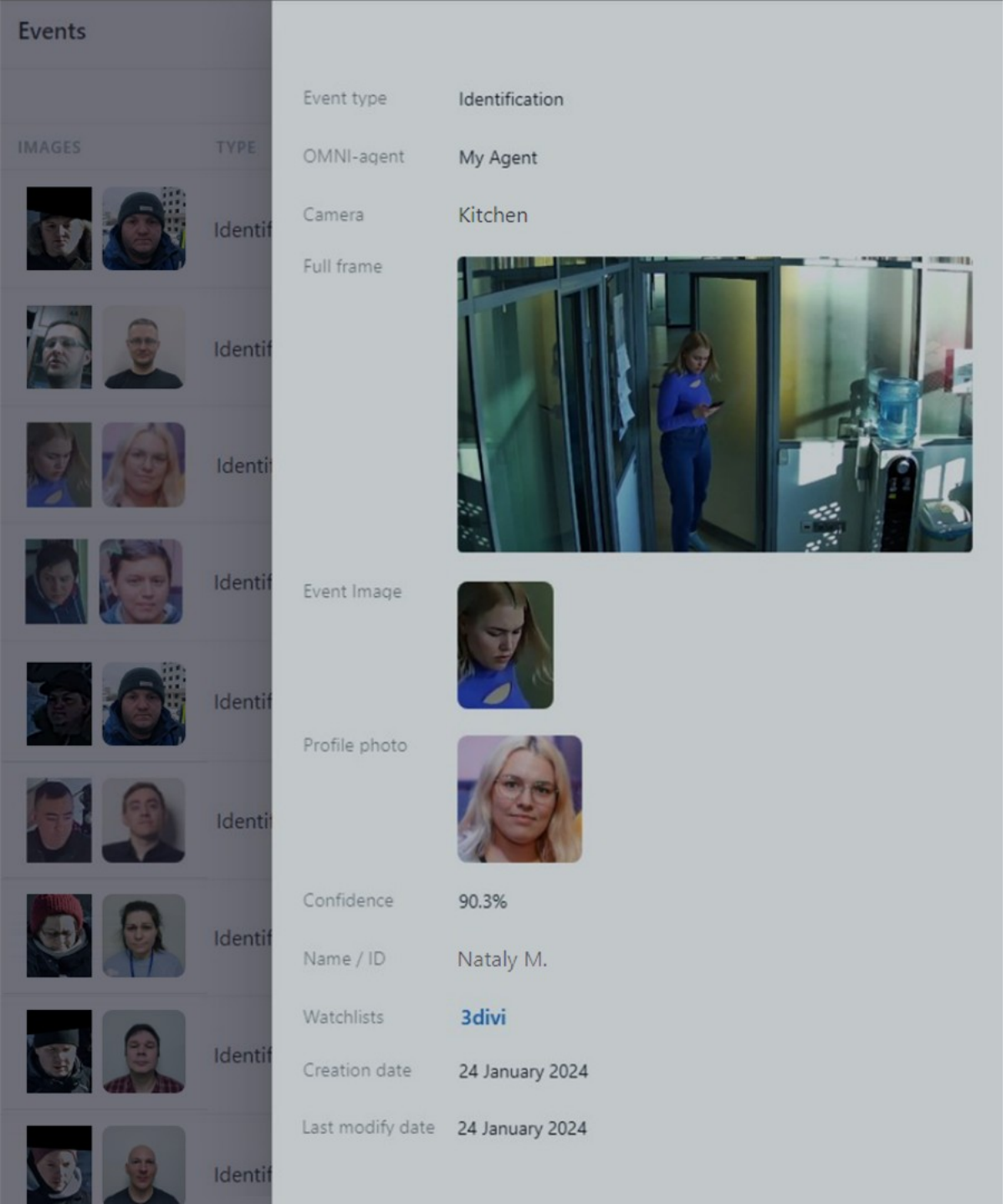
3DiVi

Main Functionality

- Creation and storage of people database (of more than 100,000,000 profiles) with face images, full names, activity history and additional user-defined text fields.
- Seamless import of biometric profiles from law enforcement systems without additional conversion.
- Support for different camera types (IP / USB / Embedded) and simultaneous multi-threaded processing of camera groups.
- Integration GraphQL API and administrator’s dashboard.
- Support for scaling processing threads with load balancing.
- Deployment in a local environment with the option to use an external database.
- Deployment in Amazon EKS and Google KE with automatic scaling of hardware resources.

Delivery Options

- Delivery in Docker containers and deployment using Kubernetes
- Available installation in an isolated environment without Internet access
- Technological components of OMNI Platform can be delivered in SDK format



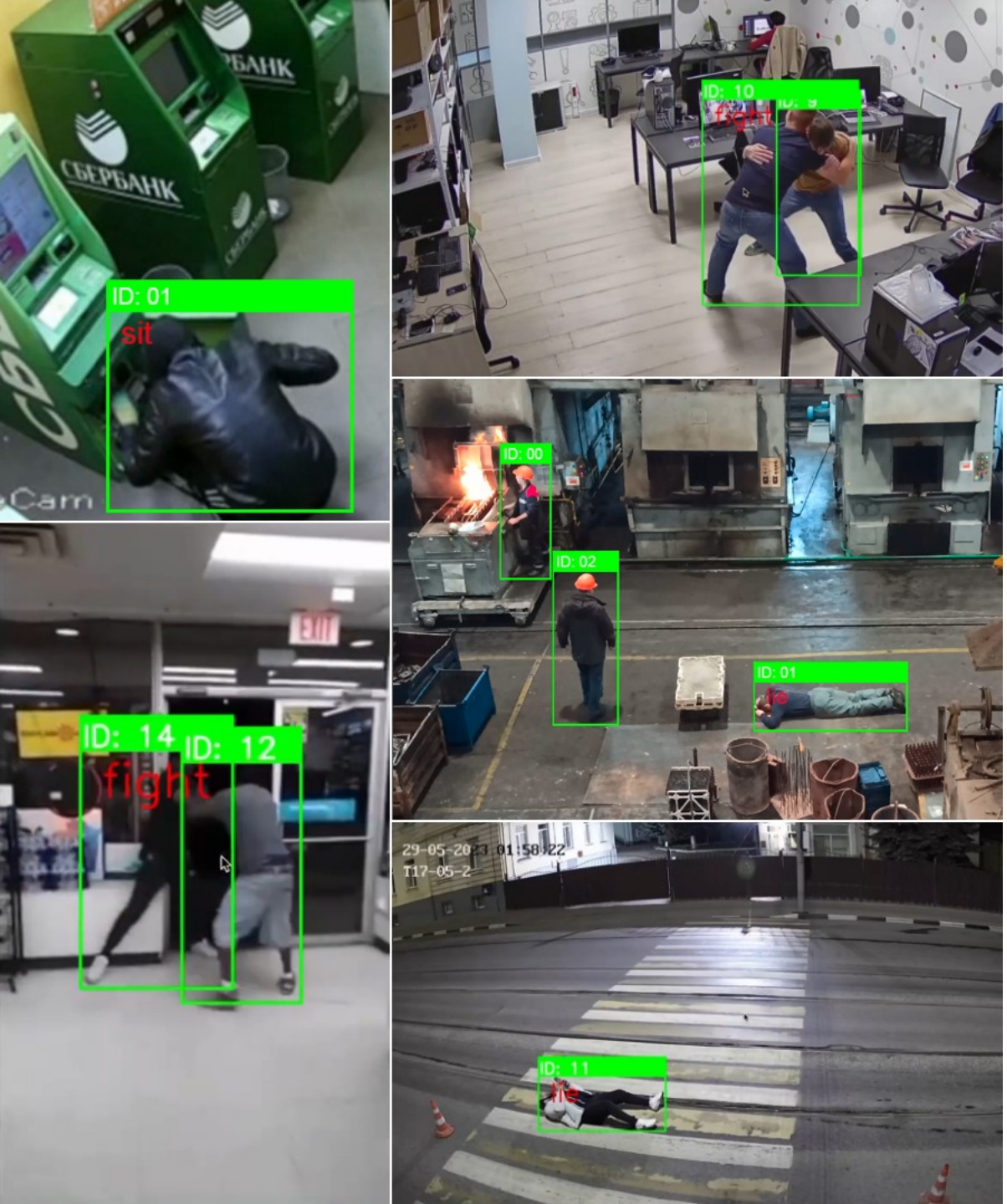
Face Identification

- Detection of unwanted / wanted persons
- Missing person search
- Notifications for expected arrivals
- Verification of announced visitors
- Request / visit logging
- Visit frequency tracking
- Time tracking
- Determination of the last known location
- Event history search
- Door access control

Unauthorized Person Monitoring

Notifications upon detecting persons not in the database (without access):

- While operating dangerous or high-precision equipment
- Working at height
- Detecting schedule breaches
- Searching for unauthorized persons in open-access areas



Human Action Recognition

Attention to situations where persons need help:

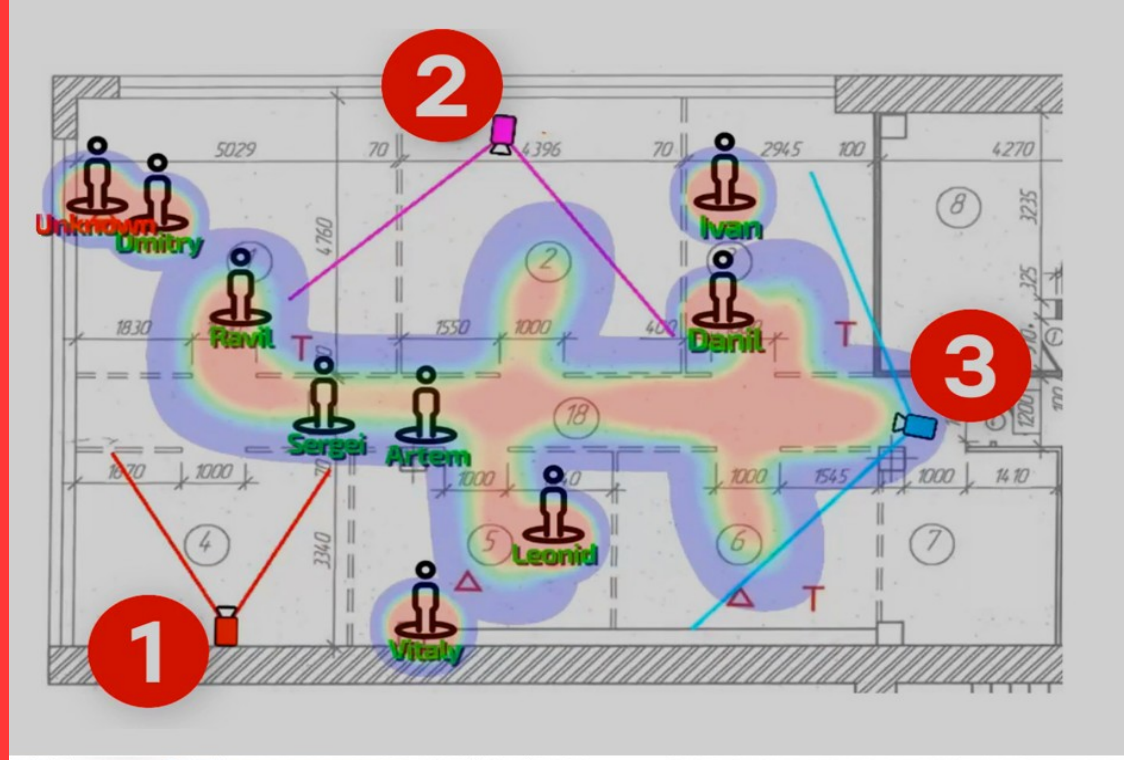
- Fights
- Fall / lying down (feeling unwell)
- Lying down (sleeping in a dangerous area, sleeping while on duty)

Atypical behavior monitoring:

- Sitting near an ATM / door (theft risk)
- Sitting / lying near equipment (risk of sabotage, deliberate damage of equipment)
- Sitting in the middle of the square (potential unauthorized meeting)

Perimeter and Area Monitoring

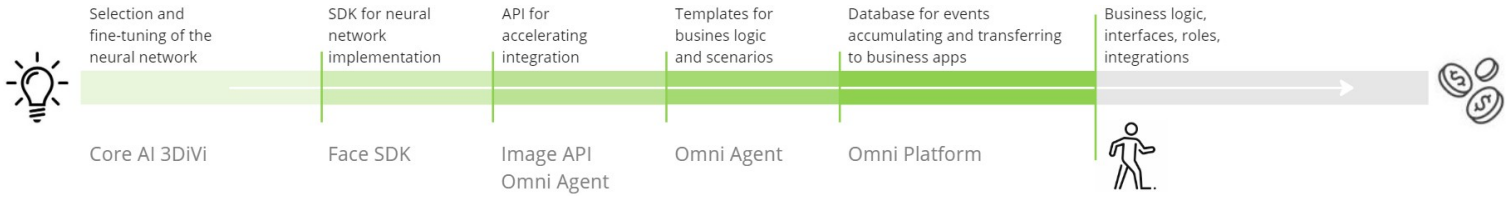
- Monitoring line crossings in barrier-free perimeter security
- Surveillance of approaching cliffs or fences for tossing/transferring items
- Notifications for entering hazardous zones
- Notifications for visitors in the waiting area to call staff
- Visitor statistics based on line crossings or entering regions of interest



Map Tracking

- Monitoring route adherence (for example, during a patrol) and identifying deviations in paths
- Accumulating movement patterns within locations for decision-making on popular or unpopular routes
- Enhancing people count accuracy in small spaces (turnstile, garage, booth) using cameras from different angles

Integration costs less than in-house development



$0 + 2-3 weeks — Testing & Exploration

3DiVi provides access to the deployed OMNI Platform, a test server, consultations and testing materials.
Customer engages their employees to study the technology for 2-3 weeks.

$9 500 + 2-3 months — Pilot level integration

3DiVi provides a devpack with the necessary set of licenses for a year, assistance in deploying and configuring OMNI Platform for a specific business case, consultations, and technical support. The amount spent on the devpack can be refunded as a discount when purchasing licenses for your project.
Customer buys the devpack, hardware (their own or in the AWS/GKE cloud), cameras, and engages their developers to integrate the product for 2-3 months.

$20 000 + 3-5 months — Product level integration

3DiVi provides a devpack with the necessary set of licenses for a year, assistance in deploying and configuring OMNI Platform for a specific business case, consultations, technical support, and product customization for integration. The amount spent on the devpack can be refunded as a discount when purchasing licenses for your project.
Customer buys the devpack and customization of OMNI Platform, hardware (their own or in the AWS/GKE cloud), cameras, and engages their developers to integrate the product for 3-5 months.

** Estimated costs are based on the experience of similar projects completed by 3DiVi*

Develop a proprietary face identification solution based on SDK

- **Required team (6-9 people):** architect, developers, analyst, QA, technical writer, manager.

  3-5 months — development of image processing functionality.
  4-6 months — development of video stream processing functionality.
  3-4 months — process debugging, test development, bug fixing.
  2-3 months — optimization for various platforms and hardware.

- **Fast response from SDK providers is needed.**

$200 000 — “MVP” level
5-8 months

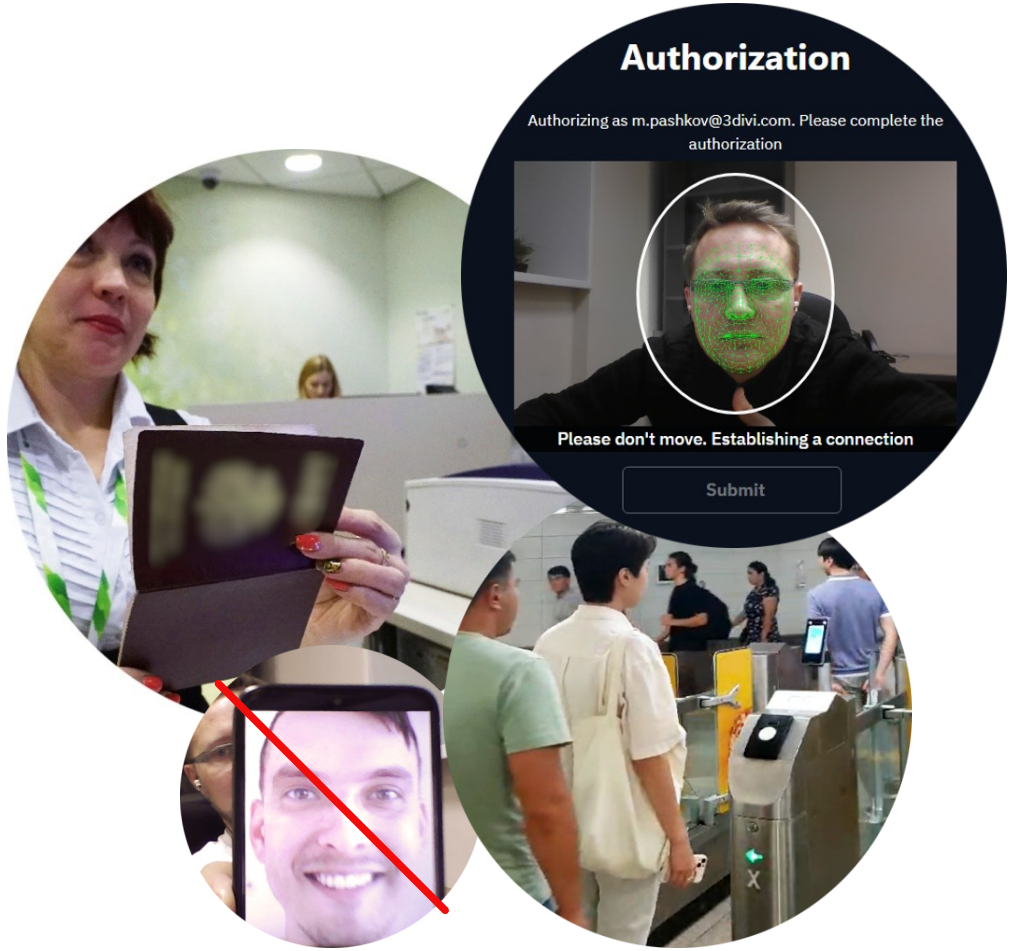
$500 000 — “Product” level
12-18 months

Use Cases / Access Control

Client Identification, Face Payment, KYC

You can integrate OMNI Platform into your own customer identification service based on facial recognition to perform the following tasks:

- Remote authorization
- Payment verification
- Transaction confirmation
- Document signing
- Verification by a photo when presenting a document



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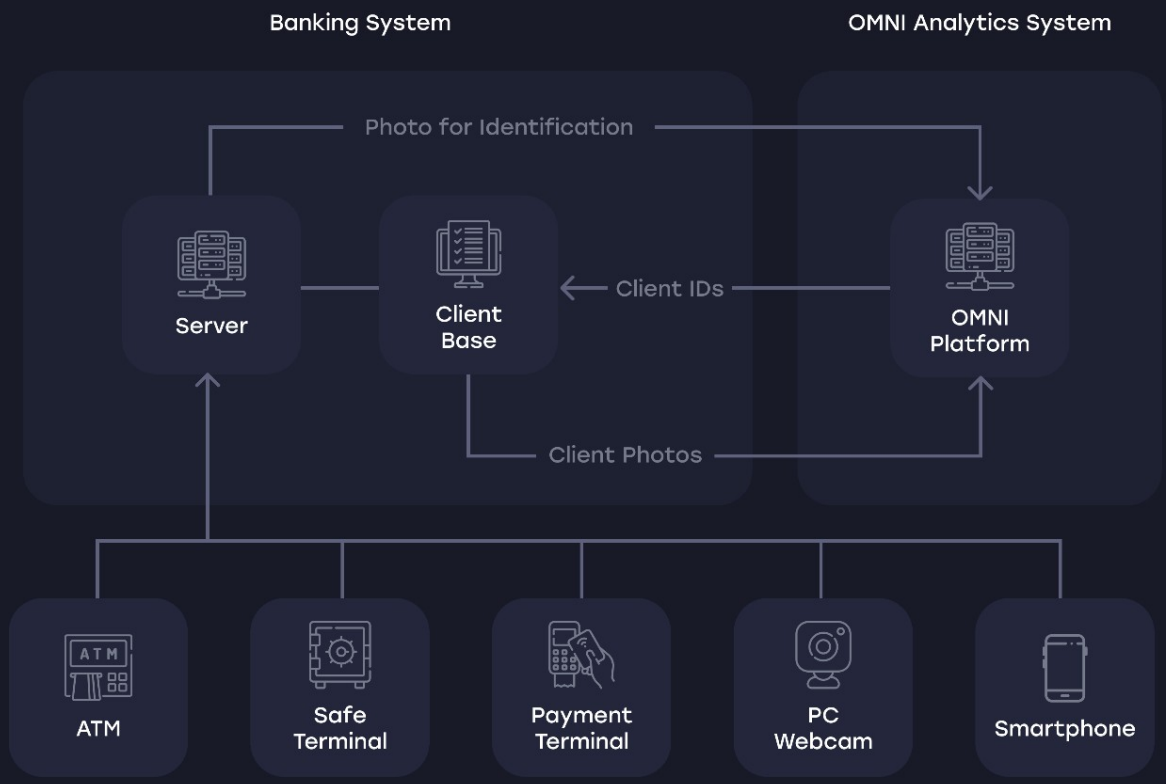
Use Cases / Access Control

Client Identification, Face Payment, KYC

Integration architecture

1. Expanding customer database in OMNI with Quality Assessment (QAA)
2. Obtaining photos from end devices or processing video streams
3. Sending photos to OMNI for Liveness verification
4. Identification in OMNI with determination of customer ID
5. Returning customer ID for transaction processing



Identification of Employees & Visitors

You can integrate OMNI Platform into your ACS (Access Control System) to develop new face identification services within your product:

- Employee identification for accessing turnstiles and doors within the enterprise.
- Remote guest pre-registration via link or messenger for their subsequent access to the office or events (conference, exhibition) by face.
- Client identification for opening door locks in hotels, fitness clubs, etc.

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Use Cases / Access Control

Identification of Employees & Visitors

Integration architecture

1. Expanding people database in OMNI with Quality Assessment (QAA)

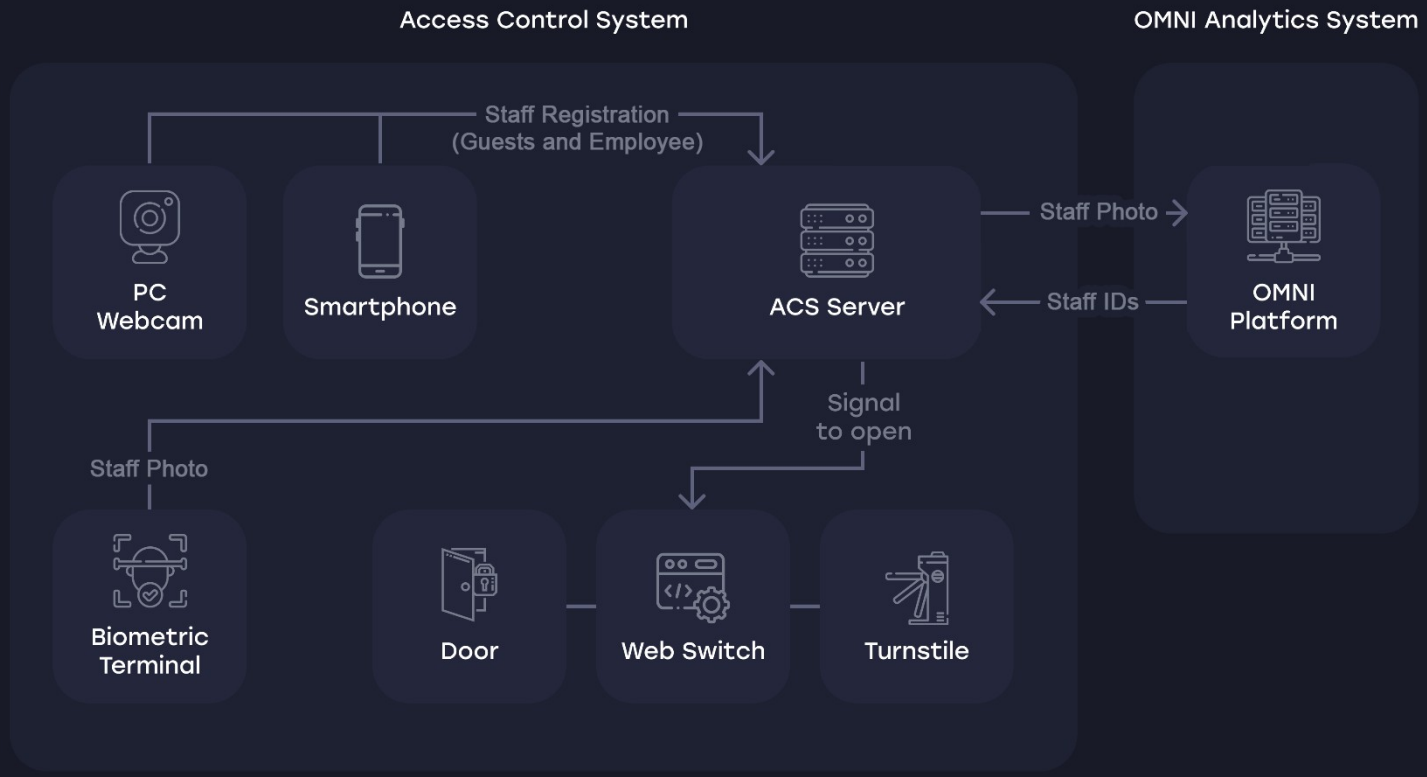
2. Receiving photos from identification terminals and guest registration photos

3. Sending photos to OMNI for Liveness control

4. Identification in OMNI with determination of customer ID

5. Returning customer ID to the ACS server for access determination

6. Sending a signal to the web relay/controller for lock/turnstile opening



Use Cases / Access Control

Time & Location Tracking

You can integrate OMNI Platform into your tracking system to identify people through surveillance cameras and determine their location within specific premises:

- Automated time tracking in working (workshops, offices) and non-working (streets, smoking areas, cafes) areas.
- Tracked location of passengers (check-in areas, security screening areas, departure lounges, etc.) or employees and guests on the enterprise premises (workshops, offices, cafes).

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Use Cases / Access Control

Time & Location Tracking

Integration architecture

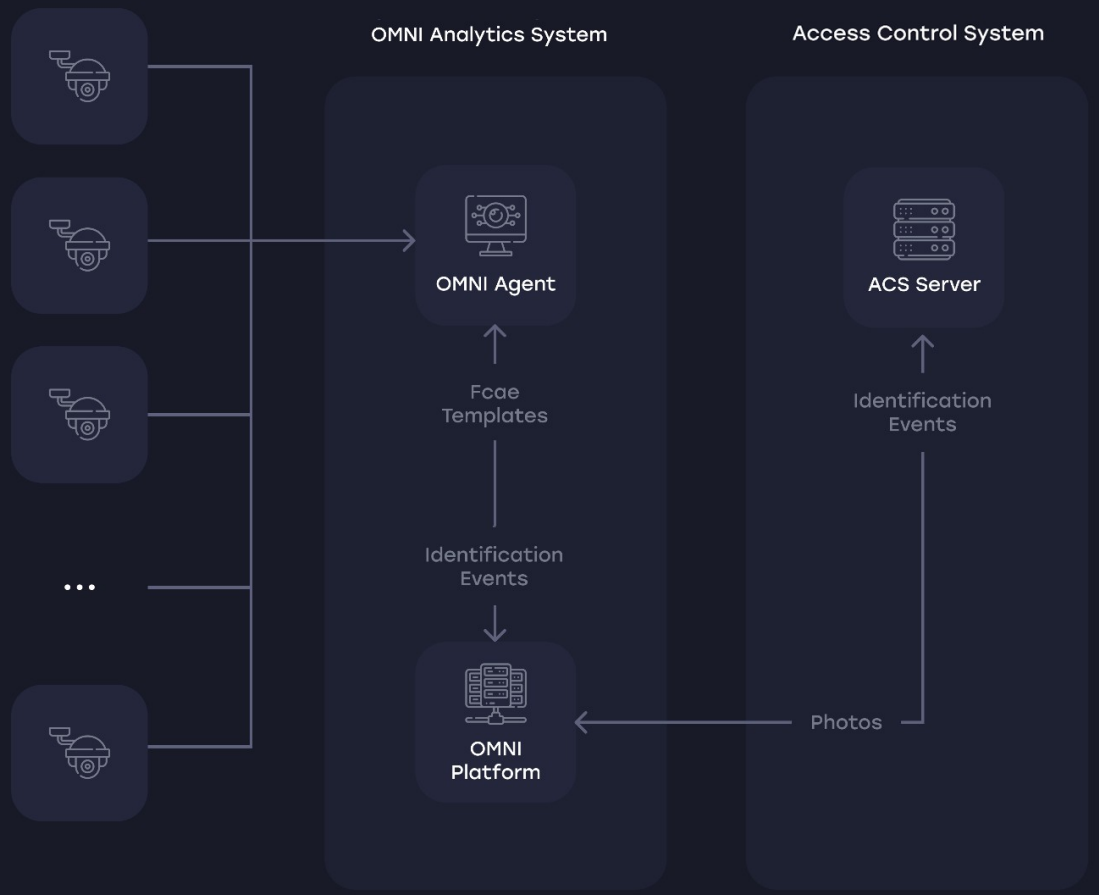
1. Expanding your database of employees and guests in OMNI.

2. Seamlessly streaming video (RTSP) into OMNI.

3. Person identification in OMNI with assigned employee/guest ID.

4. Returning employee/guest IDs to the access control system server, along with camera IDs, to determine location within specific premises (via camera).

5. Updating working hours reports and location reports bound to work/non-work premises using camera data.

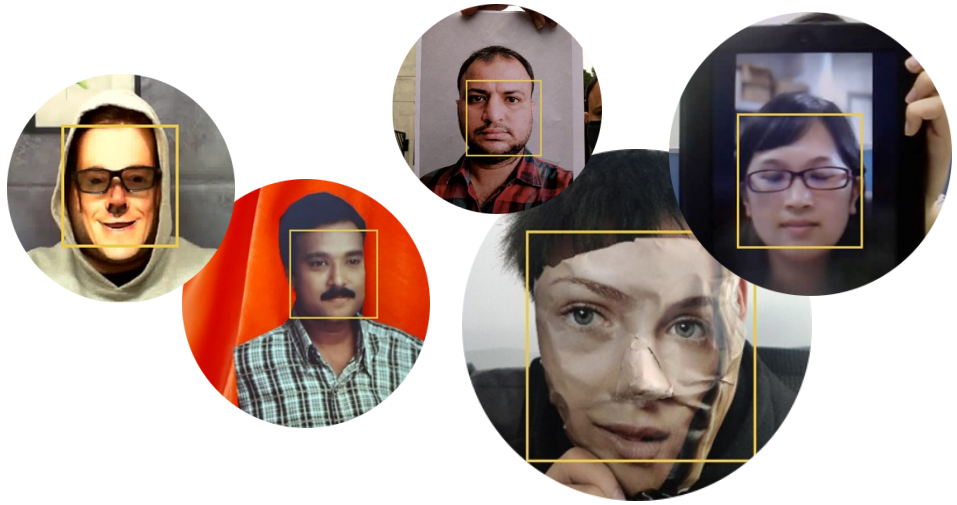


Use Cases / Access Control

Enhanced Security & Reliability Guarantee

Ensure and strengthen your security with the additional OMNI Platform features:

- Face substitution detection (liveness)
- Face search in blacklists
- Check of re-registration attempts with a different name



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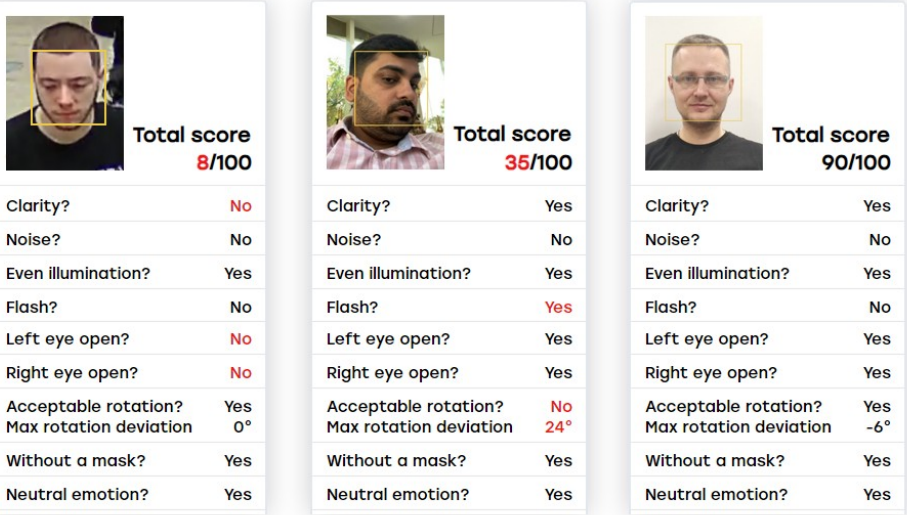


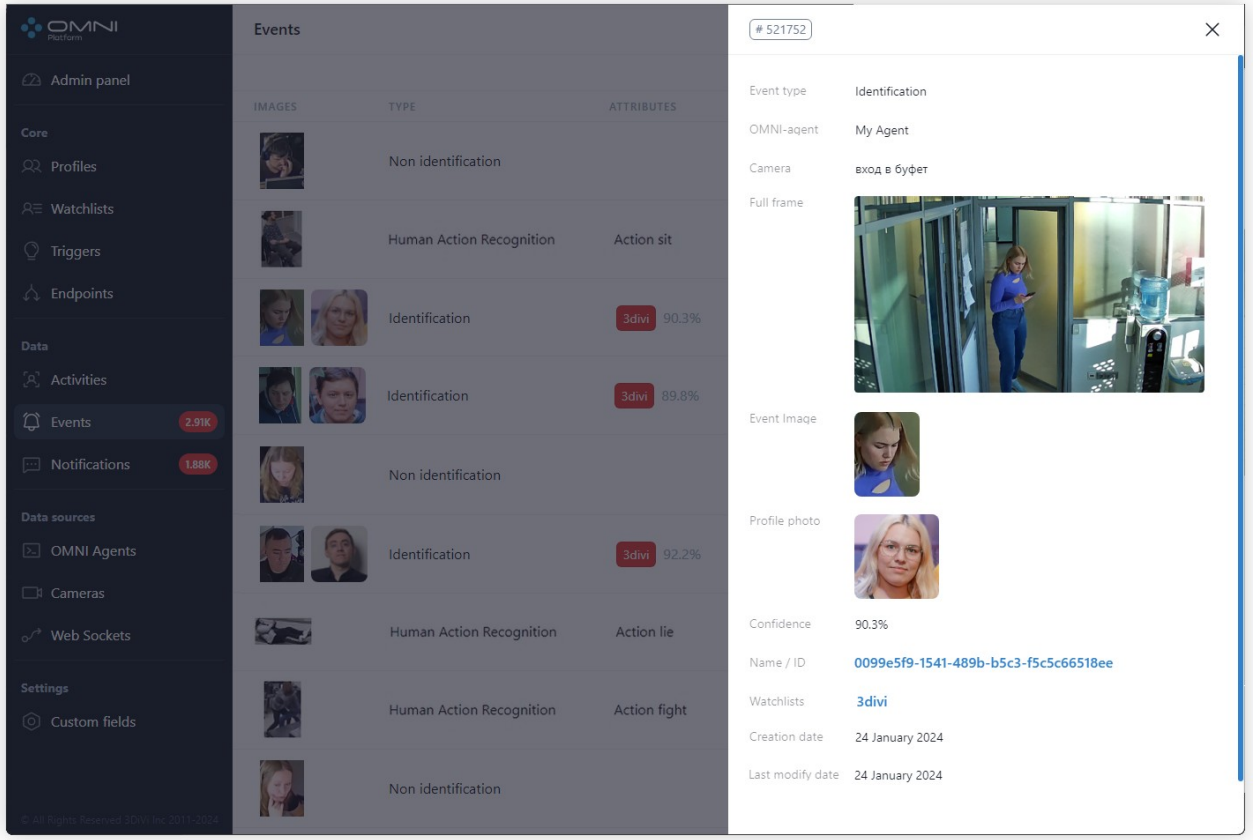
3DiVi

Use Cases / Video Analytics and Notifications

Safe City

You can integrate OMNI Platform into your video surveillance system and generate automated notifications for scenarios:

- Face identification with notifications sent in case an identified person belongs to a group: wanted, quarantine, missing, etc.
- Image search in history to determine the cameras which detected a person.
- Crossing virtual lines, entering frame’s regions of interest (approaching the edge of a bridge, well, cliff, collapse zone, railway tracks, etc.)



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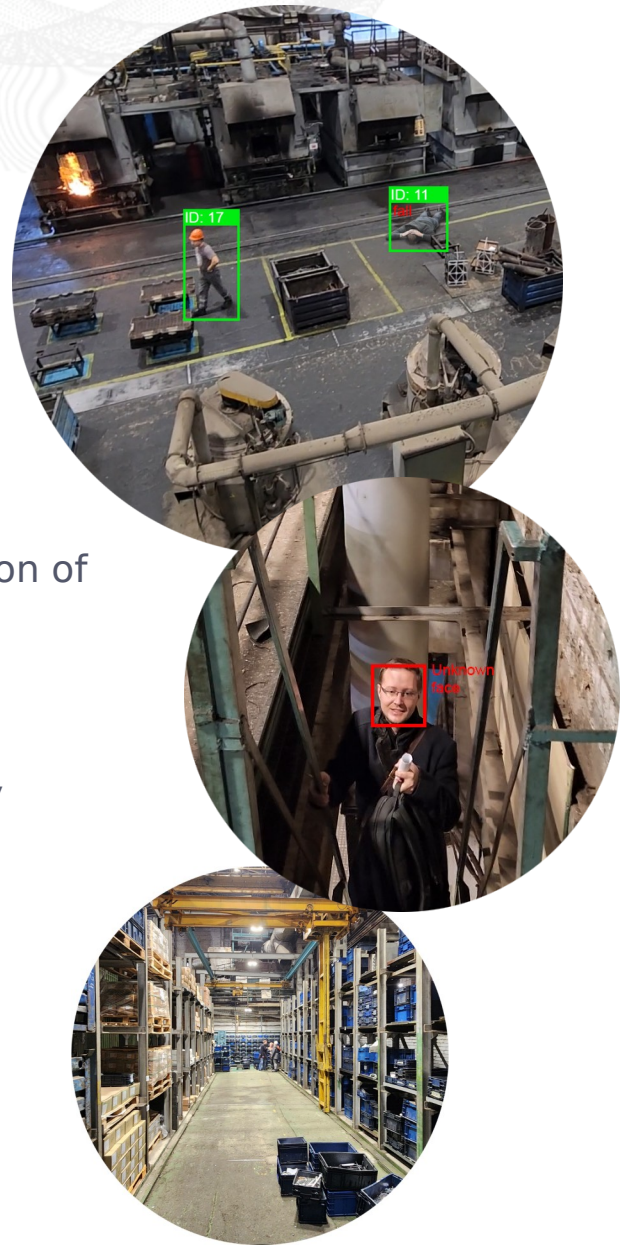
Use Cases / Video Analytics and Notifications

Safe Enterprise

You can integrate OMNI Platform into your video surveillance system and generate automated notifications for scenarios:

- Face identification with notifications sent in case an identified person belongs to a group: customers, employees, contractors, unwanted persons, etc.
- Detection of persons missing in the database (unauthorized persons on premises, detection of persons who don’t have access to high-precision/dangerous equipment).
- Concealed face passage detection (attempt to hide identity or evade regulations).
- Crossing virtual lines, entering frame’s regions of interest for seamless perimeter security (access to premises, approaching fences or the edge of a dangerous zone).



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3DiVi

Use Cases / Video Analytics and Notifications

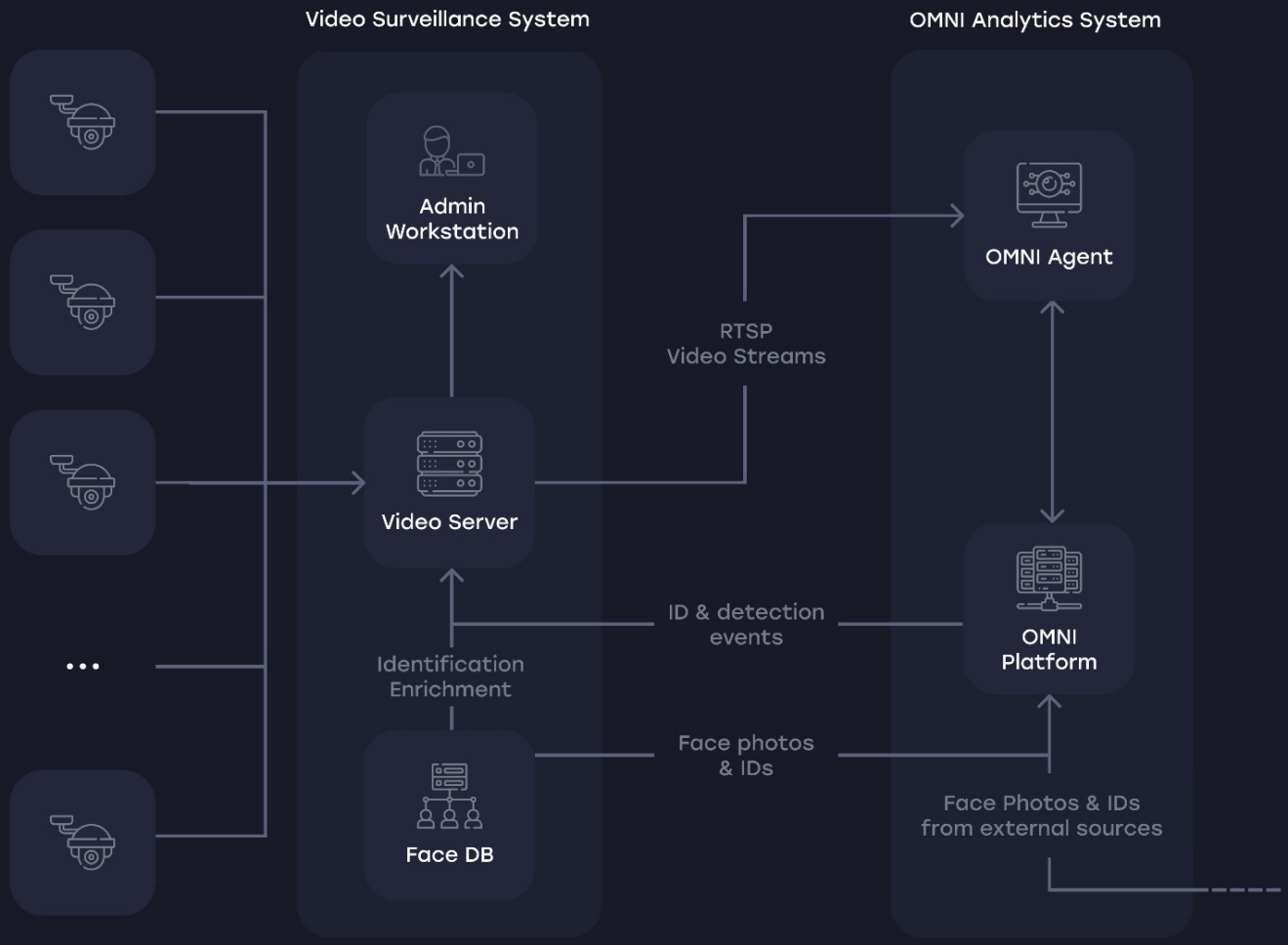
Safe City & Enterprise

Pilot integration architecture

1. Seamlessly streaming video (RTSP) into OMNI.
2. Expanding people database through OMNI interface.
3. Event retrieval from OMNI linked to video archives.
4. Event display within the interface of video surveillance system.

Product integration architecture

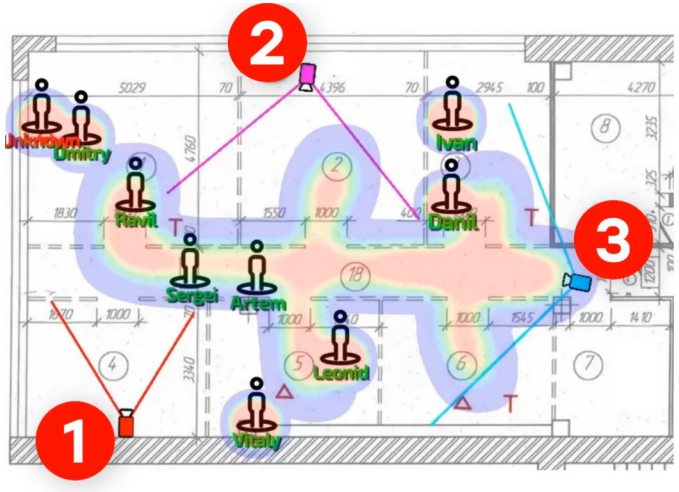
1. Seamlessly streaming video (RTSP) into OMNI.
2. Expanding people database through the interface of video surveillance system.
3. Event retrieval from OMNI linked to video archives.
4. Event display within the interface of video surveillance system.



Audience Analytics

You can use OMNI Platform to collect information about your audience and develop your own interpretation and analytics services:

- Mapping the human positions onto a floor plan to identify popular routes and empty spaces
- Counting people looking at the camera (advertising display / showcase) and calculating the attention time
- Counting visitors and identifying unique visitors
- Estimating gender, age and emotions of people within the camera's field of view



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3DiVi

Use Cases / Video Analytics and Notifications

Audience Analytics

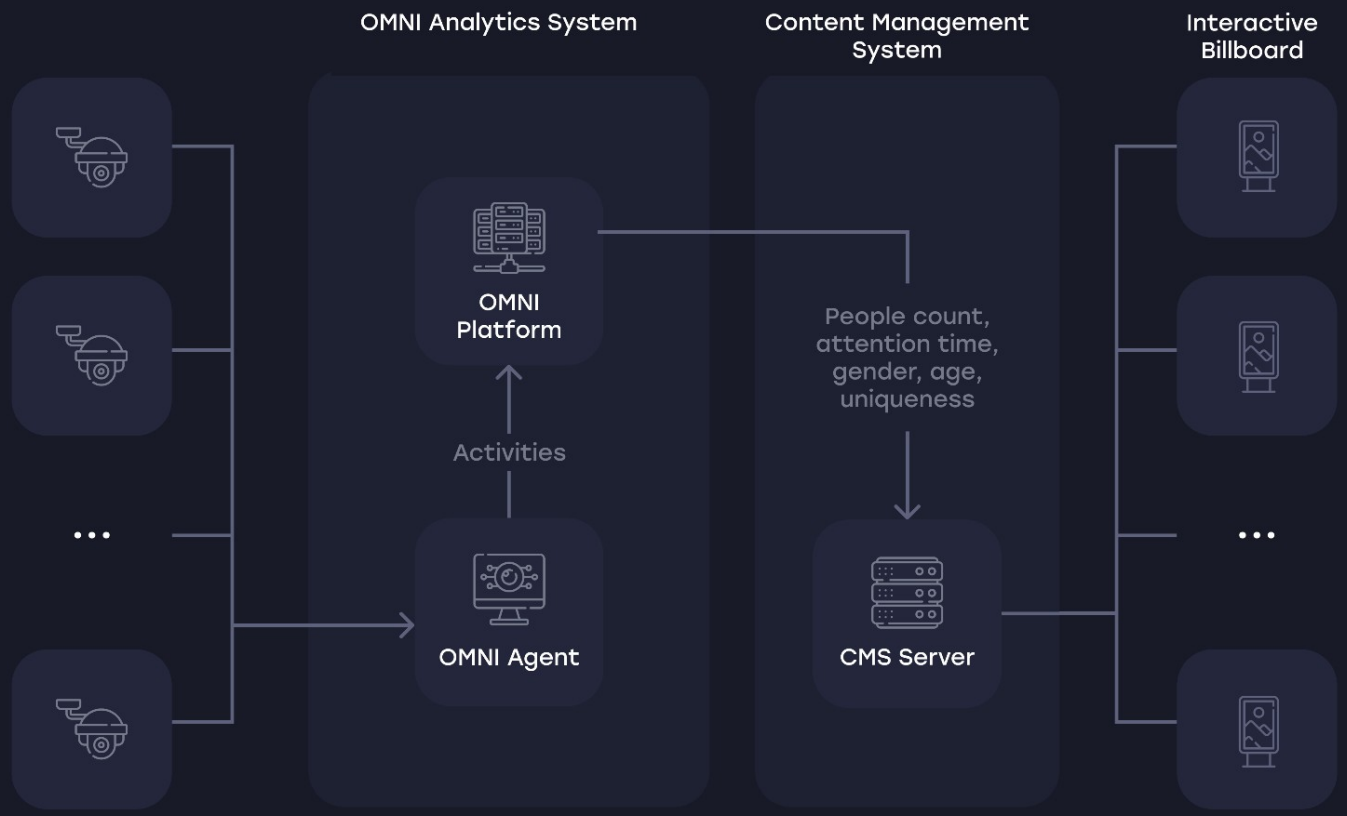
Integration architecture

1. Seamlessly streaming video (RTSP) into OMNI.

2. Accumulating data on detected faces/bodies in OMNI.

3. Getting the accumulated information from OMNI via webhooks or REST API.

4. Interpreting the obtained data to manage interactive content and generate audience reports.



Advantages

01.

High-speed and accurate algorithms

The proprietary 3DiVi algorithm ensures up to 50 mln face comparisons per second on video streams, video files, or images, with accuracy confirmed by NIST.

02.

Adapted neural networks

A suite of neural networks adapted for various tasks, including optimization for mobile and low-power devices.

03.

Multi-object support

In addition to faces and bodies, OMNI Platform can integrate up to 30 different object detectors tailored to specific task requirements.

04.

Integration support

Client support at all integration stages, assistance in selecting the optimal configuration, and sharing the company’s experience for similar business cases.

05.

Quick response time

Client support through various channels (messengers, feedback forms, email), ensuring a high speed of response almost round the clock.

Well-structured product documentation with many examples.

06.

White Label and Open Source

The interface and software code customized to the customer's needs for embedding in proprietary solutions and distribution under an Open Source license.

Licensing & Pricing Principles

1. Number of profiles in the database

Profile is an object that represents a person in OMNI Platform, serves as a container for information about this person and a biometric template. Events related/ not related to a particular profile are not licensed

2. Number of video streams processed by OMNI Agent

When working with OMNI Agent, you need to purchase licenses for the total number of video streams concurrently connected to OMNI Platform

OMNI Platform can be licensed by one or more metrics, optionally an unlimited license can be granted

You can choose license options that require the Internet connection or can be deployed in an isolated environment without the Internet access

The license can be time-limited or perpetual

We offer potential partnership opportunities providing licenses and project support with subsequent profit sharing.

3DiVi

Facial Recognition Accuracy

Accuracy by NIST standards

NIST Face Recognition Vendor Test (FRVT) 1:1	Score
VISA* True Acceptance Rate (@FAR 1E-6)	99.65%
Mugshot* True Acceptance Rate (@FAR 1E-5)	99.76%
Border* True Acceptance Rate (@FAR: 1E-6)	99.35%
WILD* True Acceptance Rate (@FAR 1E-4)	96.94%

Accuracy of facial recognition methods

FAR	12.30 TAR (%)	12.50 TAR (%)	12.100 TAR (%)	12.1000 TAR (%)
1E-04	98.9	99.2	99.4	99.5
1E-05	98.1	98.7	99.1	99.4
1E-06	96.7	97.9	98.5	99.3

Estimation of facial attributes

Attribute	Estimation accuracy
Gender	95%
Emotions	80%
Age	3.95 y/o (mean Average Error)

* **VISA** is a full frontal image with the size of 252x300 pixels. The average distance between the eyes (IOD) is 69 pixels.

* **Mugshot** is a full frontal image of variable sizes. The average IOD value is 113 pixels.

* **Border** The images are taken with a camera. Different head rotation and inclination angles are possible. Strong background illumination results in a darkened face image. There is some perspective distortion due to closedistance shooting. Some faces are partially cropped.

* **Wild** Lots of photojournalistic style images. Resolution varies very widely. Head rotation and inclination angles vary as well. Faces can be covered, for example, by hair and hands.

OMNI Platform Performance Testing

Users - Number of parallel requests

Num_threads — Number of CPU threads in use

RPS — Number of requests processed per second

Max — Maximum time to process 1 request, in ms

95% (95th percentile) — 95% of requests are completed in no more than this time, in ms

Avg (median) — Average time to process 1 request, in ms

Query	Users	Num_ threads	RPS	Max	95%	Avg
create_profiler (creating a profile from an image)	1	1	0.8	2500	1300	1234
	16	1	11.4	2122	1600	1409
detect (detecting and defining facial attributes in the image)	1	1	0.9	1240	1200	1101
	16	1	12.4	1903	1500	1290
profiles (get the list of created profiles)	1	1	4.8	379	340	209
	230	1	211.6	4412	1800	1060
search (search for a face in the database by image)	1	1	0.97	1201	1100	1030
		2	1.37	963	770	726
		4	1.8	723	570	543
		8	2.2	635	500	448
	16	1	13.7	2854	1300	1167
		2	16.3	1526	1200	981
		4	18.4	4269	1000	868
		8	17.3	3986	1000	921

Conclusion:

The most time-consuming operation "Search" takes

- 0.5 seconds for single requests
- 1.0 second under a load of 16 parallel requests

Test machine

CPU: 16 cores (32 threads)
2 x Intel Xeon E5-2683 v4

RAM: 128 GB DDR4

HDD: Samsung EVO 870 500 GB

Minimum system requirements

CPU: 4 cores x 3 GHz with AVX/AVX2

RAM: 24 GB

HDD: 100+ GB free space

20%+ available space in the file system

OS: Ubuntu 20.04.4

DBMS: PostgreSQL: 14.8, 14.7, 14.6, 14.5, 14.4, 14.3, 14.2, 14.1

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OMNI Agent Performance Testing

Number of video streams —Number of concurrently processed videos with face identification. People move within the camera's field of view, with a stream density of ~10 people per second.

Max — Maximum equipment load values

95% (95th percentile) — Equipment load during 95% of the test time

Avg (median) — Equipment load during 50% of the test time

	Number of video streams	1	5	8	10
Max	Number of CPU cores	1	8	12	16
	GPU load	82%	96%	95%	94%
	Amount of RAM	2.34 GB	4.2 GB	5.31 GB	6.18 GB
	Amount of VRAM	1.56 GB	1.89 GB	1.81 GB	1.82 GB
95%	Number of CPU cores	1	8	12	16
	GPU load	19%	78%	84%	82%
	Amount of RAM	2.34 GB	4.08 GB	5.19 GB	6.05 GB
	Amount of VRAM	1.56 GB	1.89 GB	1.81 GB	1.82 GB
Avg	Number of CPU cores	1	8	12	15
	GPU load	10%	49%	50%	46%
	Amount of RAM	2.22 GB	3.95 GB	4.94 GB	5.93 GB
	Amount of VRAM	1.56 GB	1.89 GB	1.81 GB	1.82 GB

Conclusion:

Face identification in the "Safe City" case requires for each video stream:

- 1.5 cores with GPU
- 2.5 cores without GPU

Test machine

CPU: 16 cores (32 threads)
AMD Ryzen 9 5950X @ 3,4 GHz

RAM: 118 GB DDR4

GPU: NVIDIA GeForce GTX 1080 Ti

Minimum system requirements

CPU: 4 cores x 3 GHz with AVX

RAM: 2 GB

HDD: 6+ GB free space

OS: Ubuntu 14+ (x86_64)
Ubuntu 14+ (ARMv8)
Windows 10+ (x86_64)

** Specified requirements correspond to 1 video stream in 1080p (Full HD) and 5 persons in the frame at the same time (database size up to 50K faces).*

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OMNI Platform