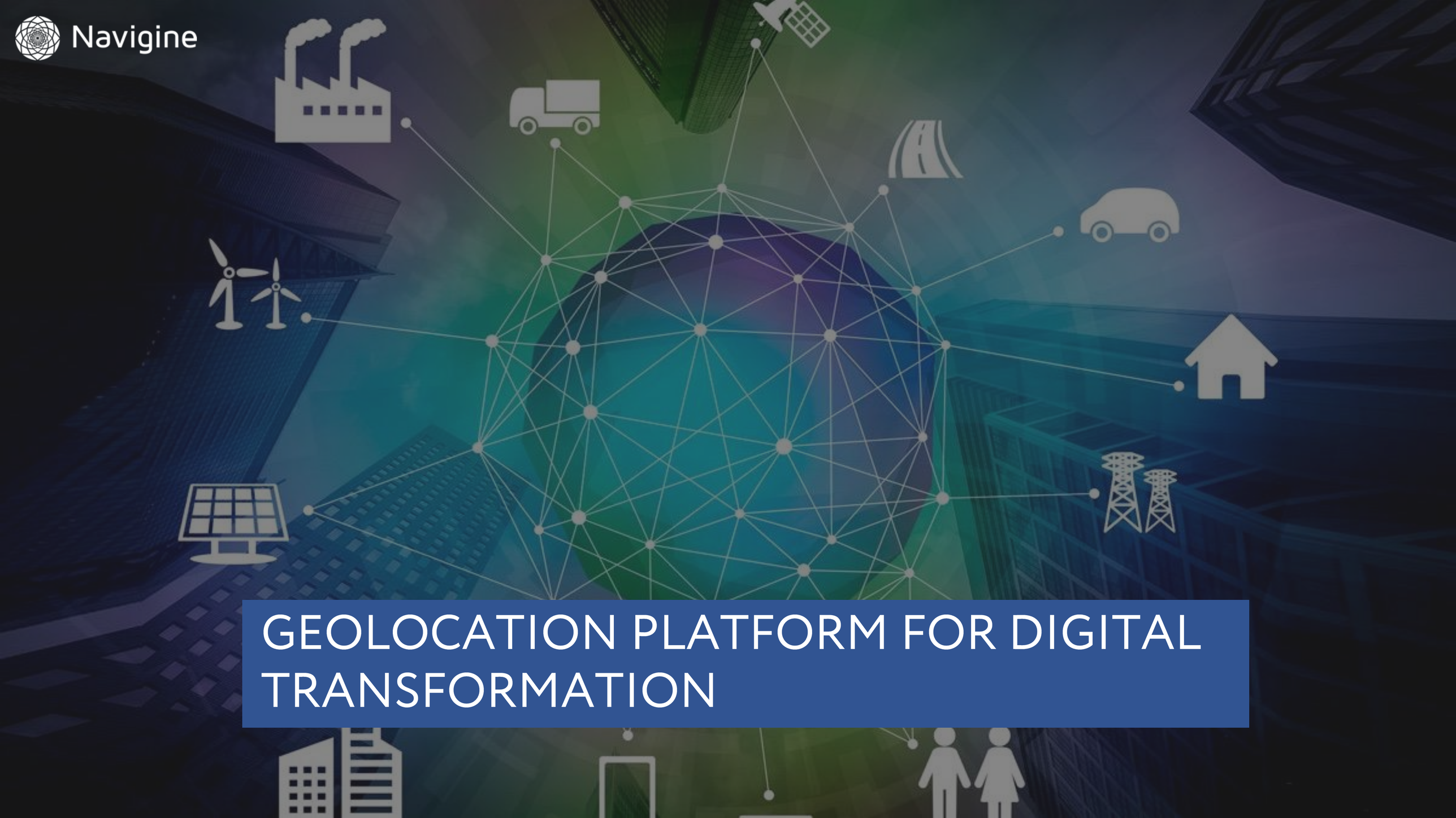
Navigine



GEOLOCATION PLATFORM FOR DIGITAL TRANSFORMATION

NAVIGINE AT A GLANCE

Navigine founded by PhDs and former top management consultants

- Headquarter in New York
- Offices in Berlin and Moscow

7+ years of R&D in indoor positioning services, international patent

2 key products

- Mobile SDK to integrate indoor navigation, marketing and analytics functions into any app
- Software system for quick deployment of asset and vehicles tracking inside large building

30+ mobile and web applications based on Navigine platform

500+ locations with Navigine installations

Navigine

PRODUCT 1: MOBILE PLATFORM

Navigine Indoor

Mobile SDK for IOS/Android that gives real-time turn-by-turn navigation and routing on indoor map

Navigine Marketing

Platform to create and manage location based push notification campaigns in mobile apps

Location Analytics

BI system to analyze mobile app users motions on indoor map via heat maps and multiple statistical reports

Navigine

PRODUCT 2: TRACKING PLATFORM

Traffic Monitoring

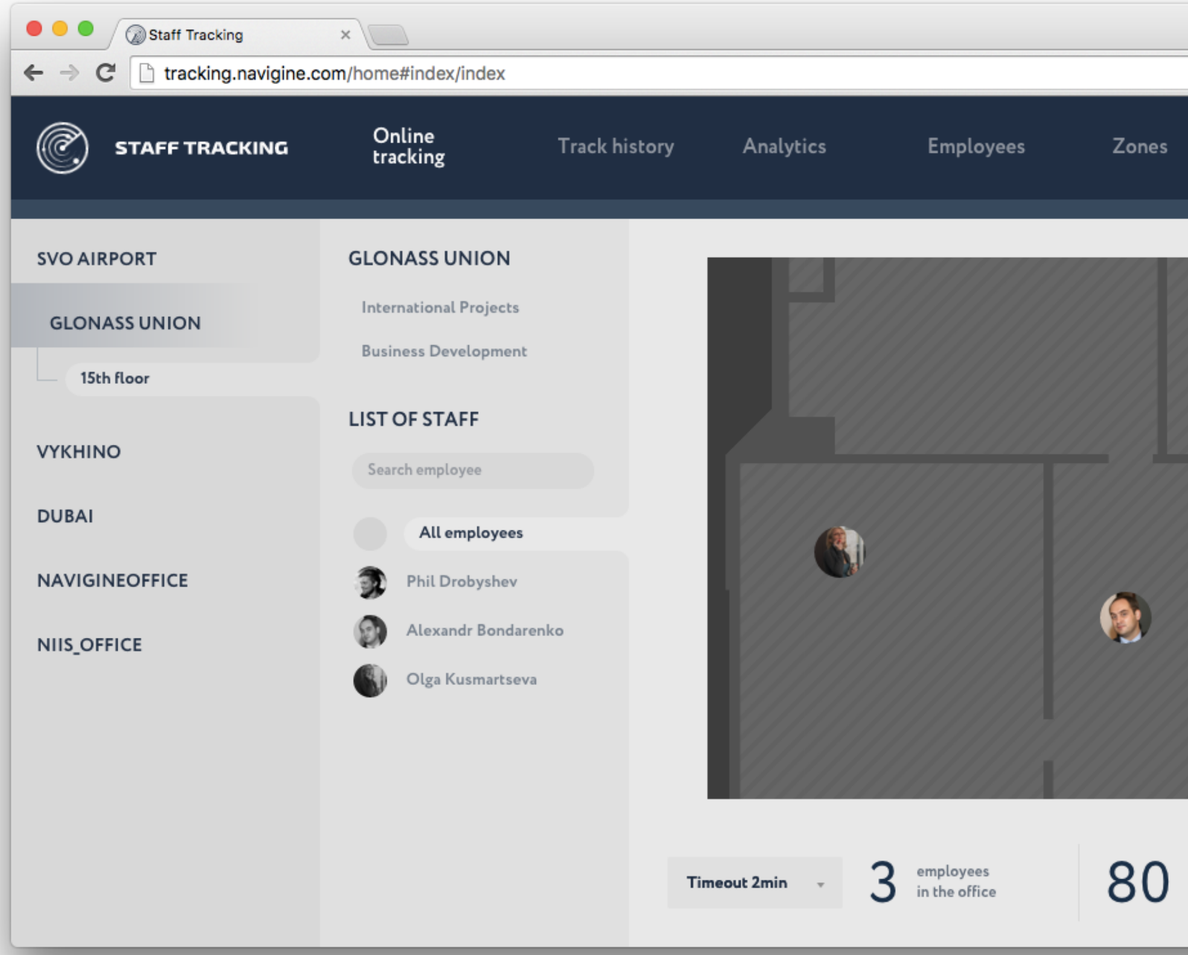
Web-service/API for monitoring of number and dwell time of tracked objects visits at given point

Zone Tracking

Web-service/API for monitoring of current number of tracked objects in each zone of a venue

Motion Tracking

Web-service/API for monitoring of tracked objects motion on indoor map in real-time



NAVIGINE SOLUTIONS ECOSYSTEM

MOBILE PLATFORM

TRACKING PLATFORM

RETAIL

TRANSPORTATION

AUTOMOTIVE

INDUSTRIAL ENTERPRISES

LOGISTICS

Navigine

NAVIGINE SOLUTIONS

RETAIL

- Navigation & Product Search
- Customer Traffic Analytics
- Marketing Communication
- Staff Efficiency Tracking

TRANSPORTATION

- Passengers Wayfinding
- People Flows Tracking
- Staff Navigation
- Assets Tracking

INDUSTRIAL ENTERPRISES

- A real-time motion system
- Asset and vehicle tracking
- Staff and assets motion analytics

LOGISTICS

- Asset and Vehicles Tracking
- Staff Navigation and Scheduling

AUTOMOTIVE

- New opportunities for cars’ navigation systems

Navigine

RETAIL - MOBILE PLATFORM

Solution: Smartcart solution for innovative shopping experience with wayfinding

Parameters:

- 87+ supermarkets in Finland are covered with BLE-based indoor navigation (1-3 meter accuracy)
- 30-60 shopping carts per store are equipped with Smartcart tablets providing directions to customers

Features powered by Navigine:

- Indoor positioning for tablets inside stores
- Directions for customers to items from shopping lists
- Location based promo campaigns and in-store offers
- Analytics collection on customers foot traffic

Results:

- 85% of customers are happy to use Smartcarts
- Customers who liked Smartcart are the ones who spend most money in-store on average
- On average 25% of adds are seen, 13% considered to ought and 5% bought the product
- 84% of users where going to use Smartcart again
- 6% average check growth

Navigine

TRANSPORTATION - MOBILE PLATFORM

Solution: Mobile application for the largest public railway system in Europe with ticket purchase and indoor navigation through train stations

Parameters:

- 5M+ total install base of the mobile app
- 31 stations are covered by indoor navigation - 5K beacons under management

Features powered by Navigine:

- Wayfinding and useful information for commuters such as schedule of trains with tracks location and ticket purchase function
- Real-time and aggregated passenger traffic analytics
- Additional marketing channels and revenue stream from hubs tenants

Results

- Significant improvement of passenger experience especially for international travelers
- Advanced foot traffic statistics to analyze and manage bottlenecks
- Beacon infrastructure monetization via third-party providers

Navigine

CAR NAVIGATION WITHOUT GPS

Data used:

ADI MEMS based IMU (ADIS 16495) (1 deg/hour)

Odometer data, GPS for initial period

Features powered by Navigine:

Real-time data collection

Real time navigation using Kalman filter

Results:

Error less than 30 m after 20 minutes of driving

Complete navigation solution for the vehicle

Case description:

The car was driven on real roads as follows:

- The filter starts with initially unknown position, velocity, orientation, sensor biases and odometer scale factor.
- The data from GNSS receiver, odometer and IMU are fed to the filter. The filter observes the errors and starts converging to the most probable output values.
- At random time, GNSS are switched. After that moment, the position is estimated using only inertial and odometer data.

Navigine

AUTOMOTIVE/LOGISTICS - TRACKING PLATFORM

Solution: Real-time car position tracking inside car repair service centre for a major premium brand

Parameters:

- 5K sq. m. total area with 200 parking slots and 10 working zones
- 33 IoT gateways deployed to track up to 150 branded BLE tags

Features powered by Navigine:

- Real-time car location tracking on a floor plan
- Collection of historical movement for all cars
- Alerts for management on expiring service terms and anomalies
- Location reports by cars, time, zones, events

Results:

- Business intelligence tool to notify managers on expiring service terms and to track centre operation performance in real-time
- Reduction of time on standard operations - up to 30%
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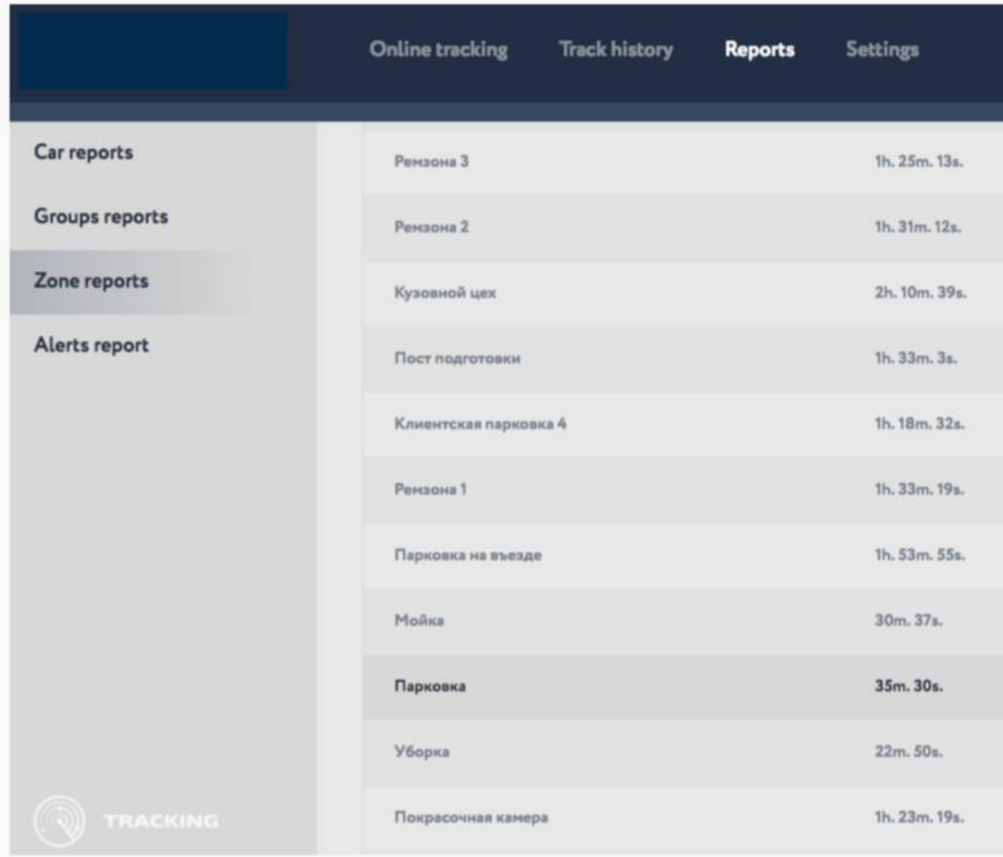


Navigine

INDOOR NAVIGATION GEODATA COLLECTION MAU 50M

Solution: SDK for mobile application for the large mobile app ecosystem

Parameters:

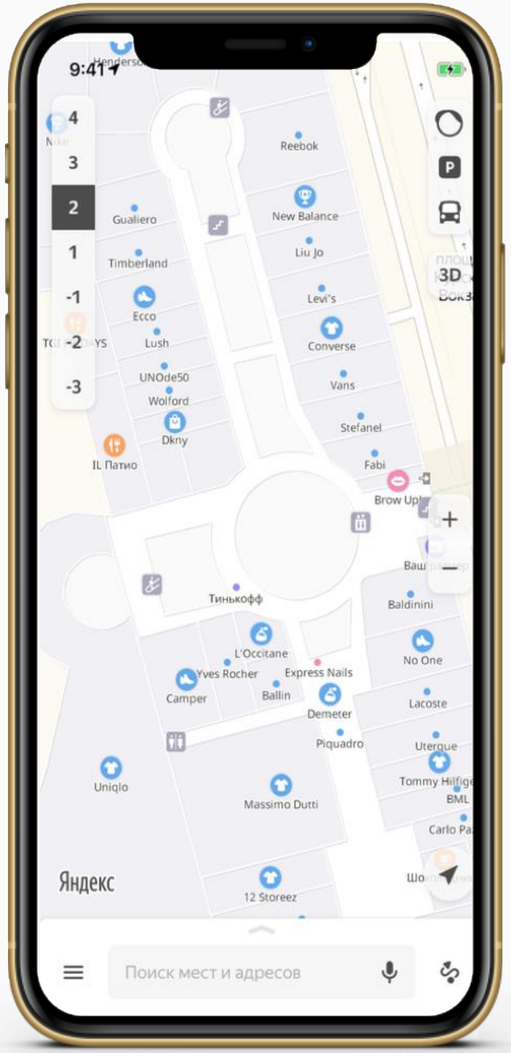
- 50M+ total install base of the mobile apps
- Wi-Fi, BLE, IoT support

Features powered by Navigine:

- Navigation and Wayfinding
- Real-time foot traffic analytics
- Offline visits - who visits offline store after watching online ad

Results:

- Significant improvement of indoor geodata collection
- Customers loyalty
- Analytic on retail store visits



Navigine

PRODUCTION CASE STAFF NAVIGATION INSIDE POWER PLANTS

Solution: SDK for mobile application for staff navigation at the power plants / electricity station

Parameters:

- 20k sq m, multiple floor harsh RF environment
- Wi-Fi, BLE, IoT navigation inside smartphone

Features powered by Navigine:

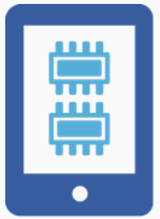
- Navigation and Wayfinding
- Real-time tracking
- Task scheduling

Results:

- Safety level improvement
- Incident reaction time decreased

Navigine

TECHNOLOGY: INDOOR NAVIGATION



Build-in sensors (gyroscopes, accelerometers, compass, barometer)

Bluetooth/Wi-Fi fingerprinting and magnetic fields

Odometry data (velocity, steps, motion model)

Map details

Fast roll out - up to 20 000 m2/ man-day

SLAM algorithm to improve accuracy through crowdsourcing

Up to 1 meter due to proprietary algorithms - at mobile devices

Navigine

TECHNOLOGY: INDOOR TRACKING

Equip staff, vehicles and other assets with Bluetooth LE/Ultra Wide Band (UWB) tags or bracelets with action range up to 50 meters

Deploy BLE/UWB trackers inside building to track the position of tags and bracelets in real time

Collect, transmit and display tags and bracelets position on the map in web interface

Up to 0.2 meters accuracy - for tags based solution

Navigine

BASIC HARDWARE TECHNOLOGIES

Bluetooth Low Energy (BLE) Apple’s iBeacon & Google’s Eddystone compatible beacons

Wi-Fi/BLE/Ultra Wide Band trackers based on generic or specialized hardware

Our software products use well-known, reliable and affordable technologies

Navigine

CASE STUDIES

Navigine

RETAIL - MOBILE PLATFORM

Solution: Smartcart solution for innovative shopping experience with wayfinding

Parameters:

- 87+ supermarkets in Finland are covered with BLE-based indoor navigation (1-3 meter accuracy)
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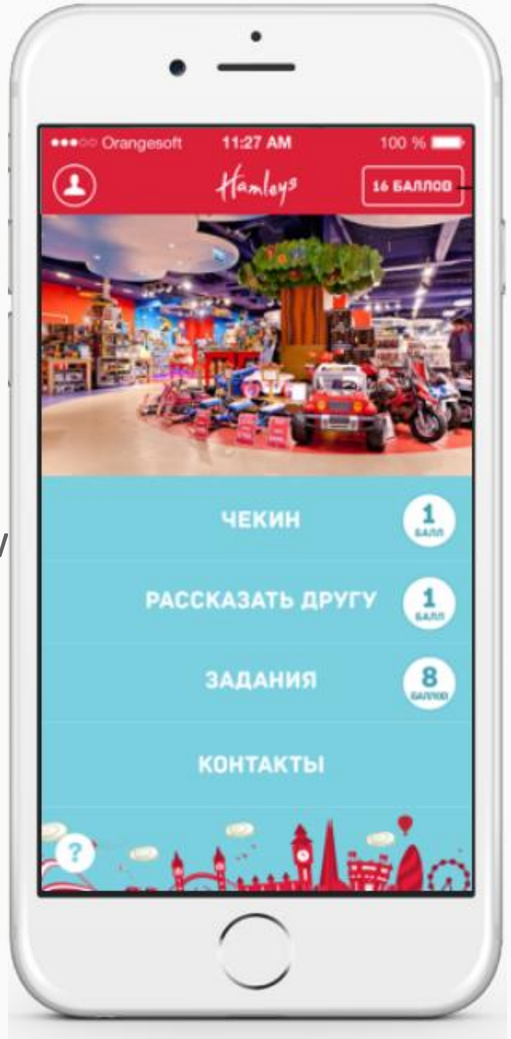
Navigine

TOYSTORE

Product: mobile app with Navigine mobile platform

Project characteristics: 3000 sq.m. , 10 BLE beacons
Project deployment time: 4 months (Navigine integration - 1 month)



Results

- IOS/Android informational app with integrated loyalty program.
- Check-ins with quiz are used to reward customers for visiting store and answ
- question.
- Mobile platform is used to verify that the visit was made.
- Information about visit is used to collect analytics and push notification.
- PR positioning Hamley’s as advanced and innovative company.
- Social interaction and promoting Hamley’s brand via sharing with friends

Navigine

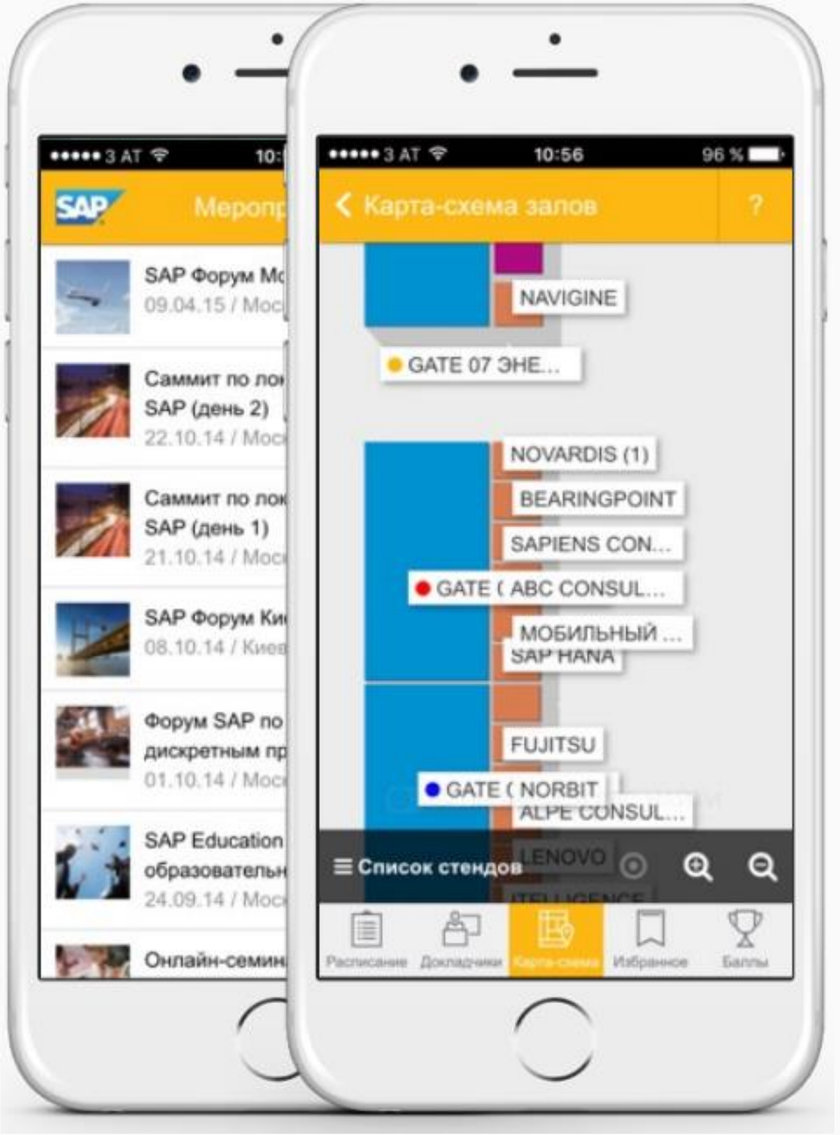
SAP FORUM

Product: mobile app with Navigine mobile platform

Project characteristics: 10000 sq.m. , 100 BLE beacons
Project deployment time: 2 months (Navigine integration - 2 weeks)

Results

- iOS/Android informational app with integrated loyalty program.
- Mobile platform is used to track participants position for loyalty program.
- Information about position is used to collect analytics and construct heatmap to identify most interesting spots at the event.
- App was used by 1000 participants just in one day
- Demo of new technology and showcasing potential implementations for current SAP HANA customers



Navigine

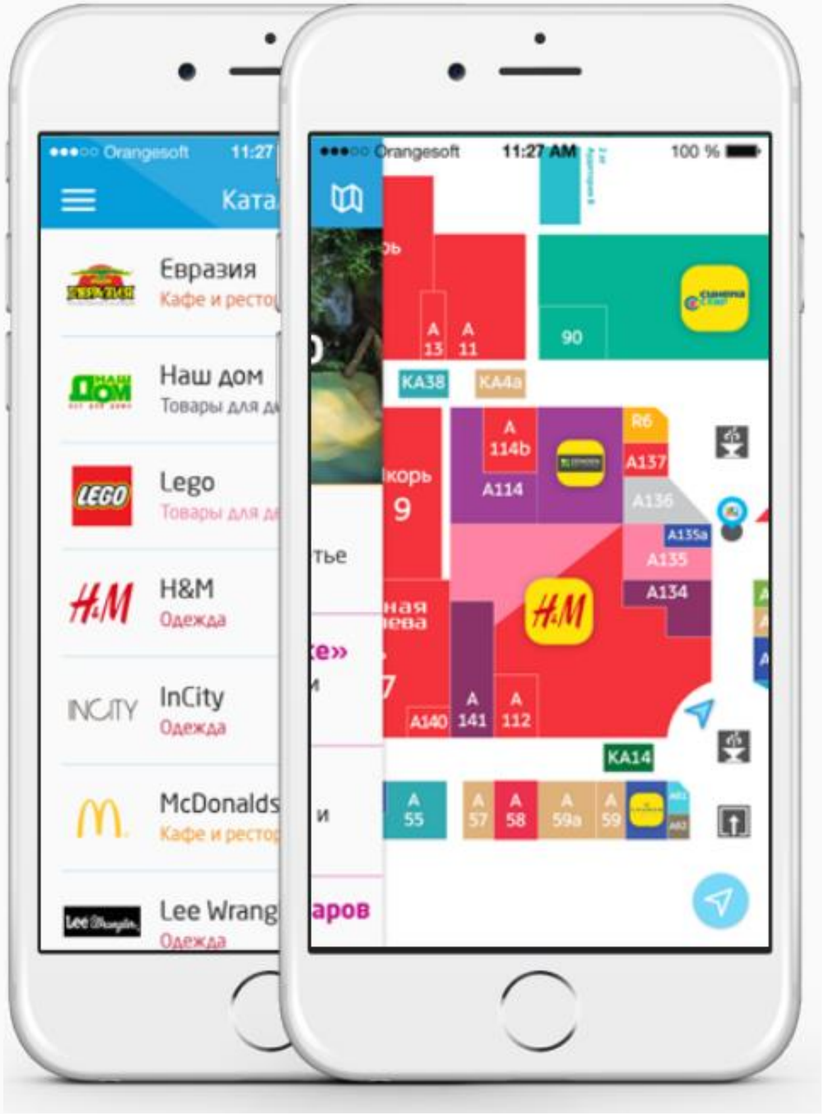
1 - SHOPPING MALL

Product: mobile app with Navigine mobile platform

Project characteristics: 50000 sq.m. , 500BLE beacons
Project deployment time: 4 months (Navigine integration - 1 month)

Results

- iOS/Android informational app for chain of shopping malls.
- Mobile platform is used to provide positioning on the map, cross floor navigation.
- Information about location is used to collect analytics and location based
- push notification and ads.
- PR positioning RIO mall as advanced and innovative company. Improvement of communication with young visitors with more than average income.

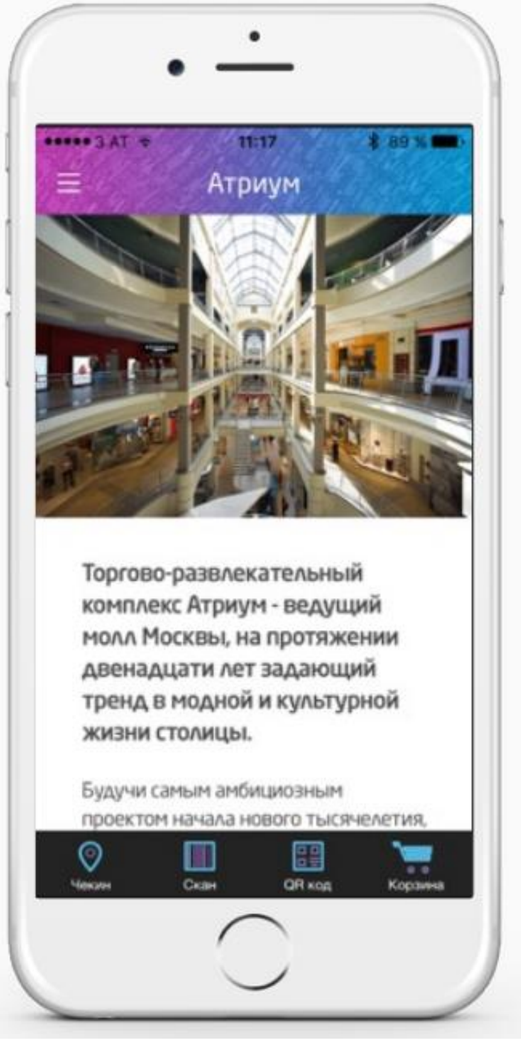


Navigine

2 - SHOPPING MALL

Product: mobile app with Navigine mobile platform

Project characteristics: 70000 sq.m. , 700 BLE beacons
Project deployment time: 6 months (Navigine integration - 1 month)



Results

- iOS/Android informational app with integrated loyalty program.
- Check-ins with are used to reward customers for visiting different stores.
- Mobile platform is used to verify that the visit was made, to provide positioning on the map, cross floor navigation and car finding features.
- Information about position is used to collect analytics and location based push notification and ads.
- PR positioning Atrium mall as advanced and innovative company.

Navigine

INDOOR NAVIGATION GEODATA COLLECTION MAU 50M

Solution: SDK for mobile application for the large mobile app ecosystem

Parameters:

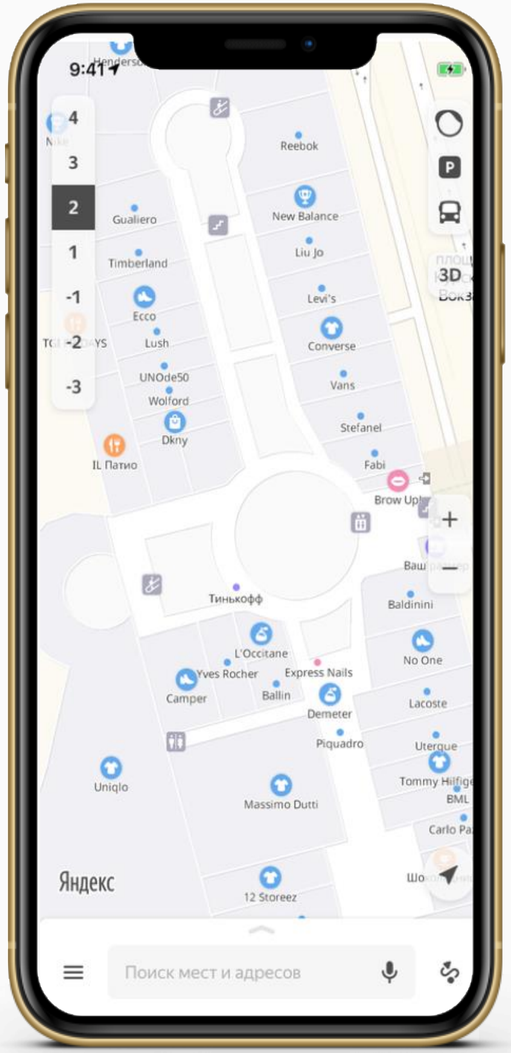
- 50M+ total install base of the mobile apps
- Wi-Fi, BLE, IoT support

Features powered by Navigine:

- Navigation and Wayfinding
- Real-time foot traffic analytics
- Offline visits - who visits offline store after watching online ad

Results:

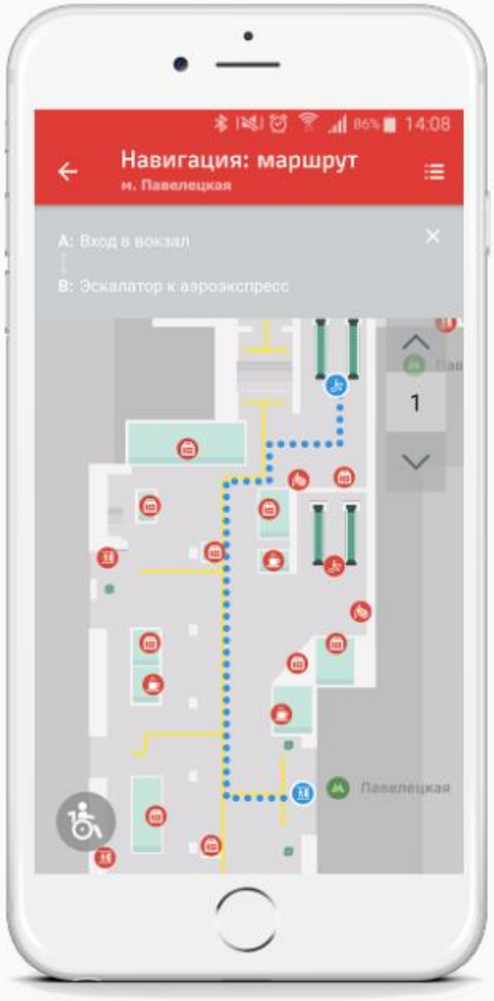
- Significant improvement of indoor geodata collection
- Customers loyalty
- Analytic on retail store visits



Navigine

TRANSPORTATION - MOBILE PLATFORM

Product: Mobile application for the largest public railway system in Europe with ticket purchase and indoor navigation through train stations



Parameters:

- 5M+ total install base of the mobile app
- 31 stations are covered by indoor navigation - 5K beacons under management

Features powered by Navigine:

- Wayfinding and useful information for commuters such as schedule of trains with tracks location and ticket purchase function
- Real-time and aggregated passenger traffic analytics
- Additional marketing channels and revenue stream from hubs tenants
- Results
- Significant improvement of passenger experience especially for international travelers
- Advanced foot traffic statistics to analyze and manage bottlenecks
- Beacon infrastructure monetization via third-party providers

Navigine

INTERNATIONAL AIRPORT

Product: iOS/Android demo app

Project characteristics: 6000 sq.m. , 60 BLE beacons
Project deployment time: 1 month

Results

- iOS/Android informational demo app for airport.
- Demo of new technology and showcasing potential implementations
- Mobile platform is used to provide positioning on the map, routing and POI finding Features like check-in desks, gates, restaurants etc.
- Information about position is used to collect analytics and location based push notification and ads.

Navigine

AIRPORTS

Product: staff and vehicles tracking service

Overall project: tracking of 1000+ employees, 10000+ baggage carts and other vehicles
Pilot project: 3 tracking objects at Al Maktoum International Airport in 3 zones Pilot project deployment time: 2 weeks
Pilot results: accurate tracking of employees and vehicles by zones, control of motion efficiency and working discipline

Expected benefits:

- Continuous monitoring and even distribution of the carts at the airport, reducing the number of bottlenecks
- Improvement of working discipline and work safety
- Improvement of effectiveness in communication with staff
- Improving the quality of customer service

Navigine

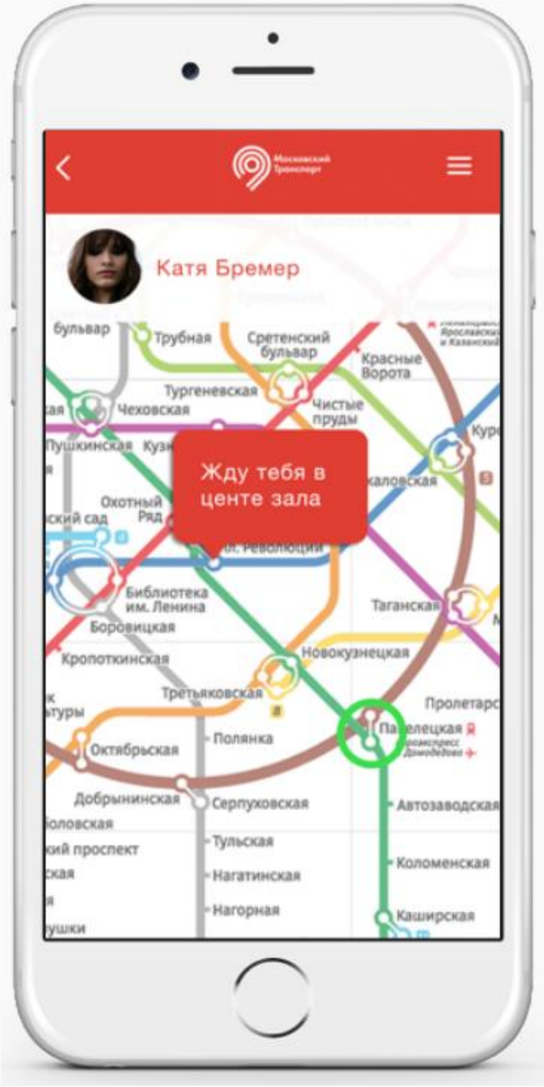
METRO: STATION

Product: iOS demo app

Overall project: navigation for passengers on 200 stations
Pilot project: 5000 sq.m. , 70 BLE beacons
Pilot project deployment time: 1 month

Pilot results:

- iOS informational demo app for the Metro.
- Demo of new technology and showcasing potential implementations
- Mobile platform is used to provide positioning on the map, routing and POI finding features like exits, platforms, ticket office etc.



Navigine

METRO: DEPOT

Product: staff and vehicles tracking service

Overall project: tracking of 30+ trains (6-8 cars each), wheel pairs and 200+ employees
Pilot project: 12 tracking objects at “Vykhino” depot in 1 zone 9000 sq.m.
Pilot project deployment time: 3 month
Pilot results: accurate tracking of employees and vehicles by zones, control of motion efficiency and working discipline

Expected benefits:

- Tracking and monitoring train cars and wheel pairs, remote control of destinaton points
- Tracking component parts at the warehouse
- Analysis of the movements (cars, wheelpairs, component parts, employees)
- Improvement of working discipline and work safety
- Improvement of effectiveness in communication with staff

Navigine

METRO: TUNNELS

Product: staff tracking and trespassers control service

Overall project: 1000+ employees, 300 km of metro tunnels
Pilot project: 1000 m of the tunnel, 10 control points
Pilot project deployment time: 6 month
Pilot results: accurate checking of employees by zones, control of motion efficiency and working discipline

Expected benefits:

- Improvement of working discipline and work safety
- Integration with security system and detecting trespassers (“friend or foe” functionality)
- Improvement of effectiveness in communication with staff
- Analysis of the movements of employees
- Assistance in quick management decision making in cases of emergency

Navigine

FACTORIES CASE STAFF TRACKING IN DANGEROUS AREA

Solution: SDK for mobile application for staff navigation at the power plant / electricity station

Parameters:

- 20k sq m, multiple floor harsh RF environment
- Wi-FI, BLE, IoT navigation inside «smart» helmet

Features powered by Navigine:

- Staff tracking in dangerous areas
- Real-time monitoring of some operational process in thectory
- Task scheduling

Results

- Safety level improvement
- Incident reaction time decreased

Navigine

IMPROVEMENT OF SAFETY AND WORKFLOW

Solution: tracking the staff tracking on the territory of the metallurgical plant using wearable devices

Parameters:

- Hazardous area ("galvanizing bath"), workshop with a large number of metal structures
- Data transfer via LoRa, hybrid positioning with

Features powered by Navigine:

- Online monitoring and recording of movements on the map
- Zone alerts, no crawls, incidents (SOS, fall and immobility)

Results

- Improving the level of labor discipline
- Determination of an individual risk factor for an employee
- Implemented time control in hazardous areas
- Reduce incident response time
- Improving control over periodic operations (equipment inspection)

Navigine

PRODUCTION CASE STAFF NAVIGATION INSIDE POWER PLANTS

Solution: SDK for mobile application for staff navigation at the power plant / electricity station

Parameters:

- 20k sq m, multiple floor harsh RF environment
- Wi-FI, BLE, IoT navigation inside smartphone

Features powered by Navigine:

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AUTOMOTIVE/LOGISTICS - TRACKING PLATFORM

Solution: Real-time car position tracking inside car repair service centre for a major premium brand

Parameters:

- 5K sq. m. total area with 200 parking slots and 10 working zones
- 33 IoT gateways deployed to track up to 150 branded BLE tags

Features powered by Navigine:

- Real-time car location tracking on a floor plan
- Collection of historical movement for all cars
- Alerts for management on expiring service terms and anomalies
- Location reports by cars, time, zones, events

Results

- Business intelligence tool to notify managers on expiring service terms and to track centre operation performance in real-time
- Reduction of time on standard operations - up to 30%
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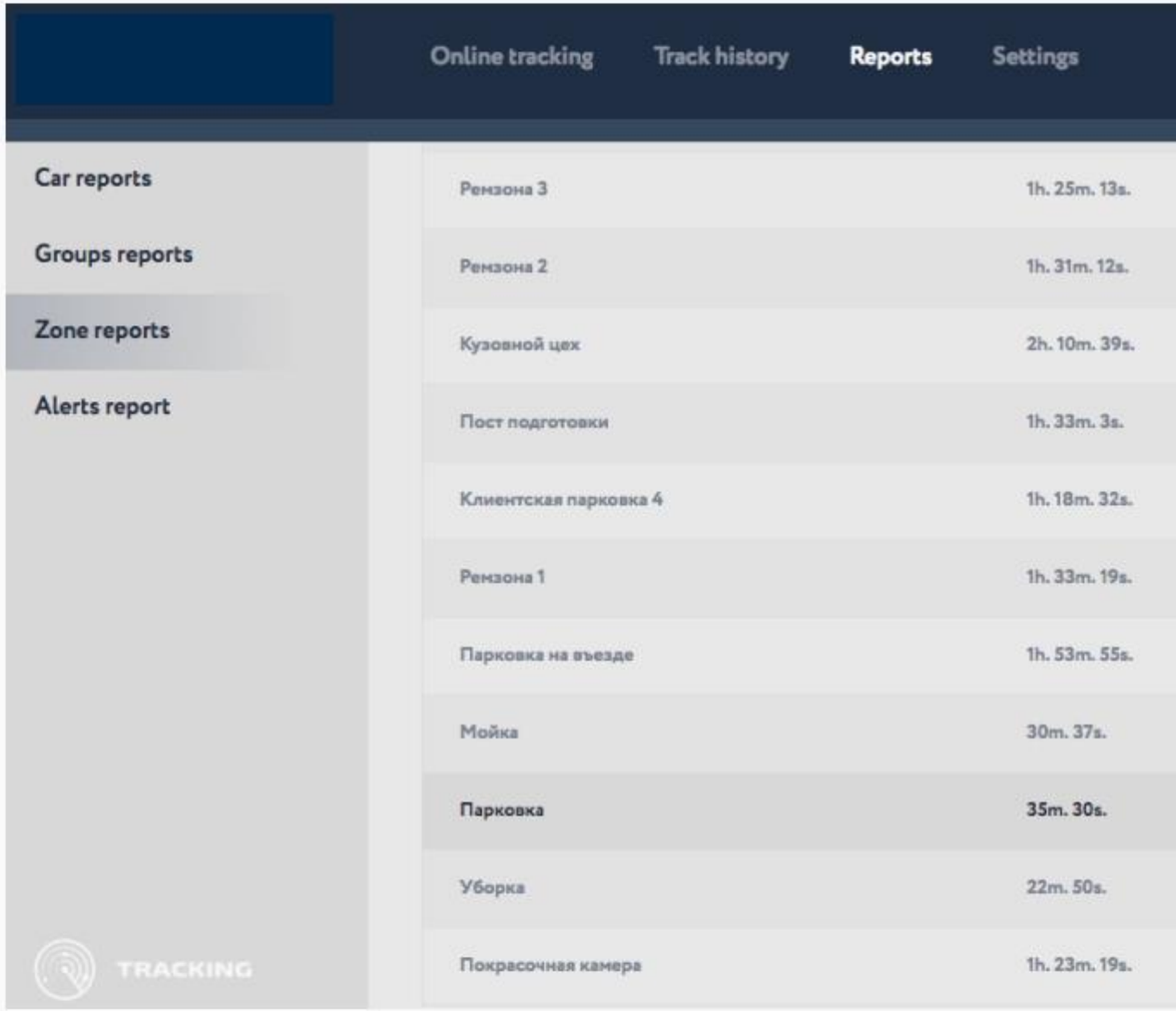

Navigine

CAR NAVIGATION WITHOUT GPS

Data used:

ADI MEMS based IMU (ADIS 16495) (1 deg/hour)
Odometer data, GPS for initial period

Features powered by Navigine:

Real-time data collection
Real time navigation using Kalman filter

Results:

Error less than 30 m after 20 minutes of driving
Complete navigation solution for the vehicle

Case description:

The car was driven on real roads as follows:

- The filter starts with initially unknown position, velocity, orientation, sensor biases and odometer scale factor.
- The data from GNSS receiver, odometer and IMU are fed to the filter. The filter observes the errors and starts converging to the most probable output values.
- At random time, GNSS measurement corrections are switched off in the filter. After that moment, the position is estimated using only inertial and odometer data.

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Navigine