AUTOMATED DRIVING PROGRESSED BY INTERNET OF THINGS
Unlocking the potential of the Internet of Things to take autonomous driving to the next level

- Urban Driving
- Valet Parking
- Car Sharing
- Highway Pilot
- Platooning
OBJECTIVES

AUTOPILOT brings together relevant knowledge and technology from the automotive and the IoT value chains in order to develop IoT-architectures and platforms which will bring automated driving towards a new dimension.

WHAT IS OUR VISION

// Enhance the vehicle’s understanding of its environment with IoT sensors enabling safer highly automated driving

// Foster innovation in automotive, IoT and mobility services

// Use and evaluate advanced vehicle-to everything (V2X) connectivity technologies

// Involve users, public services, businesses to assess the IoT socio-economic benefits

// Contribute to the IoT standardisation and eco-system
**How does it Work?**

1. Objects provide data to IoT platform using IoT standardised protocols.

2. Objects are created virtually in the IoT platform.

3. AUTOPILOT IoT platform develops applications using data from IoT data sources.

4. AUTOPILOT applications enable services that support autonomous driving.

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**IoT Platform**

- Developed using data from IoT data sources.
- Enables services that support autonomous driving.

**IoT Ecosystem**

- Connects physical objects that can be identified and integrated into communication networks.

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**Driving Services**

- Automated driving route optimisation
- Advanced cruise control
- Electronic driving尽情
- HD maps for automated driving vehicles
- Real-time car sharing
- Sixth sense driving
- City Chauffeur services for tourists
- Dynamic parking
- Driverless car technology
**PROJECT DURATION**
01.01.2017–31.12.2019

**CONSORTIUM**
43 beneficiaries, coordinated by ERTICO

**PROJECT COST**
€25,425,252

**EU CONTRIBUTION**
€19,924,984 under Horizon 2020
Grant Agreement no 731993

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**OVERVIEW**

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<th>Project</th>
<th>Brainport</th>
<th>Livorno</th>
<th>Tampere</th>
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Brainport Pilot Site
The Brainport permanent pilot site consists of three pilot areas: driverless car rebalancing service on the Eindhoven University campus, automated valet parking on the automotive campus parking and highway pilot and the platooning on the A270 motorway. We target users between two cities in the region of Brainport that are requesting car transport through different IoT enabled services. The user can select ride-sharing or car-sharing options, and can opt for different levels of automated driving.

**DRIVING SERVICES**

- **Real-time Car Sharing**
- **Valet Parking**
- **Highway Pilot**
- **Platooning**

**DRIVING MODES**

- **Urban Driving**
- **Car Sharing**
- **Valet Parking**
- **Highway Pilot**
- **Platooning**

**KEY PERFORMANCE INDICATORS**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Indicator</th>
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<tbody>
<tr>
<td>Urban Driving</td>
<td>Large community Vulnerable road user (VRU) detection (&gt; 1000 persons)</td>
</tr>
<tr>
<td>Valet Parking</td>
<td>Three different vehicle types, variety of routes</td>
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<tr>
<td>Car Sharing</td>
<td>Waiting time less than 1 minute from reservation</td>
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<tr>
<td>Highway Pilot</td>
<td>Detection of 5 different road incidences</td>
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<tr>
<td>Platooning</td>
<td>Uninterrupted crossing of intersections</td>
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</table>

**Extensive IoT Utilisation**

A great variety of IoT sources are involved such as road-side cameras (e.g. from a270 test site), traffic lights, drones, Smartphones (VRU and legacy vehicles), automated vehicles and more.

**Integrated Services**

The Brainport site will provide various options for car travel. Road and traffic situations are assessed, resulting in route options for automated driving. Different automated driving vehicles can be on-route or be obtained from storage or through rebalancing.
Livorno Pilot Site
IoT assisted automated driving (AD) in “smart roads”

The Italian permanent Pilot Site is a testing infrastructure encompassing the Florence – Livorno highway together with road access to the Livorno sea port settlement. IoT enabled manoeuvres are demonstrated with AD cars traveling from Florence to Livorno. “Sixth sense” IoT devices are deployed in the car and along the roads in both the Highway and the urban area. The Traffic Control Centre with DATEX-II node and the oneM2M platform are preeminent actors in the operations.

**DRIVING MODES**
- Urban Driving
- Highway Pilot

**DRIVING SERVICES**
- Sixth Sense Driving
- Connected E-Horizon

**KEY PERFORMANCE INDICATORS**

<table>
<thead>
<tr>
<th>Service</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Urban Driving</td>
<td>2 km test track under real-life conditions</td>
</tr>
<tr>
<td>Highway Pilot</td>
<td>More than 100 hours in real traffic situations</td>
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<tr>
<td>Communication</td>
<td>3G/4G, LTE, NB-IoT, 6LoWPAN, ITS G5 and 802.11 b/g/n networks</td>
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</tbody>
</table>

**Highway scenario**

The Highway SGC Fi-Pi-Li (Florence-Pisa-Livorno) has been adapted as “smart road” in order to allow the piloting activities:

- A DATEX II node has been deployed for real time traffic information;
- A pervasive sensing infrastructure has been deployed.

**Urban scenario**

A road circuit inside the free public area of Livorno Sea Port has been equipped in order to test vulnerable road users warnings at traffic light intersection.
Traffic cameras assist in improving efficiency and safety of automated driving

The permanent Pilot site in Finland is located in Tampere, which is the second biggest urban region in Finland. The city has taken strategic movement to be one of the major urban area test hubs for automated and connected cars.

AUTOPILOT explores how new Connectivity Technologies can support autonomous vehicles at intersections and parking places.

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<tr>
<th>DRIVING SERVICES</th>
<th>KEY PERFORMANCE INDICATORS</th>
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<tbody>
<tr>
<td>Parking Reservation</td>
<td>Valet Parking</td>
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<tr>
<td></td>
<td>Improved efficiency through camera support</td>
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<tr>
<td>Intersection Support</td>
<td>Improved safety through VRU detection by camera</td>
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<tr>
<td>VRU</td>
<td>3G/4G</td>
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<tr>
<td>Communication</td>
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Versailles Pilot Site
VERSAILLES PILOT SITE

Provide mobility services for touristic applications

DRIVING MODES

- Urban Driving
- Platooning

AUTOPilot enables tourists to explore the city of Versailles and the Castle’s gardens. Visitors pick up a ride in a connected and autonomous vehicle at one of the two car sharing stations via a smartphone application. While driving through the city, the vehicle alerts the tourist of interesting spots in their surroundings. At the Castle’s gardens, the user can switch to a fully automated driving mode before giving the car back at another station. AUTOPilot will also evaluate the added value of IoT and AD technologies in a business model of fleet management (automated fleet rebalancing).

DRIVING SERVICES

- In City Chauffeur Service for Tourists
- Driverless Car Rebalancing

KEY PERFORMANCE INDICATORS

| Platooning | 3 identical vehicles, 20 km/h |
| Urban Driving | 10 km of urban driving including 2 km of autonomous driving |
| VRU | 3G/4G, LTE V2X and 802.11 OCB networks |
| Communication | 3G/4G, LTE V2X and 802.11 OCB networks |

PILOT LEADERS

PILOT PARTNERS

SUPPORTED BY

Sensoric Equipment

Collaborative perception considers information exchange among VRUs and the AD car in order to enhance its perception and improve the VRUs safety. To be part of the IoT, the VRUs will be equipped with smart devices.

Point of Interest Notification

The pilot cars are equipped to generate announcements for local touristic points of interest based on close-range detection (Bluetooth Low Energy beacons).
VIGO PILOT SITE

To offer new services for autonomous vehicle through IoT and connectivity technologies in urban and indoor parking scenarios

The permanent Spanish test site is located in Vigo, Galicia, in the north west of the country. As a result of the participation in European Compass4D & CO-GISTICS and through local initiatives, the city integrates the urban part of SISCOGA corridor (120km). AUTOPILOT will explore how new Connectivity Technologies will enhance the perception and the functional behaviour of autonomous vehicles in complex scenarios.

DRIVING MODES
- Urban Driving
- Valet Parking

DRIVING SERVICES
- Vulnerable Road User Sensing
- HD Maps for Automated Vehicle

KEY PERFORMANCE INDICATORS

<table>
<thead>
<tr>
<th>Driving Mode</th>
<th>Key Performance Indicators</th>
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<tbody>
<tr>
<td>Urban Driving</td>
<td>Improved safety, user acceptance and fuel efficiency</td>
</tr>
<tr>
<td>Valet Parking</td>
<td>Enhanced comfortability, safer parking and time saving, autonomous driving</td>
</tr>
<tr>
<td>VRU</td>
<td>IoT, 3G/4G, ITS G5, C-V2X</td>
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<td>Communication</td>
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Urban area
Automated vehicles receive data about VRU crossing the street (through smart cameras), traffic light status and road hazard warnings (provided by Traffic Management Centre), following a cooperative security approach.

Parking area
Parking Control Centre sends to the vehicle information about the parking map and route to follow inside. AVP app receives in “real time” the status of the vehicle.

PILOT LEADER
CTAG

PILOT PARTNERS
PSA
Concello de Vigo
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