AUTOMATED DRIVING PROGRESSED BY THE INTERNET OF THINGS

Roberto Baldessari, Deputy General Manager
NEC Labs Europe

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AUTOnomated driving Progressed by the Internet Of Things

- Enhance driving environment perception with "IoT enabled" sensors
- Integrate IoT platforms in the vehicles
- Use Cloud and IoT platforms to
  - Share IoT sensor data
  - Create new Mobility Services with fully automated vehicles
Project information

**5 Large Scale Pilots on IoT** are funded by the European Commission

- AUTOPILOT is the Pilot 5: autonomous vehicle in a connected environment
- Innovation Action - 3 Years: 01/01/2017 – 31/12/2019
- 44 beneficiaries – coordinator: Francois Fischer, ERTICO
- Project costs: €25,425,252 - EU contribution: €19,924,984
- European Commission: DG CONNECT unit E.4 – IoT / H.2 Smart Mobility & living / A.1 Robotics & Artificial Intelligence

The 5 Large scale pilots are cross coordinated and supported by 2 CSA:

- CREATE-IoT (create-iot.eu)
- U4IoT (www.u4iot.eu)
<table>
<thead>
<tr>
<th>Key Performance Indicator</th>
<th>Project Target</th>
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<tbody>
<tr>
<td>Number of IoT devices integrated</td>
<td>&gt; 1000 IoT devices</td>
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<tr>
<td>Nr of Vehicles with IoT Platforms</td>
<td>&gt; 20 cars</td>
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<tr>
<td>Number of in-car sensor connected to IoT</td>
<td>&gt; 10 different sensors, &gt; 100 sensors</td>
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<tr>
<td>Number of Federated IoT Platforms</td>
<td>&gt; 10 platforms federated</td>
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<td>External information sources used</td>
<td>&gt; 100 data streams</td>
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<tr>
<td>Number of Smart Edge Devices</td>
<td>&gt; 50</td>
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<tr>
<td>Number of Virtual Entities</td>
<td>&gt; 1000 entities</td>
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<tr>
<td>Improved Perception/Local Dynamic Map</td>
<td>&gt; 20 IoT data streams used</td>
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<tr>
<td>Number of hours in real traffic situations</td>
<td>&gt; 500 hours</td>
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<tr>
<td>Demonstrations</td>
<td>&gt; 20 demonstrations</td>
</tr>
<tr>
<td>Test rides</td>
<td>&gt; 200 test rides</td>
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<tr>
<td>New IoT/AD services</td>
<td>&gt; 7 IoT/AD services developed</td>
</tr>
<tr>
<td>Podium Discussion on business models</td>
<td>&gt; 12 podium discussions</td>
</tr>
<tr>
<td>End Users tested AUTOPILOT solutions</td>
<td>&gt; 1000 end users</td>
</tr>
<tr>
<td>Workshops organized</td>
<td>&gt; 4 workshops organized</td>
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<tr>
<td>Contributions to Standards</td>
<td>&gt; 5 contributions</td>
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Driving modes and services

Driving Modes
- Urban Driving
- Highway pilot
- Platooning
- Automated Valet Parking

Automated driving Services
- City chauffeur services for tourists
- Real time car sharing
- Driverless car rebalancing
- HD maps for automated driving vehicles
- 6th sense driving
- Dynamic eHorizon
IoT Overall concept

Use a vehicle IoT platform

Create IoT and cloud based service platforms

Evaluate network performance needs

Involve many IoT sensors

IoT platforms & architecture

3rd Party Application(s)

IoT enabled Autonomous driving services

Automated Parking
Car sharing
City chauffeur

IoT eco-system

Local Dynamic Map (LDM)

Data fusion

Autonomous driving functions

Vehicle IoT enabled platform

AD+IoT Communication (3G/4G, ITS-G5, LTE-V2X)

Communication network

IoT Device

IoT Device

IoT Device

IoT Device

IoT Device

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IoT Device

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IoT Key Features for Autonomous Driving

- OMA NGSI API (100 OASC cities)
- Brokering and Discovery (FIWARE)
- Hirarchical/Mesh-up Federation (NEC Contribution to FIWARE)
- Contextualized pub/sub (ETSI ISG CIM)
- Semantic Interoperability (building on oneM2M)
- Cloud-edge Orchestration
- Edge and network optimization

IoT Architecture Emerging from Previous Projects, Trials, Trends
Autopilot
Functional Architecture
(Under Discussion)
Target Architecture (Under Discussion)
Thank you

François Fischer
AUTOPILOT project coordinator

Senior manager Innovation and Development

ERTICO – ITS Europe
Avenue Louise 326
B-1050 Brussels Belgium
www.ertico.com
Tel: +32 (0)2 400 07 96 (direct)
f.fischer@mail.ertico.com

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