AUTOPILOT
The role of IoT interoperability in Smart Mobility

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

- AUTOPilot is the Pilot about Connected and Automated Driving
- 3 Years Innovation Action: 01/01/2017 – 31/12/2019
- 44 beneficiaries – coordinator: Francois Fischer, ERTICO
- Project costs: 25 m€ - EU contribution: 20 m€
- 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)
Objectives

Merging automotive and IoT technologies to move Automated Driving towards a new dimension

- Enhance the driving environment perception with “IoT enabled” sensors
- Foster innovation in automotive, IoT and mobility services
- Contribute to the development of IoT Standardisation and eco-system
- Use and evaluate advanced V2X connectivity technologies
- Involve Users, Public Services, Business Players to assess the IoT socio-economic benefits for Mobility
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
Driving modes and new services

Driving Modes
- Urban driving
- Highway pilot
- Platooning
- Automated valet parking
- Real time car sharing

IoT enabled Services
- Vulnerable Road User sensing
- Automated driving route optimisation
- Driverless car rebalancing
- HD maps for automated driving vehicles
- 6th sense driving
- Dynamic eHorizon
Pilot sites

- **Brainport, NL**
  - Automated Valet Parking
  - Highway pilot
  - Platooning

- **Tampere, FI**
  - Automated Valet Parking
  - Urban Driving

- **Versailles, FR**
  - Automated Valet Parking
  - Urban Driving
  - Platooning

- **Daejeon, KR**
  - Urban Driving

- **Vigo, SP**
  - Urban Driving
  - Automated Valet Parking

- **Livorno, IT**
  - Urban Driving
  - Highway pilot
IoT functional architecture

Application Layer
- AUTOPilot Applications
  - Analytics
  - Context Management
  - Semantics
  - Security
  - Process & Service Management
  - Device Management

IoT Layer
- Network Communication
- Hop-by-Hop Communication

Network Layer
- End-to-End Communication
- External Services
  - Public Offices
  - Web Services
  - AUTOPILOT Vehicles
  - Pedestrians
  - Public Transport

AUTOPILOT Things
- Drones
- Traffic Lights
- Other Devices
- RSU
- Other Vehicles
Federated IoT Platforms
IoT vertical domain fragmentation

- The current marketplace is extremely fragmented, which has increased the R&D cost in each specific domain.
- Many vertical IoT solutions have been designed independently and separately for different applications, which impedes large-scale M2M deployment.

Source: CRYSTAL project/Philips
 IoT cross-domain interoperability

- Highly fragmented market with small vendor-specific applications.
- Reinventing the wheel: Same services developed again and again.
- Each silo contains its own technologies without interop.

- End-to-end platform: common service capabilities layer.
- Interoperability at the level of communications and data.
- Seamless interaction between heterogeneous applications and devices.
oneM2M standards
oneM2M high level architecture

Entities: AE (Application Entity), CSE (Common Services Entity) and NSE (Network Services Entity)

Reference Point: One or more interfaces - Mca, Mcn, Mcc and Mcc’
The oneM2M standard defines two approaches to connect oneM2M and non-oneM2M devices/applications into the IoT platform:

- **Native oneM2M devices/applications**: can interact directly with the oneM2M platform using the MCA interface.

- **Non-oneM2M devices/applications**: A dedicated Interworking Proxy Entity (IPE) shall be developed and deployed for this purpose. The IPE provides interworking between oneM2M platform and specific IoT device/application technologies or protocols.
AUTOPilot interworking components

oneM2M applications/platforms

oneM2M Devices / Gateways

Vedecom OEM Interworking Proxy
CoAP / 6LowPAN Interworking Proxy

V2X Interworking Proxy

DATEX Interworking Proxy

GPS Interworking Proxy

DENM Interworking Proxy

LDM Interworking Proxy

MQTT Interworking Proxy

DDS Interworking Proxy

Huawei OceanConnect Interworking Proxy

Watson IoT Interworking Proxy

Fiware Semantic Mediator

CAN Bus Interworking Proxy

SPAT Interworking Proxy

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Brainport
Versailles
Livorno
Vigo
Tampere
All pilot sites
The IoT data model is split into several packages, based on different standards including SENSORIS, DATEX II, etc.
Brainport pilot site
Versailles pilot site
Thank you for your attention

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