European Large-Scale Pilots Programme

IoT European Large-Scale Pilots

AUTOPILOT

Activity Group

27th February, Lisbon
Francisco Sánchez, CTAG

Co-funded by the European Commission

Outline

European Large-Scale Pilots Programme

- Automotive context introduction
- AUTOPILOT Project
- AUTOPILOT Test-Site Spain
- Summary

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The evolution of Mobility

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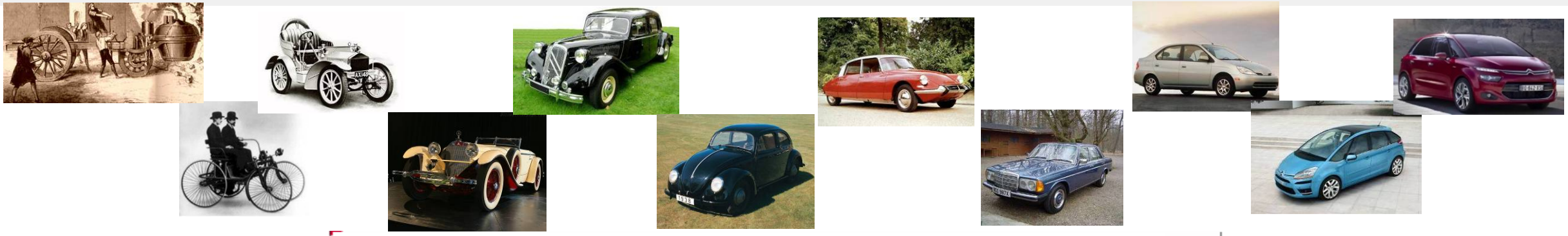
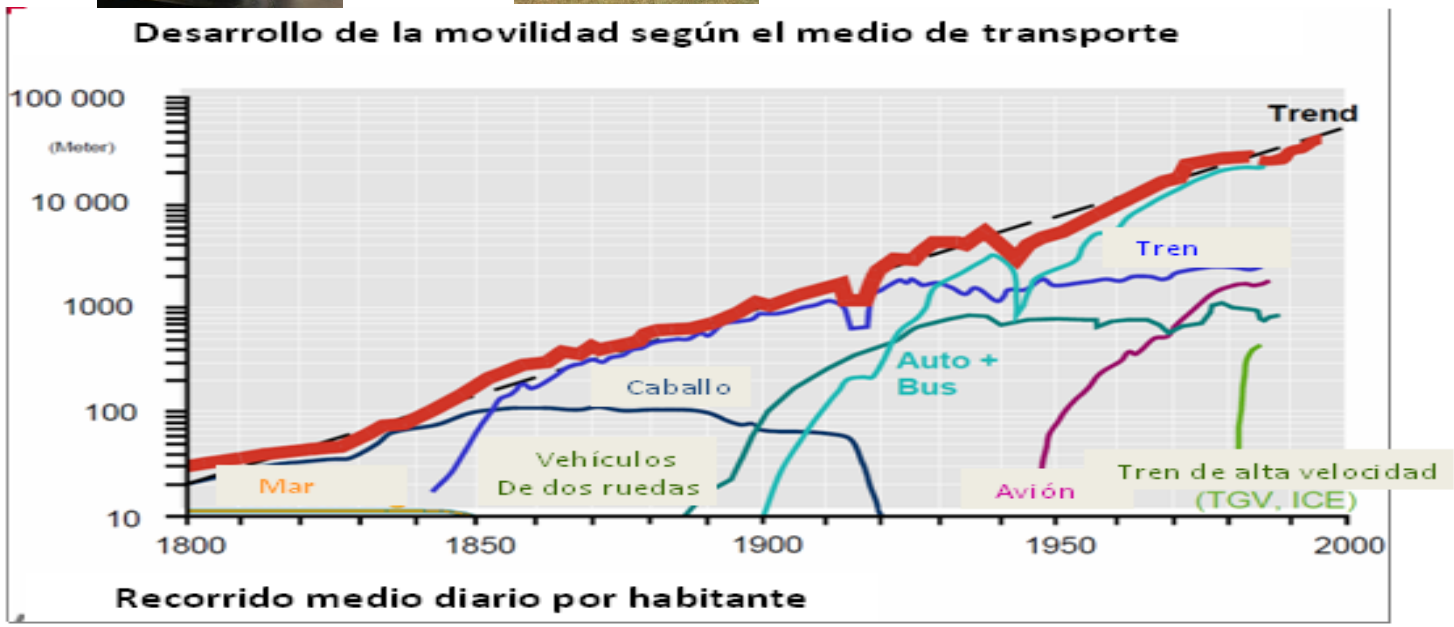
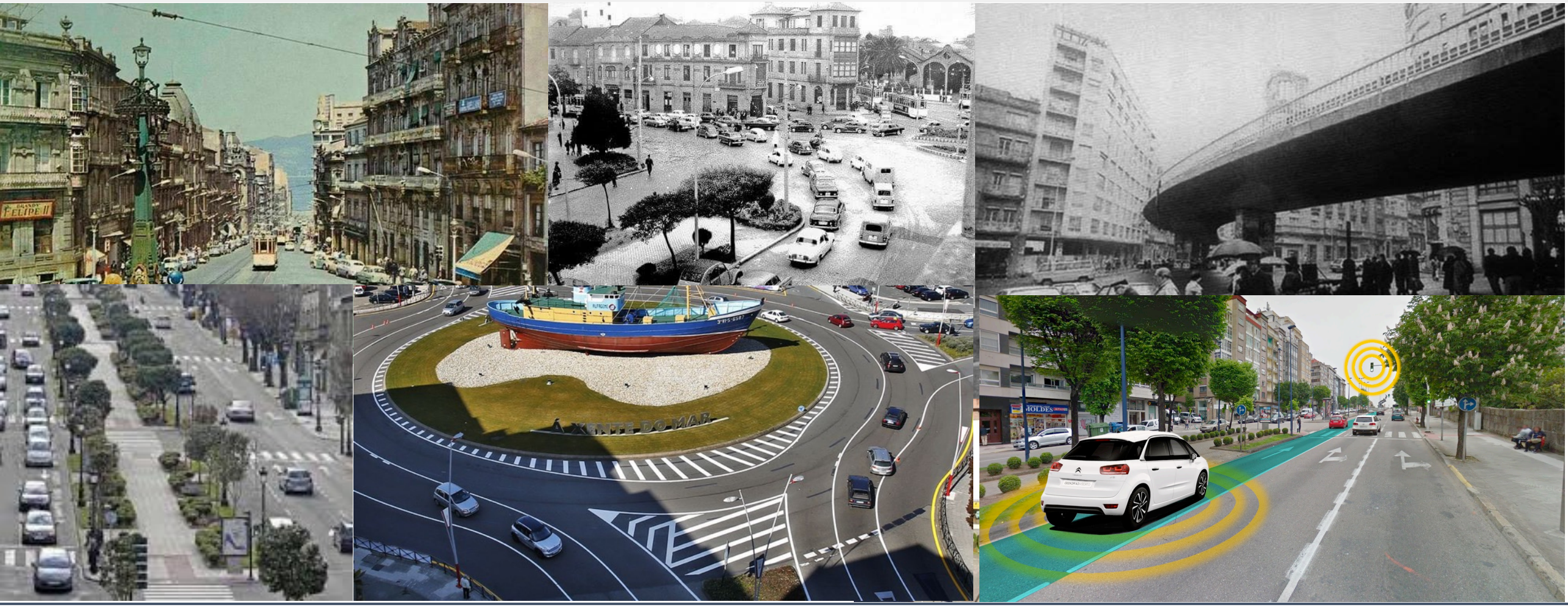




The evolution of Mobility

European Large-Scale Pilots Programme



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The evolution of Mobility

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Mobility Trends

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Aging of the population

Increase of urban population

Intelligent Infrastructures

Artificial Intelligence

Connected Vehicles

Autonomous Vehicles

Electrification

MaaS

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The evolution towards IoT

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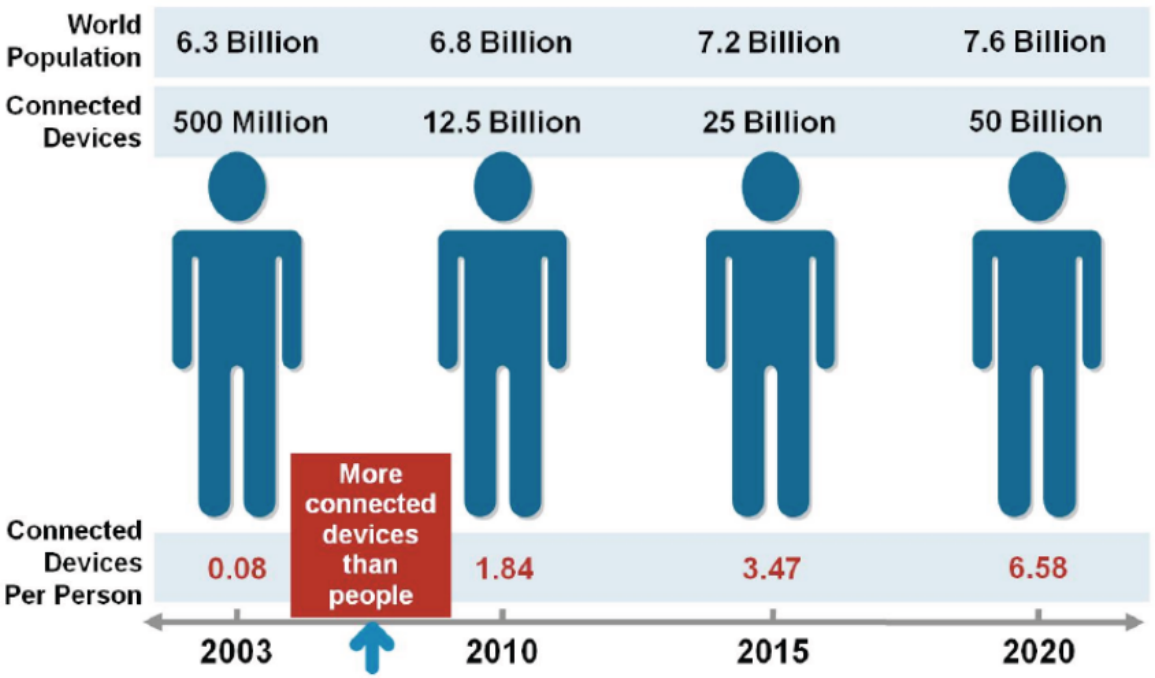

Connected vehicles sales forecast

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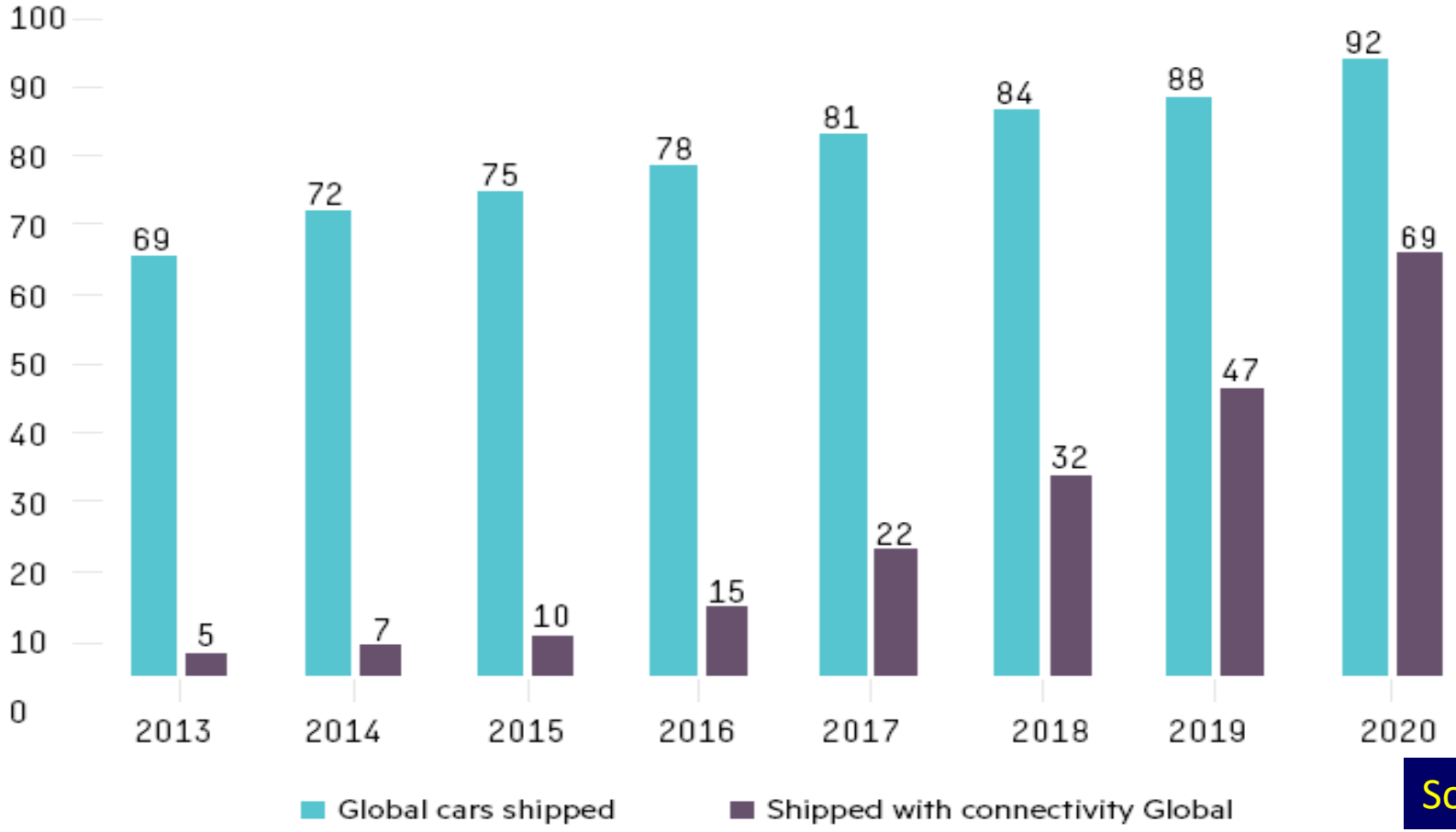

Source: HEWLET PACKARD

The dream towards autonomous driving

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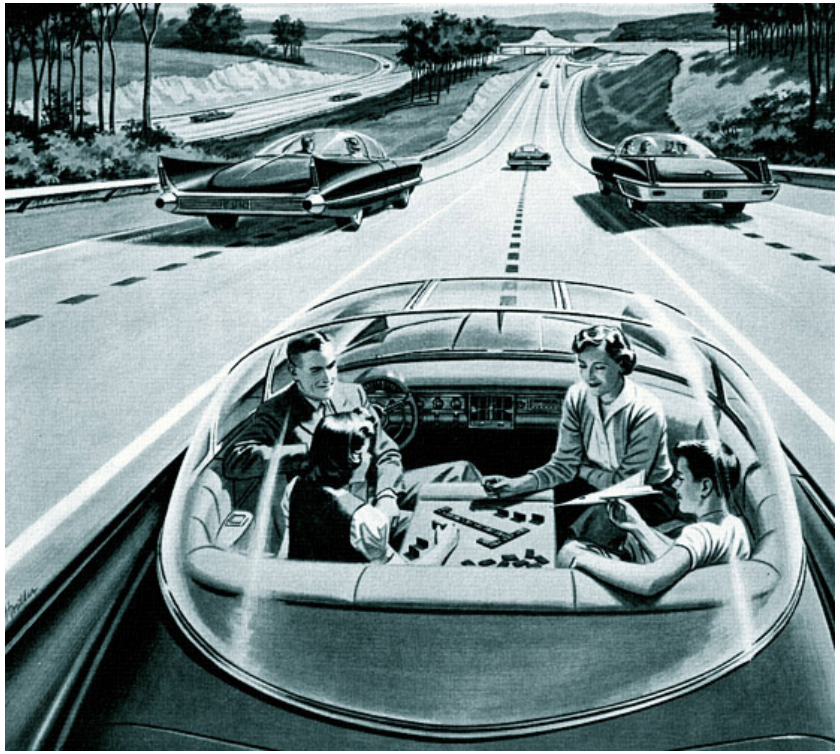

1950s.
Autonomous driving vision

1950s.
Autonomous Highway System Tests. GM y RCA desarrollaron prototipos de conducción automatizada con control por radio de velocidad y dirección.

The importance of electronics

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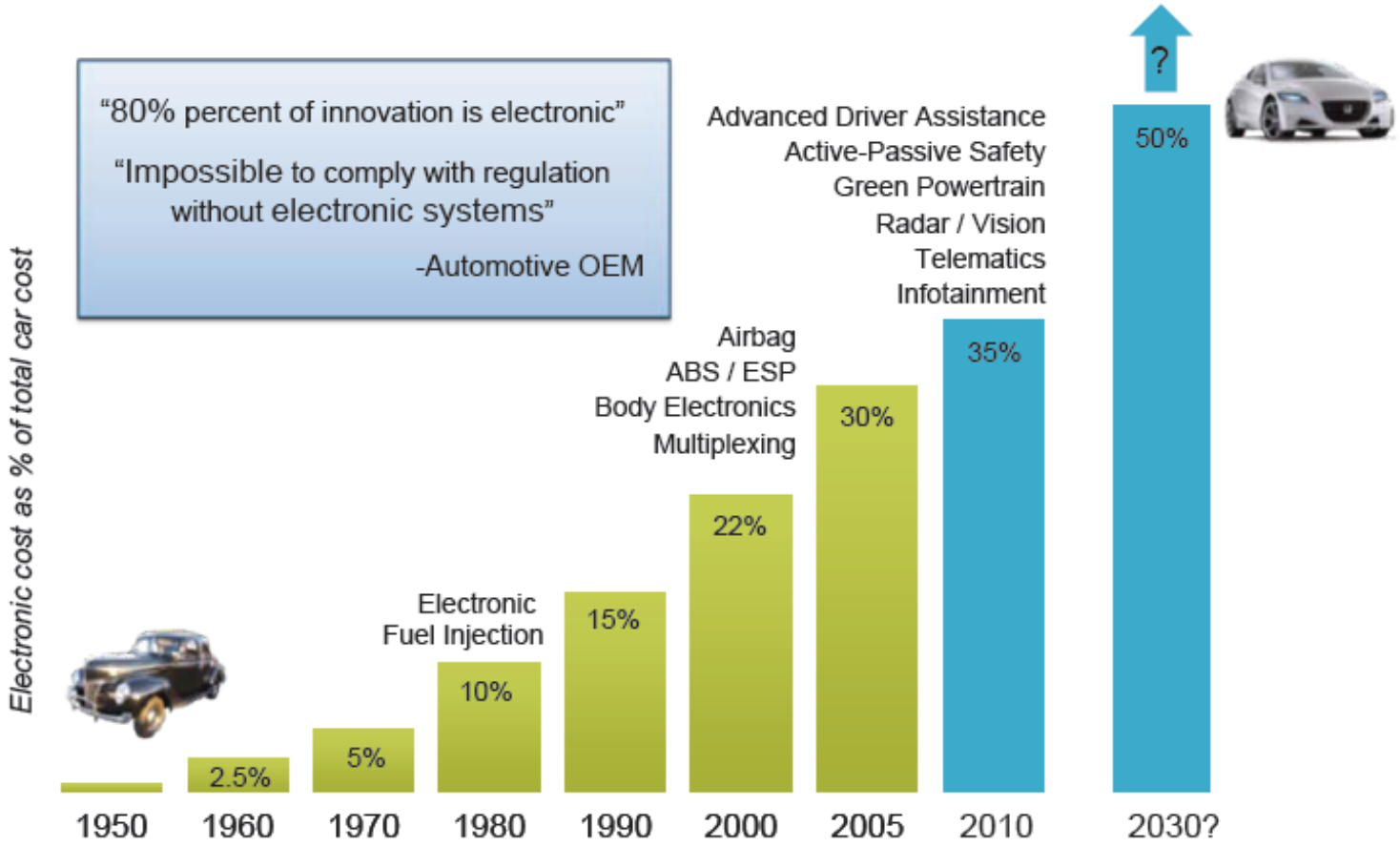

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From ADAS to automated driving

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1950

- Passive safety system development
  - Safety Belt (1959)
  - Passenger Airbag (1987)

1970

- Active safety development
  - ABS (1978)
  - ESC (1995)

1990

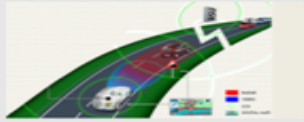
- Driver Assistance System introducction (ADAS)
  - First ADAS: ACC (1998)

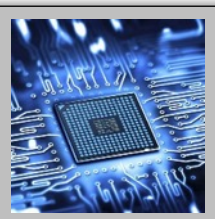
2010

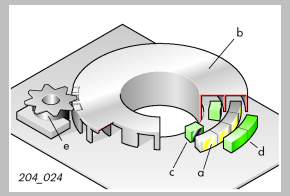
- New driver assistance systems
- Market penetration increase
- From pasive systems to active intervention systems

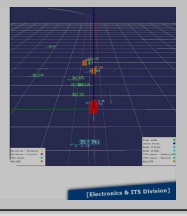
Present and Future

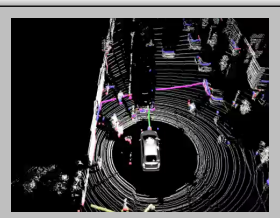
- Increase of active interventions and new assistance functions
- Usage of cooperative systems
- New HMI devices
- Multisensor and multisystem Platform development
- Advanced data fusión tecniques
- Autonomous Driving











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From ADAS to automated driving

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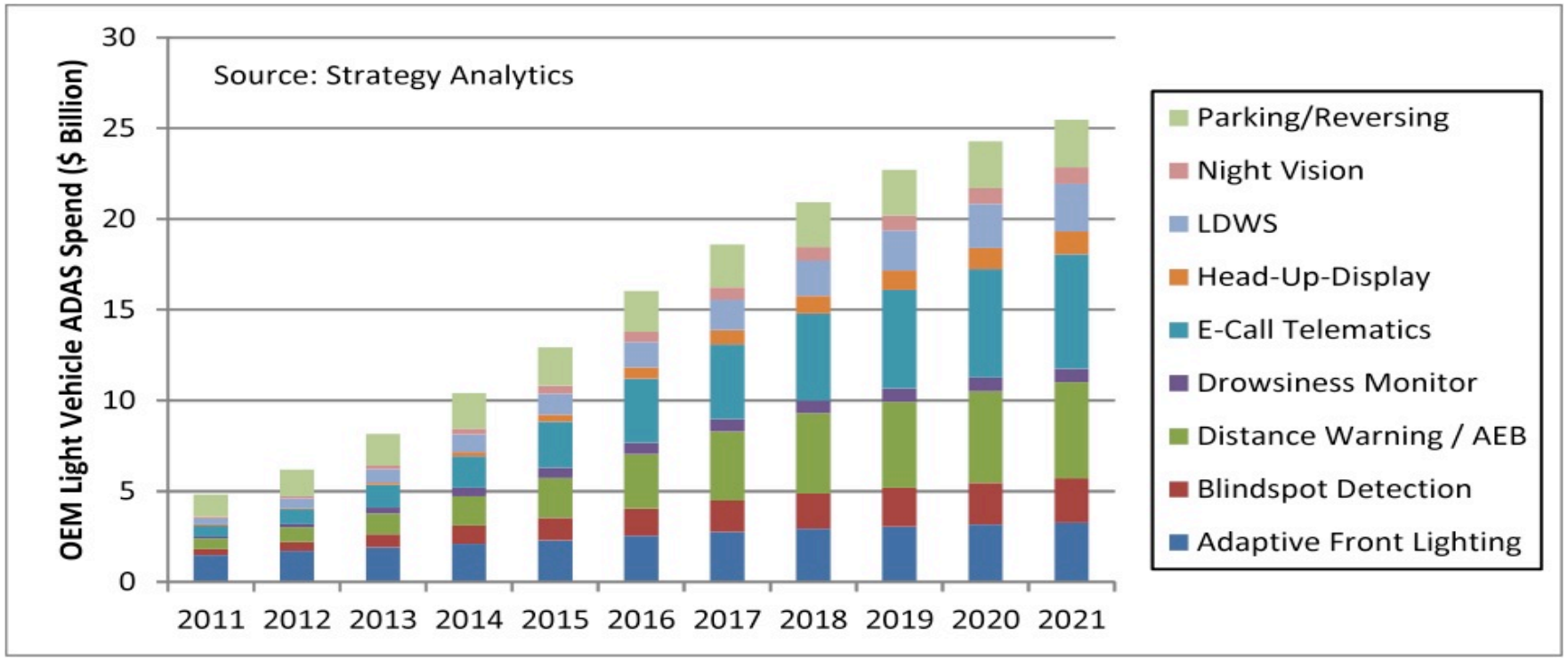


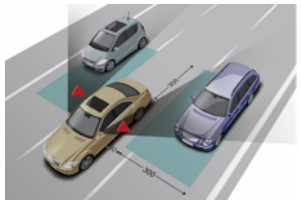
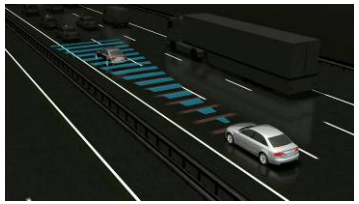
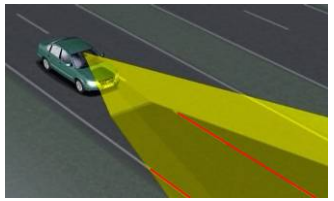


Connected and Automated Driving

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- **Motivation**

  Autonomous driving has enormous potential to improve traffic **safety** (human error is involved in 90% of the accidents) and traffic **efficiency**, enhancing **comfort** and offering a **better use of time**

- **Scenarios**

The race towards autonomous driving

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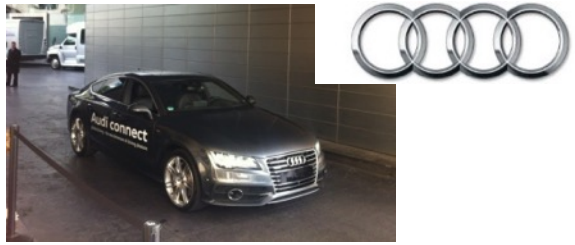

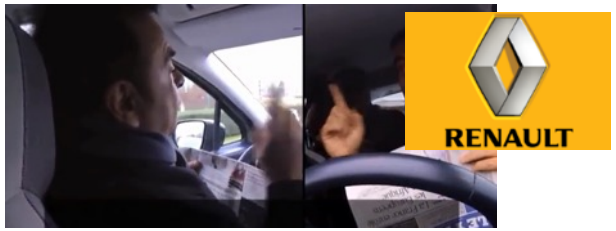

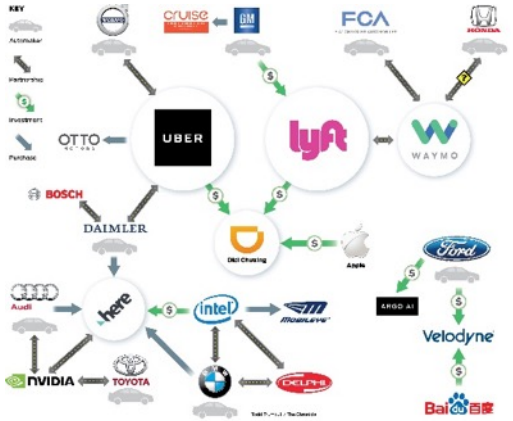

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Automated driving levels

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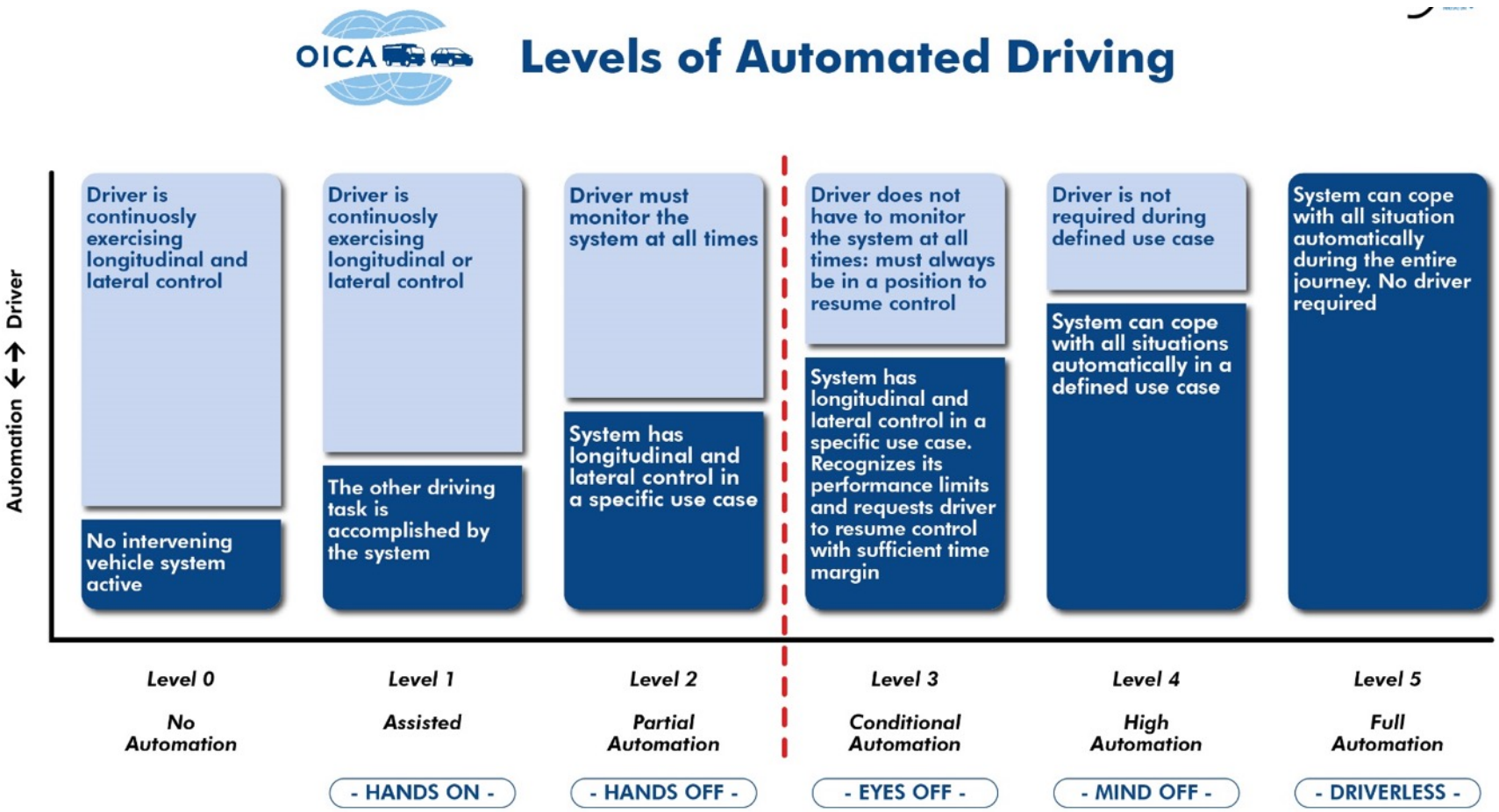

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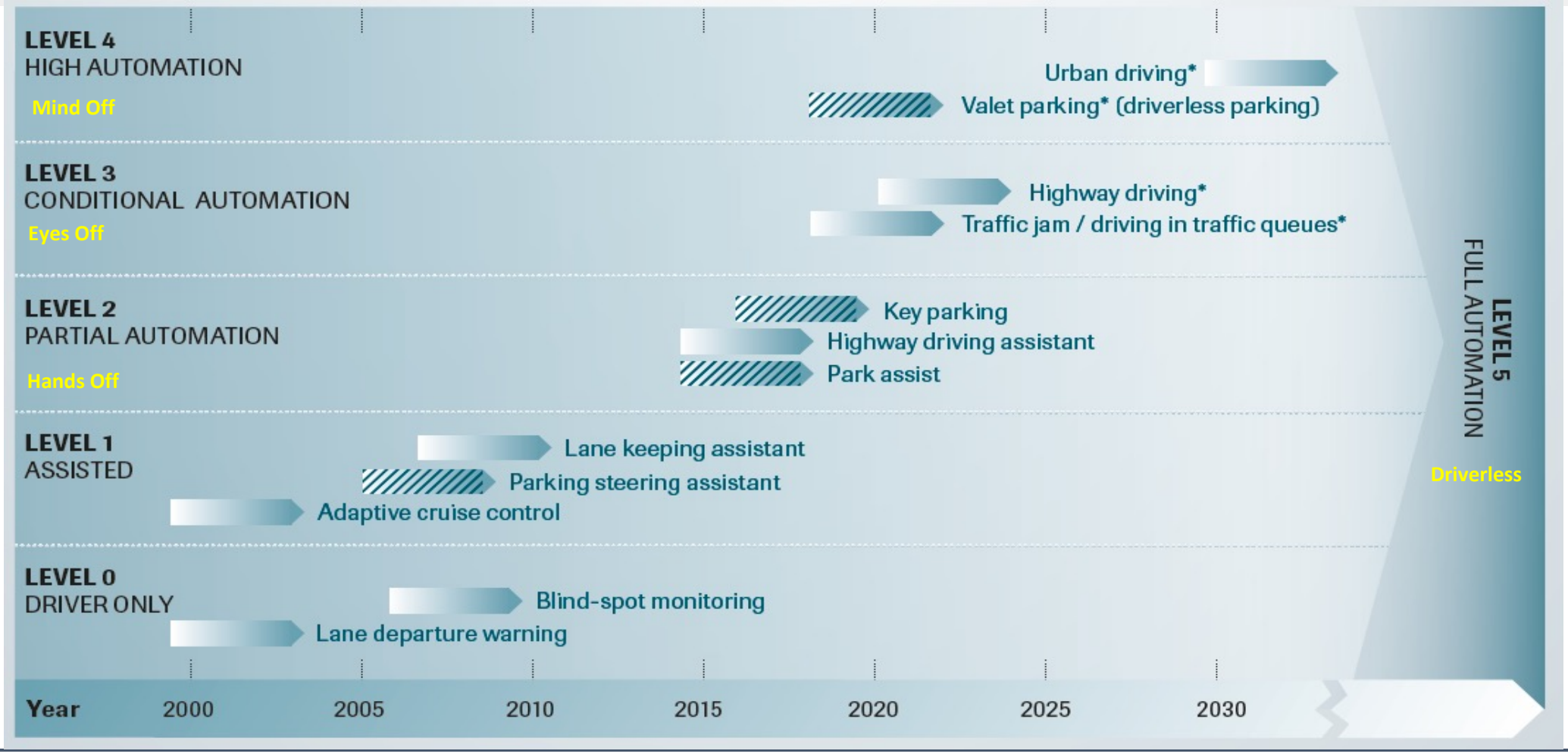
Automated driving roadmap

European Large-Scale Pilots Programme



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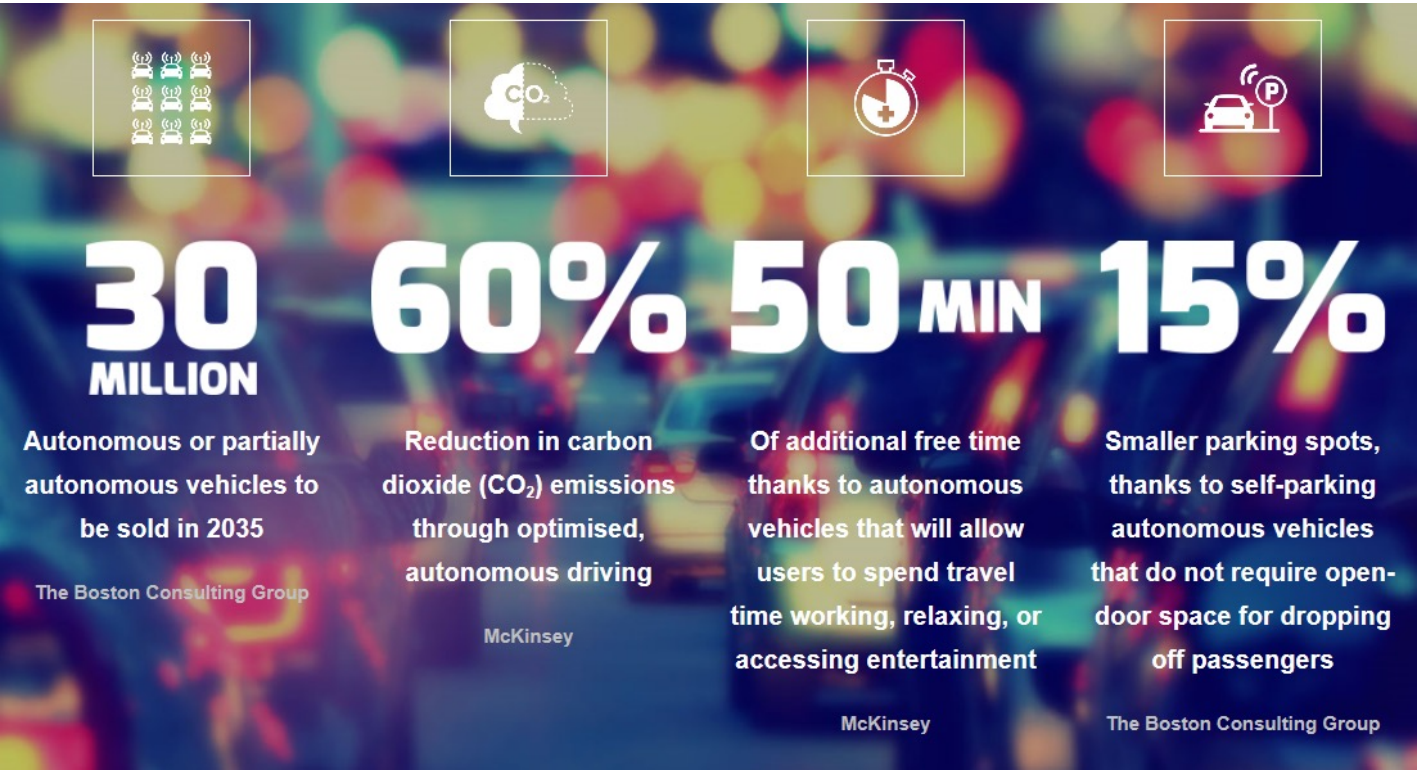
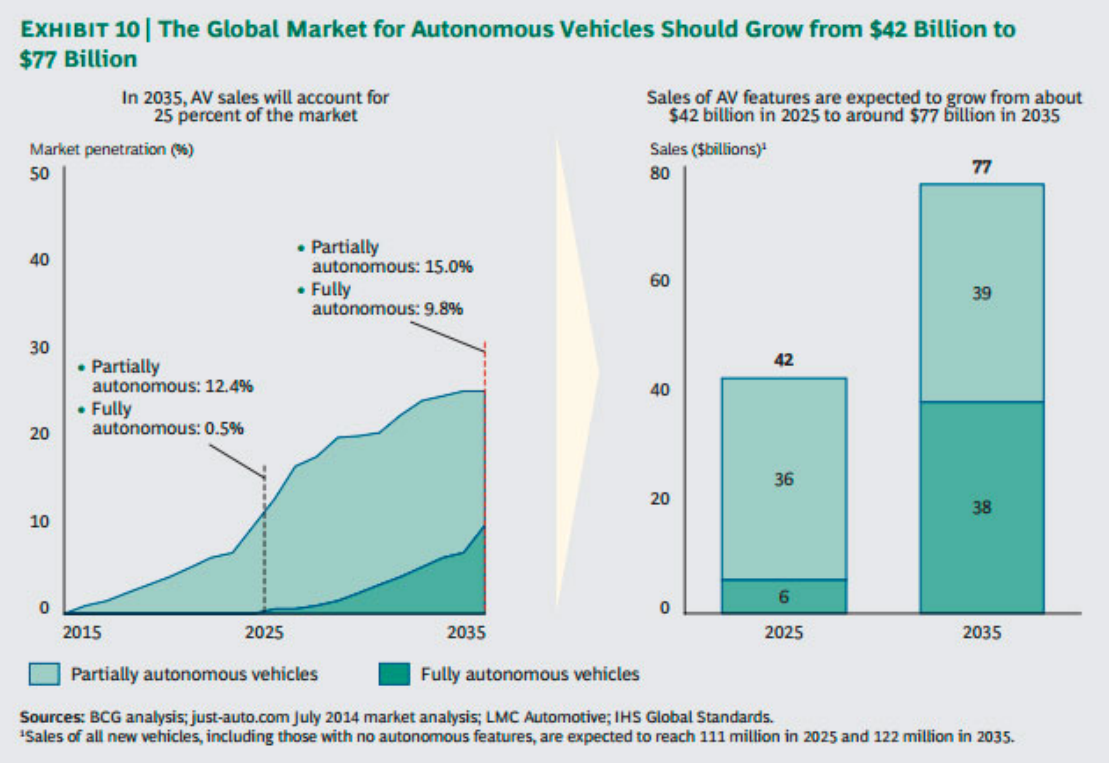
CAD Roadmap and perspectives

European Large-Scale Pilots Programme





Fuente: CARTRE EU Project

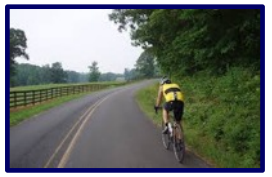
CAD complexity

European Large-Scale Pilots Programme

ESCENARIOS

AUTOVIA

RURAL



URBANO

ESPECIALES

=

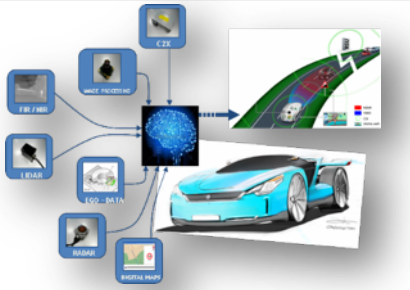
COMPLEJIDAD

VEHÍCULO AUTÓNOMO CONECTADO

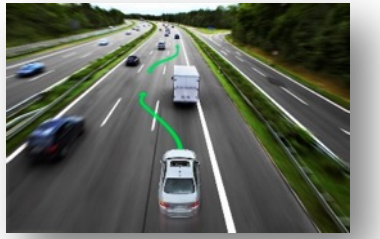
CAD challenges

European Large-Scale Pilots Programme

Testing and Validation

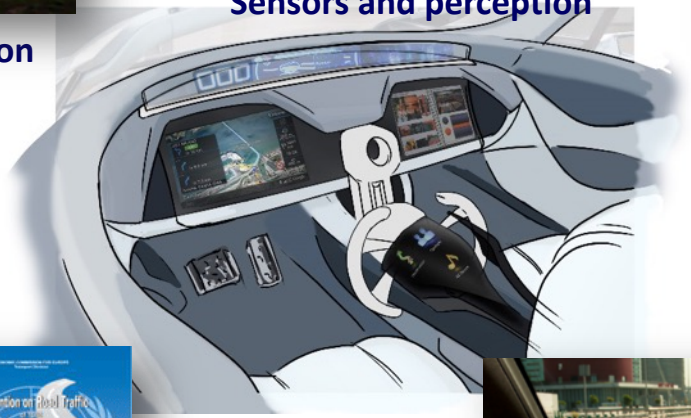


Sensors and perception



Functions and control

Connectivity



Road and infrastructure adaptation

Legislation

HMI and Human Factors

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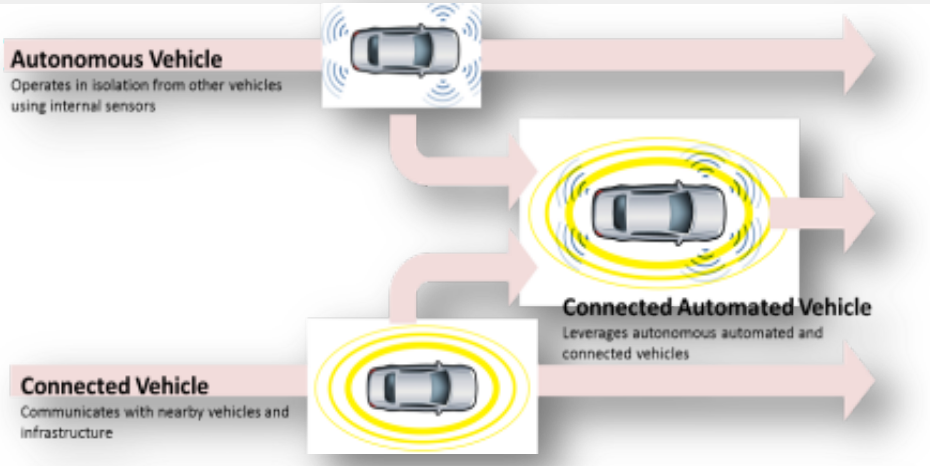
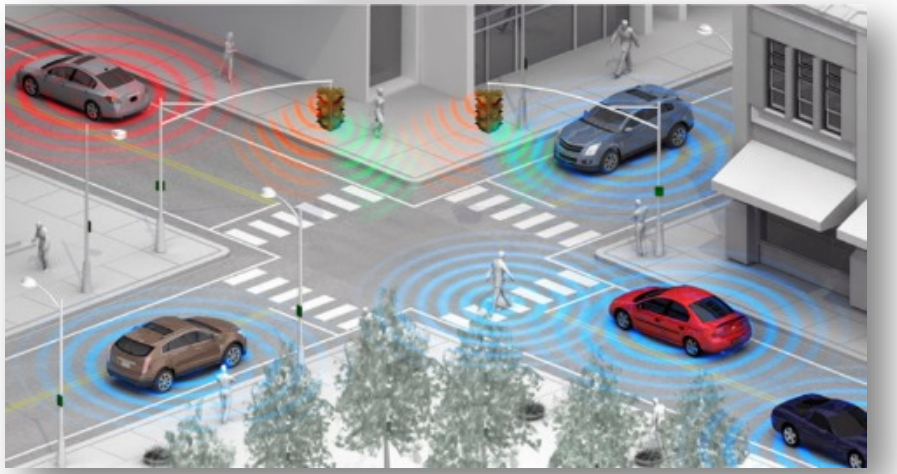
CAD challenges.
The key role of connectivity

European Large-Scale Pilots Programme

- Intelligent vehicles and intelligent roads and intelligent infrastructures
- Hybrid communication networks (celular, DSRC, …)
- V2X (V2C, V2I,V2VRU, …)
- Cooperative services Day 1, Day 1,5 and beyond
- New connectivity services devoted to the automated and autonomous vehicle
- Cooperative sensing
- **IoT**
- Artificial intelligence, Cloud Computing
- Data privacy
- Ciber-security





Outline

European Large-Scale Pilots Programme

- Automotive context introduction
- AUTOPILOT Project
- AUTOPILOT Test-Site Spain
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AUTOPILOT. Project information

European Large-Scale Pilots Programme

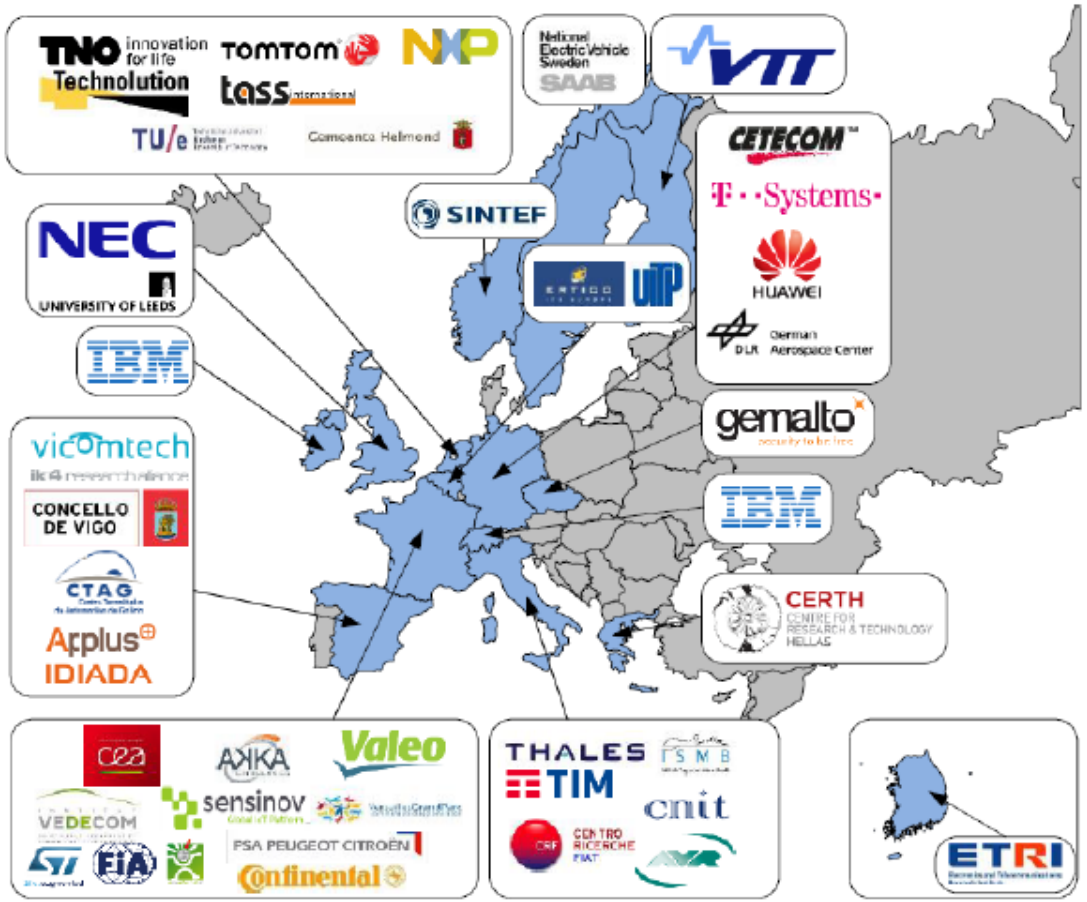
5 Large Scale Pilots on IoT are funded by the European Commission

- **AUTOPILOT is the Pilot about Connected and Automated Driving**
- 3 Years Innovation Action: 01/01/2017 – 31/12/2019
- 44 beneficiaries – coordinator: ERTICO
- Budget: 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)

AUTOPILOT
This project has received funding from the European Union's H2020 research and innovation programme under Grant Agreement No 731993



AUTOPILOT.

European Large-Scale Pilots Programme

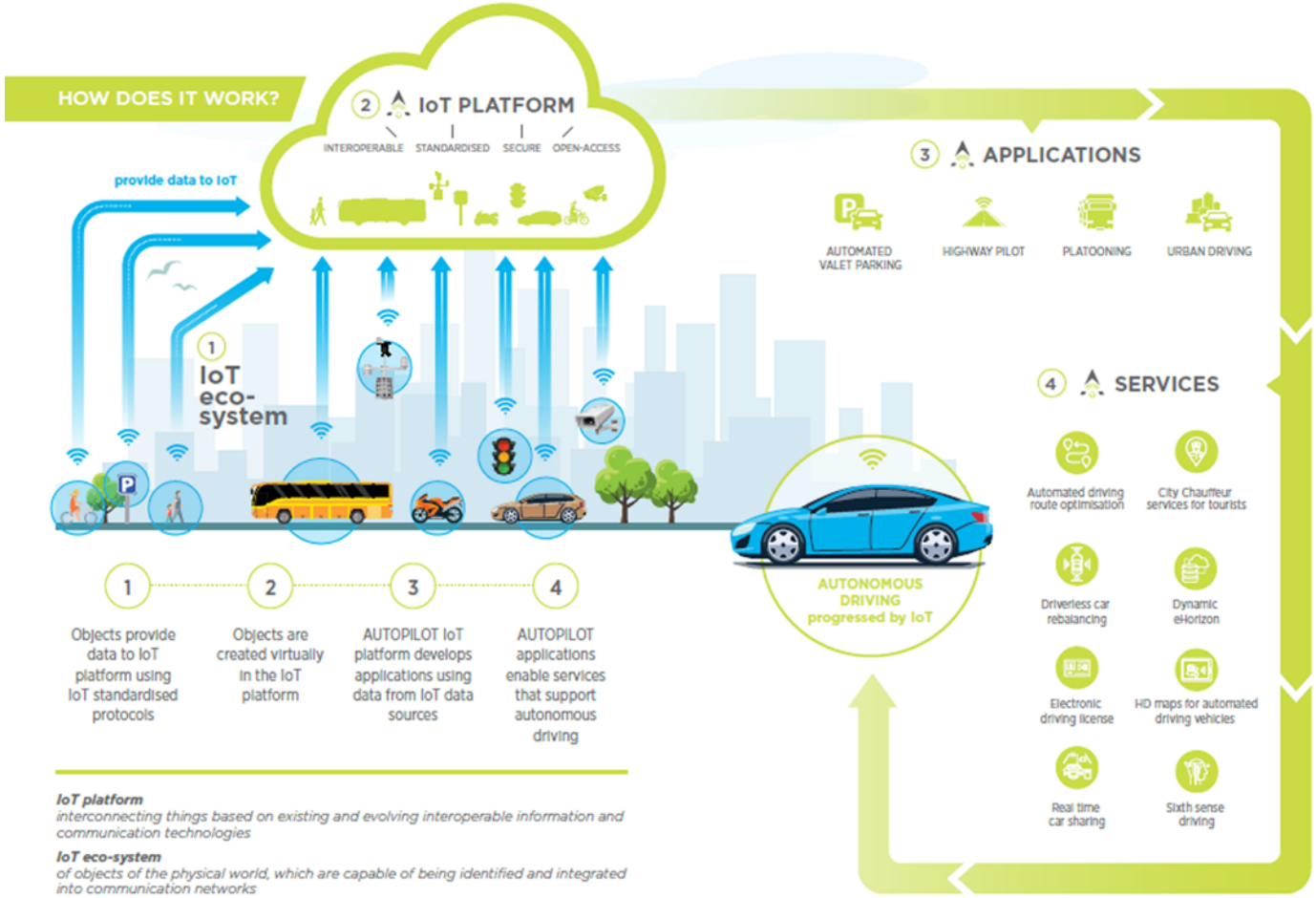
AUTOPILOT

AUTOmated driving Progressed by the Internet Of Things

AUTOPILOT - AUTOMATED DRIVING PROGRESSED BY INTERNET OF THINGS – is developing an **IoT connected vehicle platform** and **IoT architecture based on the existing and forthcoming standards**, as well as open source and vendor solutions. The IoT ecosystem accommodates vehicles, road infrastructure and connected IoT objects, with particular attention to safety critical aspects of automated driving. The project develops a range of services combining autonomous driving and IoT, such as car sharing, autonomous valet parking, and better digital maps for autonomous vehicles.

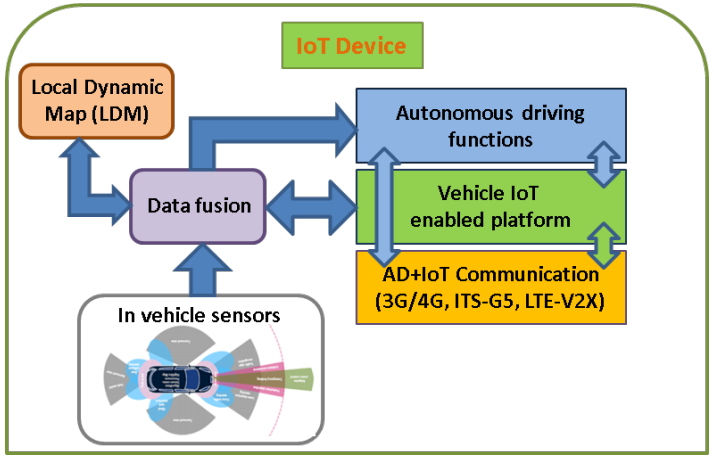
AUTOPILOT. Project information

European Large-Scale Pilots Programme



IOT to transform automated driving

Vehicle IoT integration



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AUTOPILOT. Targets

European Large-Scale Pilots Programme

- Develop global IoT platforms and architecture
  - for the provision of automated driving application and services
- Provide Vehicle IoT platform integration
  - to make the vehicle an IoT device dealing with IoT sensor data
- Deploy an Eco-system of IoT sensors (Pedestrian, vehicles, infrastructure ...)
- Use and assess advanced connectivity technology (pre-5G, LTE-V2X, ITS-G5)
- Assess IoT suitability and benefits for the automated driving, the users and for the business exploitation
- Contribute to the IoT and Functional Safety standardisation

AUTOPILOT. IoT benefits

European Large-Scale Pilots Programme

1. Use existing sensor devices connected to the internet (camera, intelligent traffic light, Smart phones, environment sensing devices …)
2. Sensor redundancy: pedestrian detected by IoT device and in-vehicle sensors
3. IoT platform federation and native wireless security (e.g. Cellular) provide the required basis to support sharing data among the relevant stakeholders
4. Create new services and business models over IoT/Cloud platform e.g. Mobility as a Service allowing 3rd party service providers
5. IoT Cloud platform to provide “augmented reality” information to vehicles: e.g. traffic jam, obstacles …

AUTOPILOT. Pilot sites

European Large-Scale Pilots Programme

Eindhoven, NL

Versailles, FR

Vigo, SP

Livorno, IT

Tampere, FI

Daejeon, KR

Use cases	FI	FR	IT	NL	SP	KR
Valet Parking	X			X	X	
Highway Pilot			X	X		
Platooning		X		X		
Urban Driving	X	X	X	X	X	X
Car Sharing		X		X		

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AUTOPILOT TEST-SITE VIGO. SISCOGA^{4CAD} Corridor

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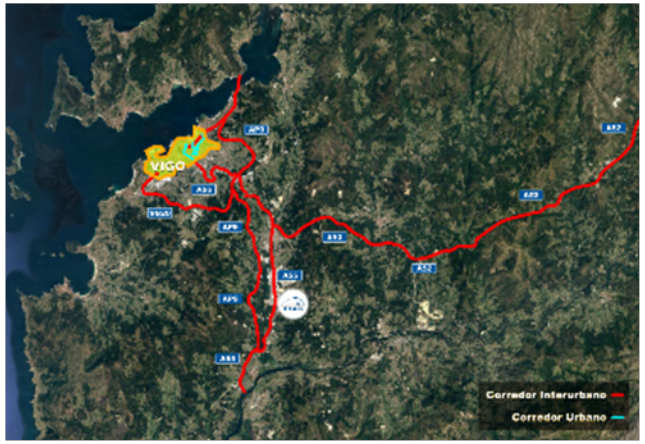

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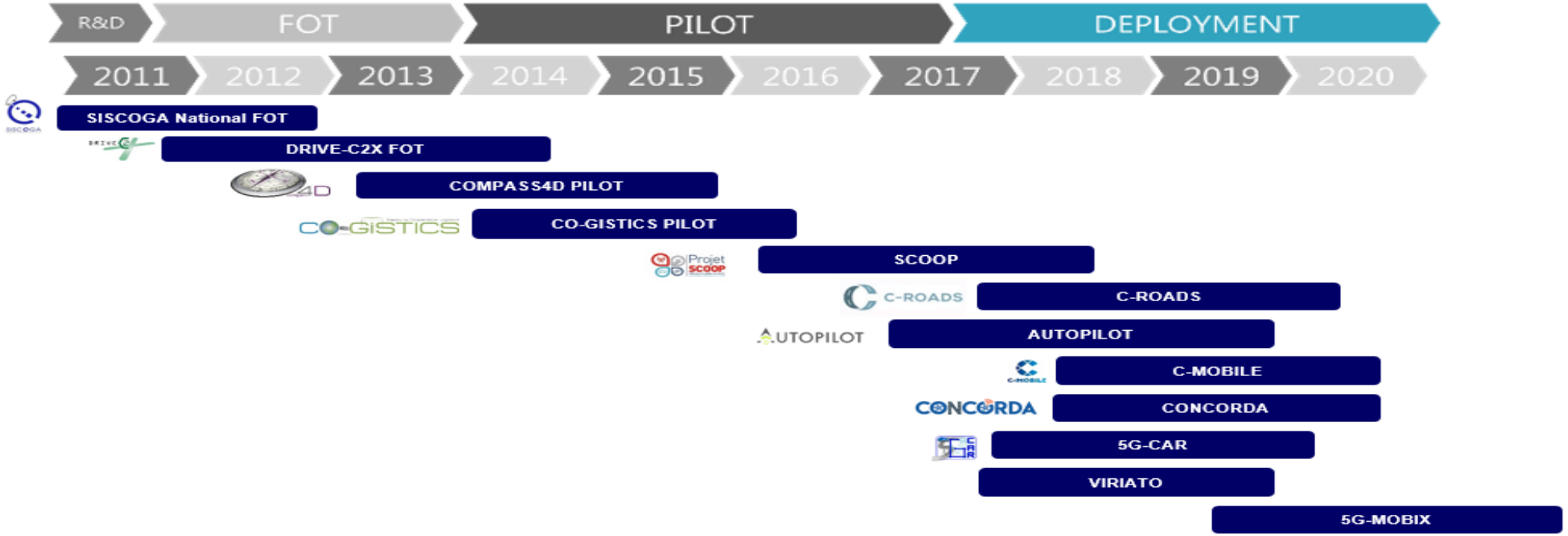
AUTOPILOT TEST-SITE VIGO. SISCOGA^{4CAD} Corridor

European Large-Scale Pilots Programme



AUTOPILOT.
Test-site Vigo

European Large-Scale Pilots Programme

CONCELLO DE VIGO	Traffic Authority Road Enabler	• **Enabling the road infrastructure adaptation and use for piloting AUTOPILOT use cases**
PSA GROUPE	Vehicle Manufacturer	• Wide expertise in C-ITS services, AD functions • **2 vehicles for being automated and equipped with IoT platform.**
CTAG	Test Site Leader	• Developing & testing of automated driving applications • Developing & testing of C-ITS and connected vehicle services • Background in Pilot managing • **1 Vehicles automated with IoT platform**

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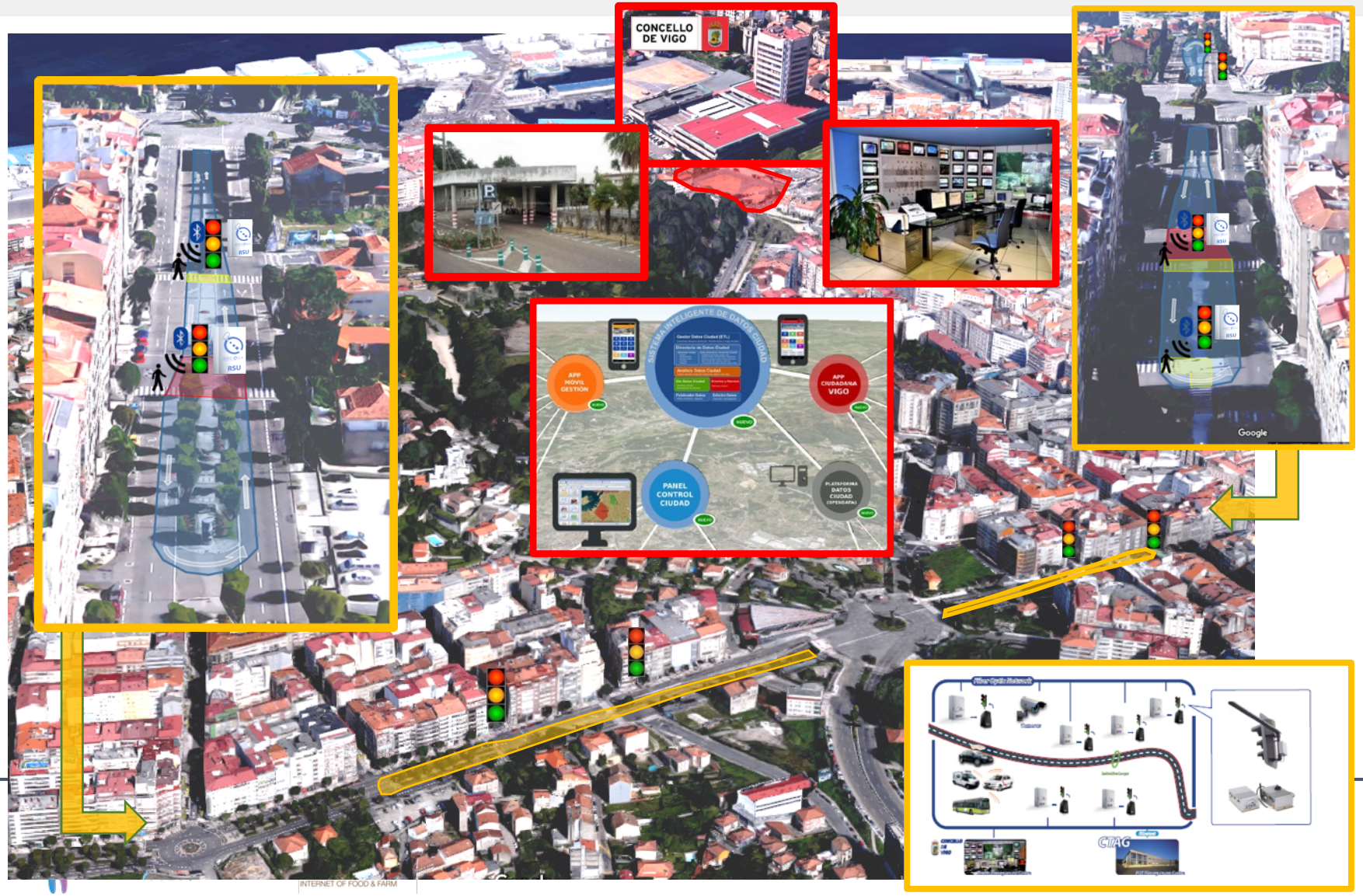
AUTOPILOT.
Test-site Vigo

European Large-Scale Pilots Programme



CREATE-IoT

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AUTOPILOT.
Test-site Vigo. General IoT architecture

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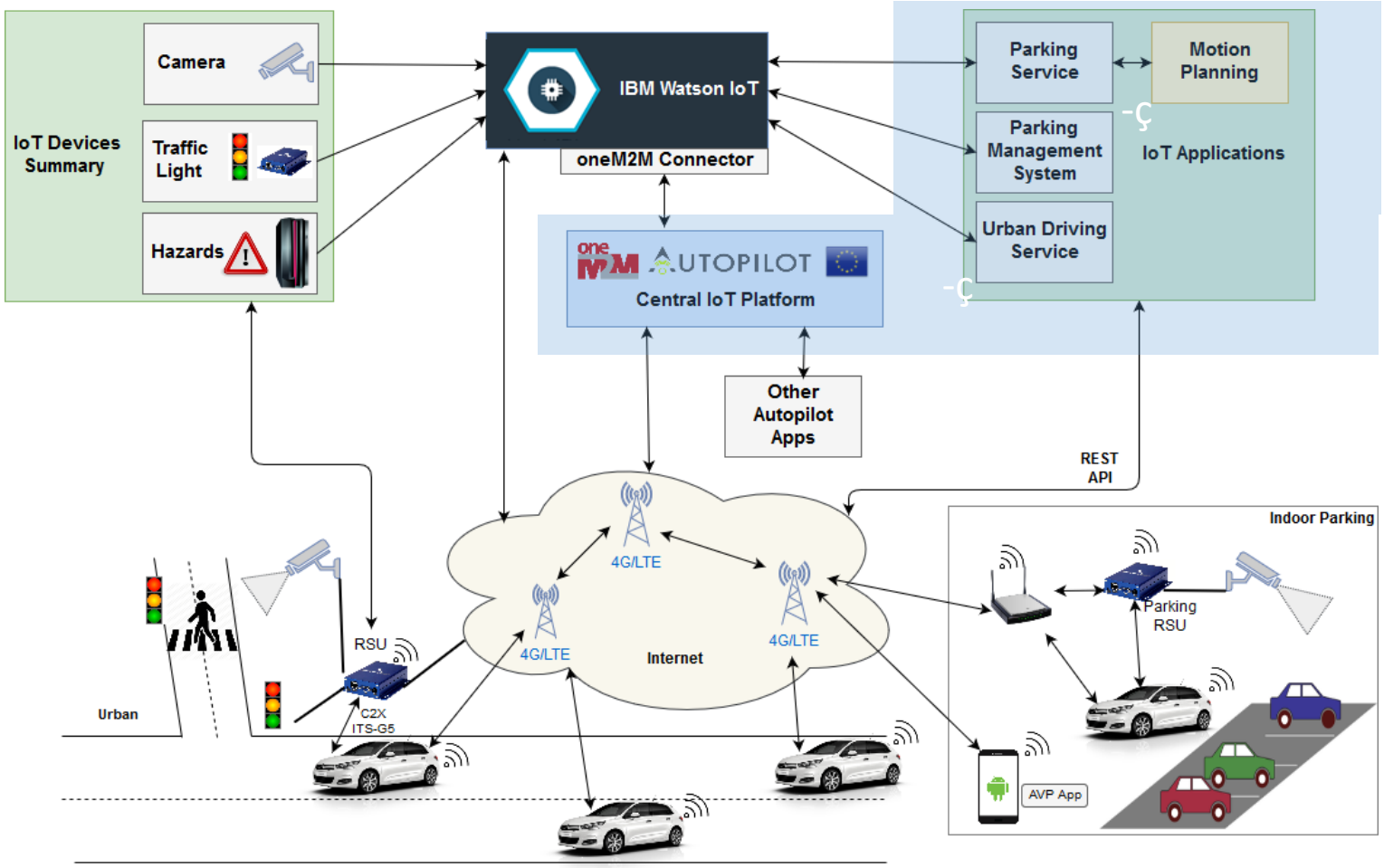
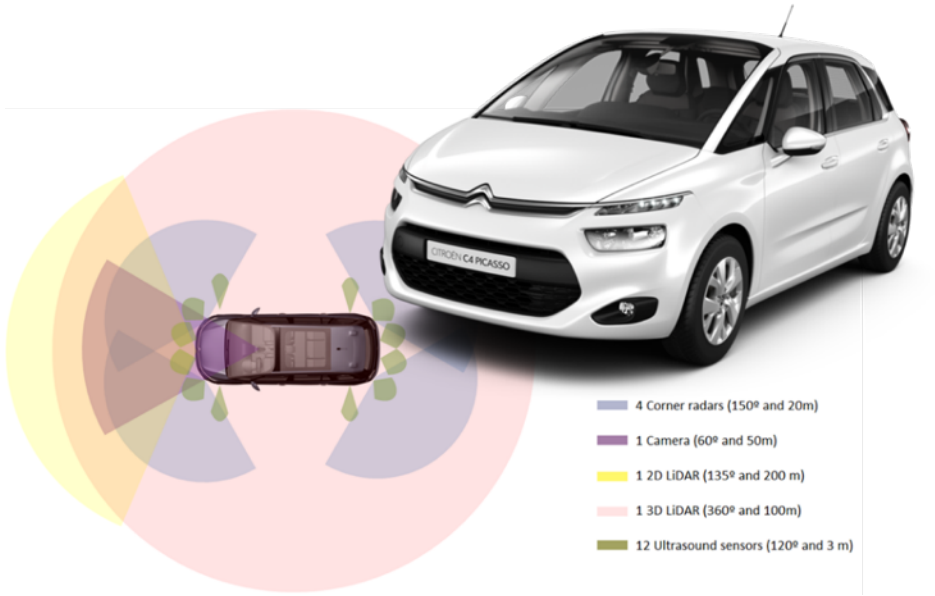
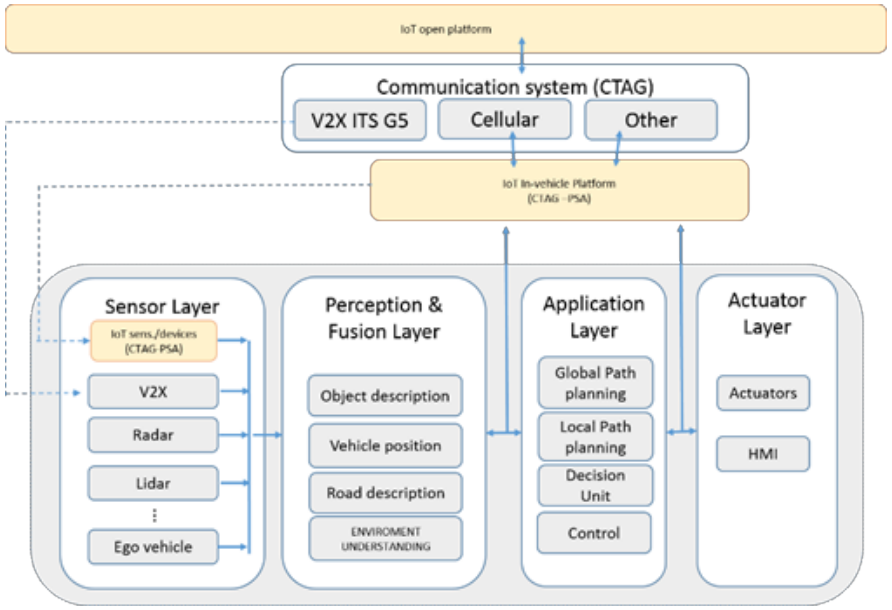


AUTOPILOT.
Test-site Vigo. Prototypes

European Large-Scale Pilots Programme

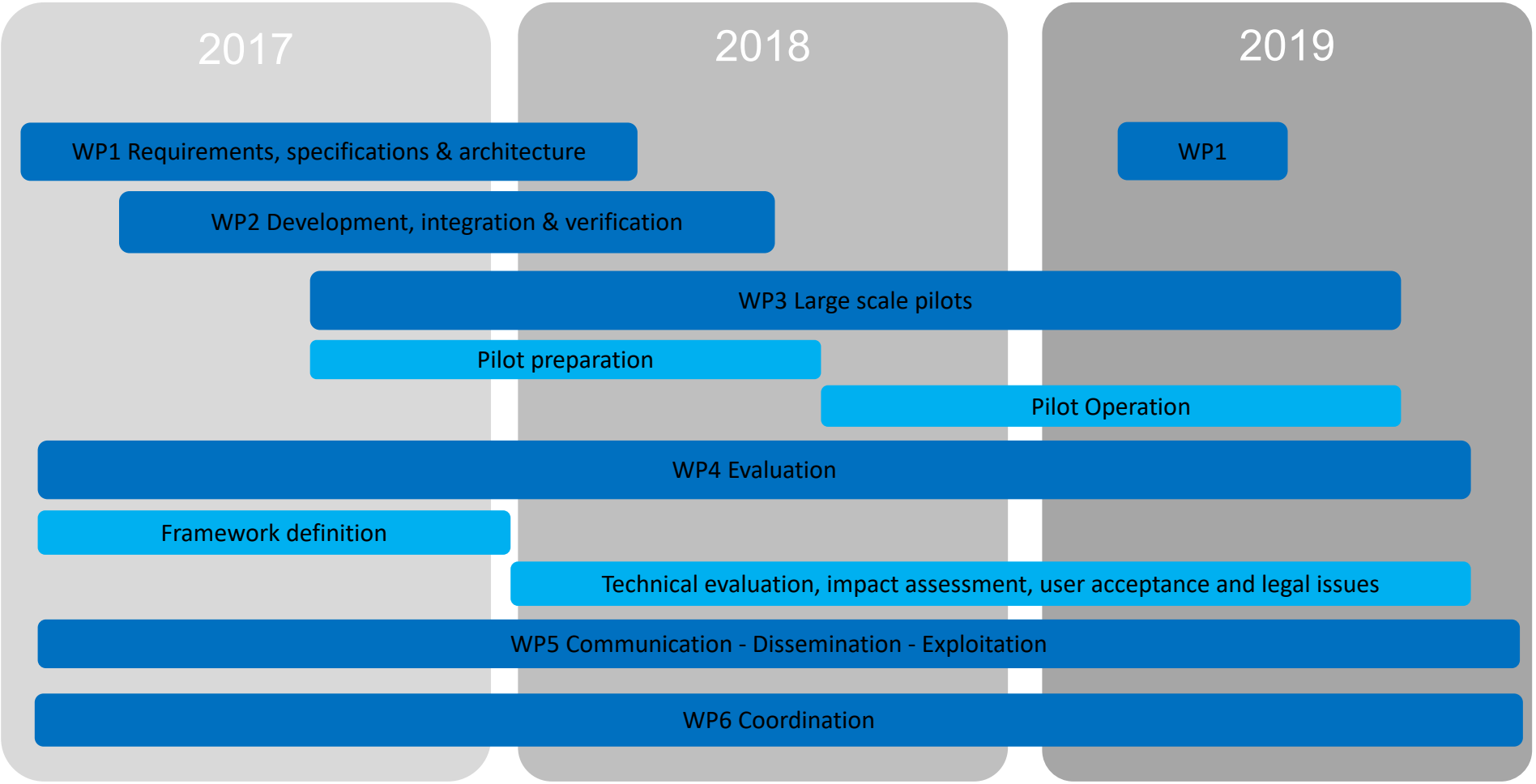




- 3 C4 Picasso Prototypes → 1 from CTAG and 2 from PSA
- 360º sensors, map unit, DGPS and rapid prototyping platforms for function and perception algorithms.
- Communication system → V2X (802.11p, G5) and Cellular
- IoT in vehicle platform

AUTOPILOT.
Test-site Vigo. Timeschedule

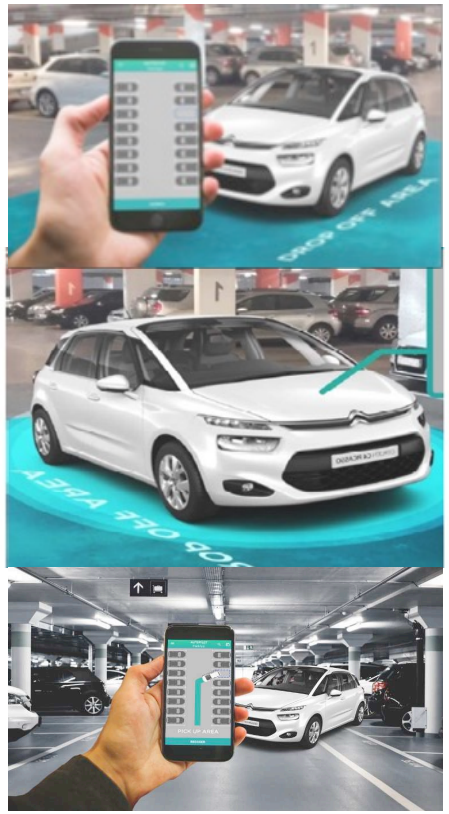
European Large-Scale Pilots Programme



AUTOPILOT Test-site Vigo. Autonomous Valet Parking

European Large-Scale Pilots Programme

- Parking Slot Booking
  - The driver publishes a parking slot request
  - The Parking service checks the available parking slots and sends back a parking slot book confirmation
  - The vehicle/driver drives to the parking drop off/pick up place and leaves the car
- Drop-off: Map reception, route following and parking maneuver
  - Parking service sends the map of the parking with the path to the slot.
  - The AD prototype follows the path to the slot using information from in vehicle and parking sensors.
  - Once the assigned slot is detected, the AD prototype performs the parking maneuver.
  - The AD prototype goes off and an information message is sent to the driver.
- Pick-up: unparking maneuver and route following
  - The driver is in the pick up area and sends a request to take the vehicle back.
  - The AD prototype starts, leaves the slot and follows the route to the drop off/pick up area using information from parking and in vehicle sensors.



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- GLOSA
  - Traffic lights send status information to the IoT Open Platform
  - In vehicle communication platform receives Traffic light status
  - The AD prototype adapts its speed in order to save fuel and avoid sudden breakings and accelerations; as well as minimize the time stopped

- VRU
  - Traffic sensor or/and in vehicle sensors detects a VRU and send the information to the IoT Open Platform
  - In vehicle communication platform receives VRU position
  - The AD prototype reduces its speed until it is safe to stop suddenly

- Road events
  - TMC sends information about a road event (road works, accident…) to the IoT Open Platform
  - In vehicle communication platform receives position and type of event
  - The AD prototype adapts the speed in order to reach the event with a speed that allows a sudden stop in a safe way.

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Outline

European Large-Scale Pilots Programme

- Automotive context introduction
- AUTOPILOT Project
- AUTOPILOT Test-Site Spain
- Summary

Thank You!

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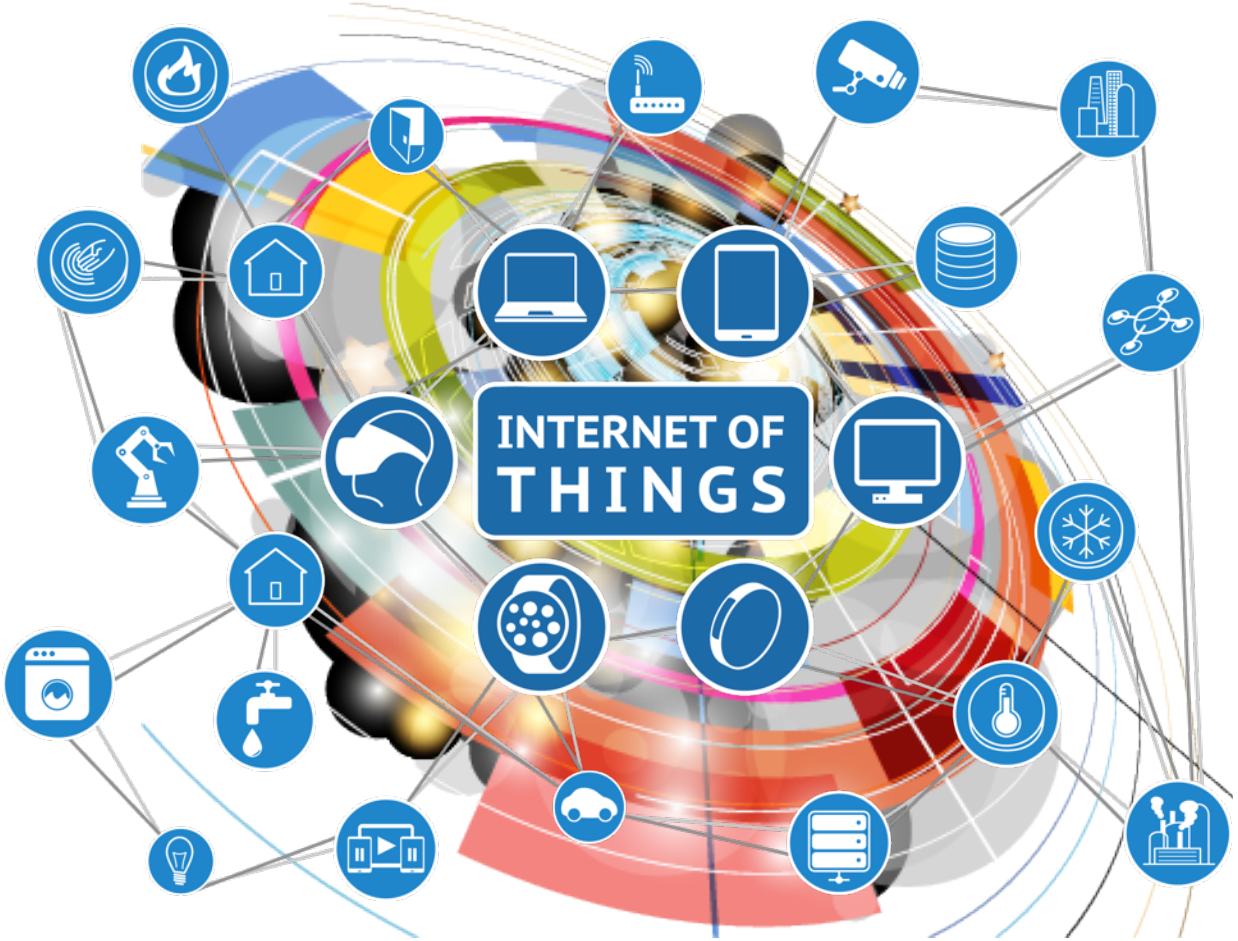

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