Autonomous Vehicles

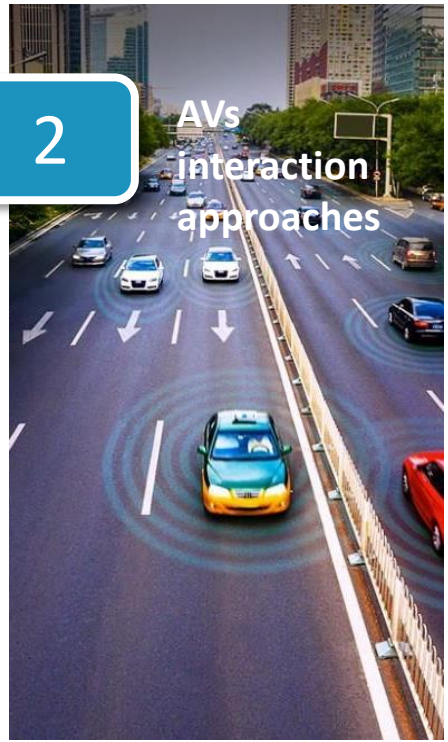
Infrastructure Overview

Brisa

Conceição Magalhães

3rd AUTOCITS workshop, October 10th, 2017

Planning for today



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Current Situation

Role of road infrastructure operators

Safety Management/Information

Traffic Management/Information

Toll collection

Tolling as the most efficient way for finance infrastructure

Brisa is a key player within European spectrum

As ASECAP member

- Exchange information, experiences and best practices on road transport policies
- Fully implement the European “user pays” and “polluter pays” principles
- Strengthening the efficiency of their network and constantly improving the level of services provided

Applying state-of-the art technology and best operational practices

SECAP has relevant influence in Europe

Fully supports the Amsterdam Declaration

With direct impact on:

- Road safety
- Efficiency objectives
- Accessibility, comfort and social inclusion
- Environmental objectives

Active participation in major projects:

C-ROADS

Projet SCOOP

ECo-AT

Automated driving will change the future of mobility in Europe

Europe, Europeans and Mobility

Europeans, on average, travel close to

35,000

passenger kilometers per year

64%

trips made by car

Every year a typical cityzen makes

923

Trips

2.5

trips per day

Automated driving will change mobility patterns

Europe, Europeans and Mobility

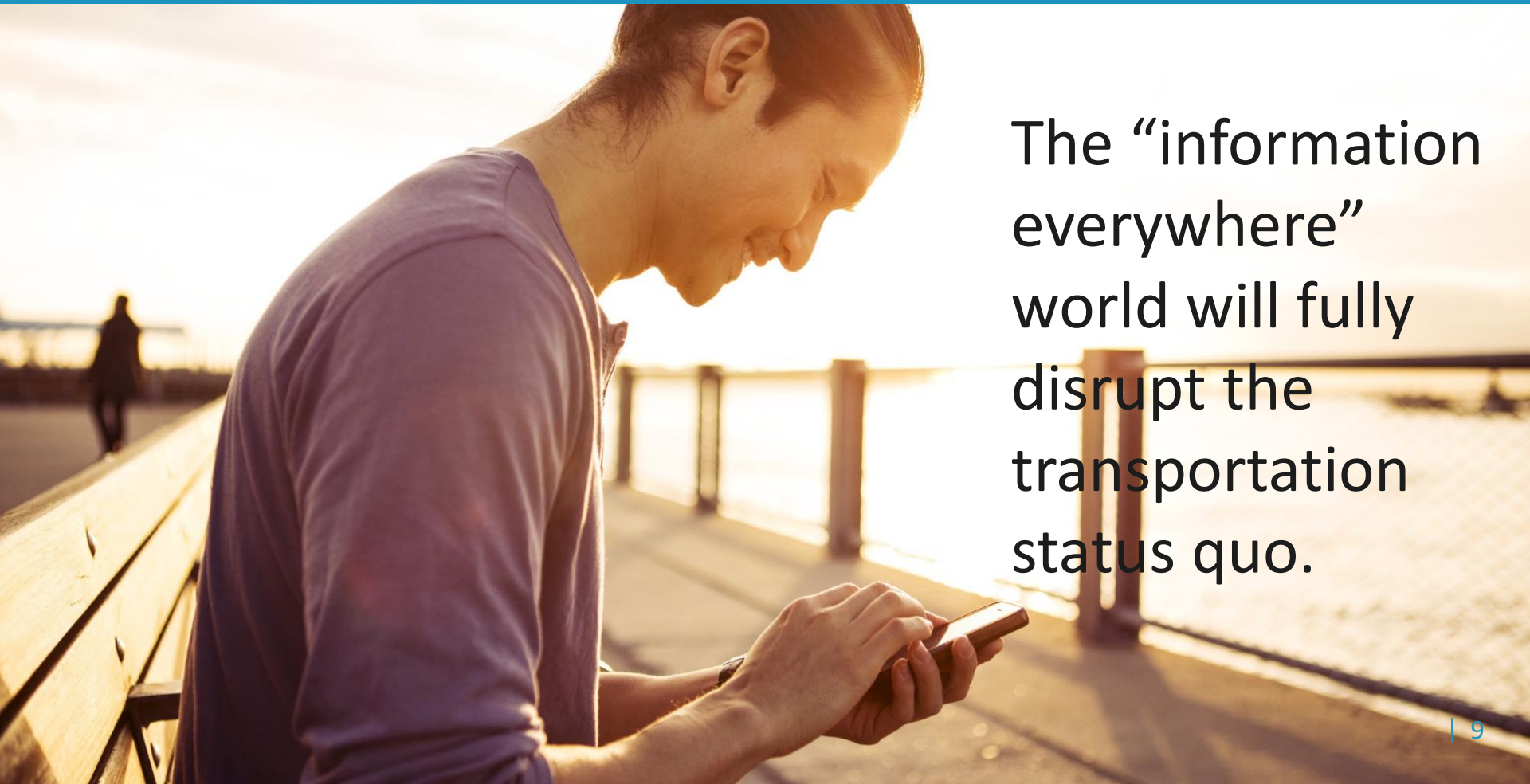
Number of miles driven per person has fallen by

8.5%

Use of **public transport** has **increased**

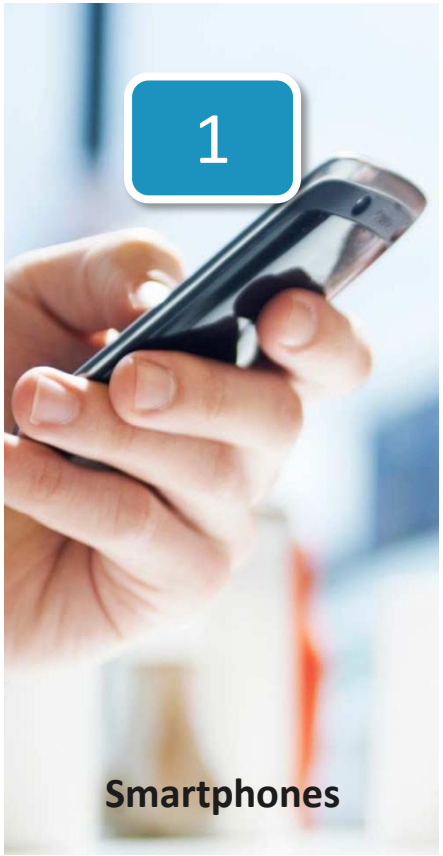
Change is happening quite fast…

Its real and happening

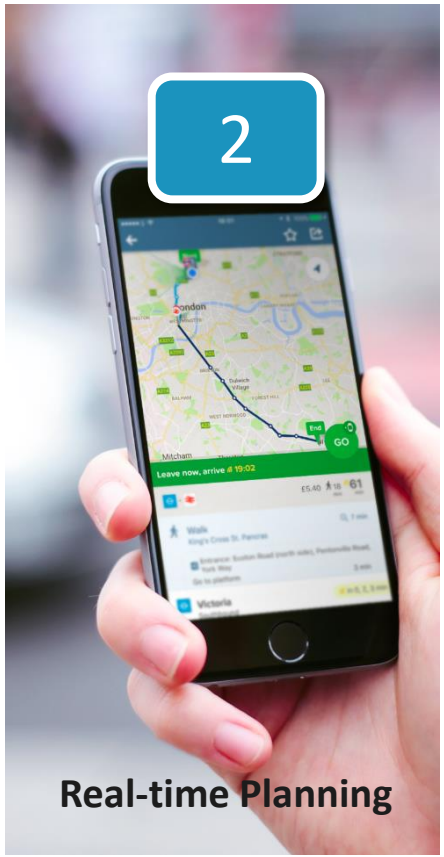


The “information everywhere” world will fully disrupt the transportation status quo.

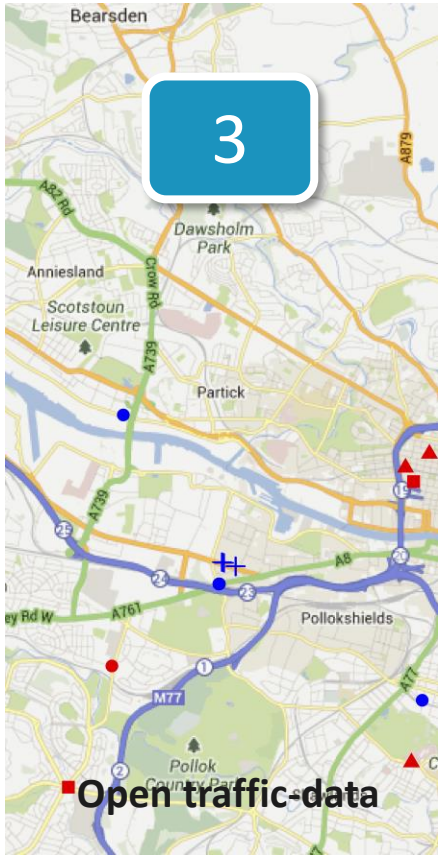
Digital age began



Smartphones



Real-time Planning

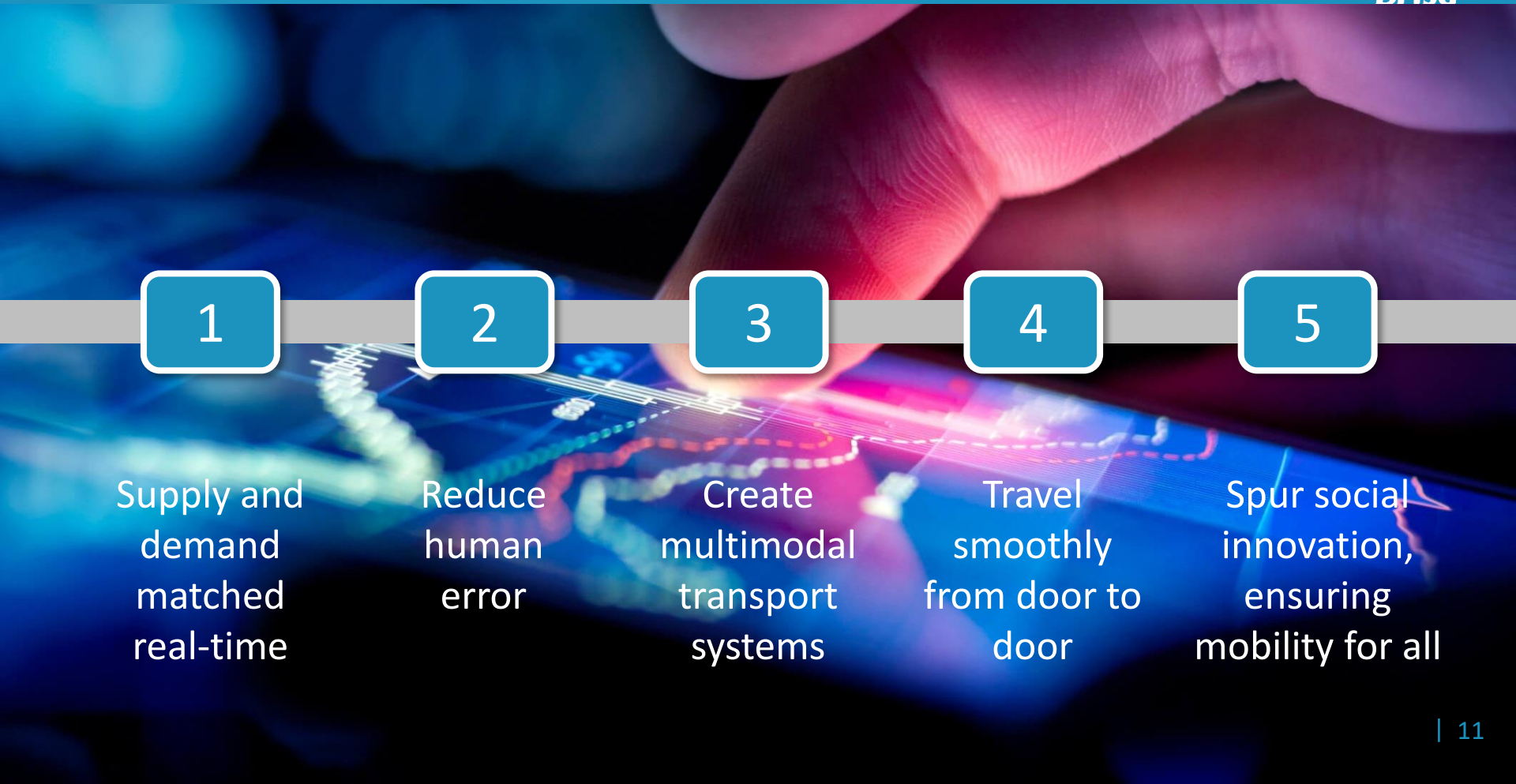


Open traffic-data

Social customer service

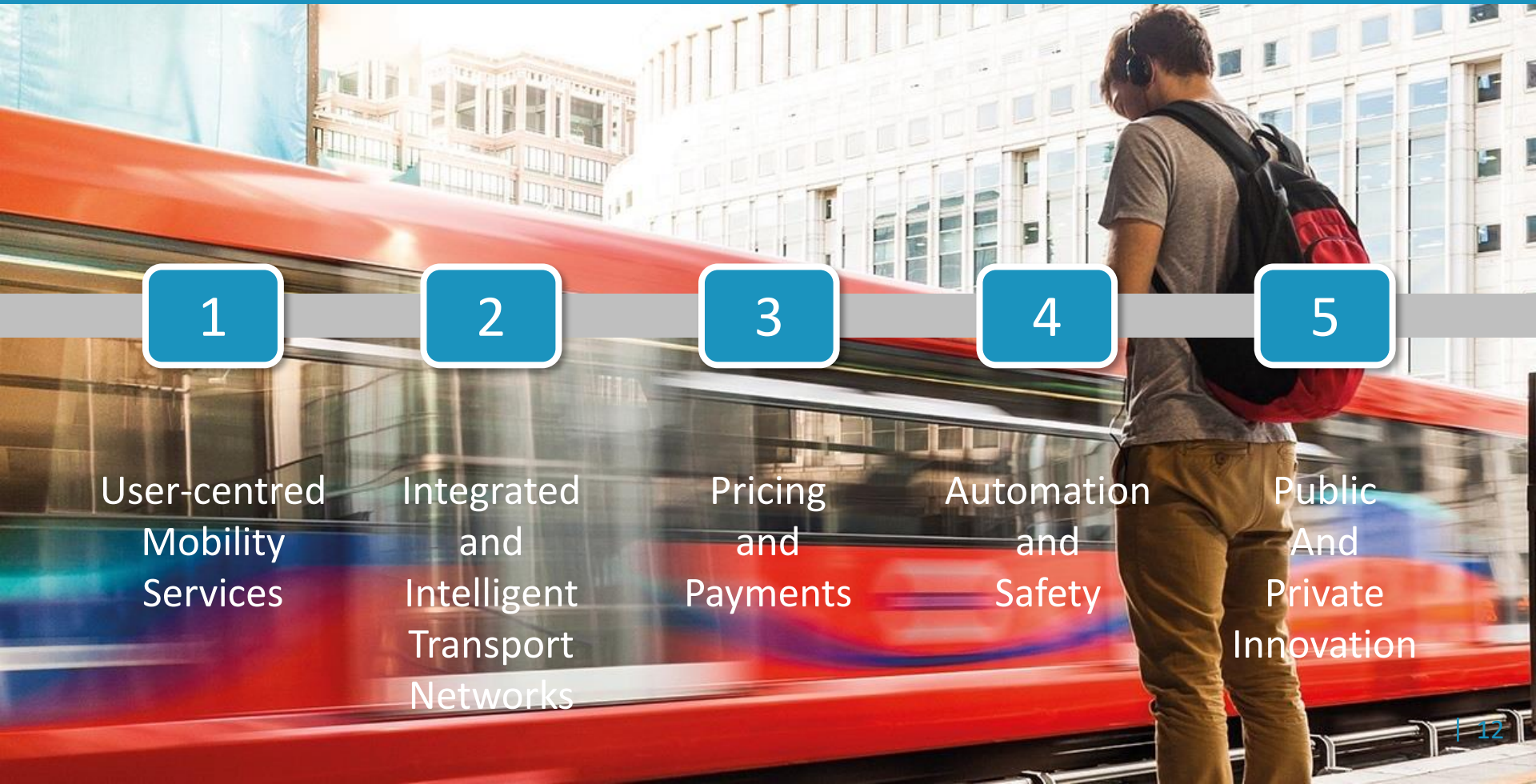
Costumers have more information than road infrastructure operators

Digital technology allows



1. Supply and demand matched real-time
2. Reduce human error
3. Create multimodal transport systems
4. Travel smoothly from door to door
5. Spur social innovation, ensuring mobility for all

Disruptive trends for road transport



1. User-centred Mobility Services
2. Integrated and Intelligent Transport Networks
3. Pricing and Payments
4. Automation and Safety
5. Public And Private Innovation

In a broader way ... The World is changing

Behavior

Access to products without the burdens of ownership - "sharing economy”

Technology

Smart systems, big data, IoT , AI, and smartphones
“always-on digital world”

Economy

Moving from a "throwaway culture" to a sustainable circular economy

Requiring increasingly more sophisticated technology

And the future is …

"25 years from now, car sharing will be the norm, and car ownership an anomaly."

Jeremy Rifkin, Author and Economist"

Source: Goldman Sachs Global Investment Research

And the future is …

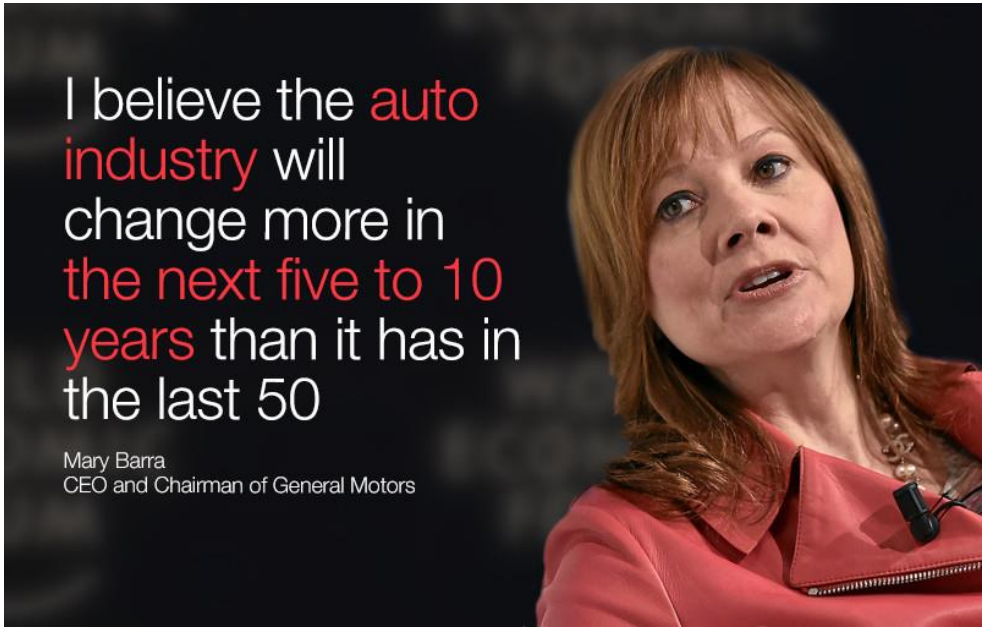
"My smartphone is my preferred mode of transportation."

Rt. Hon. Patrick McLoughlin, UK
Secretary of State for Transport

Source: Delloite, march 2015

Automotive industry is not an exception

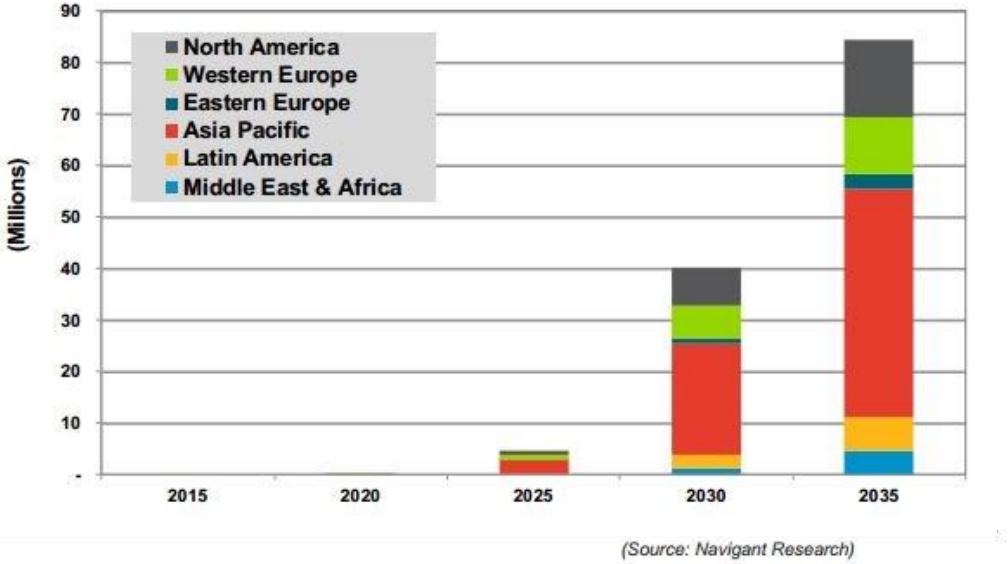
Automated driving is the major technological advancement



- Potential for change is great but…
- With new technologies come new risks
- New risks have been causing public fear and scepticism about AVs
- Motivations for their development include safety, efficiency and improvements in quality of life and work

"When" and "how" will AVs impact road infrastructure operators?

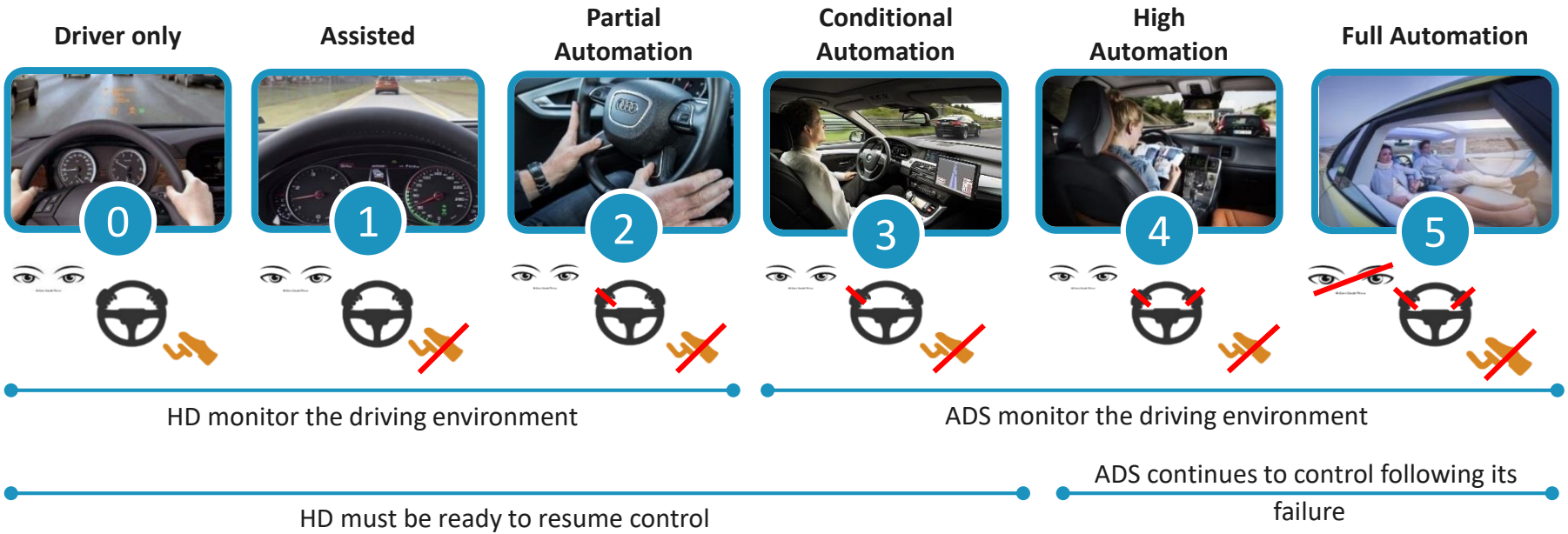
Estimated number of AVs by world region



In 10 to 14 years we might have a considerable hypothesis of having a non-negligible percentage of autonomous vehicles circulating

Autonomous vehicles are already here

Automation Levels according SAE classification



Level 3 or higher will be firstly deployed on motorways

Level 3 of automation will be deployed first

- It relies closely on V2I and I2V communications
- It could be also enhanced by allowing V2V connectivity
- It will depend on the active role of road infrastructure operators

Road infrastructure operators will need to be prepared

And road operators

Key role of traffic management centers must be underlined

Managing Effectively and Safely

- Traffic
- Accidents and incidents

Regulating the traffic flow

- conventional vehicles
- automated vehicles

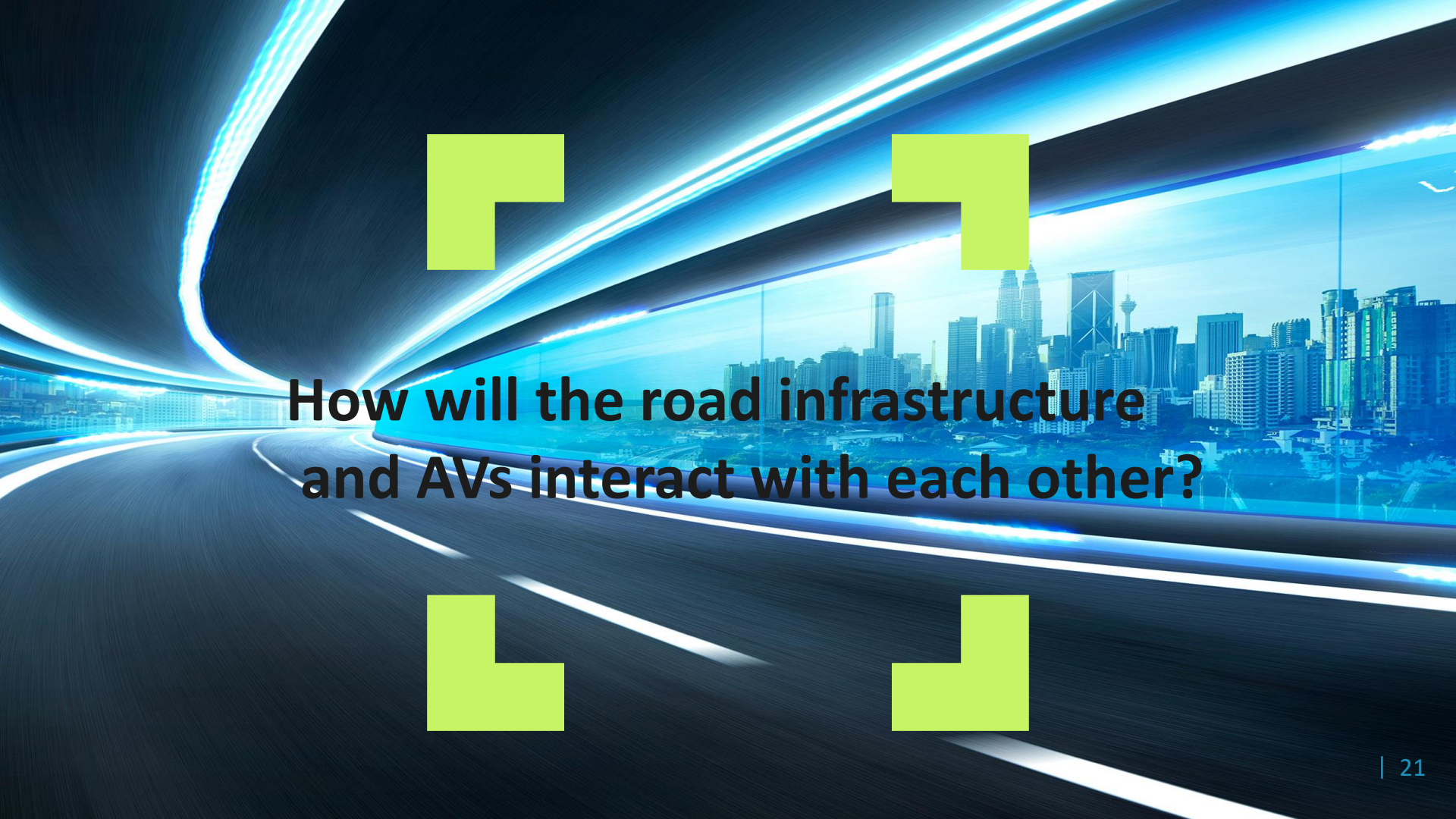
Providing new and **dedicated:**

- **Road safety information/data**
- **Services**
- **Traffic information**

AVs

- Providing **conventional services** via existing communications links

CVs


How will the road infrastructure
and AVs interact with each other?

2

AVs interaction approaches

Autonomous vehicles approach

Sensor Based Vehicles

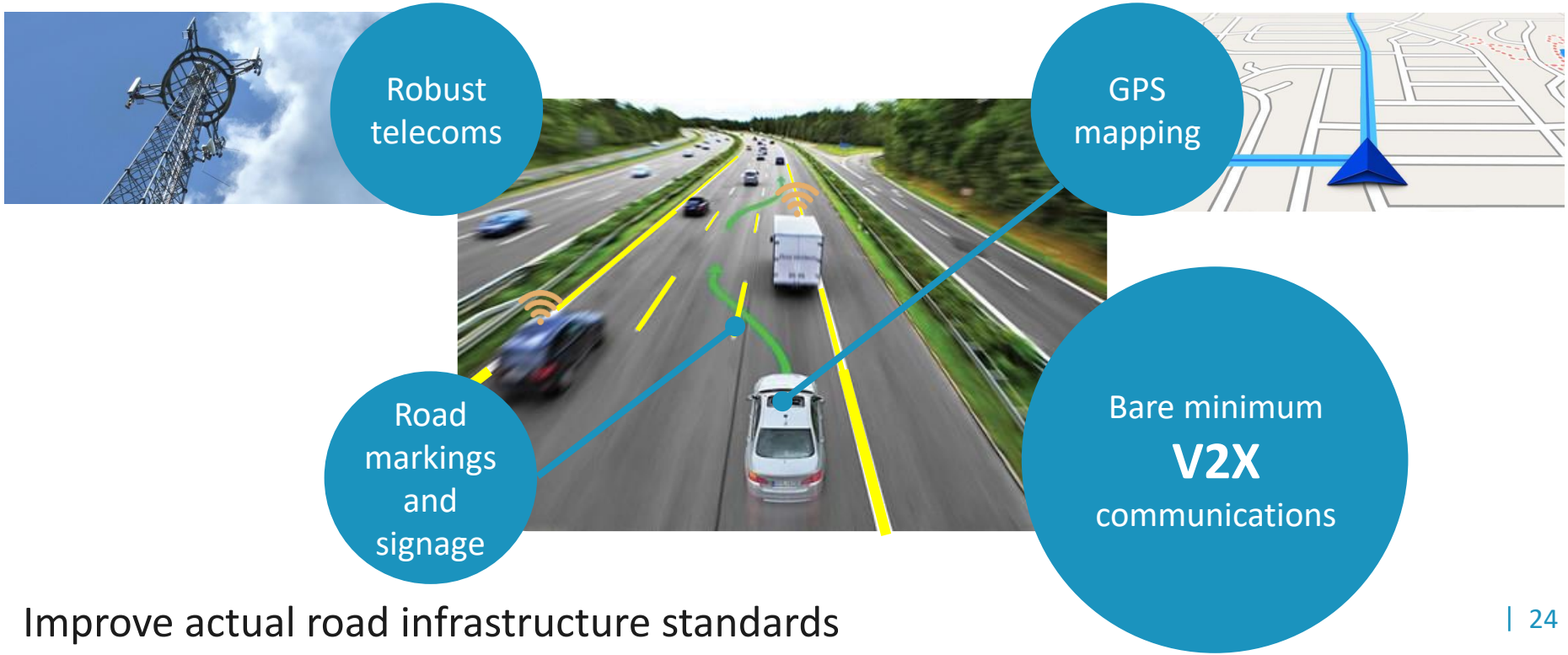
Enhanced digital infrastructure

Physical infrastructure

Relies on machine learning

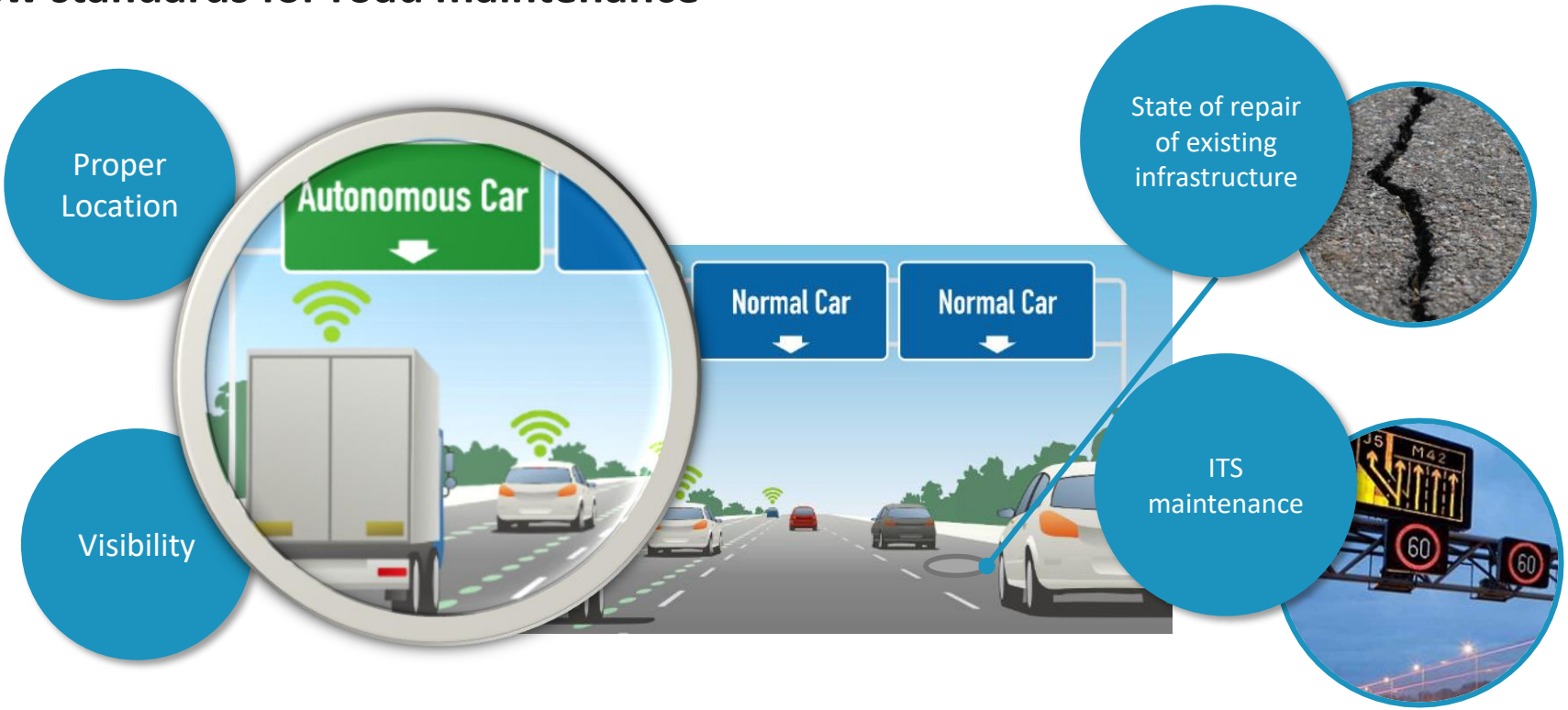
What's happening with Autonomous Vehicles

Require, for minimum, from infrastructure



Improve actual road infrastructure standards

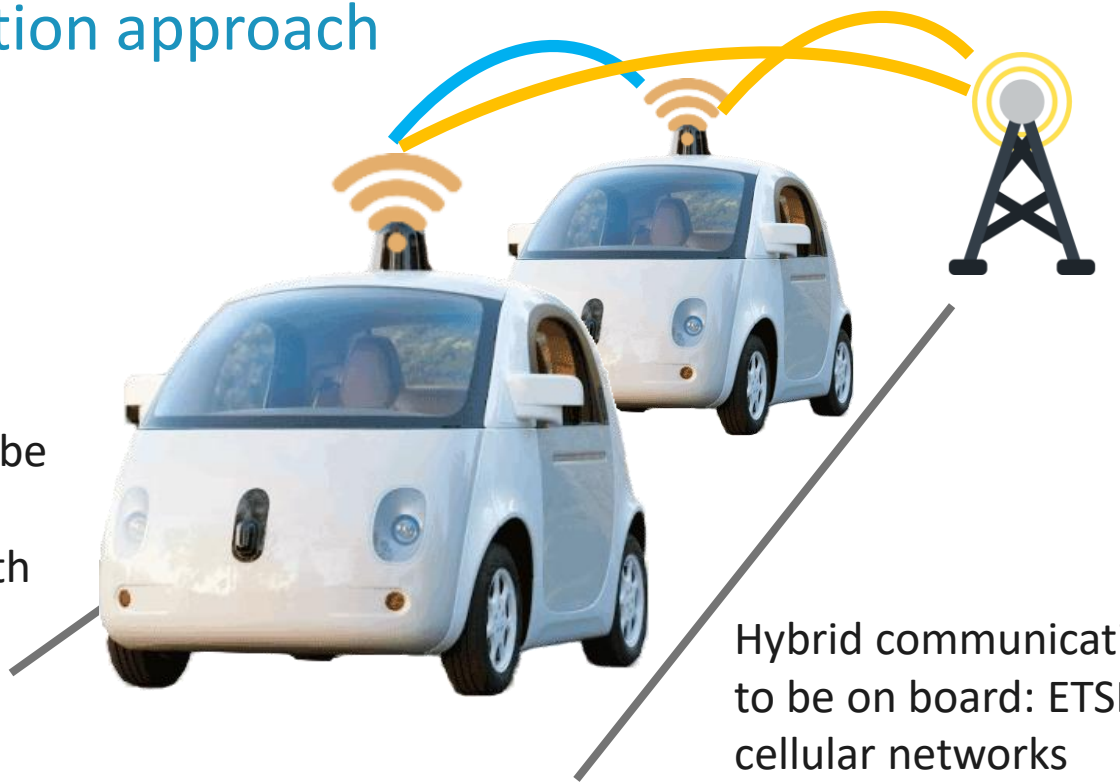
New standards for road maintenance



Replacing the need for actual infrastructure improvement

Vehicle connection approach

- Based on vehicle cooperation and communication
- Requires road infrastructure to be connected and communicate with AVs



Hybrid communication mix needs to be on board: ETSI ITS-G5 and cellular networks

Relies on wireless technology for communications

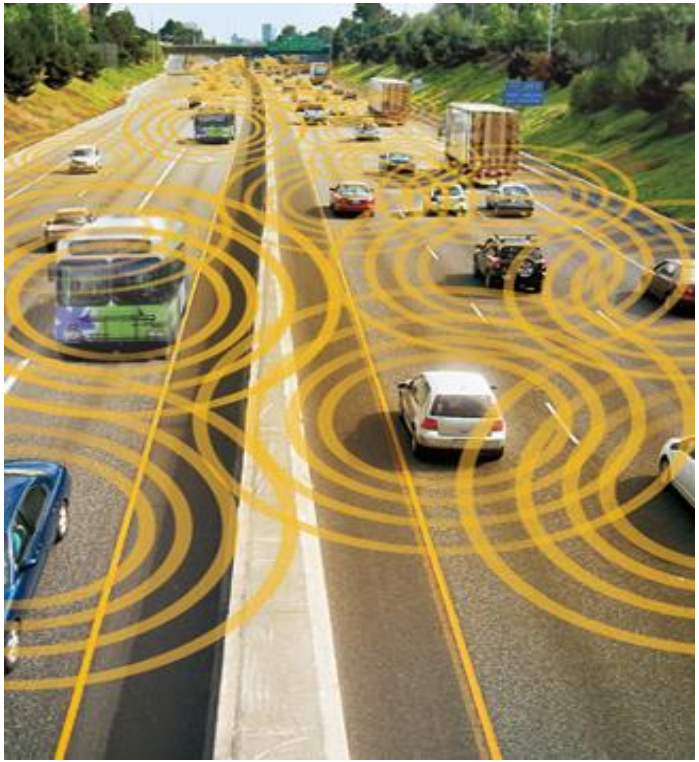
Vehicle connection approach

Main obstacles:

- Investments required to endue extensive portions of road network with wireless short range communications compliant transceivers: ITS-G5/DSRC

Different or complementary solutions are being studied:

- Cellular technology 5G for long-range communication
- Satellite based communications



Require equipping infrastructure with transceivers

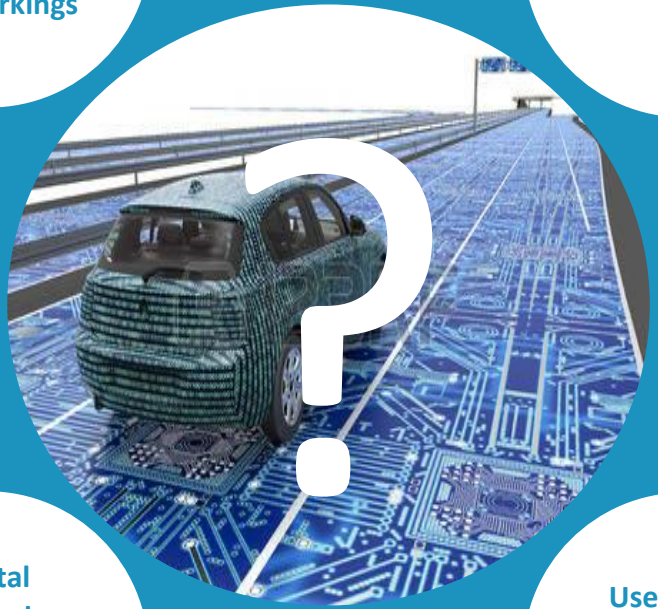
The way through

To enhance safety and create conditions for AVs success, road infrastructure must be properly adapted …

A game change: not possible before

Minimum standards for road signs and markings

Dedicated lanes for AVs



Digital mapping of speed limits

Interchangeable modular lanes for AVs

Digital infrastructure for connectivity: C-ITS

Use of hard shoulders on an as-needed basis

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Ongoing Projects

C-ROADS PORTUGAL

Co-financed: Connecting Europe Facility (CEF)

Sub-project budget: 2M€

Duration: 2017 - 2020

Coordination: IMT - Institute for Mobility and Transport

Partners:

Goals: Ensuring a test bed for AVs (A2) and truck/car platooning (A6)

A2 and A6 intelligent motorways

SCOOP@F Part 2

Financed: European Commission Program CEF Transport

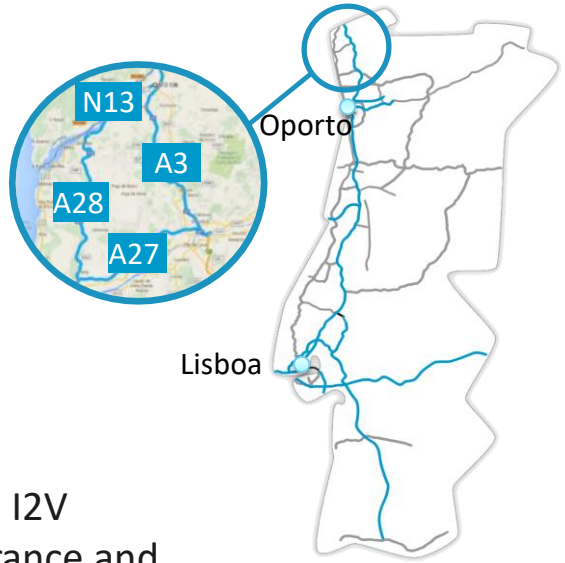
Total budget: ≈ 20 M€

Duration: 2016 - 2018

Partners:

Goals:

- Develop a large scale test for some C-ITS services
- Promoting traffic and safety information sharing: V2I and I2V
- Ensuring interoperability tests with other pilots: Spain, France and Austria



Ensuring interoperability of C-ITS platforms across some European borders

Operational integration of CVs and AVs on motorways

Financed: BRISA - Auto-estradas de Portugal, S.A.

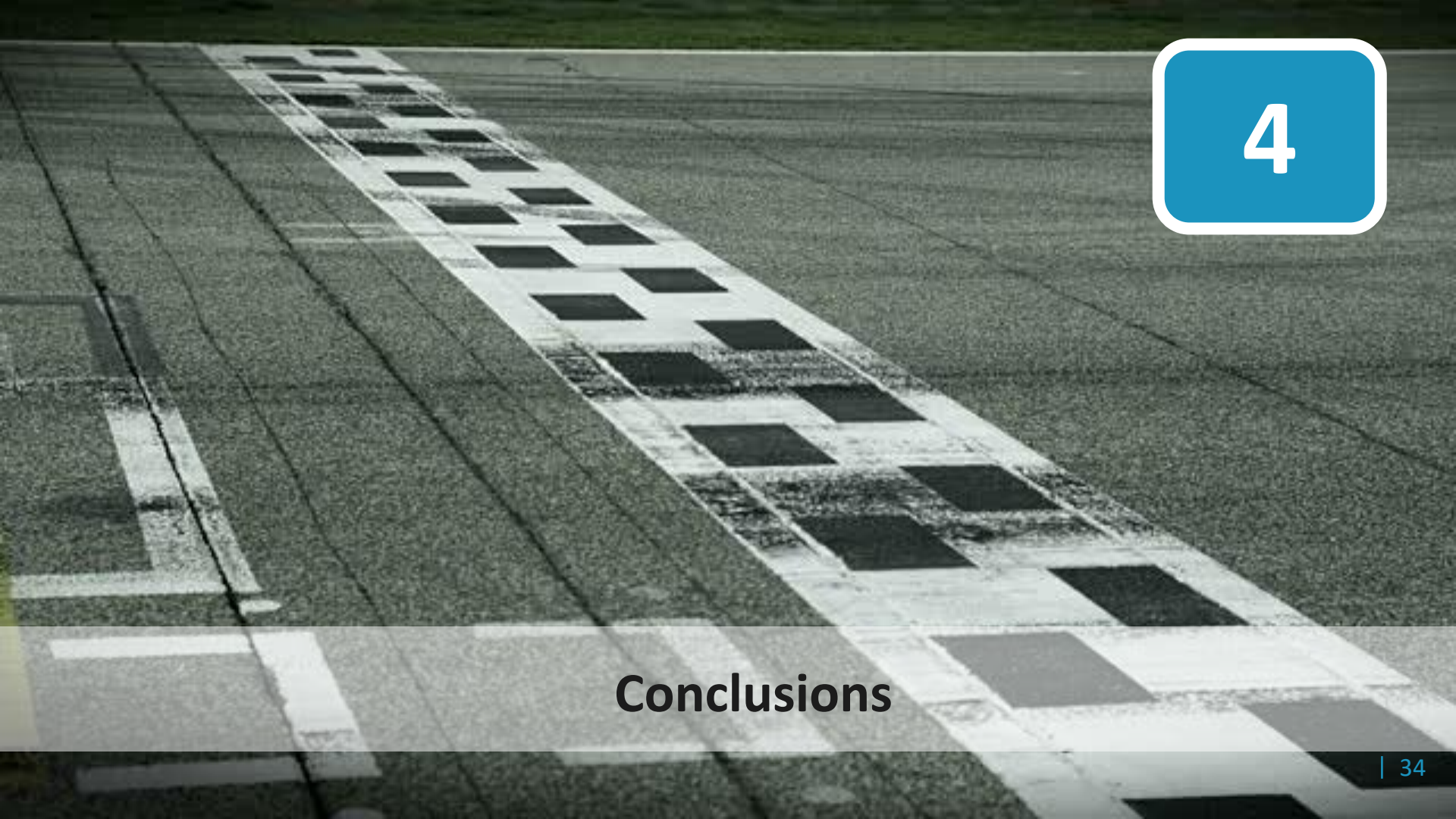
Duration: 2015 - 2020

Partners:

Goals:

- Support a smooth AVs implementation
- Support AVs operation, in mixed traffic environments
- Boost their interaction with physical infrastructure and its management
- Keep guaranteeing highest safety standards

Ensuring that the main benefits from AVs will be delivered minimizing risk



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Conclusions

Road infrastructure is facing **new challenges** and needs to be prepared for convert them into opportunities: **improving performance, becoming even more sustainable**

Adopting new and **emergent technologies**, such as AVs and C-ITS services, will **allow motorway operators** to achieve **higher** efficiency and **value from their investments**

Autonomous and vehicle connection approaches

are being studied and

can become a combined technology

To maximize AVs consumer acceptance,
policymakers, regulators and motorway operators must
work in coordinated and cooperative way

“Automation of road traffic,
it’s all about safety and efficiency.”

Mathias Wissmann,
Former German Minister of Transport
President of the German Association of the Automotive Industry (VDA)

Autonomous Vehicles

THANK YOU

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