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5 - 8 May, 2022 | Lisbon

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ITS SOLUTIONS –SMART INFRASTRUCTURES

C-ITS Implementations at Infraestruturas de Portugal

João Carlos SILVA

Departamento de ITS e Acessibilidade

Agenda

1. CURRENT CHALLENGES
Congestion, Energy, Resilience

2. SMART INFRASTRUCTURE AND C-ITS
Innovation and New Operation Concepts

3. C-ITS PROJECTS AT INFRAESTRUTURAS DE PORTUGAL
The implementation of a Smart Infrastructure

4. THE ROAD AHEAD
Next steps in Development and Deployment

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01. CURRENT CHALLENGES
Demographics

THE RISE OF POPULATION IN URBAN AREAS, HIGH TRAFFIC VOLUMES AND DENSE ROAD NETWORKS NETWORKS

Source:South China Post

Source:Rádio BandNews FM (SP/BR)

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01. CURRENT CHALLENGES
Climate Change

CLIMATE CHANGES AND EXTREME WEATHER EVENTS AND THE IMPACT ON INFRASTRUCTURES

Source: Matulla et al., 2018. Theoretical and Applied Climatology

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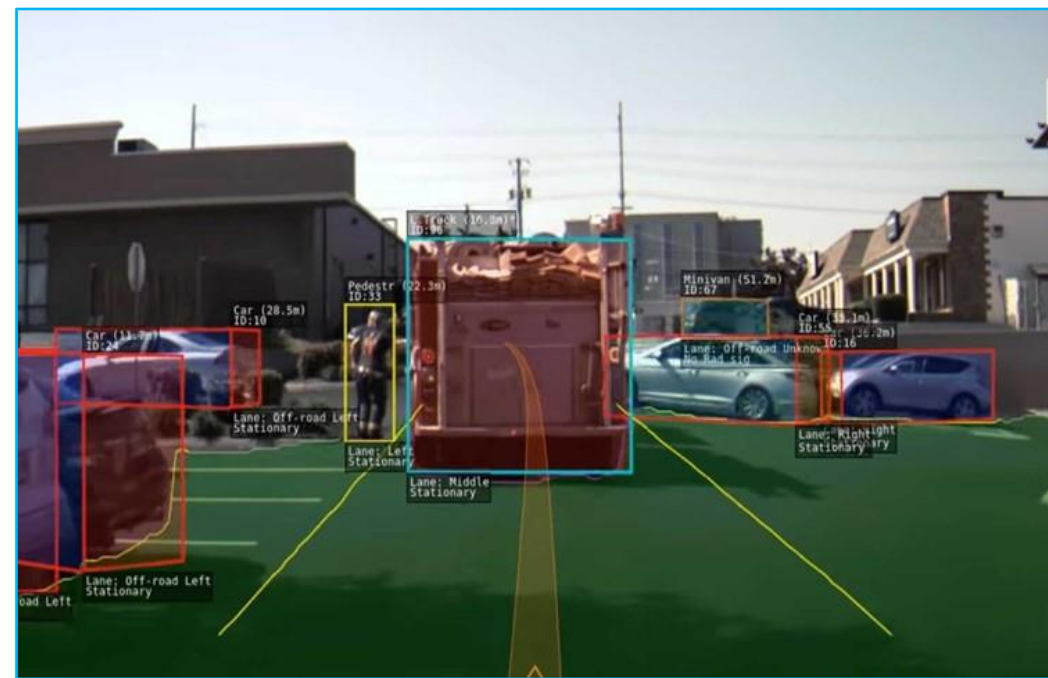*PANEL 1 – How to take into account the environmental impact of my work – Engineering innovations*

01. CURRENT CHALLENGES
Energy Transition

ELECTRIFICATION AND NEW FORMS OF ENERGY DEFINE THE SHAPE OF INFRASTRUCTURE ACCESSIBILITY

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01. CURRENT CHALLENGES
Digital Transformation

MASSIFICATION OF COMMUNICATIONS AND EDGE DEVICE CAPABILITIES VS
PRIVACY AND CYBERSECURITY ISSUES

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2. SMART INFRASTRUCTURE AND C-ITS
The need for higher levels of performance and efficiency
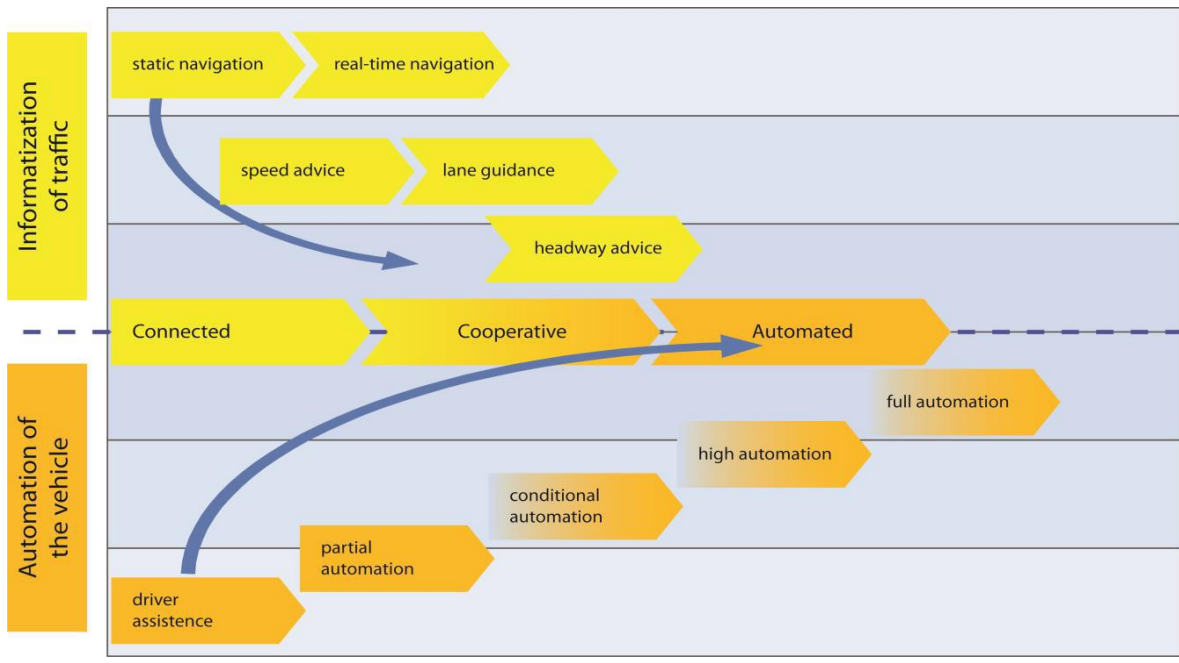
Source:Declaration of Amsterdam

Cooperative, Connected and Automated Mobility (CCAM)

- Cooperation between vehicles, infrastructure and other entities in the road environment
- High levels of vehicle automation
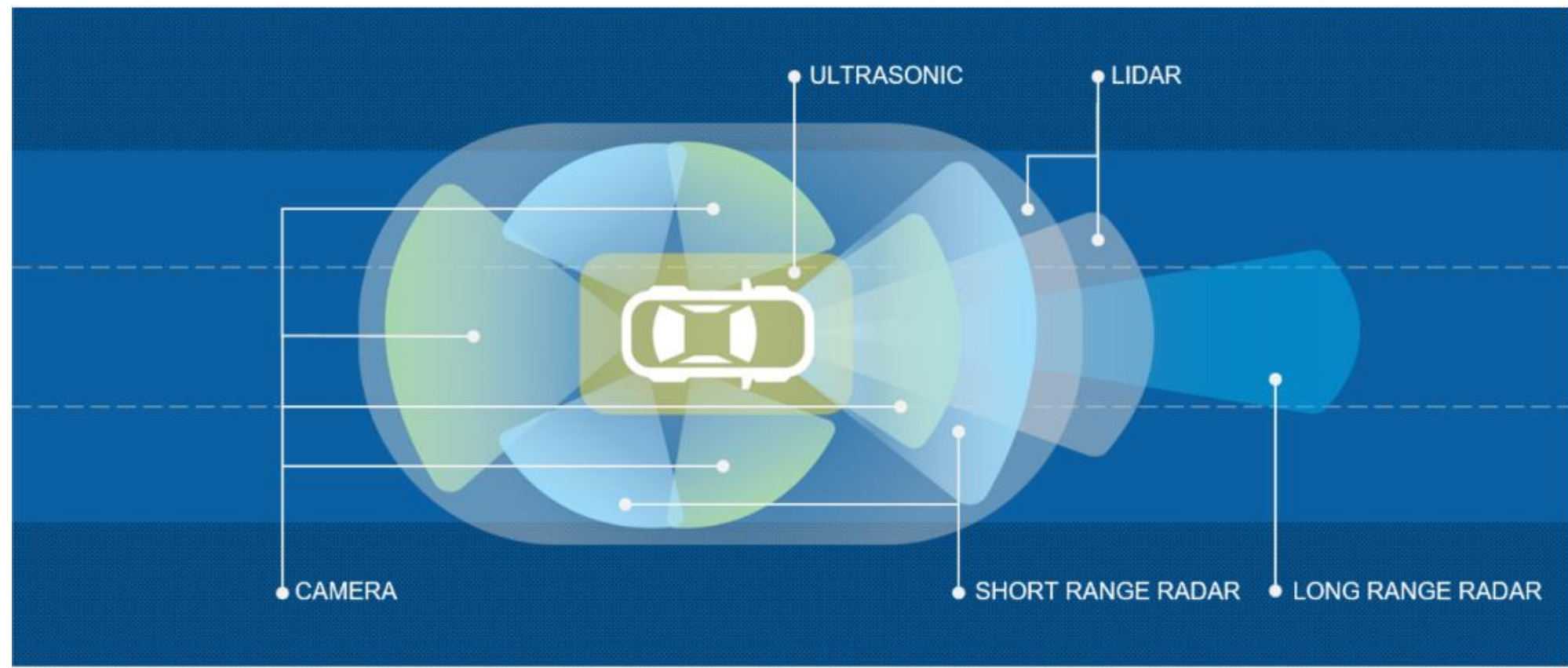- Reduction of the human role in driving activities.

Cooperative-ITS (C-ITS)

- Technologies and applications that allow communication between actors of the transport system, including between vehicles (V2V) and between vehicles and infrastructure (V2I).

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2 . SMART INFRASTRUCTURE AND C-ITS
Vehicle sensors and systems to support automation

Source:Sensor Fusion Market

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2 . SMART INFRASTRUCTURE AND C-ITS
C-ITS Communications

Source:3GAA

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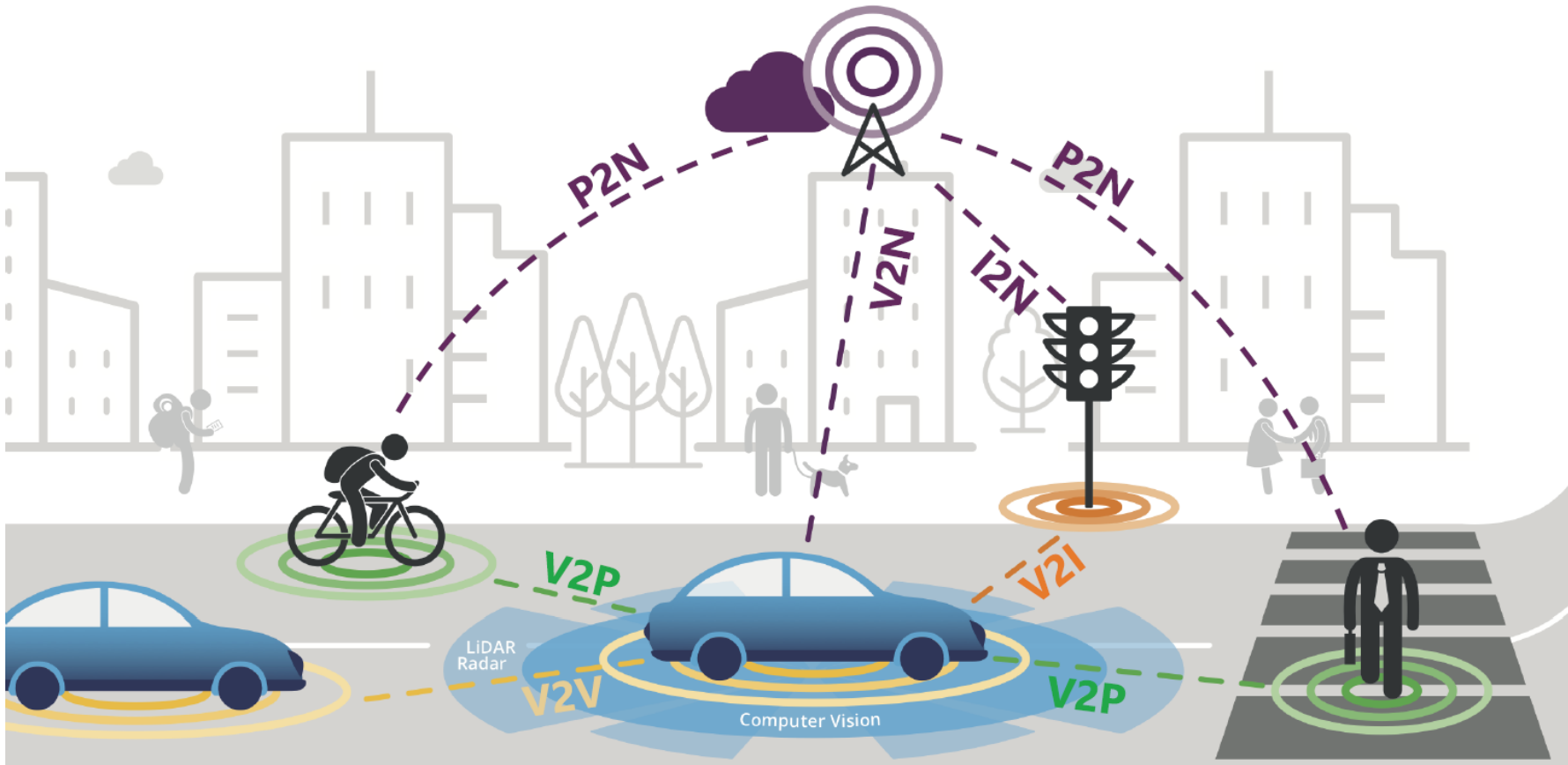
2 . SMART INFRASTRUCTURE AND C-ITS
C-ITS Platform for EU wide Cooperative Intelligent Transport Systems

European Commission

Deployment of intelligent transport services under Directive 2010/40/EU

C-ITS "Day 1 applications"
Hazardous location notifications
- Emergency brake light
- Emergency vehicle approaching
- Slow or stationary vehicle
- Traffic Jam ahead warning
- Weather Conditions

Signage applications
- In-vehicle signage
- In-vehicle speed limits
- Probe vehicle data
- Shockwave Damping
- Signal violation
- Traffic signal priority for designated vehicles
- Green Light Optimal Speed Advisory (GLOSA)

C-ITS "Day 1,5 applications"
- Information on fueling & charging stations for alternative fuel vehicles
- Vulnerable Road user protection
- On street parking management & information
- Off street parking information
- Park & Ride information
- Connected & Cooperative navigation into and out of the city (1st and last mile, parking, route advice, coordinated traffic lights)
- Traffic information & Smart routing

C-ITS platform PHASE II — Cooperative Intelligent Transport Systems towards Cooperative, Connected and Automated Mobility — FINAL REPORT SEPTEMBER 2017

C-ITS platform — Cooperative Intelligent Transport Systems — FINAL REPORT JANUARY 2016

Certificate Policy for Deployment and Operation of European Cooperative Intelligent Transport Systems (C-ITS) — RELEASE 1 JUNE 2017

Security Policy & Governance Framework for Deployment and Operation of European Cooperative Intelligent Transport Systems (C-ITS) — RELEASE 1 DECEMBER 2017

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3. C-ITS PROJECTS AT INFRAESTRUTURAS DE PORTUGAL
Two different approaches

5GMOBIX

LTE-V2X (5G)

Standard LTE-V2X

- Integration of 5.9GHz ITS short-range communications and long-range communications
- Uses PC5 standard for ITS 5.9GHz band, allegedly more efficient than ITS-G5
- Covers other mobility actors such as pedestrians (P) and network (N)

5GAA – 5G Automotive Association

- Promotes the use of technologies to support connected driving via LTE-V2X
- Association of entities in the automotive and telecommunications industry
- Develops standards related to 5G and V2X

C-ROADS

ETSI ITS-G5

Standard ETSI ITS-G5

- 802.11p-based V2V and I2V communications component over the 5.9GHz ITS band
- Normalizes messages between actors (CAM,DENM,SPAT/MAP,IVI)
- Manages PKI security based on digital certificates
- Complemented by a hybrid approach over cellular communication

C-ROADS Platform

- Launched by the European Commission to establish the interoperability and harmonization of C-ITS Services
- It has the participation of Portugal (C-ROADS Portugal) in which Infraestruturas de Portugal participates

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3. C-ITS PROJECTS AT INFRAESTRUTURAS DE PORTUGAL
5G for Cooperative & Connected Automated MOBIlity on X-border Corridors
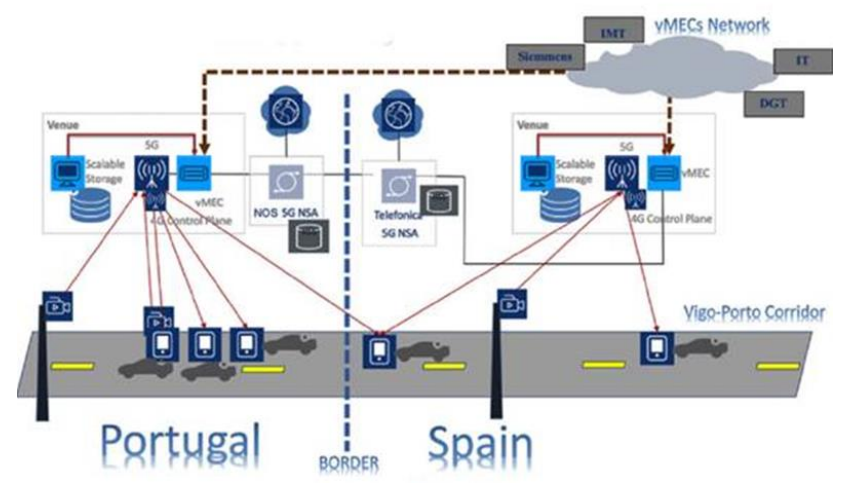
55 project partners
10 Countries

2 x-Border
Corridors

6 Pre-deployment
trial sites

International
cooperation with
China and Korea

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3. C-ITS PROJECTS AT INFRAESTRUTURAS DE PORTUGAI
PT-ES 5G Cross Border Corridor

5GMOBIX

Spain - Portugal

Porto – Vigo 5G Cross Border Corridor for Connected and Automated Mobility

Advanced Driving

Extended Sensors

Remote Driving

Vehicle QoS Support

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3. C-ITS PROJECTS AT INFRAESTRUTURAS DE PORTUGAL
Test Use Cases

Lane Merge
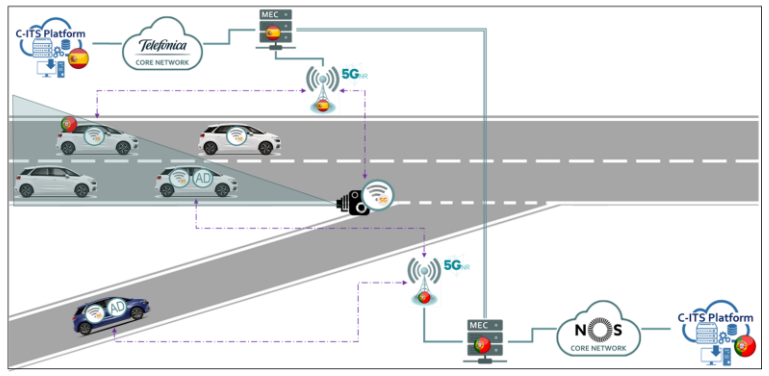
Automated Overtaking
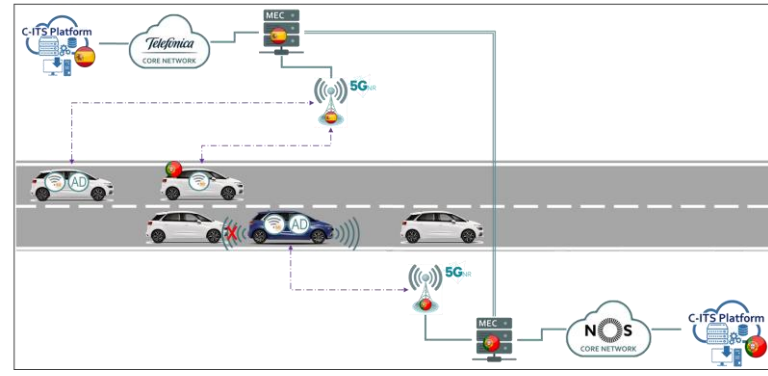
HD Maps
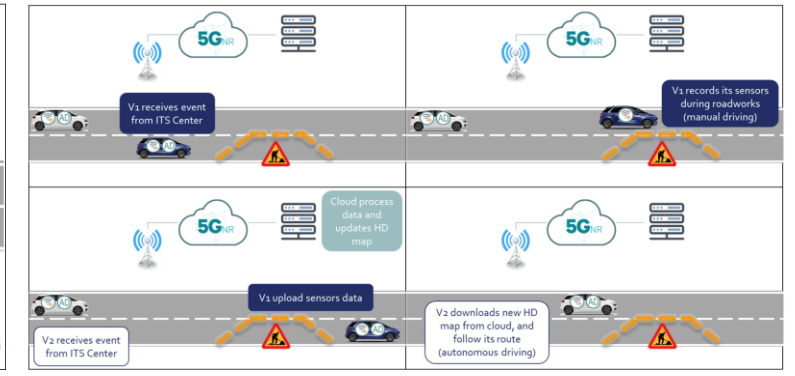
Multimedia service for passengers
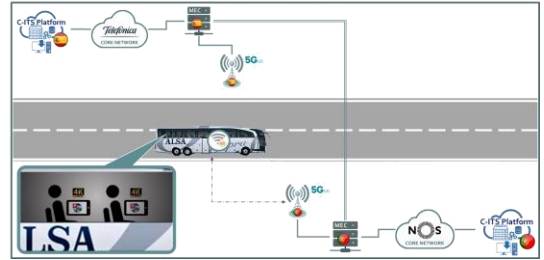
4K Video Surveillance
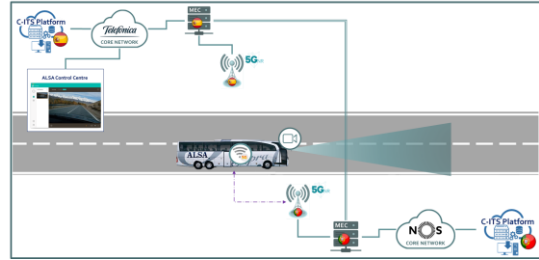
Cooperative Automated Operation

Remote Control

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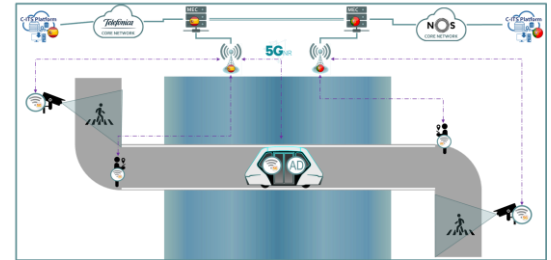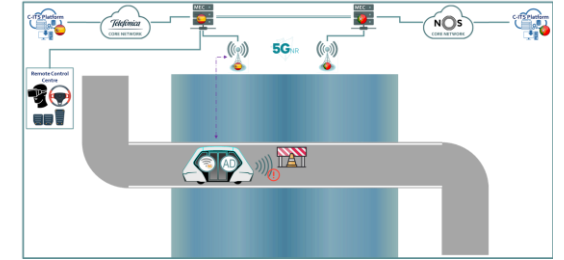
3. C-ITS PROJECTS AT INFRAESTRUTURAS DE PORTUGAL
C-ROADS EUROPEAN PLATFORM

EUROPEAN WIDE PLATFORM TO SUPPORT NATIONAL IMPLEMENTATIONS AND LARGE SCALE PILOTS
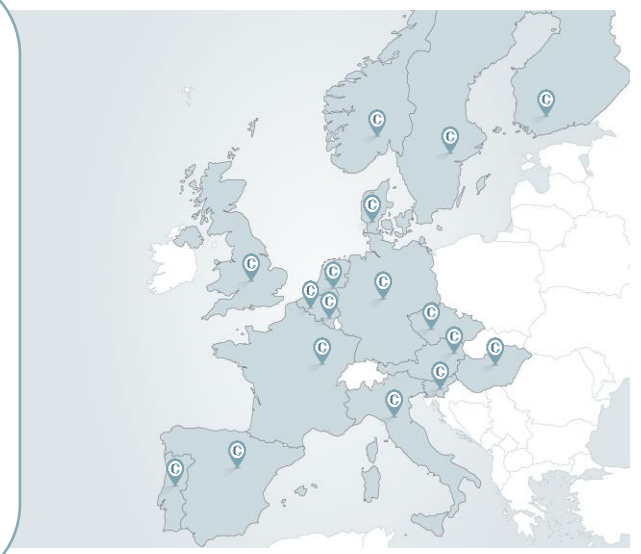INCLUDING CROSS-BORDER INTEROPERABILITY VALIDATION
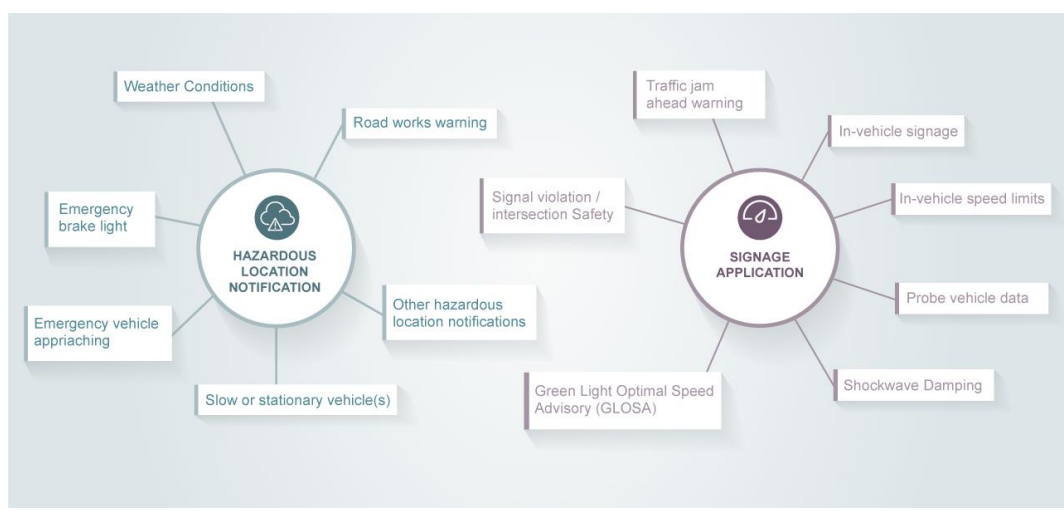
18 Core Members
7 Associated Members
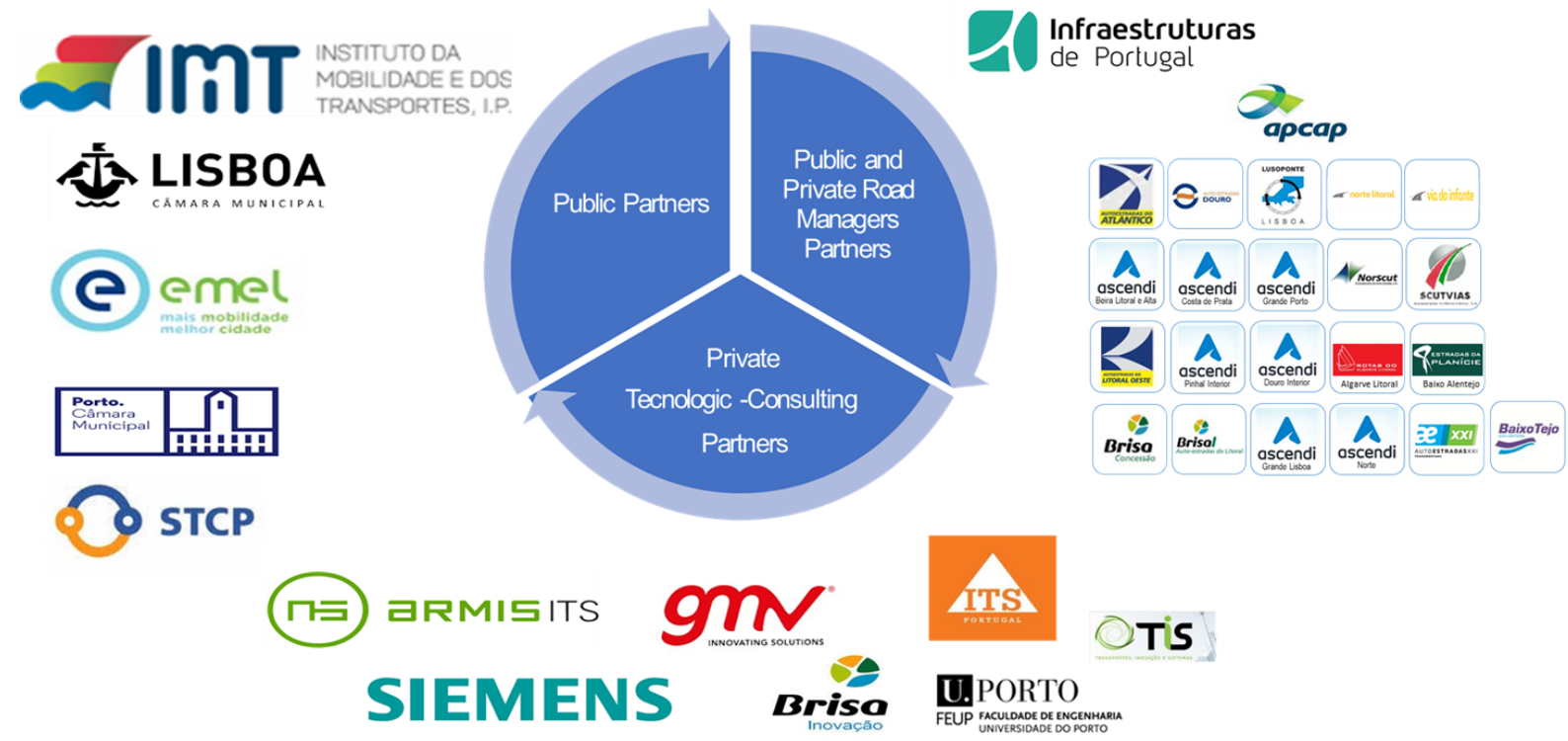
53 European Cities

20.000 km covered by
ITS-G5
2.300 operational RSU

100.000 km of roads
with C-ITS services

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C-ROADS Portugal

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3. C-ITS PROJECTS AT INFRAESTRUTURAS DE PORTUGAL
Central C-ITS System and Integration with Road Operations

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3. C-ITS PROJECTS AT INFRAESTRUTURAS DE PORTUGAL
Road Side Unit (RSU) ITS-G5 Network

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3. C-ITS PROJECTS AT INFRAESTRUTURAS DE PORTUGAL
On-Board Unit (OBU) and testing vehicle application

Event History

Navigation

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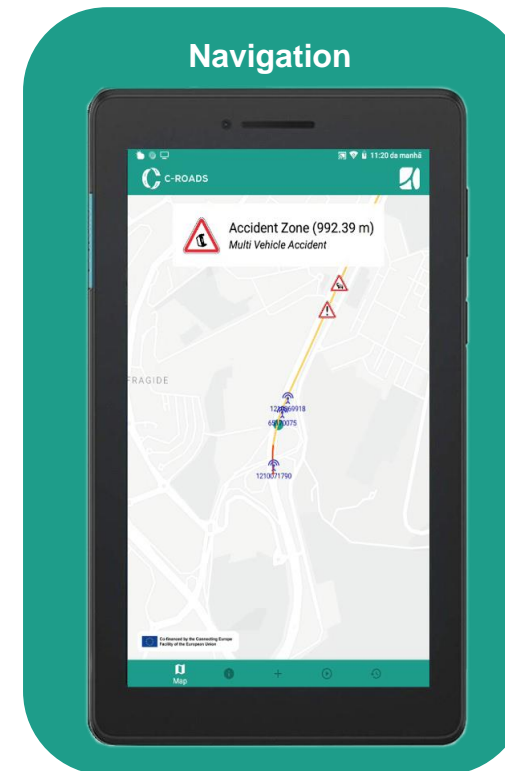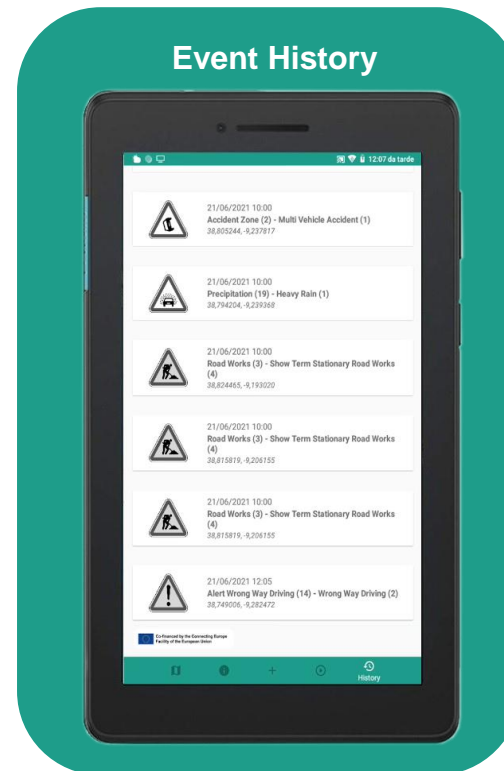Next steps in Development and Deployment

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4. THE ROAD AHEAD
C-STREETS – C-ROADS Cooperative Streets

COMING SOON

Fibre Optics Network

New Use Cases

IoT Sensors

IoT Narrow-Band Network
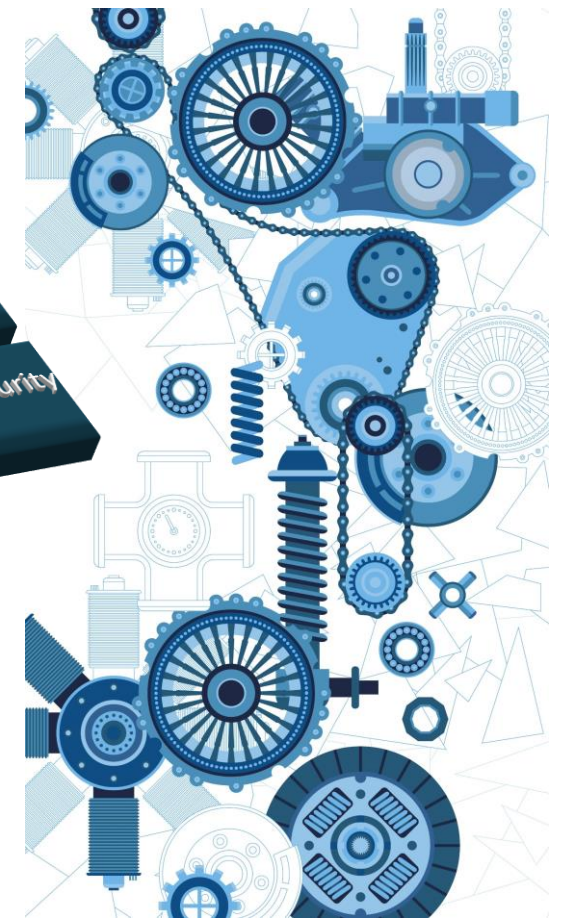
Analytical CCTV Coverage

Mobile App for Non-connected Vehicles

Day-0 C-ITS VMS

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4. THE ROAD AHEAD
The increased role of Engineering and Innovation

AI

IoT

Narrow Band

Edge Computing

5G

High Precision Positioning

HD Maps

Robotics

LIDAR

Electric Traction

Alternative Fuel

Vehicle Dynamics

ITS-G5

RADAR

Radio Interference

Driving Behaviour

Traffic Modelling

Cybersecurity

Vision

Risk Modelling

(...)

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THANK YOU

João FIGUEIREDO e João Carlos SILVA

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