C-ROADS

C-ROADS PORTUGAL

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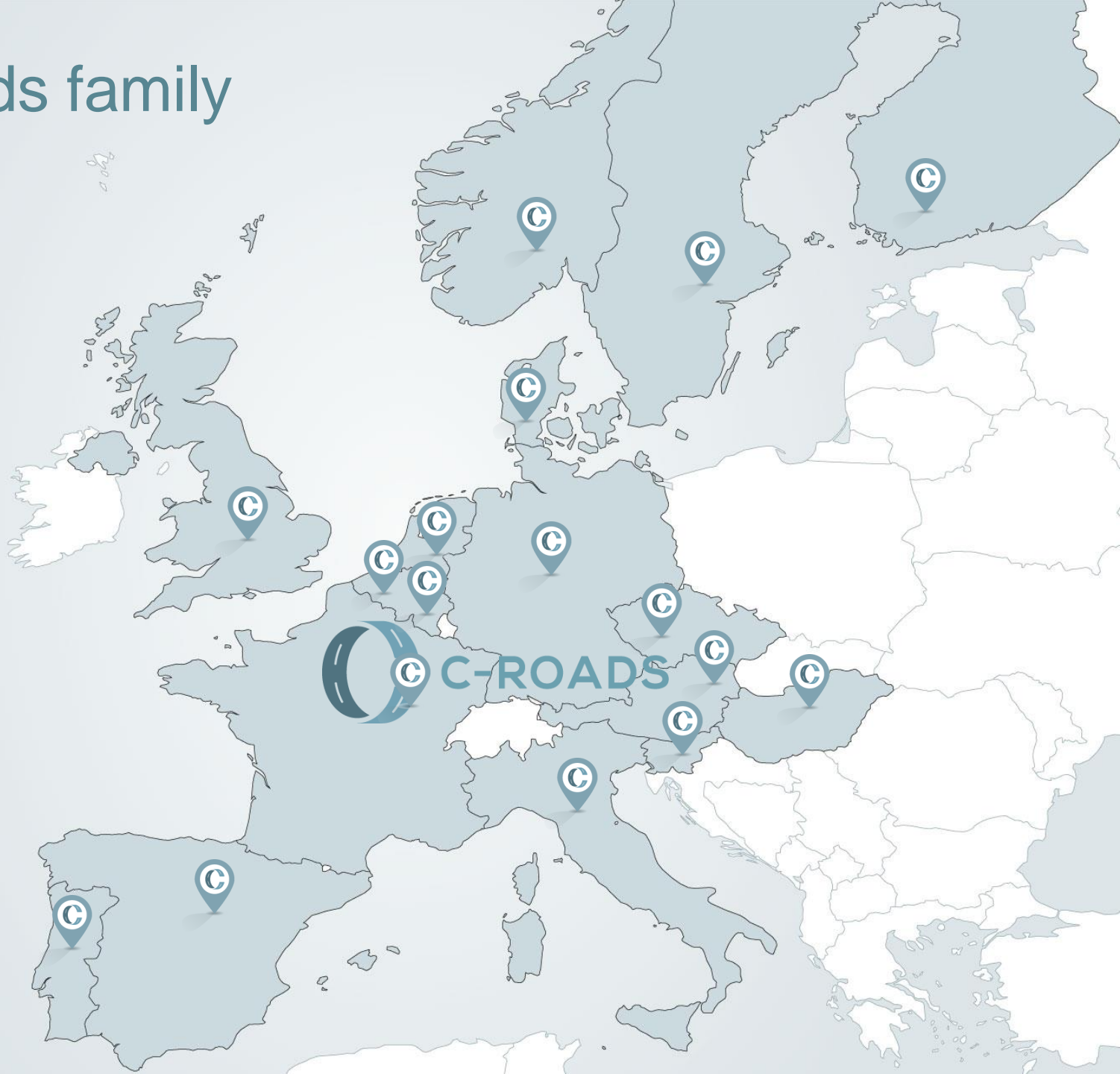
28-11-2017

Main Objectives

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- C C-Roads Portugal consists in the deployment of 5 C-ITS macro pilot cases, in the Atlantic Corridor in Portugal, covering relevant sections of the core and comprehensive network and of its two urban nodes.

- C Combined with the testbed pilot cases, the project will also develop the feasibility study for the National large scale deployment of C-ITS services, notably its long term viability, cost-efficiency and governance and business models.

- C Framed by the overall approach of the C-Roads Platform

The aim of the C-Roads Platform

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- linking all C-ITS deployments
- develop, share and publish common technical specifications (including the common communication profiles),
- planning intensive cross-testing to verify interoperability
- develop system tests based on the common communication profiles by focusing on hybrid communication mix, which is a combination of ETSI ITS-G5 and operational cellular networks.

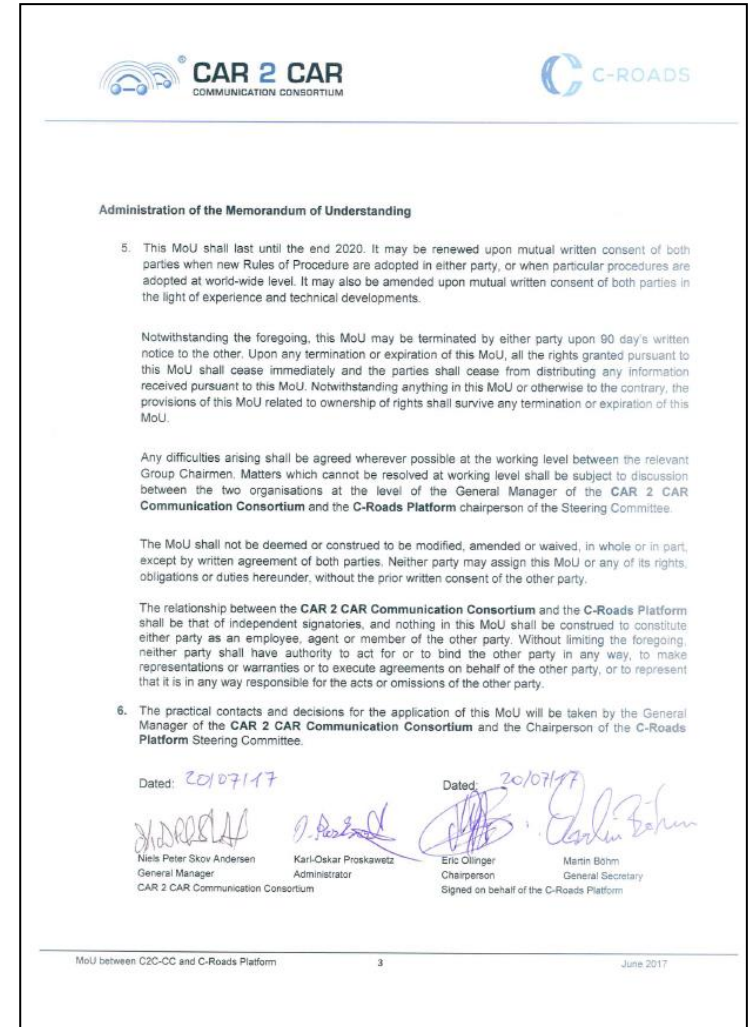➔ And by doing so C-Roads will pave the ground for making Cooperative, Connected and Automated Driving reality
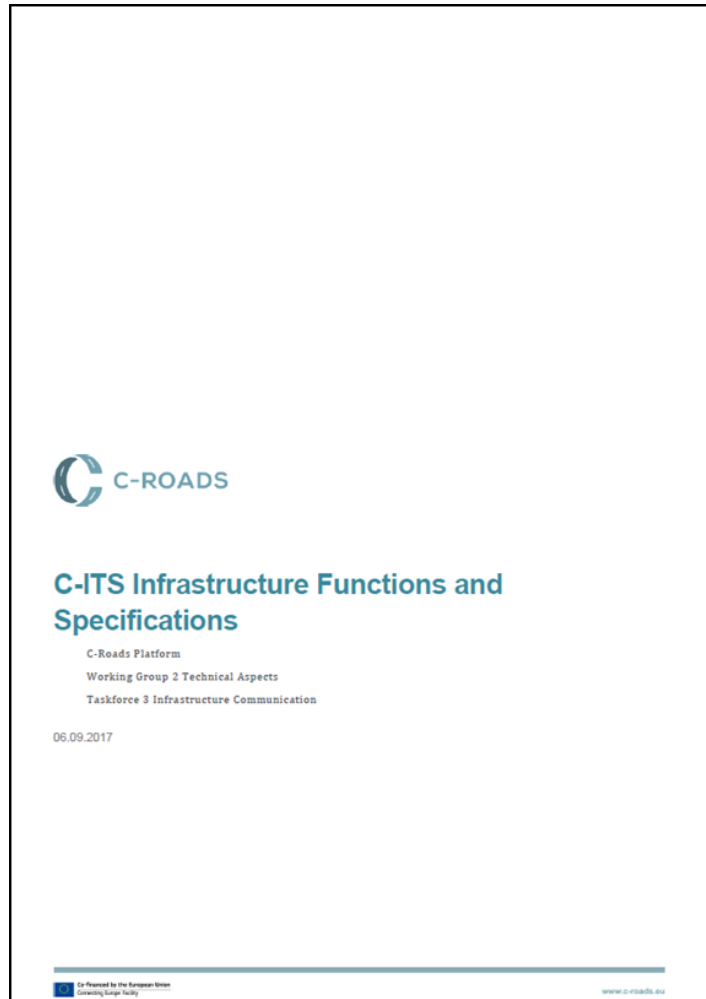
# C-Roads family

Day 1 Services

HAZARDOUS LOCATION NOTIFICATION
- Weather Conditions
- Road works warning
- Emergency brake light
- Emergency vehicle appriaching
- Slow or stationary vehicle(s)
- Other hazardous location notifications

SIGNAGE APPLICATION
- Traffic jam ahead warning
- In-vehicle signage
- Signal violation / intersection Safety
- In-vehicle speed limits
- Probe vehicle data
- Green Light Optimal Speed Advisory (GLOSA)
- Shockwave Damping

Close cooperation with C2C CC

Publication of the Communication Profile for ITS-G5

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C-ITS Infrastructure Functions and Specifications

C-Roads Platform
Working Group 2 Technical Aspects
Taskforce 3 Infrastructure Communication

06.09.2017

Co-financed by the European Union
Connecting Europe Facility

www.c-roads.eu

- ℂ Published on 14th of September
  - o Covering
    - ℂ RWW – Road Works Warning
    - ℂ IVS – In Vehicle Signage
    - ℂ OHLN – Other Hazardous Location Notifications
    - ℂ GLOSA – Green Light Optimal Speed Advisory
- ℂ Available via www.c-roads.eu

C-Roads Portugal
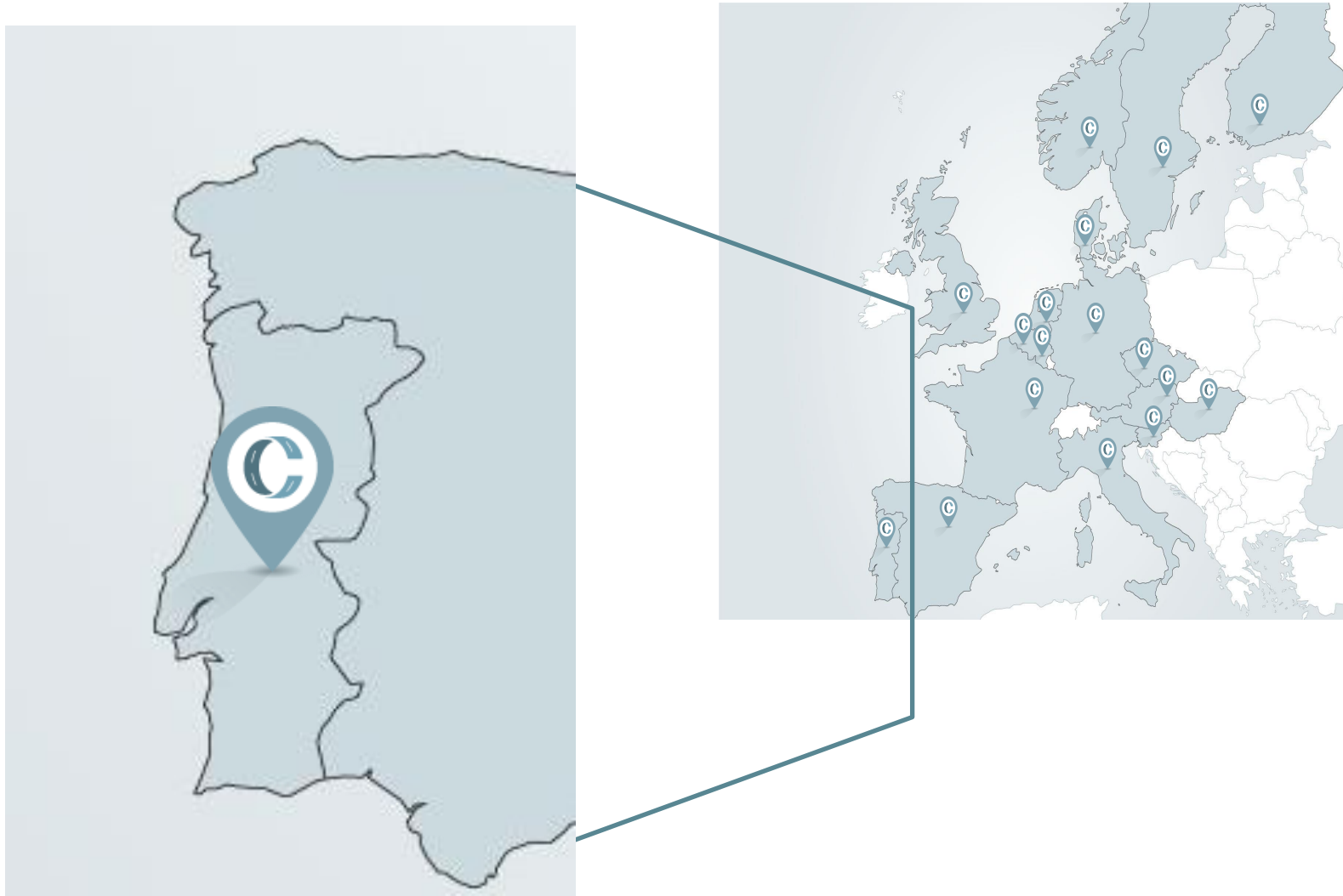
Partners

- 31 implementing bodies >> large effort of cooperation and collaboration at national level

Partners
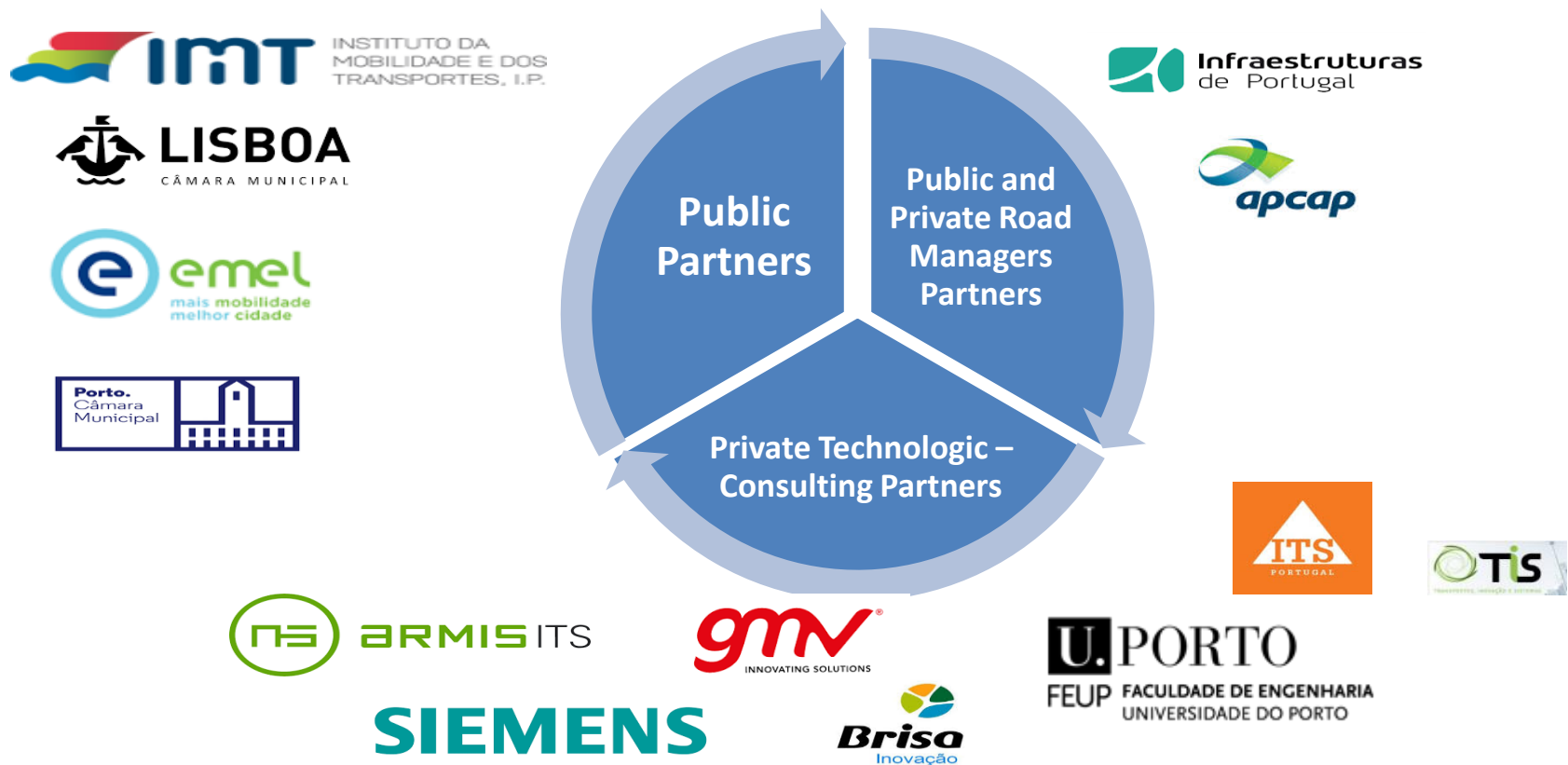
- **31 implementing bodies >> large effort of cooperation and collaboration at national level**

- IMT, CM LISBOA, CM PORTO, EMEL, STCP
- IP, BRISA, GRUPO ASCENDI, AE NORTE LITORAL, AE ALGARVE, LUSOPONTE, BRISAL, AEDL, AE ATLÂNTICO, SCUTVIAS E NORSCUT
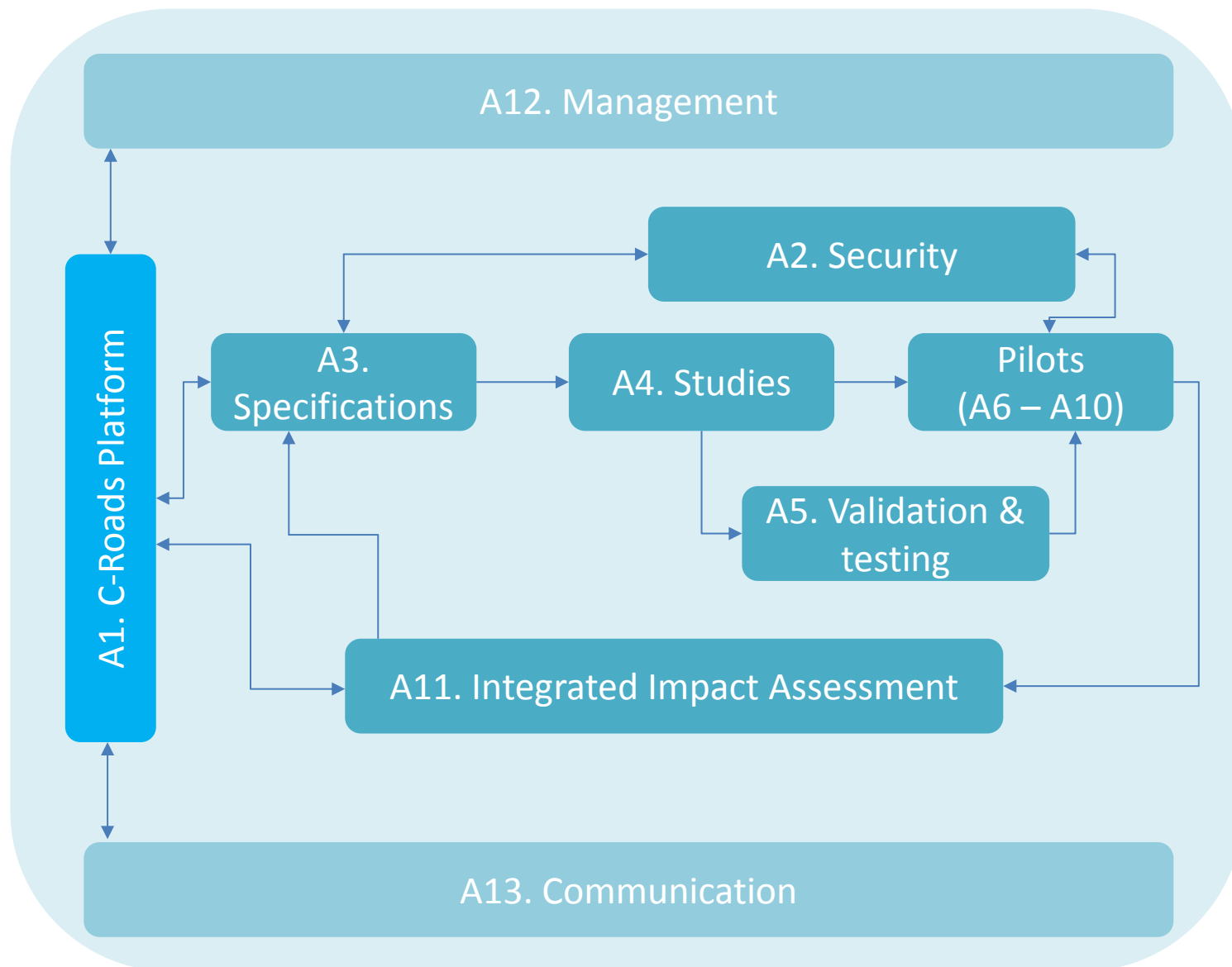- IP TELECOM, A-TO-BE, GMV, ARMIS, SIEMENS, DMS
- FEUP
- CAETANOBUS, VIAVERDE SERVIÇOS, VIALIVRE
- TIS

Integrated approach

5 macro pilots = 15 pilot activities

Road infrastructure preparation	Connecting urban nodes	Backbone data sharing

Activity 7 Pilot 2
"Portuguese network for C-ITS"
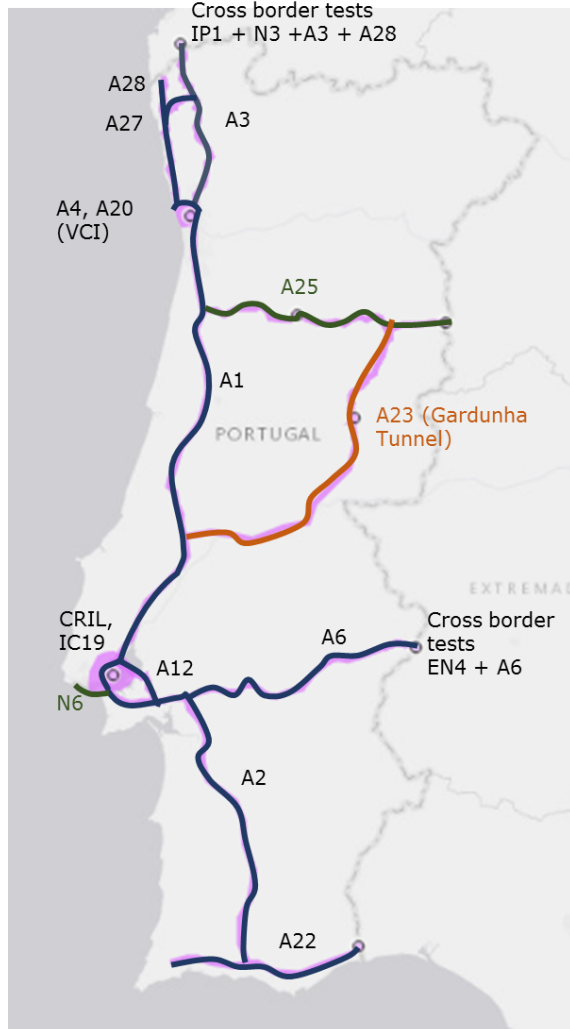
Activity 9 Pilot 4
"Lisbon urban node"

Activity 6 Pilot 1

"Single Access Point -SPA" and SPApp usage app for SPA Services"

Activity 8 Pilot 3
"Network preparation for CAD vehicles"

Activity 10 Pilot 5

"Porto Urban node"

PT network for C-ITS

Cross border tests
IP1 + N3 +A3 + A28

A28
A27   A3
A4, A20
(VCI)
A25
A1
PORTUGAL
A23 (Gardunha Tunnel)
EXTREMAD
CRIL, IC19
A6
A12   Cross border tests EN4 + A6
N6
A2
A22

Pilot case: Portuguese network for C-ITS

Demonstration of C-ITS services in core and comprehensive network (including entrances in urban nodes)

- A1 – 30 km
- A2 – 30 km
- A3 – 40 km
- A4 – 30 km
- A20 - VCI (Porto node circular) – 11 km
- CRIL (Lisboa node circular) – 19 km
- IC19 (Lisboa node circular) – 17 km
- A6 – 20 km
- A12 – 20 km
- A22 – 90 km
- A27 –24,7 km
- A28 – 88,6 km

In-vehicle app to connect C-ITS server in TEN-T network and urban nodes connections

- A25 – 8 km (Viseu)
- N6 (Lisboa entrance) – 20 km

Development of C-ITS services in tunnels

- A23 – 20 km Gardunha Tunnel

Network preparation for CAD vehicles

Pilot case: Network Preparation for Connected and Autonomous Vehicles

Connected and autonomous vehicles in open roads

- A3 – 40 km
- A27 –24,7 km
- A28 – 88,6 km

A2 the Holiday motorway

- A2 – 240 km

Connected vehicles for advanced services

- A1 – 66 km
- A2 – 54 km
- A5 (urban access) – 25 km
- A9 (urban access) – 35 km
- A12 – 24 km

Lisbon urban node

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Pilot case: C-ITS Pilot in the Lisbon Urban Node

|	
Traffic service level monitoring and travel time prediction in Lisboa node	• A36 (2ª circular) – 10,5 km
Parking availability system in Lisboa node	• Lisboa central axis (Entrecampos – Marquês) – 2,7 km
In-vehicle app to connect C-ITS server in Lisboa node	• A36 (2ª circular) – 9,8 km
Signal corridors and bus corridors prioritization in Lisboa node	• Lisboa central axis (Campo Grande – Marquês) – 4,1 km
Mobility Hub in Lisboa node	• A2 (urban access) - 40 km • A5 (urban access) – 15 km • A9 (urban access) – 35 km

Porto urban node
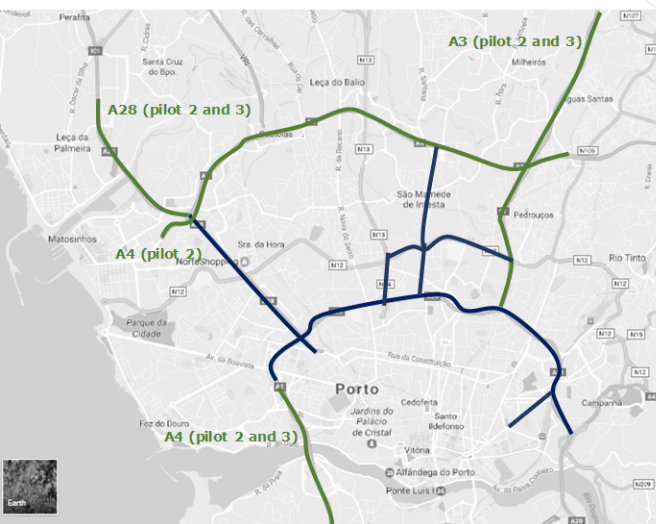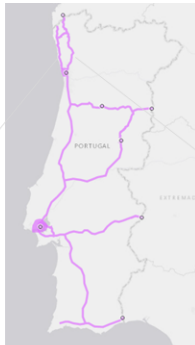
C-ITS Pilot in the Porto Urban Node

Traffic service level monitoring in real time and 2-hour travel time prediction in the Porto node

- 5,9 km (central area)
- A28 – 6 km
- A20 – 17 km
- N14 – 5,2 km

V2I and I2V integration of the CaetanoBUS vehicle with the infrastructure in Porto node

- 1,4 km (central area)

Demonstration of C-ITS services in Porto node (see pilot 2)

- A4 – 30 km
- A20 – VCI – 11 km

(Pilot activity A.3.2)

SPA: backbone data sharing

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Pilot case : SPA and SPApp usage app for SPA Services

Backbone data sharing prototype

To identify the technical and effort requirements to establish the NAP, both in terms of hardware and software, specifically requirements identification and analysis, the system modelling including the data interfaces according to the DATEXII model, the normalization of the data frames sent by each road operator and the "discovery/search and browse" functionality. We also aim at developing a prototype to validate the approach and analyse the different required functionalities

SPApp usage app

Test the potentialities of a mapping system that aims to demonstrate de use case scenarios based in Google's Maps, helping uses to connect then self's to the connected roads understand their surroundings and path. The system will compile transportation data from the nodes provided by the SPA prototype to be used by a consumer-facing app, serving as a travel companion beyond the driver and the infrastructure. The app will offer real-time traffic updates, display upcoming road hazards, provide the locations of events.
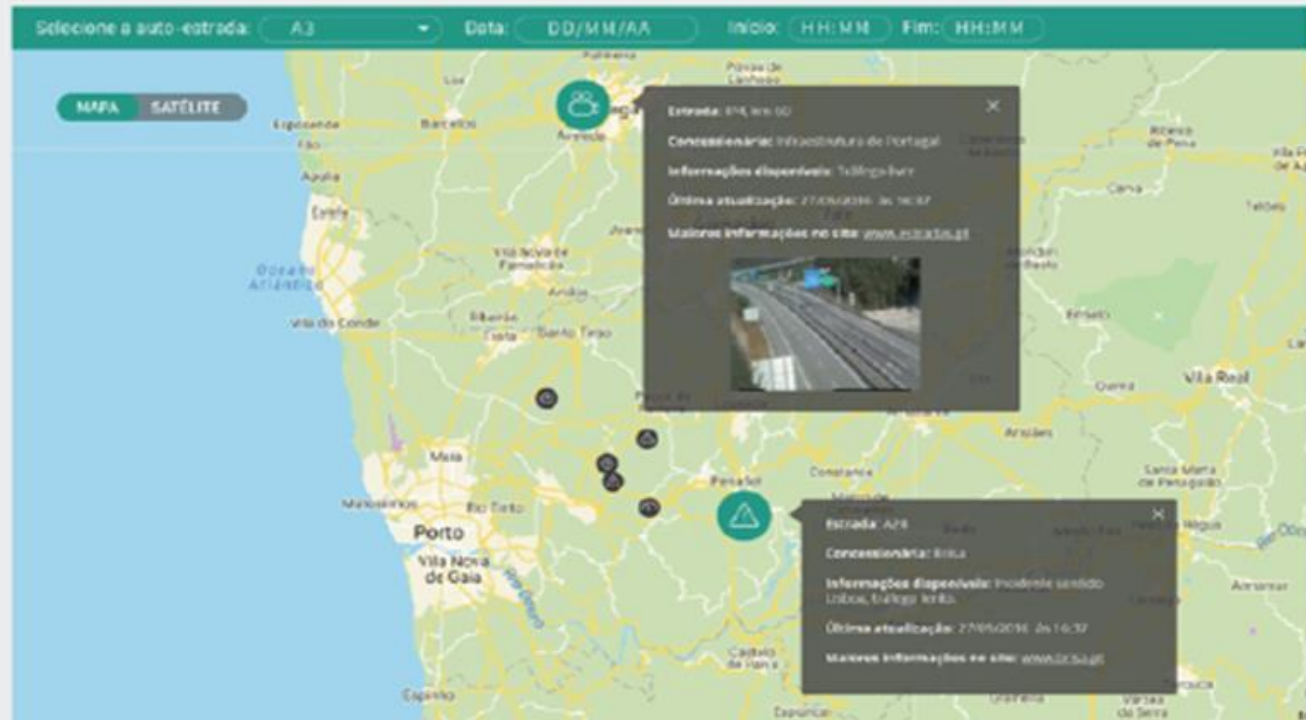
The vision is to implement an **Integrated Traffic Information System (SIIT)**, and create the Portuguese Data Sharing Backbone, paving the way for the implementation of the **Portuguese National Access Point** for the Delegated Acts (A, B, C and E).

	"SPA" and SPApp usage app for SPA Services		Portuguese network for C-ITS (incl. accesses to urban nodes)			Network Preparation for Connected and Autonomous Vehicles			C-ITS Pilot in the Lisboa Urban Node					C-ITS Pilot in the Porto Urban Node	
	Backbone data sharing prototype	SPApp usage app	Demonstration of C-ITS services in core, comprehensive network and access to urban noads	In-vehicle app to connect C-ITS server in TEN-T network and urban nodes connections	Development of C-ITS services in tunnels	Connected and autonomous vehicles in open roads	A2 the Holiday motorway	Connected vehicles	Traffic service level monitoring and travel time prediction in Lisboa node	Parking availability system in Lisboa node	In-vehicle app to connect C-ITS server in Lisboa node	Signal corridors and bus corridors prioritization in Lisboa node	Mobility Hub in Lisboa node	Traffic service level monitoring in real time and 2-hour travel time prediction in the Porto node	V2I and I2V integration of the CaetanoBUS vehicle with the infrastructure in Porto node for information and services sharing
Day-1-services covered															
Emergency electronic brake light			x			x							x		
Emergency vehicle approaching			x		x		x	x			x	x	x		
Slow or stationary vehicle(s)	x	x	x	x	x	x	x	x	x				x		
Traffic jam ahead warning	x	x	x	x	x	x	x	x	x				x	x	x
Other hazardous location notification	x	x	x	x	x	x	x	x					x		
Road works warning	x	x	x	x	x	x	x	x				x	x	x	x
Weather conditions	x	x	x	x	x	x	x	x					x	x	x
In-vehicle signage		x	x		x	x	x	x					x	x	x
In-vehicle speed limits		x	x		x	x	x	x					x	x	x
Probe vehicle data			x				x	x					x		x
Shockwave damping			x										x	x	x
Green Light Optimal Speed Advisory (GLOSA) / Time To Green (TTG)												x			x
Signal violation/Intersection safety		x				x									
Traffic signal priority request by designated vehicles													x	x	x

Day 1,5 Services

	"SPA" and SPApp usage app for SPA Services		Portuguese network for C-ITS (incl. accesses to urban nodes)			Network Preparation for Connected and Autonomous Vehicles			C-ITS Pilot in the Lisboa Urban Node					C-ITS Pilot in the Porto Urban Node	
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Day-1.5-services covered															
Off-street parking information		x	x	x		x				x	x				
On-street parking management and information										x					x
Park & Ride information		x	x			x	x	x		x			x		
Information on alternative fuel vehicles & charging stations			x				x	x		x			x		
Traffic information & smart routing			x	x		x	x	x	x	x	x	x	x	x	x
Zone access control for urban areas			x				x	x					x		
Loading zone management															
Vulnerable road user protection															
Cooperative Collision Risk Warning															
Motorcycle approaching indication															
Wrong way driving			x		x		x	x					x		
Connected and cooperative navigation		x				x	x	x						x	x

Some deployment figures

Day 1 services → **Day 1,5 services**

| Core network / Comprehensive network / cross-border sections / access to urban nodes | Urban nodes Suburban commuting áreas |

204 RSU's
141 OBU's
140 Vehicles

~ 957 km

Hybrid
communication
(ITS G5 + Cellular)

O/D matrix
In vehicle app
GLOSA
Mobility hub
Traffic prediction 2 hours
Smart Parking
Intelligent bus

~116 km

5G

RSU

ITS G5

OBU

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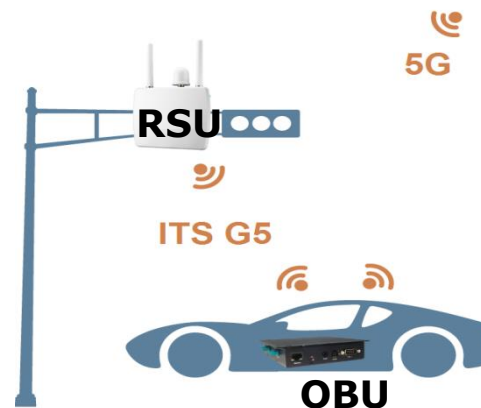
OBRIGADO

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