C-ROADS PORTUGAL

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11º Congresso do Comité Português da URSI – Lisboa, 24/11/2017
Main Objectives

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

- 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
Day 1 Services

HAZARDOUS LOCATION NOTIFICATION
- Emergency brake light
- Emergency vehicle approaching
- Slow or stationary vehicle(s)
- Other hazardous location notifications

SIGNAGE APPLICATION
- Traffic jam ahead warning
- In-vehicle signage
- In-vehicle speed limits
- Probe vehicle data
- Shockwave Damping
- Signal violation / intersection Safety
- Green Light Optimal Speed Advisory (GLOSA)
Close cooperation with C2C CC

Administration of the Memorandum of Understanding:

5. The MoU shall last until the end 2020. It may be renewed upon mutual written consent of both parties when new Rules of Procedure are adopted in either party, or when particular provisions are adopted at world-wide level. It may also be amended upon mutual written consent of both parties in the light of experience and technical developments.

Notwithstanding the foregoing, this MoU may be terminated by either party upon 90 days’ written notice to the other. Upon any termination or expiration of the MoU, all the rights granted pursuant to the MoU shall cease immediately and the parties shall cease from distributing any information received pursuant to this MoU. Notwithstanding anything in this MoU, or otherwise to the contrary, the provisions of this MoU relating to ownership of rights shall survive any termination or expiration of this MoU.

Any difficulties arising shall be settled, whenever possible, at the working level between the relevant Group Chairmen. Matters which cannot be resolved at working level shall be subject to discussion between the two organizations at the level of the General Manager of the CAR 2 CAR Communication Consortium and the C-Roads Platform Chairperson of the Steering Committee.

The MoU shall not be deemed or construed to be modified, amended or varied, in whole or in part, except by written agreement of both parties. Neither party may assign this MoU or any of its rights, obligations or duties hereunder without the prior written consent of the other party.

The relationship between the CAR 2 CAR Communication Consortium and the C-Roads Platform shall be that of independent signatories, and nothing in this MoU shall be construed to constitute either party as an employee, agent or member of the other party. Without limiting the foregoing, neither party shall have authority to act for or to bind the other party in any way, to make representations or warranties or to execute agreements on behalf of the other party, or to represent that it is in any way responsible for the acts or omissions of the other party.

6. The protocol contacts and decisions for the application of this MoU will be taken by the General Manager of the CAR 2 CAR Communication Consortium and the Chairperson of the C-Roads Platform Steering Committee.

Dated: 24.11.2017

[Signatures]
Publication of the Communication Profile for ITS-G5

Published on 14th of September

Covering

- RWW – Road Works Warning
- IVS – In Vehicle Signage
- OHLN – Other Hazardous Location Notifications
- GLOSA – Green Light Optimal Speed Advisory

Available via www.c-roads.eu
C-Roads Portugal
Partners

Promoted by

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

Public Partners
Public and Private Road Managers Partners
Private Technologic –Consulting Partners
Integrated approach

A1. C-Roads Platform

A2. Security

A3. Specifications

A4. Studies

Pilots (A6 – A10)

A5. Validation & testing

A11. Integrated Impact Assessment

A12. Management

A13. Communication
5 macro pilots = 15 pilot activities

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”

Road infrastructure preparation
Connecting urban nodes
Backbone data sharing
PT network for C-ITS

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

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

Pilot case: SPA and SPAApp usage app for SPA Services

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.

Backbone data sharing prototype

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 DelegatedActs (A, B, C and E).
# Day 1 Services

<table>
<thead>
<tr>
<th>Backbone data sharing prototype</th>
<th>SPApp usage app</th>
<th>Portuguese network for C-ITS (incl. accesses to urban nodes)</th>
<th>Network Preparation for Connected and Autonomous Vehicles</th>
<th>C-ITS Pilot in the Lisboa Urban Node</th>
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<td>Development of C-ITS services in tunnels</td>
<td>Connected and autonomous vehicles in open roads</td>
<td>A2 the Holiday motorway</td>
<td>Connected vehicles</td>
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### Day-1-services covered

<table>
<thead>
<tr>
<th>Service</th>
<th>Lisboa Urban Node</th>
<th>Porto Urban Node</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency electronic brake light</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Emergency vehicle approaching</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Slow or stationary vehicle(s)</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Traffic jam ahead warning</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Other hazardous location notification</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Road works warning</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Weather conditions</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>In-vehicle signage</td>
<td>x</td>
<td>x</td>
</tr>
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<td>x</td>
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</tr>
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<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Shockwave damping</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Green Light Optimal Speed Advisory (GLOSA) / Time To Green (TTG)</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Signal violation/Intersection safety</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Traffic signal priority request by designated vehicles</td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>
## Day 1.5 Services

<table>
<thead>
<tr>
<th>“SPA” and SPApp usage app for SPA Services</th>
<th>Portuguese network for C-ITS (incl. accesses to urban nodes)</th>
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<td>In-vehicle app to connect C-ITS server in core, comprehensive network and access to urban roads</td>
<td>Connected vehicles</td>
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<th>Service</th>
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<th>Porto Urban Node</th>
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<tbody>
<tr>
<td>Off-street parking information</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>On-street parking management and information</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Park &amp; Ride information</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Information on alternative fuel vehicles &amp; charging stations</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Traffic information &amp; smart routing</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Zone access control for urban areas</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Loading zone management</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Vulnerable road user protection</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Cooperative Collision Risk Warning</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Motorcycle approaching indication</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Wrong way driving</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Connected and cooperative navigation</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

24.11.2017
Some deployment figures

Day 1 services

- Core network / Comprehensive network / cross-border sections / access to urban nodes
- 204 RSU’s
  - 141 OBU’s
  - 140 Vehicles
- ~ 957 km

Day 1,5 services

- Urban nodes
  - Suburban commuting areas
- O/D matrix
  - In vehicle app
    - GLOSA
    - Mobility hub
  - Traffic prediction 2 hours
  - Smart Parking
  - Intelligent bus

Hybrid communication (ITS G5 + Cellular)

~116 km
C-ROADS

THANK YOU!

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