



# ***C-ROADS: Testing and Implementing C-ITS Services in Greece***

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GROUP OF COMPANIES



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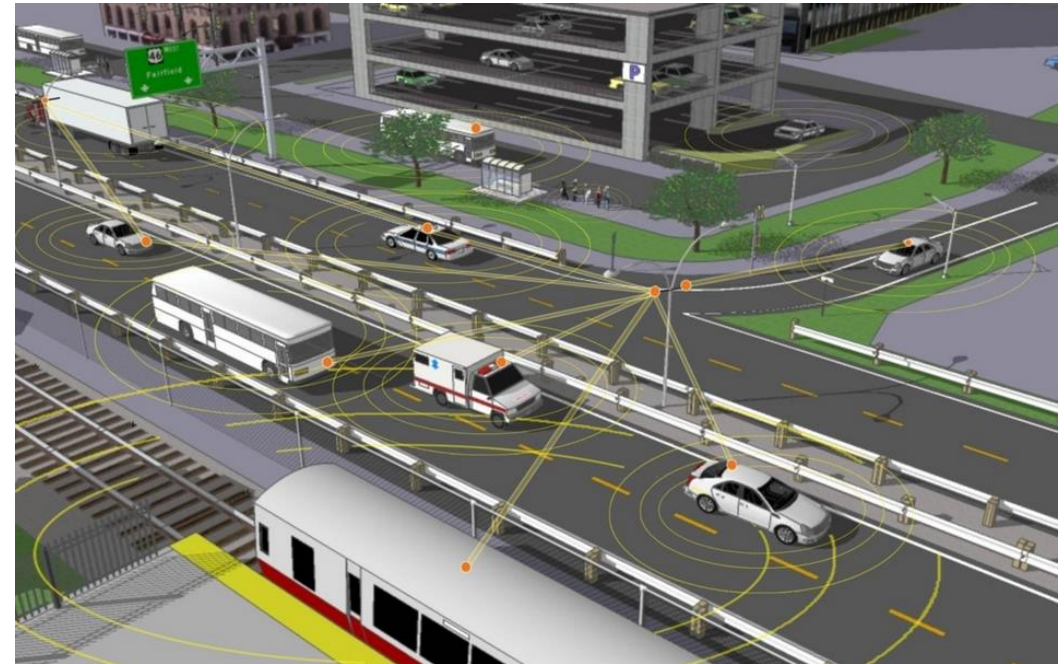


# C-ITS – Cooperative Intelligent Transport Systems



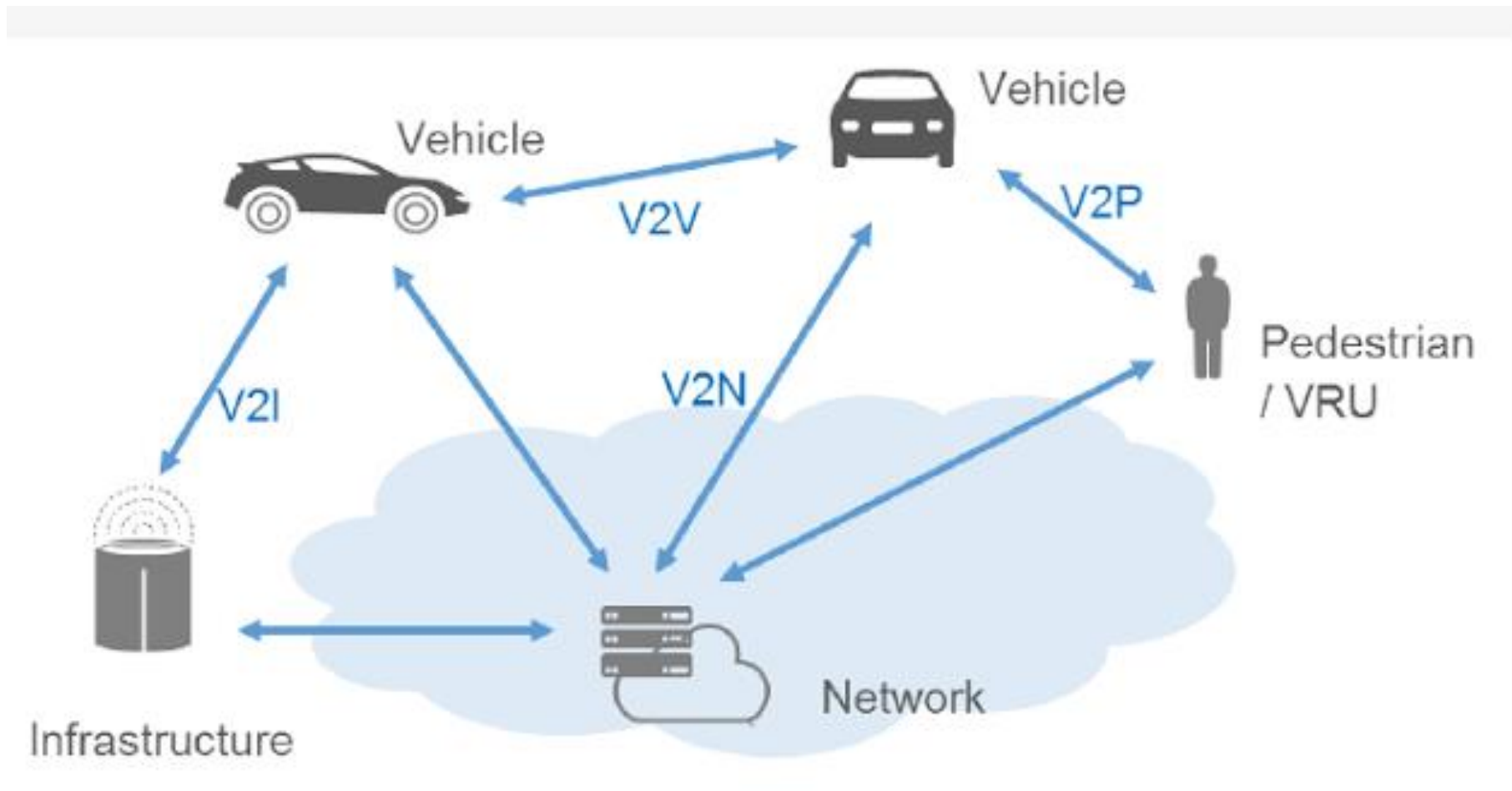
## C-ITS – Cooperative Intelligent Transport Systems

- Intelligent Transport Systems (ITS) focus on digital technologies that provide intelligence placed at the roadside or in vehicles.
- C-ITS, a sub-set of ITS, focuses on the communication between those systems – whether it is a vehicle communicating with another vehicle, with the infrastructure, or with other C-ITS systems.





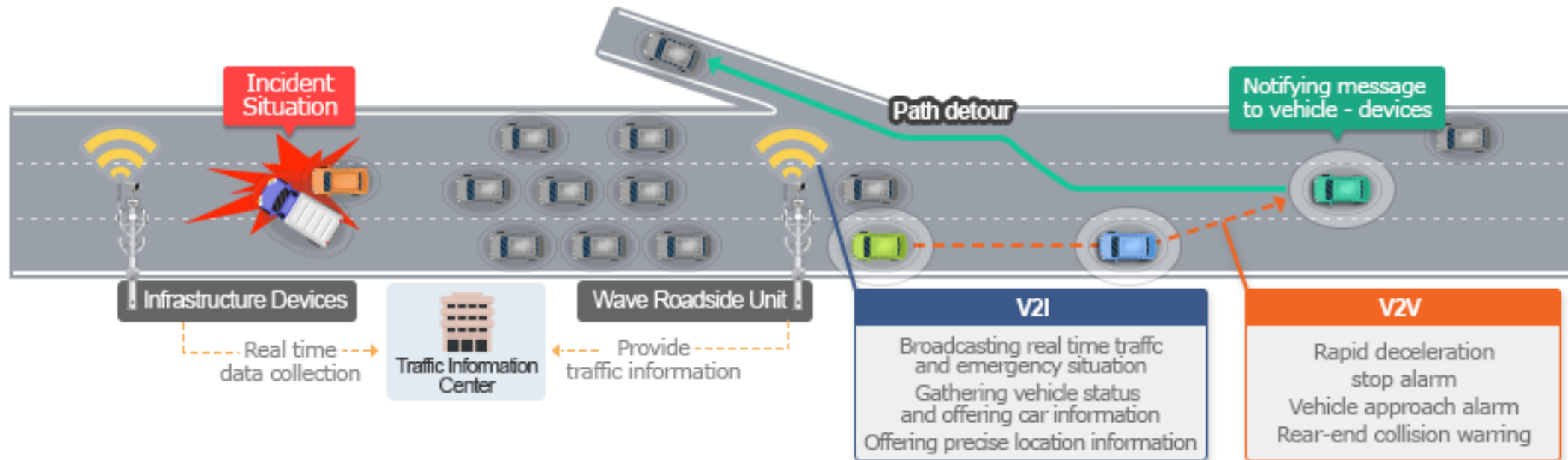
## Vehicle-to-Anything (V2X) Connectivity





## C-ITS Benefits

- Vehicles and infrastructure equipped with C-ITS can communicate a warning to each other.
- Drivers receiving the warning can take necessary actions in time to avoid potentially harmful situations.
- The use of C-ITS can help reduce congestion and improve driver comfort, traffic and energy efficiency reducing fuel consumption.





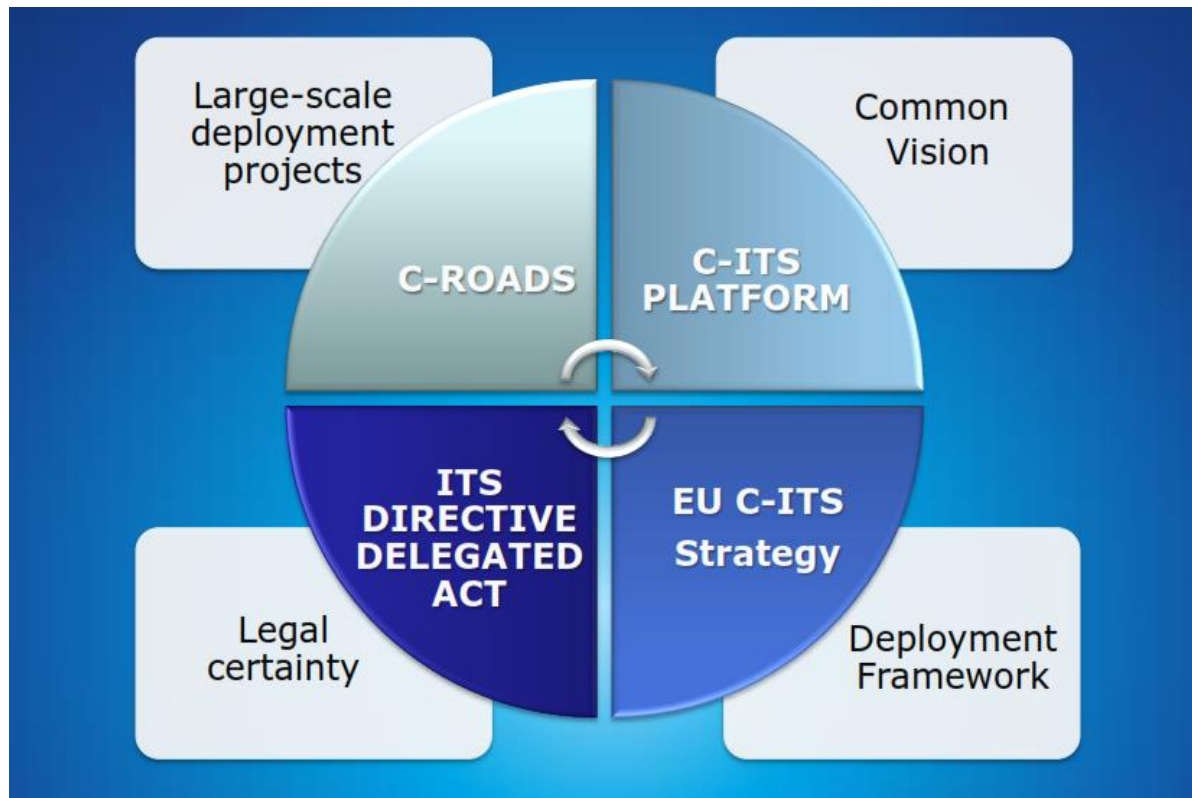
## C-ITS Services in Phase I of the C-ITS Platform

| Day 1 C-ITS services list  | Day 1.5 C-ITS services list   |
|--|---|
| <p><b>Hazardous location notifications:</b></p> <ul style="list-style-type: none"><li>• Slow or stationary vehicle(s) &amp; traffic ahead warning;</li><li>• Road works warning;</li><li>• Weather conditions;</li><li>• Emergency brake light;</li><li>• Emergency vehicle approaching;</li><li>• Other hazards.</li></ul> <p><b>Signage applications:</b></p> <ul style="list-style-type: none"><li>• In-vehicle signage;</li><li>• In-vehicle speed limits;</li><li>• Signal violation / intersection safety;</li><li>• Traffic signal priority request by designated vehicles;</li><li>• Green light optimal speed advisory;</li><li>• Probe vehicle data;</li><li>• Shockwave damping</li></ul> | <ul style="list-style-type: none"><li>• Information on fuelling &amp; charging stations for alternative fuel vehicles;</li><li>• Vulnerable road user protection;</li><li>• On street parking management &amp; information;</li><li>• Off street parking information;</li><li>• Park &amp; ride information;</li><li>• Connected &amp; cooperative navigation into and out of the city (first and last mile, parking, route advice, coordinated traffic lights);</li><li>• Traffic information &amp; smart routing.</li></ul> |



## EU C-ITS Strategy

The European Commission has adopted on 30 November 2016 a European Strategy on Cooperative Intelligent Transport Systems (C-ITS), a milestone initiative towards **Cooperative, Connected and Automated Mobility (CCAM)**.



[https://transport.ec.europa.eu/transport-themes/intelligent-transport-systems/cooperative-connected-and-automated-mobility-ccam\\_en](https://transport.ec.europa.eu/transport-themes/intelligent-transport-systems/cooperative-connected-and-automated-mobility-ccam_en)



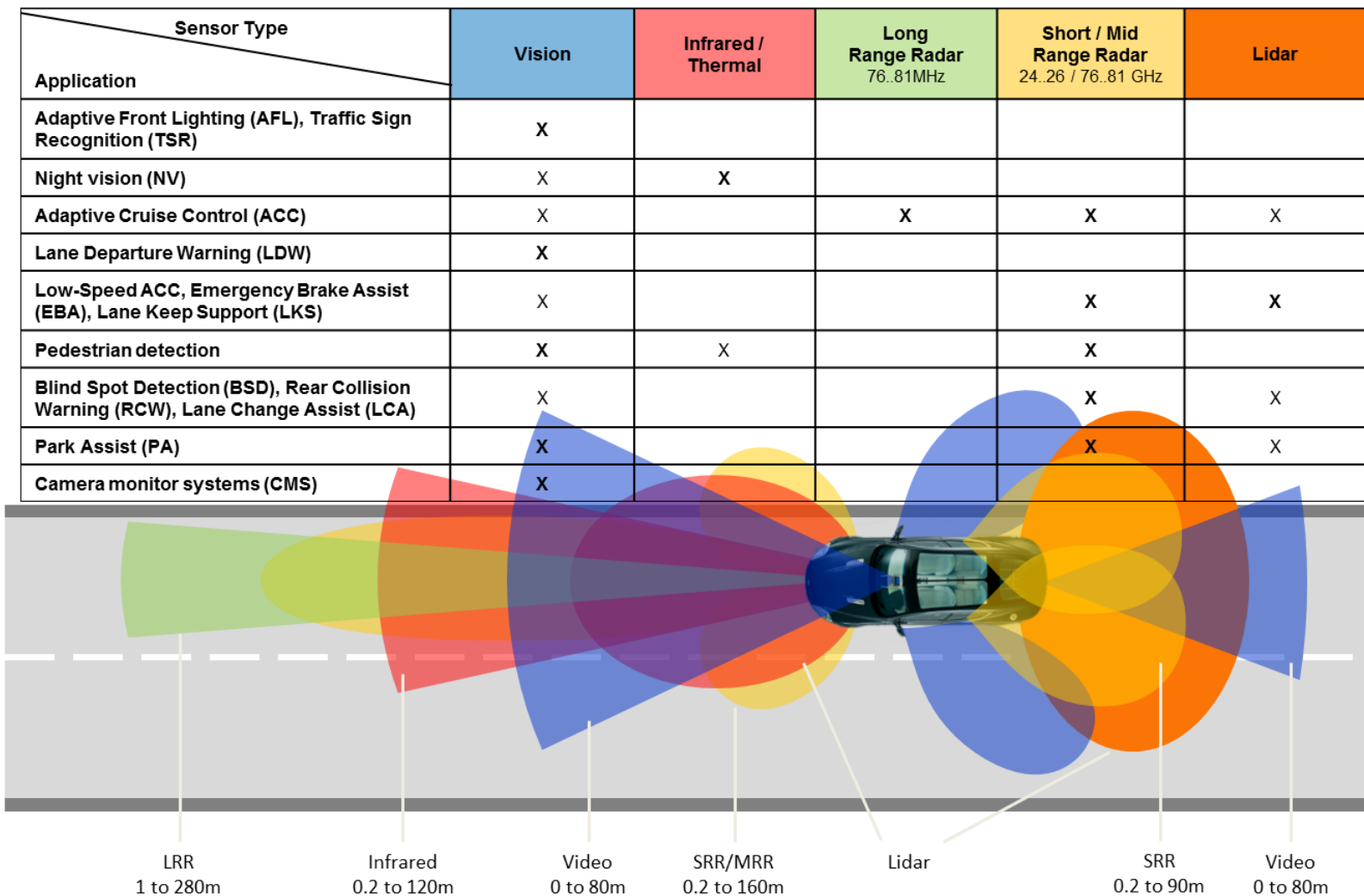


## C-ITS Use Case Critical Requirements

| Use Cases  | Impact on industry   | Critical requirements                             | Estimated value                                   |
|--|--|---|---|
| Improvements in V2X communications and allowing for features such as collision avoidance and emergency braking | Improved safety  | Latency<br>Connection density<br>Mobility         | <5 ms<br>>10,000 /km <sup>2</sup><br>>200 km/h    |
| Infotainment services  | In-car entertainment and information services of value to the driver and passengers              | Data throughput<br>Connection density<br>Mobility | >10 Mbps<br>>10,000 /km <sup>2</sup><br>>200 km/h |
| Platooning   | Improved safety and efficiency   | Latency<br>Reliability                            | <5 ms<br>>99.99999%                               |
| Data collection  | Generation of large amounts of data opens up opportunities for new charging and insurance models | Data throughput<br>Connection density<br>Mobility | >10 Mbps<br>>10,000 /km <sup>2</sup><br>>200 km/h |
| Remote monitoring and predictive maintenance   | Efficiency improvement   | -   | -   |
| Driver assistance (see through the front vehicle via in-dash cameras)  | Improved safety  | Latency<br>Data throughput<br>Mobility            | <5 ms<br>>10 Mbps<br>>200 km/h                    |

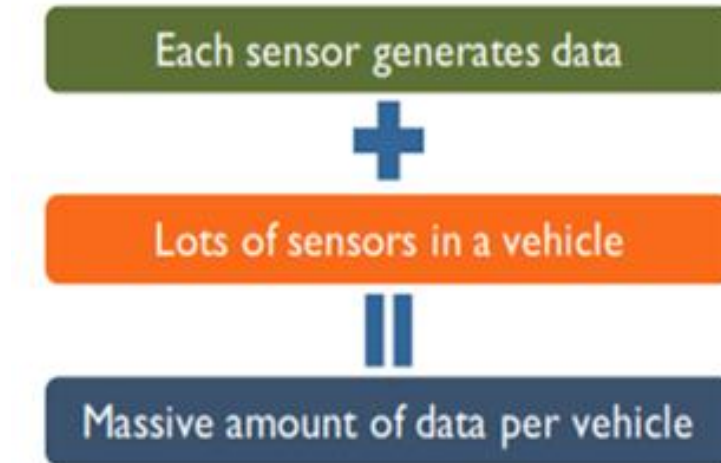


## More than 30 Sensors per Car may be needed





## Requirements of Future Connected and Autonomous Cars



High throughput in the order of 25GB/h. In a single trip, a self-driving car can generate up to **1 terabyte of data\***

Latency as low as 5ms.  
Advanced Security  
Seamless connectivity

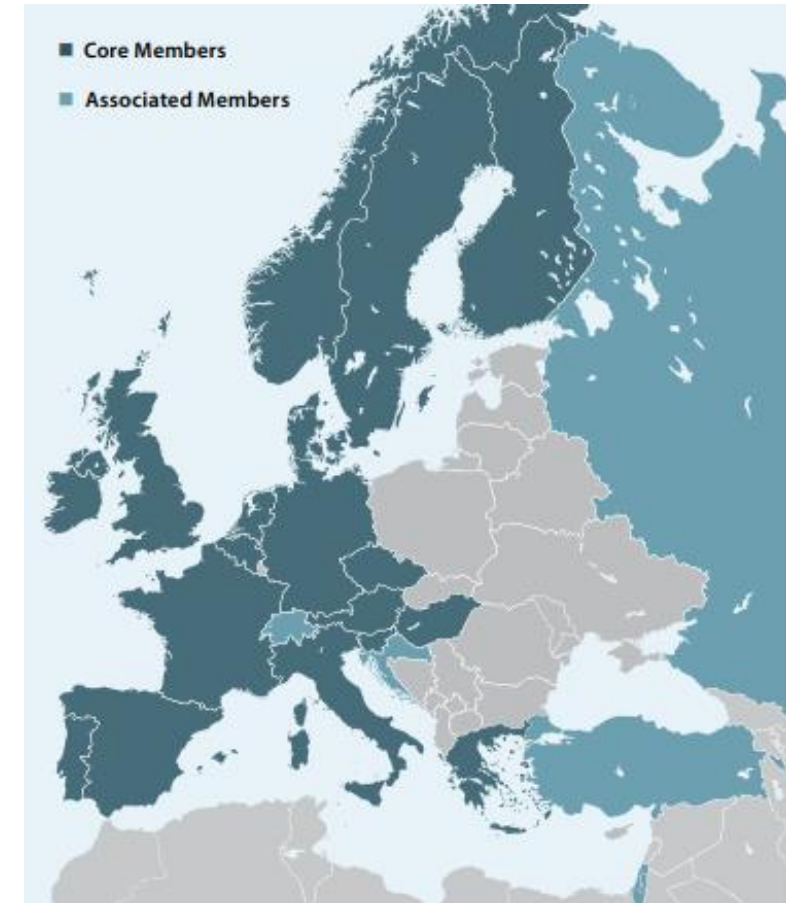
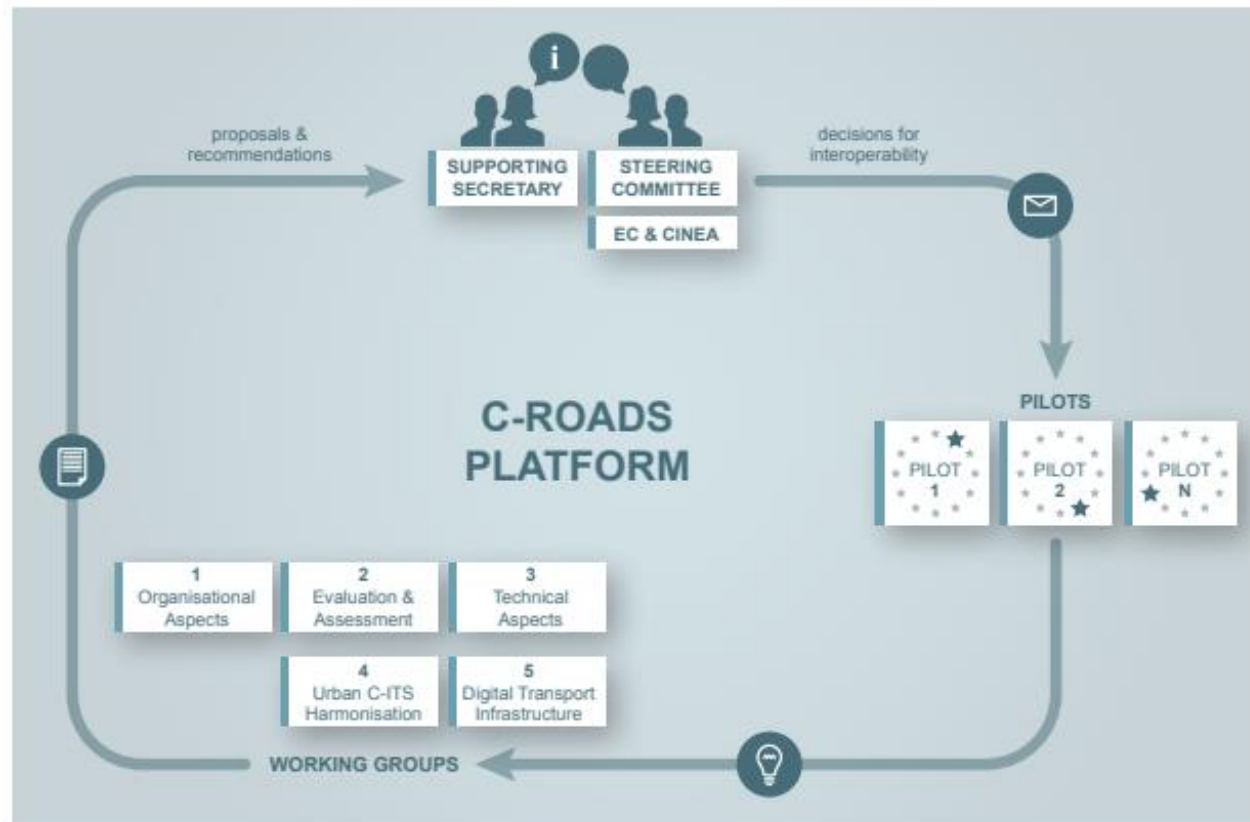
\*Source: [https://www.sas.com/en\\_us/insights/articles/big-data/the-internet-of-things-and-connected-cars.html](https://www.sas.com/en_us/insights/articles/big-data/the-internet-of-things-and-connected-cars.html)



# The C-ROADS Project

# The C-ROADS Platform

- The **C-ROADS** Platform is a joint initiative of European Member States and road operators for testing and implementing C-ITS services in light of cross-border harmonisation and interoperability. <https://www.c-roads.eu/>





# C-ROADS Greece Project

**Duration:** 01/06/2019 until 30/06/2023

**Budget:** maximum amount of EUR 1,284,650

## Partners

ICCS

CERTH

Attikes Diadromes

Egnatia Odos

University of Patras

Telenavis

Intracom

COSMOTE

G4S

Ministry of Infrastructure and Transport

Hellastron



## C-ROADS Greece Pilot



- The northern Greece test site includes 30 km of motorway with 25 RSUs + 1 mobile RSU to be deployed in Egnatia Odos.
- The Attica region test site includes 20 km of motorway with 10 RSUs + 1 mobile RSU to be deployed in Attica Tollway.
- Hybrid approach (combination of both cellular and G5 technologies employed).
- **Objective:** to produce interoperable C-ITS services in Greece that may also support relevant services of the other European members within the C-Roads Platform.



## C-ITS Services to be Tested in C-ROADS Greece

| Service                                | Use Case                         | Egnatia Odos | Attica Tollway |
|--|----------------------------------|--------------|----------------|
| Roadworks Warning (RWW)                | Lane Closure (LC)                | X            | X              |
| Hazardous Locations Notification (HLN) | Weather Conditions Warning (WCW) | X            | X              |
| Hazardous Locations Notification (HLN) | Obstacle on the Road (OR)        | X            |                |
| Hazardous Locations Notification (HLN) | Stationary Vehicle (SV)          |              | X              |
| In-Vehicle Signage (IVS)               | Embedded VMS "Free Text" (EVFT)  | X            | X              |
| In-Vehicle Signage (IVS)               | Shockwave Damping (SWD)          |              | X              |
| Probe Vehicle Data (PVD)               | CAM Aggregation (CAM)            | X            |                |
| Traffic Management (TM)                | Smart Routing (SR)               | X            | X              |

VMS: Variable Message Signs are electronic and intelligent display panels for road traffic.

CAM: Collective Awareness Messages including vehicle type, speed, etc.





## The Role of COSMOTE

- Provides full 4G coverage to both sites (One new base station has been installed in Egnatia Odos for the needs of the pilot).
- Participates in the European C-ROADS Task Force 4 that produces the specifications for hybrid communications (G5 and cellular).
- Contributes to the definition of the use cases and supports the implementation of the designed solution.
- Supports the integration activities and the verification of end-to-end proper operation for both Greek pilots.
- Ensures that KPIs are met and contributes on the impact assessment methodology and cost-benefit assessment.





**Thank you!**