C-ROADS

PORTUGUESE NETWORK FOR C-ITS

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Agenda

C-ROADS

- ◖ GMV in ITS
- ◖ GMV in C-ROADS
- ◖ C-ITS perspective for the future

Co-financed by the European Union
Connecting Europe Facility

Agenda

C-ROADS

C **GMV in ITS**

C GMV in C-ROADS

C C-ITS perspective for the future

GMV - A GLOBAL TECHNOLOGY GROUP

Multinational technology group

Headquarters in Spain (Madrid)

Over 1,400 employees

Aeronautics, Space, Defense, Security, Transportation, Healthcare, Banking & finances, and ICT industries.

Private capital

Subsidiaries in 10 countries

Roots tied to the Space and Defense industry

Engineering, development and integration of systems, software, hardware, specialized products and services

Founded in **1984**

INDUSTRIES

Aeronautics

Space

Defense & Security

Cybersecurity

Healthcare

Transport

Telecommunication

Public Sector and Corporate ICT

Banking & Finances

GMV AS AN AUTOMOTIVE TIER-2 SUPPLIER

GMV's software running in more than **1,5 Million TCU** units in the World for different customers
- Telematic Services
- Safety and Security
- Electric Vehicle

ADVANCED TELEMATICS AND SMART MOBILITY

PAY PER USE
PAYD & UBI insurance
Congestion Charging
Electronic Fee Collection

SAFETY & SECURITY
eCall
bCall
Emergency Services management
Stolen Vehicle Tracking & Recovery

HIGHWAY SERVICES & TOLLING
Electronic Fee Collection
HOV declaration & services
Smartphone-based tolling

NEW MOBILITY CONCEPTS
Car sharing
Car pooling
Dynamic parking solutions
Eco-driving
Eco-coaching
Traffic Information Generation (FCD)
Traffic Management
…and many others

SERVICES FOR THE ELECTRIC VEHICLE
EV Battery charging status / Charging History
EV Charging remote activation/deactivation
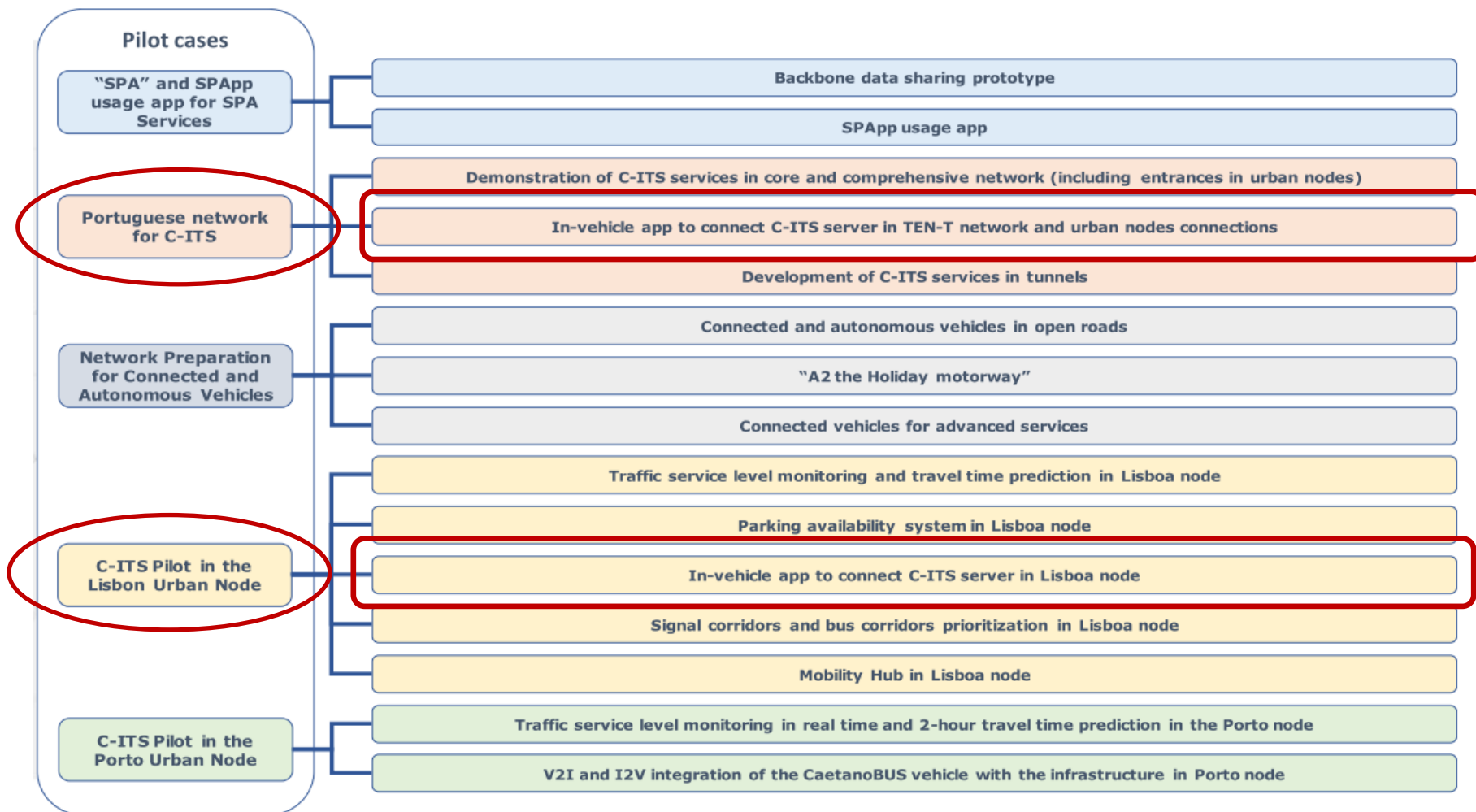EV Charging scheduler
Navigation to Charging station
…and many others

MAINTENANCE
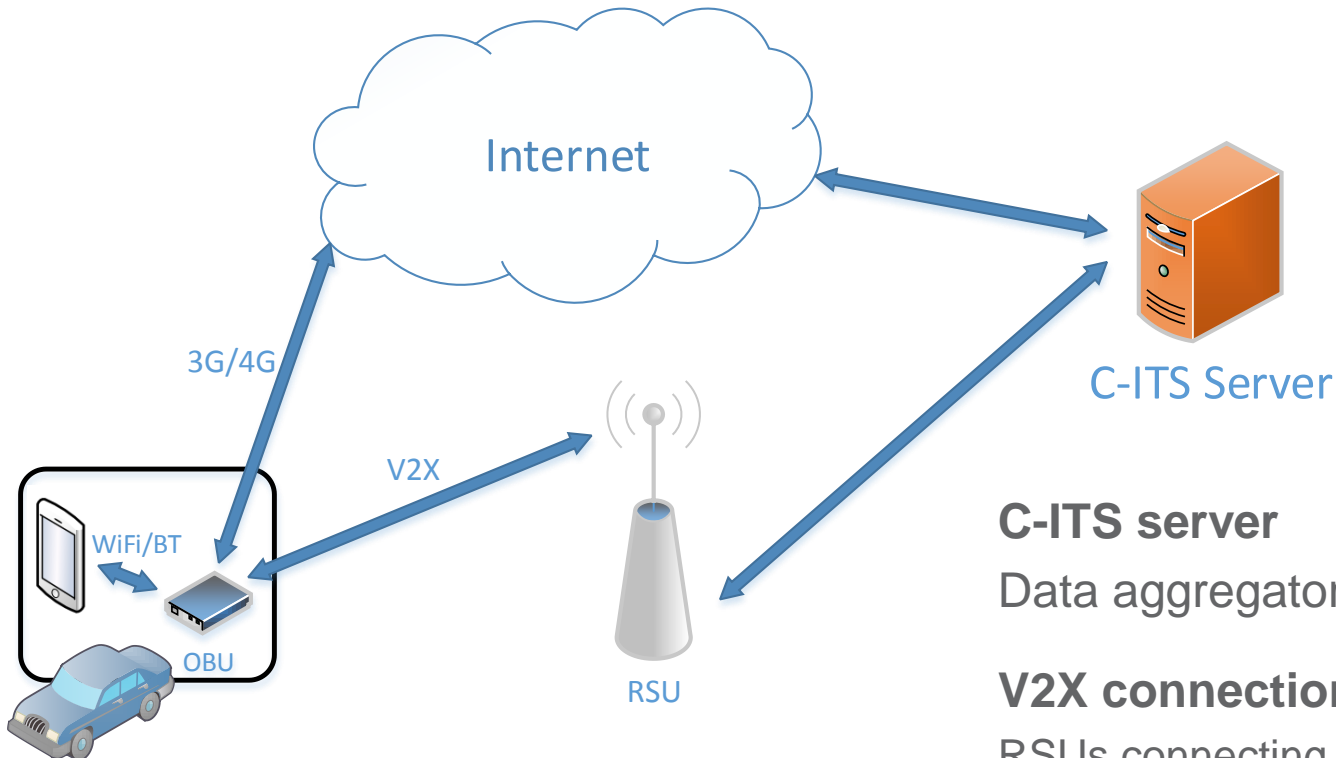Remote diagnosis
Predictive maintenance

Agenda

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C-Roads pilots

Pilot cases

"SPA" and SPApp usage app for SPA Services	Backbone data sharing prototype
	SPApp usage app
Portuguese network for C-ITS	Demonstration of C-ITS services in core and comprehensive network (including entrances in urban nodes)
	In-vehicle app to connect C-ITS server in TEN-T network and urban nodes connections
	Development of C-ITS services in tunnels
Network Preparation for Connected and Autonomous Vehicles	Connected and autonomous vehicles in open roads
	"A2 the Holiday motorway"
	Connected vehicles for advanced services
C-ITS Pilot in the Lisbon Urban Node	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
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
	V2I and I2V integration of the CaetanoBUS vehicle with the infrastructure in Porto node

C-Roads Communications

C-ROADS

Internet

3G/4G

V2X

WiFi/BT

OBU

RSU

C-ITS Server

C-ITS server

Data aggregator and service supplier

V2X connection

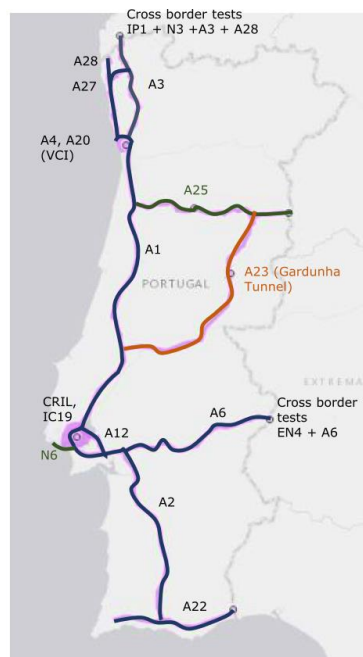RSUs connecting drivers with C-ITS server

Hybrid communications

Data received through 5.9 GHz ITS G5 and / or 3G/4G

User interface

In vehicle App connected with OBU

Pilot in TEN-T network

GMV Participation

Locations:

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

Equipments:

- 24 RSU
- 20 OBU
- 15 Vehicles

Day 1 Services:

- Slow or stationary vehicle(s)
- Traffic jam ahead warning
- Other hazardous location notification
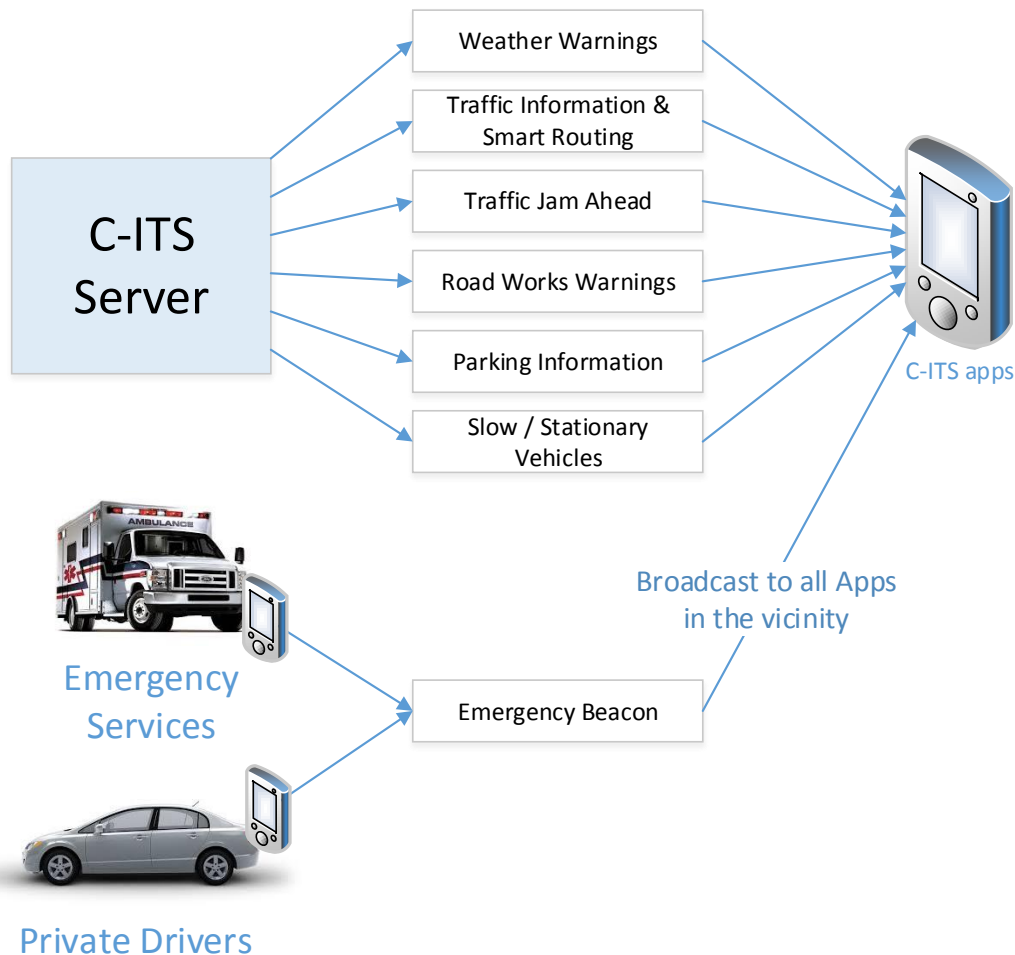- Road works warning
- Weather conditions

Day 1.5 Services:

- Off-street parking information
- Traffic information & smart routing

Partners:

- GMV, IP, ASCENDI BLA

Goals for TEN-T network pilot

Weather Warnings

Traffic Information & Smart Routing

Traffic Jam Ahead

Road Works Warnings

Parking Information

Slow / Stationary Vehicles

C-ITS Server

C-ITS apps

Emergency Services

Broadcast to all Apps in the vicinity

Emergency Beacon

Private Drivers

Goals

- Demonstrate the long term viability and scalability of C-ITS
- Roll out / larger scale deployment vision of C-ITS in Portugal
- Demonstrate the use of C-ITS on the Core Network in Portugal, urban nodes and in Traffic Management Centres (TMC)
- Demonstrate commitment and buy-in from all stakeholders, including road infrastructure operators

Pilot in Lisbon Urban Node

GMV Participation

Locations:

* A36 (2ª circular) – 9,8 km

Equipments:

* 3 RSU
* 5 OBU
* 5 Vehicles

Day 1 Services:

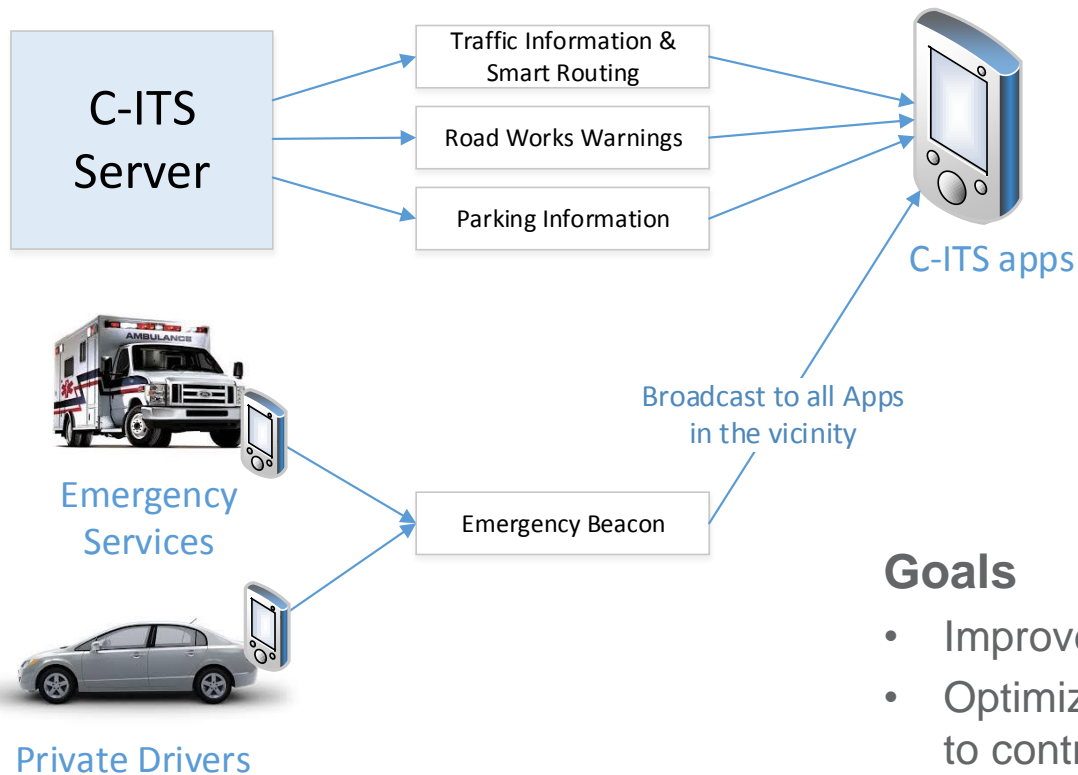* Emergency vehicle approaching
* Road works warning

Day 1.5 Services:

* Off-street parking information
* Traffic information & smart routing

Partners:

* GMV, CML

Goals for Lisbon Urban Node pilot

C-ITS Server

Traffic Information & Smart Routing

Road Works Warnings

Parking Information

C-ITS apps

Emergency Services

Broadcast to all Apps in the vicinity

Emergency Beacon

Private Drivers

Goals

- Improve driver decision capacity
- Optimize transport operation with the aim to contribute to safety and efficiency

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C-ITS perspective

"Softwarization"

- The number of vehicles in operation in the world broke the **1 billion barrier in 2010** and by 2020 it is expected to be between 1,3 and 1,5 billion vehicles.
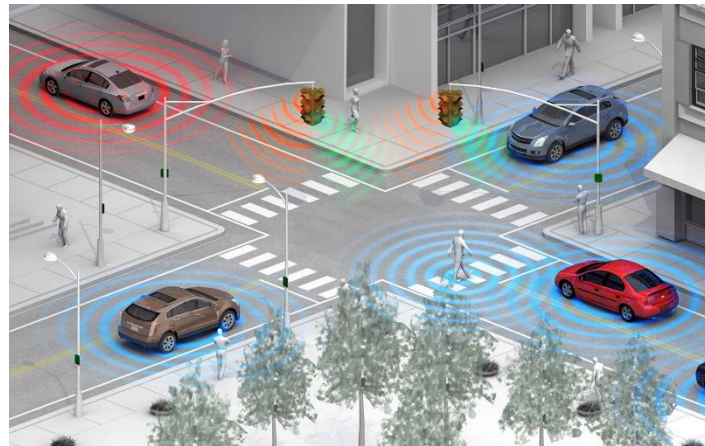- Most vehicles today have **more than 100 million lines of software code** powering their systems and features.

SW Lines of Code (millions)

C-ITS perspective
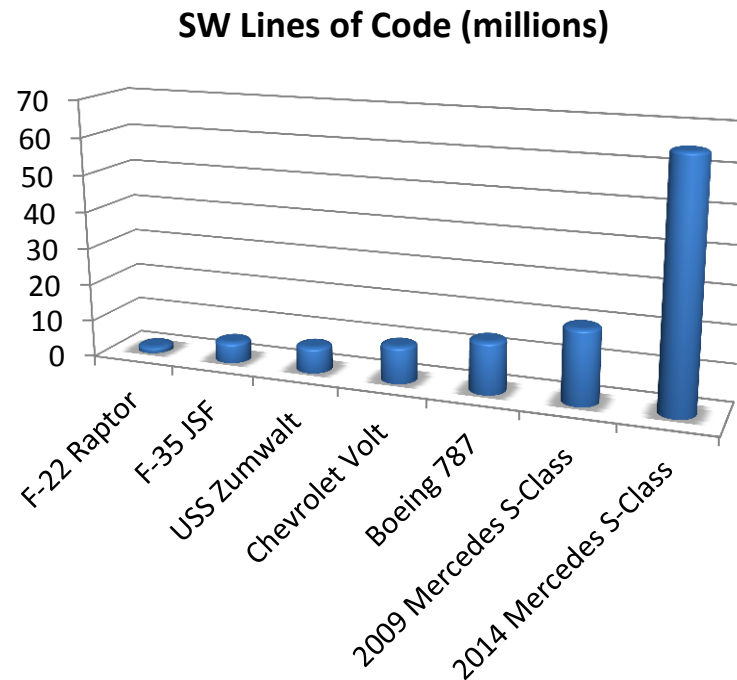
Advanced Driver Assistance Systems (ADAS)

C   There are several systems on the market today that **intervene when it is beyond the human capability to act**, like ABS (Anti-Lock System) and ESC (Electronic Stability Control).

C   New **ADAS** systems already in the market or to be introduced **in the near future have a significant impact on driving efficiency and safety**: Lane Change Assist, Lane Departure Warning, Front Collision Warning, Adaptive Cruise Control, Lane Keeping Assist, Traffic Jam Assist, Traffic Jam Chauffeur, Highway Chauffeur, Highway Pilot, …
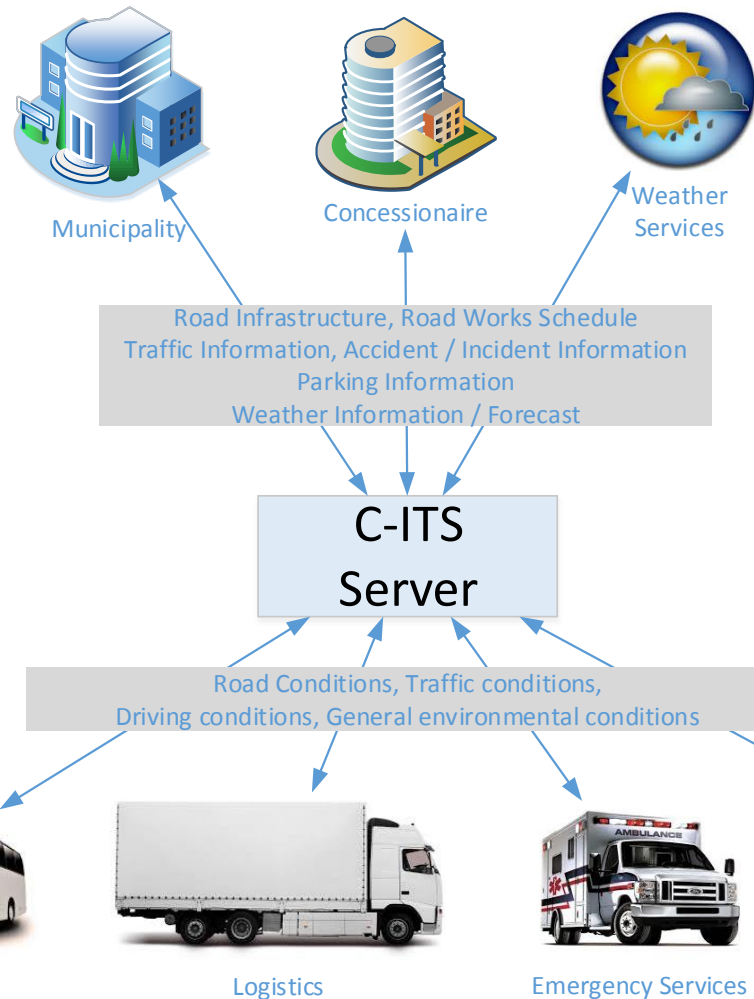
C-ITS perspective
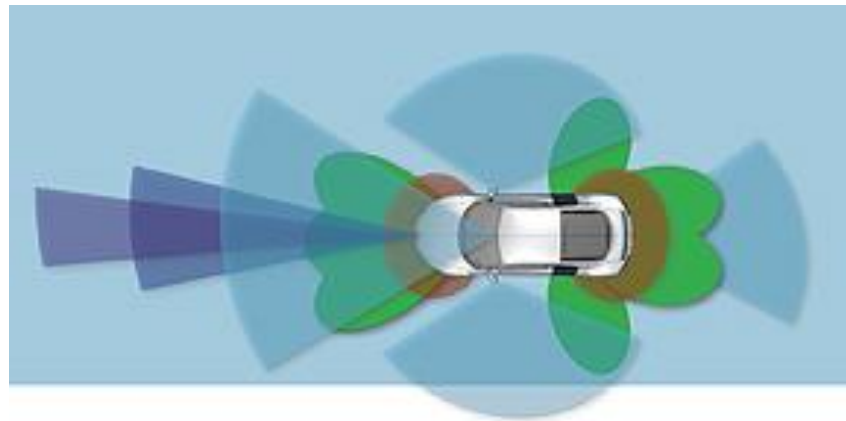
Collaborative systems - V2X

- Communication between vehicles (V2V, Vehicle-to-Vehicle) and between vehicles and infrastructure (V2I, Vehicle-to-Infrastructure) adds new capabilities to transport systems
- **Shared Information** (about road hazards, accidents and incidents, for instance) allows to reach a common goal (like vehicle platooning).
- In all these applications, **input to vehicle control** may originate or be heavily influenced by **an outside source**.

C-ITS perspective

Municipality   Concessionaire   **Weather Services**

Road Infrastructure, Road Works Schedule
Traffic Information, Accident / Incident Information
Parking Information
Weather Information / Forecast

C-ITS Server

Road Conditions, Traffic conditions,
Driving conditions, General environmental conditions

Public Transport   Logistics   Emergency Services   Private Drivers

Expectations

- Connected system
- Cooperative systems
- Road users and traffic managers to share information

Results

- Improve road safety
- Comfort of driving
- Traffic efficiency
- Pollution reduction
- Prepare the future for automated/autonomous vehicles

C-ITS perspective

C-ROADS

- **Challenges for the C-ITS implementation**
  - Telecommunication technologies
    - Message format standardization
    - Standardization on collected and shared data / usage of open data sources
    - Hybrid communications.
    - Multiple connections to several data sources using multiple technologies
    - Interoperability between user equipment and infrastructure equipment using different brands
    - Interoperability between countries
  - Security level
    - Personal information security
    - Prevent external entities to tamper with service usage
  - Service level
    - Service harmonization between sites or countries
    - Expected increase on service deployed need careful user interface design

THANK YOU!

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