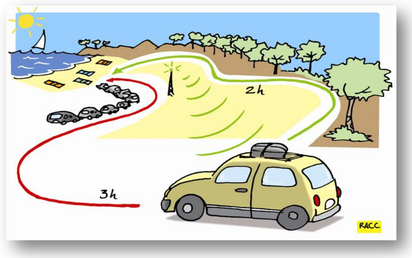
# Vehicular Networks: A reality not too far to come

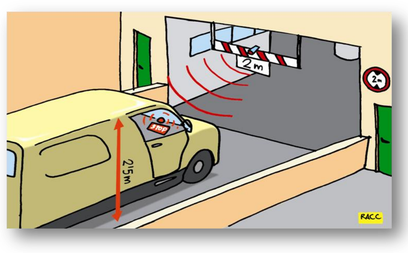
Marco Gramaglia
Institute IMDEA Networks

## Why do we need vehicular networks?

Intelligent Co-operative Systems that are based on vehicle-to-vehicle (V2V) and Vehicle to Infrastructure (V2I) communications are the next big challenge in automotive electronics and Intelligent Transport Systems

- ❑ Increased road network capacity
- ❑ Reduced congestion and pollution
- ❑ Improved traffic safety for all road users
- ❑ Improved management and control of the road network (both urban and inter-urban)
- ❑ Increased efficiency of the public transport systems
- ❑ Better and more efficient response to hazards and accidents
- ❑ Ubiquitous Internet connection

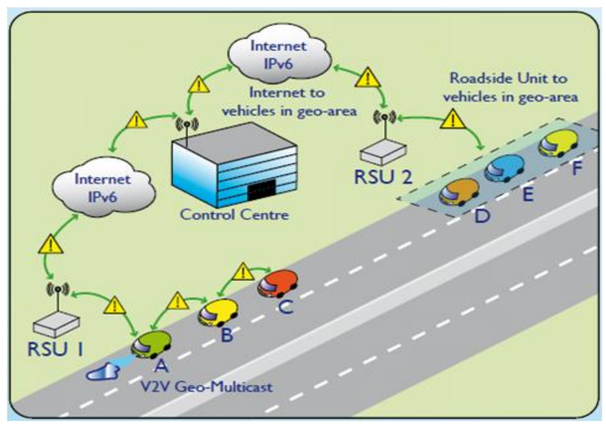




## What's inside the car?

- ❑ Vehicles are equipped with the usual safety devices (seat belts, airbags, abs)
- ❑ A new entity is deployed: the On board communication unit, OBU

- ❑ The OBU has access to the information coming from sensors placed inside the car (speed, brakes, position, acceleration,...)
- ❑ It also gathers information coming from other vehicles around (emergency brake, accidents, generic hazard,…) and from the infrastructure (traffic state, weather conditions,…)
- ❑ The OBU may also benefit from Internet connectivity capabilities, that could be used to enable in-vehicle devices to reach the Internet
- ❑ Need for smart mobility and handover mechanisms

## The inter-vehicle connectivity




- ❑ Current wireless technology limits the transmission coverage for each vehicle
- ❑ Roadside gateway deployment cannot be as dense as needed to provide full direct connectivity
- ❑ A multihop approach is needed in order to provide vehicles with connectivity to the infrastructure network (traffic information and internet connectivity purposes).
- ❑ On board devices such as GPS are used to enable geographic routing where packets are forwarded on a "per position" basis instead of a "per address" basis
- ❑ Vehicles' mobility influences the performance of the network as paths can become unavailable as a result of their movement

## Who's working on it?

- ❑ Many standardization bodies are working on vehicular networks: ETSI TC Intelligent Transport Systems, ISO TC204, IEEE 1609
- ❑ Past and present European and Spanish projects are targeting this environment
- ❑ From the research point of view, there are good venues where you can publish your work (IEEE Vehicular Technology Conference, IEEE Transaction on Vehicular Technology)
- ❑ And, of course, Institute IMDEA Networks (as development member of CAR 2 CAR communication consortium) and Universidad Carlos III de Madrid are active in this field!




Marco.gramaglia@imdea.org