

The 5G connected car

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Abstract—This document intends to give an overview of the vision of the automotive industry on 5G. After describing some use cases for the car of the future, it highlights some key research and innovation topics which need to be pursued between 5G players and the automotive industry.

Keywords—5G requirements; automotive

I. INTRODUCTION

Improvements over current mobile broadband services are needed to enable fully autonomous vehicles, as well as support systems to ensure a better security for all road users.

While exploring innovative advanced automotive services, new requirements for mobile connectivity appear such as ultra-reliability, low-latency, and a wider coverage. It is also very important that cars can communicate with each other and communicate with the road infrastructure and other participants in the city, such as pedestrians or cyclists.

In this paper, we will first explore some use cases for the 5G connected car and then highlight some key research and innovation topics which will help to deliver them.

II. USE CASES

We are currently seeing an explosion of connected car related services like:

- Driving experience improvement with connected GPS taking into account road conditions and tourist information
- Infotainment with Radio, Podcasts, Music & Video streaming, Web surfing accessible in one touch
- Maintenance services including Vehicle information & warnings, Eco-driving guidelines, Car tracking system for security reasons...
- Emergency call
- Voice calls, SMS and Instant Messaging

Beyond these services, we can foresee a lot of innovations which could benefit from the nice properties of future 5G infrastructures:

- Driver-Vehicle Dialogues which would improve the driving experience beyond recent innovative services such as driving applications using augmented reality
- Fluid Vehicle Traffic services which would guide drivers through traffic automatically taking into account the real time status of the road and destinations of all vehicles
- Cooperative Vehicles which could give the ability to warn drivers of an impending collision before it occurs or even to see through vehicles via video streaming retransmission in order to anticipate future obstacles
- Road Automation which would give new capabilities to cities to handle traffic jams or pollution peaks
- Cloud-Integrated Vehicles which could transform radically the in-car entertainment or even productivity experience for the driver or the passengers

Since the start of the project in 2012, METIS has already defined at its early stages a collection of scenarios and test cases considering both human-centric and machine-type which are expected to play a key role in future 5G networks[1]. Relevant use cases of METIS in the area of future driving are for example “traffic jam” and “traffic efficiency and safety”.

Beyond that, METIS identified the concept of “Moving Network” as a potential disruption in the way wireless access networks are deployed. A moving network describes a group of mobile nodes or terminals (e.g. vehicles with advanced communication and networking capabilities) that form an ad hoc network moving with the nodes themselves and allowing connectivity between these nodes and the rest of the infrastructure through appropriate attachment and handover. It is important to highlight that a moving network is not only restricted to networks within a vehicle, but is also extended to networks between and outside vehicles. Moving networks applications are numerous and include:

- Robust high-data rate communication links with redundancy ensured by the different mobile end points

- Flexible and demand-driven network deployment relying on the activation of relays in e.g. parked vehicles
- V2X communications to enable reliable and low-latency services such as road safety and traffic efficiency.

III. RESEARCH AND INNOVATION TOPICS

The presentation at EuCNC will highlight some key research and innovation topics which need to be shared between 5G industry players and the automotive sector in order to deliver the use cases which we described in the previous

section. As an illustration, the vision of EUCAR, the European Council for Automotive R&D, on these key topics is summarized in the exhibit below.

REFERENCES

[1] METIS D1.1, “Scenarios, requirements and KPIs for 5G mobile and wireless system,” https://www.metis2020.com/wp-content/uploads/deliverables/METIS_D1.1_v1.pdf, April 2013

[2] EUCAR, “Roadmaps for Safe & Integrated Mobility,” <http://www.eucar.be/executive-summary-ri-roadmaps-safe-integrated-mobility/>, December 2013

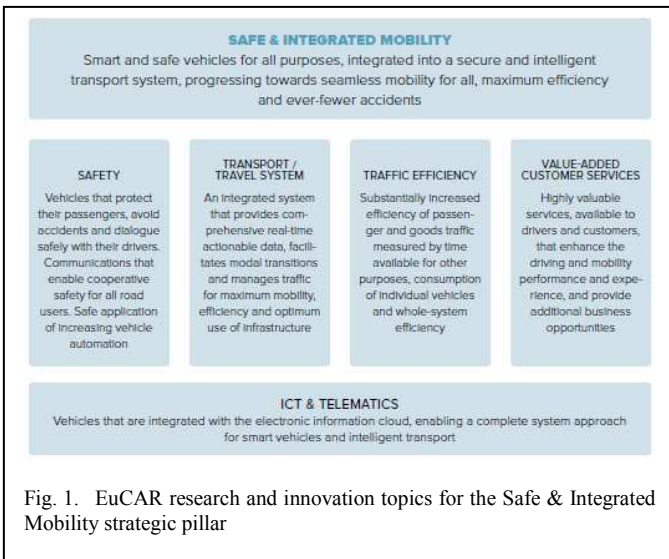


Fig. 1. EuCAR research and innovation topics for the Safe & Integrated Mobility strategic pillar