5G for Connected and Automated Road Mobility in the European union

5G-CARMEN - EU Funded Project
Roberto Fantini, TIM

Smart Road & Smart Traffic
Future Mobility Expoforum, November 19th, Torino, Italy

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Automated and Connected Vehicles
The role of 5G-CARMEN

Vehicles will merge in the digital world
From a device for moving from A to B to a smart hub that is always connected and has different levels of automation

5G-CARMEN
To provide a CCAM (Cooperative, connected and automated mobility) platform leveraging the most recent 5G advances and supporting the automotive sector in delivering safer, greener, and intelligent transportation
The Bologna-Munich Corridor

Key Figures

• Total length: ~600 Km
• Interconnecting two-major industrial poles
• Three countries covered
  • Italy
  • Austria
  • Germany
• 2 cross-country trials
• Single-country trials for pre-integration
• Four CCAM Use Cases trialed
The 5G-CARMEN Team
An Industry led Innovation Action
The 5G-CARMEN Challenges
Improving Road Safety

**Fatal car accidents on motorways in Europe**
Motorway security is an important issue for humans and car safety but still 25,300 people lost their lives on EU roads in 2017 (EC, Press Release, 2018)

**The U.S. traffic collisions in 2016**
We could improve this number only if we had the chance to get better report about crashes (crashstats.nhtsa.dot.gov)
Improving road safety

UC1: Cooperative Maneuvering

5G-CARMEN will provide a platform through which vehicles will be able to exchange speed, position, intended trajectories and manoeuvres. 5G-CARMEN will explore distributed and centralized approaches for cooperative lane merging.
Automated vehicles and human drivers are limited in their ability to ensure safe and efficient travel by their perception of the environment. 5G-CARMEN will promote extended situation awareness by enabling vehicles and infrastructure to share their perception of the road.
Prevalence of Internet-Connected Cars

As of 2015, 35 percent of new cars were connected to the internet. By 2020, it’s projected that 98 percent of new cars sold will be connected to the internet. All new cars are predicted to be internet connected by 2025. These are exciting statistics for people working in the in-vehicle infotainment industry. (statista.com)
Providing an added value platform for OTTs

UC3: Video Streaming

5G-CARMEN will explore different network architectures and configurations with the goal of delivering high-quality video.

5G-CARMEN will guarantee not only the data rate requirements but also the need for coverage at all the times.
The 5G-CARMEN Challenges
Promoting Green Driving Styles

Connectivity
It is an essential matter to reduce fuel consumption and pollutant emissions, by controlling vehicles behaviour.

Rewards
It is fundamental to provide solutions geared towards the promotion of greener driving styles.
Promoting green driving styles
UC4: Green Driving

The 5G-CARMEN platform will merge information coming from vehicles and from other data sources. 5G-CARMEN will help road operators and traffic authorities in determining courses of action aimed at improving air quality.
The 5G-CARMEN CCAM Platform
Technology enablers

- Hybrid radio access network (LTE, NR)
- Network-based interworking between C-V2X and ITS-G5
- Distributed and multi-layer network-embedded cloud
- Improved positioning and time synchronization
- Service-oriented predictive QoS
- Secure, cross-border and multi-domain service orchestration
The Bologna-Munich Corridor
Enabling Technologies

Edge cloud

- Italy TIM
- MEC Italy
- C-ITS backend
- Backend Cloud
- Optional
- Italy TIM
- Austria TMA
- Germany DTAG
- MEC Austria
- MEC Germany
- C-ITS backend
- Backend Cloud
- Optional
- Connectivity
- backend

Edge cloud

- C-ITS inter-working
- CCAM Services
- CCAM VAS
- Management, Control & Data
- Inter-PLMN NW re-selection
- Inter-PLMN NW re-selection
- Infrastructure Aggregation
- V2N
- V2V
- V2N
- V2N
- V2N
- V2N
- V2N
- V2N
- V2N

Edge cloud

- C-ITS inter-working
- CCAM Services
- CCAM VAS
- Management, Control & Data
- Precise Pos..
- Predictive Conn.
- Backend Cloud

Cloud

- Edge Cloud
- Optional

V2V

RSU
Cross-border and site Trials
Roadmap (Draft)

October 2019
- Pilot plan ready

April 2020
- Preliminary pilot report and test plan ready
- Main pilot equipment and components ready
- National use case pilots

October 2020
- Cross-border use cases pilots
Thanks!

Questions?

Roberto Fantini (TIM)

WWW: www.5gcarmen.eu
Twitter: @5g_carmen
LinkedIn: https://www.linkedin.com/company/5g-carmen/