

The 5GCAR EU initiative demonstrates future wireless vehicular communication

By 5GCAR consortium

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After two years of concept work, the 5GCAR¹ project's final demonstration takes place in UTAC-CERAM test track in Linas, France where new cooperative and connected V2X applications are made possible using 5G Cellular-Vehicle-to-everything (C-V2X) communication technologies. These applications are expected to shape the future of Advanced Driver Assistance Systems (ADAS) and automated driving towards safer and more efficient driving.



To guarantee safe and efficient driving, while providing data rate demanding infotainment services, stringent requirements are posed on the wireless communication system. The 5GCAR research and innovation initiative addresses these demanding performance requirements by bringing the fields of telecommunication and automotive closer together and investigating the benefit of 5G for demanding automotive use cases.

The demonstrations include three representative use cases that define the problem space, selected to represent various needs arising from connected and automated driving after a detailed analysis of concrete communication and automotive requirements and Key Performance Indicators (KPIs). In more detail, the use cases demonstrated are:

- *Lane merge coordination use case for cooperative maneuvers* focuses on merging a vehicle onto a highway in a safe and efficient manner. This is enabled by vehicles sharing status information, such as position, speed and heading, with a central logic that determines a collaborative maneuver and recommends corresponding actions to these vehicles. The procedure is assisted by roadside cameras that provide information on unconnected vehicles and feed this information into the maneuver planning algorithm.
- *See-through & long range sensor sharing use case for cooperative perception* focuses on extending the vehicle sensing range beyond line-of-sight by combining local and shared sensor data. In the see-through variant, a vehicle gets support by a leading vehicle during an overtaking maneuver. Using video-based localization, the front scene representing the occluded region is captured and transmitted to the following vehicle. In the long range sensor sharing variant, in-vehicle sensors are used to provide information on unconnected vehicles for a collision prediction and warning algorithm.
- *Vulnerable road user protection use case for cooperative safety* focuses on network-based positioning and collision prediction to prevent accidents with pedestrians or cyclists that are hard to avoid using only in-vehicle sensors. For that purpose, time-difference-of-arrival measurements are performed to localize and track road users. Their movement patterns are then utilized to estimate the likelihood of a collision.

In order to realize these demonstrations, a communication system has been created that represents an overall 5G architecture for automotive use cases. At the core of this system are 5G-NR sidelink communication, 5G-NR positioning, and cellular communication using 5G deployment models such as Network Slicing and Edge Computing.

The demonstrations are executed on the test track while the audience is able to experience them from within the cars and has the opportunity to discuss implementation details with the corresponding experts. For the implementation of the respective demonstrations, the diversity of the consortium was of instrumental importance with the involvement of parties from the telecommunication and the automotive industry, as well as academia and Small and Medium-sized Enterprises (SMEs).

The 5GCAR project investigated and proved the added value of 5G for connected cars, studying the domain from multiple perspectives, including business models, spectrum matters, and contributing to the conception of innovative solution for the radio access network, the system architecture, and the security and privacy framework. Multiple cooperative Intelligent Transport Systems (C-ITS) use cases, which benefit from 5G features, are demonstrated today in Linas. Moreover, the scientific work within the project impacted standardization by means of project partner contributions. Furthermore, the project has influenced the ecosystem thanks to publications and presentations in major events.

Contact

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Useful Links

- Project website: <https://5gcar.eu>
- Twitter: [@5gcar.eu](https://twitter.com/5gcar.eu)
- 5G PPP Phase 2 Projects: <https://5g-ppp.eu/5g-ppp-phase-2-projects/>



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