5G CAR: Demonstrations

Lane Merge Coordination

- Connected vehicles sharing their position and other sensor data
- Roadside cameras detecting vehicles on the road and estimating their position and other metrics
- Data fusion for combining data from roadside cameras and connected vehicles
- Lane merge coordination for coordinating trajectories among vehicles
- Optimized message delivery using low latency and high reliability communication among the different actors, as well as efficient and scalable distribution of messages over the top of cellular networks
- Cellular network using Network Slicing and Quality of Service to isolate and prioritize the use case traffic from other traffic
- V2X gateway is a context-aware messaging hub based on MQTT that can be cascaded for scalable deployments
- Dynamic map serves as a database for storing and accessing road user information

Long Range Sensor Sharing

- 2 connected vehicles share their position and other sensor data. One of them embeds a lidar detection system which is used to estimate the positions of other vehicles
- 1 unconnected vehicle (vehicle 4) is visible by the lidar-equipped connected vehicle (vehicle 3), but not in line of sight for vehicle 5
- Low-complex trajectory estimation and map matching with motion models for vehicles
- Ultra reliable prediction of collisions with near-zero false alarm rate
- Low latency transmission of warning messages from mobile edge cloud to road users
- In case a collision is predicted, the non line of sight vehicle is warned by the system a few seconds in advance. This provides substantial support to human drivers and automated vehicles, allowing for smooth braking instead of an emergency break.

See-Through

- A cooperative perception application to assist drivers and automated vehicles during overtaking maneuvers
- A camera vision system at the front vehicle capturing the front scene and transmitting sensor data (real-time video) to rear vehicle
- Video-only relative positioning and pose estimation based on 3D Map and feature tracking
- Reliable and low latency unicast V2V communication for data exchange
- Few Mbps throughput over direct link in both coverage and out of coverage scenarios

Vulnerable Road User Protection

- Highly accurate 5G radio-based localization of road users with compensation of multipath propagation
- Resource efficiency through lightweight protocol architecture
- Low-complex trajectory estimation and map matching with motion models for vehicles and pedestrians
- Ultra reliable prediction of collisions with near-zero false alarm rate
- Low latency transmission of warning messages from mobile edge cloud to road users