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Qualcomm

# 5G CARMEN

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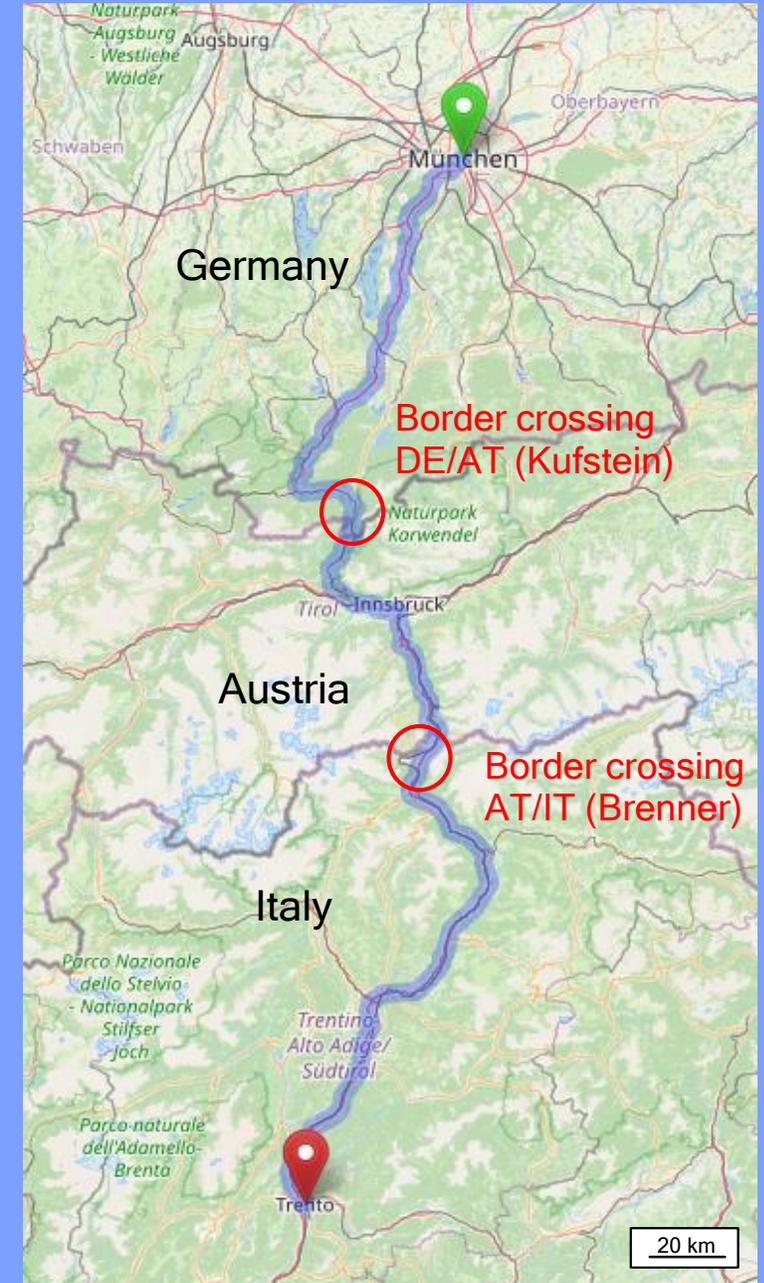
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# 600km from Munich to Bologna

- 5G aspects (V2N part of C-V2X) plus PC5 sidelink (V2V/V2I)
- Expectation for 5G: uninterrupted, low latency ( $\approx 20$  ms RTT) connection throughout the whole corridor
- Use cases e.g. Cooperative and Automated Lane Change Maneuvers and Green Driving Styles to improve air quality
- Note: current NWs are commercial 5G Non-Standalone and under roll-out



Picture source: © OpenStreetMap contributors

## Cooperative and Automated Lane Change Maneuvers

- Centralized
  - Server instance is controlling the maneuvers
- Decentralized
  - Selected information about traffic participants provided V2N2V (or V2V direct) used for helping the vehicle decisions
  - Includes warnings about an approaching emergency vehicle
  - PC5 direct communication as important redundant link
  - Higher automation level enabled depending on KPIs like redundant link quality, positioning accuracy etc.



# Cross-Border Challenges

- Challenge: cross-border = inter PLMN transition
  - Operators do not implement inter PLMN handover
  - Strategy rather: keep customer in own NW as long as possible
  - Even agreements to provide some coverage into the neighbor country
- Here: steps to speed up the process
  - Equivalent PLMN configuration (already tested)
    - => UE treats ePLMN cells the same way like current PLMN cells
    - => enables a quick move; afterwards move on higher layers needed (registration in new NW)
  - Active Re-direction when source cell in old PLMN gets weak (planned)
    - Might reduce service interruption further
- Other aspects: Local Breakout vs. Home Routing & timely creation and move of needed MEC instances



# Green Driving Styles



## Connectivity:

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

Applications: Environment analysis, Electric zones, Dynamic Speed Limit

## Green driving:

- **Real-time monitoring** of the air pollution and promotion/planning of appropriate measures to limit the negative impact of transportation on the environment.
- **Dynamic Speed Advisory** suggesting virtuous driving behavior (e.g. via speed recommendations), based on the environmental and traffic characteristics of the motorway section that is being traversed.
- **Platform merges information** coming from vehicles and from other data sources.
- 5G Carmen helps road operators and traffic authorities in determining courses of action aimed at **improving air quality**.



# Thank you

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