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Automotive Requirements for Future Mobile Networks

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January, 21st 2016

Automotive Requirements for Future Mobile Networks

Motivation

- Customer Expectation
- Expected Mobile Data Traffic 
- Vision of Automatic / Autonomous / Cooperative Driving
- Tele-operated Driving

Requirements

- Quality of Service
- Ultra low End-to-End Latency
- High Data Rates

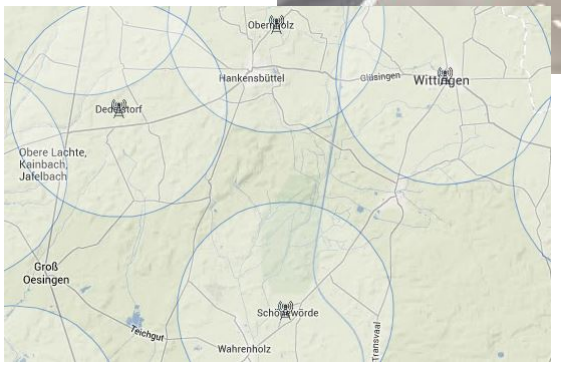
Future work items

- Coverage Extension
- Predictive Communication

Conclusion

Customer Expectation

Reliable connection **in all traffic situations and locations** for future advanced driver assistant systems (ADAS) → QoS



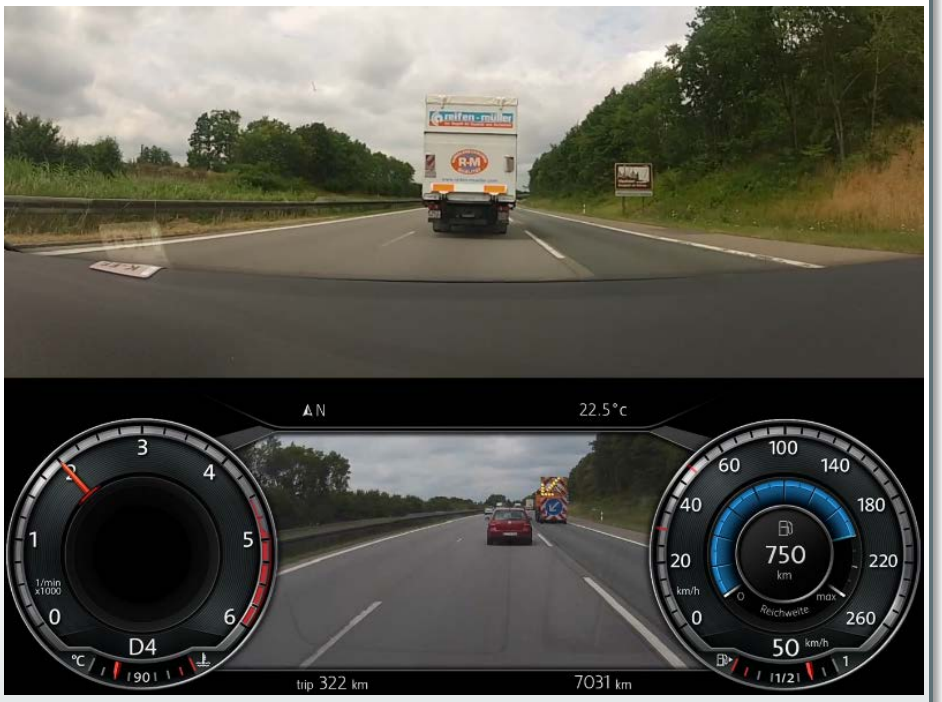
Communication **using different network operators**, independent of the contract of the vehicle occupants (safety relevant info)

Collective Perception of Environment and Related Data Rates

Example See-Through Use Case

- Video transmission from the trucks' lane-departure-warning camera to the vehicle behind
  - Video stream of 1.7 Mb/s @ 640x480 pixel @ 15 Hz
  - Video stream of 12 Mb/s @ 1280x720 pixel @ 25Hz
- Use the camera signal of other vehicles in the environment model of ego-vehicle
- Enhanced reality projection for situation awareness e.g. overtaking a slow vehicle

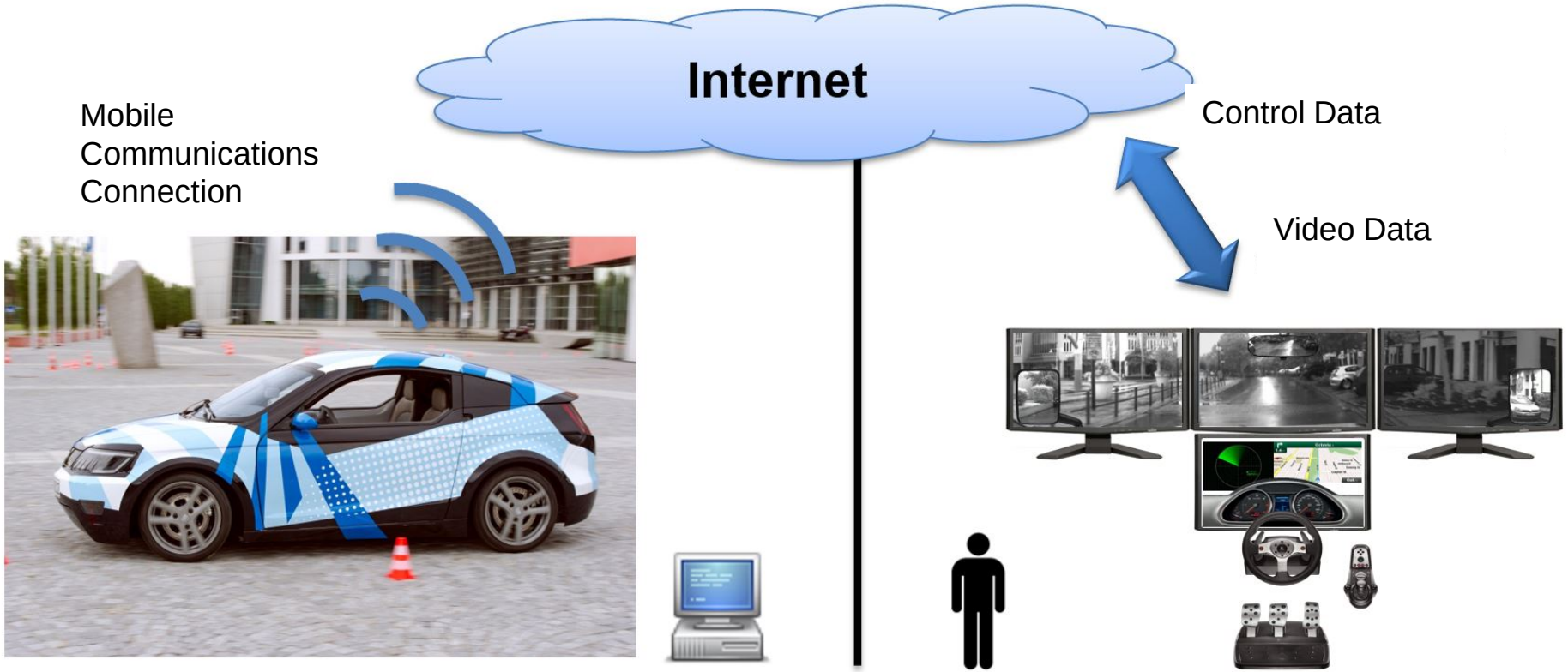
Camera view of truck



Video via 5G

5G-Communication: Tele-Operated Driving

Connected: ubiquitous coverage

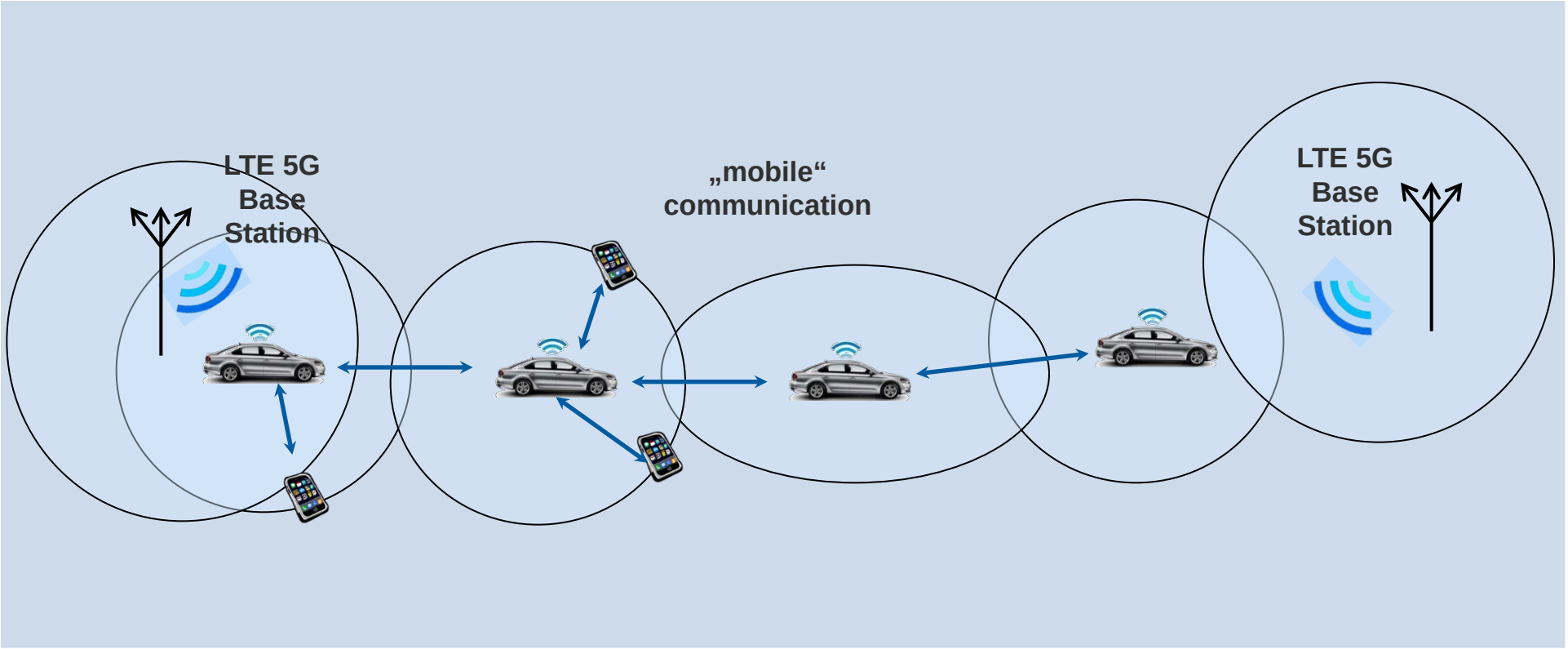


Video images of the surrounding and control inputs are transmitted between the vehicle and the remote operator workstation via mobile connection

Quelle: ATZ, M. Lienkamp, TU München Teleoperated driving

5G-Communication: Device-to-Device And Relaying

Connected: ubiquitous coverage



Predictive Communication

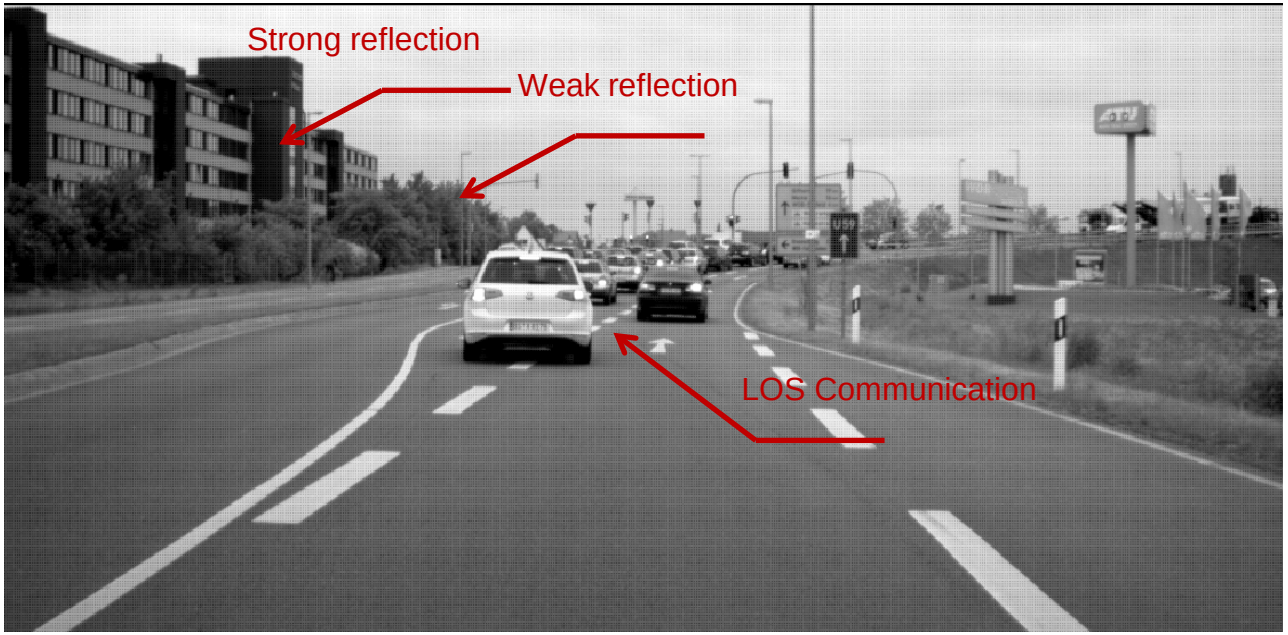
Using unique properties:

- Form factor
- Antenna placement
- Vector of motion
- Energy resources

Prediction via:
Sensors, Maps, Extracted features, Cooperation

Potential improvements:

- Localization of scatters
- Deep fading prevention
- Channel estimation: Precoding
- LOS to NLOS detection
- Spectrum and TX technique selection



Conclusion
Automotive Requirements for Future Mobile Networks

- **Reliable and ubiquitous connection for future advanced driver assistant systems (ADAS)**
- **High data volumes at low latencies for future cooperative automatic driving functions**
  - **for the Direct Communication between Vehicles**
  - **and for applications like e.g. tele-operated driving.**
- **Communication using different network operators, independent of the vehicle occupants contract (safety relevant information must be forwarded)**
- **Complement to the WLAN-Based Vehicle2X Technology (IEEE 802.11p)**

Thank you!