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Digital IT Infrastructure and Connectivity

Cellular technology based V2X

A complete solution based on a single unified technology

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Automotive and C-ITS

- **Automotive services**
  - Focus on value add services to owners of connected car, e.g:
    - Infotainment services
    - Autonomous driving assistance
    - Navigation and maps
    - WiFi hotspot in the car
    - Various convenience features
    - Vehicle life-cycle management
    - ...

- **Cooperative Intelligent Transportation System (ITS)**
  - Day 1.5 application focus on warning warnings and assistance to the driver like:
    - Emergency breaking ahead
    - Emergency Vehicle warning
    - Intersection assistance
    - Probe vehicle data
    - ...
  - Day 2 more advanced applications like:
    - Collision avoidance
    - Platooning
    - ...

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[Logo of Connected and Automated Driving Conference]
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- **V2X Indirect links**
  - Longer distances and reach to other devices
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- **V2Networks**
  - Connectivity to multiple services and stakeholders

Interconnection

Vehicle OEM Clouds

OTT Clouds E.g. Waze, Google Maps

C-ITS Cloud

Roadside Infrastructure Provider Cloud

V2Networks

V2V

Slippery Road!
LTE-V, 3GPP Rel. 14

- First 3GPP release of a cellular V2X solution already released
  - Enhancements added in future releases, capitalizing on investments in the overall mobile broadband eco-system

- Key characteristics:
  - Physical layer based on the technology developments mobile and LTE
  - Reuse of higher layers from DSRC
  - V2V, V2I, V2P can work fully autonomously
    - no need for an operator subscription or cellular coverage
  - No issue with cross border / roaming

- Performance benefits by mobility optimized technology
  - 90% packet reception ratio (PRR) achieved at 75-135% larger inter car distances
Trials and Proof-of-concepts

5G CONNECTED MOBILITY
Test track of approx. 30 km along the A9 motorway and a high speed railway track. Partners include BMW Group, DB, MNOs, BASt, BNetzA, and TU Dresden.

NORDIC WAY
EU Connecting Europe Facility (CEF) project – kicked off 2015
Finish, Danish, Norwegian and Swedish road/traffic authority are signing partners. Project goal: Show Cooperative-ITS over cellular (for some use cases) that are interoperable in the Nordic countries.

CONVEX
AUDI, Ericsson, Qualcomm, SWARCO and the University of Kaiserslautern. Perform Cellular-V2X trials based upon the 3GPP’s Release 14, including V2X communication. Co-funded by the participating organizations and the German Federal Ministry of Transportation and Digital Infrastructure.

TOWARDS 5G CONNECTED CAR
Partnership between Ericsson, Orange, and PSA Group. Aims to leverage 4G to 5G technology evolution to address connected vehicle requirements, such as ITS, improve road safety, and enable new automotive and in-car services.

KISTA 5G TEST NETWORK
Nobina AV Buses
5G RDV / KTH Concept car

BMW DRIVING CENTER SEOUL
SK Telecom, BMW and Ericsson Providing 5G coverage of BMW driving center to test multiple Vehicle Connectivity related use cases. High speed mobility, high data rate connectivity demonstrated.
Thank You!

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