

CONFERENCE

Connected and Automated Driving

TOGETHER, SHAPING THE FUTURE



April 4, 2017

Digital IT Infrastructure and Connectivity

Cellular technology based V2X

A complete solution based on a single unified technology

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03-04

April 2017

Brussels





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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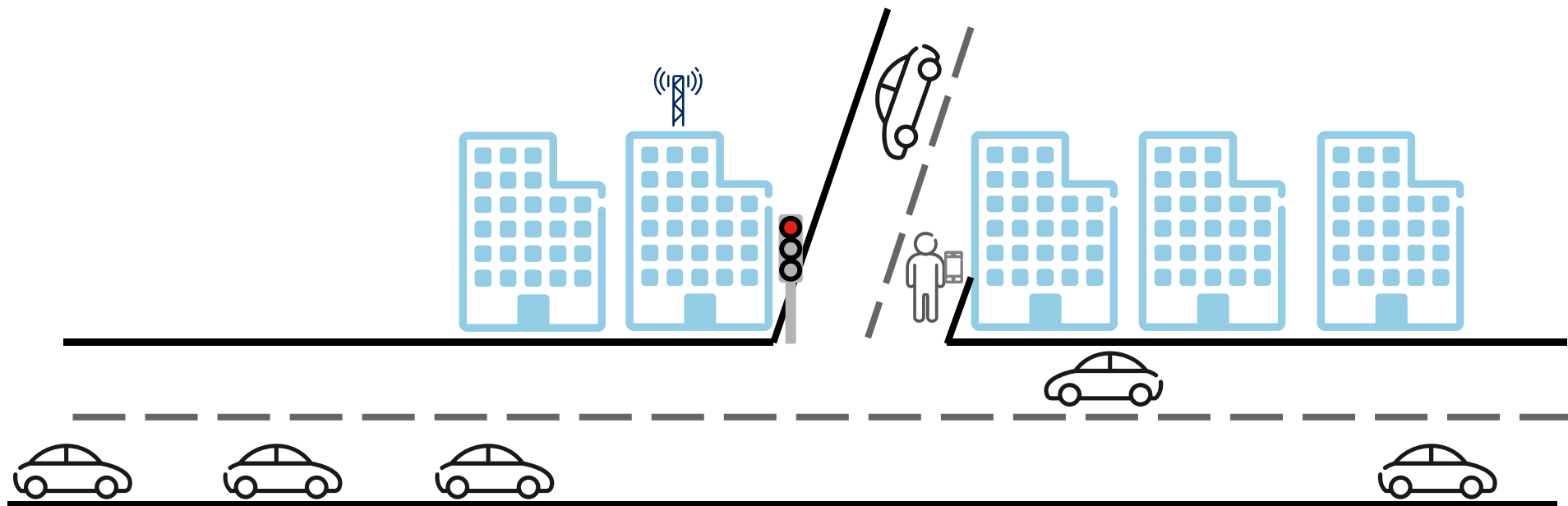
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Cellular-technology based V2X

- complete solution on a single unified technology



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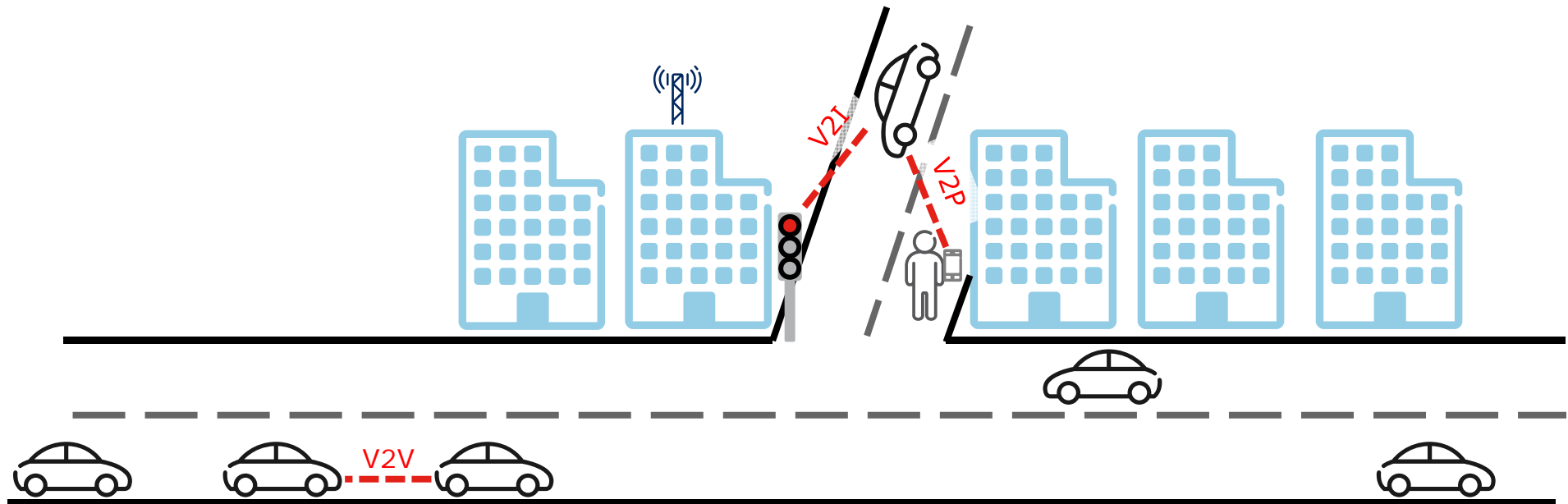
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Cellular-technology based V2X

- complete solution on a single unified technology

- V2X Direct links
- Cellular service not required

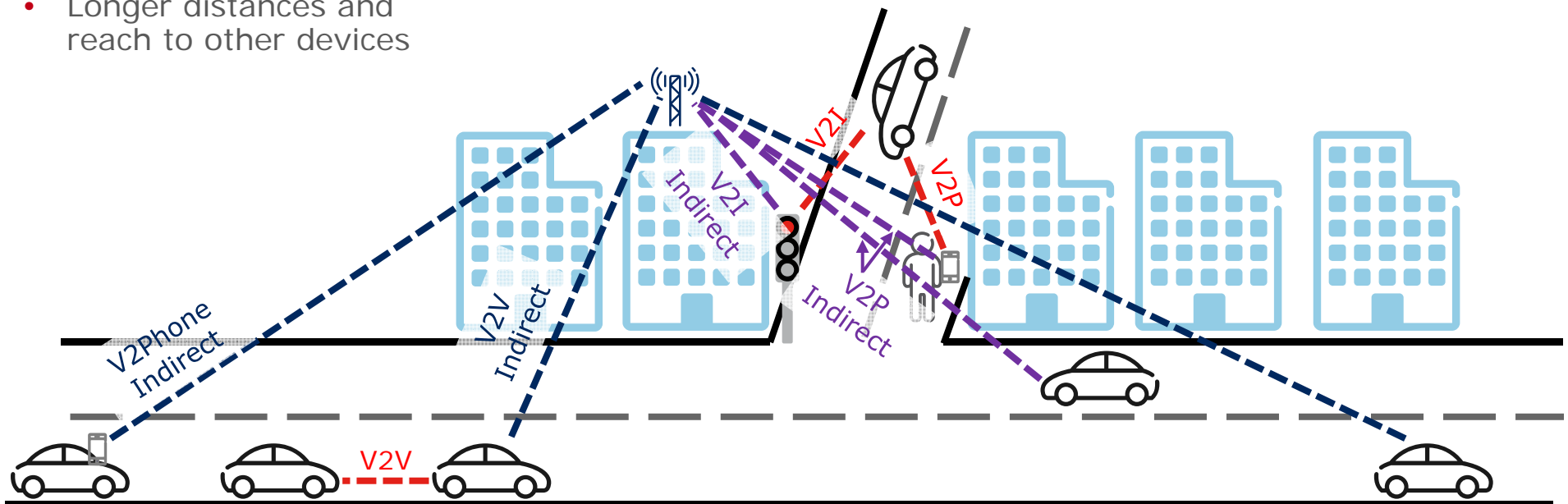




Cellular-technology based V2X

- complete solution on a single unified technology

- **V2X Direct links**
 - Cellular service not required
- **V2X Indirect links**
 - Longer distances and reach to other devices



Slippery Road !

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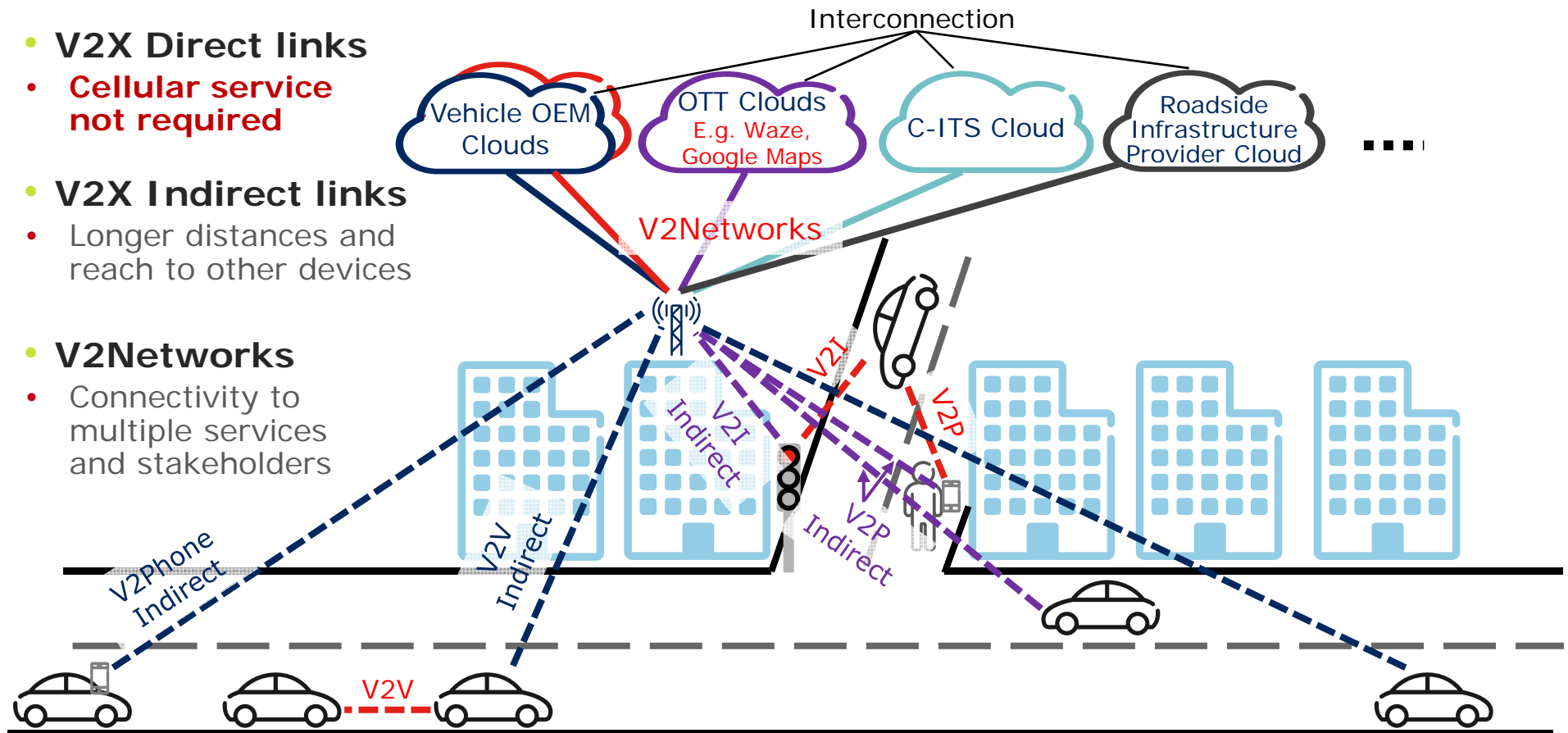
European
Commission



Cellular-technology based V2X

- complete solution on a single unified technology

- **V2X Direct links**
- **Cellular service not required**
- **V2X Indirect links**
- Longer distances and reach to other devices
- **V2Networks**
- Connectivity to multiple services and stakeholders



Slippery Road !

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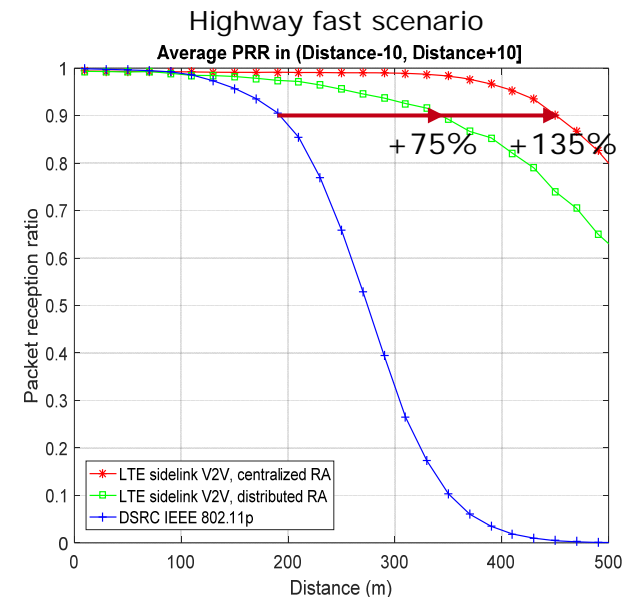
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LTE-V, 3GPP Rel. 14

- 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



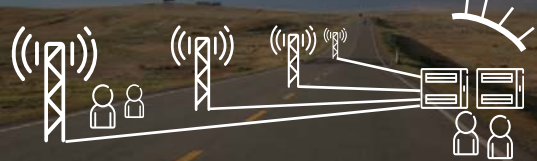
Source: Blasco, R. et al., 3GPP LTE Enhancements for V2V and Comparison to IEEE 802.11p, 11th ITS European Congress, Glasgow, Scotland, 6-9 June 2016



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.



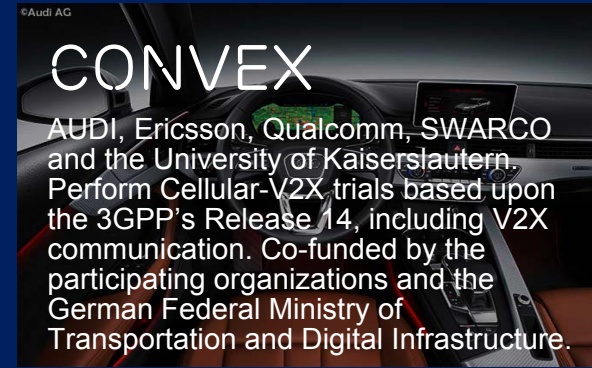
NORDIC WAY

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



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Thank You !



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