Safer Urban Mobility through C-V2X connectivity

5GAA

Berlin, May 2019

Continental

vodafone business

Motivation – Improving Road Safety

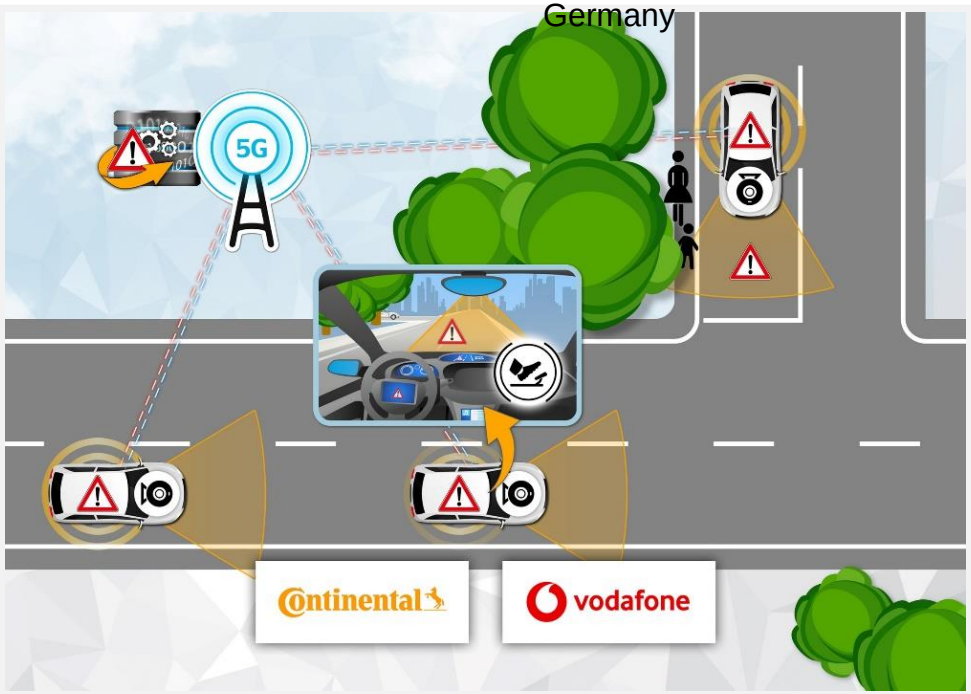
Accidents involving pedestrians and cyclists account for around 25% of road traffic deaths in Germany[1]

Significant impact to lives and society

[1] Federal Statistical Office of Germany

Benefits

- Reduce accident count and injuries
- Enable new services
- Improve driving experience
- Leverage “low-cost” front-end and relocate heavy processing to edge cloud



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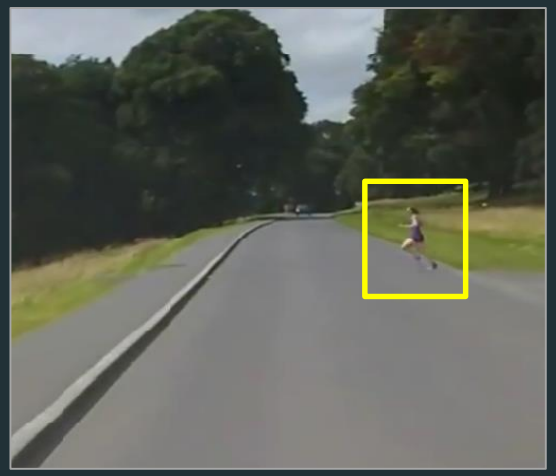
Edge Computing Enabled Pedestrian Safety Shield


Child


Jogger


Person on phone


Person with coffee

Business Motivation – Making Roads Safer with Artificial Intelligence

For assisted driving and autonomous vehicles

See


AI and video camera in vehicle

Analyse & Predict

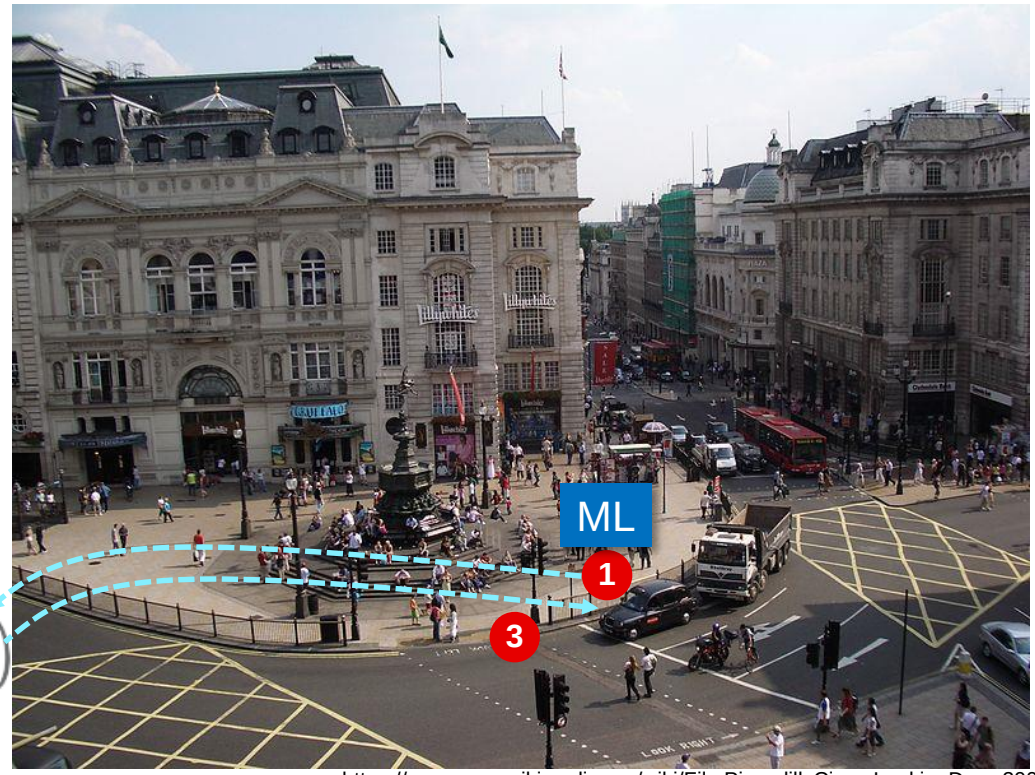

AI in network edge cloud

Alert and brake


Vehicle

Proof of Concept: Artificial Real-Time Intelligence with MEC

MEC: Multi-access Edge Computing



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1. Distributed AI application in car sends video data over 4G (5G) radio to Vodafone's Multi-access Edge Computing site inside the telco network.
2. Video data is processed in near real-time by Machine Learning algorithms at the edge cloud.
3. Results of real-time image processing are sent to the car where comparison to local analysis can be done, making final decision: instruction to driver or autonomous car.

Challenges

- Required processing power
- Hardware acceleration
- Real-time responsiveness

Distributed Edge

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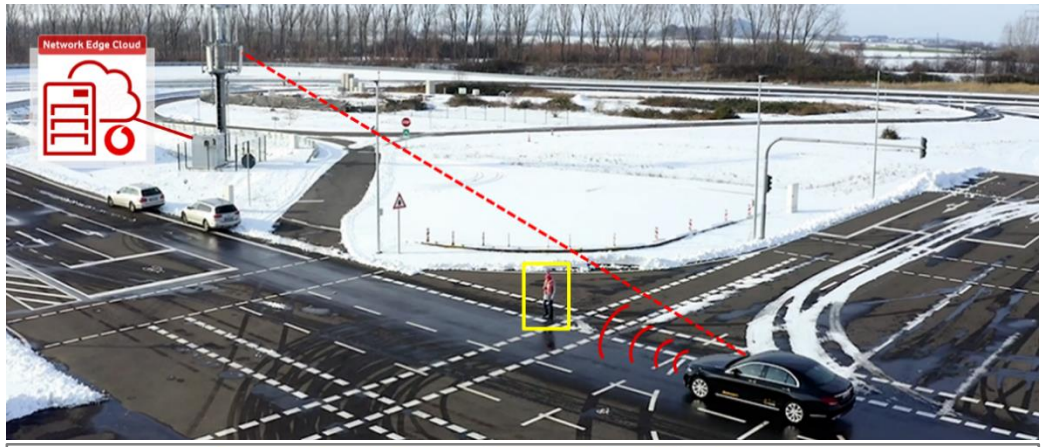
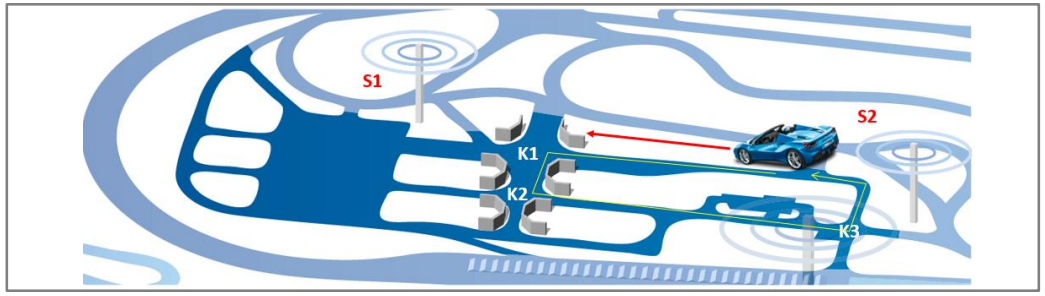
Realisation at Vodafone's 5G Mobility Lab (DE) and R&D Lab (UK)





5G Mobility Lab

Aldenhoven Testing Center

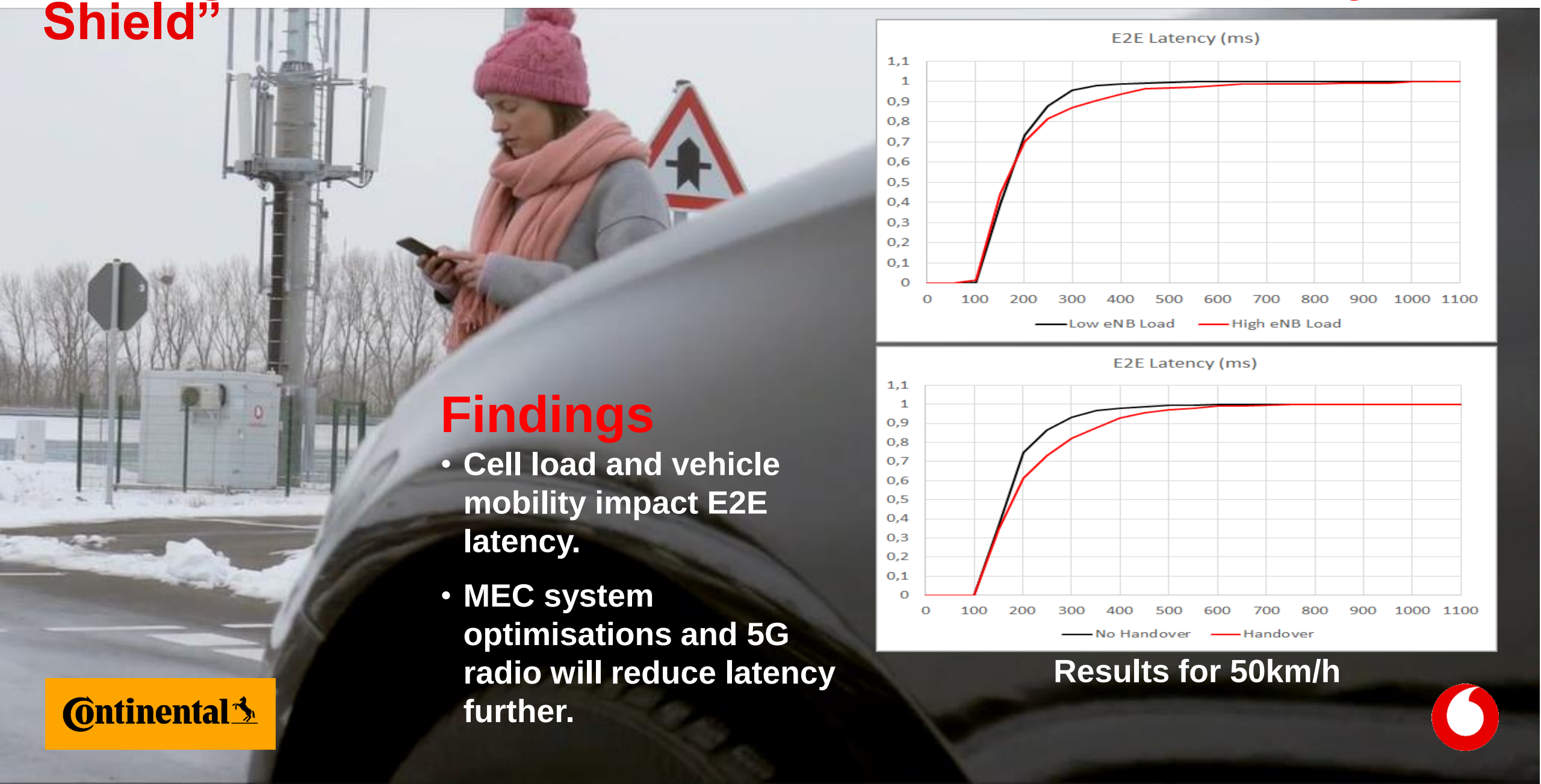
2 Phase Strategy

1. Indoor lab testing in controlled environment
   - Emulating network latency, load, packet loss
2. Outdoor testing with application hosted in RAN
   - Exposure to outdoor radio, speed, cell load

Drive tests in January 2019:

- 4G outdoor radio
- Vehicle speed 30 – 70 km/h
- Varying radio cell load
- Radio handover

Findings from the Proof of Concept “Pedestrian Safety Shield”



Findings

- Cell load and vehicle mobility impact E2E latency.
- MEC system optimisations and 5G radio will reduce latency further.

Results for 50km/h

Summary

With edge computing

- Access to heavy, edge-based compute power
  - Only low-cost front-end in vehicle
  - Shorter path towards mass adoption
  - Reduced processing demand on vehicle
- High quality service and application capabilities
  - Improved road safety for VRUs
- Improved trust between entities
  - Only local data exchange with closest edge cloud

Scalability & Flexibility

- Service heavily depends on uplink bandwidth
- Radio resources are traditionally geared towards downlink
- Spectrum availability increases with 5G
  - With further improvements in throughput and latency
  - Network slicing aims at improving service availability and reliability
- Flexible service upgradability through MEC
  - Much lower number of edge clouds than vehicles to upgrade

We're looking forward to discuss in 5GAA how to further develop such business scenarios and ecosystems

AI and edge cloud enabled pedestrian safety shield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