

Wie 5G-Technologien die Vernetzung von Fahrzeugen und Verkehrsteilnehmern mit der Verkehrsinfrastruktur vorantreibt

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Edge Computing change the game



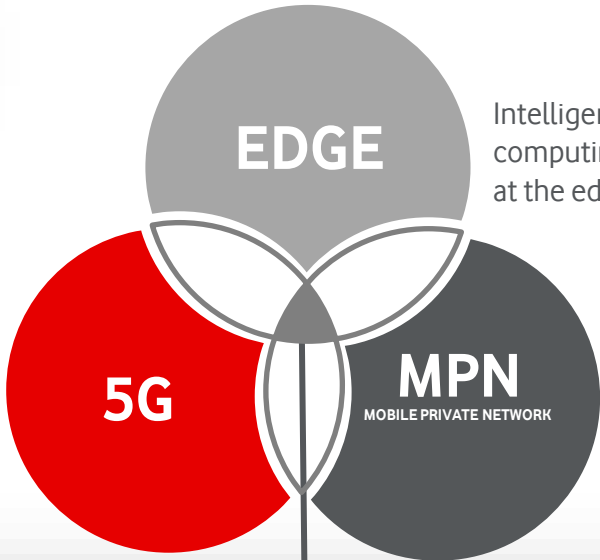
Cloud computing



Flexibility, agility and pay-as-you-go cost efficiency

Multi-access Edge Computing

Combines the best of both worlds



On premise or on device edge

Low latency, data volumes and data privacy



AR/VR



Gaming



IoT



V2X

Transformed experiences



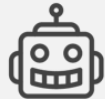
Drones



Healthcare



Factory



Robotics

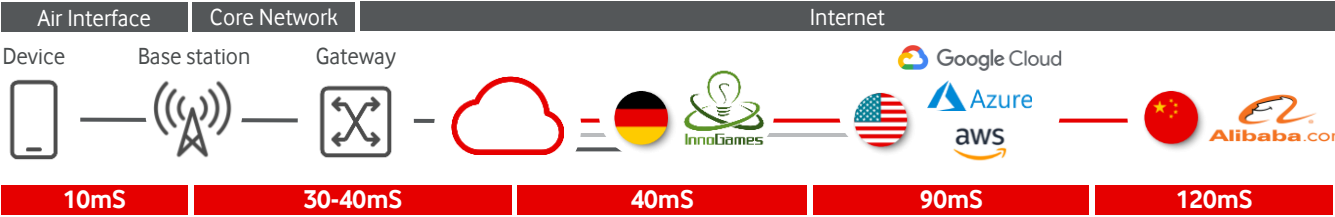
Delivering ultra-low latency communications and intelligent services in previously hard-to-reach places



Bringing Edge to life

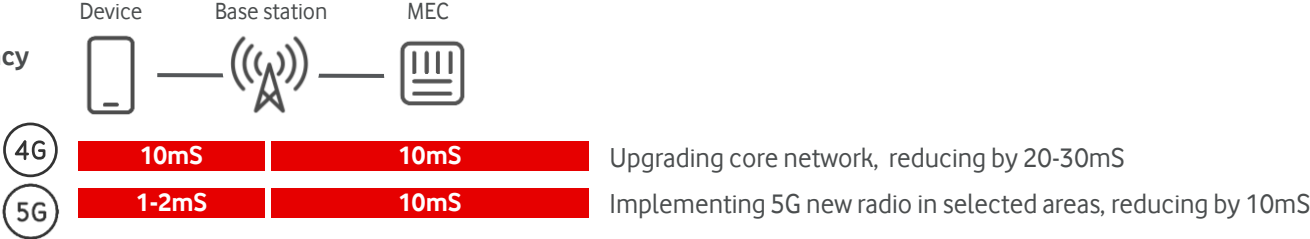
Without MEC

Approx. latency
Σ80 – 170mS



With MEC

Approx. latency
Σ10 – 30mS



Source: VFDE - Corporate Strategy, Group Technology

1. Sub-10ms latency in 4G and 5G radio is something we will see only in very good radio conditions over short distance – like private networks



The benefits of Edge Computing – enabling digital innovation



Low latency for real-time operations and complex decision-making in seconds, new use cases and applications



Bandwidth efficiency as applications are hosted locally



As data processing moves to the edge, computing power increases (cheaper devices, longer battery life and improved UX)



Data privacy, security with resilient backup options



Regulatory compliance as data is stored in a physical location



Vodafone is committed to make European Roads safer for Everyone

- Secure and reliable communication channel for **V2X Services leveraging 5G and Edge Cloud**
- **Platform** to distribute, broker and validate **V2X messages in real-time**
- **Digital Infrastructure Provider** for Road Operators
- **Trusted Platform provider** for European road operators and mobility service providers



[Link to the STEP Intro on Workplace](#)



STEP | V2X at the Edge

Vodafone is committed to make
European Roads safer for all

Platform to distribute, broker and validate
V2X messages in real-time leveraging 5G
and Edge Cloud

Hazard Warnings



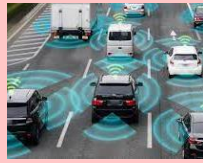
VRU Assistance



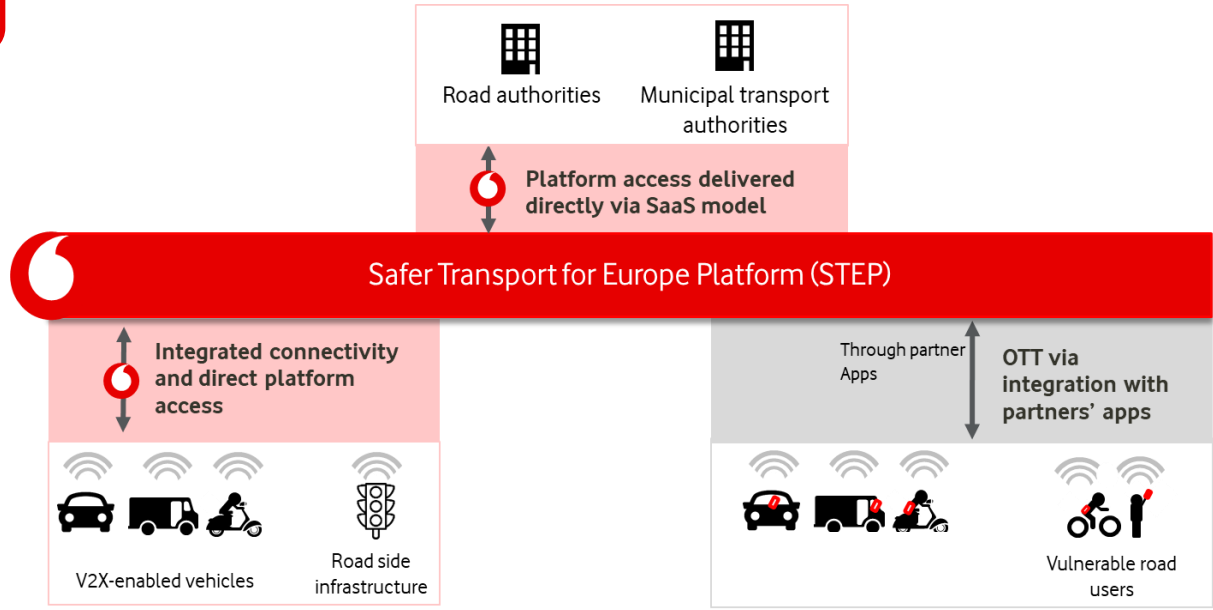
Infrastr. to Vehicle



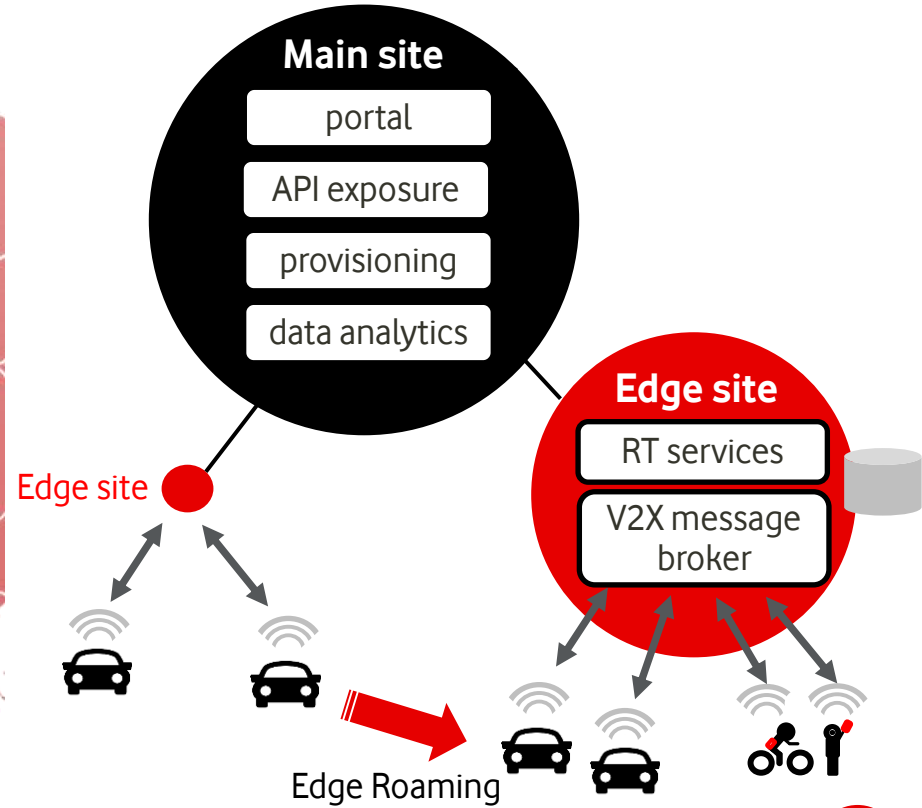
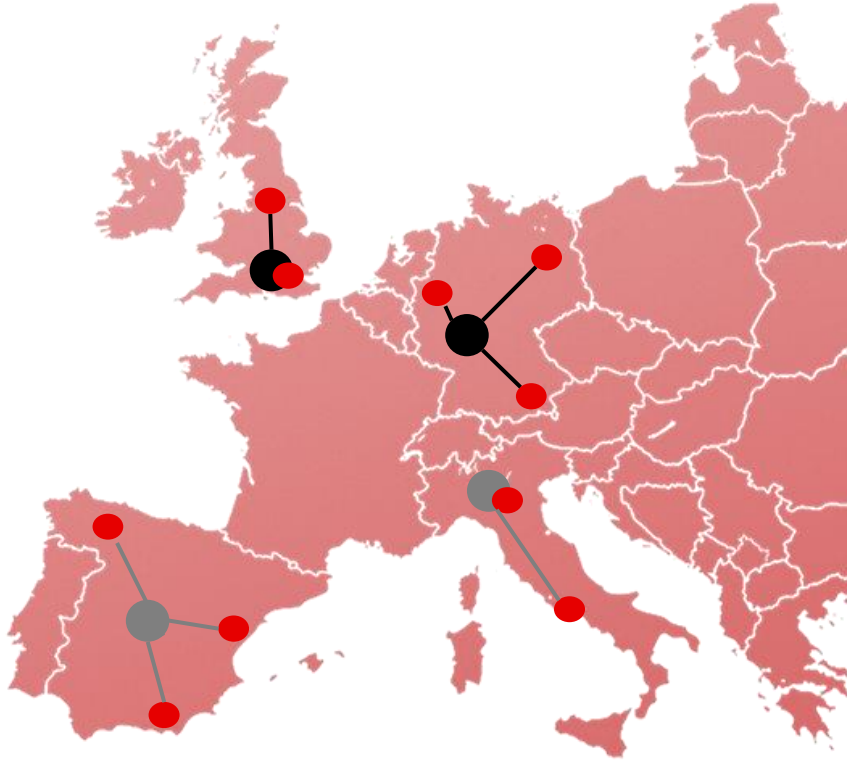
Vehicle Probe Data



STEP aims to scale – Starting in the V2X /
Connected Mobility space and using it for all types of real-
time data broker applications



STEP | Edge Deployment



STEP | Current Edge Deployment

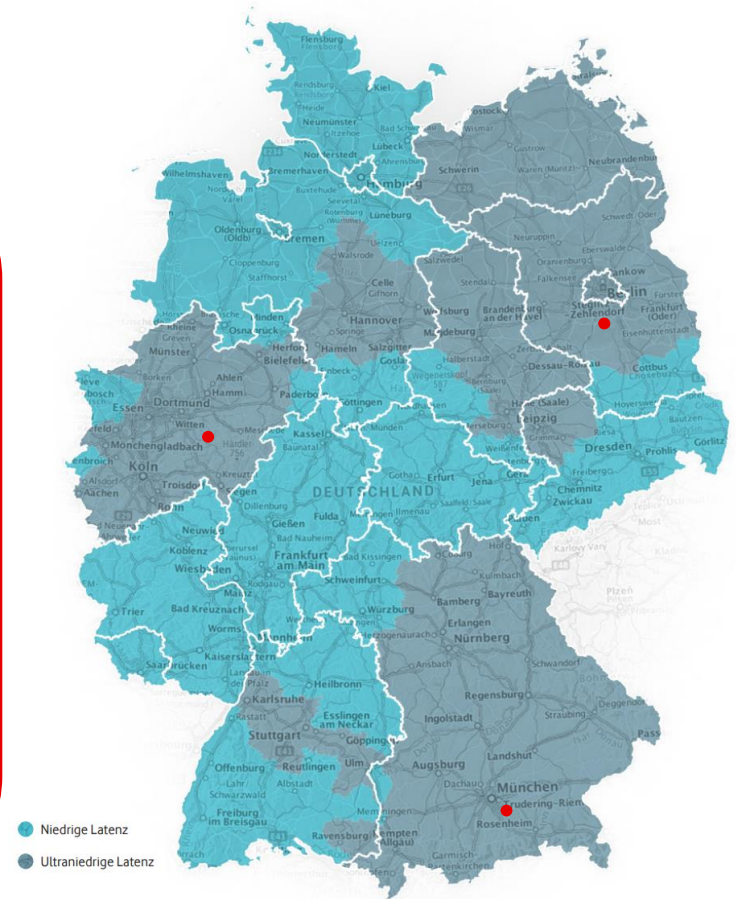
UK and Germany

First platform using MEC (Edge) in UK and DE

Low-latency: RTT < 50 ms

Ultra-low latency: RTT < 10 ms

+ approx. 10 ...15 ms for radio



USE CASES

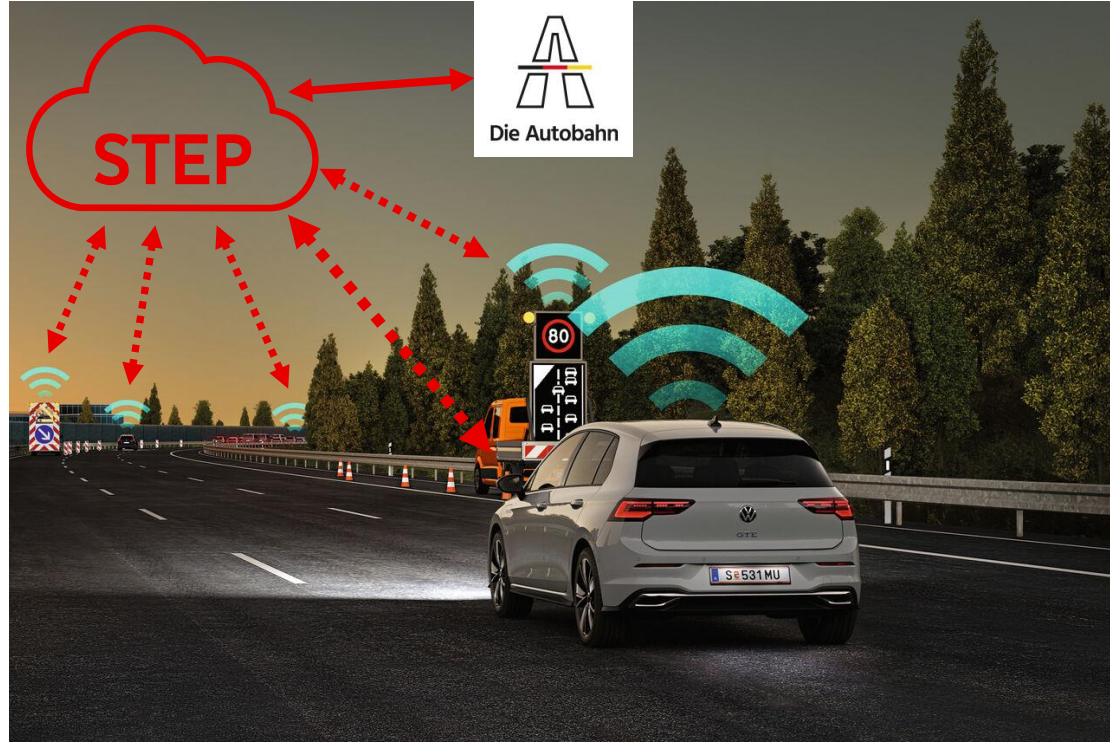
- Smart Junction – Vulnerable Road Users (VRU) Warning: Pedestrian detection
- Vulnerable Road Users (VRU) – Cyclist Detection
- Emergency Vehicle Warning
- Excess Speed Warning
- TimeToGreen (GLOSA)
- Road works warning
- Driving Academy



STEP | Real-time Hazard Warning Distribution

- Hazard Warnings distributed at the STEP V2X-Edge, complementing direct V2X communication (CV2X-PC5 or ITS-G5)
- Supported messages
 - Accidents
 - Hazardous Weather
 - Traffic jam
 - Road Works
 - Objects on the Road, Human on the road
 - Bad road conditions, slippery road
 - Heavy braking, Collision risk
 - Many more ...

[TS 102 894-2 - V1.3.1 - Intelligent Transport Systems \(ITS\): Users and applications requirements; Part 2: Applications and facilities layer common data dictionary \(etsi.org\)](#)



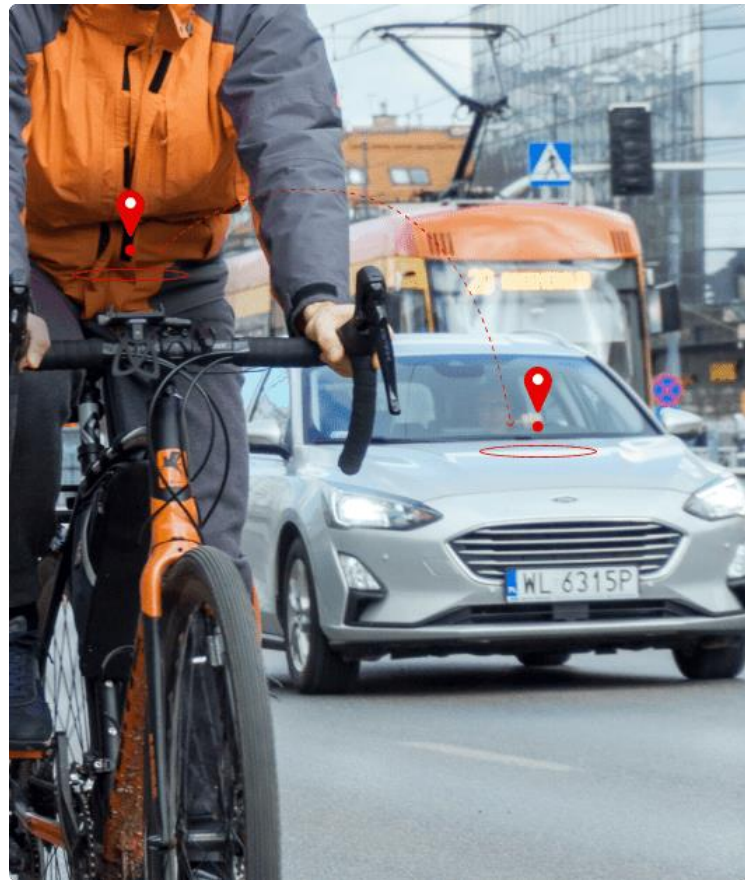
STEP | Road Operator data – Time to Green

- IVI data from road infrastructure distributed in real-time to vehicles
 - Dynamic Speed advice on highways
 - Road Works topology
 - Traffic light information per lane and green light speed advisory (GLOSA)
- Vehicle Probe data provided to road operators



STEP | VRU Safety

- Awareness of VRUs (pedestrians, cyclists) to vehicles and vis versa
- Vodafone provides smartphone SDKs (iOS, Android) for smartphone developers
- Camera-based detection in road infr. Is considered



STEP | Connecting road operators and road infrastructure

- Providing real-time info about road works, speed advice and traffic lights
- Increase awareness of road works
- Optimising traffic flow
- Connecting special vehicles to increase safety and smooth emergency services



Join us on
step.vodafone.com

and create your own V2X app, see

<https://github.com/Vodafone/HelloV2XWorld-Android>
<https://github.com/Vodafone/HelloV2XWorld-iOS>

