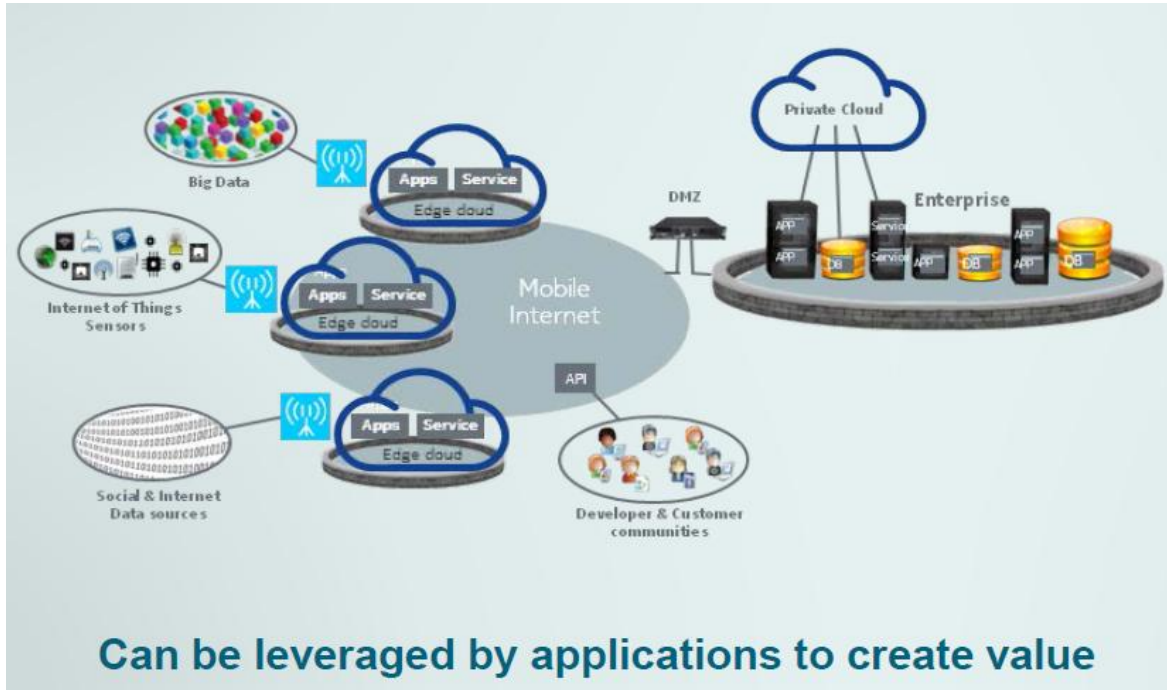


Mobile Edge Computing Technology for V2X

Xuan HE
2015/07/28

MEC Concept

Mobile-edge Computing: An environment for Innovation and value creation

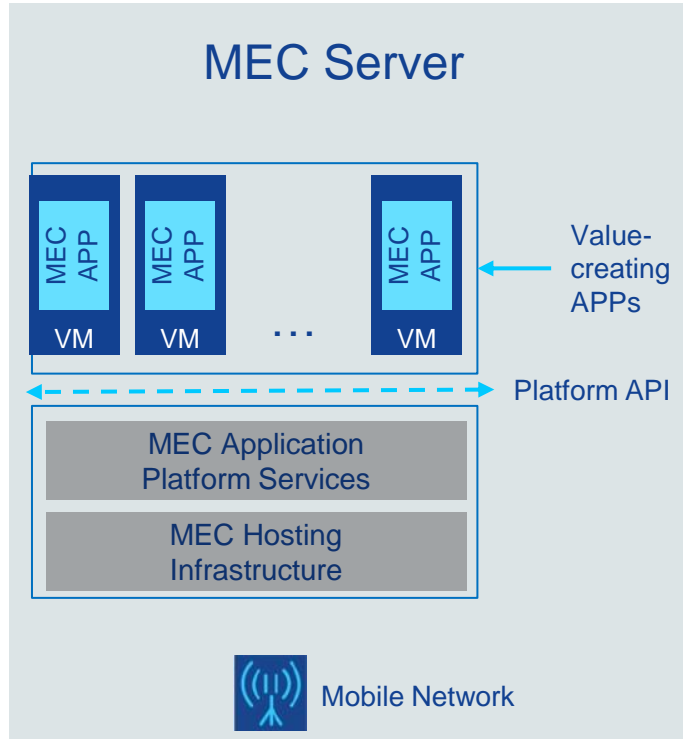


Offers application developers and content providers cloud-computing capabilities and an IT service environment at the edge of the mobile network

This environment is characterized by:

- Proximity
- Ultra-low latency
- High bandwidth
- Real-time access to radio network information
- Location awareness

MEC Technology



MEC Platform API

Application agnostic, providing the opportunity to revolutionize, differentiate and create

Promotes interoperability and mass deployment

Allows smooth porting of value-creating applications on every mobile-edge server, with guaranteed SLA

The vast majority of the population can be served

MEC scope focuses on enabling third-party applications to be hosted in the mobile network edge.

Connected Car Communications

LTE Complement to ITS G5

ITS G5 Communication

Direct vehicle to vehicle

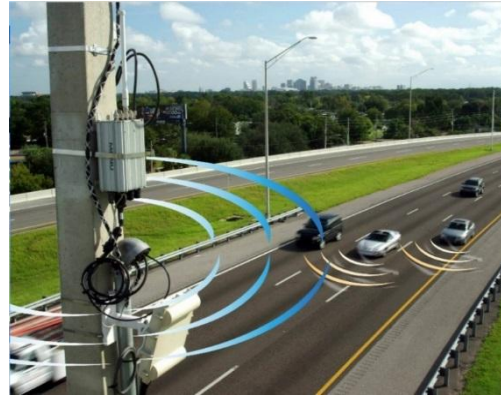


V2V is about proximity, path prediction and collision anticipation/warning:

- Intersection & Lane Change
- Rear end

ITS G5 Communication

Short Range



V2I is about broader road conditions:

- Incidents
- Alerts

LTE Communication

Mid and Long Range



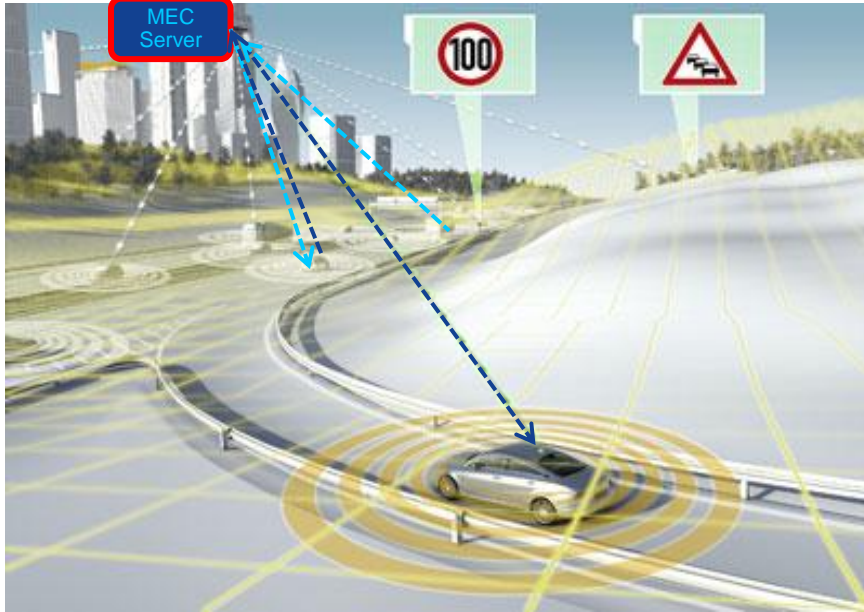
V2X via location-cast is about Electronic Horizon far ahead of the vehicle:

- Weather/road/traffic conditions
- Incidents

Innovation and benefits of Nokia's MEC Server

Direct communication between vehicles and as well as between vehicles and cloud over cellular

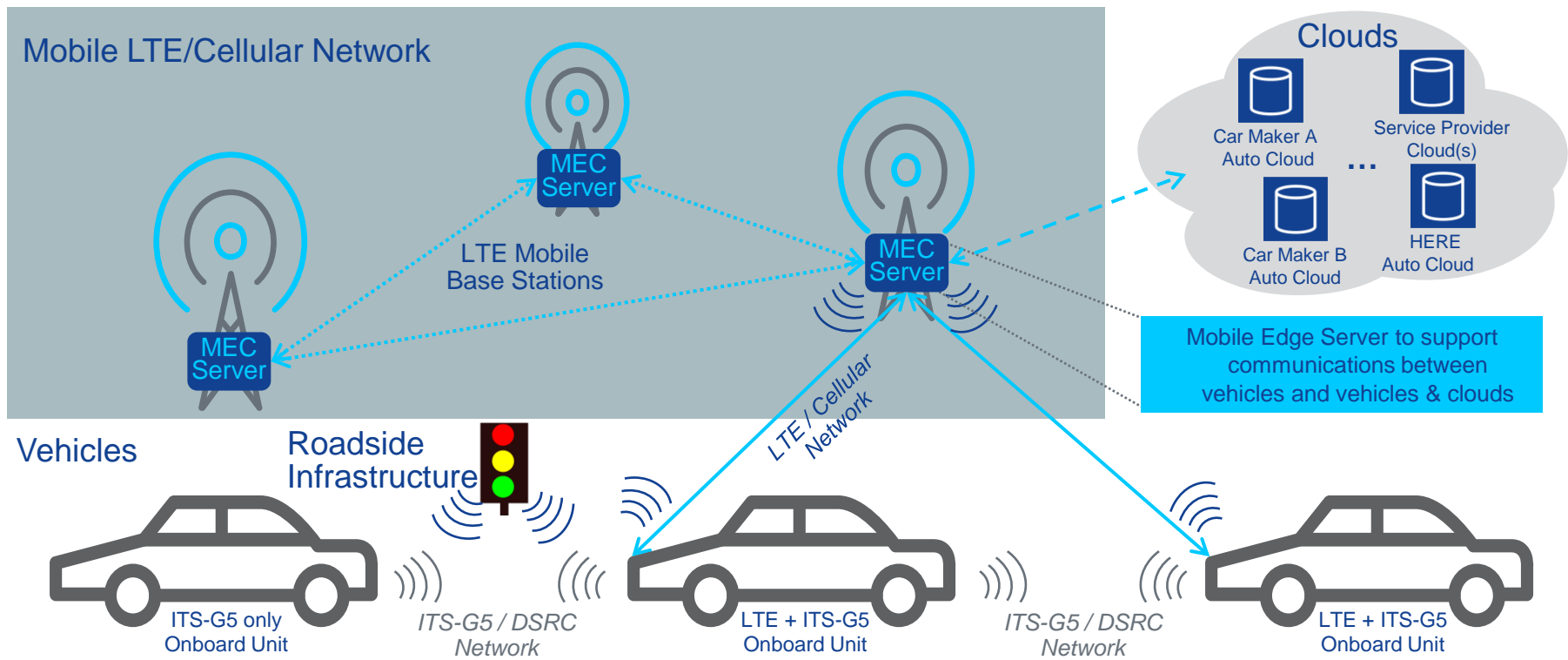
(LTE – **short**, mid and Long Range)



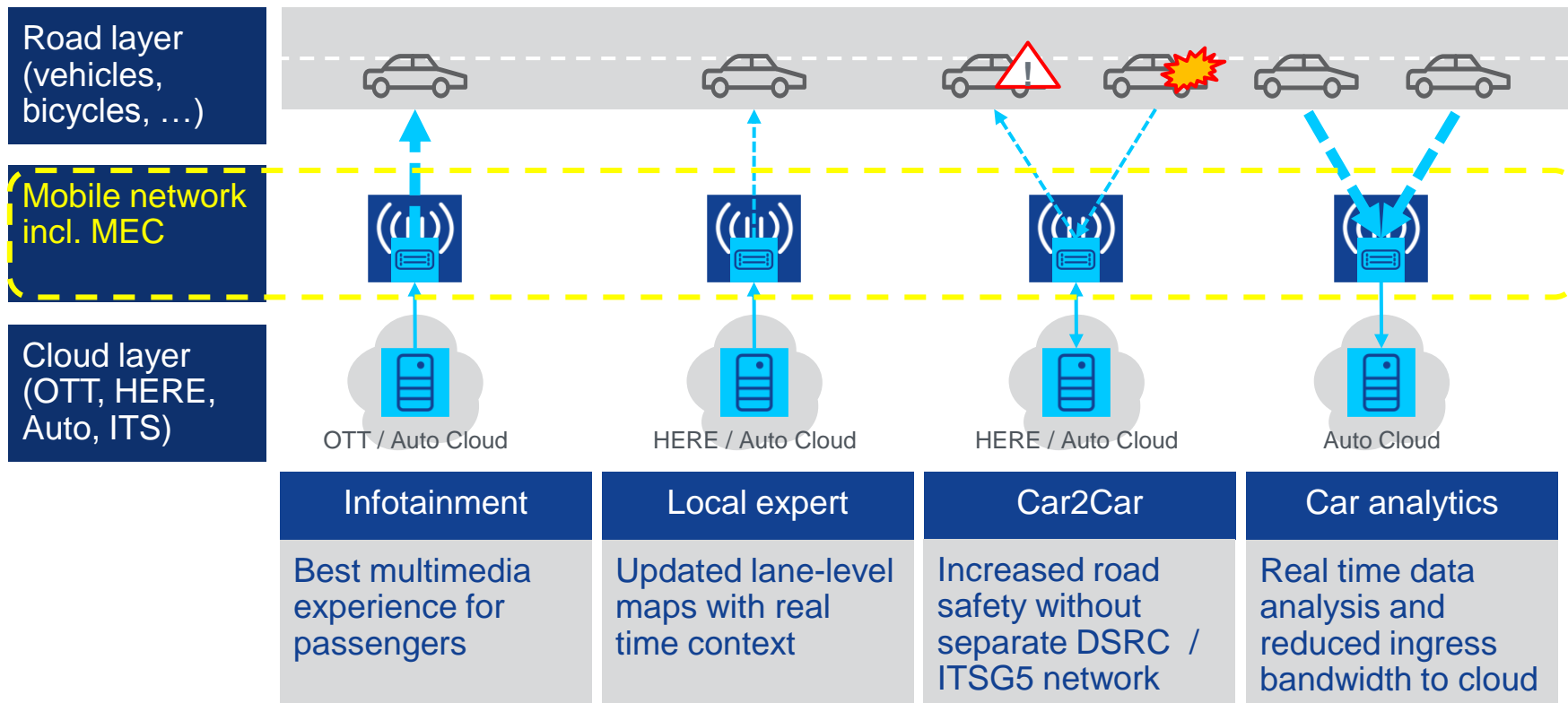
- LTE base stations along the motorway are equipped with Nokia's Edge IT server (the central cloud is extended by "edge cloudlets")
- Vehicles can communicate with very low latency (< 50ms) over distance from 10m to >2000m and more: e.g. used for hazard warnings
- LTE is or will soon be available with full coverage in most countries
- Investment of enhancing LTE with MEC cloudlets is substantially less than building new ITS G5 roadside infrastructure in particular in rural areas

V2X – vehicle-to-vehicle/infrastructure communications via LTE

High level architecture of a connected cars ecosystem



V2X – vehicle-to-vehicle/infrastructure: High level use cases



MEC for Connected cars: Notification use cases

Road Hazard Warning and Cooperative Awareness

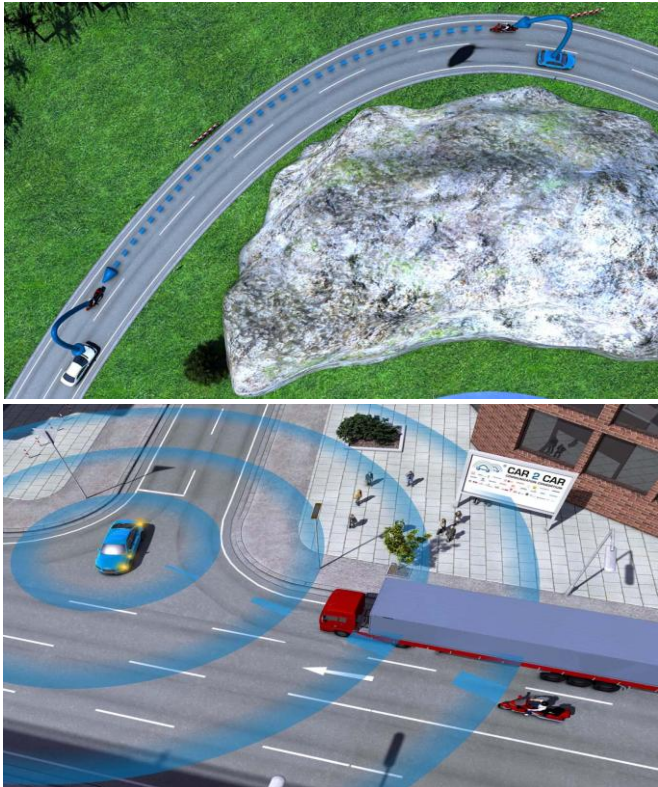


Image source: <http://www.car-to-car.org/index.php?id=171> and ... ?id=196

Warning of dangers ahead

DENM: Decentralized Environmental Notification Message
=> low latency / large sector requirements

- Slow or stationary vehicle
- Obstacle on the road
- Wrong-way driver
- Emergency electronic brake lights (EEBL)
- Adverse weather condition

Monitoring of surrounding vehicles

CAM: Cooperative Awareness Message
=> low latency / “not-visible” area requirements

- Intersection collision warning
- Longitudinal collision risk warning
- Blind spot assistance

MEC can provide
ultra-low latency networks
to avoid collisions and dangers

ETSI ISG Mobile Edge Computing – Status May 2015



MEC members

Founding members

NOKIA



NEC



**TELEKOM
AUSTRIA
GROUP**

SpiderCloud
Wireless



SAMSUNG

INTERDIGITAL



SONY



FUJITSU



Istituto Superiore Mario Boella



Saguna



Telefonica

ETSI MEC portal:

<http://portal.etsi.org/tb.aspx?tbid=826&SubTB=826>

MEC participants



NOKIA