6 challenges to the introduction of Connected Vehicles

Maxime Flament, CTO, 5G Automotive Association
5GAA brings together automotive, technology and telecommunications companies to work closely together to develop end-to-end connectivity solutions for future mobility and transportation services.

5GAA unites 118 members* from around the world working together on all aspects of C-V2X including technology, standards, spectrum, policy, regulations, testing, business models and go-to-market.

*as of May 2019
C-V2X is a unified technology platform which integrates:

- **Short-range**, network-less, direct communications (LTE-V2X PC5 today)

- **Long-range** cellular network communications (LTE-V2X Uu today)

A comprehensive approach to connected vehicles is essential.
Globally: ~1b veh
EU: ~298m veh
17.5m veh/Year
(Source: ACEA, 2018)

Predicted 150m veh will be connected in 2020
(Source: Gartner, 2016)

14 car makers will deploy C-V2X from H2-2020 in China

All Ford will be C-V2X enabled by 2022 in US
(Source: FORD, 2019)

$USD 253bn by 2025
(Machina Research, 2017)
Some 5GAA challenges which will accelerate deployment of C-ITS services

1. Make cutting-edge technology available globally
2. Exploit fully the current mobile networks
3. Enable complex interaction Use Cases
4. Predict and Guarantee Quality of Service
5. Guarantee cross-border continuity of services
6. Test and Certify Cellular-V2X
7. Include Pedestrians, Cyclists, Riders, and others
1. Make cutting-edge technology available globally

Qualcomm® Connected Car Reference Design, Gen 2

Qualcomm Snapdragon™ Automotive 4G/5G platforms

Security /
ECDSA

VEPP

Telematics Apps

V2X stack & apps

Application Processor

With telematics SDK

Multicore CPU

Multicore DSP

Accelerator
ECDSA

Stack apps

VEPP

Security verifies

Rel-14/Rel-15 C-V2X

5G / 4G spectrum sharing

Dual SIM Dual Active (DSDA)

Multi-frequency GNSS with QDR3

RF management with envelope tracking

Standalone FDD

Non-standalone TDD

Rel-14/Rel-15 C-V2X

SDRs

PMIC

HSM

RF ICs +
antenna modules

RF front-end

Memory

Source: Qualcomm,
Announced at the MWC2019, Barcelona
2. Exploit fully the current mobile networks (V2N)

V2X via Mobile Network: E-Class 2016

- Cars are connected to the Daimler Vehicle Backend
- Data filtering and aggregation
- Markets: USA, EU, China
- Security and Privacy ensured
- OEMs and Data supplier are invited to share
- Event detection and plausibility check
- No additional components necessary
- Data relevance check
- Display icon on map and generate speech output

Mobile work zone live from the trailers (market dependent)

Source: Daimler
3. Enable complex interaction Use Cases (perception, negotiation, multi-lateral agreements)

Source: Continental
C-V2X supported by Predictive QoS

1. Connected vehicle is driving
2. Vehicle receives in-advance notification of network quality degradation
3. V2X Application takes appropriate action/countermeasure (e.g., decreases speed)
4. Network QoS degradation takes effect. Necessary action has already been taken.

"QoS is estimated to drop in 20 seconds"

Or avoid the bad QoS route
Ericsson and Daimler have shown down to 100 ms handover time with IP address continuity using standard cellular functionality*

*Requires extension of roaming agreements between operators + harmonized configuration

Source: Ericsson
Enabling Deployment: lift barriers and accelerate time-to-market

• 5GAA C-V2X testing event in Europe successfully demonstrated exceptional level of interoperability (April 2019, Germany)

• Memorandums of Understanding signed in 2019 with leading interoperability and certification organisations to accelerate deployment roadmap:
7. Include pedestrians and cyclists

Source: Cobi

Source: BMW

Source: Cowboy

Source: Bosch

Source: Bosch
Beyond Automotive
– Other 5G Automotive enabled applications

A major step stone for stakeholders in automotive, transportation, city management and well beyond