Connectivity for Automated Driving

Needs and Challenges

Maxime Flament, ERTICO – ITS Europe
CARTRE: Coordination action for Automated Road Transport For Europe

Objective: Support faster deployment of connected and automated driving across Europe

- October 2016 – September 2018
- Coordination & Support Action
- 2 EU-funded Projects
- 36 consortium partners
- 30+ associated partners
CARTRE thematic area Connectivity consolidates many inputs from different European Initiatives

“High Level Group GEAR 2030 report on automotive competitiveness and sustainability”
https://ec.europa.eu/docsroom/documents/26081

M. Flament - Connectivity
Connectivity
For Automated Driving

Cooperative
Connected
Low Latency
Back-office
QoS
Urban
Highway
Private
Shared
Fleet
Level 1-2
Level 4-5
C-V2X
3GPPP
802.11p
ETSI
5G
IEEE
NB-IoT
Cellular
Edge
V2I
V2V
V2N
OEM Cloud
Traffic Manager
Service Cloud
APIs
Source: Deutsche Telekom - modified from original
Day 1: Cooperation starts
- "I share where I am and what I hear"
- Hybrid connectivity (3G/4G + ITS-G5)
- Advanced Driver Assistance Systems

Day 2: Automation starts
- "I share my perception data"
- Hybrid includes 5G
- Some Roads human backup

Day 3: Coordination starts
- "I share my intentions"
- Hybrid 5G connectivity
- Most Roads NO human backup

Day 4: Driverless world
- "We coordinate all manoeuvres"
- Hybrid 6G connectivity
- Fully automated

Timeline:
2019 - 2021 - 2023 - 2025 - 2030 - 2035 - 2040 - 2045
Breakout session: Connectivity

• Christian Rousseau, RENAULT on OEM perspectives on connectivity
• Jaime Moreno, DGT, on DGT 3.0 activities in Spain
• Mikael Fallgren, ERICSSON, on 5G-enabled use cases (5GCAR project)
• Francois Fischer, ERTICO, on use of IoT for transport (AUTOPilot project)
• Angelos Amditis, ICCS, on ICT infrastructure for AD (ICT4CART project)
Q&A session
On L2 V2V penetration:

Lower levels of automation cannot (and will not) wait for wider penetration of the V2V/V2I short range communication.

Level 2 automated vehicles will rely essentially on their on-board sensors and may additionally include Internet connectivity to connect to a back end service (e.g. vehicle cloud).

Source: Intel
The S-curve dilemma for embedded C-ITS in cars

What about opt-in rate?

Source: RWS, TRA2018
On C-ITS and functional safety:

Current C-ITS standards do not yet answer the needs for automated driving and safety critical applications

Risk Assessment:
Numerous unknown along data chain:
- Penetration & Opt-in
- Position and sensing quality
- Map Matching
- Vehicle warning triggers
- Message error and integrity

No guaranteed quality

Source: ISO 26262/Functional Safety - embitel
On needs for additional standards:

There will be a need for a next generation of V2V-V2I protocols and communication technologies.

Next steps:

• Short range secure exchange of sensor and maneuvering data
• high degrees of reliability and quality control.

Source: Autonet2030
M. Flament - Connectivity

Monday, June 11, 2018
Higher levels of automation will require reliable and low latency connectivity to a vehicle cloud or back end to operate safely.

Only on this basis, Automated Driving “service suppliers”, most likely OEMs, will take the responsibility of the driving task. Would this connectivity fail, the vehicle should ask the driver to pay attention to the road situation e.g. L2.

Source: CLEPA/ACEA
Technical implementation – possible cloud structure

Source: ASFINAG, TRA2018
Case study – hazard warning

Various OEM systems as well as the detection systems of the road operator detect a hazard, this is reported to the traffic cloud and in turn the road operator issues a general warning.

Source: ASFINAG, TRA2018
On “Killer” V2V application:

Are CACC and platooning the best level 1-2 applications motivating V2V fitment on all vehicles?

One of the only AV opt-in application requiring V2V is CACC/Platooning.

Will it become the driving force behind the fitment of V2V units?
On IoT and horizontal issues:

Current issues on data privacy, cyber security, data location, publication and access, service discovery, etc. should be addressed using common horizontal approaches.

Cooperation with ICT especially Internet of Things community communities is more than needed in order to bring these issues at a wider horizontal level in transport and avoid designing specific road transport solutions.
On the evolution towards 5G:

Development of V2X have accelerated significantly and will eventually lead to 5G working jointly with standards such as ITS-G5 and C-V2X.

Source: Qualcomm

M. Flament - Connectivity