

Workshop on “Vehicle Technologies for Connected, Cooperative & Automated Mobility”

Context

With respect to the need for advanced vehicle technologies for Connected, Cooperative & Automated Mobility (CCAM), robust and accurate environment perception is absolutely essential for highly automated vehicles to enable the extraction of reliable information for real-time driving decision-making which must be performed in a safe and unambiguous way

Different sensing sources (using technologies including radar, lidar, ultrasonic sensors, cameras, etc.) can be aggregated with ‘sensor-fusion’ to enable the vehicle to perceive its surroundings before function-specific software uses the information as input to think and act appropriately, deciding which actions the vehicle shall take before executing them accordingly.

In tomorrow’s highly automated vehicles, systems must be ‘fail operational’ such that, in the event that the limit of the Operation Design Domain (ODD) is reached, the vehicle brings itself into a safe state with a minimum risk manoeuvre. Hence the automated driving system must be provided with comprehensive fault detection, identification and accommodation capabilities so that malfunctions can be immediately diagnosed and enable switching to a fall-back mode of operation in order to ensure safety.

Overview of the Workshop

An International Workshop focusing on “Vehicle Technologies for CCAM”, organised by CLEPA supported by ERTICO and VDI/VDE-IT, was held on 16th June 2021.

Close to 300 participants listened to more than 20 industry experts from around the world who presented the latest technologies under development and together presented the state-of-the-art of CCAM.

The event started with an overview of the main takeaways from the project ARCADE. Then, the project L3 Pilot coordinator presented the current status of automation (level 3) before the Chairman of the CCAM Partnership presented this recently-formed partnership to focus on level 4 automation, illustrating aspects of the shared vision to take connected and automated driving to the next level.

Industry experts presented their latest developments during the two technical sessions:

- Technical Session A focused on environment perception, decision-making and artificial intelligence, highlighting the need for collaboration among the different actors and agreeing on the common framework to develop key elements in technology, including sensors and data fusion. The role of standardisation was mentioned in the context of supporting market take-up through the setting of common methodologies for testing and validation.
- Technical Session B focused on safety aspects in CCAM such as human-machine interaction, human factors, life-on-board and inclusiveness. Key challenges were discussed, such as the user acceptance of these new technologies.

Summary of the main take-aways from Technical Sessions A & B

- ADAS L3 and AD L4/L5 require different sensor technologies & coordination/standardization
- Increased number of sensors & fusion of sensor signals for compatible representation leads to higher amounts of data and higher demand for computational performance to handle very complex scenarios: Computation (object detection & classification) needs to be very energy-efficient and the amount of data needs to be reduced intelligently

- Many aspects related to connected and automated driving still require further standards and/or liaison activities.
- Unless we come to agreement on what it means for an AV to "drive safely", there will be no AVs: "Driving Safely" is driving at a societally acceptable risk balance and proving you are doing so;
- Transparency is key in safety assurance as aviation has proven: without transparency, how can industry collaborate on a safer future and how can governments set policy and assure a wary public?
- Infrastructure-based technology can resolve complexities and pass pertinent information to the various traffic participants.
- Standardizing fail-operational AD architectures can reduce cost and effort: It makes little sense to compete on non-consumer features – instead, working together to create an ecosystem in the industry is the only way forward;
- The next steps of collaboration & homologation preparation include virtual data qualification to leverage more simulation, scenario database industrialization & scalability, and developing standards for positive risk balance demonstration
- SAE International is working with other Standards Development Organizations to harmonize global standards: in addition to exchanging information, agreements are being established where needed to jointly publish standards to maintain consistency while reducing overlap and the burden on industry to participate in multiple, redundant efforts.
- With regard to exception approvals in the EU, a more harmonized approach is required: Ideally, exemption approval from one country bound by cross-border agreement should automatically apply to other countries;
- Technology solutions are being developed which aim to deliver a holistic HMI concept that considers all aspects of the interface between humans and machines
- Understanding driver status will be key to achieving complete autonomy
- The ambition is to create a full customer experience with the passenger feeling better at the end of the journey
- A broad variety of use-cases and User Experience design domains will need to be addressed and, as mobility will become more inclusive, the range will expand even more
- Personalized solutions will be based on "Sense-Think-Act" closed loop approach
- International cooperation could help accelerate the take-up of a personalized and predictive cockpit

Conclusion

In conclusion, the leader of CCAM Partnership Cluster 2 "Vehicle Technologies", highlighted the relevance of having all actors involved and being seated at the table. In this context, the CCAM Partnership, currently being supported by the ARCADE project, provides the appropriate forum for discussion in Europe. However, there will continue to be the need to ensure that the conversation takes place also at the global level, in the spirit of international cooperation, in order to support the development and adoption of these technologies around the world.

Programme

13.30 **Opening Session**

- Presentation by the European Commission, *Rogge Ludger, Tom Alkim*, DG-RTD
- Introduction to ARCADE Project; *Stephane Dreher*, ARCADE Coordinator, ERTICO
- Overview of the CCAM (Cooperative, Connected and Automated Mobility) Partnership: *Armin Gräter*, Chairman of the CCAM Partnership, BMW Group
- Introduction to Mobility.E Lighthouse & COSMOS Project: *Benjamin Wilsch*, COSMOS Coordinator, VDI/VDE-IT

14.00 **Keynote Presentation on L3Pilot Project:**

Aria Etemad, L3Pilot Coordinator, Volkswagen Group Research

14.30 **Technical Session A: Focus on Environment Perception, Data fusion, Decision-Making and Artificial Intelligence;**

Moderated by *Gereon Meyer*, VDI/VDE-IT, & *Margriet van Schijndel*, TU Eindhoven

- **Harmonization: Standards and Exemption Approvals for Development Vehicles “Status Quo, Gaps and Improvement Recommendations**
Michele Giorelli, Technical Manager of Advanced System Engineering, APTIV
Main points addressed:
 - What are the main challenges for standardisation in CCAM?
 - Is there any fundamental activity (in standard and/or regulation) that could enable the AD driving commercialization?
 - What steps should EU authorities take to streamline exemption approvals of development vehicles?
- **Data driven development for CCAM**
Eckard Steiger, Director of Industrial Cooperation in Automated Driving, BOSCH
Many points addressed:
 - Which are the challenges faced by suppliers in terms of setting up scalable data infrastructure, identifying relevant data, organizing data access, while considering and implementing safety argumentation and GDPR compliance?
 - Which kinds of collaborations could support the supply industry in this area?
 - Which role should the public side play?
- **From Driving Assistance to Driving Automation: Location data as a critical factor for automated driving**
Philip Hubertus, Product Manager Autonomous Driving, HERE
Main points addressed:
 - When will High-Definition maps to be available on the market?
 - When will Automated Driving be available on all roads?
- **System Partitioning for Sensor Fusion & AI Power Consumption**
Cyprian Grassmann, Distinguished Engineer Radar System Engineering, INFINEON
Main points addressed:
Is sensor fusion needed or does camera processing suffices?
How to achieve power efficient AI for automated (electrical) driving?

- **Automation in Mobility: And What's Next?**

Pierre-Olivier Millette, Director of Automated Driving Technical Policy EMEA, INTEL

Main points addressed:

- From a regulatory perspective, what are the key conditions to the success of automation?
- What can the industry do to better facilitate the regulator's job?

- **Challenges in designing AD fail-operational architectures**

Moritz Antlanger, System Architect, TTTech Auto

Main points addressed:

- Diverse redundancy is an important aspect in making systems fail-operational. What are some of the challenges in achieving HW & SW diversity?
- Adding more sensors, control units, and SW to a car than absolutely necessary is expensive. What are some of the strategies for cost reduction while maintaining safety?

- **Sensing performance contribution to safety & end user acceptance of Automated Driving**

Samia Ahiad, System & Validation Metier Manager, VALEO

Main points addressed:

- How do we define the quantity & quality of data to be recorded?
- How do you ensure scalability and reuse of the data ? and may be how to leverage digital twins of our sensors and virtual data ?

- **General questions:**

- Ecosystem partnerships are becoming increasingly popular as an advanced form of cooperation between companies. Companies from technological domains have mastered the ecosystem approach and have proven that the approach leads to a long term-success. What type of best practices and lessons learned can be taken from these success stories?
- In your opinion, what are the main challenges to overcome for the achievement of successful collaborations? Could it be the change of mindset from "always protecting your know how" to "openly share your know-how for the sake of further improving it"?

16.00 **Keynote: SAE International's Standards Roadmap for Connected & Automated Road Vehicles:**

Ed Straub, Director of the Office of Automation, SAE International

16.20 **Technical Session B: Focus on Safety, HMI (Human Machine Interaction), Human factors, Life-on-Board, and Inclusiveness;**

Moderated by: *David Storer, CLEPA, & Peter Urban, IKA - RWTH Aachen*

- **Solutions for a Connected, Personalized and Predictive Cockpit**

Anna Rossi, Director of Technology Partnerships, FAURECIA

Main points addressed:

- How feasible is it to move from techno-centric to user-centric approach?
- Which interior solutions and technologies should be leveraged with this approach?

- **Protecting occupants in automated vehicles**

Alexander Gulde, Senior Director of Engineering, AUTOLIV

Main points addressed:

- What can be done to protect people outside the vehicles (vulnerable road users, ...)?
- What role does safety (and occupant protection) play regarding the end users' willingness to embrace automated mobility?
- Is enhanced/adequate "passive safety" (occupant and VRU protection) perhaps a prerequisite for higher automation and new vehicle types?
- What other challenges do you see which are not fully recognized today?

- **Towards socially optimized traffic: Smart routing and driver expectation**

Alexander Kroeller, Manager Research & Innovation, TomTom

Main points addressed:

- What are the key requirements for authorities, and for private companies, to enable such routing services?
- What role does autonomous driving play in this context?
- How will acceptance change when the driver is not in control?

- **Fundamental Technologies Enabling CCAM**

Tim Leinmüller, Head of Fundamental Technology R&D Dept, DENSO

Main points addressed:

- How will cybersecurity engineering (vehicle) processes integrate with infrastructure and IT backend engineering?
- What is the scope of cybersecurity vehicle type approval (UN R155)? Will it also include services/infrastructure outside of the vehicle?
- What kind of role simulations would play to assure the safety of ADS? What are the simulation related challenges?

- **The Human Factor in Mobility**

Zachary Bolton, Innovation Manager North America, Continental

Main points addressed:

- How will mobility solutions achieve positive gains promised by "being connected and cooperative with one another" more quickly?
- What challenges or corner cases of autonomous mobility can be addressed immediately by increasing the technology of our infrastructure?