CAR 2 CAR
COMMUNICATION CONSORTIUM

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by Niels Peter Skov Andersen
(General Manager, C2C-CC)

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Editorial

by Niels Peter Skov Andersen | General Manager of the CAR 2 CAR Communication Consortium

Sine the last CAR 2 CAR Forum end of October 2019 at Torino the CAR 2 CAR Communication Consortium succeeded in making considerable progress in assisting to improve road safety and road efficiency. By end of 2019 Volkswagen presented the new Golf 8 with Car2X technology as standard equipment. With the Golf 8 entering European roads the deployment and operation phase of C-ITS definitely has started and will be complemented in 2020 by further cars and the European C-Roads pilot sides switching their Infrastructure2X serves into operation. This milestone to further improve road safety using the innovative Car2X system was honoured by Euro NCAP rewarding Volkswagen's 'Local Hazard Warning' system with an 'Advanced' award for advanced safety technologies, complementing Euro NCAP's existing star rating scheme.

By end of March 2020 the CAR 2 CAR Communication Consortium has published the release 1.5.0 documents of the Basic System Profile. Here security as well as positioning and timing requirements have been updated considering the backwards compatibility to release 1.4.0. The importance of testing of the Car2X implementations and of future cooperative functions increases steadily with each new Car2X vehicle model and infrastructure implementation that are being developed. To help to ensure proper functioning of the cooperative system and to ensure interoperability

and backwards compatibility across borders and brands Nordsys and Vector have presented their sophisticated testing tools with hardware in the loop capabilities being able to support the developers in testing their customised design in multiple heterogeneous time-varying traffic and environment scenarios.

From the beginning Car2X has been designed to support fore-sighted driving and automation for improving road safety and traffic efficiency anywhere at any time independent of any dead zones. These features are also of high importance for automated trucks and working machines being operated in confined areas as well as for agricultural machinery being operated on the fields. Usually car drivers and motorcyclists are not too much familiar with the size, speed, behaviour and visibility of agricultural machinery on the roads and locally impacted road conditions especially during the agricultural campaigns. The Agricultural Industry Electronic Foundation (AEF) provides some insight into the potential of using Car2X for optimising the processes on the fields and for improving road safety by avoiding accidents where agricultural machinery might be involved.

During the past months new members have joint the CAR 2 CAR Communication Consortium. The achelos GmbH, Hellenic institute of transport, Microsec Ltd. and Vaisala introduce themselves and are **... »**

» ... looking forward to the co-operation within the C2C-CC.

By end of January the CAR 2 CAR Communication Consortium has put a new server into operation. This also offered the opportunity for updating and complementing the content of the public website. Furthermore, when logging-in you can expire the new integrated tooling offering the experts of the C2C-CC members latest information, self-maintenance of the personal address book information and allocations to Competence Groups and Taskforces including automatic update of the related e-mail distribution lists. Furthermore, the Collaboration Area now builds on NextCloud offering improved user friendliness and security. In addition, the flexible web-tool supports easily establishing of new groups and maintaining of existing groups. This feature might be helpful for the planned restructuring and re-organising of the existing Competence Groups. The discussion on establishing stakeholder groups has been started during the last CAR 2 CAR Week. You are invited to participate in the discussion and recom-mending how to update the Competence Groups.

The Journal at hand also briefly reports about the CAR 2 CAR Forum 2019 and the CAR 2 CAR Weeks having been organised in-between. The last 9th CAR 2 CAR Week having been organised from 9 to 12 March 2020 at Burg Warberg was already affected by several travel restrictions of some of the C2C-CC members due to the expansion of the Corona pandemic in Europe. In-between spatial distance and home office have become accepted temporary measures in many companies to curtail the spreading of the virus. Virtual web-meetings complementing the face-to-face meetings on-site have proofed their worth and enabled the Technical Organisation to network the experts of the C2C-CC members and stay operational. Depending of the developments during the next weeks and months also the next planned CAR 2 CAR Weeks in June and September might need to be organised in a hybrid mode or even virtually only.

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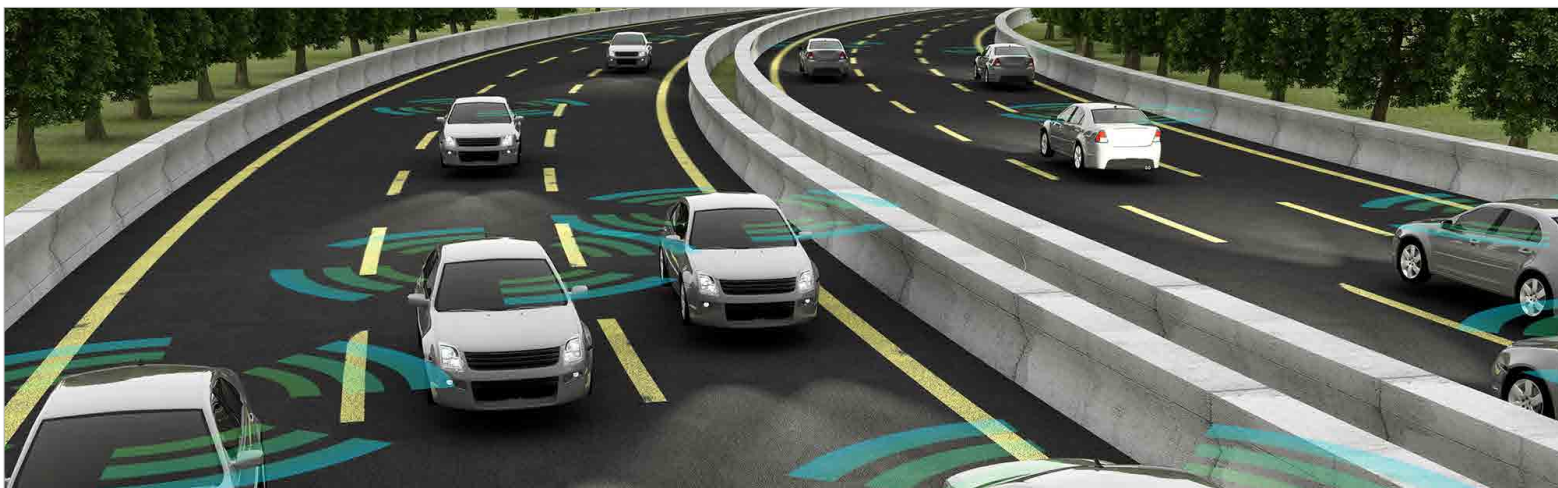
New CAR 2 CAR Members

achelos GmbH

Type of Member:
Associate Member

Type of Business:
security. connected.
achelos is a manufacturer-independent software development and consulting firm based in Paderborn, Germany. Founded in 2008, the company develops and operates highly specialised products, solutions and services for security-critical applications in international markets.

Alongside general security-related topics, we focus on industry solutions in the healthcare, mobility, public and IoT segments. Our customers and partners include government institutions, private companies and organisations with security requirements for digital applications. Our ideas, products and solutions in the field of embedded security have been incorporated into many national and international projects.

Security is key to our success.
achelos produces test concepts for conformity-assessment with technical specifications and BSI guidelines, and prepares evaluations and certifications according to security standards such as Common Criteria. References include electronic ID systems and electronic health cards, digital tachographs, and public key infrastructures (eIDAS).

achelos is ISO 9001 and ISO 27001 certified.

www.achelos.de/en

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Microsec Ltd.

Type of Member:
Associate Member

Type of Business:
Microsec Ltd. provides vehicle-to-everything PKI certificates for test, pilot and live "security on" deployments to ensure authentic and secure communication for connected, cooperative and automated mobility and logistics. Microsec brings additional Root CA, HSM and PKI expertise to strengthen the security consciousness of the automotive industry. The Microsec V2X PKI system is backed by the medium-sized

company that employs 100 people and is headquartered in Budapest, Hungary. The firm is an active participant of the IT market since 1984. Today, Microsec has a prominent role in Public Key Infrastructure-based electronic **...** »

» … signature solution developments, online user authentication, delivery systems and encryption. The company is the operator of „e-Szignó Certificate Authority", providing eIDAS qualified trust services, audited by TÜViT (TÜV Nord Group). Microsec contributes to technical standards as a Full Member of the European Telecommunications Standards Institute (ETSI).

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VAISALA

Type of Member:
Associate Member

Type of Business:
Vaisala is a global leader in weather, environmental, and industrial measurements having its headquarters in Helsinki, Finland. Our customers include meteorological agencies, airports, winter maintenance authorities, and the automotive industry in over 150 countries world-wide.

Vaisala's focus in future mobility, smart and connected highways are reference and professional grade road surface and road weather observations, air quality observations and respective forecast services. Our offering includes stationary and mobile sensors that remotely measure the layer thickness of water, snow and ice on the road sur-

face, and road surface temperature. We also provide a full portfolio of atmospheric weather sensors for wind, humidity, pressure, temperature and visibility.

Using these and other observations Vaisala provides premium, high resolution road weather and road surface state nowcast and forecasts for B2B use-cases including automotive infotainment, driver notification and assistance services, and winter maintenance applications.
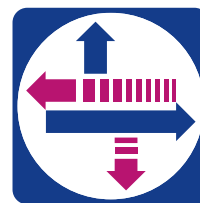
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CERTH-HIT

Type of Member:
Development Member

Type of Business:
The Hellenic Institute of Transport (HIT) is part of the Centre for Research and Technology Hellas (CERTH), which is a non-profit organization under the General Secretariat for Research and Technology (GSRT), of the Greek Ministry of Development and Infrastructures. CERTH-HIT is headquartered in

Thessaloniki, Greece, with departments in Athens and other cities. CERTH-HIT's main objective is the conduct and support of applied research activities in all field of … »

New CAR 2 CAR Members

» ... transportation. More specifically on issues related to the organization, operation, planning and development of transportation systems, infrastructures, standardization, economic analysis, management, vehicle technology and the impact assessment of land, maritime, air, and multimodal transport services.

CERTH-HIT is actively involved in the fields of Cooperative-ITS and Cooperative, Connected and Automated Mobility (CCAM). Our organisation is currently developing and testing both C-ITS Day 1 and Day 1.5 services, under real world conditions. We focus on interoperability issues of C-ITS services, technical validation and verification of C-ITS use cases in the field, as well as in-vitro and in-situ impact assessment of C-ITS services. We conduct simulation work related to Cooperative, Connected and Automated Driving (CCAD), which also encompasses simulation of realistic V2X protocols.

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Euro NCAP rewards Volkswagen's 'Local Hazard Warning' system with an 'Advanced' award
by Volkswagen AG / Euro NCAP

Volkswagen's car-to-x communication system becomes the first technology to be rewarded by Euro NCAP in nearly six years. The technology, fitted as standard to the Golf 8 and to future ID models, allows cars to communicate with each other and with properly equipped road infrastructure and emergency vehicles to give the driver advanced warning of local safety hazards. Using ITS-G5 technology, cars equipped with the system can transmit a signal to others if they have broken down or have stopped suddenly and present a safety risk. Other manufacturers are also considering equipping their vehicles with ITS-G5 technology and, in time, it may be possible for drivers to receive advance warning of motorcycles and tractors.

Secretary General of Euro NCAP, Michiel van Ratingen, said, "This is an exciting area of safety and one

which offers the potential to help road users who have, so far, been difficult to protect, like motorcyclists. It is already on Euro NCAP's roadmap but its full potential will not be realised until many vehicles are equipped with a compatible system, along with roadside hazards. Volkswagen are to be congratulated for making the technology standard on high-selling vehicles like the Golf". **... »**

» ... *https://www.euroncap.com/de/presse/pressemitteilungen/volkswagen-safety-technology-rewarded-by-euro-ncap/*
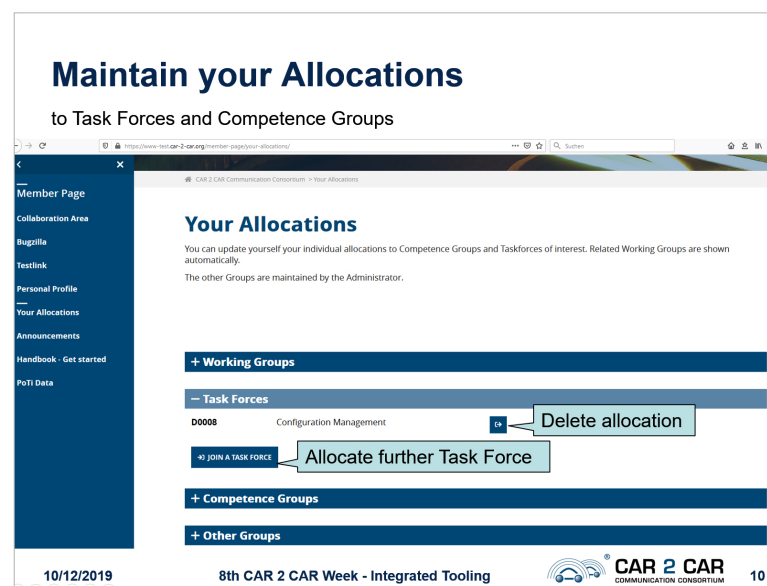
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New Web-Implementation improves Cooperation
by Dr. Karl-Oskar Proskawetz | Administrator of the CAR 2 CAR Communication Consortium

More transparency and improved workflow processes are promised since switching to the new server, updated website and integrated web-tooling by end of January 2020. Experts now can maintain their personal data sets themselves and any changes made are considered for all functionalities close to real-time. The customised integrated web-tooling has implemented a single-sign-on concept and supports automated standard processes as well as flexible special purpose solutions fostering the cooperation and workflow within the CAR 2 CAR Communication Consortium.

During the past years the CAR 2 CAR Communication Consortium developed to a two-track organisation dealing with Day 1 Deployment and Operation issues and R&D issues of C-ITS considering the next phases of the functional and technical Roadmaps. Today the Technical Organisation is organised in a matrix structure with Competence Groups representing the experts sub-grouped by their skills, interests or stakeholder scope and with Working Groups focusing on Deployment and operation or Functional and Technical R&D issues. The Work Programme collects all Work Items with their specific tasks to be processed by Taskforces and links them with the Working Groups. After each CAR 2 CAR Week the Work Programme is updated as new Work Items might be created and existing Work Items might be finalised or updated. Furthermore, temporarily cooperation with external experts has to be supported requiring highly flexible and reliable processes. These developments initiated the starting point for designing the integrated tooling concept.

All registered experts of the CAR 2 CAR Communication Consortium ... »

Maintain your Allocations
to Task Forces and Competence Groups

Your Allocations

You can update yourself your individual allocations to Competence Groups and Taskforces of interest. Related Working Groups are shown automatically.
The other Groups are maintained by the Administrator.

Member Page
Collaboration Area
Bugzilla
Testlink
Personal Profile
Your Allocations
Announcements
Handbook · Get started
PoTi Data

+ Working Groups

− Task Forces

D0008   Configuration Management   ⟶ Delete allocation

» JOIN A TASK FORCE   Allocate further Task Force

+ Competence Groups

+ Other Groups

10/12/2019   8th CAR 2 CAR Week - Integrated Tooling   10

» ... receive an individual login to the C2C-CC website. Their personal data set comprises the login credential, membership status, address book information, allocations to the Competence Groups and Taskforces or other Groups and taken roles like rapporteur of a Taskforce or chair of a Competence Group, Working Group or other Group and being part of activated corresponding e-mail distribution lists. The individual access rights to tools, folders and documents depend on the roles and allocations taken by the experts. Until end of 2019 all this information had to be updated by the Administrator in different databases and most of the experts have not been fully aware about their individual status and further options.

In-between the Consortium has switched to the new server and took the opportunity for updating the published content. For experts of the C2C-CC members the integrated tooling concept for all web-based tools and services offers more transparency and flexibility. The improvements have been implemented in line with the GDPR policy. The new implementation allows to inform all experts having logged-in about the latest news, initiatives and events planned. The menu of the member page offers the logged-in expert the opportu-

nity to maintain the individual data set. The expert can update the address book information inclusive phone numbers and e-mail address in case they have changed. Furthermore, each expert sees the current status of the individual allocations to Competence Groups and Taskforces and all other offered but not taken options. Updating the status of allocation is done by a few mouse clicks. The C2C-CC data base ensures that all groups, access rights and e-mail distribution lists are up-to-date close to real time. The shown menu also enables to switch easily to the new Collaboration Area and further web-tooling. The Consortium took the opportunity to switch to a new software for the Collaboration Area and to integrate this tool in the single-sign-on concept while the other web-tools of Bugzilla and TestLink are currently only linked. The next generation of the web-tools shall also be integrated in this user-friendly concept. The Collaboration Area offers the common file repository for sharing information between all experts of the Consortium. In addition, the Collaboration Area provides the up-to-date address book for supporting the individual contact between the experts where required. The Consortium calendar provides an overview of important external dates like ETSI TC ITS standardisation, ITS congresses or CCAM meetings as well as dates of the Steering Committee and of the Technical Organisation like CAR 2 CAR Weeks. Chairs shall consider the other dates and fill-in their meetings for reducing possible conflicts to a minimum.

For guiding the experts in using the complete functionality of the new integrated tooling and in finding most important documents of the Consortium a handbook ... »

Collaboration Area – File Repository [1/3]

Main folder structure

Where you are

Sub-folder structure
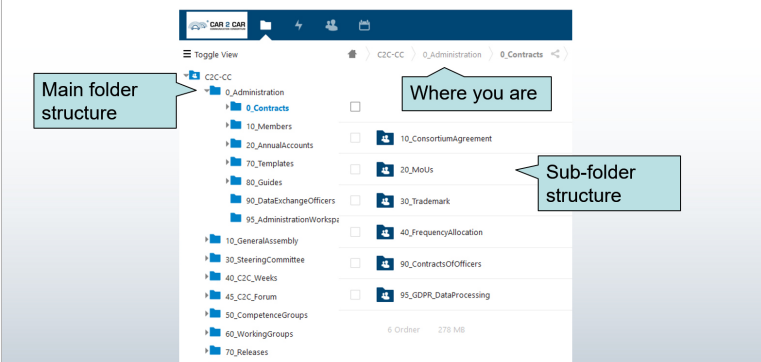
» ... "getting started" has been developed which can be easily accessed by the website menu of the member page.

During the 8th CAR 2 CAR Week in December 2019 the test implementation was presented to the interested experts and volunteers could expire and test the functionality online by themselves. The following test period did not uncover any severe problems. By end of January 2020 website and tooling have been switched to the new implementation. In a next step an improved registration process for the CAR 2 CAR Weeks shall be integrated and activated for the registration the participation in the 10th CAR 2 CAR Week.

You should keep your personal data set up to date for benefiting from the new implementation improving cooperation and workflow processes within the CAR 2 CAR Communication Consortium.
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CAR 2 CAR Forum 2019
by Dr. Karl-Oskar Proskawetz | Administrator of the CAR 2 CAR Communication Consortium

The last year´s CAR 2 CAR Forum was organised on 29 and 30 October 2019 at Torino, Italy and complemented by a Workshop the next day. The launched Golf 8 and ID.3 by Volkswagen equipped with WLANp as standard, the ongoing procurement of C-ITS infrastructure by the C-Roads Pilots and the published C-ITS Deployment Statement during the ITS World Congress at Singapore highlighted important milestones to bring Day 1 onto European roads into operation. The main focus was given to the next phases of C-ITS for reaching accident free traffic and supporting automation. The definition phase of Day 2 has started and proposed features for consideration as well as the technical evolution of C-ITS were discussed in-depth. The workshop at the Torino City Hall addressed the state-of the art and future developments of C-ITS with focus on its application to meet the needs of cities. During the oncoming years Torino and further 42 European cities will bring in their expertise to the C-Roads platform for harmonising C-ITS services and implementing them.

In 2019 the CAR 2 CAR Forum was organised at the Environment Park in Torino, Italy. The first session started with a presentation of Eddy Hartog (DG Connect) on 5G corridors and cross border testing. This was followed by an update on the C-Roads partnership of 18 member states, 43 cities, and 7 associated members and the ongoing C-ITS procurement based on ... »

Torino

» ... the recent release 1.5 of the communication profile. C-Roads plans to demonstrate the state of the art reached in a European C-ITS Roadshow event in 2020. Volkswagen wrapped up the long way towards standard deployment of C-ITS in the new Golf 8. The outlined hazard warning services are seen as first step towards cooperative traffic safety following a seamless evolution strategy of the whole Volkswagen group.

In the second session the developments of C-ITS services interacting with the railway environment in the Czech Republic were outlined. The use cases address railway and tram level crossing as well as further public transport crossings and stops. The lessons learned have to be considered for future C-ITS implementation. While deployment on railway crossings will take some more time the public transport companies show a very high interest in the benefits of C-ITS. The commercial vehicles highlighted their interest in C-ITS beyond Day 1 to increase safety, to lower fuel consumption, to enable new flexibility and to reduce congestions. For public roads platooning, collective perception and manoeuvring coordination are of high interest. Parallel platooning and remote control are additionally subject for confined areas. High numbers of trucks on motorways

call for truck platooning to increase safety, to avoid unnecessary stops and thus also reduce fuel consumption. The ENSEMBLE project paves the way for the first generation of multi-brand truck platooning. Due to the complexity level 4 autonomy of trucks starts in confined areas before being applied to public motorways followed by urban areas. In all cases V2X communication based on ITS G5 is seen as essential. Powered two-wheelers show great potential for future mobility. However worldwide trends of car and motorcycle fatalities still show remarkable high numbers. The majority of accidents are caused by perception failures of other vehicle drivers. In-depth studies show that motorcycle approach indication (MAI) and warning (MAW) are seen as powerful use cases to reduce the number of PTW accidents. The published BSP 1.4 includes the PTW input but compared to cars some differences have to be considered. Antenna position, positioning and timing still remain challenges for PTWs and are addressed by dedicated work items. E-bikes are expected to benefit from PTW developments and lessons learned.

At the end of the second session Paul Spaanderman highlighted that during the ITS World Congress 2019 at Singapore the C-ITS Deployment Group has published and promoted a statement "C-ITS deployment takes off" supported by more than 60 European stakeholders. Claire Depré (DG MOVE) pointed out that this statement was very much appreciated by the European Commission and highlighted in her keynote the continuous support of C-ITS deployment, day 2 and towards cooperative connected automated mobility for involving the entire mobility sector. The European Commission supports the ... »

» ... developments with funding as well as a common security trust domain for all of Europe. C-ITS Point of Contact (CPOC) and Trust List Manager (TLM) are fully hosted by the European Commission and will be complemented by the European Root CA.

NXP presented the PedalACC use case study during the third session. For improving road safety in addition to motorised vehicles also other road users have to be considered. The increasing VRU accident statistics of bikes and pedelecs during the past years motivates to consider this group for future C-ITS use cases. In the project adaptive cruise control supporting green light optimised speed advise (GLOSA) at co-operative intersections and VRU protection are developed for electrical cargo bikes. In addition, several further uses cases are seen to complement the portfolio of valuable services for bicycle riders in future. The demonstrations show that C-ITS is mature and ready for roll-out in battery powered small electric vehicles to support and enhance VRU protection. IAV reported about a shuttle and ITS ecosystem developed by the HEAT project. HEAT aims on proofing the concept for highly automated minibuses in public transport and enhancing the acceptance for highly automated driving. A closed loop line traffic on public streets in the Hamburg harbour city is used for test and demonstration. In the current test phase instructed passengers with a vehicle attendant are driven on a part of the track. The HEAT specific V2X covers Spat/MAP and CPM with local infrastructure as well as communication with a control centre to ensure the safe and reliable operation. For the ITS World Congress 2021 the fully automated opera-

tion of the shuttle with 50 km/h in real traffic shall be demonstrated. The last presentation of the session on quantum computing and quantum-safe cryptography was given by Mark Pecen (chairman ETSI TC Cyber WG QSC). He outlined the basics of quantum computing and its application for solving certain types of problems extremely easily and highlighted its relevance for security. Quantum computers will break today's public key encryption standards while symmetric algorithms show higher robustness. Quantum safe algorithms require other mathematical approaches, e.g. based on hash-, code-, lattice-, multivariant-, or isogeny functions. He outlined and assessed the main features of these candidates and highlighted the ongoing international standardisation of quantum-safe algorithms. First draft standards are expected between 2022 to 2024. He pointed to work done at ETSI and progress reached in this area and informed about new work items. This was complemented by a brief overview of the work done by other standardisation bodies.

The last session of the first day addressed important building blocks for accident free driving. Continental questioned the possibility of functional safety for ... »

»... platooning and cooperative driving. The definition of functional safety was explained for a V2X emergency brake assist system (EBA) giving more detailed insight into the hazard analysis and how the safety targets can be reached. The safety measures with respect to communication, correctness of data and extension for automated driving functions were discussed in more detail. Even ETSI ITS-G5 protocols already protect the communication additional safety certificates and/or ASIL-qualifiers are necessary to meet the functional safety requirements. The last presentation of the session highlighted the need of comprehensive testing of C-ITS implementations to ensuring interoperability, conformity and (functional -) safety. Lessons learned from the European train control system (ETCS) are considered to be helpful for ensuring interoperability of V2X applications. State of the art testing and shortcomings were discussed for the CAM message. Real field data of operated test tracks can be used for manoeuvre extraction and generating further relevant test cases. Even some issues still have to be solved, the outlined approach is expected to enhance the V2X quality significantly.

During the second day the technical organisation of the CAR 2 CAR Communication Consortium presented selected results of the current work. During the session on European C-ITS Deployment the development of the published BSP R1.4.0 was outlined and builds the base line for interoperability of all new specifications. This release as well as future work is closely harmonised and synchronised with C-Roads specifying the infrastructure related profile. Deploying C-ITS and developing C-ITS further results in some challenges. Error corrections as well as new features have to ensure interoperability and the backwards compatibility to the BSP R1.4.0. As ad-hoc networks do not have a system operator, taskforce operations took care for defining and preparing processes for handling problem reports. SPAT/MAP messages turned out to be used differently, e.g. with respect to confidence of time change details, optional data elements and topology accuracy. For overcoming the issues C2C-CC worked on solutions for the most pressing issues in close cooperation with C-Roads. The results of this task will be handed over to C-Roads for considering the issues and proposed solutions in the infrastructure profile and specifications.

The second technical session outlined the C2C-CC roadmap and the process for describing Day1 feature extensions to be considered for the next C-ITS deployment phases. As one important feature the exchange of pre-crash object information was discussed. ETSI specified the TR 103 562 proposing the CPM message structure. This message and its containers were outlined and discussed on given examples. Considerations for expressing the object quality were discussed. Currently theoretical analysis and **...»**

» ... metric assessment is treated. The specification shall be released by February 2020. Furthermore, the main results of a whitepaper dealing with vulnerable road users (VRUs) was presented. In the whitepaper selected use cases are discussed with respect to methods, technology needs, obstacles and other aspects. The methodology was outlined with reference to a diagram shown. The identified topics will be discussed by the different groups of the technical organisation for developing C-ITS approaches to improve safety of VRUs. Another group investigates approaches for cooperative and connected automated driving for identifying an initial set of common functionalities (services) and technical aspects (technologies) to be considered for making the roadmap towards automated driving happen. The need and the role of the road infrastructure and related benefits are also investigated. C-ITS is considered as additional sensor supporting cooperative perception and cooperative manoeuvres as well as mapping and localisation. The results of more than 13 R&D projects have been analysed. The generalised results on use cases, identified functions, technologies, requirements and impacts have been documented in a white paper. Some of the

identified key functionalities like intention sharing, trajectory sharing, and match making were outlined and discussed. The further activities will address the required basic technologies and analyse additional use cases.

The security session addressed the protection profiles for C-ITS end entities and considerations related to Quantum computing. The protection profile provides an implementation independent specification of security and assurance requirements. Any product compliant to the protection profile must meet the security requirements provided by this security target. The role of the protection profiles in certification process of products was outlined. The security policy specified by the European Commission requires the use of certified cryptographic modules and C-ITS stations to be certified. Currently common criteria are applied to certify the C2C-CC protection profile building the base line for common security requirements. The risk assessment, life cycle and architecture considerations, HSM protection profile, vehicle ITS station protection profile and harmonisation with C-Roads were outlined and discussed. Looking further to the future the impacts on cryptography of Quantum computation need to be considered for meeting the security and privacy requirements. A first assessment addressed the required lead time for making C-ITS Quantum-safe considering characteristics of hardware and algorithms. Here research activities are still required. Considering the roadmap towards cooperative automated driving the next steps are recommended for well designing and facilitating future evolutions of crypto mechanisms & **... »**

» ... security protocols (by enhancing crypto agility, etc.).

The last session of the CAR 2 CAR Forum addressed the technical roadmap and developments for supporting the next C-ITS deployment phases. With the launch of the Golf 8 and transforming C-Roads pilots into operation C-ITS is commercially available for improving road safety. The 70 MHz of the ITS spectrum is dedicated to safety related and non-safety related automotive applications and rail ITS but not protected. The further worldwide harmonisation of the 5.9 GHz spectrum is pushed by the WRC 2019. For requesting new spectrum for C-ITS during the WRC 2023 it is too late for meeting all required preconditions. Different organisations have defined C-ITS use cases and spectrum studies indicate the need of spectrum from around 40 MHz to 100 MHz. Reducing the indicated big span requires a clear and realistic methodology as used by the C2C-CC for aggregating to common calculation methods. The C2C-CC method was outlined for the different message types considering different environmental scenarios. The results were used for mapping the applications to the channels considering the safety communication radius. Another presentation highlighted the work on specifying the IEEE 802.11bd standard offering a seamless evolution of the access layer for C-ITS. This new standard shall be finalised by December 2021 offering higher spectral efficiency, increased reliability and extended range, fully backwards compatibility and interoperability with IEEE 802.11p allowing a seamless evolution and protection of all investments of the current ongoing C-ITS deployment. The details of the main technical features and the seamless evolution of the physical layer have been illustrated and outlined. Today´s existing positioning technology in cooperative ITS only offers insufficient positioning accuracy for supporting automated driving and involving VRUs into C-ITS. For the future new approaches are required and the challenging requirements were illustrated for some use cases. Fine timing measurement (FTM) specified in IEEE802.11-2016 Ranging or IEEE802.11az Next Generation Ranging as well as IEEE802.15.4z on UWB ranging (to be published soon) were seen as valuable candidates for enhancing the ranging capabilities for C-ITS. First tests of UWB look very promising. IEEE802.11bd shall provide a set of new "tools" for positioning when available. For taking advantage of these capabilities an integration of these technologies into future releases of the ITS standards will be required. Position and Timing quality is essential for C-ITS use cases and their quality. The PoTi requirements are part of the BSP 1.4 and consider also new PTW aspects. For PoTi compliance assessment a new data set has been collected and processed to verify equipment of vendors. A related PoTi white paper is under development. At ETSI STF 558 is developing EN 302 890-2 to be published in Q3/2020. **... »**

» ... Complementing the work and results of the PRoPART project have been presented. Finally, the work on hybrid communication and multi-channel was discussed. Beyond BSP 1.5 safety related information will be exchanged in a multi-communication environment. For C-ITS multi-channel operation IEEE 802.11p and 802.11bd protocols were considered operating in the 5.9 and 60 GHz spectrum as well as new message sets and functional safety requirements. Results of the work done within C2C-CC will be brought into ETSI for international standardisation.

The following day a workshop on city aspects was organised at the Torino City Hall. In three presentations C2C-CC experts informed about C-ITS for road safety and transport efficiency in Europe, the roadmap and use cases, the C-ITS technology and its deployment, further developments and evolution. C-Roads complemented these presentations by focusing on preparing cities for the deployment of harmonised C-ITS services. Experts from Torino side reported about the city lab for testing 5G use cases. The 5T organisation presented its mobility services, infrastructure for traffic information and traffic control, enforcement systems, the mobility control centre and evolution of the infrastructure. Furthermore, 5T outlined its engagement in the Smart Road Project and the C-Roads Italy 2 Pilot. TTS Italia as member of the ITS Nationals took the opportunity for presenting its activities. The last presentation of the STEVE project outlined the Smart tailored L-Category Electric Vehicle Demonstration in heterogeneous urban use cases.

All released presentations are offered for download from the website of the CAR 2 CAR Communication Consortium after having logged-in https://www.car-2-car.org/meta/car-2-car-forum-2019-download/.

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Virtual 8th CAR 2 CAR Week
by Dr. Karl-Oskar Proskawetz | Administrator of the CAR 2 CAR Communication Consortium

For the first time the CAR 2 CAR Communication Consortium has successfully organised a CAR 2 CAR Week by using web-conferences only.

As the participants did not have to travel the 8th CAR 2 CAR Week could already start on Monday, 9 December 2019 at 9:00 and ended on Wednesday, 11 December 2019 at 17:00. Up to three concurrent web-meetings served the parallel meeting sessions of the Competence Groups and Taskforces. ... »

CAR 2 CAR
COMMUNICATION CONSORTIUM

» ... On Monday, 09 December 2019, 09:00 the virtual 8th CAR 2 CAR Week started with the joint Opening Plenary session. This was followed by the series of parallel sessions of the Taskforces and Competence Groups on Monday and Tuesday full-time. One time slot was spent for outlining the Integrated Tooling concept, demonstrating online the implemented features of the test implementation and inviting all experts to feedback their testing comments. During Wednesday the meetings of WG Deployment, WG Functional and WG Technical have been organised consecutively. The virtual 8th CAR 2 CAR Week ended after the Final Closing Plenary session at 17:00.

Even for sessions with more than 40 participants the web-conferences showed a stable performance in quite good quality. The organisation of the parallel and successive meeting session might be improved for making it easier for experts to participate in selected session being organised in parallel web-meetings.

The web-meeting tool has proven its worth even in the case of the complex organisation of a CAR 2 CAR Week. Due to scheduling conflicts of the experts the organisation of face-to-face meetings would have not been practicable. Organising the CAR 2 CAR Week virtually lowered the hurdle of the experts for participating in meetings of interest and saved a lot of business travels.

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9th CAR 2 CAR Week
by Dr. Karl-Oskar Proskawetz | Administrator of the
CAR 2 CAR Communication Consortium

During the days of beginning Coronavirus Disease (COVID-19) the hybrid organisation concept of the 9th CAR 2 CAR Week organised from 9 to 12 March 2020 has proven its worth. Several companies and organisations issued travel restrictions for international events on short notice causing a lot of organisers to cancel or shift their events. Even less experts participated in the face-to-face meetings onsite at Burg Warberg the event was successful as the other experts took the opportunity to join the sessions of interest via GoToMeetings. As usual during the first two days up to four parallel sessions of Taskforces and Competence Groups were organised. This was followed by successive joint sessions of the three Working Groups during the third day. The meetings of the Technical Organisation were finalised with the Closing Plenary organised in the morning of the last day. The outcome of the 9th CAR 2 CAR Week was reported to the following Steering Committee meeting.

... »

Burg Warberg

» ... During the first two days of the 9th CAR 2 CAR Week the Competence Groups and Taskforces held their work meetings on Simulation, COM-COSP, Security, Multi-Channel Organisation, SPaTEM / MAPE, PoTi, Functional Safety and Collective Perception. They reported their issues discussed and results to the successive joint meetings of the three Working Groups Deployment, Technical and Functional on Wednesday. During the final Closing Plenary on Thursday morning the three Working Group summarised their reports and the Technical Organisation updated the Work Programme, released several documents and agreed on budget requests for supporting the technical work. The agreed proposals of the Technical Organisation have been reported during the following Steering Committee meeting which decided about the raised questions and proposals received from the Technical Organisation. The documentation of all sessions is found in the Collaboration Area.

The organisation of the 9th CAR 2 CAR Week had to deal with short-term travel restrictions issued by several companies and organisations as precautionary measure with respect to the Coronavirus Disease (COVID-19). The general setup of organising face-to-face sessions with complementing web-conferences has proven its worth. However, the online registration process uncovered some weak points as required short-term changes of registrations have not been supported. The recognised shortcomings have been considered in listed requirements for redesigning the online registration tooling. This shall be available already for the next CAR 2 CAR Week allowing experts to modify their individual registration until the given deadline passes. Furthermore, the session organisers shall receive the opportunity for monitoring the registrations of their sessions and easily creating a list of their participants.

The next 10th CAR 2 CAR Week will be hosted from 15 to 18 June 2020 by Renault SW Labs at Sophia Antipolis, France. Complementing GoToMeetings will be organised for each of the sessions.

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CAR 2 CAR Release 1.5.0
by Mario Friedrich | CAR 2 CAR Technical Management

The first series vehicles equipped with C-ITS are on the roads now. We took this seriously so that we decided for quality and accepted a slight delay of R1.5.0.

That mean, before we released the updated specifications on the 27th of March, every single change had to undergo a sorrow analysis **... »**
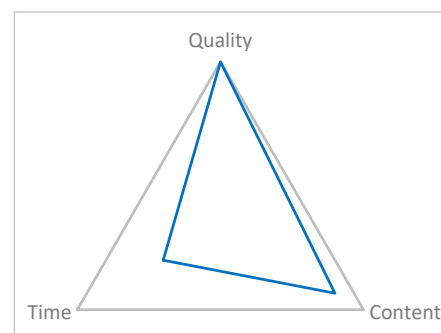

**Figure 1: Release 1.5.0 –
quality versus content versus time**

» **...** of its backward compatibility. That lead to a significant increased effort in the Change Control Board (CCB) but also an increased effort for the experts which had to tune the solutions more often compared to previous releases.

We had a very demanding time to get the RfCs (Requests for Change) done, especially in the first quarter of 2020. Thanks to a high commitment, we were able to schedule weekly telephone conferences to get the RfC solutions agreed from an expert point of view. At the same time the CCB increased its throughput drastically.
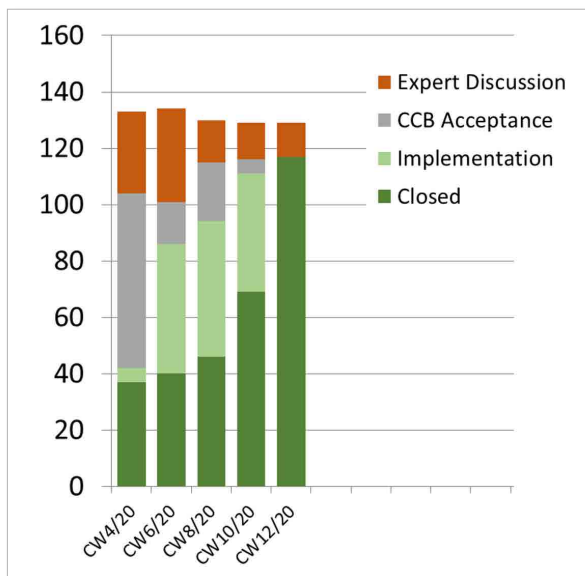
Figure 2: High RfC throughput in Q1 of 2020

The result is quite impressive, more than 90% of the RfCs were solved. The remaining are shifted to future releases. None of the remaining RfCs have been shifted, just because we had run out of time, but based on explicit decisions, e.g. that

other standards need to be updated first, before we can follow with the profiling.

Thanks to all the contributions, we have realized an updated release bundle, consisting of the 16 consistent documents. They are not just consistent within the single documents but all the documents of the release bundle are consistent with each other.

The R1.5.0 release bundle consists of the:

- Basic System Profile,
- Triggering Conditions,
- HSM Protection Profile and
- more formal documents like the Reference List or the Release Overview.

New in this release bundle are the changes through 129 RfCs, which lead, e.g. to

- major detailing of the position and timing requirements and
- new requirement for the authorization ticket changeover.
- Furthermore, two new documents have been added:
- a separate Glossary and
- Automotive Requirements for SPaT and MAP, which has become the prototype for an efficient alignment with the infrastructure side now.

Thanks a lot for your high commitment!

"

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Re-Structuring Competence Groups for Improving Consideration of Stakeholder Interests
by Paul Spaanderman | PaulsConsultancy BV (PC)

The C2C-CC has been restructuring the organisation and has separated the operations and quality management of the first operational BSP from R&D for new services, functions and technologies. By this a work group (WG) Deployment has been setup for realisation and maintenance. For R&D the WG's Functional and Technical have been installed.

WG Technical takes responsibility for the realisation of the system services and underlaying technical specifications and related aspects. The WG Technical maintains the overall Technology Roadmap.

WG Functional in the first place is responsible for the functional direction in general sense and maintains an overall functional roadmap reflecting the C2C-CC vision and objectives. It is responsible for the alignment between the different functional stakeholders in line with the C2C-CC vision.

Originally the WG Functional would consist of a flat content-oriented organisation (e.g. a roadmap group and applications group), this as at that time forming the WG, the C2C-CC was mostly passenger vehicle oriented. Today a variety of functional stakeholders such as motorcycle and Infrastructure stakeholders have interest in C-ITS and are member of the consortium while seeing further stakeholder differentiation (e.g. Agriculture and Emergency). Recognising this change is reason to look for a WG Functional organisation which reflects the interests of all stakeholders efficiently is envisioned. For this reason, a setup of Stakeholder group specific CG's has been proposed and is
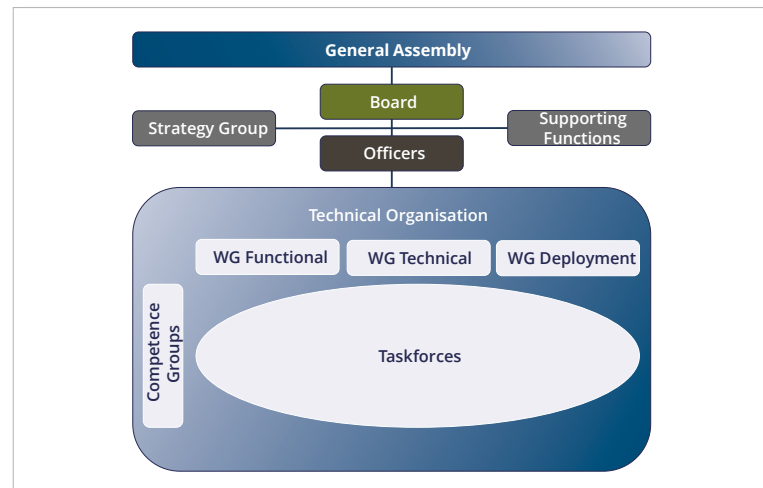
currently being prepared resulting in specific CG's for passenger vehicles, Trucks and special Vehicles, Motorcycles and Infrastructure. Each of these groups should detail their stakeholder specific roadmap in line with the C2C-CC vision and translate this in activities and generation of work items (WI) with support of all CGs there were needed. Functional and Technical Task forces will be responsible for the realisation of the WI's in a timely fashion.

By organising this each stakeholder group has its own place in C2C-CC to realise their specific aspects to realise interoperability will all stakeholders.

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The SAFERtec security evaluation approach, results & future challenges

by Sammy Haddad, Oppida | András Váradi, Commsignia | Panagiotis Pantazopoulos, ICCS | Angelos Amditis, ICCS

INTRODUCTION

Cyber-security evaluation seeks to gain evidence that the relevant security, privacy and safety requirements of an IT system are satisfied. Towards that end, carefully-designed evaluation processes of the considered systems are needed. The (so-far) most credible evaluation approach, the Common Criteria (CC) standard [1], relies on an exhaustive series of evaluation tasks to provide the highest possible assurance at the expense of increased costs. Applying the CC over the connected vehicles' paradigm which integrates a mosaic of third-party modules and interfaces is eventually challenging; the cost in resources and time further increases while relevant tools are lacking.

SAFERtec [2], a H2020 EC-funded research and innovation action (see Car2Car Journal issue 20, May 2018), addressed the challenge of introducing a security assurance framework carefully designed for the connected vehicle (referred-to as ToE i.e., Target of Evaluation).

A SECURITY ASSURANCE FRAMEWORK FOR CONNECTED VEHICLES

The project has mainly relied on CC and partially on a previous approach i.e., CARSEM [3]. It carefully designs an adaptable assurance framework considering the automotive cyber-security challenges. A number of timely V2I use-cases (e.g., optimal driving speed advice, provision of real-time traffic-hazard information, priority request in intersection-crossing) have been selected to serve as a basis for the application and evaluation of the framework's efficiency.

In line with CC and CARSEM approach the SAFERtec Assurance Framework reuses the set of CC evaluation tasks, but enhances them and defines new ways to execute the whole evaluation:

- Agility in the achievable assurance. An adaptive assurance can be provided to capture a broad range of use cases (from Day1 to higher levels of automation) and match the products' criticality (from the temperature sensor to the Hardware Security Module storing private keys). Moreover, an assurance class has been especially defined to provide assurance at system-level by ensuring the correct composition of individually-evaluated critical components.

- Reduced cost and shorter total evaluation time compared to CC. That is achieved by modifying/adapting a set of evaluation requirements to the automotive specificities and needs. Another improvement is the definition of reference data sets and tools to ease the developer's burden of the evaluation-inputs definition.

Along this line, the project has taken into account the community work (e.g., C2C, ETSI WG5 work etc.) and introduced a set of innovative contributions (Figure 1 presents the evaluation tasks SAFERtec **...** »

affects circled by blue dots) to ease, harmonize and enhance the production and quality of evaluation-inputs: a) Innovative risk analysis methodology combining the EBIOS, SecureTropos and PriS approaches [4] to support the appropriate editing of evaluation inputs (i.e, Security Target, specification and architecture documents). b) Definition of a modular approach for the definition of security targets (i.e., the definition of the security requirements to be evaluated) through the definition of a modular Protection Profile (PP) for connected vehicle [5],[6] which constitutes a central component of CC evaluation allowing to gather in an implementation-independent way harmonized security requirements; c) Introduction of assurance composition evaluation tasks (i.e., the new AOP assurance class extending CC ones) to validate assurance at system-level by demonstrating that critical components that have been independently evaluated, are correctly used and their security functions are interacting as intended with no security breaches; d) Providing a SAFERtec-developed online tool to support CC-based cyber-security evaluations on automotive products.

Our detailed yet empirical estimation (based on the long partners expertise, previous experimentations and received feedback) suggests that the SAFERtec improvements may achieve up to 60% lower costs compared to CC and shorten evaluation time by 50% for high assurance levels (compared to regular software evaluation).

FRAMEWORK's APPLICATION AND EVALUATION RESULTS

The consortium has put together two (identical) test-benches (see Figure 2) configured to realize the considered use-cases and be used as a basis for the SAFERtec evaluation tasks [7].

Two different experimental evaluations have been run; one for the module-level validation of the critical components and a second at system-level to validate the SAFERtec approach.

Concerning module level evaluation, three security critical components have been evaluated regarding the requirements defined in the SAFERtec PP: the OBU application, the OBU protocol control stack and the OBU HSM. Since even optimized security evaluation approaches (i.e., concerning mature products already operationally proven) lie outside the scope of a research project requiring increased resources, we have focused on a partial evaluation for specific security requirements in order to obtain feedback on the SAFERtec assurance ... »
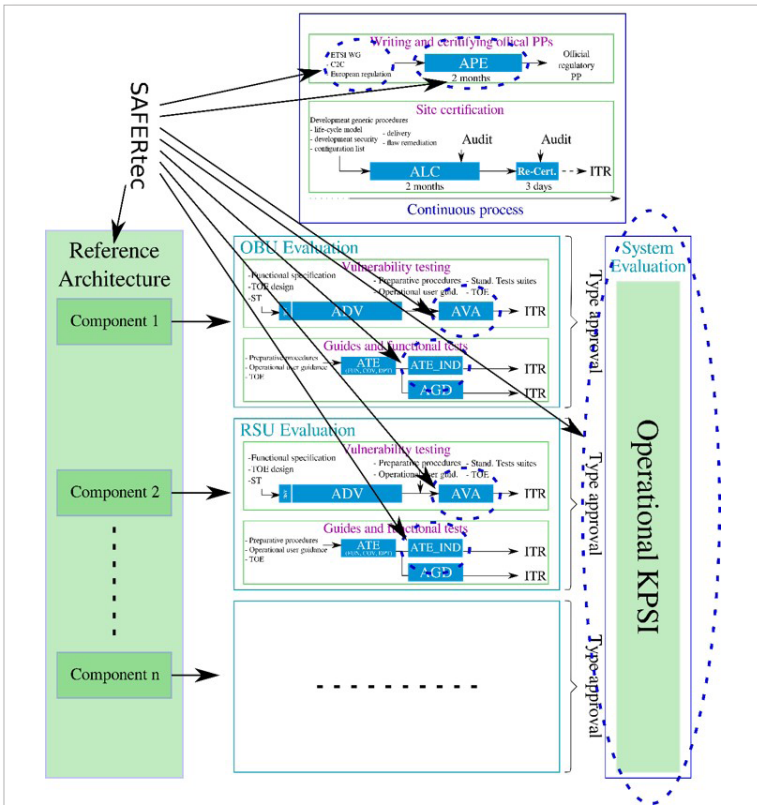

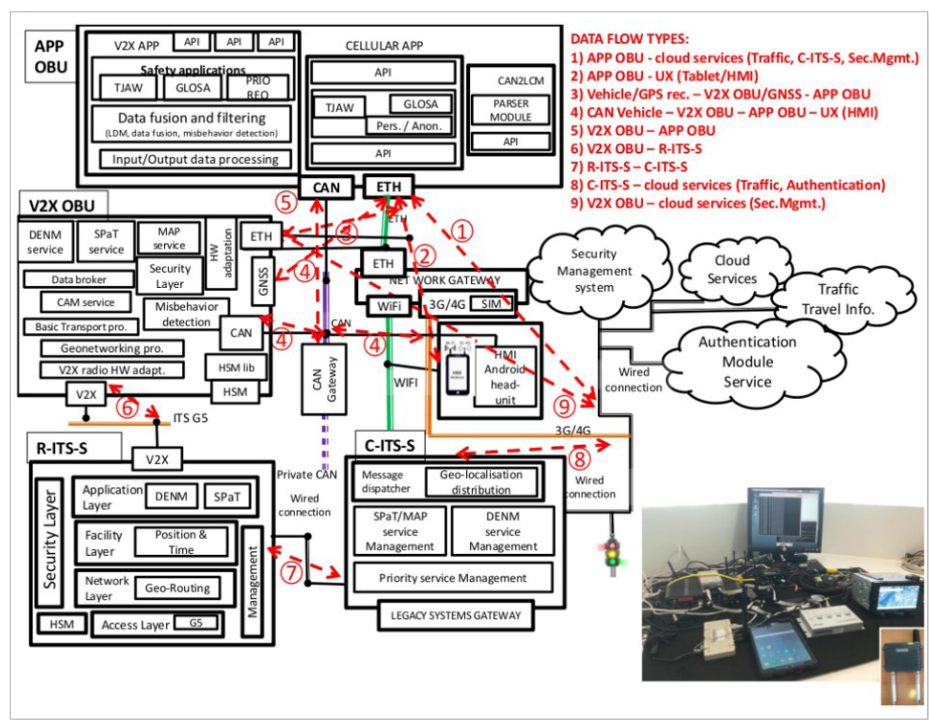**Figure 1 SAFERtec enhancements over the CC evaluation framework**

Figure 2 Experimentation test-bench: logical architecture and physical implementation (right-bottom corner)

...» framework properties. In particular, we focused on evaluation tasks for which SAFERtec provides enhancements in order to evaluate our approach benefits. Security target evaluation tasks, partial functional and documentation evaluation tasks as well as vulnerability tests/plausibility checks have been run. The project approach was iterative (reports were produced and inputs were updated as long as non-conformities were identified), aiming to obtain sufficient insights/feedback and maximize the achieved assurance for each component (even if the iterations number was not exhaustive).

One research thread of particular interest due to lack of mature standards and significant impact on security relates to Misbehavior Detection (MD) requirements which is a term used for the V2X ad-hoc network to detect faulty or otherwise malicious nodes-ITS stations. By having incorrect data fields identified, a report can be assembled to-

wards the Public Key Infrastructure (PKI) to subsequently take counter actions e.g., remove the credentials of the ITS station from the PKI (revoke). SAFERtec has extended its relevant PP module to include specific requirements related to MD (MD detection rules). The Security attribute chosen is "Plausibility of carried information", which consists of Received signal strength, Message type, Time stamp, Geo-position and Velocity. The aim is to protect the receiving vehicle by reducing (or eliminating) trust from a transmitting vehicle (its pseudonym ID) which has been found to misbehave on the basis of the above requirements.

The second evaluation step was the validation of the approach at system-level. For that we simulated real attack conditions on the running use cases to identify all remaining vulnerabilities after executing our assurance framework. This has been done twice, once to validate the assurance approach **...»**

...» and the added security strength to the system; then, a second time to evaluate the capability of the proposed framework to adapt to extensions of security requirements (i.e., addition of security modules and enlargement of the corresponding security targets). The first tests demonstrated that the evaluated components were in fact hardened and that the vulnerability found were due to the chosen security targets (accepted risks) defined for specific Day 1 use cases. Second-round of testing demonstrated that added security modules to cover the previously identified weaknesses and cope with higher automation (and higher risks) were correctly assessed by the framework.

FUTURE RESEARCH DIRECTIONS

A rich spectrum of research challenges has been (further) revealed through the SAFERtec achievements. Further adaptation of security assurance tasks (e.g., CC evaluation classes) to the automotive ecosystem is needed. The compilation of additional relevant Protection Profiles for automotive ToEs is one such direction (other components of the system not yet covered). On the other hand, exhaustive testing is needed to reveal vulnerabilities and allow for the improvement of security assurance methods. The development and usage of automated/online tools (such as the SAFERtec toolkit) to further support the otherwise time-consuming assurance tasks remains an important open challenge.

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From lab to field: a consistent, integrated test solution for functional V2X
by Manfred Miller | Nordsys

The networking between vehicles and with the infrastructure by means of V2X communication is challenging function testers in the automotive industry and on infrastructure side. Up to now, the scope of testing has been limited to clearly definable system boundaries, which have resulted from the vehicle electrical system architecture, the sensors embedded in it and the data supplied by the latter. Rest bus simulations in HiL test environments have therefore long been established and are state of the art. With V2X communication, however, external data sources now come into the scene and have to be considered for functional tests of the V2X application. The source for this external data can be other vehicles (V2V communication) or from the infrastructure (I2V communication), such as traffic lights. In short: the traffic events that take place around your own vehicle. In this respect, test solutions should not only consider the remaining bus of the own vehicle (the ego vehicle), but especially the simulation of the traffic environment. In analogy to the vehicle electrical system rest bus simulation, this can be described as "rest traffic simulation" in V2X networks.

Soft system boundaries and agile standards

The system boundaries the application development engineer has to take into account when developing V2X functions are no longer as clearly defined as before. From
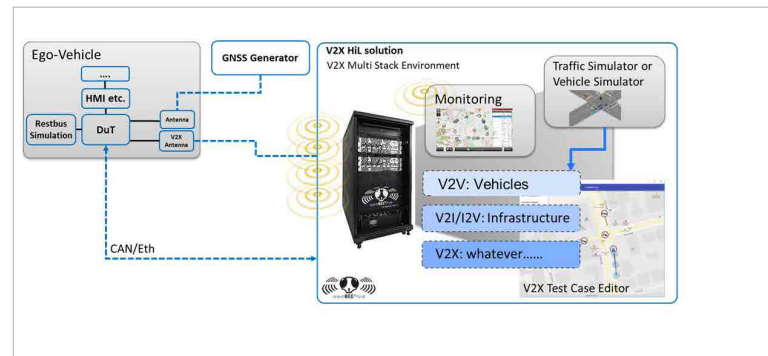

Test-Setup-HiL

the point of view of the on-board sensor network, V2X communication is just another sensor that supplies data for the processing ECUs. At least this is the case when receiving V2X messages. From this point of view, the procedure for the developer does not change. There are, however, several crucial differences compared to the conventional, self-contained vehicle electrical system:

1. The number of data sources (i.e. V2X transmitters) is variable

2. The nature of the data sources may vary: Other vehicles or infrastructure components

3. Different target markets with different V2X standards, e.g. Europe and Unites States

4. Competing or complementary radio technologies (ITS-G5, LTE-V, 5G)

The differences mentioned above have a significant influence on function development, since the development context can no longer be defined clearly. **...»**
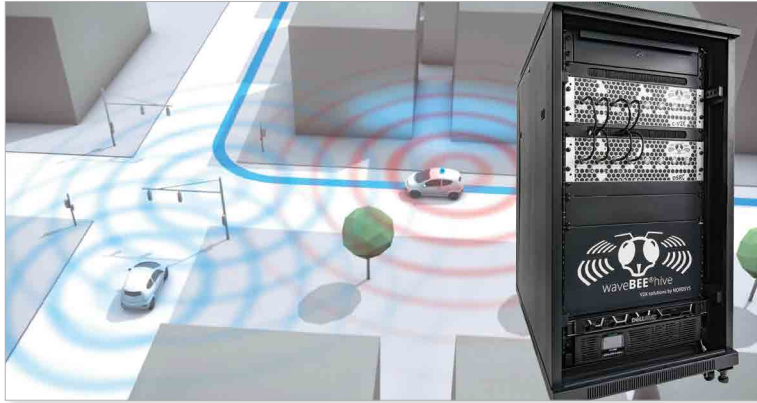
v2x szenario hive

... » This circumstance becomes particularly apparent when testing the functions. The very simple example of a warning function for a special vehicle approaching makes this clear. In a large ad-hoc network with any number of participants, the corresponding V2X application must analyse, based on the V2X messages, whether the own vehicle is affected by the emergency vehicle and how to react in this situation: Ignore, inform, warn and if applicable, how to priories the messages. If this scenario is placed on a multi-lane intersection in combination with the V2X messages of the infrastructure and other vehicles, the developer needs procedures for complex environmental tests in which the ego vehicle is only one of the many components of this network.

The scenario described above requires a different approach for the functional tests than was the case with conventional, self-contained onboard networks: The test scenario no longer includes the remaining bus simulation as in the vehicle's own onboard network, but rather a remaining traffic simulation must be provided which at least displays the messages on the air interface as realistically as possible. A closer look at the surrounding traffic is usually not necessary, because ulti-

mately only the messages sent are decisive for the test.

waveBEE® hive – compact test solution for bench tests

With the test solution waveBEE® hive (hive = beehive) from NORDSYS GmbH, a compact HiL test rack for functional tests is available that meets the aforementioned requirements. The rest traffic simulation – or better said the messages broadcasted by the surrounding traffic and infrastructure - can be generated easily by mouse click in the waveBEE® creator software integrated in the test rack. The test cases or even complex test scenarios generated this way can be reproduced in time and location. As an option, several traffic simulations like SUMO can be connected to the test bench, whereby reproducibility is also given here. Especially the reproducibility of test cases is a problem with V2X messages. Since the messages are signed with certificates, a simple replay of test data is not expedient. The test fails because neither timestamps nor signatures from the Device under Test are considered valid. **...** »

waveBEE hive

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... **»** When talking about test traffic simulation, the question inevitably arises how many V2X modems are actually needed for the test setup. If the traffic volume to be simulated is high, the number can easily be 50 or more. In the waveBEE® hive this problem is solved in a smart way by simulating the transmission channels via a single V2X modem. Thus, for example, only 3 modems are required to simulate 60 vehicles or V2X stations. The system is extremely scalable and therefore even load tests can be performed. By means of the integrated certificate management, messages with signature as well as unsigned ones can be generated. The waveBEE® hive supports the standards in Europe, North America and China. Adaptation to LTE-V/C-V2X can be achieved by exchanging the V2X modems if required.

The monitoring solution, which is also integrated, records, decodes and visualizes all messages of the air interface. It thus serves as a reference for the Device under Test and allows the validation of the functions to be tested.

waveBEE® to-go – the step to field tests

Test drives in the field for testing V2X systems is a really challenging job. If performed in a conventional way it would take several cars (and perhaps vulnerable road users) and additional infrastructure like traffic lights, roadwork trailers or gantries to execute the tests. The equipment might not be the issue, but more the labour costs for all the test drivers and the management of the test environment. Another problem is the reproducibility of the test case with all the participants. On the other hand, the step from laboratory tests to field tests with the real

PRscenarioeditor

test vehicle is a central requirement of function testers. But is real environment necessary for that? No, not at all! In practise the tests can be performed with the same formal description of the test case (or even complex test scenario) like in the described manner above using waveBEE® hive. Even in the field the environment can be simulated by generating only the messages broadcasted by it. The mobile system waveBEE® to-go supports the simulation of several V2X stations based on the same test cases as in the lab. This way, even field tests are highly reproducible and regression safe, because the test case is executed always the same way.

waveBEEto-go editor

... **»**

... »   Conclusion

The approach of the waveBEE® testing eco system using an abstract description of V2X test cases instead of replaying pre-recorded data has several advantages. The test case can be executed in a lab environment as well as under real conditions with the real car under test. Every test is reproducible and therefore fits the requirements for regression testing - at any time and any location. Furthermore, the test setup is much simpler because only a few modems are needed to perform even tests with hundreds of V2X stations. Finally, the tests can be executed with or without the V2X security mechanisms.

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Different Methods of V2X Function Testing – Which Fits Best for You?
by Jens Buttgereit | Vector

In today's vehicle architectures with first generation V2X ECUs, the V2X ECU handles the sending and receiving of radio data, processes the radio data and executes supported V2X applications. Resulting warnings and recommendations are transmitted to the HMI ECU and displayed to the driver.

In NextGen ADAS systems of modern vehicles, however, V2X data will be fused with already available radar, lidar and camera data. The fused data is transmitted as an object list, e.g. based on the ASAM OSI[1] standard , to the ADAS ECU. The object list contains data like detected vehicles, obstacles and signs and is the basis for decisions calculated by the ADAS functions. V2X data can significantly improve the reliability of these applications by extending the artificial horizon of the vehicle, especially at high speeds.

This results in additional requirements on tools for development and testing of ADAS systems, as OEMs and TIER1s have to include V2X test data in their existing ADAS algorithms and test environments. How does the development of such ADAS ECUs and functions in development tools like CANoe .Car2x looks like? Let's take the example of the simple "Emergency Electronic Brake Light" (EEBL) function for explanation.

To be able to trigger the mentioned function in simulations, HiL tests and real driving tests, it is necessary to create realistic scenarios. In these scenarios geographical routes are defined. Vehicles can be placed on these routes, and their behavior as well as their relationship to one another can be configured. For example, it can be configured that one vehicle (the stimulator) brakes **... »**

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[1] *https://www.asam.net/standards/detail/osi/*

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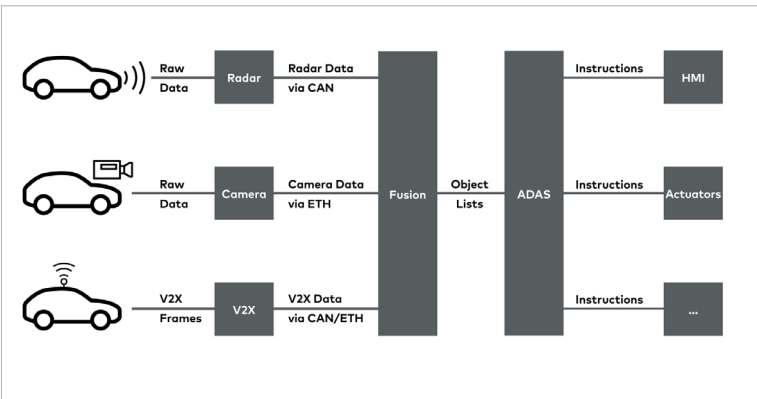
... » sharply while the second configured vehicle (the device under test - DUT) approaches quickly from behind. The test tool stimulates the ADAS ECU with the defined scenario data via CAN or Ethernet, provides the according GNSS position and brings it in a test ready status. The scenario data from the stimulator vehicle is used as environment stimulation to trigger the function on the ADAS ECU. To set up a fully automatic test environment, variations of the same scenario may be created. In these variations, relevant parameters like the speed of the vehicles differ. Test tools with an integrated test environment, that can load and execute such scenarios, will generate the corresponding V2X, CAN or Automotive Ethernet frames and stimulate the ADAS ECU synchronously. If tests can be automated and their results logged and presented in test reports, it makes it easy for function developers to check and document whether the function is working properly or not.

If the function shall be tested under realistic or real conditions, e.g. in a HiL test system or during a test drive, the test tool must be able to send V2X frames to the radio unit of the DUT. As different physical layer technologies (802.11p, C-V2X) are present on the market, test tools have to support them as well. At Vector, the VN4610 is available as measurement interface for 802.11p. For C-V2X support, there are already interfaces available to connect 3rd party hardware or specific measurement equipment like the CMW500 from Rohde & Schwarz.

However, as a function developer, the focus is not on testing the physical layer, the ADAS ECU and the functions running on it shall be tested without connecting the com-

munication unit. This is one advantage of Canoes multibus capability. The same scenario-based approach as described above is used to generate the required information. But instead of being mapped to V2X frames, the information is now mapped to e.g. Automotive Ethernet frames or object lists. These frames or object lists can then be sent to the ADAS ECU via its network interfaces. The logical level of development like creating routes, vehicles, defining transmission behavior and other intelligence is therefore independent of the used network interfaces. The communication medium to stimulate the ADAS ECU can be chosen as desired.

Tests created with the CANoe .Car2x Scenario Editor can be set up within a few minutes and are sufficient in many cases. However, if the scenario needs physical models for vehicle dynamics, powertrain, sensors and traffic, 3D simulation environments like DYNA4 for virtual driving tests can be used. Here, CANoe determines based on the positions and driving behavior of the vehicles when to generate V2X (or other bus type) data, just as it is done in the Scenario Editor. Tests performed with DYNA4 are very detailed and allow efficient development of **...** »
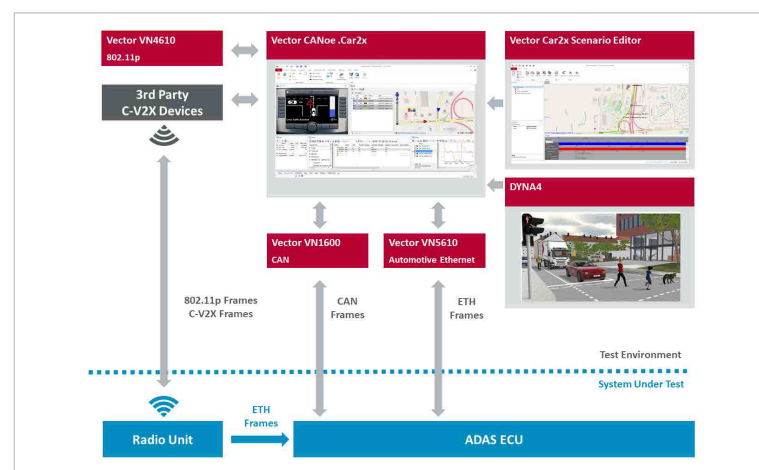
... » ECU functions through closed-loop simulations.

Tools like CANoe for development, analysis and test of ECUs and their functions offer function develop-

ers great flexibility in the development of NextGen ADAS functions, for which V2X will be an important additional input.

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Activities on using Car2X for improving road safety and also for improving the agricultural processes on the fields and at the farm.
by Norbert Schlingmann | AEF

The Agricultural Industry Electronic Foundation (AEF) representing 220 members including all major agricultural equipment manufacturers (AGCO, John Deere, CNHi, Claas, SDF, Kubota, Krone and many others) was initially established to create guidelines for the standardization of ISO 11783 (commonly known as ISOBUS) systems. This focus has been expanded to a wider range of topics to include electrification, camera systems, farm management information systems (FMIS), Ethernet communication and Wireless In-field Communication (WIC).

The AEF Project Team Wireless In-field Communication was tasked with taking a detailed look into wireless communication concepts. Their focus has taken into account technology decisions for suitable radio standards, corresponding transport layer protocols for machine-to-machine (M2M) communication and secure communication methods. M2M standards enable directcommunication between cooperating machines.

Standardized M2M communication between equipment of different manufacturers in the agricultural domain creates high value opportunities for customers worldwide and

is the basis of the goals for this project team.

- Use case definition for Ag Machinery
- Definition of radio standard for short- and mid-range wireless communication
- Usage and integration of existing communication protocols
- Specification of common software library
- Functional safety and security concept
- Conformance testing

The AEF experts defines a framework for secure M2M communication. For the physical communication layer, it intends to adopt existing industry standards of the telecommunication and vehicular communication domain. Specific demands in terms of reliability, safety, security and responsiveness from a wireless communication system will be required to determine sophisticated layer protocols.

AEF is considering the creation of a manufacturers-independent library to provide a common communication layer similar to the security library developed for Tractor-Implement-Management which was successfully launched in December 2019. ... »

... » After extensive review, the AEF has decided to work with IEEE 802.11P. The Cooperative Intelligent Transport System (C-ITS) has obtained a dedicated frequency range located in the 5.9 GHz domain. C-ITS is based on IEEE 802.11p with an extended range of up to 1000 m. It is a promising option for the short- to mid-range communication.

Especially in rural areas where cellular connectivity is often insufficient, there is high need of a proven radio technology that demands less infrastructure and is robust. Currently 802.11p as used in ITS-G5 for C-ITS is the best available technology and for our industry will be fully sufficient from performance point of view for the next decade.

During 2018 it was necessary to prove out some of the concepts the team had been working on with field testing. Together with the University of Paderborn, AEF defined a harvesting scenario to prove the usage of 802.11p.

Picture of an overtaking manoeuver in the harvesting scenario

A typical loading/unloading scenario to measure the wireless performance with three vehicles was set up. The figure below shows the scenario during an overtake manoeuver of one vehicles. During the overtake, a tractor with a trailer, drives from behind in between the sender and the receiver, two different shadowing effects were seen: The shadowing of the third tractor with a trailer in between the sender and the receiver and the additional shadowing due to the discharge chute during the overtaking manoeuvre.

The results show that there are no major problems using the 802.11p protocol stack developed for automotive applications. The range that can be covered is clearly sufficient, especially since there are typically no major obstacles such as buildings on an open field.

However, the size of the harvesting machines and additional mechanics as the discharge chute have a huge impact on the signal. This has to be taken into account when designing communication systems for agricultural vehicles. A possible countermeasure could be the use of multiple antennas at different positions on the vehicle.

Agricultural equipment is involved in road traffic accidents around the globe. Wireless communication systems can improve road safety when used in conjunction with smart car features available on automobiles and motorcycles. This safety feature has been successfully prototyped in a project between the European Telecommunication Standard Institute (ETSI) and AEF in 2018 as well.

A strong collaboration between the AEF teams with the Car2Car Consortium, the European Telecommunications Standards Institute (ETSI), AgGateway and the ISO organization was established. This participation and consultancy of industrial and academic partners in the field of radio technology, communication and vehicular networks, security solutions and distributed **... »**
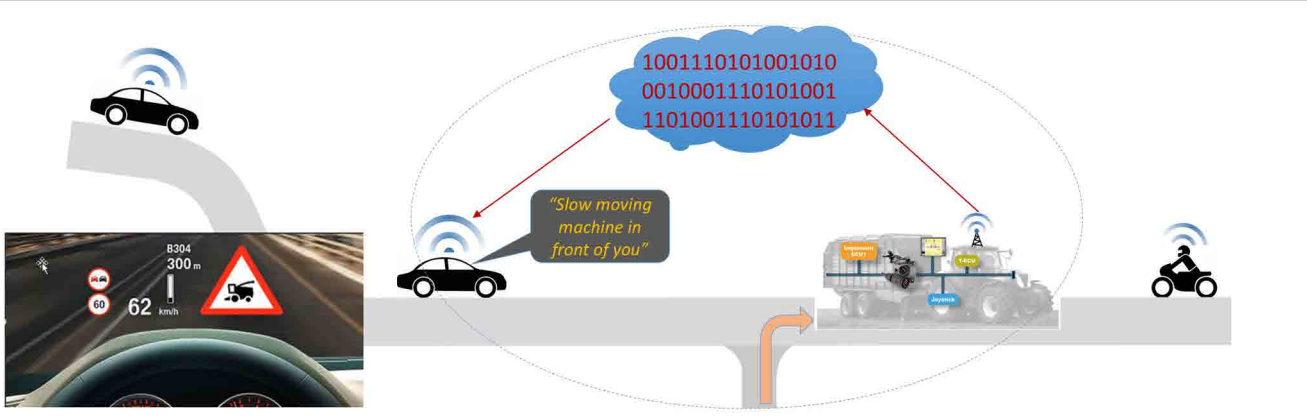
... » software systems proved to be very successful and needs to continue.

AEF intends to develop common guidelines for wireless communication for agricultural equipment. The underlying key scenario includes several use cases for data synchronization and remote control of co-operating machines.

This requires the consideration of cutting-edge industry standards, engineering solutions, as well as research in the field of wireless communications, machine-to-machine communication, industry automation and Internet of Things.

For more information on this project team activities or interest in joining AEF the AEF office office@ aef-online.de will provide all necessary information.

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CAR 2 CAR Weeks
Meeting Schedule in 2020 and 2021

The draft schedule of the CAR 2 CAR Weeks being organised in 2020 was already published in the last issue of CAR 2 CAR Journal. By end of 2019 the hosting of the CAR 2 CAR Weeks in 2020 has been confirmed. In-between ETSI has published its planning of the TC ITS standardisation weeks in 2021. This enabled the C2C-CC to plan ahead its CAR 2 CAR Weeks also for 2021.

According to the current planning two further CAR 2 CAR Weeks will be organised during 2020 as follows:

... »

Save the date

15 to 18 June 2020

10th CAR 2 CAR Week

hosted by Renault SW Labs, Sophia Antipolis, France

Both CAR 2 CAR Weeks will be complemented by GoToMeetings for each of the sessions allowing flexible hybrid organisation of the working meetings of the Technical Organisation as face-to-face meetings on-site and complementing virtual web-meetings. In case the face-to-face meetings cannot be organised due to the Conrona pandemic the CAR 2 CAR Weeks will be organised virtually by web-meetings only.

Save the date

28 Sept. to 1 Oct. 2020

11th CAR 2 CAR Week

hosted by Hessen Mobil, Frankfurt/Main, Germany

Considering the planning of the ETSI TC ITS standardisation weeks in 2021 and further known dates of relevant conferences the CAR 2 CAR Communication Consortium has planned further CAR 2 CAR Weeks as follows:

Save the date

07 to 10 December 2020

12th CAR 2 CAR Week

virtual meetings only

Members of the CAR 2 CAR Communication Consortium are encouraged to offer the hosting for the 13th, 14th and 15th CAR 2 CAR Week in 2021.

In case you are interested in hosting one of the CAR 2 CAR Weeks you should contact the Administrator of the Consortium via E-Mail under: contact@car-2-car.org.

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Save the date

08 to 11 March 2021

13th CAR 2 CAR Week

Save the date

14 to 17 June 2021

14th CAR 2 CAR Week

Save the date

04 to 07 Oct. 2021

15th CAR 2 CAR Week

Imprint

CAR 2 CAR
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