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(General Manager, C2C-CC)

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The ADAC sees C2X as a milestone in road safety, just like ABS and airbags in those days. At last there is the possibility of completely preventing accidents - and not just mitigating their consequences. **... »**

Editorial

by Niels Peter Skov Andersen

General Manager of the CAR 2 CAR Communication Consortium

This year's CAR 2 CAR Forum is approaching after a year that for most people became very different from what they had expected. When we met at the CAR 2 CAR Forum in Turin last year we could celebrate that VW had introduced Car2X communication as standard in the VW Golf 8 the first series vehicle implementing the technology we have been working on in the CAR 2 CAR Communication Consortium, but we had little idea of how COVID-19 would impact us all in 2020. My last travel before Europe was closed down was the CAR 2 CAR week at Burg Warberg in March 2020, if I had not understood COVID-19 has changed the world I realised when I at return picked up my car at the airport parking – and saw it was the only car left at the parking lot.

The COVID-19 situation of course also has impacted the members of the CAR 2 CAR Communication Consortium, many of our members introduced reduced working hours and asked their employees to work from home. This has impacted the resources our members have been able to provide to support work in the consortium, but we have managed to continue our workflow and have so far been able to maintain our work programme with only a few minor delays. This because our members have been committed to support the consortium and that we have been able to shift our meeting activities to virtual meetings. We already were well underway with a very significant use of virtual meetings long before

COVID-19 hit. We were already organising the CAR 2 CAR weeks as hybrid meetings – physical meeting combined with GoToMeeting session for remote participation. This allowed us to maintain the already planned meeting schedule, by keeping the virtual part of the meetings and dropping the physical part of the meeting. This has worked surprisingly well throughout the year, but clearly it does not allow for coffee break discussions.

This year we have also changed the CAR 2 CAR Forum to a virtual event, of course the virtual event does not allow for all the interesting off-line discussions, but we have found it important to share the progress of our work with the full membership and all interested parties.

And there has actually been a lot of progress as we continue towards fulfilling the goals of the consortium.

The CAR 2 CAR Communication Consortium (C2C-CC) aims at assisting towards accident free traffic (vision zero) at the earliest possible date. It further aims at supporting the highest safety level at improved traffic efficiency anywhere, anytime at the lowest cost to the end user and the environment. While working on solutions supporting all driving levels from manual to fully automated it considers specific needs of stakeholders, types of vehicles and users. The C2C-CC contributes to the development and specification of robust and reliable solutions that allow for a continuous and seamless evolution of required ... »

» ... *functionalities. It enables technologies driven by innovation and competition, thereby fostering concepts of cooperation between the road users and with the road infrastructure. This is based on sharing information, awareness, perception and intentions while focusing on tactical level and considering strategic and planning level as required.*

We are progressing well on the services for day two and beyond, and it is important that we keep up the momentum; we are not doing this work for the sake of technology but to spare human life. Therefore, it is important that we keep up the progress and get the improved road safety as quickly as possible, and not let somebody lead us into a situation where they say in a couple years there would be an even better radio technology for short range communication – this might be true engineering progresses constantly, but the technology we have today is adequate to cope with the day 1 and day 2 and beyond services. Thus, it can improve road safety today and we do not have to wait to spare human life until potential future technologies have been studied.

It is also important to stress that we in the CAR 2 CAR Communication Consortium are not working in a vacuum. We are closely working together with the other relevant actors in the field of C-ITS and CCAM (Cooperative, Connected Automated Mobility). We have been and are involved in the EU CCAM platform. We have strengthened our cooperation with the road operators in the European C-Roads projects, the latter through our regular (virtual) meetings with the C-Roads partners. These are held to coordinate, discuss and align our understanding, of how to fill in the information in the messages to be exchanged in the C-ITS and how to interpret it. This work has shown to be very important in order to ensure a consistent provision of information both from the different actors – this work clearly has proven the old saying the devil is in the detail. Originally some major C-Roads demonstration and test events had been planned for this autumn, but due to the COVID-19 situation the programme have been drastically reduced, however members of the consortium have a few weeks ago participated in a successful test event organised by C-Roads partners.

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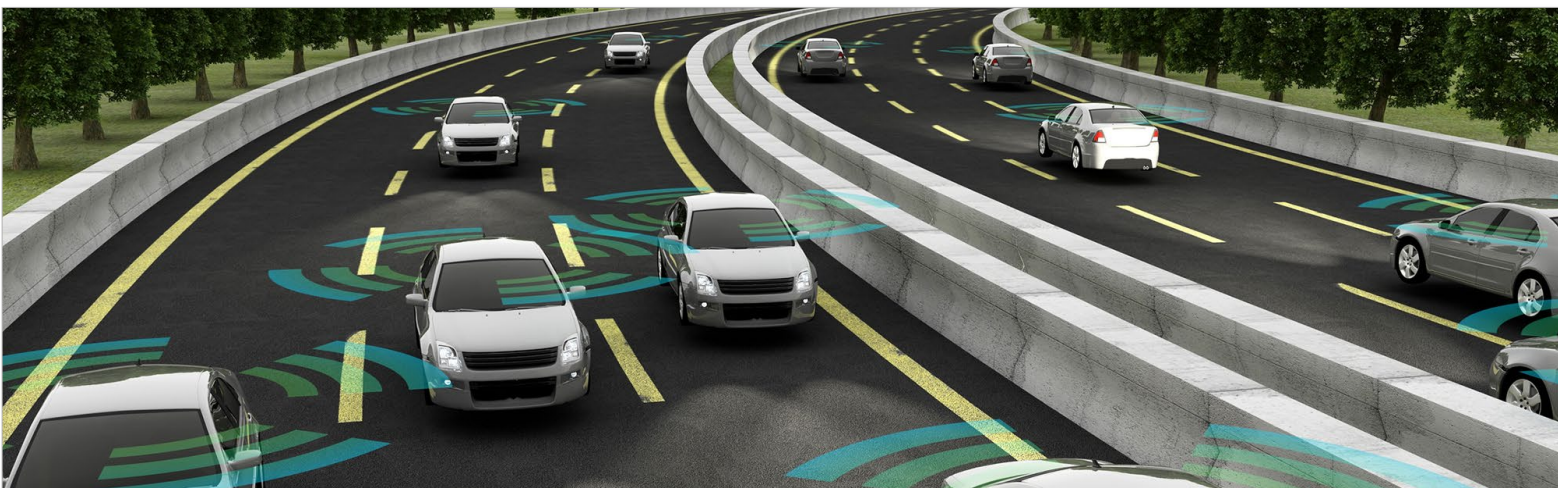
New CAR 2 CAR Members

Universidad Miguel Hernández de Elche (UMH)

Type of Member:
Development Member

Type of Business:
The Universidad Miguel Hernández de Elche (UMH) is a public Spanish University with a focus on Engineering, Health sciences and Biotechnology. The UWICORE (Ubiquitous Wireless Communications Research) laboratory is part of UMH's Department of Communications Engineering, and is dedicated to research on wireless and mobile communications and networking applied to connected and automated driving and Industry 4.0. The laboratory works on the design of communications and networking protocols, resource management and medium access control, system design and optimization, and experimental research (including hardware and software prototyping). Related to V2X networks, the laboratory has significant experience on the design, understanding and optimization of IEEE 802.11p, LTE-V2X, 5G NR V2X and mmWave V2X. The laboratory also actively contributes to the design of cooperative perception and cooperative driving/maneuvring services for Connected and Automated Driving. The laboratory closely works with industry and actively participates in European projects and initiatives. UWICORE is a member of ETSI and contributes to the activities of ETSI's Technical Committee on ITS. The laboratory is currently a member of ETSI's STF group on multi-channel operation.

https://www.umh.es/

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Why Seamless Evolution Makes the Difference
by Dr. Karl-Oskar Proskawetz

Administrator of the CAR 2 CAR Communication Consortium

Improving road safety and traffic efficiency by cooperation between all road participants and with infrastructure requires safety-related functionalities. These functionalities must be of high reliability and quality. Both aspects build on connectionless ad-hoc mobile short-range V2X communication called ITS G5 in Europe. With respect to multi-brand and cross border operation, considering different cycles, interoperability and backwards compatibility is of paramount importance for safeguarding cooperative V2X operation and investments. **... »**

» ...   In 2002 the CAR 2 CAR Communication Consortium was established to assist improving road safety and traffic efficiency and supporting automation on the roads by designing and developing the new approach of a cooperative system. Preventing accidents requires tactical countermeasures during the last couple of seconds before a critical situation or even a potential crash might occur. As a consequence, data exchange between vehicles in their local vicinities is required. The cooperative V2X system design results in a connectionless ad-hoc mobile short-range V2X communication (ITS G5) network approach. This involves multiple stakeholders in the European / international automotive domain. Also the involvement of the interest groups from the European road infrastructure domain is required and further stakeholders are to be considered.

With regard to vehicle brands, locations of the road network and the timing of the cooperative V2X provision for one of the successive innovation phases, the implementation of cooperative functions and technologies in new vehicles and road infrastructure cannot be strictly synchronized.
The useful life of most of the vehicles in Europe varies between some years up to 15 years and a multiplicity of old-timers is being operated in road traffic even longer than 20 years. Looking to the European road infrastructure the lifecycles usually exceed even 30 years. The existing cooperative V2X-enabled mobile network of in vicinity speaking vehicles and road infrastructure, which will continue to grow over the years, will remain fully functional as long as each new cooperative vehicle is interoperable with the existing cooperative V2X fleet. As a re-

sult of these existing different life cycles of cooperative V2X implementations, the CAR 2 CAR Communication Consortium demands the principle of interoperability and backwards compatibility for all elements, functions and technologies of the cooperative V2X system from the beginning. This will ensure that the cooperative communication network can grow and remain fully functional. Any further evolution or new technology shall not jeopardise functionality and performance of realised implementations in the market.

Does this basic principle of seamless evolution hinder disruptive innovations in the road transport domain? The experiences of latest developments show that the design of new technologies, functions and message sets granting evolution becomes harder but can be solved. A prominent example at present is the standardisation of the new NGV (Next Generation V2X) radio at IEEE. The NGV standard (called IEEE 802.11bd) is being specified to be fully interoperable with current ITS G5 standard while flexibly offering powerful new features. NGV radio access technologies are co-channel interoperable, backwards compatible, co-channel coexisting and ensure fair co-channel access with ITS G5. The seamless evolution of the NGV radio enables efficient, best use of the allocated ITS spectrum, avoiding expensive redundant radio technologies or retransmissions of "translated" messages in parallel channels. The more powerful transmission features are automatically used when no older radio system is detected in the vicinity. When comparing the seamless evolution of the automotive ITS G5 with the incompatible – neither co-channel interoperable, nor co-channel   ... »

»... coexistent and not backward compatible – PC5 side links of LTE-V2X (Rel. 14&15) and NR-V2X (Rel. 16&17) resulting consequences become evident.

The seamless evolution of the ITS G5 system safeguards lives and investments from the beginning and in future without any drawbacks. The ITS G5 system forms the reliable basis for many disruptive developments in mobility. The change from today's individual driving to assisted and cooperatively supported driving up to cooperative fully automatic driving in the future is promoted by the system. By its very nature, it protects vulnerable road users and other road users, because cooperative safety measures are already integrated.

Looking to the pan-European 112-eCall system consequences of incompatible innovations can be adumbrated. Since 2018 the implementation of the 112-eCall system is compulsory for all new passenger cars in Europe. The 112-eCall can be crucial in serious traffic accidents to ensure that rescue services are on the scene in time. It ensures much faster medical care for accident victims - and thus saves lives. Once most cars are equipped with it, the EU expects 2,500 fewer road deaths per year. The 112-eCall system re-

quires a data transmission using an in-band modem which works only for 2G systems, no migration is in place for 4G and 5G. When buying a new passenger car these days you would expect that the 112-eCall will be your guardian angel during the lifetime of your car. However, the mobile network operators already have announced to intend to switch-off their older 2G and 3G communication networks starting next year in 2021. This would result in a disaster as the whole vehicle fleet in the field and in production would lose its 112-eCall safety of life functionality.

In 2020 the new VW Golf 8 received the EURO NCAP Advanced Reward for the first European C-ITS implementation with standard cooperative local hazard warning. In 20 years, the organisation of traffic on European roads may have changed completely. But we assume that the drivers of VW Golf 8 classic cars will still be able to benefit from the cooperative local hazard warning services implemented today and that future cooperative automated vehicles will benefit from the CAM and DENM messages of the VW Golf 8.

The principle of seamless evolution of safety-related systems makes the difference.

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Updated C2C-CC Website and New Categories

by Dr. Karl-Oskar Proskawetz

Administrator of the CAR 2 CAR Communication Consortium

Early in 2020 the CAR 2 CAR Communication Consortium updated its website appearance. The new website focuses more strongly on the purpose and objectives of the consortium since its foundation in 2002: Accident-free traffic as soon as possible (Vision Zero). Furthermore, the concept, power and implied requirements of cooperative intelligent transport systems and services (C-ITS) were described in more detail. New categories like FAQs and Glossary complement the new outline. Of course, the released work results are published on the "Documents" pages as before.

In the past, the CAR 2 CAR Communication Consortium received many questions from students, but also from external experts, about C-ITS as an additional powerful sensor that complements radar, camera and other vehicle sensors. The Car 2 Car website is therefore intended to help to better understand the needs, idea, concept, basic principles, key requirements and performance of C-ITS. Our goal is to explain why C-ITS contributes to accident prevention and how it can improve traffic flow and capacity. Further questions included topics like the usage of short-range and long-range communication, security and privacy, functionalities, technologies, interoperability considering lifecycles, deployment and further development up to support disruptive innovations.

New sublinks under *"About C-ITS"*
The updated website aims to answer most of the questions above. Therefore we also established the new subcategory *"C-ITS FAQs"*, to answer all the frequently asked questions about C-ITS. This also allows to take up newly raised questions and make the associated answers publicly accessible.

Furthermore, we recognised that frequently used abbreviations in the C-ITS domain might lead to confusion as very often their definition or meaning is not clearly specified or described. To solve this problem, the C2C-CC established the new sub-category *"C-ITS Glossary"*. The glossary allows us to give definitions and background information on abbreviations used in the C-ITS domain.

Finally, we added a link to "Google Scholar" which can be found under *"C-ITS Papers"*. This offers website users the opportunity to easily find scientific papers, e.g. related to the IEEE ad-hoc WLAN radio standards.

The new categories are expected to complement very well the information already published and shared by the CAR 2 CAR Communication Consortium in its published position papers, white papers and basic system profile documents.

Have a look at the C2C-CC website: *www.car-2-car.org.* //

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CAR 2 CAR Forum 2020

by Dr. Karl-Oskar Proskawetz

Administrator of the CAR 2 CAR Communication Consortium

Since 2007, the CAR 2 CAR Communication Consortium has organised the annual CAR 2 CAR Forum. This event offers space for discussions about the current state of the art, the challenges to be overcome, the deployment, and the latest developments. Furthermore, this event also promotes networking between members and external experts. Due to the Corona (COVID-19) pandemic this year´s CAR 2 CAR Forum 2020 will be organised as web-based conference for the first time. All interested experts are invited to participate free of charge.

The this year´s CAR 2 CAR Forum will be organised during the period from 3 to 12 November 2020. As usual, the first day will focus more on strategic, policy and framework issues, while in the other sessions the technical organisation of the CAR 2 CAR Communication Consortium (C2C-CC) will report on and discuss selected topics. Participation in the web-conferences of the CAR 2 CAR Forum 2020 is open to all interested experts free of charge. However, advance registration for meetings of interest is required.

In the morning session on 3 November speakers report about C-ITS initial deployment & road operators´ view. This will be followed by the afternoon session, which will focus on the next steps towards cooperative automated driving.

The technical organisation organises four web-sessions in the morning on 4 & 5 and on 11 & 12 November 2020.

CAR 2 CAR Forum 2020

Save the Date
3 to 4 November 2020

1. The first web session on November 4 focuses on functional topics such as road maps, motorcycles / VRUs, collective perception, safety at intersections and cooperative automated driving.

2. The second web session on 5 November will deal with technical aspects for the time after day 1+. These include frequency issues, the development of new radios, multi-channel operation, functional safety and compliance with position and time specifications.

3. The third web session on 11 November will focus on the topic of security. Here, the development and certification of protection profiles as well as alternative certification schemes, the detection of misbehaviour and the next challenges for C-ITS will be discussed.

4. The fourth and final web session on November 12th will focus on the ongoing Day 1 deployment. During this session, release management and technical cooperation with C-roads will be discussed, as well as testing, e.g. cross-border testing, and operational issues, such as the follow-up of existing deployments.

»… After the CAR 2 CAR Forum 2020 all presentations released by the speakers will be offered to the registered participants for download.

The detailed programme information of the CAR 2 CAR Forum 2020 and the links for online registration are published on the C2C-CC Events website under:

https://www.car-2-car.org/news-events/car-2-car-events/.

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10th CAR 2 CAR Week

by Dr. Karl-Oskar Proskawetz

Administrator of the CAR 2 CAR Communication Consortium

The organisation of the 10th CAR 2 CAR Week was planned at Renault in Sophia-Antipolis. Due to the Corona (COVID-19) pandemic the 10th CAR 2 CAR Week from 15 to 18 June 2020 has been completely organised virtually using GoToMeetings. The Technical Organisation could make good progress even social contacts and side talks suffered.

During the first two days of the 10th CAR 2 CAR Week the Opening Plenary was followed by three parallel tracks covering 17 sessions of the Competence Groups and Taskforces. These sessions addressed

- Security,
- Position and Timing,
- Guidance for Next Phases,
- New Applications,
- IVI Requirements,
- Collective Perception,
- Multi-Channel Usage,
- Functional Safety,
- Automation,
- Spectrum Issues,
- Requirements for Harmonisation and Operations.

The results of these meetings were presented on Wednesday to the three working groups "Deployment", "Technology" and "Functional".

During the final plenary session on Thursday morning, the implementation of two new work items on weather forecast and dissector files and some further updates of the work plan were agreed.

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11th CAR 2 CAR Week

by Dr. Karl-Oskar Proskawetz

Administrator of the CAR 2 CAR Communication Consortium

Due to the Corona (COVID-19) pandemic also the 11th CAR 2 CAR Week from 28 September to 1 October 2020 has been completely organised virtually only using GoToMeetings. Originally the 11th CAR 2 CAR Week was planned as a face-to-face event at Hessen Mobil in Frankfurt / Main.

During the first two days of the 11th CAR 2 CAR Week the Opening Plenary was followed by three parallel tracks covering 17 sessions of the Competence Groups and Taskforces.

These sessions addressed among others

- Automotive Requirements on IVIM,
- Multi-Channel Operation,
- Agricultural Use Cases,
- Security,
- Position and Timing,
- Mapping of TPEG2-TEC to DENM,
- Vulnerable Road Users,
- Extended Weather Information,
- Guidance for Next Roadmap Phases,
- Collective Perception,
- Traffic Jam Detailing,
- Spectrum Issues,
- Requirements for Harmonisation and Operations.

Furthermore, Hessen Mobil used the opportunity to report on the ongoing C-ITS deployment in the European C-ITS corridor from Rotterdam to Vienna.

On Wednesday, the task forces and competence groups reported on their results to the three working groups "Deployment", "Technology" and "Functional".

During the final plenary session on Thursday morning, new work items on post-quantum cryptography, vulnerable road users - VRU 2.0 and some other updates of the work plan were agreed.

As usual, the next and last CAR 2 CAR week this year is planned as a virtual event for the period from December 7 to 10, 2020.
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Competence Group Powered Two Wheeler (PTW)

by Hennes Fischer

Yamaha Motor Europe N.V.

Updated requirements in Day 1 applications

Since Triggering Conditions for several Day 1 use cases differ between Powered Two Wheelers and cars, the Competence Group PTW has worked on these modified requirements and they are now part of BSP1.4. and later versions.

However, motorcycle safety will mostly benefit from Day 2 applications. In particular, the applications grouped under Motorcycle Approach Information (MAI) and Motorcycle Approach Warning (MAW) address most accidents, where the other vehicle driver fails to recognize an approaching motorcycle. These accidents, in case of European roads, amount to around two third of collisions with motorcycles involved.

MoU with CMC had results

After a MoU was signed between C2C-CC and CMC (Connected Motorcycle Consortium), the motorcycle group enjoyed the support of CMC's PTW experts on relevant PTW Work Items.

This accelerated the work of the Competence Group PTW and the description of MAI/MAW use cases (WI F0008) will be completed until end of 2020.

The remaining work Items, CAM/DENM messages for PTW (F0005), GNSS positioning for PTW (F0007) have progressed, and results will be presented in Q4/2020 as well.

C2C-CC BSP is aligned PTW (CMC) Basic Specification

The initiative of the Competence Group PTW lead to the inclusion of the public version of C2C-CC BSP into a dedicated Basic Specification for PTWs, which will be issued by CMC at the end of 2020. The work results described in this Basic Specification will also fuel the future work of the CG PTW in C2C-CC in a mutual way.

... »

In critical situations a motorcycle Icon is shown to car drivers

A slow moving tractor turn into a field and the motorcycle rider decided to overtake the van is a potential critical situation

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» ...

Receiver expectation to be discussed further

The definition of day 2 use cases and their standardisation still requires a cooperation in C2C-CC with all relevant experts and vehicle makers. Because of their different vehicle construction and dynamics, messages from PTWs may need extension of CAM and mutual understanding and agreement of confidence level of these messages need to be discussed between the stakeholders.

Examples relate to path prediction, needed to determine the likelihood of a collision. For motorcycles, yaw rate for example is a critical value due to their particular vehicle dynamics.

RWW often on country roads behind corners, where the motorcycle rider has limited view

Therefore, the CG PTW would support an initiative in C2C to also discuss 'receiver expectations' regarding messages from motorcycles.

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PICTURE CREDITS: CMC

Explore the potentials of the advanced Digital Testbed Dresden

by Dr. Birgit Jaekel, Sebastian Pape, Luise Fitzthum | *TU Dresden,*

Dr. Thomas Otto | *Fraunhofer IVI ,*

Dr. Christian Andrä, Marcel Kolling | *Sächsische Energieagentur – SAENA GmbH*

INTRODUCTION

By integrating and using cooperative intelligent transport systems and services, future traffic is getting smarter, more efficient and safer than today. The success of automated and connected driving in urban areas requires not only simulations and test drives on closed test sites but also enormous testing effort under real traffic conditions. Supported by the Saxon initiative "Synchronized Mobility 2023", activities of setting up a pilot system for connected and automated driving in Dresden started in 2015. In addition to the excellent Saxon landscape of R&D institutions, SMEs and administrative authorities supporting these activities, the testbed offers optimal conditions for developing, testing, and demonstrating ITS applications and services in real traffic situations already today. Since 2016, the city has been designating as Digital Testbed for connected and automated driving by the German Federal Ministry of Transport and Digital Infrastructure (BMVI). Since 2019 the Digital Testbed belongs to one of the three German and 43 European C-ITS Pilot cites of C-ROADS – Urban Nodes[1].

... »

1 C-ROADS – Urban Nodes is an initiative for Connecting Europe Facilities co-financed by the European Union.

» ... What has been done and where the testbed is heading towards will get pointed out in the following examples explaining the applied infrastructure elements, the seamlessly integrated traffic management system, and R&D activities.

FEATURES & ACTIVITIES

Along highly trafficked urban and suburban roads, including main roads with connecting functions and access roads, Dresden runs a network of C-ITS corridors with a length of approximately 20 kilometres per driving direction (see the following map). A further C-ITS corridor on rural roads (B170) of about five kilometres per driving direction and connected with the urban corridors is being currently deployed. The testbed Dresden is characterised through a coherent network of corridors that are merging into each other. This enables a variety of test scenarios in a spatially concentrated way. The corridors located at the city centre providing interactions with other road users including pedestrians and cyclist as well as intersections with trams. Close attention is therefore paid to pedestrian crossings and cyclist paths. Also, special road infrastructure such as tunnels and crossings sections are available on the test corridors. Furthermore, some corridors are supported by high-precision and high-resolution logical map descriptions in the open ASAM standard Open-DRIVE.

Features of Dresden's C-ITS corridors:

- **Corridor Airport:** urban and suburban road, approx. 6 km, 50 to 70 km/h, two lanes, divided roadways, separate cyclists' lanes, connected to the highway

- **Corridor City South:** urban road, approx. 8 km, 50 km/h, two lanes, partly divid-ed road-ways, separate cyclists' lanes, incl. more complex junctions, tram line, tram tracks and crossings

- **Corridor City VW:** urban road, approx. 8 km, 50 km/h, one or two lanes, partly divided road-ways, complex junctions, bus lanes, tram tracks and crossings

- **Corridor City Friedrichstadt:** urban road, approx. 2 km, 50 km/h, one or two lanes, partly divided roadways, complex junctions, bus lanes, tram tracks and crossings

- **Corridor B170:** rural road, approx. 5 km, 50 km/h to 70 km/h, two lanes, divided roadways, separate cyclists' lanes, connected to the highway, hilly profile
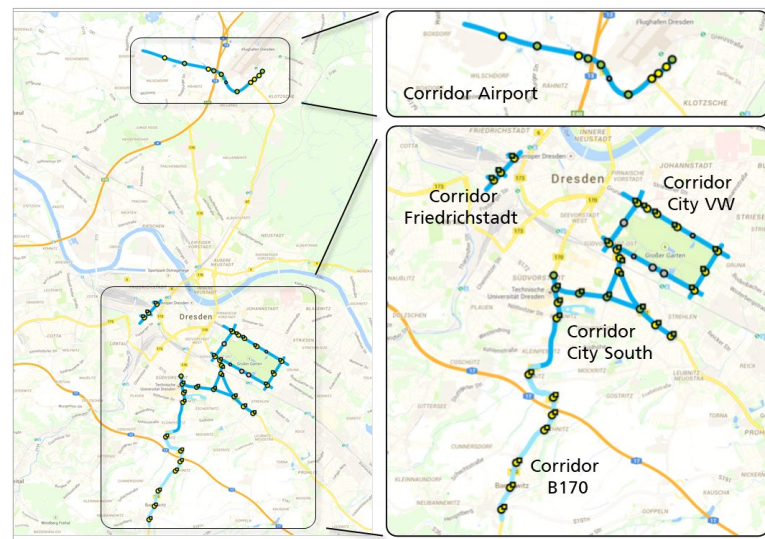
C-ITS corridors incl. locations of RSUs of the Digital Testbed Dresden (map background source: google.maps.com)

Within the C-ITS corridors, traffic lights amongst others are equipped with Road Side Units (RSU) allowing vehicle-to-infrastructure communication (V2I). As a special feature of the testbed in Dresden, the C-ITS corridors **... »**

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» ... are equipped with RSUs for productive purposes operated by the City of Dresden as well as smart RSUs operated by Fraunhofer Institute for Transportation and Infrastructure Systems (Fraunhofer IVI). Productive and smart RSUs are distinguished by their number of message types. In 2020 approx. 25 productive RSUs are installed across the city area and able to send and receive ETSI compliant CAM, SPATEM and MAPEM messages, e.g. for C-ITS service GLOSA and PVD. In addition, another approx. 15 smart RSUs are part of the C-ITS corridors located in parallel to the existing traffic light of productive RSUs. By those smart RSUs new messages and services going beyond the state of the art can be developed and validated for test and research purposes. Currently, the smart RSUs in Dresden can provide the message types DEMN, CPM, IVIEM, SREM, SSEM, RTCEM, MRM, MCM as well as the C-ITS services of PVD, GLOSA, TSP (and from 2021 on VRU and EVA) according to the ETSI standards and drafts. The central part for connected and automated driving in Dresden is the performant C-ITS backend REMAS for the operation of the testbed, including monitoring and the management of various C-ITS resources, such as RSU, vehicles, and C-ITS services. REMAS is developed and operated by Fraunhofer IVI. Dresden's C-ITS corridors are constantly under development in terms of ensuring the current PKI-security level as well as being per-manently updated on current protocol and security versions.

The C-ITS infrastructure in Dresden allows the city to positively influence traffic by creating more continuity in the traffic flow. Using the new message types and C-ITS services pro-

vided by the smart RSUs the basis for increasing traffic safety is paved. One central element for calculating global optimisation strategies for the traffic flow is Dresden's traffic control centre VAMOS. It represents the core component of a fully automated and modularly designed operative traffic management system. VAMOS was developed and hosted at the Chair of Traffic Control and Process Automation of TU Dresden. For several years now, VAMOS services influence and improve the traffic quality on Dresden's roads. Information about the current traffic situation is obtained through a variety of traffic detectors. Additionally, dynamic traffic information based on Floating Car Data is gathered. The measured data is transmitted directly to the VAMOS data centre where it gets processed, evaluated and archived. Following a complex data analysis, the current as well as a forecast traffic situation are determined. Accordingly, a permanent observation of the detector values is mandatory to select the optimal management strategy. The range of fully automated measures reaches from simple traffic congestion information to an even more comprehensive set of measures including dynamic traffic signs, coordinated traffic light controllers and the accompanying information output. Thereby, the interests of any user are considered (private and public transport, bicycle, and pedestrians). More innovative solutions to optimise traffic flow are being under development constantly.

In the context of Saxon initiative "Synchronized Mobility 2023" VAMOS and REMAS were integrated into different C-ITS R&D projects like SYNCAR[2], HarmonizeDD[3] and REMAS[4].   **... »**

» ... This mainly involved connecting the traffic management centre via various interfaces to a mobile cloud and the REMAS C-ITS backend. Via these interfaces, VAMOS and REMAS supplied the C-ITS corridors with traffic data such as traffic quality (level of service) and travel times. VAMOS has been used for modelling and microscopic simulation of selected nodes along the test tracks. Furthermore, the traffic light prediction for GLOSA applications was created by VAMOS. For this purpose, the current and historical switching information of the traffic lights was used.

The Digital Testbed Dresden offers in addition to the former the platform for several R&D projects: As one of the pilots of C-ROADS Germany – Urban Nodes Dresden serves as a testbed for the ongoing roll-out of the Day-1 Services of PVD, GLOSA, TSP, EVA as well as the further development of the Day-1.5 Service of VRU. The C-ROADS C-ITS pilot is being coordinated by the Fraunhofer IVI. Further projects such as IVS-LOK and Rad im Fokus[5], both running within the Saxon initiative "Synchronized Mobility 2023", are utilising the testbed for their activities as well. IVS-LOK[5] focuses on the lane specific localisation for Intelligent Transport Systems, Rad im Fokus develops a warning and support system for cyclists across all modes of transport that operates with the information provided by connected and automated vehicles.

OUTLOOK & TESTING OPPORTUNITIES

The Digital Testbed Dresden is an integral part of future C-ITS development. It will be employed to serve further research activities carried out through TU Dresden, Fraunhofer IVI, and others. Results of these activities will be transferred to 24/7 operation, used as blueprints for other cities or regions, being used within other R&D projects and contribute to standardisation processes. Hybrid communication yielded not only to cover urban scenarios but also suburban and rural roads. In that context, a seamless interconnection and interoperability of any urban and rural C-ITS data source/sink are being targeted.

To share the existing potential of the testbed in Dresden as well as to further define the requirements for connected and automated driving in urban and rural areas, carmaker, automotive suppliers, and R&D institutions are welcome to join the Digital Testbed Dresden. The Sächsische Energieagentur – SAENA GmbH as independent competence centre of the Free State of Saxony regarding energy-related topics, including increasing efficiency in mobility, acts as organisational coordinator of the C-ITS activities in Saxony. Due to that role, SAENA is providing the single point of contact for all kinds of request may it be testing intents or information provision.

Further information and a contact form is available under:
https://www.effiziente-mobilitaet-sachsen.de/koordination-ivs-test-feldaktivitaeten-in-sachsen.html

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5 Funded by the European Regional Development Fund (ERDF) and the Free State of Saxony.

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C2X is a milestone — ADAC conducted its own tests early on

Guest article by Dr. Reinhard Kolke

Head of ADAC Technical Center

The ADAC sees C2X as a milestone in road safety, just like ABS and airbags in those days. At last there is the possibility of completely preventing accidents - and not just mitigating their consequences. This is why the ADAC published the results of extensive tests with the Volkswagen Golf 8 as early as the beginning of 2020 (*www.adac.de/c2x*). It is the first car to have C2X on board as standard and the C2X does not cause any follow-up costs.

Test scenario: The car with a breakdown warns the following traffic. ADAC C2X Tests with VW Golf 8

ADAC C2X Tests with VW Golf 8

This already leads us to the demands that we, as consumer protectors, place on C2X:

1. Cars of all manufacturers must quickly speak the same C2X language. Only then can C2X develop its full effect.

2. C2X warnings must reach other road users quickly. An ADAC manufacturer survey conducted in June 2020 showed, that forwarding can take up to two minutes for some models (*www.adac.de/c2x/Download-PDF*). That is far too long in a dangerous situation! Just think: During this time, a car can cover a distance of four kilometers at 120 km/h, so that numerous cars have already crashed into the end of a traffic jam in the fog before they were warned. Some manufacturers manage to transmit a warning within 0.1 seconds. In principle, the ADAC is technology-neutral, but in our opinion it makes little sense to wait for new technologies like 5G, because they still have to prove in practice what they can do with C2X. Especially since demonstrably powerful technologies are available. And we shouldn't always refer to China, where the construction of a high-speed radio network along the highways, planned for 2021, has been postponed indefinitely.

3. C2X should be free of charge in all new cars and in every equipment variant. Security should not depend on purchasing power. After all, an inexpensive car can also be life-saving for the owner of a luxury car - if it sends a danger warning via C2X.

... »

» ...

4. No subscription or follow-up costs for C2X! If after one or three years of use the system suddenly costs money (as is the case with some manufacturers today), the system will quickly be forgotten and switched off. With corresponding negative effects on traffic safety. Just imagine an airbag or ABS would switch off after a certain amount of time.

We at the ADAC Technical Center see the great chance that some accidents will not have to happen at all - and we are looking forward to it. Until then, we are working with full passion and commitment to make this a reality for the benefit of consumers.

ADAC C2X Tests with VW Golf 8

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Ipswich Connected Vehicle Pilot

by Max Z Jamwal-Girdler

Cooperative and Automated Vehicle Initiative (CAVI)

Australian drivers are jumping at the chance to take part in the country's largest connected vehicle trial in the City of Ipswich (Queensland, Australia) confirming their curiosity about future vehicle technologies.

The Ipswich Connected Vehicle Pilot (ICVP) is one of several pilots being delivered by the Queensland Department of Transport and Main Roads' (TMR) Cooperative and Automated Vehicle Initiative (CAVI).

CAVI is preparing Queensland for the arrival of new vehicle technologies, examining safety benefits, user perceptions and infrastructure needs.

Up to 500 drivers will take part in the pilot with participants' cars temporarily fitted with a dashboard-mounted screen, an external antenna, and a Vehicle Intelligent Transport Systems Station (V-ITS-S) under the seat.

Transport and Main Roads Director-General Neil Scales said drivers participating in the nine-month trial would receive advisory warnings when their behaviour was becoming unsafe.

"This pilot focuses on infrastructure-to-vehicle communications, giving drivers warnings of hazards when their speed is too fast **...** »

» ... approaching red lights, back-of-queue on a motorway, a broken-down vehicle or a traffic light crossing when pedestrians are present," Mr Scales said.

"This new technology will help people to drive safely and potentially reduce road trauma.

"The driver will still be in control of the vehicle, as there is no vehicle automation."

The connected vehicle pilot is a hybrid communications cooperative intelligent transport system (C-ITS) built in accordance with the emerging European C-ITS standards.

Unlike other parts of the world, C-ITS is not yet available in vehicles in Australia and the ICVP is the first large-scale, on-road Australian pilot.

The pilot will run with two participant groups - a control group and a treatment group.

The treatment group will measure changes in driver behaviour from a baseline period without C-ITS warnings to a treatment period where C-ITS warnings are presented.

The control group will never receive C-ITS warnings to ensure any changes in behaviour are due to the C-ITS, rather than other unrelated or confounding factors.

The pilot includes six infrastructure-to-vehicle safety-use cases.

- In-Vehicle Speed (IVS),
- Advanced Red-Light Warning (ARLW)
- Turning Warning for Vulnerable Road Users (TWVRU) which uses the local traffic light information.
- Road Work Warning (RWW)
- Roadside Hazard Warning (RHW)

- Back of Queue (BoQ)

Within the pilot area there are 29 Roadside Intelligent Transport Systems Stations (R-ITS-S) located at traffic lights.

The R-ITS-S broadcasts signed signal phasing and timing (SPaT) messages and the intersection map (MAP) to Vehicle Intelligent Transport Systems Stations (V-ITS-S) over 5.9GHz.

The V-ITS-S use the vehicle's continuous awareness message (CAM) to determine the relevant infrastructure messages, and provide visual or auditory warnings to the driver on a temporary pilot display mounted on the vehicle's dash.

The C-ITS Station provides this data as signed, decentralised environment notification messages (DENM) and in-vehicle information messages (IVIM) via a cloud-based broker.

The V-ITS-S subscribe to the relevant geographic tiles on the broker to access this data.

The various stations request certificates via cellular communications from the pilot Security Credential Management System (SCMS) that are used to sign the C-ITS messages.

Data sent and received by the stations is sent back to the cloud.

This data will be used to assess the health of the systems and evaluate the safety impacts.

The pilot is supported by the Motor Accident Insurance Commission, iMOVE Australia,Telstra, Queensland University of Technology's (QUT) Centre for Accident Research and Road Safety, Ipswich City Council and the federal Department of Infrastructure, Transport,   **... »**

» **...** Regional Development and Communications.

The ICVP is due to conclude in 2021. For more information visit:

www.qld.gov.au/cavi

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The Global Cyber Security Ecosystem and its importance in standardisation

by Attila Rozgonyi

Microsec

If vehicle-to-everything communication is the topic, the discussion usually revolves around the actual implementations and mechanisms powering them, but there is significantly less talk about their security aspects and even less about the standardisation of those.

It can be stated, that without the appropriate security measures, V2X communication would do more harm than good – for example, if it used no short-term certificates (eg. Pseudonymous Authorization Certificates in the European, and OBE Pseudonym Certificates in the American ecosystem) the vehicle could be easily traced and tracked by malicious actors. The interoperability of said security mechanisms is very crucial as well and the easiest way to ensure that is with establishing proper industrial standards and specifications.

Standardisation work can be very hard to keep track on and the cause of this is mainly that newcomers can get confused about what to follow at all. That is indeed not as easy as it sounds, because even for a not-so-wide subject as V2X security, there are at least a dozen organisations that contribute. Luckily, standards often reference each other and organisations creating them often rely on each other's work. Regarding European cybersecurity, this is well presented by the ETSI TC CYBER's comprehensive **... »**
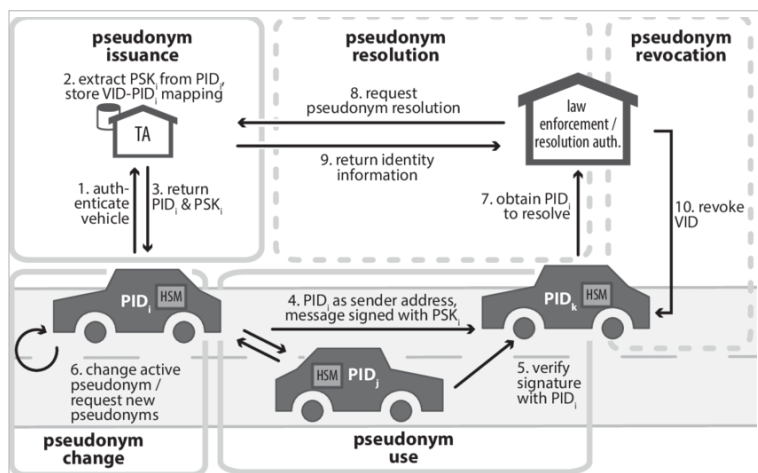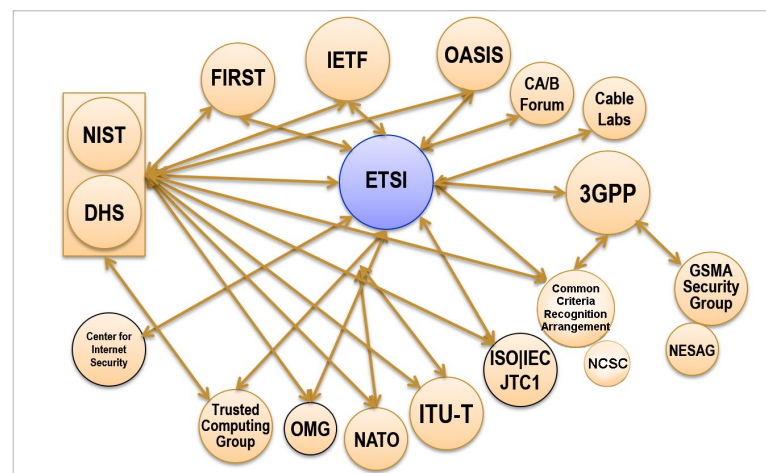

Figure 1: Pseudonymous certificates' lifecycle

Figure 2: Relationshipship system of the ETSI standardization work

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» ... document, called the Global Security Ecosystem.

This document was formerly a Technical Report (TR) with the ETSI document number of 103 306. Since then, it has become a Wiki page with the same structure, so it is more convenient to update and follow. As of the time of this article's publication, it is located at *this URL*.

The Wiki provides an overview of the global aspects of cyber security work. This is very important because cyber security has a lot of different fields with different related institutes and organisations even disregarding standardisation. The document for example lists reference libraries, Cyber Security Centres of Excellence, IT developer forums and even major hacker events, such as DEF CON.

From a standardisation view, this can be a very good starting point for collecting potential reference material, helpful information or even possible collaborators. For ETSI members it can be also helpful to understand the Institute's extensive network of contacts and related organisations.

So, for those who work in a security-related field, it is already implied how this Wiki can be used, but from a CAR 2 CAR viewpoint it is as well interesting because the list is always expanding and the last entry was just an automotive association active in the V2X field. This suggests that in the near future it could focus more on vehicles' communication and the related organisations, abbreviations etc. Summarised, it is very possible that the document could help standardisation experts working on intelligent transport systems, and adding the related associations to the list could even raise more awareness to this field of cyber security, thus moving forward the related work processes.

References and further reading:
- *Jonathan PETIT, Florian SCHAUB, Michael FEIRI, Frank KARGL: Pseudonym Schemes in Vehicular Networks: A Survey*
- *ETSI TR 103 306 V1.4.1 (2020-03); CYBER; Global Cyber Security Ecosystem*
- *ETSI CYBER Global Cyber Security Ecosystem Wiki*

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C-ITS roadside units in the TENtec interactive map

by Alexander Hausmann

AustriaTech

The location of operative roadside C-ITS stations all over Europe is now available in the interactive map viewer operated by the European Commission. This marks an important milestone for improving the public perception and visibility of C-ITS services in the course of the ongoing transition from roll-out to live operation of cooperative services. The large number of operative roadside stations and their broad distribution is yet another proof of success of the harmonised approach pursued by the C-Roads Platform and all its pilot sites.
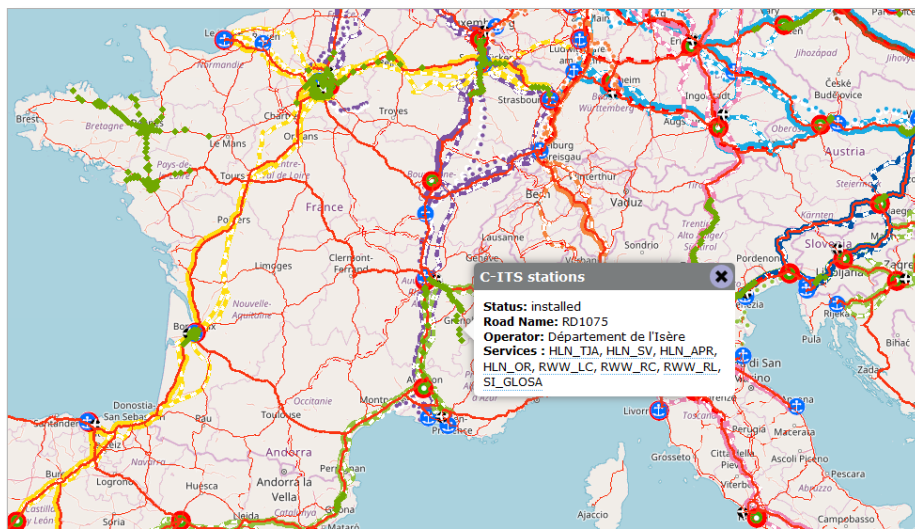
Cooperative services via ITS-G5 short range communication are existing and operational on European roads. The interactive map viewer shows all existing and operational infrastructure, which has already been installed in the field and which is compliant with the C-Roads specifications. In detail, the map provides information on status, the road name, the road operator and C-ITS services covered. The displayed C-ITS stations are based on the information provided by the respective road operator via the members of the C-Roads Platform and will be updated on a quarterly basis. The location of the C-ITS stations as well as their development, operation and maintenance, is under responsibility of the single road operator.

The comprehensive availability of C-ITS stations underlines the importance and practical relevance of the short-range ITS G5 approach as counterpart to long-range cellular communication in the scope of a hybrid communication approach as given by the harmonised communication profile of C-Roads. It is evident that C-ITS has successfully started to manifest in daily driving and is on the verge of bearing fruit with regards to a European harmonised approach for more road safety and efficiency.

Explore the map here: *https://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/map/maps.html* (Layers ➔ C-ITS stations)

Request the harmonised communication profile here:

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Long-term Planning of the next CAR 2 CAR Weeks in 2020/2021

In principle, the dates of the C2C weeks planned in the long term for 2020 and 2021 remain unchanged. However, due to the uncertainties resulting from the Corona (COVID-19) pandemic and from potential travel restrictions for the C2C-CC members, a flexible organisation is required for each of the events. In general, in 2021 the CAR 2 CAR Communication Consortium aims on organising the CAR 2 CAR Weeks as face-to-face events again complemented by web-meetings. A new registration tool for C2C-CC events has been developed. The new registration tool will flexibly allow participants to register, monitor and change the individual details for each of the sessions last minute during the registration period.

You should make a note of the next dates.

Save the date

07 to 10 December 2020

12th CAR 2 CAR Week

virtual event

Save the date

08 to 11 March 2021

13th CAR 2 CAR Week (hybrid)

planned to be hosted by C2C-CC at Burg Warberg

Save the date

14 to 17 June 2021

14th CAR 2 CAR Week (hybrid)

planned to be hosted by Renault SW Labs, Sophia Antipolis

Save the date

04 to 07 Oct. 2021

15th CAR 2 CAR Week (hybrid)

planned to be hosted by Hessen Mobil, Frankfurt/M

Imprint

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