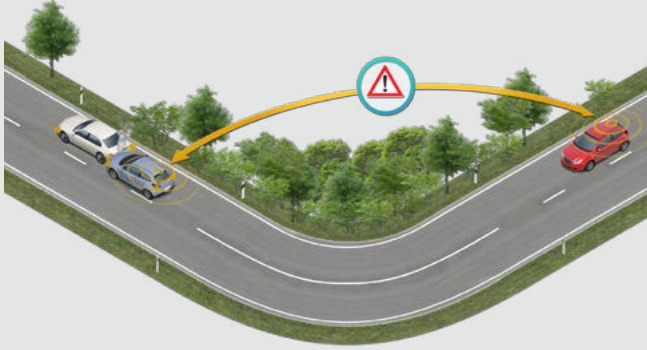
CAR 2 CAR -Newsletter-

Issue 19 / October 2017



CAR 2 CAR COMMUNICATION CONSORTIUM

In Issue 19

C-ITS steps forward towards improving safety in Europe

by Dr. Karl-Oskar Proskawetz, Administrator of the CAR 2 CAR Communication Consortium

The CAR 2 CAR Communication Consortium is close to finalise the development of its new Consortium Agreement which shall provide the required flexibility for meeting the future European challenges and developments in the field of cooperative ITS.

Early 2014, the European Commission decided to set-up the C-ITS Platform. The second phase of the Platform has been finalised in September 2017. Now, the European Commission has entered the phase of preparing the announced ITS Delegated Act. C-ITS is going to be deployed as off 2019. OEMs have started their serial development, and especially on the road infrastructure side, you can already see a lot of C-ITS pre-deployment projects such as the European C-ITS Corridor, SCOOP@F, InterCor and C-Roads. The C-Roads Platform has published the first release of the I2V Basic System Profile and is working hard on ensuring European-wide C-ITS interoperability.

Already some time ago, the preparation of the next innovation phases of C-ITS has started. The CAR 2 CAR Communication Consortium is updating its roadmap from initial deployment towards cooperative automated driving. Several R&D projects have been initiated dealing with automated driving of trucks and passenger cars on motorways as well as within cities. Sharing collective perception information between the C-ITS users is expected to contribute to further safety improvements in future. This enhanced feature is currently standardised at ETSI TC ITS. The position information of road users is one of the key-elements for C-ITS services. Higher accuracy of the ego-position of the road users will allow the improvement of the service quality and the development of new services. Cooperative positioning is a promising R&D result which might be of high interest for further C-ITS developments and for involving new stakeholders.

The present newsletter provides you with a lot of information especially on the C-ITS environment. This information perfectly complements the programme of the oncoming CAR 2 CAR Forum organised on 28 and 29 November 2017 at Braunschweig, Germany. The CAR 2 CAR Forum will supply the latest information on the current state of C-ITS deployment, on security & privacy, on the preparation of the next innovation steps as well as on the intention of further stakeholder groups making use of C-ITS in future.

CONSORTIUM NEWS

CAR 2 CAR Forum 2017 on 28 and 29 November 2017 in Braunschweig

by Sonja Eickmann, CAR 2 CAR Communication Consortium

On 28 and 29 November 2017, the annual conference of the CAR 2 CAR Communication Consortium will take place in Braunschweig, Germany. The CAR 2 CAR Forum is organised in the Volkswagen Halle, and it is the ideal opportunity for all active and basic CAR 2 CAR members to obtain the latest Consortium and working groups news as well as to get in contact with each other.

On the first conference day, four plenary sessions will address the Consortium's activities towards C-ITS Deployment, and future perspectives towards cooperative automated driving. Presentations will be given by CAR 2 CAR members as well as guest speakers from the European Commission, automobile, infrastructure and related industries' stakeholder associations, as well as European projects. Afterwards, all active members can take part in the General Assembly, while basic members and invited guests have the chance to join a city tour and to visit the Braunschweig Christmas market. All Forum participants will meet again for the evening event in the Restaurant Zucker.

On the second day, the CAR 2 CAR working groups will present their latest results on general and special deployment issues. They will reveal the progress towards European C-ITS Deployment, roadmaps and use cases, as well as future C-ITS developments.

In well-tried tradition, the Forum is accompanied by an exhibition of C-ITS related projects and products by CAR 2 CAR members. The exhibition is already fully booked.

Detailed information about the agenda, travel and hotel recommendations as well as the online registration form can be found on the ***CAR 2 CAR website****.*

11th
CAR 2 CAR Forum
28 and 29 November 2017
Volkswagen Halle, Braunschweig

Please note that registration is mandatory!
Online-Registration on CAR 2 CAR Website:
https://www.car-2-car.org/index.php?id=276

Developing the new C2C-CC Aggrement

by Dr. Karl-Oskar Proskawetz, Administrator of the CAR 2 CAR Communication Consortium

The final new CAR 2 CAR Communication Consortium Agreement shall be in place for the CAR 2 CAR Forum 2017. The new contract system overcomes shortcomings of the current contract and shall allow more flexibility of internal processes and of required cooperation with other stakeholders and organisations.

During the General Assembly 2016, all active C2C-CC members were informed about the need for developing a new C2C-CC Agreement and about the main intended changes. The drafted documents have been discussed within the Steering Committee, and comments have been considered in the further development. In September 2017, the final draft documents have been shared with the Technical Committee and some selected C2C-CC members for receiving their additional views and comments.

In between, the revised final draft documents including latest comments received have been handed over to an external lawyer firm. The external lawyer firm shall develop the final version of the new C2C-CC Agreement, shall ensure its consistency and being in line with current laws.

The new C2C-CC Agreement consists of five documents:

- *Statutes*

complemented by

- *Workplan*
- *Organisation*
- *Working Procedures*
- *List of SC members, TC members and WG chairs*

The final documents will be shared to all active C2C-CC members as soon as possible.

The new C2C-CC Agreement shall be made effective from 1 January 2018 and all active C2C-CC members will be asked to sign the documents for enabling continuity of the work within the CAR 2 CAR Communication Consortium.

Jointly deploying interoperable V2X-Services based on ITS-G5 on European Roads by 2019

Common Statement of CAR 2 CAR Communication Consortium and the C-Roads Platform

The CAR 2 CAR Communication Consortium and the C-Roads Platform have signed a Memorandum of Understanding for enabling a close cooperation between the automotive industry, road authorities, and road operators for preparing the deployment of initial cooperative ITS services across Europe by 2019. Short-range wireless communication from Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I) – based on the ITS-G5 standard (IEEE 802.11p) – represents together with hybrid communication technologies an essential cornerstone towards safe connected automated driving. Both partners strongly support the recommendation developed by the European Commission's C-ITS Deployment Platform to utilise short range communication in the 5.9 GHz frequency band. In accordance with the European C-ITS strategy (COM (2016) 766) adopted in November 2016, the hybrid communication approach builds on combining short-range ITS-G5 and wide area cellular and broadcast communication under a complementary principle.

Interoperability of C-ITS services is a pre-requisite for enabling seamless driver experience while travelling cross-border on European roads. Vehicles need to understand and correctly process messages sent by each other – irrespective of the brands – as well as by the road operators for enabling the best-possible support of the drivers in each individual traffic situation. Initiatives to achieve this requirement are broadly facilitated by the European Commission and gain additional importance with increasing automation of the vehicles.

Since its foundation in 2002, the CAR 2 CAR Communication Consortium focused its work on establishing European standards for short range communication between vehicles and traffic infrastructure. The allocation of the 5.9 GHz band for these purposes has mainly been driven by the Consortium. Its members have initiated and supported numerous research projects as well as largescale field operational tests on national and European level. As a result of this, ITS-G5 has proven to be ready for enabling short-range communication. Now that the systems enter the deployment phase, the Consortium is working closely together with infrastructure deployment initiatives to ensure a seamless market introduction of V2I communication.

From left to right: Pierpaolo Tona (Project Manager – INEA), Martin Böhm (General Secretary C-Roads), Eric Ollinger (Chairperson C-Roads), Niels Peter Skov Andersen (General Manager CAR 2 CAR Communication Consortium), Karl-Oskar Proskawetz (Administrator CAR 2 CAR Communication Consortium), Claire Depre (Head of Unit, Intelligent Transport Systems, DG MOVE, European Commission).

In 2016 the C-Roads Platform has been established as the platform of Member State authorities and road operators for harmonising the roadside C-ITS deployment across Europe. As infrastructure deployment initiatives are growing in number, the CAR 2 CAR Communication Consortium commits to close collaboration with the C-Roads Platform for jointly fostering the successful C-ITS deployment in Europe starting in 2019. With the signing of this memorandum, major European stakeholders are displaying initiative by moving closer together and emphasising their commitment to the common goal of harmonising C-ITS deployment across borders and throughout Europe.

About the CAR 2 CAR Communication Consortium

Enhancing road safety and traffic efficiency by means of Cooperative Intelligent Transport Systems and Services (C-ITS) is the dedicated goal of the CAR 2 CAR Communication Consortium. The industrial driven, non-commercial association was founded in 2002 by vehicle manufacturers affiliated with the idea of cooperative road traffic based on Vehicle-to-Vehicle Communications (V2V)and supported by Vehicle-to-Infrastructure Communications (V2I). Today, the Consortium comprises 88 members, with 18 vehicle manufacturers, 39 equipment suppliers and 31 research organisations.

Over the years, the CAR 2 CAR Communication Consortium has evolved to be one of the key players in preparing the initial deployment of C-ITS in Europe and the subsequent innovation phases. CAR 2 CAR members focus on wireless V2V communication applications based on ITS-G5 and concentrate all efforts on creating standards to ensure the interoperability of cooperative systems, spanning all vehicle classes across borders and brands. As a key contributor, the CAR 2 CAR Communication Consortium works in close cooperation with the European and international standardisation organisations such as ETSI and CEN.

About C-Roads

The C-Roads Platform is a joint initiative of European Member States and road operators which are in the phase of deploying C-ITS for testing and later operation. Pilot installations will be harmonised across borders, ensuring interoperability based on cooperation within the C-Roads Platform. Key elements are the joint development of technical specifications that will provide the basis for all pilot deployments, as well as the common cross-site testing to achieve interoperability of the deployed CITS services.

C-Roads Platform Members have agreed to work together on achieving actually harmonised deployment and thus enable interoperable and seamless cross-border C-ITS services for European travellers. Facilitated by the European Commission and reflected in the European C-ITS strategy (COM (2016) 766), the main goal is to link C-ITS pilot deployment projects in EU Member States against the background of a commonly harmonised operation. The general principles of the C-Roads Platform are agreed as follows:

- *Develop, share and publish common technical specifications (including the common communication profiles),*
- *Verify interoperability through cross-site testing,*
- *Develop system tests based on the common communication profiles by focusing on a hybrid communication mix, which is a combination of ETSI ITS-G5 and operational cellular networks.*

WORKING GROUP NEWS

ETSI Standardization on Collective Perception

by Hendrik-Jörn Günther, Volkswagen Group Research

A direct communication link between traffic participants is expected to help increase traffic safety and efficiency. With Day-1 deployment around the corner [1], the number of vehicles and infrastructure components capable of Vehicle-to-X (V2X) communication will increase. First-to-market Intelligent Transportation System Stations (ITS-Ss) in Europe are likely to use the IEEE 802.11p [7] based ETSI ITS G5 communication stack [4]. These stations will be able to broadcast their current position and information about their dynamic state, using the standardized Cooperative Awareness (CA) messages [2]. Information about detected abnormal or hazardous traffic situations will be broadcast by using the standardized Decentralized Environmental Notification message [3]. Albeit the CA messages provided by Day-1 ITS-Ss aim at sharing information about the current state of the disseminating ITS-S, they do not convey data about the station's current (driving) environment.

However, due to reduced costs and adapted safety regulation requirements, the number of traffic participants equipped with perception sensors, such as Radio Detection and Ranging (Radar) or Light Detection and Ranging (Lidar) sensors, will increase significantly. Today, these perception sensors are mainly used for driver assistance and safety systems, such as Adaptive Cruise Control or emergency braking applications. The information gathered by these sensors, however, is private to its collector. Looking ahead, Day-2 ITS-Ss may however utilize their perception sensors to not only gather information for themselves, but also for other traffic participants in their surroundings. Especially in situations with obstructed Lines of Sight (LoSs), i.e. as often encountered on intersections such as the one in Figure 1, the idea of sharing perception information will help to increase each other's awareness and to develop novel safety applications.

As depicted, the perception sensors of the blue communication-enabled vehicle approaching the intersection are not able to detect the white, non-communicating vehicle approaching from the right due to obstructed LoS conditions. Imagine the blue and white vehicle on a collision trajectory – even with on-board perception sensors and Day-1 communication capabilities, a collision might not be prevented or its severity reduced.

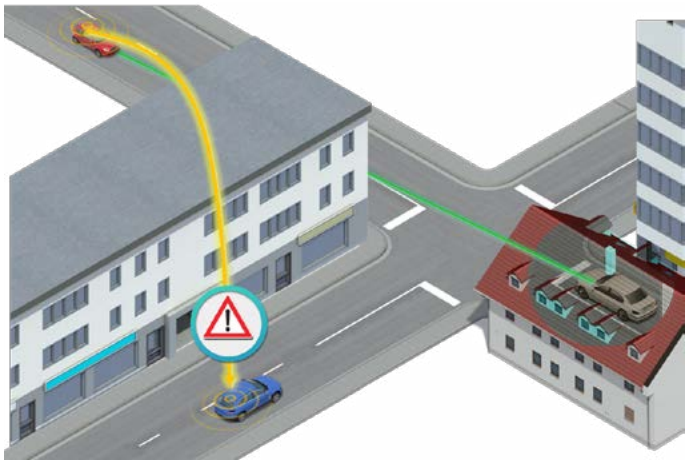


Figure 1: Vehicle out of sight warning

However, the perception sensors of the red communication-enabled vehicle approaching the intersection from the left have a direct LoS into the intersection and are therefore capable of detecting the approaching white vehicle. Being a Day-2 ITS-S, the white vehicle may share this information with its surrounding traffic participants, such as the blue vehicle. Consequently, safety applications activated on the blue vehicle may issue a warning to the driver concerning the prospective collision trajectory.

The mechanism described above for sharing sensor data is called Collective Perception and aims at combining communication and perception capabilities of ITS-Ss by sharing information about a disseminating station's current environment. On a broader sense, Collective Perception defines the concept of exchanging abstract descriptions of detected objects between different ITS-Ss by means of V2X communication. The concept decreases the ambient uncertainty of ITS-Ss by contributing information to their mutual Field of View (FoV). At the core of the concept stands a common message format describing locally perceived objects and providing the information required by the receiver to perform data fusion processes.

As part of current standardization activities in the ETSI, the TS 103 324 [6] for the Collective Perception Basic Service has been initiated, aiming at providing a specification for the concept of Collective Perception. Whilst specification of the concept takes place as part of the TS, a technical report TR 103 562 [5] has been opened along with the TS with the objective of creating a common understanding of the underlying working principles and message formats. The timeline for the TR envisions final draft approval by mid 2018, with publication about a year later. Simultaneously, the stable draft of the TS is expected to be available by Q3/2019. The supporters and contributors of both the TR and the TS comprises Original Equipment Manufacturers, suppliers, telecommunication companies and infrastructure providers alike. The current work focuses on the identification of the information to be included as part of the new message format. The prospective format thereby not only focuses on the requirements for sharing information gathered by vehicle mounted sensors, but also on the requirements for sharing information from sensors mounted to infrastructure components, e.g. Road Side Units.

Furthermore, the participants are currently identifying research questions which need to be addressed as part of the standardization work for Collective Perception. Sharing information about the current environment of an ITS-S has similar requirements as encountered by the CA message. Consequently, these research questions focus on the identification and analysis of further components of the communication stack which might hinder the dissemination of Collective Perception messages, i.e. especially the Decentralized Congestion Control mechanism in situations of higher traffic densities. Apart from direct contributions, further input is provided by several research projects with timelines overlapping with the specification phase of the CP basic service.

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[2] ETSI EN 302 637-2 V1.3.2 - Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 2: Specification of Cooperative Awareness Basic Service. ETSI, Nov. 2014.

[3] ETSI EN 302 637-3 V1.2.2 - Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 3: Specifications of Decentralized Environmental Notification Basic Service. ETSI, Sept. 2014.

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[7] IEEE Std 802.11-2012, Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications. IEEE Computer Society, Mar. 2012.

PROJECT ENVIRONMENT

Announcements

by Sonja Eickmann, CAR 2 CAR Communication Consortium

C-Roads published harmonised C-ITS specifications

The C-Roads Platform has recently published the first release of the harmonised communication profile for Cooperative Intelligent Transport (C-ITS) services. This release is based on the respective ETSI and CEN standards, comprises the results of several test cycles of the C-Roads partners across Europe, and is already fine-tuned with the automotive industry. While C-Roads is focusing on a hybrid communication approach, which is a combination of existing short range and cellular communication technologies, the first release focusses on the communication profile for IEEE 802.11p/ETSI ITS-G5 short range communication. Based on the cooperation with the CAR 2 CAR Communication Consortium (see article on page 3 of the present newsletter), the first release focuses on I2V (Infrastructure-to-Vehicle) communication, providing high level Day-1 Services are profiled in the first release in line with the EC Phase 1 C-ITS Deployment Platform report. **Find detailed information on the website of the C-Roads Platform**

EU EIP C-ITS workshop for lessons learned in C-ITS corridor pilots

On 22 November 2017, EU EIP (European ITS Platform) and the C-ROADS Platform jointly organise a C-ITS workshop on lessons learned in C-ITS corridor pilots. This workshop is scheduled for 10 to 16.30 h and takes place at INEA in Brussels, Belgium. Representatives from major European C-ITS corridor projects and involved stakeholder organisations will present and discuss lessons learned from the first pilots and deployment initiatives. In this sense, the workshop is a follow up to the third edition of "C-ITS Deployment is underway!" from 14 February 2017 which has been hosted by CODECS and the Amsterdam Group at Schiphol Airport. **Find more information on the EU EIP website**

ITS World Congress 2017: Integrated Mobility Driving Smart Cities

In the oncoming week, from 29 October to November 2017, the international ITS community meets for the ITS World Congress 2017 in Montreal, Canada. The ITS World Congress 2017 brings together global leaders in intelligent and transformative transportation to showcase and evaluate the latest innovative concepts, active prototypes, and live systems. It is the key ITS-event for academics, researchers, policymakers, businesses, entrepreneurs, investors, implementers, and the media. **Find more information on the ITS World Congress Website**

Launch of European project L3Pilot on automated driving

With L3Pilot, a European project which tests the viability of automated driving as a safe and efficient means of transportation has started in September 2017. L3Pilot is operated by a large-scale European Research consortium of Vehicle Manufacturers, SMEs, suppliers, research institutes and universities, insurers, authorities and user groups, and will run for four years. The project focuses on large-scale piloting of SAE Level 3 functions, with additional assessment of some Level 4 functions. The functionality of the systems used tested and validated under variable conditions with 1,000 test drivers and 100 vehicles in 11 European countries. The tested functions cover a wide range from parking to overtaking, and urban intersection driving. With this large coverage of driving situations, L3Pilot is the first project worldwide demonstrating and testing a comprehensive setup of automated driving functions. These tests will provide valuable data for evaluation of technical aspects, user acceptance, driving and travel behaviour, and impact on traffic and society. **Find more information on the L3Pilot Website www.l3pilot.eu**.

C-ITS Platform finalised its work on cooperative, connected and automated mobility (C-ITS)

by Hennes Fischer, Yamaha Motor Europe N.V, and Dr. Karl-Oskar Proskawetz, Administrator of the C2C-CC

In 2014 the European Commission established the C-ITS Deployment Platform as a cooperative framework including national authorities, C-ITS stakeholders and the Commission, in view to develop a shared vision on the interoperable deployment of C-ITS in the EU. The Final Report of the first phase of the C-ITS Platform was endorsed on 21 January 2016. The second phase of the platform further developed the shared vision on the interoperable deployment of Cooperative Intelligent Transport Systems (C-ITS) towards cooperative, connected and automated mobility in the European Union. The Working Groups on Security, Data Protection, Compliance Assessment and Hybrid Communication have all worked on issues that are essential to the interoperability of C-ITS deployment and hence relevant for the preparation of Delegated Act(s) on C-ITS. The Final report of this second phase of the C-ITS Platform has been endorsed on 20 September 2017.

C-ITS Platform Phase II Launched its Report in September

Also in the second phase of the C-ITS platform organised by the European Commission, C2C-CC members have been involved in key areas to make sure, that the industry position is materialised in the final report.

The phase II final report was presented to the platform experts in September 2017. After the first phase of the platform having focused on a wide range of topics, this second phase concentrated on most urgent and most critical topics.

***IT Security** is such a critical issue, where automotive industry needed to campaign for practical solutions and was faced controversial discussions amongst the various parties. One of the controversies emerged around the certificate policy and the frequency of the need to renew certificates for ITS stations of vehicles. The C2C-CC members made it clear, that a balance has to be found between security concerns and practical solutions in order not to delay deployment as off 2019. The members of this WG however did not find a common agreed solution. The EU suggested roll out a 4-years pilot for EU Cyber Security Credentials Management ending in 2021 for further evaluation of the issue.*

As a concrete outcome of the work in the C-ITS Platform, the Commission has published the first version of the European C-ITS Certificate Policy on its website in June 2017.

***Data Protection** proved to be another hot topic. In particular, some national data protection bodies suggested high barriers for the use of personal data originating from the use of C-ITS applications. It was made clear from industry side, that C-ITS is not about collecting data as such, but more about cooperative exchange of information between ITS stations/vehicles to improve road safety. C2C-CC members had the impression, that still there is a different perception amongst different stakeholders about definition of personal data. Niels Andersen made it clear, that C-ITS system design is not about tracking vehicles in response to data protectors asking for a 'Do not track function'. Obviously the goal for improving road safety, the basic principles of the short-range communication system and related design rules need better explanation within the various stakeholders. In reference to Art. 29, the working group formulated interim proposals. At this point in time, no legal clarity could be reached. Furthermore, the forthcoming e-privacy directive will not be expected during this EU presidency period.*

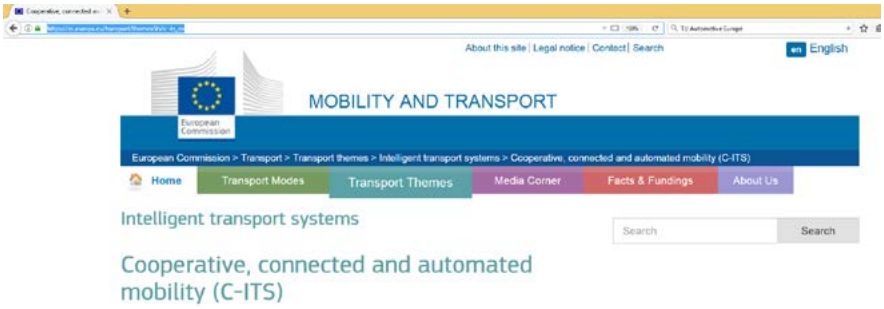
***Compliance Assessment** WG recommended to only evaluate a complete ITS station and not the individual parts. C2C-CC opposed proposals requesting even system components to be individually scrutinized. Compliance assessment of components of ITS stations will be in responsibility of the OEMs or suppliers.*

***Road Safety** WG addressed 5 issues:*

- *Priority C-ITS services from a safety point of view*
- *Technical issues*
- *Human Machine Interaction*
- *Driver behaviour*
- *Traffic rules*

The group concluded that day1 and day 1.5 applications can provide significant safety benefits. In particular, the Motorcycle Approaching Indication was regarded as a major safety step in VRU protection. The motorcycle representatives amongst C2C-CC members have been deeply involved in this discussion.

Also in the other WG dealing with Enhanced Traffic Management, Physical and Digital Infrastructure, Urban Automation and Business Models, several C2C-CC members, in particular suppliers, have been involved.



References

The final draft report is made available on the website of the European Commission

https://ec.europa.eu/transport/themes/its/c-its_en

Current Status of SCOOP@F

by Christine Tissot, Renault

SCOOP stands for "Systèmes Coopératifs" and is one of the most important pre-deployment project for cooperative intelligent transport systems (C-ITS) in Europe enabling the exchange of information between vehicles and between vehicles and road infrastructure equipment's / units (RSU). Launched in 2014 by the French Secretary of State in charge of Transport, the first years were spent with the selection of the priority services, the functional and technical specifications, the development and compliance assessment of all components of the completely new eco-system.

The objectives of SCOOP are

1. *Improving road safety and the safety of road operating agents who intervene on the roads for construction works and other maintenance operations,*
2. *Making traffic management more efficient and contributing to the reduction of CO_2*
3. *Optimizing infrastructure management costs, making vehicles fit for the future and developing new services.*

Therefore, SCOOP prepared the deployment of basic cooperative ITS services:

4. *Large scale testing of Day-1/1.5 services with more than 2000 serial vehicles, several hundreds of technical service cars from infrastructure providers (which have a dual role as a vehicle and as a mobile RSU) and several hundreds of fixed RSU. Some RSU will have additional functions for tolling station announcement and security certificate & logging data transit,*
5. *Granting services harmonization by basing all technical & functional specifications and developments on publicly available standards. The communication protocol is based on IEEE 802.11p / ETSI ITS G5 that use dedicated short ranges in the 5.9 GHz frequency band,*
6. *Provisioning of an efficient operative security system (PKI-based)*

and is today ready to launch its first assessed equipment's on the market. Thus, Renault started this autumn 2017 as the first European car-manufacturer the production of a limited number of 1000 serial Megane cars, equipped with ITS G5 components in the Spanish plant in Palencia. First end customers are going to take over their cars and to run them during 2 to 3 years. During this time, SCOOP will gather real field information for evaluation and feedback in several impact studies.

In a second wave, SCOOP will design and test enhanced cooperative ITS services:

7. *Elaborating a hybrid communication system (ITS G5 and currently existing cellular technology in accordance to the requirements of the European C-ITS Platform),*
8. *Enabling the evaluation of the long term infrastructure equipment strategy,*
9. *Contributing to interoperability of cooperative ITS in the EU towards the partnership in the European project C-ROADS.*

Figure 1: ITS G5 deployment zones in France (blue: first wave; green: next waves)

Interoperable and integrated deployment of cooperative ITS G5 fits into a logic of optimisation of overall costs related to road safety and the management of existing infrastructure, while offering new and more pleasant services whose business models have yet to be tested. In fact, the industry linked to the development of cooperative ITS has significant potential for job creation across Europe and could enhance the ITS sector's economic growth.

It was therefore fundamental that SCOOP federates numerous public and private partners around the French Ministry of ecological and solidary transition, who acts as a coordinator: local authorities, road operators, car manufacturers PSA and Renault, universities and research institutes. Since January 2016, the telecom operator Orange, the trust services provider IDnomic and Austrian, Spanish and Portuguese partners have joined the project.

Following major types of services, linked to the EU Directive 2010/40 on ITS priority road safety actions, are considered:

- *Onboard signaling of unexpected and dangerous events like emergency braking, end of traffic jam queue, slippery road, animal / pedestrian / obstacle on the road, stationary vehicle, accident, extreme weather conditions,*
- *Road works alert on planned roadworks, rescue and recovery actions, slow moving or winter maintenance,*
- *Data collection with regards to traffic and event data.*

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During the first wave, SCOOP aims to deploy over 2000 km of roads on five sites: Ile-de-France, Paris-Strasbourg highway, Isère, the ring road of Bordeaux, Bretagne. These sites are characterized by a great diversity of geographical topographies, of traffic and road types:

- *motorways including tolling stations,*
- *structuring roads in the metropolitan area,*
- *bi-directional interurban and local roads,*
- *a large part of the second and third Paris ring roads that are used for both local and long distance transit.*

Other areas will follow within the projects C-ROADS and Intercor.

As a concrete example of RSU deployment could be taken the implementations in Western France between the cities Nantes, Rennes and St. Brieuc where nearly every 2 to 5 km a RSU will be installed.

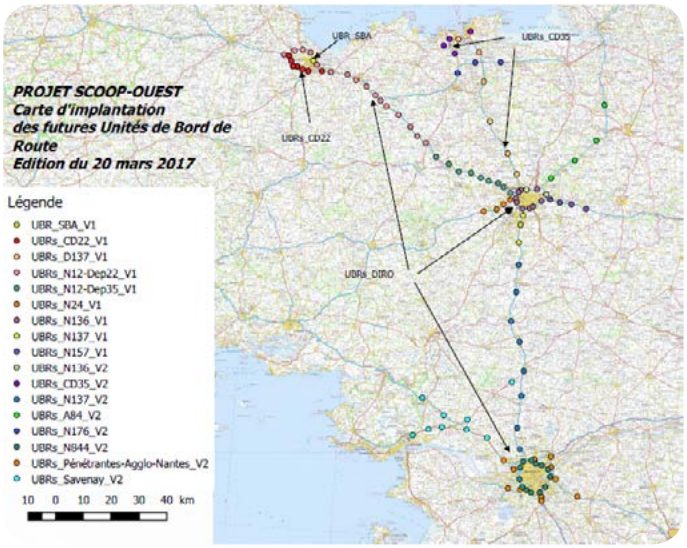

Figure 2: Future RSU deployment in the French Region "Bretagne"

The SCOOP architecture contains on the one hand components that interact directly on the road and on the other hand back-office components for the coordination of the overall traffic management and the security of the system.

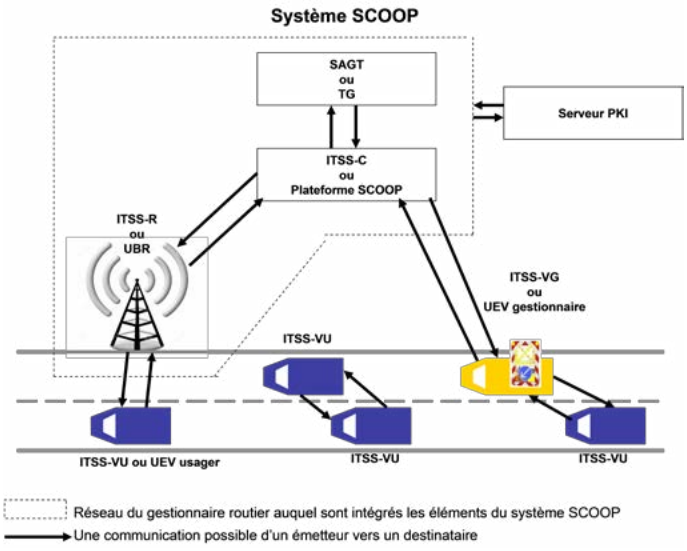

Figure 3: Global functional architecture between Intelligent Transport System Stations (ITSS)

- ***SAGT*** *means « Système informatique d'Aide à la Gestion du Trafic (SAGT ») or « Terminal de Gestion (TG) » and is the traffic management system under the responsibility of each road operators.*

- ***The central ITS station, called ITSS-C or SCOOP platform****, receives and processes information received from the management terminal or the road operator's traffic management system. It sends information to the operator's cooperative equipment (roadside stations or stations in the operator's vehicles) but does not communicate directly with the user's vehicles. It processes information received from the roadside stations and makes it available to the operator.*

- ***The roadside stations (or units), called RSU or ITSS-R****, receive the information from the SCOOP platform and broadcast them locally to users' vehicles. They also receive information and queries transmitted by vehicles, which are than processed (for storage, routing or sending). Event-based messages are sent in a non-consolidated form to the SCOOP platform, while traffic information will be transmitted to the platform after having it consolidated.*

- ***The users' vehicle embedded units, called ITSS-VU****, are the ITS stations installed in end users' vehicles, which are linked to an already existing serial human-machine-interface (HMI). They are able to broadcast automatically or manually via the HMI messages to other ITS stations.*

- ***The road operators' vehicle embedded units, called ITSS-VG****, are the ITS stations installed in road operators' vehicles, which are linked to a dedicated human-machine-interface (HMI). These units are able to fulfill all functionalities of an ITSS-VU as well as specific road operator functionalities (« operator » or « mobile ITSS-R » mode). So, they are also able to broadcast automatically or manually via the HMI messages to other ITS stations. They receive information sent by other vehicles or roadside units, process it and allow the potential display to the driver via its HMI. But ITSS-VG can also communicate (send or receive messages) directly with the SCOOP platform. This* ***mobile ITSS-R function*** *designates the fact that the ITSS-VG sends, like a ITSS-R, directly to the SCOOP platform the event-based messages transmitted by the users' vehicles or created by the operator ITSS-VG itself. Nevertheless, the ITSS-VG does not send any other traffic information – consolidated or not – than it's own.*

- ***The PKI*** *(Public Key Infrastructure) under the responsibility of the French Transport Ministry and operated by a trust service provider aims to secure the exchanges between the ITS stations thanks to its issued electronic certificates. This PKI system complies with current ETSI standards and most of the requirements of European Certificate Policy. Recent decisions and or discussions about crypto-agility, different key lengths, pseudonym renewal algorithm and protection profiles are not yet implemented. The SCOOP@F PKI nevertheless already implemented a pseudonym renewal algorithm. This French PKI is composed of 1 RCA, of 3 Long Term Certificate Authorities (LTCA) for the road operators, for PSA and Renault and of 1 Pseudonym Certificate Authority (PCA). So, all stakeholders – road operators and car manufacturers – are covered by the same PKI.*

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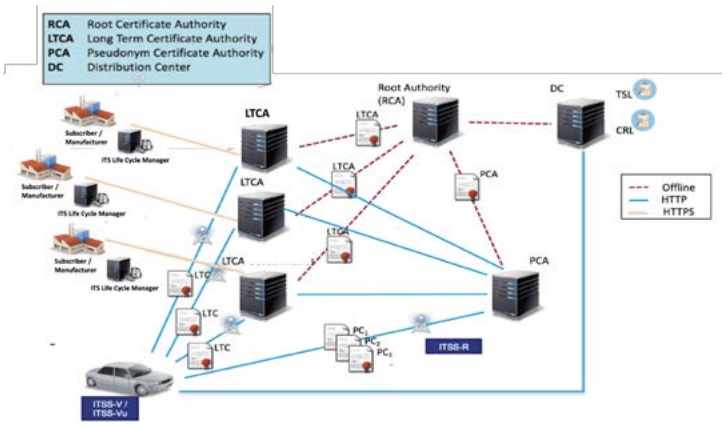

Figure 4: French operational PKI

Two main ITS G5 cooperative message types are yet used to realize the SCOOP use cases: the CAM (Cooperative Awareness Message) and DENM (Decentralized Environmental Notification Message) – transmitted via the control channel CCH. These messages could also be generated by the road operator's traffic management system (SAGT) and transmitted through the roadside units. Nevertheless, it has been necessary to translate DATEX II V2.3 messages used by the road operator's systems into ITS G5 messages and to establish a conversion matrix for mainly the level of quality that has to filled in the protocol. Furthermore, some RSU also broadcast service announcement messages by using an extended CAM-I message protocol to realize the download of logging messages and the request of security pseudonyms towards the service channel SCH1.

But SCOOP also uses 3 types of messages related to SCOOP experimentation: those for the evaluation of the project (i.e. impact studies like accidentology analysis), those for the supervision of the eco-system to anticipate any maintenance activities and those for the technical compliance assessment prior to the field launch. They are called U-log (usage loggings) or T-log (technical loggings). They are transmitted completely anonymously and were subject of a procedure at the national privacy agency CNIL.

To realize all these functional and technical SCOOP requirements, Renault adopted an add-on solution by fully integrating a stand-alone ITS G5 modem (called VXU), by replacing the conventional serial antenna by a new antenna block including FM, GNSS and 2 ITS G5 channels and by adapting the serial Head Unit (HU) to display SCOOP alerts on the serial HMI. The VXU is related to the HU via an innovative Bluetooth protocol allowing the exchange of vehicle CAN data to trigger automatically the messages or manually triggered messages, pre-filtered alerts for HMI-display and security certificate request & logging data transit.

Renault cars will be assembled in the conventional plant and maintained all over the French aftersales network as diagnostic and repair methods are completely aligned to serial processes.

Nevertheless, by realizing the HMI software update Renault had to respect the requirement of the national agency of privacy to always display the status of the SCOOP system. As the SCOOP consortium decided to activate the services by default, Renault inserted on the main screen the SCOOP picto to enter directly in the setting menu for activation or deactivation. A colored picto indicates an activation, a gray colored one a deactivation.

1 Picto SCOOP
2 Event type
3 Remaining distance between the car and the event
4 Recommandation
5 New speed advice if available
6 Quality level of the information

Moreover, Renault observed following points during these first 3 years that shall be considered for larger European harmonization and applications beyond Day2:

- *The technical and functional specification period took much longer time than expected due to different approaches between road operators and car manufacturers. It is mandatory to pursue discussions with them to involve all infrastructure related activities in a coordinated and agreed way.*
- *Public tenders have less flexibility to adapt specifications step by step within an iterative process or as an upgrade once the component installed. The lack of publicly available C2C CC BSP might now be resolved due to the MoU with C-ROADS. Same relationship should be insured with Autosar.*
- *Missing governance and certification policy on an European level until mid 2017 pushed SCOOP to deploy a French PKI. Although some of the recent European requirements are not fulfilled yet, this PKI might be integrated in the future European structure. Nevertheless, no standardized process is yet available to charge certificates through RSU. SCOOP deployed such a solution but Renault developed also an alternative solution via 3G communication.*
- *Current C2C-CC triggering conditions are less adapted to other roads than highways and should more account other types of roads and traffic conditions, especially in preparation of urban C-ITS.*
- *There is an urgent need to fill the lack of available ETSI or other test case descriptions especially for harmonized compliance assessment for V2I / I2V, Datex II and CAM-I services.*

C-ITS day1 / 1.5 pre-deployment based on ITS G5 is operative. The floor is from now on to end users to run and appreciate the services.

C-ITS Corridor – The implementation of cooperative systems in Germany

by Konstantin Sauer, Federal Ministry of Transport and Digital Infrastructure (BMVI),
Christian Leitzke, Hessen Mobil Road- and Traffic Management, and Holger Drees, Federal Highway Research Institute (BASt)

The C-ITS Corridor Rotterdam – Frankfurt/M – Vienna is one of the frontrunners of C-ITS deployment in Europe. The German part of the C-ITS Corridor has recently successfully finished its trial operation phase in Hessen. The road operator Hessen Mobil has established processes for the integration of cooperative systems in the operational processes and has tested and validated all organisational, functional and technical aspects. This lays the foundations for expanding the service coverage to all German Federal States in the years ahead.

The common goal of the C-ITS Corridor is to make individual mobility efficient, safe and environmentally friendly. For the introduction of the first applications of cooperative systems, deployment projects are running in all three Member States: The Netherlands, Germany and Austria. In Germany, the implementation is focused on two applications: Road Works Warning and Vehicle Data for improved traffic management (see figure 1).

***The German C-ITS Corridor project** was launched in 2013 and consists of nine project groups, each working on a subject area or a system component. Project management is carried out by the Federal Ministry of Transport and Digital Infrastructure (BMVI). For more information see www.c-its-corridor.de.*

An iterative process was used to develop and test the applications in the C-ITS corridor project. This had the advantage that (partially) working applications were created within short periods of time, which could then also be tested directly with the automotive industry.

Public Key Infrastructure

Certificates are used for the secure communication between the ITS Roadside Stations (IRS) and the vehicles with the help of which the transmitted messages are signed or the received messages are verified. The certificates are provided by a Public Key Infrastructure (PKI), which is operated on behalf of the Federal Office for Information Security (BSI) and is made available to all communication participants by the public authorities. For the private side in the form of automobile manufacturers and suppliers, the C2C CC operates its own PKI. Public and private PKIs are compatible with each other and are considered mutually trustworthy so that the relevant messages can be verified on either side. Short-term certificates with a validity period of 48 hours are used for the service implemented in the project. During the operational use of the IRS, the IRS connects to the PKI via mobile network and receives the necessary certificates for signing of the messages. Due to this short period of validity, a function for withdrawing these short-term certificates is not absolutely necessary, which simplifies the development work and the effort to manage the certificates.

Development and Tests

For the implementation of the overall system, the development work was divided into various sub-sections. At the beginning the individual specifications for the IRS and ITS Central Station (ICS) were developed and a data model for the data exchange between IRS and ICS was created. In parallel, the interfaces between the individual sub-systems (IRS / ICS, ICS / MDM, ICS / TCC, ICS / geo-service) were defined. **Next page ▶**

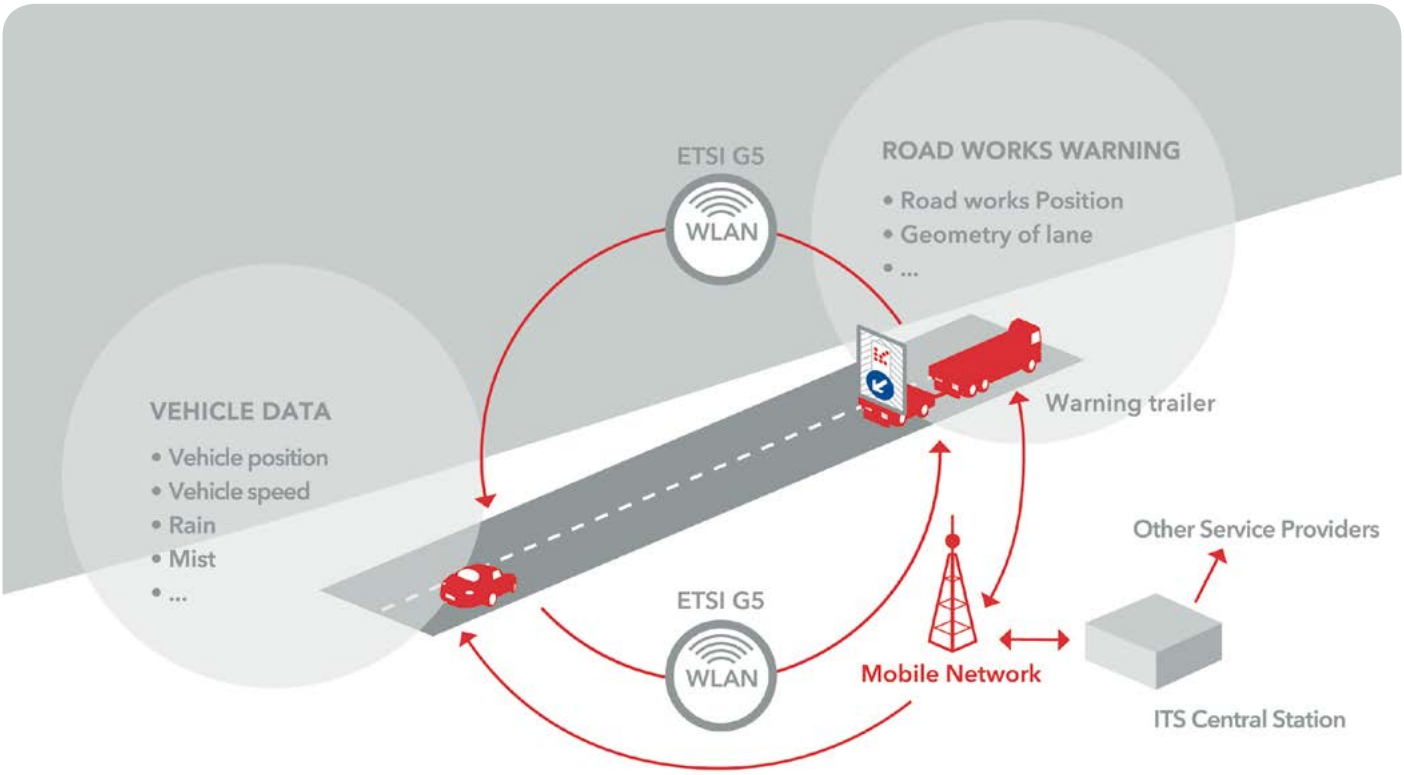

Figure 1: The first two applications of the C-ITS Corridor

The subsystems were then implemented. In addition to the IRS and the ICS, this included a geo-service to locate the trailers as well as software for data exchange between the TCC and ICS. The exchange between the TCC and the ICS is necessary in order to provide additional information about planned road works of shorter duration via the DENM. For the connection to the mobility data marketplace (MDM), an appropriate DATEX II profile for road works was prepared on behalf of the federal government, which is the basis for the delivery of road works information from the ICS to the MDM.

One challenge was the implementation of IT security, that is, the link to a PKI, as a large number of requirements arose during the course of the project at European level, which had to be implemented in the project. At the same time, coordination with the automotive manufacturers and suppliers was necessary in order to achieve interoperability of the systems on both sides.

The development of the IRS and the cooperative control centre (ICS) was accompanied by several test cycles between 2014 and 2016, which were initially concentrated on individual subsystems and their functions (test cycle 1 and 2) and, subsequently, tests of the entire system (test cycles 3- 5). The test cycles were supported by the participation of different automotive manufacturers, suppliers and contractors commissioned for the individual subsystems by Hessen Mobil. Finally, the two-part final test cycle 5 looked at all subsystems, from the IRS to the ICS via the ICS, the PKI connection and the connection to the TCC to provide the information on planned road works. Furthermore, communication with the vehicles, even over long distances, was successfully tested.

The current topic is the development of the IRS and the ICS including the connection to the mobility data market place, via which the road works information of the ICS can be made available to third parties.

Trial Operation

Within the framework of the C-ITS Corridor project, Hessen Mobil started the open trial operation of the cooperative system developed in the project in April 2017 and sent a road works warning via ETSI G5 to selected short-term road works via the road works warning trailers used on site. Hessen Mobil equipped road works warning trailers of various road maintenance depots in the Rhine-Main area with the necessary technology to extensively test and evaluate the system components, the overall system and the operational processes in the operational road service.

Figure 2: Test area in the Rhine-Main area

Within the trial, about 100 test drives were carried out under various operating conditions (use cases), evaluated and documented in an evaluation report. Some parameters are the speed of the transmitting unit and the receiving vehicle, the traffic volume, the weather conditions, the truck density, the route topology, and the peripheral development.

Various automotive manufacturers and suppliers carried out further tests. Of particular importance was the participation of road operators from Austria and the Netherlands, as a cross-border functionality was tested in this manner and can be secured at an operational level in operational service.

The tests were used to evaluate the correctness of message contents as well as the PKI functionalities and send and receive ranges. Other evaluation subjects were the traces generated by the IRS and the central functions of the system. A significant result of the test drives was the realisation that the communication distances of up to 1.5 km, depending on the route topology, were more than sufficient for road works warning in most use cases. Initial evaluations of the test runs also showed that the traces generated by the IRS meet the requirements.

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Figure 3: Example of a use case test drive, Copyright: Hessen Mobil, 2017

Prospects

The roll-out and live operation of the two C-ITS Corridor services "Road Works Warning" and "Vehicle Data for improved traffic management" are about to launch in the corridor countries. The developed applications will first be rolled out and implemented into the daily processes of road operation in the following German corridor states: Hessen, North Rhine-Westphalia, Rhineland-Palatinate, Baden-Württemberg, Bavaria and Lower Saxony. The roll-out will then take place in the other Federal States in a subsequent stage. Due to the involvement of a large number of project partners in the operation (road operators, automotive industry, other Federal States and countries etc.) structured processes and close cooperation between all stakeholders are essential to ensure the end-to-end functionality of the two cooperative services. The comprehensive set of documents and experiences of the C-ITS Corridor are shared and appreciated as a basis for harmonisation on European level. In parallel to the objective of nationwide coverage with the running services, the work of the C ITS Corridor serves as a basis for the deployment of new C ITS services within the C Roads project in Hessen and Lower Saxony. Experiences of the C-ITS Corridor are shared in the C-Roads Platform and appreciated as a basis for harmonisation on European level.

UK CITE – UK Connected Intelligent Transport Environment

top

by Chris Holmes, Jaguar Land Rover

Introduction

UK Connected Intelligent transport Environment (UK CITE) is a project to create the most advanced environment for testing connected and autonomous vehicles. Over 40 miles of urban roads, inter urban A roads and expressway, and motorway will have combinations of three V2X technologies (LTE C-V2X, ITS-G5, Wi-Fi) and test the feasibility of a fourth (LTE-V PC5). The project will establish how these technologies can improve journeys, reduce traffic congestion, and provide entertainment and safety services through better connectivity. The project is expected to take a total of 30 months and is made up of the following consortium members: Visteon Engineering Services Limited, Jaguar land Rover Ltd, Coventry City Council, Coventry University, Highways England Company Ltd, HORIBA MIRA, Huawei Technologies (UK) Co Ltd, Siemens PLC, Vodafone Group Services Ltd, Transport for West Midlands (TfWM) and WMG at University of Warwick.

Project scope

Project is focussed at building a real world Connected Car to infrastructure demonstrator through bringing together multiple technologies for the purpose of testing both the technical and commercial viability of aroad network "Connected Corridor" as a foundation for C-V2X , ITS 5G and autonomous cars. It will explore providing both ITS services and convenience related connectivity service to the vehicles, generating revenue to offset the infrastructure/running costs. The project will look at trialling a range of technologies towards enabling autonomous vehicles whilst providing real world benefits near term. The project will establish a living lab test environment that will entice vehicle manufactures to use the UK as a hub for connect vehicle & autonomous vehicle research and development. The three technology aspects to the project include testing of Vehicle to Vehicle and Vehicle to infrastructure communications and interoperability between vehicles manufactures and technology providers, trialling the use of a ITS connected "app" for Virtual Road side and driver messaging and testing of street level Wi-Fi to understand if it is a viable technology to provide convenience and or automotive related services.

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The project scope will cover the following:

- *LTE-V vehicle direct commination verses ITS-G5 802.11p for communication to and from vehicles to infrastructure as well as vehicle to vehicle and LTE (C-V2X) and ITS-G5in co-operative deployment*
- *Testing of bandwidth & latency for difference and therefore suitability of ITS-G5 vs. LTE for safety critical and non-critical use cases.*
- *A limited installation of road level Wi-Fi 802.11 a, b, g network to provide an open Wi-Fi convenience service and enable MNO data offloading for non-priority data services and understand Wi-Fi to LTE handovers*
- *Investigation of ITS related communications and convenience related communications co-existing on the same network*
- *Is there a business model whereby the revenue generated by convenience related services offsets the infrastructure for safety related services*
- *Can a mobile app including virtual gantry messaging VRS accelerate the ability to roll out next generation managed Motorways and A-roads ahead of the adoption of V2X technology in vehicle*
- *Investigate HMI solutions for driver assistance and warning messaging including the V2V and virtual gantry messaging how and where should the information be presented to the driver*
- *Modelling and simulation of managed motorways and A roads and impact of better driver information*
- *Providing research to inform specification of substantial planning highways investment across UK (Road Investment Strategy and Growth Deal) to ensure that this is adequately future proofed to accept emerging technology*

Participant focus within consortium

Project execution is divided into work packages with each consortium member having well defined responsibilities. The overall project management is led by Jaguar Land Rover and Visteon. Feature development is mainly done by Visteon for most of the use cases, with Jaguar Land Rover developing features focused on Driver warning like Electronic Emergency Brake Light warning (EEBL) Visteon is also responsible for driver interface (HMI) testing i.e. how best can the V2X information be communicated to driver. Jaguar Land Rover is mainly responsible for vehicle integration, testing and validation of V2X on Jaguar Land Rover cars.

Siemens and Highways England takes care of back end office system and infrastructure. WMG takes care of defining the security and access framework for the trial period, risks and threats of existing standards where improvements could be made prior to a wider technology role out. University of Warwick focuses on the business part which includes understand the business case behind the technologies being studied and potential legal and regulatory constraints. Coventry city council focuses on PR, Marketing and Dissemination. Horiba MIRA deals with simulation and modelling of vehicles, road users and infrastructure. Vodafone provides LTE cellular network and Huawei being the provider of LTE-V technology.

Test route

The test route for the road trials will have five different road types as given below.

- *Smart Motorway (M42)*
- *Motorway (M40)*
- *Expressway (A46)*
- *A-road (A45)*
- *Urban (A4114/A4035*

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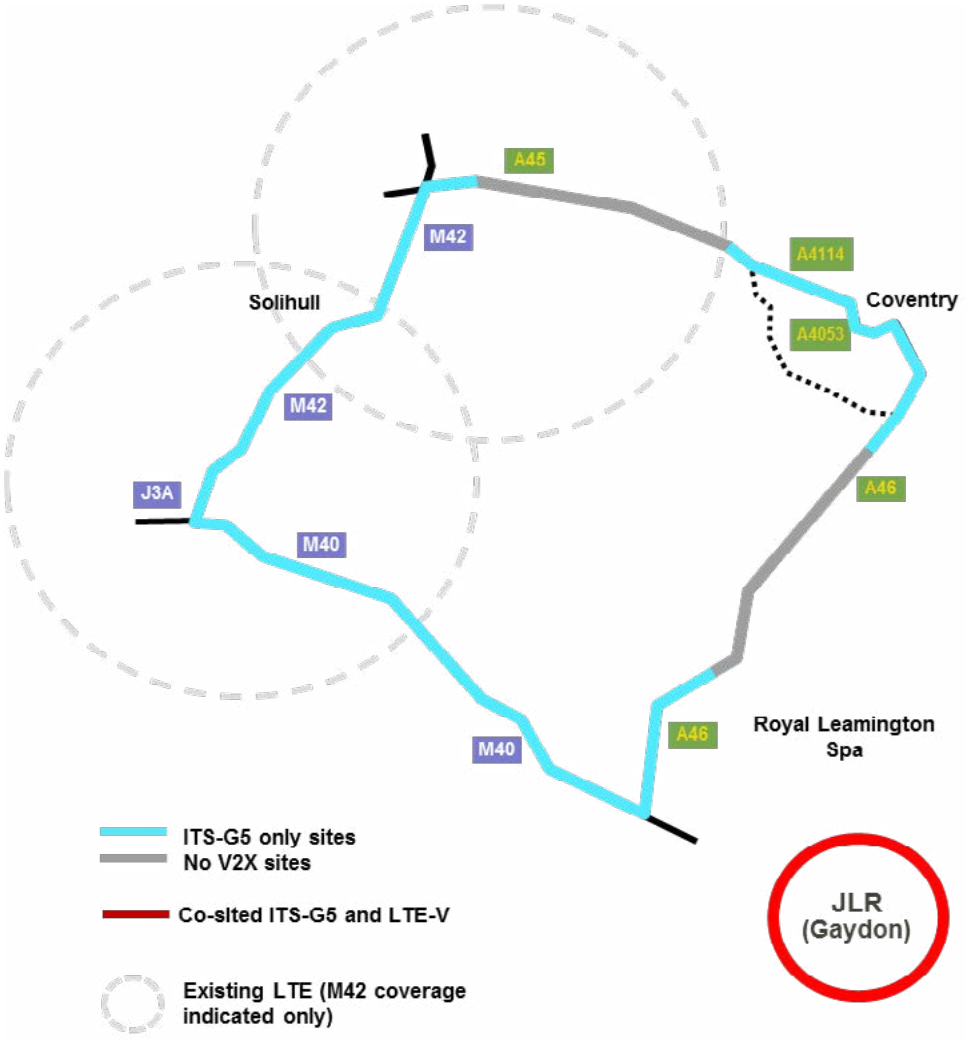


The test cycle consists of bench testing followed by track testing on three Jaguar Land Rover vehicles and then moving to road trails and finally large scale road trails with more than thirty connected cars and 60+ mobile handsets taking part.

Use Cases

A set of eight use cases are planned as part of the project.

Electronic Emergency Brake Light warning (EEBL)

This function enhances the safety of vehicles in a dense driving environment. It aims to avoid (fatal) rear end collisions which can occur if a vehicle driving ahead suddenly brakes on highways, especially in dense driving situations or in situations with decreased visibility. The driver will be warned before he is able to realize that the vehicle ahead is braking hard, especially if he/she does not see the vehicle directly (vehicles in between).[2] This use case is used to assess DSRC and LTE VDC technologies.

Emergency Vehicle Warning (EVW)

Wireless communication is used to distribute messages about approaching emergency vehicles which claim the right of way. If a received message is relevant in the current situation the driver will be informed at an early stage. Depending on the OEM's strategy the information is displayed on the head unit or another display device and may also be augmented by audio or haptic signals.

Road Works Warning (RWW)

Roadside units mounted on road works send messages to approaching vehicles, making drivers aware of potentially dangerous conditions at road works.

Traffic Condition Warning (TCW)

This feature allows any vehicle or road side unit to signal to other vehicles the current traffic condition at the point of sensor. Such data may be propagated by the traffic management system in order to mitigate the impact of the traffic condition on traffic flow

Cooperative Adaptive Cruise Control (CACC)

Cooperative Adaptive Cruise Control (CACC) system is an enhancement to ACC system by the addition of wireless communication with preceding vehicles and/or the infrastructure to augment the ACC active sensing capability. It is a semi-autonomous use case which improves "convoy" ACC (less advanced platooning) to negate acceleration or deceleration events which typically cause traffic to bunch and slow down. This use case is used to assess DSRC and LTE VDC technologies.

In-Vehicle Signage (IVS)

Roadside units mounted on traffic signs and key points along the roadway send messages to approaching vehicles, increasing the likelihood of drivers being aware of potentially dangerous conditions in case a roadside traffic sign is not noticed.

Lane Merge Assist (LMA)

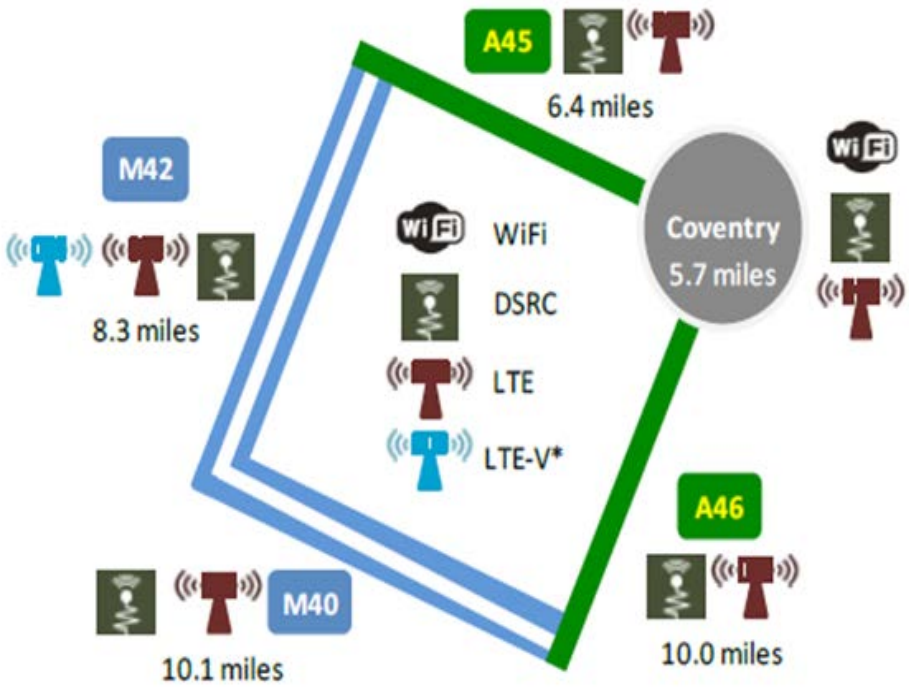
Roadside units communicates the position of the planned merge and the time at which the joining vehicle has to be there to merge with the main carriage traffic without causing a ripple effect.

Floating Car Data (FCD)

Any vehicle that encounters adverse weather conditions whilst driving shall alert other approaching vehicles of the risk for them associated to this dangerous situation. This feature avoids traffic delays and collisions due to local weather situation.

Current status

The project started in the mid of 2016. As of now all use cases have been defined, vehicle and high level architecture finalized and infrastructure design completed. Feature development for first four use cases viz. EEBL, EVW, RWW and TCW is completed and ready for testing on track, with test strategy in place. The road test and large scale trialing on connected corridor is planned from March 2018.



CODECS: Intensified dissemination of harmonised findings

by Dr. Karl-Oskar Proskawetz, Coordinator of CODECS

CODECS has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 653339.

The coordination and support action CODECS has entered its last project year. Dissemination of harmonised findings comes more and more into focus, following the phases of collecting information from the stakeholders and assessing the compiled information received. While CODECS is developing a harmonised C-ITS roadmap as well as guidance for C-ITS deployments, further workshops and webinars are organised for involving the stakeholders in dedicated C-ITS issues. The final results will be presented during the TRA 2018 at Vienna.

In July CODECS, updated its report analysing the "State-of-the-Art Strategy for C-ITS Deployment" for considering strategic issues mainly due to the Phase II of the C-ITS Deployment Platform, the C-Roads projects, and the publication of "A European strategy on Cooperative Intelligent Transport Systems" (Nov. 2016). The draft version for giving guidance for C-ITS Deployment is being developed and will be published soon.

Furthermore CODECS developed internal documents on "Use Case Definition and Stakeholder Roles" and on "Initial Harmonised Use Case Road Map" building the basis for workshops and webinars and final publications by end of the project.

On 19 May 2017, CODECS organised a public workshop on "Hybrid Communication" for C-ITS at Brussels for networking the stakeholders, sharing the different views on hybrid communication and initiating the first step towards a common understanding. The drafted results of the workshop have been used as input for continuing the discussion within the WG Frequencies and Hybrid Communication of the C-ITS Platform on 10 July 2017.

Recently, on 17 October 2017 at BASt, Bergisch Gladbach, CODECS organised a workshop addressing the "Long-Term Road Works Warning" use-case based on the generalised philosophy of using the C-ITS message sets. Together with the C-Roads platform CODECS organises the EU EIP workshop "lessons learned" at INEA, Brussels on 22 November 2017.

The published documents as well as the presentations given in the workshops and webinars can be downloaded from the ***CODECS website www.codecs-project.eu****.*

Presentation of CODECS Final Results

Make a note of the TRA 2018 at Vienna on 16 to 19 April 2018 where CODECS will present its final results!

Imprint

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