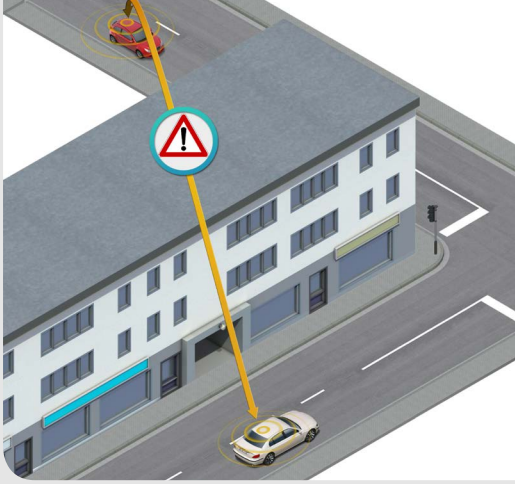
CAR 2 CAR -Newsletter-

Issue 18 / March 2017



CAR 2 CAR
COMMUNICATION CONSORTIUM

In the 18th Issue

Support for the European approach towards cooperative, connected and automated driving

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

During the past 15 years, the European CAR 2 CAR Communication Consortium (C2C-CC) has successfully evolved to an international consortium with 89 members from all over the world, and it achieved well reputation. Due to the high awareness for the C-ITS developments in Europe, the Chinese delegation Spectrum MIIT visited Germany in early December 2016 in order to learn more about the C-ITS technology and the deployment approach in Europe. On this occasion, the German spectrum regulator BNetzA as well as several C2C-CC members have executed seminars on dedicated C-ITS topics at Berlin. Furthermore, the Consortium organised a one-day workshop at Braunschweig for highlighting its position and the main corner stones of the C-ITS approach in Europe, and for especially promoting the international harmonisation of the C-ITS frequency spectrum. C2C-CC members demonstrated some automotive and infrastructure devices in operation for underlining the readiness of the C-ITS technology for deployment in 2019.

During the past years and still ongoing, the C-ITS Platform develops the harmonised European vision on C-ITS deployment. In its notice from end of November 2016, the European Commission published the Masterplan for bringing C-ITS onto European roads in 2019. The C2C-CC supports this European approach towards cooperative, connected and automated driving. Day One deployment will be based on existing technologies – ETSI ITS G5 for short range communication, and cellular for wide range communication, following seamless co-existence and complementary principles. The EC will maintain the designation of spectrum used by ETSI ITS G5 for safety-related services, and supports measures to protect this frequency band from harmful interference. With respect to security, the EC will steer the development of a common security and certificate policy for deployment and operation of C-ITS. On infrastructure side, the EC will make full use of the C-Roads Platform as coordination mechanism for C-ITS deployment at operational level.

Looking to the United States, the NHTSA published the expected Notice of Proposed Rulemaking (NPRM) on V2V communications during December 2016. Also Australia considers to follow the European C-ITS approach. In Europe, the automotive industry has started the serial C-ITS development. A major step for the serial development is seen in

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the integration of ETSI ITS-G5 and especially the "Basic System Profile" specified by the C2C-CC into the AUTOSAR Release 4.3. Furthermore, the ongoing ETSI Plugtests are important for ensuring proper implementation of the specifications.The C2C-CC is also active in looking to the C-ITS phases beyond Day One. The working group Roadmap has restarted with a new chair, and sub-working groups focusing on functional safety and on infrastructure aspects will be established. Complementing the C2C-CC, use-cases and technologies are also discussed within the Amsterdam Group and the European Coordination & Support Action CODECS aiming at a C-ITS Roadmap harmonised with all stakeholders. Here, new technologies and algorithms are assessed with respect to enabling new C-ITS use-cases or improving the level of service of already considered use-cases.

With respect to communication the C2C-CC recently studied possible 802.11p enhancements with new state-of-art IEEE 802.11-2016 innovations. By comparing the performance improvements observed of new features (e.g. new channel coding, antenna diversity, etc...) individually, it becomes clear that a new "IEEE 802.11px" including these enhancements could lead to a serious performance increase and will reflect state of the art for direct ad hoc and safety communication technology. Backward compatibility and requirements of high speed vehicular ad hoc networks are taken into account. The C2C-CC decided to take the necessary steps towards an IEEE802.11px specification and implementation. For example each new feature will need to be designed and optimised for an operation in a high speed vehicular environment.

The C2C-CC wants to use the spectrum performance increase in an optimisation either towards latency or range or data rate, depending on the requirements of applications per channel. The C2C-CC in alignment with the Amsterdam Group (with Road Authorities and Operators) is right now defining which V2V and V2I applications should be placed on which channel. The CAR 2 CAR Communication Consortium confirms that at least 50 MHz in 5.9 GHz spectrum are necessary for safety-related C-ITS. It will implement short range communication technology for all V2X applications of the roadmap making use of the complete 70 MHz C-ITS spectrum in 5.9 GHz.

The oncoming years of C-ITS deployment and further development of C-ITS towards cooperative automated driving will be of higher dynamics and competition. New roles and responsibilities have to be taken by the C-ITS stakeholders. With respect to the future needs, the CAR 2 CAR Communication Consortium is developing a new C2C-CC Agreement. The C2C-CC aims on improving its performance and on achieving more flexibility which allows the adaption to the challenges towards C-ITS deployment in 2019, and required activities for successfully steering and guiding the future C-ITS developments.

Dr. Karl-Oskar Proskawetz, Administrator of the C2C-CC

CONSORTIUM NEWS

CAR 2 CAR Communication Consortium strongly supports the European Strategy for C-ITS Deployment

by the CAR 2 CAR Communication Consortium

The European Commission has recently published the European Strategy on Cooperative Intelligent Transport Systems (C-ITS) – an important milestone for realising cooperative and automated mobility on European roads. The CAR 2 CAR Communication Consortium (C2C-CC) strongly supports this strategy, highlighting a hybrid communication approach for transmitting C-ITS messages using both direct vehicle communication (V2X ITS-G5 technology) as well as mobile radio communication. All research and development activities of the Consortium show that the V2X ITS-G5 technology is mature and displays a number of advantages for direct vehicle communication.

*With the publication of the **COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS – A European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility – Document COM(2016) 766 final on 30 November 2016**, the European Commission has set the scene for C-ITS deployment in Europe. The C2C-CC expresses its strong support for this strategy, which considers a combination of different communication technologies for transmitting C-ITS messages. Hybrid communication based on existing mobile radio and direct vehicle communication has been identified as the best way for supporting automated and connected driving. For direct vehicle communication, V2X communication based on ETSI ITS-G5, IEEE 802.11p (V2X ITS-G5) is favoured.*

The advantages of the V2X ITS-G5 technology are real-time operation in all scenarios (independent of cellular infrastructure even during high-performance operation), the capability of automotive functional safety (ISO 26262), and established concepts of security-by-design and privacy preserving technology, all-in-all harmonised with the C-ITS Deployment Platform.

V2X ITS-G5 has been developed and it is ready for the market. This is a precondition to facilitate V2X rollout in 2019. Suppliers are contracted with the V2X implementation. The essential IPRs and patents on V2X ITS-G5 are owned by members of the European C2C-CC and can be used royalty-free by all its members.

Recently, two important actions happened, which argue for V2X ITS-G5:

- *ETSI ITS-G5 and especially the "Basic System Profile" specified by the C2C-CC have been integrated into the AUTOSAR Release 4.3. This release was published on 30 November 2016 and can be used by all manufacturers (automotive and infrastructure). AUTOSAR is the industrial standard for the vehicular electronic architecture. Vehicle manufacturers evaluate this as an important required step on the way implementing safety related applications.*
- *In USA, the long expected NPRM (49 CFR Part 571, Federal Motor Vehicle Safety Standards; V2V Communications) has been signed and forwarded to US Federal Register for publication. As a result, IEEE 802.11p and the WAVE protocol extensions have become mandatory in the USA.*

For the vehicle manufacturers it is of high importance that V2X systems are compatible in USA and Europe. The European system V2X (ETSI ITS-G5 / IEEE 802.11p) and the DSRC (Wave / IEEE 802.11p) system proposed by the NPRM are hardware compatible.

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 with

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Vehicle-to-Vehicle Communications (V2V) supported by Vehicle-to-Infrastructure Communications (V2I).
Today, the Consortium comprises 89 members, whereof 18 vehicle manufacturers, 40 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 ETSI 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.

COM (2016) 766 - A European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility

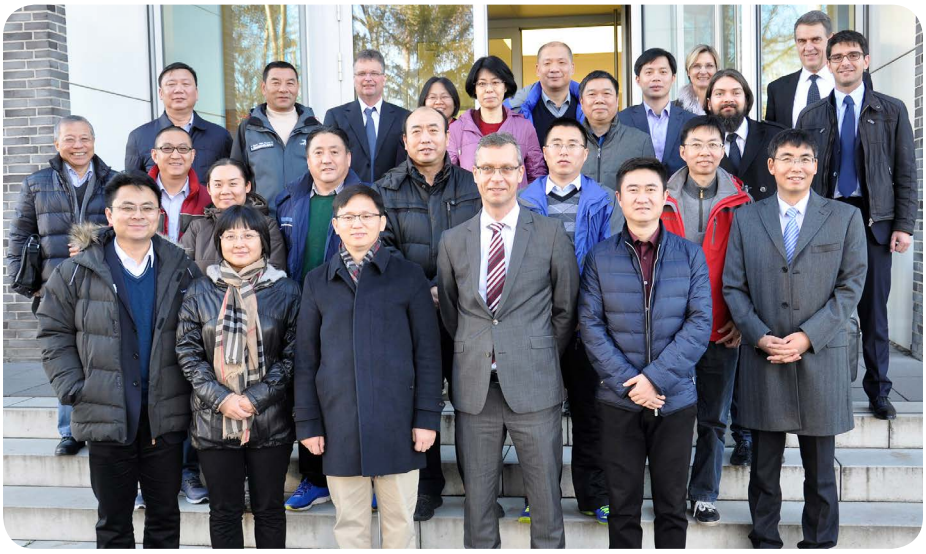
Setting the scene for the Pan-European Deployment of Cooperative, Connected and Automated Vehicles
C-ITS platform final report & Annexes

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

Chinese Delegation Spectrum MIIT visited the C2C-CC

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

In order to take stock of the latest developments in intelligent transport systems and services, in 2016, several Chinese delegations visited the most important commercial, research and business regions. On 2 December 2016, the CAR 2 CAR Communication Consortium organised a one-day seminar at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt, DLR) in Braunschweig for 20 experts of the Chinese delegation Spectrum MIIT. The seminar focused on the day one deployment, the C-ITS roadmap towards cooperative, automated driving and related spectrum challenges. The presentations were complemented by exhibits from the CAR 2 CAR members Nordsys, IAV and DLR.
*The General Manager of the CAR 2 CAR Communication Consortium Niels Peter Skov Andersen outlined the Consortium and its activities. The European Commission statement from 30 November 2016 (**see article on page 2 of this newsletter issue**) indicates that the regulatory and policy framework for deployment is underway which allows a common European deployment. However, the key focus areas on spectrum, compliance assessment, security and privacy need to be finalised for enabling the day one deployment. The deployment of the day one use cases and further safety related use cases in Europe is dedicated to ITS G5 and the internationally harmonised 5.9 GHz frequency spectrum. The 63 GHz spectrum is considered for extension and the 3.4 to 3.8 GHz band might be an option to achieve the required redundancy for enabling cooperative automated driving. During the past years, Europe has spent many efforts for achieving a protection of the already existing DSRC tolling system using the 5.8 GHz spectrum. With respect to the development and life cycle of vehicles, Niels Peter Skov Andersen highlighted that the communication system and its services need to be available and reliable at least for the next 20 years.*
The following presentations on the C-ITS day one deployment, the C-ITS roadmap and the spectrum challenges gave detailed insight into the current status and further ongoing developments. The lectures were complemented by the presentation of existing C-ITS hardware. Nordsys showed its powerful C-ITS product family waveBEE for application development and C2X simulation. IAV presented the C-ITS roof beam of an emergency vehicle and visualised the C-ITS functionality by a related simulation. The DLR informed about the functionality and usage of the existing application platform intelligent mobility (AIM) and showed a cooperative traffic light and a C-ITS research vehicle.
The leader of the Chinese delegation Spectrum MIIT Ph. D. Song Qizhu thanked the C2C-CC for the well organised and very informative seminar. The General Manager Niels Peter Skov Andersen expressed the willingness of the CAR 2 CAR Communication Consortium for continuing the established information exchange.



The CAR 2 CAR Communication Consortium welcomed 20 experts of the Chinese delegation Spectrum MIIT to a one-day information seminar at the German Aerospace Center in Braunschweig.

The leader of the Chinese delegation Spectrum MIIT, Ph. D. Song Qizhu, thanked Niels Peter Skov Andersen, General Manager of the C2C-CC, for the well organised and very informative seminar.

The next level – An evolution of 11p towards an enhanced 11px system

by Jérôme Härri, EURECOM, Michelle Wetterwald and Friedbert Berens, FBConsulting Sarl, Bettina Erdem, Continental

Introduction

Recently, possible 802.11p enhancements with new state-of-art IEEE 802.11-2016 innovations have been studied by the C2C-CC. By comparing the performance improvements observed of new features individually, it becomes clear that a new "IEEE 802.11px" including these enhancements could lead to a serious performance increase and will reflect state of the art for direct ad hoc and safety communication technology. Backward compatibility and requirements of high speed vehicular ad hoc networks should be considered.

The existing PHY and MAC layer of the ETSI ITS-G5 and the US WAVE system are based on amendment IEEE 802.11p, an extended version of the IEEE 802.11a RLAN (a.k.a. WiFi) standard. The 802.11a standard has been extended to accommodate the characteristics of mobile communication channels such as multipath fading and Doppler in a cooperative environment. This amendment was approved in 2010 and is now integrated the 802.11 standard [1]. Nowadays, the deployed building blocks are no longer fully state of the art and the performance of the PHY and MAC layers behaviour could be significantly improved by adapting techniques defined in more recent versions of the IEEE 802.11 standards family. In addition, 3GPP has proposed recently to deploy an LTE variant known as LTE-V2X as an alternative to the IEEE based 802.11p system to be used in future cooperative and centralized ITS systems. A recent study, presented at ITS World Congress 2016 [2], has shown that LTE-V2X can provide a BER improvement of up to 5dB compared to IEEE 802.11p. The LTE variant includes an enhanced channel coding based on block turbo codes and some multiple-antenna techniques. These building blocks lead to the mentioned performance enhancements.

The C2C-CC has decided to take the necessary steps towards an IEEE802.11px specification and implementation. This article gives an overview of the possible evolution of the existing 802.11p system and the performance gains to be achieved. The considered techniques are well-known and their implementation blocks are broadly available.

Existing IEEE 802.11p characteristics

Overview

The 802.11p technology was defined as an amendment to the IEEE 802.11-2007 version of the standard. It consisted in a modification of the state of the art WiFi at that time, the 802.11a, known as OFDM WiFi at 5GHz. This amendment has been integrated into the IEEE 802.11-2012 [1] update of the standard as a new mode of operation called 'Outside the Context of a BSS' (OCB). Accordingly, the 802.11p formally no longer exists, but the name remains widely used and known as 'WiFi in Vehicular Environment'. 802.11p proposed modifications in both PHY and MAC layers. Indeed, OCB mostly describes the modifications at the MAC layer only, while the modifications in the PHY layer are specified as a new WiFi profile using existing techniques with an adapted set of parameters.

Reusing the characteristics of 802.11a WiFi at PHY layer

802.11a replaced the initial WiFi DSSS and FHSS modulations schemes with a new OFDM modulation more adapted to mitigate frequency selective channels. An 802.11a modem consists of three major blocks: Scrambler, Interleaver and Convolutional encoder. The function of the Scrambler is to whiten the bit stream such that correlated bit corruptions will be uncorrelated on the original bit sequence. The Interleaver modulates the bit stream on an OFMA subcarrier. The convolutional encoder (and the related Viterbi Trellis decoder) provides the channel coding functionalities and as such, influences the WiFi Packet error performance. Convolutional coding demonstrates an improved BER per SNR compared to transmissions without any channel coding. It remains the default channel coding of all modern WiFi, including for the latest amendments (e.g. 802.11ac). It is therefore the channel coding mechanism adopted for 802.11p.

The key modifications in the PHY layer introduced in 802.11p are due to the potential Doppler shift, which can potentially create inter-symbol interference (ISI). For an 802.11a OFDM inter-symbol guard interval of 0.8 µs, a strong ISI is expected. The guard interval must then be doubled, which in turn increases the total OFDM symbol duration and as consequence halves the available bandwidth to 10MHz. Accordingly, 802.11p mandates to operate on 10 MHz channels instead of the 20 MHz used for 802.11a. The increased OFDM symbol duration also impacts the IEEE 802.11p slot time which is increased from 9 µs to 13 µs. Same as 802.11a, the 802.11p does not support antenna diversity.

Simplifying the characteristics of 802.11 WiFi at MAC layer

The key modifications in the MAC layer introduced in 802.11p are related to the OCB mode. It allows any mobile node (MN) to be able to communicate to another MN without having previously created or joined a BSS. A MN operating in OCB mode can then directly transmit broadcast and unicast messages to any other MN without the additional delay that would be due to the communication management. Another modification of the 802.11p concerns the Enhanced Distributed Channel Access (EDCA) parameters. Considering the critical nature of vehicular-related communications, the EDCA parameters have been reduced, and Transmit Opportunity (TXOP) declined, as shown in figure 1.

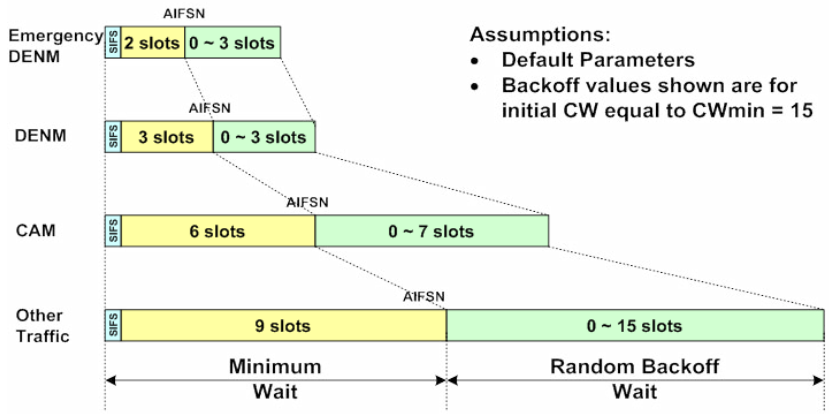


Figure 1: IEEE 802.11p EDCA parameters

Enhancing the 802.11px system

As described before, the 802.11p is based on the IEEE 802.11a amendment. Considering that 802.11p as well as 802.11n, 802.11ac and the upcoming 802.11ax are part of same WiFi standards family, the MAC and PHY mechanisms used for 802.11p could be improved by using those from 802.11n, 802.11ac or 802.11ax, without needing a major redesign of the vehicular WiFi technology. At the PHY layer, 802.11p may be significantly improved to keep up and even outperform current state-of-art V2X competitors.

The 802.11p can be optimised through at least the following functions:

- ***Antenna Diversity*** *– Multi-paths may be better mitigated through the use of antenna diversity including some MIMO techniques.*
- ***Improved channel coding*** *– the binary convolution code present in all WiFi system is outdated and should be replaced by more enhanced mechanisms.*
- ***Increased OFDM Pilots*** *– OFDM currently only uses 4 pilots homogeneously located within the 52 OFDM subcarriers. The dynamic vehicular channel might require more pilots spread in a schema better adapted to the vehicular wireless channel.*

Among them, two innovations are worth emphasising in IEEE 802.11n and thus the actual IEEE 802.11-2012 standard [1]: (i) ***Space-Time Block Codes (STBC)*** *for Antenna diversity and (ii)* ***Low Density Parity Check (LDPC)*** *codes. The addition of pilot symbols would require a more complex update of the IEEE standard. The focus of a medium-term improvement of the existing 802.11p systems would thus be on the inclusion of an improved channel coding scheme and some antenna techniques.*

Advantages of LPDC codes

LDPC codes conceptually work as a block of bits encoded according to a structure, which may check corrupted bits by a simple bit-sum parity check. In figure 3 the performance gain of an LDPC code specified in the IEEE 802.11-2012 standard compared to a conventional convolutional code is depicted for a static AWGN channel. It can be seen, that for a similar coding rate of around 0,8 the LDPC code has a gain of between 2dB and 3dB for a Bit Error Ratio of 10-5. Under dynamic channel conditions, even higher gains can be assumed.

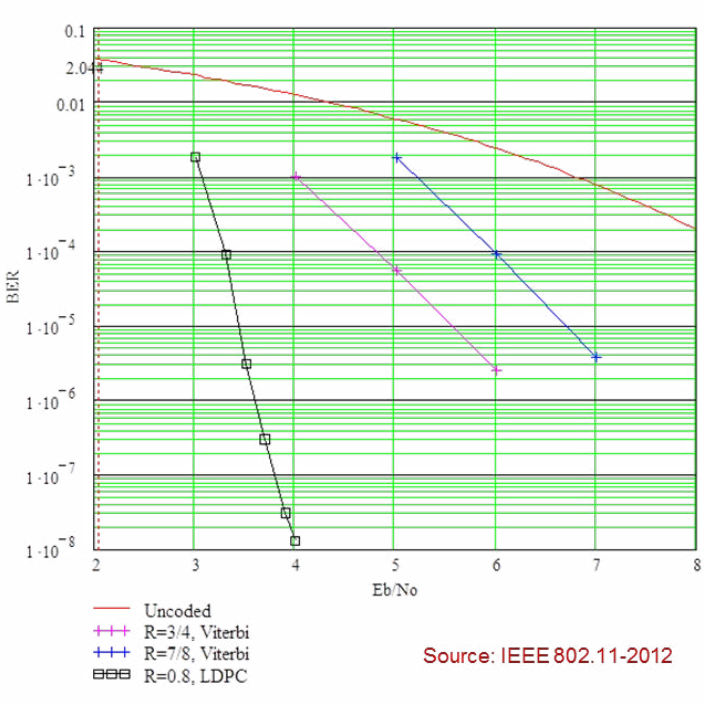


Figure 2: Performance comparison between LDPC codes and Convolutional Codes

Advantages of STBC

The general concept is that two signals at a receiver are always better than one to be able to decode data. Space-Time codes (e.g. Alamouti codes) allow to encode data so they can be sent on different spatial streams. Conversely, it is possible to decode data at a smaller required SNR given the combinational diversity of the two streams. Unlike traditional MIMO, where the two antennas may be used to transmit two different data streams to a receiver and doubling the link capacity, STBC takes a 2x1 approach, where the two TX antennas are used to send the same stream of data to a single receiver antenna. Figure 3 illustrates the difference between STBC and MIMO in 802.11n.

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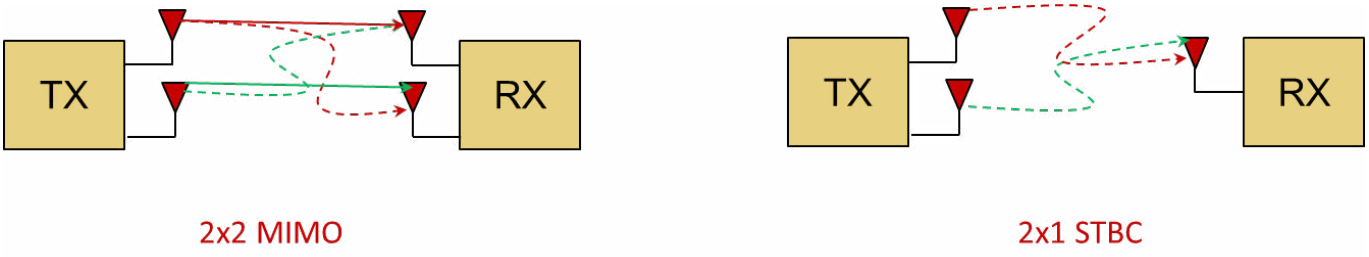

Figure 3: Antenna Diversity - MIMO vs. STBC

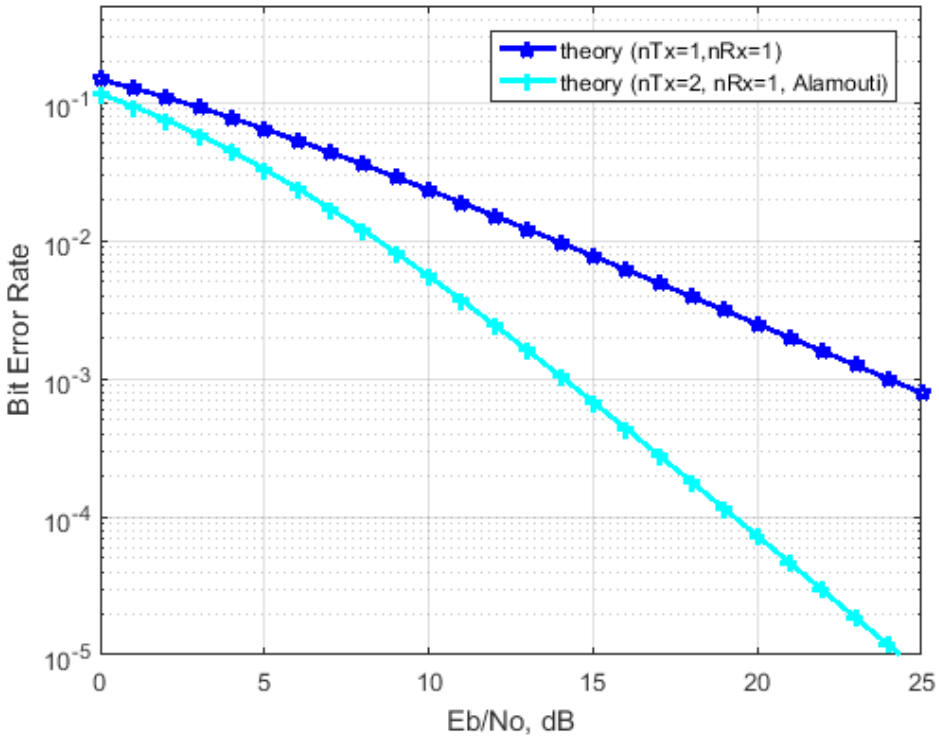

Figure 4: Impact of STBC on BER (Rayleigh Fading)

The benefits from Alamouti STBC are depicted on figure 4 for an uncoded case in a Rayleigh Fading environment. In low SNR regions (< 10dB Eb/N0), a gain of 2dB to 3dB can be observed when using STBC codes. At higher SNR regions, even higher gains are possible.

From the antenna point of view, an implementation of two RX antennas could add some additional gains to the overall system performance even for systems that do not deploy STBC on the transmitter side.
In summary, the total reachable gain on PHY-layer could be in the range of 5dB to 6dB by combining an improved channel coding scheme with enhanced antenna techniques. This gain can be translated into a range extension of up to 100% or a corresponding data rate increase.

Summary

On the physical layer the actual ETSI ITS-G5 is based on the IEEE 802.11a standard and block structure. The reachable performance is well sufficient for the use cases envisaged in day one deployment. Nevertheless, a mid-term evolution of the PHY-layer will improve the overall performance and capacity in the near future to ease the integration of additional ITS services into the system and will enhance ETSI ITS-G5 and the US Wave system to the state of the art V2X communication technology, which outperforms competing V2X system proposals in a robust, ad-hoc as well as safety V2V and V2I communication in a spectrum efficient way.
The improvements proposed in this article will lead to a significant performance gain with a limited complexity increase. The reached performance gains could be used

- *To increase the data-rate by using higher order modulation schemes,*
- *To increase the communication range,*
- *To reduce the interference potential by reducing the packet size and thus the duty cycle of the transmission,*
- *To improve the robustness and reliability of the system,*
- *To improve the capacity of the system in the sense of simultaneously supported ITS stations.*

The proposed solutions are all available in the existing set of IEEE 802.11 standards and could be specified using references to the corresponding parts of the IEEE 802.11p standard. These proposals also demonstrate the capability of the system to evolve and remain adapted to actual developments in the field of communication technologies.

References:

[1]
IEEE 802.11™-2012: "IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications".

[2]
Takayuki Shimizu, Hongsheng Lu, John Kenney , "Preliminary Comparison of Suitability of IEEE 802.11p and LTE-V2X for V2V Safety Applications", ITS World Congress 2016

New CAR 2 CAR Members

by Sonja Eickmann, CAR 2 CAR Communication Consortium

Otto-von-Guericke-Universität Magdeburg

Type of Member: Development Member

Type of Business: *The Working Group Embedded Smart Systems (Faculty of Computer Science) contributes competences in the area of sensor and feature failure models in the C2C-CC. Based on an abstract representation failure impairing observations can be evaluated for individual applications at design-time as well as at run-time. This research is driven by distributed applications in automotive and robotic scenarios.*

Toshiba Electronics Europe

Type of Member: Associate Member

Type of Business: *Toshiba Electronics Europe (TEE) is the European electronic components business of Toshiba Corporation, which is ranked among the world's largest semiconductor vendors. TEE offers one of the industry's broadest IC and discrete product lines including high-end memory, microcontrollers, ASICs, ASSPs and display products for automotive, multimedia, industrial, telecoms and networking applications.*

UL Underwriters Laboratories

Type of Member: Associate Member

Type of Business: UL is a global independent safety-science organization with a worldwide team sharing a passion to make the world a safer place. Today, UL also aims to enable Trust in the digital society as our life and our cars are increasingly connected. For over a century we have been innovating in methodologies to increase safety and security, with a focus on emerging technologies. UL fosters safe living and working conditions for people everywhere through the application of science to solve safety, security and sustainability challenges.

WORKING GROUP NEWS

Latest news from Sub Working Group Powered Two Wheeler (PTW)

by Hennes Fischer, Yamaha Motor Europe N.V

The Sub Working Group Powered Two Wheeler (PTW) with BMW Motorrad, Honda, Yamaha, KTW AG and Kawasaki Motor Europe N.V. worked together with other C2C-CC members such as Continental and IAV to complete the scrutiny of CAM and DENM messages.
The group has formulated a report to highlight the differences in certain messages between cars and motorcycles:

BSP not including motorcycle requirements

This study resulted in a request for change in the Basic System Profile (BSP), highlighting that other requirements will apply to vehicle types other than cars (i.e. motorcycles). Currently, only cars are defined in the BSP and trucks and motorcycles are not included as separate categories. This may cause discrepancies in the BSP as soon as we look at these other vehicle types. In order to combine forces, the PTW group wishes to liaise with a future truck group, once established.

Triggering conditions

Day 1 applications also bear a challenge regarding triggering conditions and the group is about to finalise the report on differences between cars and motorcycles. The next steps both on CAM/DENM messages and Triggering conditions will be to discuss these finding and proposals in WG Application and further feed it into C2C-CC relevant groups also in view of future ETSI work on next generation CAM/DENM definitions.

Motorcycle Antenna Performance

As reported in last year's newsletter, antenna performance bears a challenge for motorcycles. The group worked together with C2C-CC antenna specialists from CETECOM and IMST on the definition of motorcycle antenna criteria. The goal is to set requirements for PTW antenna performance and to evaluate these criteria in the test lab.

The characterisation of the antenna pattern of a motorbike was conducted by CETECOM in an SAR (Semi Anechoic Room) in order to receive close to reality data. Outcome is, according to CETECOM, that total radiated power of horisontal plus vertical polarisation averaged in four defined sectors (forward, left, right and backwards) might be the right 'Test plan and assessment concept for day 1'. The suggested procedure is similar to the C2C-CC Sub WG, however, considering different limits.

More in depth results are available in the investigation report delivered by Dr. Nevermann from CETECOM in Essen.

Measurement of antenna pattern at CETECOM.

ITS at the World Radiocommunication Conference 2019 (WRC'19)

by Bettina Erdem, Continental, and Friedbert Berens, FBConsulting Sarl, on behalf of the Working Group COM-COSP

Introduction

*On a world-wide level the International Telecommunication Union (ITU) is a specialised agency for information and communication technologies of the United Nations. The ITU Radiocommunication Sector (ITU-R) is responsible for preparation of the designation of global radio spectrum among the Nations through an international treaty. As part of the process the World Radiocommunication Conferences (WRC) are held every three to four years as the final decision step in the definition of coordination rules. It is the task of WRC to review, and, if necessary, revise the **Radio Regulations**, the international treaty governing the use of the radio-frequency spectrum and the geostationary-satellite and non-geostationary-satellite orbits. The international treaty is usually signed by around 160 of the 193 Nations which are members of the ITU. Revisions are made on the basis of an agenda determined by the **ITU Council**, which takes into account recommendations made by previous world radiocommunication conferences.*

The general scope of the agenda of world radiocommunication conferences is established four to six years in advance, with the final agenda set by the ITU Council two years before the conference, with the concurrence of a majority of Member States.

*Under the terms of the **ITU Constitution**, a WRC can:*

- *revise the **Radio Regulations** and any associated frequency assignment and allotment plans;*
- *address any radiocommunication matter of worldwide character;*
- *instruct the **Radio Regulations Board** and the **Radiocommunication Bureau**, and review their activities;*
- *determine **Questions** for study by the **Radiocommunication Assembly** and its **Study Groups** in preparation for future Radiocommunication Conferences.*

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*On the basis of contributions from administrations, the **Special Committee**, the Radiocommunication Study Groups, and other sources (see Article 19 of the Convention (Geneva, 1992)) concerning the regulatory, technical, operational and procedural matters to be considered by World and Regional Radiocommunication Conferences, the **Conference Preparatory Meeting (CPM)** shall prepare a consolidated report to be used in support of the work of such conferences (**see ITU web page [1]**).*

As a result of the WRC-15 in Geneva an agenda item (AI1.12) for the WRC-19 covering ITS has been established. The scope is to consider possible global or regional harmonised frequency bands for the implementation of ITS including the band 5.8/5.9GHz.

Agenda for the 2019 World Radiocommunication Conference

*1.12 to consider possible global or regional harmonized frequency bands, to the maximum extent possible, for the implementation of evolving Intelligent Transport Systems (ITS) under existing mobile-service allocations, in accordance with Resolution **237 (WRC-15)**;*

Figure 1: WRC'19 Agenda Item 1.12

Agenda item 1.12

Until the WRC-15 and during the WRC-15 no cooperative ITS specific spectrum decisions have been taken by the ITU-R. During the WRC-15 the APT (Asian Pacific Telecommunity) has proposed a new Agenda Item (AI1.12) for the upcoming WRC-19 to investigate the potential of a world-wide harmonisation of the ITS spectrum with a particular recognition of in the 5.8GHz and 5.9GHz band.

In addition, the work in this Agenda Item should support the co-existence investigations related to the discussion of a possible RLAN 5GHz extension band under Agenda Item 1.16 of the WRC19. In Figure 2 the development of the new Agenda Item 1.12 for the WRC-19 from the initial proposal to the approval during the WRC-15 is depicted.

Originally the agenda Item 1.12 on ITS harmonisation has been initiated in 2015 by Japan via the APG to the World Radio Conference 2015. The activities in the preparation work toward the WRC-19 are led by the Japanese delegation. Currently the main contributors in the discussion on ITU-R level are Japan, US, China and Germany.

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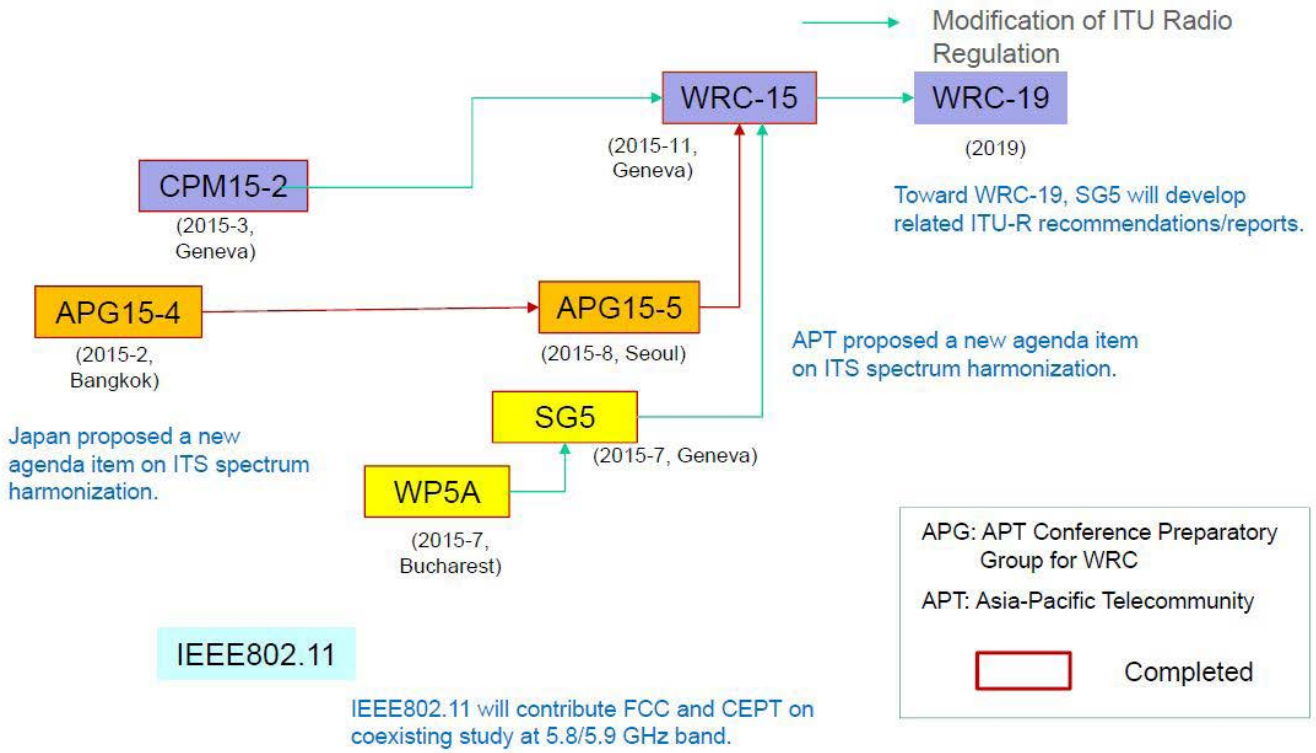


Figure 2: Development towards the new ITS Agenda Item 1.12 for WRC-19

Structure of work and Schedule

In the preparation process for the WRC-19 different Study Groups (SG) in the ITU are involved with the main charter to develop the decisions to be taken during the conference. For the development of the Agenda Item 1.12 and 1.16 the responsible SG is the ITU-R Study Group 5 (ITU-R SG5, Terrestrial Services) which is covering all questions related to terrestrial services except for broadcasting services.

The SG5 is split into four working groups called Working Party (WP):

- *WP 5A (Mobile Land Radio > 30MHz and Amateur services)*
- *WP 5B (Maritime, Aeronautical and radiodetermination services)*
- *WP 5C (Fixed Wireless systems and other systems below 30MHz)*
- *WP 5D (IMT-Systems)*

As part of SG5 the WP5A is responsible for the topics of land mobile radio systems (with the exception of International Mobil Telecommunication (IMT) which is handled in WP5D) and amateur radio services. WP5D is the main driver for the world-wide spectrum designations and requirements for future mobile radio systems called IMT-2020 (e.g. 5G). In preparation of the WRC-19 the Working Parties meet around 2 times per year for 2 weeks in a row mostly in Geneva, Switzerland. The next WP5A meeting will be held between 22 May and 1 June 2017.

Some further meetings of WP5A are planned:

- *19th meeting [November 2017]*
- *20th meeting [May 2018]*
- *21st meeting [November 2018]*
- *22nd meeting [May 2019]*

Inputs to the WRC preparation could usually be done directly via the responsible national authority. There are several regional groups which are considering common views and proposals as regionally agreed proposals towards the ITU process of WRC preparation:

- *Asian Pacific Telecommunity (APT)*
- *Arab Spectrum management group (ASMG)*
- *African Telecommunications Union (ATU)*
- *Inter-American Telecommunication Commission (CITEL)*
- *Regional Commonwealth in the field of Communications (RCC)*

From the European side inputs to the ITU-R level discussions are prepared by the CEPTs Conference Preparatory Group (CPG) where common European positions for the 48 CEPT member countries are developed. These positions are important inputs to the discussions during the preparation and the final decision taken by WRC-19. The topics relevant to C2C-CC are prepared on the working level in the CPG Project Team D (CEPT PTD).
In the European position finding the CEPT coordinator for a specific Agenda Item has an important role to play by collecting, guiding and consolidating the different national positions. Furthermore, the CEPT coordinators are the main international contact points for the other regional regulatory organisations and have access to their consolidation processes and corresponding conferences. In addition, the CEPT Coordinator will speech in the name of all 48 CEPT Members during the WRC. It has been agreed that the C2C-CC, ACEA, CLEPA will support the two CEPT co-coordinator positions for the Agenda Item 1.12 (ITS). Currently, Ms Bettina Erdem from Continental holds one of these important positions as delegate of Germany, and Ms Andrianilana Pakotondradalo (ANFR) holds the other one as delegate of France.

The work towards WRC-19 preparation has already started, the next opportunities to be involved and to actively contribute to this work at CEPT level are:

- *CPG PTD#3 3-5 May 2017*
- *CPG19-4 04-07 July 2017*
- *CPG PTD#4 12-14 September 2017*
- *CPG19-5 09-12 January 2017*
- *CPG PTD#5 [27 February - 1 March] 2018*
- *CPG PTD#6 [12-14 June] 2018*
- *CPG19-6 26-29 June 2018*
- *CPG PTD#7 [28-31 August] 2018*
- *CPG PTD#8 [22-25 January] 2019*
- *CPG PTD#9 [07-10 May] 2019*

Conclusion

A cooperative ITS system requires a world-wide harmonised access to the spectrum resource in order to simplify the large-scale deployment. The activities on ITU level towards this goal focused in the Agenda Item 1.12 of the upcoming World Radio Conference 2019 are an excellent opportunity for the automotive industry to avoid a further fragmentation of spectrum and to facilitate the cross-border coordination and the usage of ITS in vehicles. Since several smaller ITU member states (193 members overall) use the results of the World Radio conferences as guiding inputs for their national spectrum allocation decisions the outputs of the WRC-19 will have a significant influence onto the further development of the C-ITS deployment world-wide.

The active participation of C2C-CC members in the national preparatory meetings in their home countries is needed. The continued support as CEPT coordinator (Bettina Erdem, Continental) and technical contributors (contributions generated by C2C-CC Sub-WG COM-COSP) will guarantee an important role of the industry in this overall harmoniaation process.

We would like to take the opportunity to highlight the support via personal participation at several WRC-19 conferences of the following C2C-CC members and would like to encourage others in C2C-CC to follow and to participate in at least national alignment processes of WRC invited by the national frequency regulatory authorities: Bettina Erdem (Continental), Jean-Philippe Kermoal (Bosch), Dr. Friedbert Berens (FBConsulting).

References:

[1]
http://www.itu.int/en/ITU-R/conferences/wrc/Pages/default.aspx

PROJECT ENVIRONMENT

A European template for the use case description for ITS

by Paul Spaanderman, EU-Project CODECS (Grant Agreement No. 653339)

In business, use case descriptions are used to define functionally to reach the business objectives, and therefore in general stay insight the organisation. In case of cooperative ITS, use cases have to be aligned with other stakeholder groups such as authorities and infrastructure companies.

Over the years, various different ways of specifying an ITS use case were introduced, but the varying formats didn't make it easy to compare or relate. It still can happen that similar named use cases were expected the same but had completely different objectives. The CODECS project therefore took the initiative to see whether a common way of describing an use case could be reached. CODECS held several workshops and the use case description template has been developed by cooperation with different organisations such as CEDR, POLIS and the CIMEC project over the last one and a half year. The template is created to give a common ground to allow easy alignment about ITS use cases among the stakeholders. The objective is to reach interoperability for the specific use case only and to provide freedom of choice how to realise the required applications and to differentiate in the market.

The template is based on the experience in many projects and the realisation is guided by several articles and standards (as listed below). To ensure that the use case functionally can be realised, the use case descriptions incorporate many aspects. The use case however does not need to be described completely, but only the aspects required for all stakeholders to realise interoperability of the use case. The use case description includes (see figure 1) functional expectations and system boundaries, desired functional behaviour, situations and scenarios and it can include profiling elements or reference to specific profiles. Different profiles can exist such as the BSP of the C2C-CC which supports several use cases. For the profiles there are no templates yet. The use case template is available at the ***CODECS project website****.*

References:

1. *"Defining and Substantiating the Terms Scene, Situation, and Scenario for Automated Driving" by: Simon Ulbrich, Till Menzel, Andreas Reschka, Fabian Schuldt, and Markus Maurer.*

2. *ISO/DTR 20529-1 (01-2017), Intelligent transport systems (ITS); Framework for green ITS (G-ITS) standards - Part 1: General information and use cases definition.*

3. *ETSI TR 102 638 (Draft 1.1.5), Intelligent transport systems (ITS); Vehicular Communications; Basic Set of Applications; Use case definitions.*

4. ***Results from the CODECS workshops in 2016 and 2017-02-28***

5. *The Dutch Profile Part A – Use case catalogue (01-2017)*

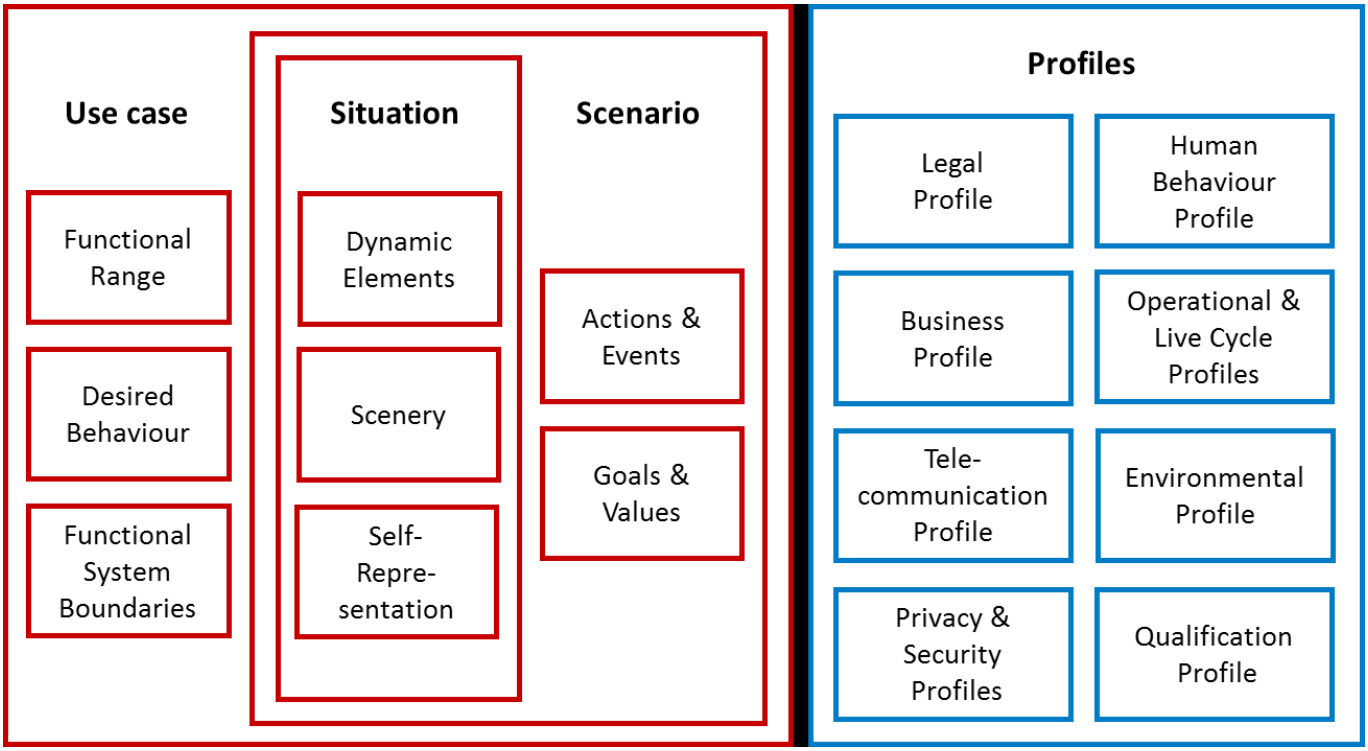


Figure 1: Aspects of the use case description.

The 5th C-ITS Plugtests™ event in Livorno showed convergence between IoT and ITS

by Sebastian Müller, ETSI

Participants of the 5th C-ITS Plugtests™ event.

Livorno cruise terminal, event headquarter close to the Old Fortress, symbol of Livorno.

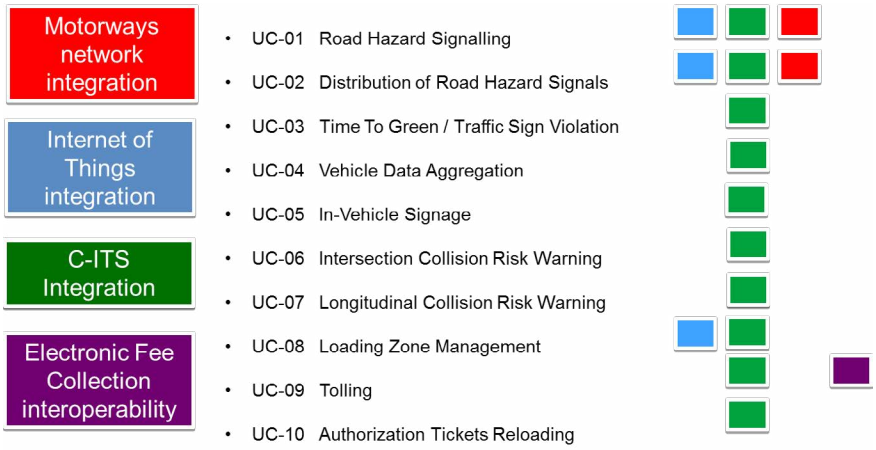
ETSI successfully held its 5th C-ITS Plugtests™ event, a two week testing event for co-operative transport systems focusing on vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications. Testing took place from 7 to 17 November 2016 around the port of Livorno, Italy. In addition, the Sea Port Innovation Conference Day was held on 16 and 17 November where attendees were able to take a demo tour on the test track. ETSI had worked for several months with its partners ERTICO, CNIT, Livorno Port Authority, Regione Toscana (Tuscan Regional Government), AVR (Livorno/Florence highway), Autostrade Tech (motorway network), and Telecom Italia to put in place the testbed. This event contributed to ITS deployment, tested interoperability of ITS equipment from all key vendors and demonstrated the convergence between ITS and Internet of Things.

This event trialed the ITS ecosystem under real life conditions from infrastructure to applications in vehicles, thus demonstrating conformance to ETSI ITS Release 1 standard and interoperability of ITS G5 radio equipment. Companies from Asia, Europe and North America had the opportunity to connect their equipment to the test infrastructure. This was a unique chance for solution providers to maximise the effectiveness of their ITS solutions in urban environments.

In Livorno, the cruise terminal was the testbed headquarter and a test-drive path was used for setup of testing equipment in the field. The infrastructure included a 10 minutes test drive on the Livorno-Florence highway, an IoT testbed enabling a set of specialised test cases on large-scale distributed sensing and actuation. The latter can be seen as a vertical realisation of M2M communications in the context of Intelligent Transport.The test site included variable message signs, traffic lights, IoT sensors and cameras as well as connectivity with the highway control center. Different topics were addressed, including road hazard signaling, traffic sign violation, intersection collision risk warning and loading zone management.

The IoT-ITS trial was presented at the ETSI IoT / M2M workshop on November 17 2016 in the ETSI Headquarters. ***A copy of the presentation is available here.***

The 5th C-ITS Plugtests™ event report is available here.



Overview of the executed Use Cases.

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C-ITS Deployment is underway Part III -3rd public workshop of the Amsterdam Group and CODECS

by Dr. Karl-Oskar Proskawetz, ITS automotive nord GmbH, Coordinator of CODECS

The 3rd workshop on C-ITS Deployment jointly organised by the Amsterdam Group and CODECS on 14 February 2017 at Amsterdam showed the impressive dynamics reached on making C-ITS Deployment in Europe happen in 2019. Complementing the European Framework of the European Commission, projects like the C-ITS Corridor and NordicWay reported their progress, and others like Intercor, the national C-Roads projects and the C-Roads Platform outlined their activities for bringing C-ITS onto the road. Gerhard Menzel presented the C-ITS Masterplan of the European Commission, which was published in November 2016. Based on the common vision developed by the C-ITS Platform, the European Commission formed its strategy and deployment framework on cooperative, connected and automated mobility.

Priorities are given to the deployment of Day 1 and Day 1.5 C-ITS services. Common security and certificate policy for deployment and operation of C-ITS will be ensured. Privacy and data protection safeguards shall be in place in 2018. C-ITS deployment makes use of a hybrid communication approach based on the existing technologies ETSI ITS G5 and cellular networks. Operation of ETSI ITS G5 and 5G has to follow the principles of seamless co-existence and complementarity. The EC will maintain the designation of the 5.9 GHz spectrum used by ETSI ITS G5 for safety-related ITS services and support measures to protect this frequency band from harmful interference.

Gerhard Menzel highlighted that the EC will make full use of the C-Roads platform as the coordination mechanism for C-ITS deployment at operational level for testing and validation, ensuring the interoperability of Day 1 C-ITS services across Europe. The C-ITS deployment initiatives shall complete their harmonised C-ITS communication profiles and publish them. Industry players are invited to use the opportunities offered by C-Roads for validation.

The national C-Roads projects, Intercor and the C-ITS corridor outlined their pre-deployment sites, addressed use-cases, planned activities and timelines. In 2016, the NordicWay pilots already started their operation. The C-ITS Corridor is recognised as the first implementation of C-ITS activity at least in Europe with strong liaison to SCOOP, the Amsterdam Group, the C-ITS Platform and C-Roads. The road infrastructure profile for Day 1 Use Cases and their scenarios is agreed among the three countries Netherlands, Germany and Austria. First test cycles with the security solution are planned to start in March 2017. Freezing HW and SW requirements, and finalising open issues on spectrum, security, privacy and compliance assessment were discussed to overcome the critical paths to C-ITS deployment.

More than 50 experts from 14 European countries, representing research institutes, authorities, OEMs, suppliers, cities and ITS associations, joined the workshop at Schiphol Airport in Amsterdam.

Torsten Geissler, Chairmen of the Amsterdam Group, gave the introduction to the workshop and highlighted the latest activities in the Amsterdam Group.

The more than 50 participants of the workshop appreciated very much the up-to-date and comprehensive information and opportunity for direct networking with speakers and actors.

All presentations are available for download on the CODECS Website.

AMSTERDAM GROUP

Get It In On The Road, Get It In the Vehicle.

CODECS

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

US NHTSA published Notice of Proposed Rulemaking (NPRM)

by John Kenney, Toyota

On December 13, 2016, the US National Highway Transportation Safety Administration (NHTSA) published a long-awaited Notice of Proposed Rulemaking (NPRM). NHTSA is the agency within the US Department of Transportation (DOT) that regulates passenger vehicle safety. In the NPRM they propose to require Dedicated Short Range Communication (DSRC) technology in new light vehicles, specifically to send and receive Basic Safety Messages (BSMs) to enable vehicle-to-vehicle (V2V) collision avoidance applications. In this brief report we will review the motivation for a mandated deployment, timeline for this NPRM and an eventual regulation, and the main content of the NPRM.

During the more than one decade during which DSRC technology has been a subject of industry research, development, and testing, it has been recognized that deployment would follow a different model from more common technical advances. This is due to the cooperative nature of vehicle-to-everything (V2X) services, for which the value of equipping a vehicle depends on the number and placement of other devices with which the vehicle may interact. Successful V2X communication also requires interoperability based on a common set of protocols. US DOT recognized several years ago that a mandated DSRC deployment could accelerate penetration and safety benefits, and also ensure interoperability.

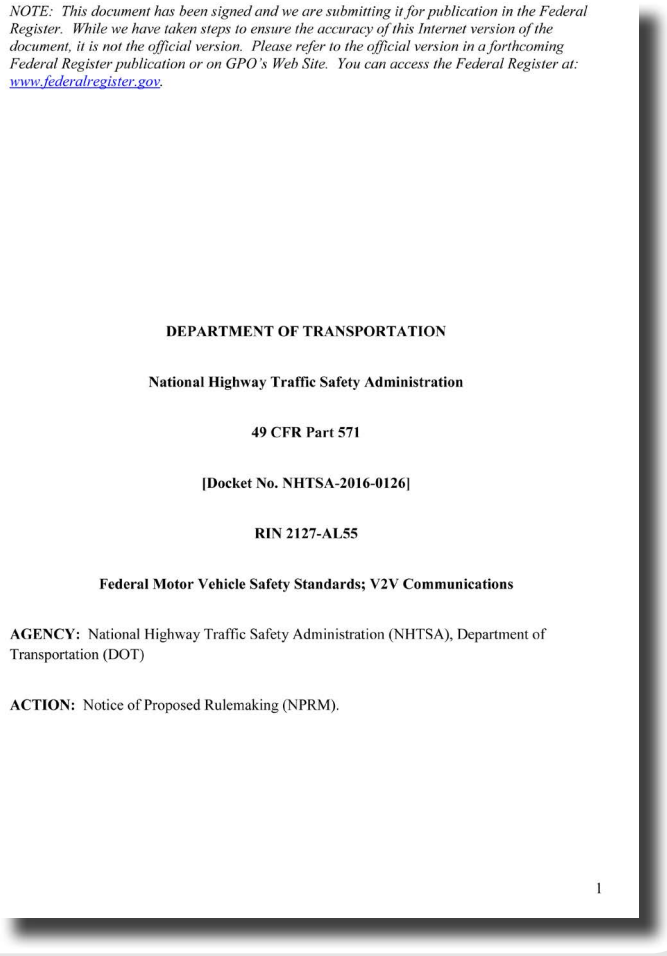
In 2012-13 US DOT conducted a large-scale trial using almost 3000 DSRC-equipped vehicles operating for one year in normal driving. Data collected during the trial was analysed and used in simulations that allowed NHTSA to estimate the benefits of a DSRC V2V mandate. In February 2014 NHTSA announced an intention to pursue a mandate. In August 2014 NHTSA released an Advanced NPRM (ANPRM) and a "V2V Readiness" report, providing insight into their longer term intentions. They also estimated they would be prepared to release a full NPRM in 2016. During 2015 the IEEE and SAE DSRC standards committees updated all of the standards relevant for DSRC BSM communication. US DOT completed the draft NPRM in December 2015 and submitted it for review within the US Government. Permission to publish the NPRM was obtained after almost one year, a longer than usual review period, probably because of concerns about spectrum sharing (currently under consideration in the US) and DSRC security, among other issues.

The NPRM is open for public comment until April 12, 2017. Any individual, group, or company may provide comments, and many DSRC stakeholders and outside interests are expected to do so. NHTSA will consider the comments and then decide among several possible next steps. It could issue a final rule, withdraw the proposed rule, or publish a supplemental NPRM for further comment. We can expect most of NHTSA's work to be conducted internally, without much public notice until decisions are made. NHTSA suggested in the NPRM it might take until 2019 to adopt a final rule. The effective date of the requirements in the rule would begin two years after adoption, likely in 2021, which will give automakers time to design the DSRC V2V systems for their new vehicles. The first year of enforcement will start a 3-year phase-in period. During the first year the NPRM proposes to require at least 50% of new cars from each manufacturer to be equipped, rising to 75% in the second year, and 100% in subsequent years.

The proposed rule focuses on the Basic Safety Message specified in SAE standard J2735, and the associated requirements for sending that message as part of the DSRC protocol suite specified in the following standards: IEEE 802.11, the IEEE 1609.x series, and SAE J2945/1. The closest analogues to the BSM in the European C-ITS standards are the Cooperative Awareness Message (CAM) and the Decentralized Environmental Notification Message (DENM). The NPRM also suggests that "alternative (non-DSRC) technologies" could be used to convey the BSM if they meet performance and interoperability requirements, including the capability to send and receive BSMs inter-operably with DSRC devices.

The NPRM specifies that under the mandate the BSM would be transmitted on 10 MHz channel 172 in the DSRC band plan (5855-5865 MHz), which is consistent with current DSRC rules specified in Federal Communications Commission (FCC) regulations. But, the NPRM also recognises the current FCC proceeding to explore allowing unlicensed devices to share the DSRC spectrum on a non-interference basis. If the FCC proceeding results in a modified band plan such that channel 172 is no longer the preferred BSM channel, the NHTSA rule could be modified.

While the rule would require both transmission and reception of the BSM, the reception requirements are limited to those associated with channel congestion mitigation. The NPRM does not propose to require receivers to implement any specific collision avoidance applications, though clearly NHTSA believes automakers generally will do so for competitive reasons. Those applications would be proprietary to each automaker. NHTSA does, however, retain the right to mandate a minimum set of applications if automakers do not generally implement them on their own. ***Next page ►***



NOTE: This document has been signed and we are submitting it for publication in the Federal Register. While we have taken steps to ensure the accuracy of this Internet version of the document, it is not the official version. Please refer to the official version in a forthcoming Federal Register publication or on GPO's Web Site. You can access the Federal Register at: www.federalregister.gov.

DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Part 571

[Docket No. NHTSA-2016-0126]

RIN 2127-AL55

Federal Motor Vehicle Safety Standards; V2V Communications

AGENCY: National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT)

ACTION: Notice of Proposed Rulemaking (NPRM).

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The two most likely applications would be Intersection Movement Assist (IMA) and Left-Turn Across traffic (LTA). These two applications form the basis for most of the benefit analysis in the NPRM. They were selected because they are less likely to be supportable by vehicles that only use their own sensors (e.g. radar, camera). NHTSA's analysis shows that in a fully deployed light vehicle fleet those two applications alone would likely save between 955 and 1321 lives per year. Applying BSM data to other crash scenarios, perhaps in combination with self-sensor information, would presumably add to the benefits. NHTSA's cost estimate is $135 to $301 per vehicle in 2051 (30th year of a mandate), including amortized cost of the security infrastructure, measured in 2016 dollars. The range reflects certain variables, the largest of which is whether the automaker deploys a 1-radio or a 2-radio DSRC system.

The NPRM is quite lengthy and detailed, and we cannot go into any great detail in this brief report. Of course, commenters can suggest changes to the proposed rule. NHTSA specifically asks for comments on several such alternatives, including: alternatives to required received BSM authentication, alternatives to required Misbehavior Detection, and an "if equipped" alternative to the mandate itself. Under the if-equipped approach, automakers would not be required to equip their vehicles with DSRC BSM capabilities, but any vehicle that is optionally equipped would be required to meet the requirements specified in the NPRM. To be clear, NHTSA proposes to mandate DSRC equipment, and to include specific authentication and Misbehavior Detection requirements, but they specifically request comment on their decisions in these areas.

The NPRM only proposes requirements related to the BSM, and does not address the many other DSRC applications that have been the subject of the US DOT Connected Vehicle research program, including V2I, V2P and Cooperative Automated Driving.

In summary, NHTSA has taken an important step to require DSRC Basic Safety Message capabilities in new light vehicles within a few years. Comments are now being collected, and we can expect the process leading to a final rule to take up to two years. If a final rule is adopted, we can expect the deployment requirement to phase in after another two years, with all new vehicles equipped approximately six years from now. Of course, voluntary deployment is available to any automaker in the period before a mandate takes effect, and we have already seen announcements to this effect.

Announcements

by Sonja Eickmann, CAR 2 CAR Communication Consortium

ITS World Congress 2017 in Montreal

ITS World Congress 2017
Montréal

Under the theme "Integrated Mobility Driving Smart Cities", the 24th ITS World Congress will take place in Montreal, Canada, from 29 October to 2 November 2017. The congress is produced by ITS America in conjunction with ITS Canada and co-organized by ITS Europe and ITS Asia-Pacific, and is expected to attract more than 10.000 intelligent transportation professionals. It will focus on how transformative transportation and integrated mobility is the epicenter of Smart Cities critical infrastructure connectivity. Participants will learn how cities across the globe are using technology to individualise urban solutions. Exhibitors will showcase their leadership and innovation for improved systems delivered to city's citizens for a better, more equitable quality of life. The ITS World Congress brings together global leaders in intelligent transport systems to showcase and evaluate the latest innovative concepts, active prototypes, and live systems. Academics, researchers, policymakers, businesses, entrepreneurs, investors, implementers, and the media will engage in robust discussions and spirited debates as to how this rapidly changing and ever-expanding industry is addressing the very real challenges facing the mobile, connected societies today and in the future. Find more information on the ***ITS World Congress website****.*

hypermotion in Frankfurt – new trade fair for the transport systems of tomorrow

The boundaries between logistics, mobility, infrastructure and transport are falling. New, networked, integrated and inter-modal systems are being created. To reflect these changes and to discuss their impact on the economy and society, the Messe Frankfurt (Germany) has launched the new trade fair Hypermotion. This event will be the first independent platform with digital transformation in the mobility and transport sector as the superordinate theme.
The goal of Hypermotion is to become the new leading trade fair for intelligent transport systems of the future. The product groups of Hypermotion combine the core elements of the present and future traffic systems. The seven thematic areas - Connectivity (basically ITS as known to date), Monitoring & Transparency, Data Analytics & Security, Hypermodality, Sustainability, Synchronized Logistics and Smart Regions – are all interlinked and encompass the core elements of the transport systems of both today and tomorrow: infrastructure, equipment & services and applications. ***Find more information on the hypermotion website****.*

Transport Research Arena 2018 in Vienna

From 16.-19. April 2018, the Transport Research Arena, Europe's biggest Transport Research Conference, will take place in Vienna. Under the topic "a digital era for transport solutions for society, economy and environment", about 3.000 international experts will discuss the latest research results and future developments in mobility and transport. The Transport Research Arena (TRA), initiated in 2006, takes place every two years in another European city. The TRA is supported by the European Commission, the European Technology Platforms ERTRAC, ERRAC, WATERBORNE as well as CEDR and ALICE. ***Find more information on the TRA Website****.*

Announcements

by Sonja Eickmann, CAR 2 CAR Communication Consortium

CIMEC Final Conference on 18 May in Brussels

The European Coordination and Support Action CIMEC (Cooperative ITS for Mobility in European Cities) presents its main findings during the final project conference on 18 May 2017 in Brussels, Belgium. All interested stakeholders are invited to register for this event, which provides an occasion to learn about views and requirements of cities regarding C-ITS. Furthermore, European activities, national programmes and plans for cities to move towards C-ITS deployment will be subject of the discussion. More information about the CIMEC final conference and the registration form can be found on the ***CIMEC website****.*

Automobile Barcelona: Connected Hub

From 11 to 21 May 2017, the Automobile Barcelona will take place at the Fira de Barcelona Montjuicin Venue in Barcelona, Spain. Automobile Barcelona will offer two interconnected events at the same show: While the motor show (11 to 21 May) will address the automobile industry's latest models and developments, the Connected Hub (11 and 12 May) will bring together technology, mobility and new business models around the Connected Car. The Connected Hub will have three different areas, each tackling, from different angles, the technology and solutions that are already carving out the future of automobiles and mobility worldwide: It includes a congress lasting two days in which the industry's leaders will share their vision and strategy. The programme of talks will include the connected vehicle, safety, smart mobility and the ecosystem of alliances between the various technology and automobile industries. The Innovation Square will present the latest developments of the connected car, digital transformation, geolocalisation and cyber safety, platforms, 3D printing, infotainment, consultants, big data and components. Furthermore, a big demo area will demonstrate company's and brand's most advanced technology applied to vehicles. This big open space will be a showcase in which trade visitors, the specialist technology and motor press and the end consumer can witness the sector's latest developments in an interactive and practical way. The Motor show opens its doors from 11 to 21 May, with 11 and 12 May reserved for professional visitors and the press. The Connected Hubs takes place on 11 and 12 May for professional visitors. Further information can be found on the ***Automobile Barcelona Website****.*

12th ITS European Congress in Strasbourg

"ITS Beyond Borders" is the main theme of this year's ITS European Congress, taking place from 19 to 22 June 2017 in Strasbourg, France. The Congress provides the opportunity to exhibit and demonstrate state of the art ITS solutions. All ITS stakeholders can come together, discuss and make the necessary contacts to move initiatives forward and to develop their business. The conference, exhibition and demonstrations take place in and around the Strasbourg Convention and Exhibition Centre (SCEC). The conference programme with plenary, executive and special interest sessions, stakeholder workshops, technical/scientific and commercial paper sessions, discussions and project dissemination sessions is shaped by six topics: 1. Mobility services – from transport to mobility, 2. Next generation goods delivery, 3. Transport networks evolution, 4. Connected and automated transport, 5. Satellite technology applied to mobility and 6. ITS and the environment. Furthermore, unconventional concepts and new visions for ITS can be submitted in the category "Freestyle". Technical visits will lead to the Strasbourg Autonomous Port, the IoT-LAB and the Strasbourg Traffic Management Centre. More information about the Congress and the registration can be found on the ***ITS European Congress Website****.*

Imprint

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