



**CAR 2 CAR**  
COMMUNICATION CONSORTIUM

### *CAR 2 CAR Communication Consortium – Cooperative ITS deployment*

*by Søren Hess (General Manager, C2C-CC)*

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*A Happy New Year to all members and stakeholders in the CAR 2 CAR Communication Consortium.*

*I thank you very much for all your activities and support to the consortium during 2010. We have achieved a lot – but the good news is of course the year 2011 will be even more successful.*

*The CAR 2 CAR Communication Consortium is currently developing*

*plans for deployment of cooperative ITS. We have agreed on day-one applications and timescales for implementation. The day-one applications and use cases are in focus for the standardization activities and coordination with road operators and road authorities as well as traffic management organizations have been initiated. Plans for a phased implementation and deployment with increasing use case complexity are being developed.*

*It is important to synchronise the standardization activities – field operational tests –, deployment plans and initiatives between the different stakeholders as well as the global deployment plans and activities in particular in EU, USA and Japan but also in other countries and regions such as China, India etc.*

*The C2C-CC has a strong focus on safety services and applications based on Vehicle-2-Vehicle but also Vehicle-2-Infrastructure Communication in the 5.9 GHz band. Environmental applications and traffic efficiency will, however, be a natural element of cooperative ITS deployment. Therefore Public Private Partnership between the automotive industry and traffic management infrastructure stakeholders is of utmost importance.*

*The C2C-CC has for a number of years taken the lead in development, test and validation of the ad hoc technology with applications, facilities, communication and security. We have done a number of successful tests both independently and as part of research projects. Major field operational tests in Germany and France will be operational in 2011 and 2012 and similar FOTs will be established in other European countries. Also results and experiences from field tests in other parts of the world including USA will be available in the ongoing planning of cooperative ITS deployment. Within the EU the ITS Directive has been agreed and a number of regulatory activities have been initiated based on the ITS Directive and Action ►*





► Plan including the important ITS Committee. It is important that the automotive industry within the CAR 2 CAR Communication Consortium as a major stakeholder in cooperative ITS is directly involved in the decision process for ITS deployment. A Public Private Partnership between the regulators, the infrastructure stakeholders and the automotive industry is necessary to achieve the early deployment we are all looking for.

At the successful CAR 2 CAR Forum held at the Renault premises in Paris end November 2010 we arranged workshops based on use cases based on the results of the C2C Working Group activities during 2010. A key factor is the important Working Group Roadmap for Deployment we established last year. We have developed a technical roadmap for deployment and identified open issues which we are now responding to. We also had contributions and discussions with other

stakeholders in cooperative ITS – European as well as international – confirming that the CAR 2 CAR Communication Consortium is a key stakeholder in deployment of cooperative ITS. 2011 will be a very active year for the CAR 2 CAR Communication Consortium – a number of new members have applied for membership and the consortium will lead the developments towards deployment of cooperative ITS in Europe and worldwide.

## Membership News: Standardisation Mandate M/453

by Søren Hess (General Manager, C2C-CC)

The standards developments for cooperative ITS is currently based on the standardization Mandate M/453 from the European Commission. The mandate is the framework for the standardization activities within ETSI TC ITS as well as in CEN TC 278 and other standards organizations on cooperative ITS.

In the joint Mandate report from April 2010 CEN and ETSI agreed on a split of responsibility and division of work between the two organizations. The communication standards including network and transport layer - access layer and the Management and security area are being developed within ETSI TC ITS together with application standards for Vehicle-2-Vehicle Communication and most of the facility layer standards as well as testing and interoperability standards and specifications.

The CEN responsibility covers standards for infrastructure and traffic management requirements together with the related Vehicle-2-Infrastructure Communication applications.

Within ETSI TC ITS we see a very high activity level in development of the relevant standards strongly supported by the C2C-CC where in particular the suppliers play a very central role in the ETSI Working Group activities.

In particular the communication standards as well as the network and transport protocol standards including IPv6 are developing very satisfactory even if there are still a number of standards to be drafted, agreed and adopted. The standardization is supported by ongoing contacts with other SDOs including ISO TC 204 WG16 and IEEE as well as IETF.

Also the security standardization is well underway in close cooperation with IEEE and a new Specialist Task Force (STF) on security standardization starts in February 2011.

Standardization for application and message sets as well as facility layer standards with the important CAM and DENM standards that have now been published are also very well underway. The standardization for V2V applications are developed in close cooperation with the relevant ISO TC 204 WG14 group and cooperation is also established with the TC 204 WG3 in particular on standardization for Local Dynamic Maps. Further support and activities within ETSI is necessary to achieve the objective of providing the minimum set of standards for cooperative ITS by July 2012. Close cooperation with CEN is also important to cover the infrastructure part of the standardization and a coordination group with

strong representation from the European Commission, CEN and ETSI has been established to coordinate the ongoing activities. For the standardization of applications in particular the coordination of message sets is important and discussions between CEN and ETSI on this topic will be initiated at the next meeting beginning February 2011. Contacts have also been initiated with SAE in order to provide for global harmonization of message sets as relevant.

International coordination of standards activities have also been initiated in order to achieve global interoperability of cooperative ITS with global standards.

It is my expectation that ETSI TC ITS with the continued strong support from the C2C-CC as well as other stakeholders will be able to provide the required standards on cooperative ITS within the timeframe of July 2012. This is of course important for the early deployment of cooperative ITS planned by the C2C-CC.

The yearly international workshop arranged by ETSI TC ITS will this year take place in Venice 9-11 February 2011 – with strong contributions from European and international stakeholders and of course from CEN and ETSI TC ITS as well. On further standardization activities see the ETSI web site [www.etsi.org/its](http://www.etsi.org/its)

## International workshop of cooperative ITS in Busan

by Søren Hess (General Manager, C2C-CC)



In connection with the ITS World Congress in Busan, Korea in October 2010 the 6<sup>th</sup> international workshop on cooperative ITS was arranged by the CAR 2 CAR Communication Consortium.

The workshop was developed in close cooperation between European Commission, US-Department of Transportation and the MLIT from Japan with the C2C-CC in a leading role.

The workshop agenda included the following sessions

- Harmonization of standardization for cooperative ITS

- Coordination of vehicle communication based on cooperative system demonstrations and tests with lessons learned from recent regional activities

- Sustainability services support to vehicle communication based cooperative systems;
- Role of aftermarket/nomadic devices to support initial deployment of vehicle communication systems

The workshop was arranged with a panel discussion without formal presentations but based on a voting arrangement where participants voted via mobile phones on particular questions/dilemmas related to the agenda item in question. The voting results displayed on the screen formed the basis for a lively discussion among the workshop participants.

To further stimulate discussions two groups of presentations were organized

- Information about detailed planning and envisaged results from large scale FOTs
- Public Private Partnership as a pathway to deployment

The discussions were very lively and the workshop was very much appreciated by the more than 80 participants from all over the world. It was a very good start of the ITS World Congress and led to further discussions and contacts during the following days of the ITS World Congress in Busan.

There was a general agreement that the C2C-CC should continue to play a leading role at future international workshops – next one in Orlando October this year.



On 23<sup>rd</sup> and 24<sup>th</sup> November 2010 the 4<sup>th</sup> CAR 2 CAR Forum was organised at the Renault Square Com in Paris. Christian Balle (Director of safety advanced projects, Renault) welcomed about 150 participants. In his speech he pointed out that for a fast deployment the CAR 2 CAR Communication Technology has to be embedded in vehicles and additionally aftersale offers are necessary. Concerning the needs of a wide-ranging deployment of Vehicle-2-Infrastructure Communication Technology and the cooperation of road operators are mandatory.

After the welcome session the first day of the CAR 2 CAR Forum was divided in three sessions. The presentations of the first plenary session held by Juhani Jääskeläinen (EC), Timo Kosch (BMW Group), Hans-Joachim Schade (CEN) and Søren Hess (General Manager, C2C-CC) highlighted the European focus on cooperative ITS.

The second plenary session "Towards Cross-Border Cooperative Transport" contained the presentations "Cooperative Traffic Management and the aspects of Road Operators" held by Gerd Riegelhuth (Hessisches Landesamt für Straßen- und Verkehrswesen), the "Testing and Demonstration of Cooperative Systems in France" by Gerard Segarra (Renault) and a contribution about the European Cross-Border Field Operation Tests project "Drive C2X" held by Matthias Schulze (Daimler).

The third plenary session "Towards Cooperative System Deployment" started with a service provider's view on the "Deployment of Cooperative Services" held by Russ Shields (Ygomi).

Hermann Meyer (Ertico) gave a lecture on the "Stakeholders Aspects of Cooperative System Deployment" and Søren Hess complemented the session with a presentation about the "Cooperative System Deployment and Open Issues".

The scientific programme of the first event day was rounded up by a guided tour of the Renault

eco<sup>2</sup> exhibition. Shortly after the exhibition the participants used the bus transfer from the Renault Square Com to the evening event in the Atelier Renault situated directly at the gorgeous christmassy adorned Champs-Élysées.

After the welcoming speech of Emmanuel Bonbon



Figure 1: Session 1 – European Focus on cooperative ITS

(Head of Driving assistance, connectivity & multimedia engineering department, Renault) all participants concluded the day in a relaxed atmosphere with a delicious dinner.

The workshop sessions on the second day of the Forum were organised use case oriented. Based on given use cases the related aspects and issues of the C2C-CC Working Groups Application, Communication, Security, Simulation and Roadmap were presented and discussed.

The first workshop about the "Hazardous Location Warning (HLW)" use case was chaired by Markus Straßberger (BMW Group) and split in the topics:

- Introduction / Motivation by Thomas Kuhn (Continental)
- Application logic by Lan Lin (Hitachi)
- Communication pattern by Roberto Baldessari (NEC)
- Security measures

by Hervé Seudié (Bosch)

- Simulative support by Björn Schünemann (FhI Fokus)
- Deployment by Markus Strassberger (BMW Group)
- Discussion

The second Workshop chaired by Tim Leinmüller (DENSO) was realised on the basis of the Greenlight Optimal Speed Advisory (GLOSA), Energy Efficient Intersection Control (EEIC) and Intersection Collision Warning (ICW) use cases.

- Introduction / Motivation by Christian Wewetzer (Volkswagen)
- Application logic by Robert Mänz (Audi)
- Communication pattern by Achim Brakemeier (Daimler)
- Security measures by Florian Friederici (FhI Fokus) and Hendrik Schweppe (EURECOM)
- Simulative support by Tobias Lorenz (DLR)
- Deployment by Christian Wewetzer (Volkswagen)
- Discussion

Within the third Workshop "Key Components of the CAR 2 CAR Communication Consortium System" Klaus Jaschke (DLR) gave an insight in the current status and structure of the Simulation Handbook approach.

The C2C-CC WG SEC topic of Elmar Schoch's (Volkswagen) presentation was the "Public Key Infrastructure" and pointed out basic and additional requirements for C2C PKI as well as certification and the major results in 2010 and ongoing work of the WG SEC. With the presentation "Congestion Control on ITS-G5" by Achim Brake-meier (Daimler) the objectives of Decentralized Congestion Control (DCC) and the architecture were elucidated. At 5 p.m. the second day of the event ended and the CAR 2 CAR Forum 2010 was successfully closed. ►



Figure 2: WG Workshop 2 – EEIC & GLOSA



► During the event the CAR 2 CAR member's exhibition in the Espace Millésimes of the Renault Square Com presented several posters about research results, hardware communication units and communication models as well as a demonstrator of Audi. The simulator of the DLR with a set up of the Modular and Scalable Application-Platform for ITS Components (MoSAIC) was presented providing an implementation of GLOSA (Green Light Optimal Speed Advisory). Human drivers had the possibility to test MoSAIC with the GLOSA application by driving in one of the three driving simulators (one static simulator and two simple desktop workspaces) at the same time in the same city simulation scenario.



Figure 3: CAR 2 CAR member's exhibition

All participants took advantage of the breaks, lunches and social events for lively discussions and networking.

All presentations of the CAR 2 CAR Forum and pictures of the event are provided for download on the internal website of the C2C-CC.

## COMeSafety2

by Gunnar Heyms (C2C-CC)



The Project Communications for eSafety2 (COMeSafety2) has been accepted by the European Commission. It is funded within the seventh Framework Programme, Subprogramme Area ICT for Mobility of the Future, with the subject index Innovation and Technology Transfer. The project duration is 36 months, starting in January 2011.

Participants of the project are the Bundesanstalt für Straßenwesen, Centro Ricerche Fiat, Daimler, ERTICO, Søren Hess, ITS Niedersachsen, Renault, Transportation Sustainability Environment, Volvo and BMW Forschung und Technik as Project coordinator.

The COMeSafety2 project proposal aims at the coordination of the activities towards the realisation of cooperative systems on European roads. The project will support and coordinate the development of the necessary standards un-

der the ITS standardisation mandate at ETSI and CEN. It will support the mutual validation and exploitation of programme results under the EU-US cooperation agreement by active participation in task forces and organisation of workshops. The project will push the finalisation and implementation of the European ITS Communications Architecture, taking up from the COMeSafety Support Action in FP6.

The project will target international and especially intercontinental synergies of FOTs. The project will provide a platform to bring together all stakeholders to agree on technical solutions and will aim at roadmaps that will offer ways how to realize and implement research results in a developing real-world cooperative system environment. It will support the creation of the corresponding research agendas to address open technical issues, explore new fields and develop further innovations. It will promote technical advances, standards and agreements on

cooperative systems to the stakeholders and a wider professional public, supporting the Intelligent Car Initiative and the eSafety Forum.

**Programme type:**  
Seventh Framework Programme

**Subprogramme Area:**  
ICT for Mobility of the Future.

**Contract type:**  
Coordination and support actions

**Start date:** 2011-01-01  
**End date:** 2013-12-31  
**Duration:** 36 months  
**Project Reference:** 270489  
**Project cost:** 2,973,730 EURO  
**Project Funding:** 2,300,000 EURO

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## Working Group Application

by Lan Lin (Hitachi)

During the year 2010, WG APP has been focused on the support of the standardization within ETSI TC ITS. A series of important specifications were successfully published in 2010 within the ETSI TC ITS WG1:

- ETSI DTR 102 6387-2, "Intelligent Transport Systems (ITS); Vehicular Communication, Basic Set of Applications, Definition"
- ETSI DTS 102 637-1, "Intelligent Transport Systems (ITS); Vehicular Communication, Basic Set of Applications, Part 1: Functional requirements"
- ETSI DTS 102 637-2, "Intelligent Transport Systems (ITS); Vehicular Communication, Ba-

sic Set of Applications, Part 2: Cooperative Awareness Basic Service" (CAM)

- ETSI DTS 102 637-3, "Intelligent Transport Systems (ITS); Vehicular Communication, Basic Set of Applications, Part 2: Decentralized Environmental Notification Basic Service" (DENM)

Furthermore, the C2C-CC WG APP has contributed to ETSI TC WG 1 to define a work program related to the application and facility layers as required in the EU mandate M/453. WG1 is now following this program to initiate and work on other work items.

Within 2011, this support will be continuing from C2C-CC WG APP. Furthermore, C2C-CC WG APP has a plan to work on other new messages in order to support the BSA development. This new set of message specifications will be mainly information provided from infrastructure side (I2V message), such as traffic light status, road topology etc. As CAM/DENM, the WG APP will take inputs from different EU and national R&D and FOT projects, consolidate them and provide the specifications to the standardization body.





Working Group Roadmap for Deployment

by Christian Wewetzer (Volkswagen)

**Introduction**

People working on driver information and assistance systems share a common vision for the future: vehicles will be able to handle many – if not all – driving tasks efficiently and on their own. To achieve this vision, vehicles do not only have to “see” (e.g. with help of radar sensors) and “feel” (e.g. through ESP sensors), but have to “talk”: autonomous environmental sensors must be complemented with wireless communication among vehicles.

The required transition from autonomous driver assistance systems to cooperative systems possesses significant challenges for the automotive industry. First, this novel type of system requires organizational changes in form of new departments in the companies. New processes around standardization, development and testing must be established, where car manufacturers have to find a balance between highly intensive collaboration towards common standards and competitive differentiation. Second, the complexity of cooperative systems makes calculation of investments as well as prediction of ROI a hard problem; on the other hand, these numbers are required as every modification of a vehicle is subject to detailed ROI analysis. Third, the special user experience of cooperative systems especially in the rollout phase calls for new forms of marketing. And fourth, the technical complexity inherent in a communication technology is high. Deployed in-vehicle communication devices must be stable and secure over a lifetime multiple times longer than that of consumer devices, and should in principle be compatible with more complex devices that are introduced at later development stages.

Given these challenges, the following major requirements arise for deployment of the first Car-2-X Communication System:

- 1) The system should be as simple as possible.
- 2) The system should enable a variety of functions to compensate the significant investments to be made during the further deployment process.
- 3) The system should be forward-compatible in the sense that it should be able to perform more advanced cooperative functions in collaboration with future Car-2-X Communication Systems.

**The Four-Phase Deployment Roadmap**

With respect to the aforementioned requirements, C2C-CC WG Roadmap for Deployment has developed a four-phase roadmap for deployment (shown in Figure 1). The idea is to start deployment with a basic system and to gradually extend the complexity of the system and its

use cases over time, founding on the experience gained with the first systems.

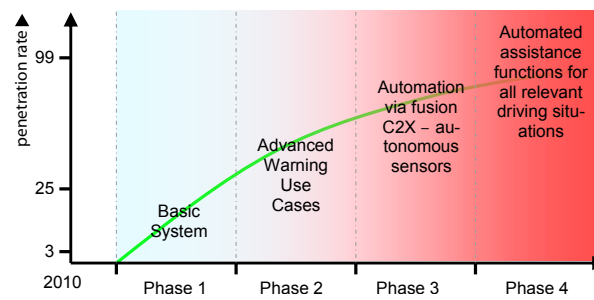


Figure 1: Four Deployment Phases

**Phase 1: The C2C-CC Basic System**

During 2010, WG Roadmap in cooperation with the other technical C2C-CC Working Groups has detailed phase 1, elaborating a set of day-one use cases (listed in Table 1) and a first collec-

a working market for cooperative systems. With proposing the basic system it is not the intention to develop a closed, standardized device (which would be hinder competitive differentiation). The proposal is to integrate at least the outlined building blocks into a deployed system, so that this system is cooperative in the sense that it generates and forwards the relevant messages at the right place, with appropriate information quality, and at the right time.

**Outlook**

To move forward towards a fast and wide deployment of the first systems, it is necessary to identify the required work tasks for deployment in

Use case	Domain	Stakeholders outside automotive industry involved
Emergency Vehicle Warning	Safety	Essential
Emergency Brake Light	Safety	-
Stationary Vehicle Warning, V2X Rescue Signal	Safety	-
Traffic Jam Ahead Warning	Safety	-
Pre-Crash Support (Transmit Vehicle Mass)	Safety	-
Traffic information & recommended itinerary; enhanced route guidance & navigation	Efficiency	Support
Hazardous Location Warning	Safety	Support
Road Work Warning (stationary and moving)	Safety	Essential
Signal Violation Warning	Safety	Essential
Green Light Optimal Speed Advisory	Efficiency	Essential

Table 1 - Day One use cases

tion of required system building blocks (depicted in figure 2) that form a basic system for day-one operation. The goal was not to develop a “Swiss Army Knife” for Car-2-X Communication, but a system of manageable complexity, bringing considerable traffic safety and efficiency benefits.

The outlined system may be regarded as an open in-vehicle platform, in the sense that the disseminated information is available to other recipients like vehicles or other stakeholders such as traffic infrastructure

providers. The underlying messages are based on open standards which have the potential to be extended if stakeholders should feel the necessity.

Recall from the described challenges that competitive differentiation is essential to establish

detail, and to organize this work. Fundamental milestones in this pre-development phase include finalizing the standards, establishing modes of collaboration with other stakeholders, as well as production and evaluation of the first complete system prototypes.

Positioning & Time (incl. minimum data quality requirements)	Relevance Checking	C2CCC PKI (Certificate Distribution and Revocation)
Message Formats (e.g. CAM/DENM)	Vehicle Data Provider (incl. minimum data quality requirements)	
Rules for Message Generation / Revocation	Service Management Support	Plausibility Checking (coarse, e.g. to prevent replay attacks)
Geo-Based Addressing	Congestion Control	Privacy via time-varying Pseudonyms
Geo-Routing Protocol	Multi-Channel Support	Secure Communication (Signatures, Certificates)
IP-based Addressing	Service Management	In-Car Security Levels (Level of Protection)
ETSI ITS G5 European Profile Standard	Congestion Control	
Multi-Interface Support	Multi-Channel Support	

Figure 2 - Building Blocks of the Basic System

WG Roadmap is looking forward to this challenging task, and will – in close cooperation with the other C2C-CC Working Groups and committees – proceed towards a detailed work plan, as this plan is an essential step towards successful deployment.



## Working Group Security: Public Key Infrastructure

by Norbert Bißmeyer (Fraunhofer SIT)

In order to protect message integrity, as well as the privacy of involved drivers, security is a major requirement for all applications used in the Car-2-X (C2X) Communication. Due to the wireless communication and the decentralized character of the ad-hoc network attacks are inevitable and are hardly detectable by central entities. Especially, safety critical applications which trigger their actions based on data received from other network entities are relying on the trustworthiness of the exchanged messages.

As a consequence, the C2C-CC Working Group Security follows the widely accepted approach of a Public Key Infrastructure (PKI), which provides digital certificates that are used to sign messages in the C2X Communication.

In order to meet the specific C2X requirements, the C2C-CC has developed a flexible and scalable PKI concept which is aimed towards distribu-

tion and revocation of digital certificates to all communication entities in the C2X Communication network. In this proposal, great importance has been devoted to all processes to interoperability with other PKIs (e.g. in the U.S.) and extensibility for future additional implementations. The proposed PKI bases in general on ITS certificate formats defined in IEEE 1609.2, but may use for long term identifies also classical certificate formats such as X.509. Furthermore, the operation of the PKI entities (i.e. Root CA, Long-Term CA and Pseudonym CA) is designed in a most flexible way so that countries, organizations (e.g. from the telecommunication sector or classic CA providers) and OEMs can be integrated in a loose hierarchy. Due to the necessity of cross-border integration in a European C2X-PKI political issues are considered as well as possibly different privacy regulations in the

participating countries. A flexible choice of parameters in the certificate distribution process (i.e. number of valid certificates in parallel, maximum lifetime of certificates, preloading interval) allows strengthening of communication security as well as adaption for future installation. This flexibility has also a positive effect on the cost estimation in the deployment phase of C2X Networks regarding certificate management and distribution.

In order to evaluate the operability of the general concept a prototypical implementation of the PKI is already integrated in the field operational test sim<sup>TD</sup>. Additional mechanisms and process proposed by the C2C-CC will be tested and evaluated in further European projects. A possible candidate could be the project PRESERVE.

## Working Group Simulation: Handbook for Vehicle-2-X Cooperative Systems simulation

by Alexander Gerdaldy (Bosch)

As announced in the last newsletter, the Working Group simulation has compiled a first draft of the handbook for Vehicle-2-X Cooperative Systems simulation.

In cooperation with many partners, the current version of the handbook already comprises many aspects of the V2X simulation domain and will be further extended (see figure 1).

The Working Group set up a use case template providing a first overview of the investigated use case through the description of objectives, boundaries, stakeholders, etc. This template is filled for the three use cases "Green Light Optimal Speed Advisory (GLOSA)", "Intersection Collision Warning (ICW)", and "Hazardous Location Notification (HLN)" which will be used to proof the approach of the handbook in the future.

There is an ongoing work towards requirement specifications for the three use cases. These specifications are needed to know the corresponding Performance Indicators (PIs) and to choose the right simulators providing the necessary data for these PIs.

For the handbook, we already set up a general list of Performance Indicators and analysed the use case specific PIs. These use case specific PIs will be revised in the future using the requirements specifications.

Furthermore the handbook comprises descriptions of simulation architectures and simulation models for communication simulation (including wireless communication), traffic simulation (including driver models) and application simu-

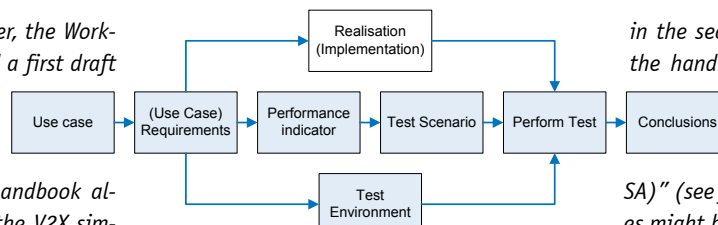


Figure 1: Process within the handbook

lation and how they interact to build a joint V2X simulation system.

A first XML based scenario template is given in the handbook. This template allows for tool-independent scenario descriptions on different levels of detail. It will be extended in the future to offer detailed model specific settings and to assure the completeness of the template with regard to the different simulation models needed.

The Working Group simulation has contributed to the CAR 2 CAR Forum 2010 in Paris. With-

in the second day workshop we demonstrated the handbook approach for the two use cases "Hazardous Location Notification (HLN)" and "Green Light Optimal Speed Advisory (GLOSA)" (see figure 2) and showed which challenges might be addressed by which simulations.

In the case of GLOSA, the Working Group presentation focused on the simulations for energy saving aspects and driver acceptance studies. The preparation of that forum led to very valuable discussions and improved the collaboration between the different Working Groups.

In the next time we will extend the handbook to illustrate and to follow the handbook approach starting with the uses cases, describing the requirements and performance indicators ending with guidelines how to choose the right simulations and simulators to test V2X systems.



Figure 2 - GLOSA use case



## ITSSv6 Presentation

by Thierry Ernst (Inria)

IPv6 ITS station stack for Cooperative Systems Field Operational Tests (ITSSv6) is a project funded by the European Commission, running for three years from February 2011. Its objective is to develop a reference open-source implementation of the IPv6 networking layer of the ITS station (ITS-S) standard specified by ETSI TC ITS and ISO TC204 (CALM) and optimized for the deployment of Cooperative Systems. The IPv6 stack is developed in relation with and made available to third parties, in particular to Field Operational Tests (FOT) projects of Cooperative Systems, that need IPv6 for Internet-based communications. The target third parties that will be considered in priority are European FOT DRIVE-C2X and FOTs and their national counterparts, such as SCORE@F in France around Paris and the Test Site Norway in Trondheim. However, any third party will be allowed to make use of this IPv6 ITS station stack. Selected third parties will be trained and assisted in the use of IPv6 and configuration of the IPv6 ITS station stack. A limited amount of budget is provisioned so that the code could be adapted to specific hardware, Linux variants and communication media, in particular 802.11p and 2G/3G radios.

Cooperative Systems applications that rely on internet communications (road safety, traffic efficiency and value-added services) require performant and secured IPv6 communications. Performance and security of the IPv6 communications will be on the agenda of ITSSv6. The project takes as an input communication software developed by earlier projects, mainly FP6 CVIS and FP7 GeoNet. Additional IPv6 features are integrated into the IPv6 stack and brought to IPv6-related ETSI and ISO work items to complement the current ITS station standards.

**Methodology:** An open **User Forum** will gather key members of the ITSSv6 consortium and representatives of prospective third parties (national and European Cooperative Systems projects, industry consortium, etc.). It will be created from the start of the project and collect technical requirements. Technical requirements are then provided to the ITSSv6 consortium to ensure as much as possible that the IPv6 ITS station stack delivered by ITSSv6 complies with specific project and FOT needs (networking features and configuration, hardware drivers, kernel version, features, performance, etc.). ITSSv6 will define the IPv6 networking requirements based on the input of the user forum and from

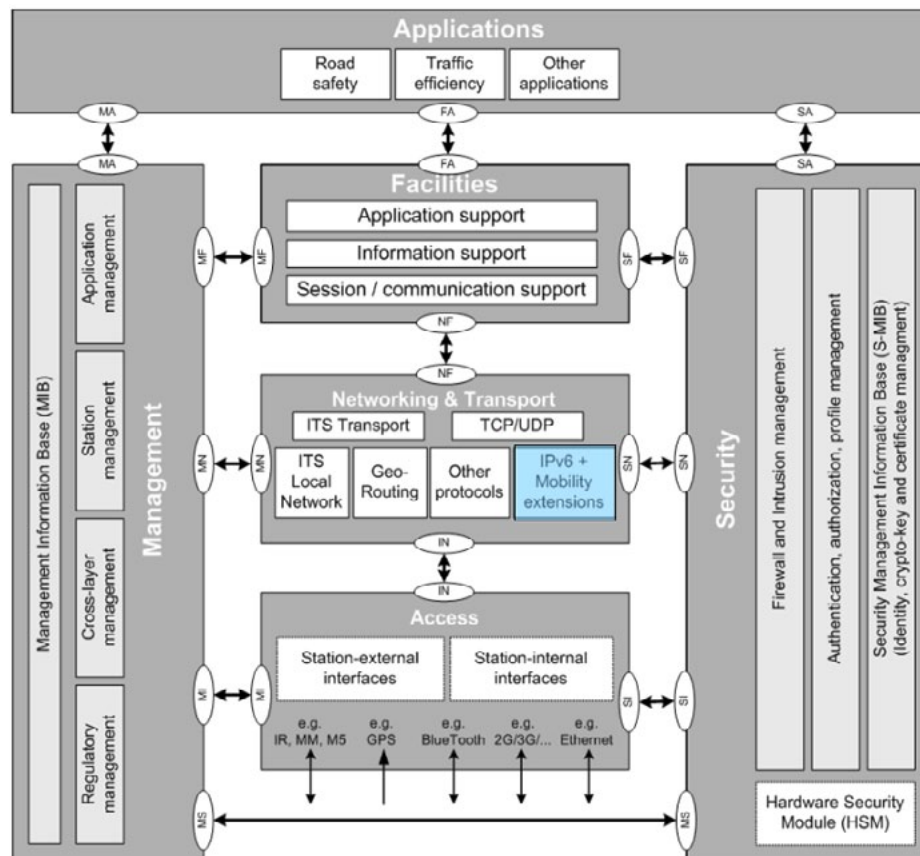


Figure 1: ISO TC204 WG16 / ETSI TC ITS - ITS Station Reference Architecture and Scope of ITSSv6

the analysis of typical Cooperative System applications, existing FOTs and projects, and existing features in ITS station communication architectures (ISO CALM, ETSI). IPv6 features will be proposed and classified into three classes: short term, medium term and long term. **Short term** (Class-1) features will be immediately implemented, validated and contributed to FOTs and projects in a first release and specifications will be proposed to SDOs. **Medium term** (Class-2) features will next be implemented, validated and contributed to FOTs and projects in a second release and specifications will be proposed to SDOs. **Long term features** (Class-3) will just be analysed and specified at a research level as recommended future extensions. An **intel-based basic open platform (BOP)** convenient for the development of an **open-source IPv6 ITS station stack** and for the porting exercise will be selected. The development work performed under **Linux** will be **based on the IPv6 software implementation provided by FP6 CVIS** (CVIS COMM SP). Relevant modules provided by FP7 **GeoNet** (IPv6 GeoNetworking) and ANR **MobiSeND** (IPv6 security for mobility) will be fully integrated into a first release of the IPv6 ITS station stack working with a minimum set of wireless medium (802.11p and 2G/3G) and

hardware (Intel-base). All ITSSv6 developed features will be integrated and validated on the BOP. Portability of the IPv6 ITS station stack to **specific target platforms (STP)** defined by selected third parties (FOTs and projects) will be analysed and documented. Actual porting to STPs will be decided according to the complexity and the amount of available resources within ITSSv6. The IPv6 ITS station stack will be publicly released at least twice. The performance of each released IPv6 ITS station stack will be evaluated on the BOP both indoor and on vehicles under realistic field tests. A major contribution of ITSSv6 is to train third parties in IPv6 and in the use of the IPv6 ITS station stack and to help with the integration to various platforms. Third party users will be trained appropriately to IPv6 in general and the use of the IPv6 ITS station stack in particular. Dissemination will be done at all levels: science, standardisation, industry, authorities, and the Cooperative Systems community at large in various form (newsletter, scientific papers, technical papers, workshop, discussion forum).

**Organization:** The work that needs to be performed to achieve ITSSv6's aims and objectives is divided in six work packages (WP). The technical development follows the implementation ►



► cycle: specification (WP2), development (WP3), validation and evaluation (WP4). To ensure a good organisation of the project and exploitation of the project results, partners are committed to a number of tasks directed to third parties using the output of the project, from providing them with documentation and training material to IPv6 specifications and software to porting the results to specific target platforms (WP5) and dissemination in FOTs, fora, SDOs, industrial and academic communities (WP6). The WPs are defined as follows:

- **WP1 – Project Management:** To ensure the efficiency of the project management with respect to technical objectives as well as efficient administration and financial coordination (progress report, cost statements, review preparation).
- **WP2 – System Specification:** To identify and specify missing IPv6 protocols and fea-

tures needed in the ITS station communication architecture

- **WP3 – Implementation & Integration:** To implement and integrate new IPv6 features into a reference open-source IPv6 ITS station stack.
- **WP4 – Validation & Evaluation:** To validate the technical correctness and to evaluate the performance of the integrated IPv6 ITS station stack produced by WP2.
- **WP5 – Porting to FOTs:** To port the IPv6 ITS station stack release to various platforms deployed in FOTs, to produce documentation and to assist FOTs in using IPv6 (theoretical assistance) and using the IPv6 ITS station stack (technical hands-on assistance) to specific FOT needs.
- **WP6 – Dissemination:** To ensure the proper dissemination of ITSSv6 output to relevant Cooperative Systems stakeholders.

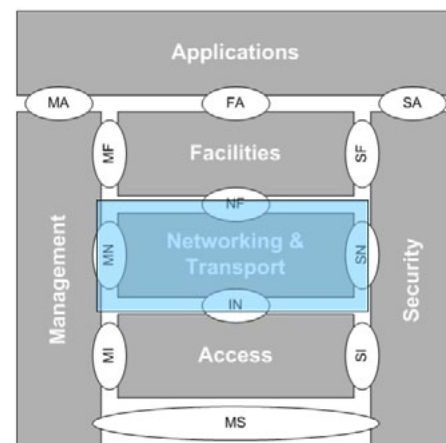


Figure 2: Scope of ITSSv6 work

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