CODECS – Coordination and Support for C-ITS in Europe

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Abstract

CODECS is a Coordination and Support Action for Cooperative Intelligent Transport Systems funded by the European Commission in the Horizon 2020 programme. Communication of vehicles directly amongst each other and with road infrastructure enables a plethora of information and warning services for a safe, sustainable and comfortable future mobility. These services require new cooperations not only between private and public sector in order to provide seamless experience for the end-user. The issues to be tackled jointly are of very different nature ranging from fundamental technical and organisational aspects to legal concerns. Therefore lively exchange between the new collaboration partners is essential. In order to support this and to foster C-ITS deployment in Europe CODECS was set up as a nodal point for the various involved stakeholder groups.

The CODECS consortium, consisting of road operators, car manufacturers, automotive industry experts as well as user and cities representatives, aims at pooling the main actors' preferences and requirements for a concerted C-ITS roll-out across Europe. The inventory phase was the starting point when the numerous pilots and deployment initiatives and private key stakeholders were brought together and the current plans, concepts and ideas were gathered. Numerous documents were analysed and several workshops organised. The experiences of this knowledge exchange and the constant survey of the C-ITS landscape in Europe were used in the consolidation phase to come up with guidelines and recommendations. This report summarises the CODECS activities.

Keywords: Cooperative Intelligent Transport Systems, C-ITS, C-ITS deployment, CODECS, Coordination and Support Action.

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Nomenclature

BSP Basic System Profile
CAM Cooperative Awareness Message
C-ITS Cooperative Intelligent Transport System
CODECS Cooperative ITS Deployment Coordination Support)
DENM Decentralised Environmental Notification Message
EC   European Commission
I2V   Infrastructure-to-Vehicle
PT   Public Transport
V2I   Vehicle-to-Infrastructure
VRU Vulnerable Road User
TEN-T Trans European Transport Network

1. Introduction

Deployment of vehicles communicating directly amongst each other and with road infrastructure is expected for 2019, enabling a plethora of information and warning services. In order to let traffic participants experience the benefits of cooperative intelligent transport systems and services (C-ITS) seamlessly and get services for a safe, sustainable and comfortable future mobility operational, the best possible combination of public and private motivations is crucial.

The required collaboration of the involved stakeholders comprises various technical and organisational aspects, e.g. coordination between front runners, aligned roadmaps and roll-out plans for later deployments, guidance and a stable framework for additional deployments starting in later phases.

1.1. About CODECS

A Coordination and Support Action (CSA) serving this goal is CODECS (COoperative ITS DEployment Coordination Support). Funded by the European Commission (EC) in the Horizon 2020 programme and running from May 2015 to April 2018, CODECS was set up as a nodal point for the various stakeholder groups involved in C-ITS deployment in Europe. Since 2016, these efforts are complemented by the CEF-funded C-Roads platform and project family, which was also started with a focus on service harmonisation for use cases with infrastructure involvement.
The CODECS consortium, consisting of road operators, car manufacturers, automotive industry experts as well as user and cities representatives, aims at pooling the main actors' preferences and requirements for a concerted C-ITS roll-out across Europe. The various aspects are summed up in three key areas, which are presented in the single sections of this report:

- Coordination of Initial Deployment Activities: Networking European deployment initiatives to conceptualise a blueprint for deployment (V2I/ I2V),
- Road Mapping for Cooperative ITS Deployment in Europe: Consolidating stakeholder interests in a use-case-centric roadmap, and
- Strategy Coordination Support: Supporting strategy coordination regarding open issues.

For all of them, a crucial step is the interactive discussion with the stakeholder network – not only for starting the inventory on the technical as well as strategic deployment status, but also for making the consolidated results and developed guidelines available and providing them for discussion by high-level decision makers. This guiding three-step-process represented in all work packages is illustrated in Fig. 1.

1.2. CODECS – General Actions and Accomplishments

Main task of CODECS is sharing all gained insights, and transferring the gathered knowledge is especially important towards the end of the project lifetime. As an essential first step, CODECS established a diverse
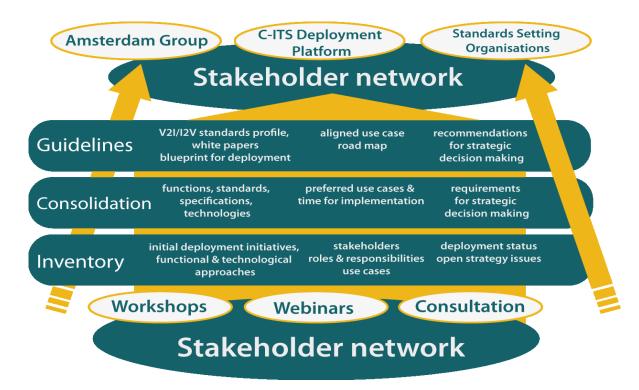
Fig. 1 CODECS work process for all work packages

stakeholder network for stimulating a transparent information flow and exchange of lessons-learned from initial deployment.

Through several workshops, webinars and personal consultation, CODECS delivers an inventory on the status and various implementation approaches, including technologies, functional specifications, roles and responsibilities of different stakeholders as well as issues for strategic decision making. While the rather technical facets have been addressed and progressed in corridor projects and pilots all over Europe, the more strategic dimension to C-ITS deployment has been brought up for discussion in high-level councils, e.g. the C-ITS Platform of the EC.

CODECS' main contribution is facilitating knowledge exchange in the whole C-ITS arena, on a horizontal level, e.g. between pilots and organisations, as well as vertically, e.g. between EC, strategic management level and actual operational implementers. CODECS has organised in total more than 15 workshops with a typical attendance of 50-60 experts from 15 European Member States for knowledge exchange between pilots and deployment initiatives while workshops with a more dedicated technical scope have attracted a more focused audience of 25-30 experts. The cross-sector participation has involved at minimum road administrations, road operators, automotive industry, ITS supplier industry, ITS Nationals, automobile clubs and city representatives. Bringing together public and private interests in the best possible way, CODECS also developed a cross-sector roadmap for C-ITS deployment in Europe and helped to establish a shared view and vision, as communicated by the EC in its "strategy on cooperative, connected and automated mobility".

2. Coordination of Initial Deployment Activities

The number of C-ITS pilots and deployment initiatives in the Member States of the European Union has increased significantly. They aim at complementing the deployment plans of the automotive industry with Infrastructure-to-Vehicle/Vehicle-to-Infrastructure (I2V/V2I) applications. The plurality of initiatives poses the challenge of interoperability. While the initial applications of Vehicle-to-Vehicle communication (V2V) and the underlying message formats (CAM/DENM) are covered by the basic system profile (BSP) of the CAR 2 CAR Communication Consortium, the profiling of standards for the initial services with infrastructure involvement has not yet been completed. The CODECS work package 2 is devoted to close this gap by establishing and supporting the cooperation and interaction between infrastructure operators and car industry.
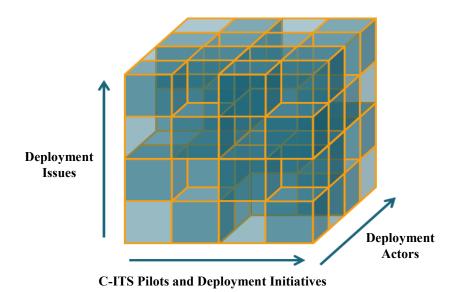
C-ITS Pilots and Deployment Initiatives

Fig. 2 Perspectives of stocktaking

The preparation of C-ITS deployment involves elements of bottom-up and top-down coordination. Different pilots and deployment initiatives have started from local and regional test beds or living labs, maturing in a mid-term perspective into long-distance corridor deployments covering substantial parts of the TEN-T core network.

2.1. Information Sharing on C-ITS Deployment Initiatives

CODECS has contributed essentially to the information exchange of European C-ITS deployment initiatives. It has been a continuous task not only to bring stakeholders together from different C-ITS deployment initiatives, but also to build the bridges to the initiatives which started during the CODECS lifetime. Especially the C-Roads Platform which spans an umbrella over a number of C-Roads pilots across Europe takes a prominent role in the European C-ITS landscape.

A comprehensive stocktaking is included in the deliverable D2.2 which represents the core of the first phase – the inventory phase – and initiates the second phase – the consolidation. It gives a comprehensive overview of the developments with regard to three perspectives, cf. Fig. 2: the different C-ITS pilots and deployment initiatives, the issues to be solved for deployment and core actors' view on C-ITS deployment.

Information sharing is a continuous task which was proven by the manifold C-ITS deployment initiatives which started during the project. In cooperation with the Amsterdam Group three workshops have been organised featuring the progress of C-ITS deployment in Europe. They attracted a large audience from a broad range of interested stakeholders. Detailed summary reports have been published on the CODECS website.
The workshop format evolved from a platform for the frontrunner projects and initiatives which made active use of exchanging their experiences and knowledge to an event where all new pilots and platforms present their progress. The growing number of pilots and deployment initiatives made it difficult to present all of them in detail. However the C-Roads Platform ensures the collaboration and constant exchange of the C-Roads pilots, so there remains the need to expand the exchange with existing and upcoming pilots and initiatives outside C-Roads.

2.2. Consolidation and Guidance

In order to help institutions preparing for C-ITS Deployment, distinct levels of "deployment knowledge" as well as the link between these levels have been considered in a deliverable on guidance for C-ITS Deployment. A broad overview of relevant aspects, normative and informative documents like standards and agreed specifications have been provided. Organisational and technical questions have been covered. Typical challenges and potential impact have been presented as well as solution approaches how to tackle the challenges as a kind of blueprint.

3. Road Mapping for Cooperative ITS Deployment in Europe

Pursuing the objective of supporting coordinated C-ITS road mapping with respect to functions/use cases enabled by V2V and V2I involves the following activities:

- Identifying the stakeholder landscape for deployment of C-ITS services,
- Collect Information about foreseen and desired use cases. This information will be conveyed into a report providing short descriptions of each of the use cases and applications. (Grouping & combining)
- Analysing applications and use cases to figure out the required support by the different stakeholders responsible for the C-ITS deployment. Consulting representatives of the different parties in order to collect their priorities for the different applications and use cases together with their expectation for the point of time for deployment. Harmonising the use cases across stakeholders. Assessing whether key technical specifications for the applications and use cases are in place or if work to create additional technical specifications for the applications and use cases is required.
- Collecting information, priorities and perspectives on C-ITS use case deployment by different stakeholders. Creating a harmonised use case road map. Rough timeline for possible deployment of basic and advances applications through different deployment phases. Identifying requirements for standardisation if not all needed standards are in place. Sharing the harmonised roadmap with the involved stakeholders to obtain feedback leading to revision of the roadmap.
- Iterating this dialogue with the stakeholders and the standards setting organisations. Updating roadmap, potentially with clear definitions of deployment phases Day One, Day Two and beyond.

To ensure involvement of relevant stakeholders in the elaboration of well-aligned roadmaps, CODECS organised a workshop on perspectives in functional road mapping. The purpose of the workshop was to get input from stakeholders for C-ITS use cases in some areas that have not necessarily been the key focus in the early work on C-ITS which was primarily driven by the automotive industry. The principal initiative of the automotive industry for the early development of C-ITS, in cooperation with some national road operators, has led to a primary focus on V2V safety use cases and V2I use cases primarily centred around the motorway scenarios.
The focus of the CODECS workshop was chosen to be on areas which have received less attention before:

- Public Transport (PT)
- Vulnerable Road Users (VRUs)
- Non Safety

The workshop brought the participants on an equal footing and succeeded in triggering an interactive discussion of potential future use cases enabled by V2X communication with international C-ITS stakeholders. The debate proved that also in the various stakeholders' perspectives there are assorted use cases benefitting PT, VRUs and Non-Safety services which need to become an integral part of C-ITS future roadmaps.

An initially harmonised use case roadmap has been compiled and published as deliverable D3.3.

4. Strategy Coordination Support

CODECS has provided strategy coordination support in two directions: On a horizontal level, CODECS has taken inventory on and consolidated the strategy status and thematically-focused open strategy issues perceived by stakeholders, being active on the technical-operational level and investing in initial C-ITS deployment in pilots and corridor projects. On a vertical level, CODECS has taken up the requirements on strategic decision making sampled from these deployment stakeholders for discussion on the strategic domain, in decision-making councils like e.g. the C-ITS Deployment Platform.

4.1. Inventory phase

Strategy coordination support started with an inventory on the state-of-the-art strategy for C-ITS deployment in Europe. CODECS partners have compiled a list of relevant strategy documents related to the deployment of C-ITS, with international, national and also regional focus. These documents were analysed with respect to the state-of-the-art as well as strategy issues needing special attention. The results of this analysis were published in

a report by mid November 2015 and were updated twice in 2016 and 2017. The updated analysis report is available on the CODECS website.

All major strategic issues which have been identified throughout the project lifetime have been addressed and discussed by either the Amsterdam Group, the Working Groups of the C-ITS Platform of the European Commission and the C-Roads Platform:

- Strategic issues brought forward by the reviewed national ITS reports discuss some technical aspects, however not in the level of detail of the C-ITS Platform or the C-Roads Platform. It is recommended that Member States give a more elaborate description in an update of their ITS reports on how these aspects are taken care of and how the Member State is connected to the EU initiatives on these topics.
- Public acceptance was hardly mentioned in the reviewed reports, but the C-ITS Platform specific Working Groups are dedicated to this topic.
- With regards to legal issues, data protection & privacy and security & certification, the strategic issues brought forward by the reviewed reports only discussed the need to cover these areas, but do not focus on more detailed aspects, whereas the C-ITS Platform Working Groups discuss such issues from a variety of viewpoints and offer solutions to a number of issues identified in these fields. In the C-Roads initiative the knowledge and experiences from the early deployment initiatives are brought together and harmonised where needed and possible.
- Concerning the topic business cases, "infrastructure investments" and "access to data" were identified as the major issues.
- The complexity of investments in urban environments was pointed out. In cities there does not seem to be one killer application but rather a set of applications that would make C-ITS a success. Facilitating procurement and providing guidance to city authorities are some of the actions that need to be taken in order to facilitate C-ITS investments in cities.
- Implementation issues can be categorised into general implementation issues and "traffic safety and efficiency" related implementation issues which are about the human machine interactions, the non-equipped user and training & awareness.

4.2. Consolidation and Guidance

Since most of the strategic issues have been covered by the working groups of the mentioned platforms, CODECS has focused on initiating activities concerning the gap issues:

- The terms "use case", "scenario" and "application" are widely used for describing future C-ITS services. However due to unclear definitions of the terms the descriptions do not fit to each other and often important aspects are not covered. For overcoming this issue CODECS organised a workshop on C-ITS use cases in order to find a common understanding of use cases as a strategic issue in C-ITS deployment. Use cases known from deployment initiatives and projects were mapped to definitions and templates for the terms use case and scenario.
- The deployment of C-ITS services in urban environment needs special attention because of its cross-cutting nature in organisation of urban traffic management. Making use of the POLIS network, several city pool workshops have been organised that provided closer insight how technology can be used to serve the needs of cities. Close relations to the H2020 sister project CIMEC have cross fertilised this debate.
- Although Phase I of the C-ITS Platform dedicated a working group to "Hybrid Communication" it was not carried forward in the second phase. CODECS has brought new energy into these discussions and organised a workshop on this topic. Very fundamental information on all dimensions and relevant aspects of Hybrid Communication were shared. This knowledge exchange led to a better common understanding of the issue. It was pursued by – and served as a basis for – a workshop at the end of Phase II of the C-ITS Platform.

5. Conclusion

CODECS has successfully promoted and supported C-ITS Deployment in Europe. It has been appreciated in its role as nodal point for all stakeholders. It has provided a top view on the dynamic C-ITS landscape, built bridges for new stakeholders and initiatives and ensured a constant exchange with existing and new platforms. Gap issues have been identified and tackled in workshops or drawn attention to. Several public deliverables and

regular newsletters on the one hand as well as workshops and webinars on the other hand have contributed to a comprehensive and sound information exchange. They are accessible through the website www.codecs-project.eu.

Acknowledgements