

DEPLOYMENT OF COOPERATIVE SYSTEMS ON THE C-ITS CORRIDOR IN EUROPE

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German, Dutch and Austrian highway operators, in cooperation with partners from the automotive industry, have launched the gradual deployment of Cooperative Systems. This allows the exchange of traffic-related information among vehicles and between vehicles and the roadside infrastructure.

Cooperative Systems support applications that can make an important contribution to improve road safety, transport efficiency and environmentally-friendly mobility. They are also considered the basis for additional services and the development of new businesses. In recent years Cooperative Systems and the underlying communication technologies have been developed, studied, enhanced and tested in numerous research projects and initiatives. Not only has this research resulted in the first set of international standards, which are the necessary technical basis for an introduction into real operation, but it has also demonstrated the benefits of this technology.

In June 2013, the national transport ministries of Germany, the Netherlands and Austria signed a Memorandum of Understanding (MoU), which marked the start of Cooperative Systems.

Figure 1: The C-ITS Corridor Rotterdam – Frankfurt/M – Vienna
Source: C-ITS Corridor



The ministries agreed:

- to develop a common launch/rollout timetable for the implementation of the first cooperative applications on highways
- to define common conventions that ensure a harmonized interface with vehicles in the three countries
- to implement roadside facilities for the first collaborative applications (see website <http://c-its-korridor.de>)

A highway corridor, extending from Rotterdam (Netherlands), via Frankfurt/M. (Germany) to Vienna (Austria), was chosen as the route for the first deployment - the so-called C-ITS Corridor (Cooperative ITS Corridor, figure 1).

STARTING WITH TWO APPLICATIONS

The Netherlands, Germany and Austria have agreed upon the introduction of two cooperative services: (1) roadworks warning and (2) improved traffic management by vehicle data (figure 2). They are part of the “Day 1” services defined by the

Amsterdam Group, a group in which representatives from European public and private road operators collaborate with the automotive industry to stimulate deployment of Cooperative ITS (see website <http://www.amsterdamgroup.eu>). Both applications have been selected because of their present relevance, as there are still many accidents related to roadworks, and with regard to the further dissemination of C-ITS technology. The applications should help to pave the way for other services, which could be added at a later date.

(1) Roadworks Warning

This service focuses on providing appropriate in-car information about roadworks, well adjusted to the needs of the approaching drivers. The service can be made operational by equipping roadworks safety trailers (see figure 2) – with a GPS and communication system. The roadworks safety trailer continuously determines its position and sends this to the back office, where it is evaluated. If available, background information about the roadworks is added and sent back to the roadworks safety trailer. The trailer transmits a warning to approaching vehicles via ETSI ITS G5 (“WiFi for the transport sector”). At the same time, the back office can provide data to a Single Point of Access, where it is made available for third parties, so that all interested providers of traffic information services are able to use data to improve their own services. Single Point of Access is, for instance, the Mobility Data Marketplace (MDM) in Germany and the National Data Warehouse (NDW) in The Netherlands.



Figure 2: Safety trailer used in Germany
Source: Hessen Mobil – Road and Traffic Management

The expected main benefits of this service are:

- Increased safety of the site personnel
- Higher traffic safety in the highway network
- Better (on-line) information on the actual position of roadworks for traffic control centres
- More reliable information for roadworks planning and management

(2) Improved Traffic Management by Vehicle Data

The Cooperative traffic management service, with the inclusion of vehicle data, aims to improve traffic management by highway operators. Vehicles send messages, for instance, to the ETSI ITS G5 unit of the roadworks safety trailer (see figure 3), which then pre-processes the data and forwards it to the traffic control centre. These messages are standardized Cooperative Awareness Messages (CAM) and Decentralized Environmental Notification by Messages (DENM). CAMs are sent continuously. They contain information about the current position of a vehicle, its speed, direction and dimensions. DENMs are sent event-driven when the vehicle detects ice, a traffic jam or a broken-down vehicle, for example.

The following benefits will be sought:

- Congestion avoidance thanks to optimized routes and network control, including environmental benefits
- Improved traffic safety and incident management
- Proliferation of C-ITS technology to make it usable for further applications

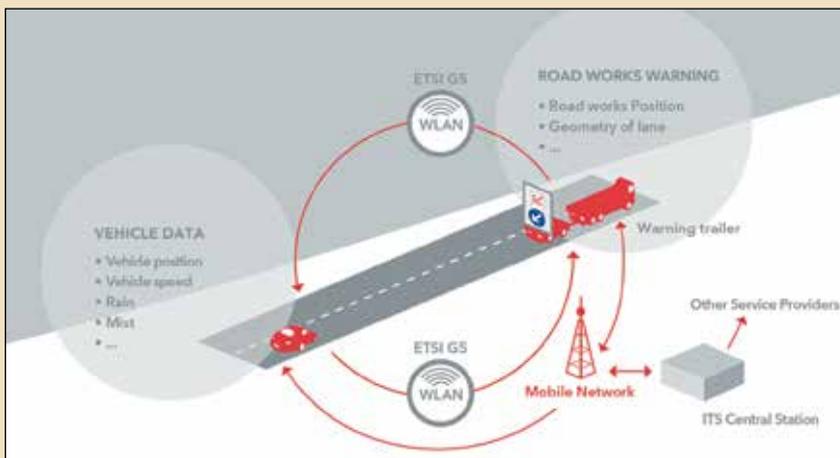


Figure 3: Schematic diagram of the first applications in the C-ITS Corridor
Source: C-ITS Corridor

CROSS BORDER ORGANIZATION

One particular challenge of the C-ITS Corridor is the effective cooperation among the three countries. Each country has its own political and legal environment, as well as different conditions in terms of infrastructure for Cooperative Systems. This results in different procedures for the conception and realization of the C-ITS Corridor.

In Germany, the partners involved - industry and the public sector - make investment decisions for the launch of Cooperative Systems from different perspectives. A concrete launch cannot be coordinated with the industry due to competition rules. This means that any party may act only in its own jurisdiction, which requires extensive coordination between the partners. The effort of voting for the first real applications for regular operation is considerable. The development and introduction of the two services is carried out in a multi-stage, iterative process. The Federal Ministry of Transport and Digital Infrastructure (BMVI) is responsible for this. The highway operators of the federal state of Hesse are carrying out the initial development and testing of the new technology. Hessen Mobil is developing prototypes for the Roadworks Safety Trailer, as well as the enhancements of the traffic control centre. After a six-month pilot phase in Hesse and the advanced technology has been optimized, the roll-out will take place in five other German federal states, which are located along the C-ITS Corridor. Subsequently the introduction will take place in the remaining federal states.

In Austria, the project ECo-AT (European Corridor - Austrian testbed for Cooperative Systems) is responsible for the joint corridor deployment. This project is led by ASFINAG, Austria's national highway and expressway operator, and is split into two distinct phases, a "specification definition and testing phase" and afterwards an actual "deployment phase."

In the first phase the system specifications are defined and a living lab for testing is set up by ASFINAG. The work progress on the specification documents is made publically available for comment through a set of four releases up to the end of 2015. With the setting up of the living lab and the finalization of the system specifications, the first phase will conclude.

In the second phase, after verifying the results of the first phase, ASFINAG will commence with the actual deployment on the Austrian part of the corridor and further sections of the highway and expressway network from 2016 onwards (see figure 4).

The EcoAT project is cofounded by the Austrian Federal Government via the Climate and Energy fund (KliEn).



Figure 4: Highway management in Austria
Source: ASFINAG

In the Netherlands, in 2013, the minister announced the “Better Informed on the Road Action Program” in which the private sector, public authorities and knowledge institutes cooperate to develop the services required for road traffic/travel information and traffic management. It outlines a strategic course of action for a period of 10 years, aimed at providing continuity and reassurance for all stakeholders.

With the program giving the overall guidance, now there are several C-ITS projects running in the Netherlands and new ones still planned. In addition to the corridor, there is a trial in Amsterdam and a shockwave control project on highway A58. So-called “tables” were established to discuss common issues with these projects. Rijkswaterstaat, the operator of the national roads, is responsible for the Dutch part of the C-ITS Corridor. It carries out the project in precompetitive cooperation with the

private sector. Compared to the two partner countries, a particular challenge with this is the relation with existing systems. On many highways there is an extensive highway management system with gantries (every 500-800 m) providing information, with which in-car messages have to be consistent (see figure 5).



Figure 5: Highway management in the Netherlands
Source: Rijkswaterstaat

In spite of the individual, national views on the C-ITS Corridor project, the three participating countries rigorously follow the objective of a consistent, cross-border system solution. Effective coordination among the ministries of transport and road operators of the three countries is ensured by strategic and operational level teams. Moreover, the project works closely with internationally established organizations and bodies. These include the European Commission (in particular the C-ITS platform), the Amsterdam Group and international standardization bodies (CEN / ISO / ETSI).

DEFINING AND BUNDLING ROLES

Cooperative Systems put new challenges on stakeholder cooperation. In comparison with conventional ITS, there is much more interaction with stakeholders in a new and emerging co-operative area. In this context, the word “cooperative” does not only refer to interacting technical components, but also to stakeholders behind the technology. For a smooth operation, closely networked and meticulously coordinated cooperation is required.

Cooperative Systems also bring change to roles and responsibilities. There will be new roles, for which appropriate actors have to be identified or new organizations will need to be created. On the other hand, there are established actors and stakeholders, who have to find a new position in the new overall cooperative structure. Actors, who were previously in no relation to one another, might also become partners because

of common objectives. The international dimension makes this change of roles and responsibilities even more complex since many roles and responsibilities can no longer be defined at the national level.

In the C-ITS Corridor, close cooperation between road operators and vehicle manufacturers takes place. This requires an important change for road operators as well as vehicle manufacturers. In their traditional roles, there was very limited contact between road operators and vehicle manufacturers. In order to reach a successful deployment, national public operators now have to cooperate with private organizations with international interests. The impact of this should not be underestimated for the C-ITS Corridor.

PRIVACY AND IT SECURITY

Other challenges are IT security and data protection, two topics which are closely linked. Both are subject to the ever-growing and complex demands of a digital society. However, they are often conflicting: while privacy ideally requires anonymity, IT security requires a review of the authenticity of messages. In order to take into account both aspects in a balanced way, the three countries have involved their respective experts and responsible institutions for data protection and IT security from an early stage.

While the Roadworks Warning application does not require special treatment according to data protection laws, the situation for the other application is different. For cooperative traffic management with the inclusion of vehicle data, an overall privacy protection concept needs to be developed. This content is closely related to the requirements of data security and is intensively pursued.

OUTLOOK

On the infrastructure side, introduction of the first applications of Cooperative Systems on the C-ITS Corridor is an important step being taken towards a new technology in Europe. It provides road operators with emerging opportunities for traffic management. Together with industry partners, such as the Car-2-Car Communication Consortium, a technological basis is being created on which new applications, as well as new roles and responsibilities, can and will be developed. This also creates the basis for further applications, such as emergency vehicle warnings, end-of-traffic-jam alerts or broken down vehicle warnings. It is expected that, in the foreseeable future, costs and benefits of Cooperative Systems will be in a favourable ratio, which will promote the additional equipment of vehicles and transport infrastructures with the appropriate technology. In this way Cooperative Systems will gradually move into the everyday life of traffic participants and will be taken for granted as car radios are now. ♦

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