Projet SCOOP
véhicules et routes connectés
connected vehicles and roads

Information letter No 8

February 2020

Co-financed by the Connecting Europe Facility of the European Union

Francisco SANCHEZ, Director of the Electronics Division, CTAG, Spain

CTAG has been involved in C-ITS in Spain for many years, and has developed the SISCOGA corridor. Can you tell us a bit more about it?

The SISCOGA Smart Corridor, managed by CTAG, is a permanent corridor where operational tests on car-to-car and car-to-infrastructure communication systems can be conducted.
The creation of this corridor was started by 2009 when activities related with C-ITS were initiated in CTAG. Counting on the support of DGT (Spanish Ministry of Traffic) since the very first moment to make it possible, the SISCOGA corridor has evolved not only in terms of areas covered by C-ITS technology but also in terms of C-ITS services available for users along this past decade.
In this sense, SISCOGA corridor is currently comprehending a proving ground in CTAG facilities, more than 150 Km of interurban roads close to Vigo city and 80 urban intersections in this location (support of Traffic Department of Vigo Council has been key here) where it is possible to test a wide set of the most relevant C-ITS services and their application in Connected and Automated Driving.
Participating as test site in a number of the most significant European C-ITS related projects (DRIVE C2X, COMPASS4D, COGISTICS,...) during these last years has allowed to keep the level of standardization always up to date, becoming the entrance door to participate now in projects like SCOOP or C-ROADS where the experience gathered is being used to collaborate on harmonizing C-ITS deployments across Europe.

What is the role of CTAG in SCOOP?

Within SCOOP, CTAG is managing the technical aspects of the participation of Spain in the X-Test activity.
In this sense, CTAG has been jointly collaborating with the other participant countries in analysing standard usage and use cases deployed to elaborate first and execute after the convenient set of X-Test scenarios to measure the level of interoperability among the different C-ITS implementations.

What are the main learnings from this cooperation?

Main learning from this cooperation is that dealing with interoperability issues at international level is mandatory for a successful and optimal C-ITS deployment. Proud of being part of what was one of the first initiatives tackling this aspect, it is now good to see how whole big projects (as C-ROADS) have come up to follow this path.

You organized a cross-test session in Vigo with French and Portuguese partners, what are the results of this session ?

From that session in December 2017, results obtained were already suggesting what was concluded after carrying out all the planned X-Test sessions. In this sense, it should be highlighted both the creation of a X-Testing framework solid enough to validate end-to-end interoperability and detect potential interoperability gaps at any level and also a trust relationship between security X-Tests partners PKIs at RCAs' level in order to create a (project specific) global trust domain.

Do you see opportunities for further cooperation?

Yes, for sure. Actually we all are now on board the C-ROADS platform. It is our aim that experiences and lessons learned from SCOOP X-Test activity will be of help to support harmonization of C-ITS deployments across Europe.

Information letter No.8

Publication Manager: S. Chinzi
Editors: N. Patin, E. Ollinger
Production: A. Estable

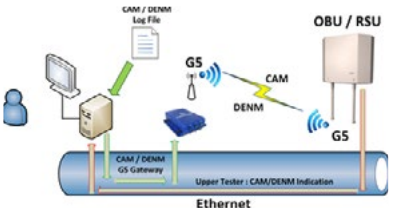
#0 > About X-tests

Interoperability among different systems is the key to take full advantage of benefits that C-ITS based systems and applications can bring to the transport sector. Under this perspective, checking how interoperable is SCOOP@F system with other countries and existing C-ITS implementations becomes one of the major concerns of SCOOP@F. After a cross check of technical specifications of the different countries, laboratory testing and open road tests were realized in 2018.

Full interoperability was demonstrated between France, Spain, Portugal and Austria. French OEM (Renault SA and PSA) have successfully communicated with the infrastructure, by exchanging secured messages in the 3 foreign countries. Also Spanish and Portuguese vehicles went in France and Austria and demonstrated full interoperability.

#1 > Lab tests

The objective of this part was to assure that no major constrains would be encountered during the 'practical' test phase in terms of standards used for implementations. Following a conformance test approach, by means of logs exchange (remote method) and participation at ETSI Plugtests, it was checked that all participants shared a common understanding of the ETSI standards followed for implementations.



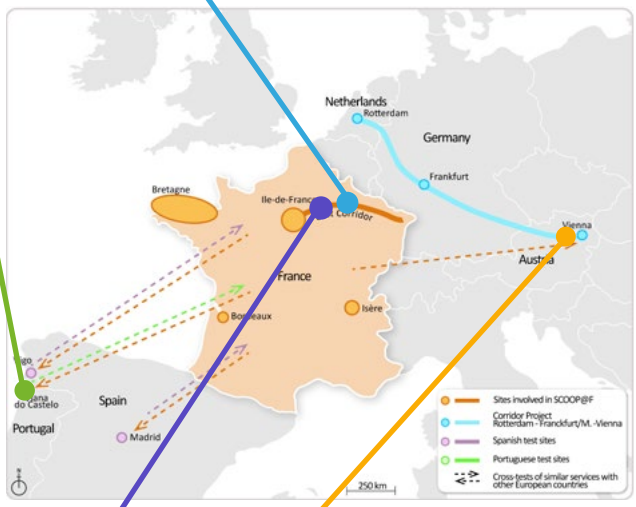
#2 > Cross border testing SP/PT/FR

Location: Vigo

This first on road X-Test session took place on 10 Kilometers included in the permanent C-ITS corridor SISCOGA that lead from CTAG facilities (used as base camp for vehicle set up, brief and debrief sessions,...) to the Spain-Portugal border and the seamless 5 kilometers of Portuguese highway A3, creating a real cross-border scenario for this first SCOOP X-Test session on open road.

Different scenarios were tested during this session. An example is provided in this picture.

The main conclusion drawn from this session is that end-to-end interoperability among Spanish and French participants (both V2I and V2V) was validated as HMI results obtained during test executions matched with what was expected according to the predefined event conditioning in the different scenarios. Besides this, it was also possible to discuss on different message parameters configuration (e.g. event distance radius) that could cause functional issues even if systems are interoperable and confirm that provision of traces and event history values is key to release reliable information to the driver.

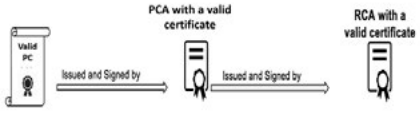


#3 > Security testing AT/FR/PT/SP

Location : Reims

Goal of this second session was to test security aspects of V2V and V2I communications. The X-Tests were held in the city of Reims, using University of Reims facilities as base camp for vehicle set up, brief and debrief sessions, and driving along A4 highway operated by SANEF, to perform the different scenarios.

This session took place jointly with the Intercor PKI Security TESTFEST whose objective to check the use of different Public Key Infrastructures (PKIs) and the authentication of messages sent from different ITS stations was aligned with the scope of the X-Tests activities within SCOOP project. All the involved partners in X-Test activity were able to test also functional aspects (including forwarding algorithms using the platoon of 19 vehicles on the first day) even if the main objective of the tests is to verify messages authentication and validate the trust chain.



During this session, all partners were able to exchange information with different configurations of PKI.

#4 > Cross border testing AT/FR/PT

Location: Vienna

The goal of this third session was to keep on testing end-to-end interoperability among X-Test participants in real environment involving security aspects for G5 based communication. Also mitigation on Protected Communication Zones was tested by means of including this info into CAM messages and checking if Vru-ITS-S reduced their power when entering into these zones.

Location for this X-Test session was the Living Lab existing in Vienna, supported by AustriaTech and operated by ASFINAG together with industry partners Kapsch TrafficCom, Siemens and Swarco.

HMI results obtained during test executions matched with what was expected according to the predefined event conditioning and no issues were detected dealing with security configuration when messages were in vehicle received. Therefore end-to-end interoperability was validated. Concerning protected zones (CAM based use case), messages were well interpreted as emission power was decreased in all the protected zones.

#0 > About hybrid X-tests

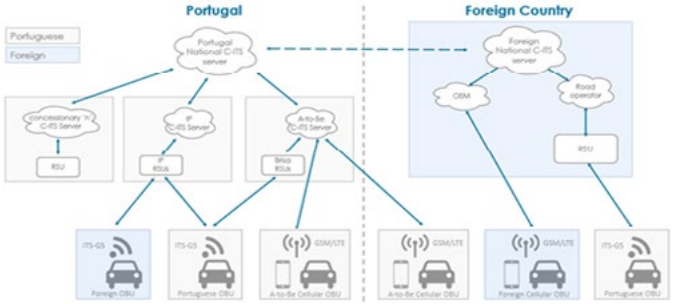
This second series of cross-tests within the project SCOOP@F represents the ambition of partners (France, Spain and Portugal) to evaluate the overall C-ITS system interoperability in a cross-border environment.

The cross-border tests aims at:

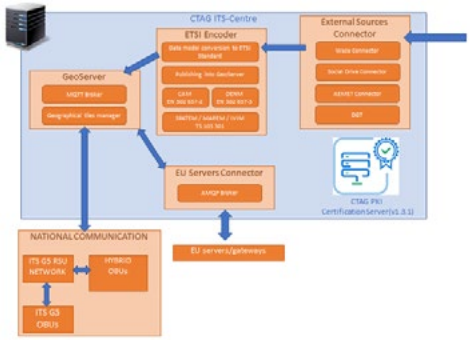
- Evaluating the C-ITS system in open-road environment involving several European countries
- Experimenting in real conditions the hybrid communication solution; which implies on one hand the long-range communications (3G/4G) and short-range communication (ITS-G5)
- Contributing to the identification of the key aspects to be considered for a successful deployment of C-ITS among the European members states

35 km test run that was planned for starting on CTAG's facilities (A) in Spain to Aldeia - Vila Nova de Cerveira in Portugal (B).

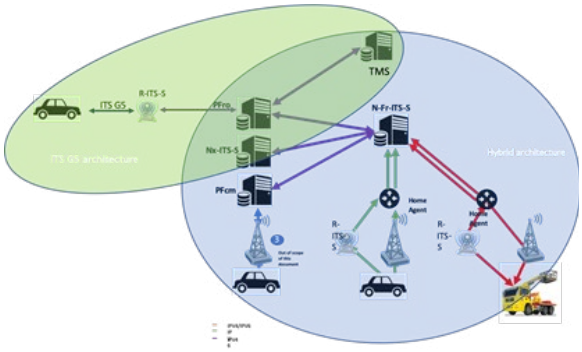
#1 > hybrid architecture for Portugal



#2 > hybrid architecture for Spain



#3 > hybrid architecture for France



#4 > Conclusion

Although the goal of a basic interoperability for hybrid C-ITS communication was obtained so all programmed events were successfully end-to-end transmitted, it became clear that such a complex communication scenario like the one faced here with different technologies and related communication standards entering in force (i.e. ITS G5/ cellular, security frameworks,...) still needs some extra fine tuning to get a full functional interoperability. This extra fine tuning is mainly related to make more robust the process to exchange/ share those data elements which, when being used in one single domain are not creating major issues for their management, but they can create conflicts when the ecosystem gets more complex.

On the other hand, leaving apart configuration issues previously mentioned, it also became clear that it should be investigated mechanisms that avoid/mitigate the service unavailability sometimes existing when changing of cellular network when entering in a different country.

#5 > Participants

- CTAG (Spain): 1 Vehicle equipped with a Hybrid OBU (cellular + ITS G5 – security v1.3.1) and 2 RSUs (security v1.3.1)
- A-to-Be (Portugal): 1 Vehicle equipped with a Hybrid OBU (cellular + ITS G5 – security v1.2.1) and 4 RSUs (security v1.2.1)
- Infraestruturas de Portugal (Portugal): 1 Vehicle equipped with a Hybrid OBU (cellular + ITS G5 – Security v1.2.1) and 4 RSUs (Security v1.2.1)
- Renault (France): 1 vehicle Megane equipped with a Hybrid OBU (cellular + ITS G5 – security v1.2.1)
- PSA (France): 1 vehicle C4 equipped with a Hybrid OBU (cellular + ITS G5 – security v1.2.1)