

DRIVE



Accelerate cooperative mobility

Deliverable D33.1

## DRIVE C2X FOT test site adaptation

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## Executive summary

This document describes the process and results of the DRIVE C2X test site adaptation. The objective of the adaptation is that the seven selected test sites will be adapted in a way that FOTs could be carried out by using the DRIVE C2X reference system. The adaptation performed in the context of work package 33 targets to the ITS system – but not including application adaptation as these are addressed in WP37 - and the test system. The work required and performed to reach such a mature status at the test sites that the reference system developed in SP2 is running and FOTs can be conducted is highly test site-driven. This is not only the case, since the status and background of the DRIVE C2X test sites are highly heterogeneous, but also the desired level of DRIVE C2X compliancy is – in detail – rather different. Therefore, the performed adaptations are complex to align and difficult to compare.

The technical adaptation targets to two technical units: (1) the ITS stations with all its functionalities up to and including the facilities layer and (2) the DRIVE C2X test system.

The project defined three different types of test sites: (1) a system test site (Netherlands), (2) large-scale functional test sites, and (3) small-scale functional test sites. System test sites serve as reference test sites to the other two types of test sites which are only differentiated in size. It must be stated that the type limits were softened during the project and that the a-posteriori typing would not reflect the initial idea. The following test sites are the DRIVE C2X test sites.

- Test site Netherlands

The system test site takes in a special role. It is the main test site, where the complete and original reference system shall be deployed and running. The system will be deployed first to the system test site. It serves as a role model for other test sites.

- Test site Germany

The test site Germany is based on the work performed in the nationally funded FOT project "Sichere Intelligente Mobilität Testfeld Deutschland (sim<sup>TD</sup>)". The sim<sup>TD</sup> project includes a big FOT (about 120 equipped vehicles) and it runs in parallel to DRIVE C2X with a head start of about 12 months. The complete DRIVE C2X project benefits from the experiences gained at the test site Germany.

- Test site Sweden

The Swedish test site was a test site in the CVIS, COOPERS and the SAFESPOT projects. The test site has been in use in close cooperation with Volvo Technology as well as the Swedish Road Authorities. Compared to other test sites in the project, a large number of test vehicles and users are expected.

- Test site France

The background of the French test site is the national project SCORE@F, which has a similar scope as DRIVE C2X. The two projects implement different reference architecture system but have compliant data collection to perform impact assessment or driver behavior analysis.

- Test site Finland

The test site Finland is located in Tampere with the addition of closed test track in neighbouring city of Nokia. The equipped part consists of 21 km two- and four lane roads, but the tests can be carried out practically anywhere in the street network with movable RISs. The test site's experiences gained during the EUROFOT project will be exploited. The DRIVE C2X project will also make use of the unique meteorological winter conditions of the test site in Finland.

- Test site Italy

The test site Italy is a part of the Brennero highway, operated by Autostrada Brennero in collaboration with Centre Recherche FIAT. The test site implements the original reference system and is the only test site where the wrong way driving in gas station application is deployed.

- Test site Spain

The test site Spain (located near Vigo) is operated by CTAG with the support of the Spanish Ministry of Traffic (DGT) and covers about 60 km. The test site was created by CTAG and DGT within the framework of the national funded project SISCOGA (SIStemas COoperativos Galicia). DRIVE C2X will be built upon systems developed during the notionally funded project.

The adaptation of the applications developed in SP2 and deployed to the test sites is not described in this document, as there is a dedicated work package WP37 and the deliverable D37.1. Moreover, the work performed regarding the system test site in the Netherlands is only partly described here where needed. That is because extensive and in-detail descriptions are available through the work package dedicated to the system test site WP32 and the deliverable D32.1.

The work package has a stringent design, which is reflected in this document too:

- (1) Analysis of test sites,
- (2) Adaptation requirements,
- (3) Test site adaptation.

The work performed in WP33 is logically and chronologically performed in these steps.

### **Analysis of test sites**

The work package started with the analysis of the selected test sites. The objective of the task was to get an overview of the test sites capabilities in order to derive adaptation requirements in the subsequent step.

The test sites are of central relevance within DRIVE C2X. Therefore, it was requested that the partners (representatives for SP2 and SP4) state requirements and claims regarding the analysis of the test sites. The result of this joint work has been captured in a questionnaire given to the test sites. The results have been collected in an internal document, which is available to all project partners. A summary of this test site analysis is included in this document.

The test site analysis depicts the status of the test sites before the adaptation. It must be stated, that test sites started out with very different preconditions.

## Adaptation requirements

Based on the detailed analysis of the test sites, the second step in the work package has been to derive the adaptation requirements. The requirements were derived from the information about the (1) reference system, (2) the project's and test site specific evaluation objectives and (3) last but not least the capabilities of the test sites identified in the previous step of the work package. The adaptation requirements were collected from the test sites and were documented on different levels of details. In this document, we give an overview of the requirements.

Based on them, the following adaptation aspects and backgrounds are listed:

- (1) Setting up a DRIVE C2X conform ITS system (excluding application management aspects),
- (2) Setting up a DRIVE C2X conform test site (addressing the relevant test system)
- (3) Fleet management,
- (4) Field operational test aspects,
- (5) Test site specific objectives.

The adaptation requirements build the basis to subsequent step - the test site adaptation.

## Test site adaptation

Having derived and collected the adaptation requirements in the second task of the work package, we started the adaptation work itself. Since the application adaptation is not part of this work package, we divided work into the adaptation or setup of

- (1) the ITS system excluding the applications,
- (2) the test system.

The work performed, and the results obtained are documented here. It needs to be noted, that the adaptation is validated in the work package 34, where the piloting was carried out.

It soon became clear that not only the starting conditions of the test sites were varying a lot, but also the objectives of each test site were partly different in detail (e.g. implications from the list of applications selected to be deployed at test sites, level of use of the reference system given by SP2). Thus, the nature of adaptation became highly test site-specific and very challenging.

## Conclusion

The heterogeneous initial capabilities and varying objectives of the test sites resulted in seven different test sites. Thus, adaptation challenges with such a setup do also provide some general advantages (which are not really associated with work package 33): it has been shown, that the DRIVE C2X reference system runs on multiple hardware platforms. Moreover, test sites exploited the capabilities of the OSGi approach and exchanged (adapted) software components on demand. Generally speaking, the reference system has been adapted to meet very different environment and conditions – thus to function under more realistic conditions.

As initially stated, some of the adaptations will be continued based on the current experiences gained during the piloting (work package 34). It is expected that these mainly target to the test data flow from tests sites to a central instance and finally to system evaluators of SP4.