

**2<sup>nd</sup> ETSI C-V2X Plugtests  
Remote Event  
20– 31 July 2020**

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**Keywords**

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Interoperability, LTE, C-V2X**ETSI**

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## Executive Summary

ETSI, in partnership with 5GAA, has organized the 2<sup>nd</sup> C-V2X Plugtests™ interoperability events for C-V2X (Cellular Vehicle-to-Everything) using mobile communication technology for direct communication between vehicles, from vehicle to pedestrian and from vehicle to infrastructure. This event was hosted remotely by ETSI, from 20<sup>th</sup> to 31<sup>st</sup> July. The 2<sup>nd</sup> C-V2X Plugtests event enabled ITS stations and PKI vendors to run interoperability test sessions to assess the level of interoperability of their implementation and validate the understanding of the ETSI ITS security standards. Around 300 test scenarios were executed between vendors based on ETSI ITS security test specifications [ETSI TS 103 600](#).

Participating companies from the automotive sector tested the interoperability of their solutions. In addition, they ran conformance tests with ETSI conformance test system to assess their compliance with ETSI ITS security standards.

The 2<sup>nd</sup> ETSI C-V2X Plugtests attracted a total of 16 vendors (full list below), with 81 participants via remotely. Observers from different organizations witnessed the execution of more than 300 tests, based on a test specification ETSI TS 103 600, with a 94 per cent success rate.

The following equipment was tested:

### **C-V2X device vendors:**

- CNIT
- COMMSIGNIA
- CTAG
- LINKS FOUNDATION
- QUALCOMM (Supporting other vendors)
- SAVARI
- VECTOR INFORMATIK

### **PKI Providers:**

- ATOS /IDNOMIC
- BLACKBERRY
- CRYPTA LABS
- CTAG
- ESCRYPT
- MICROSEC
- BOSCH (Supporting ESCRYPT)
- TESKA LABS (Supporting CRYPTA LABS)



The Plugtests event was a pure testing event and no products were certified.

The next face to face C-V2X Plugtests event is planned for Q4 2020.

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## 2 References

The following documents have been used as references in the Plugtests. The participants in the Plugtests agreed on a set of specific documents and versions for the second Plugtests. Please see also the test specification document for the references.

- [1] ETSI EN 302 636-4-1 (V1.3.1): "Intelligent Transport System (ITS); Vehicular communications; GeoNetworking; Part 4: Geographical addressing and forwarding for point-to-point and point-to-multipoint communications; Sub-part 1: Media independent functionalities".
- [2] ETSI TS 103 097 (V1.3.1): ITS Security; Security header and certificate formats.
- [3] ETSI TS 102 941 (V1.3.1): ITS Security; Trust and Privacy Management.
- [4] ETSI TS 102 940 (V1.3.1): ITS Security; ITS communications security architecture and security management.
- [5] IEEE 1609.2a-2017: IEEE Standard for Wireless Access in Vehicular Environments—Security Services for Applications and Management Messages.
- [6] EU CP v1.1: EU Certificate Policy for Deployment and Operation of European Cooperative Intelligent Transport Systems (C-ITS).
- [7] ETSI EN 302 637-2 (V1.4.1): "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 2: Specification of Cooperative Awareness Basic Service".
- [8] ETSI EN 302 637-3 (V1.3.1): "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 3: Specifications of Decentralized Environmental Notification Basic Service".
- [9] ETSI TS 103 600 (V1.1.1): "Intelligent Transport Systems (ITS); Interoperability test specifications; Test descriptions for security".
- [10] ETSI TS 103 096 (V1.4.1): ITS Security; Conformance test specifications for ITS Security.
- [11] ETSI TS 103 525 (V1.1.1): ITS Security; Conformance test specifications for ITS PKI management.
- [12] ETSI TR 103 099 (V1.4.3, draft): Intelligent Transport Systems (ITS); Architecture of conformance validation framework (draft for PKI conformance tests).

## 3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

3GPP	3rd Generation Partnership Project
ATS	Abstract Test Suite
CA	Certification Authority
CAM	Cooperative Awareness Message
CMS	Cooperative Mobility Services
CRL	Certificate Revocation List
CTL	Certificate Trust List
DENM	Decentralized Environmental Notification Message
ECTL	European Certificate Trust List
EUT	Equipment Under Test
GPSD	Daemon that receives data from a GPS receiver. It provides a unified interface to receivers of different types, and allows concurrent access by multiple applications
GN	GeoNetworking
ITS	Intelligent Transport System
ITS-S	ITS Station. Can be either RIS or VIS. This acronym is used when the role of the ITS Station is not relevant for the scope of the test. Note: When the role is relevant for the test, then RIS or VIS is used.
MAC	Media Access Control layer of the access layers
PHY	The Physical layer of the access layers
NO	Test is recorded as NOT successfully passed
NA	Test is not applicable
OK	Test is recorded as successfully passed
OT	Test is recorded as not being executed due to lack of time
PKI	Public Key Infrastructure
Test Session	A paring of vendors that test together during a given time slot
TSR	Test Session Report. Report created during a test session
TTCN-3	Testing and Test Control Notation Version 3

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## 4 Technical and Project Management

### 4.1 Scope

The goal of interoperability testing is to check that implementations of devices with different form factors can work together and provide the functionalities specified in the standards. The 2nd C-V2X Plugtests event will enable ITS stations and PKI vendors to run interoperability test sessions to assess the level of interoperability of their implementation and validate the understanding of the ITS security standards.

### 4.2 Timeline

Registration to the C-V2X Plugtests event was open from 29<sup>th</sup> April 2020 to 12<sup>th</sup> June 2020 to any organisation willing to participate in testing the ITS security. After registering to the C-V2X Plugtests event, participating organisations had to sign the Rules of Engagement (RoE) and Non-Disclosure Agreement (NDA) they received upon registration. Upon signature of the Rules of Engagement (RoE) and Non-Disclosure Agreement (NDA) sent to the official contact, the participants received their credentials for the C-V2X Plugtests WIKI and invitations to the preparation conference calls.

The following clauses describe the different phases of the Plugtests event preparation. It is worth noting that since the start of the documentation phase until the first week of the remote Plugtests event, weekly conference calls were run among organisers and participants to discuss and track the progress, anticipate and solve technical issues, review the test plan, etc.

### 4.3 Test Scheduling

The preliminary test schedule was developed before the Plugtests event and was circulated to all the participants in advance for comments. ETSI test reporting tool was used to schedule the test session between all the devices. The test schedule allowed for each C-V2X device vendors to test against all C-V2X device vendors and PKIs. Each day was organized in a morning test session from 10.00 to 13.00 and in an afternoon test session from 14.00 to 18.00.

During the test event the test schedule was constantly updated according to the progress of the test sessions. This was done during the alternate days wrap-up meetings via conference calls.

#### 4.3.1 Documentation

Once the registration to the Plugtests event was closed, the following documentation activities were launched in parallel:

##### **EUT Documentation**

Participants documented their EUTs, by providing the information directly to the Plugtests event team. The Plugtests event team compiled the final EUT table for all the participating vendors and was appended to the Plugtests event Test Plan.

All the information described above was made available in the Plugtests event WIKI, so that it could be easily maintained and consumed by participants.

#### 4.3.2 VPN Integration

From 15<sup>th</sup> of June to the 03<sup>rd</sup> of July 2020, participants were asked to make a VPN request to connect to the ETSI HIVE. The online VPN request allows to request your VPN connection and to monitor the progress of the VPN tunnel implementation. The Remote Integration and Pre-testing phases of the CV2X Plugtests are based on the remote connection of all vendors to the Hub for Interoperability and Validation at ETSI (HIVE) via an IPSec GRE VPN Tunnel.

#### 4.3.3 Pretesting

From 8<sup>th</sup> of July to the 17<sup>th</sup> of July 2020, participants were asked to execute basic use cases with each other based on [ETSI TS 103 600](#) to check the VPN connectivity and debug any network issues before the remote Plugtests event.



### 4.3.4 Plugtests event

From 20<sup>th</sup> of July to the 31<sup>st</sup> of July 2020, participants ran the Interoperability Test Sessions via ETSI HIVE and reported the test results in the ETSI Test Reporting Tool.

The 10 days were dedicated to off-site interoperability test sessions involving all the participating EUTs organised in several parallel tracks.

The scheduling of individual test combinations was done dynamically using ETSI Test reporting tool with the inputs and requests from the participants. The schedule was adapted during the test session slots on a per need basis.

## 4.4 Tools

### 4.4.1 Plugtests event WIKI

The Plugtests event WIKI was the main source of information for the C-V2X Plugtests event, from logistics aspects to testing procedures. Access to the WIKI was restricted to participating companies.

The main technical information provided in the wiki was organised as follows:

- **Event Information** – Logistics aspects of the Plugtests event.
- **Company Information** – Name of the participants of the Plugtests event.
- **Base Specs and Test Specs** – ETSI TC ITS Test Specifications used for EUTs Testing.
- **Network Information** – IT Network Infrastructure of the Plugtests event.
- **Equipment Registration** - Participating EUTs overview.
- **PKI Information** – Security certificates provided by PKI vendors.
- **Interoperability Testing**– Important Information for EUTs Testing.
- **Conformance Testing**– Information regarding ETSI Conformance Test System.
- **Yellow Box Setup** – ITS bridge related information used by C-V2X device vendors.
- **GPSD server** - Calendar, logistics, agendas and minutes of the weekly conference calls run during the remote integration and pre-testing phase.
- **Test Reporting Tool** - Documentation of the Test Reporting Tool.
- **Conf Calls** – Presentation from conference calls.
- **Social Event** – Social event details.

In addition, the embedded WIKI Chat and Slack was used among the participants to communicate with each other during the pre-testing phase and Test Sessions, include their remote colleagues (back-office support) in the discussions.

### 4.4.2 Test Reporting Tool (TRT)

The Test Reporting Tool guides participants through the Test Plan test cases during the on-site Test Sessions. It allows creating Test Session Reports compiling detailed results for the individual scheduled Test Sessions.

Only the companies providing the EUTs for each specific Test Session combination have access to their Test Session Reports contents and specific results. All companies involved in a specific session and who have entered the test results were required to verify and approve the reported results at the end of each session. Only test report which has been approved by all involved parties are considered as valid.

Another interesting feature of this tool is the ability to generate real-time stats (aggregated data) of the reported results, per test case, test group, test session or overall results. These stats are available to all participants and organisers and allow tracking the progress of the testing with different levels of granularity, which is extremely useful to analyse the results.

2020-07-22 10:00	210	Interop IV	CFG_ITS-S	Vector - ITS-S CNIT - ITS-S
2020-07-22 14:30	210	Interop III	CFG_ITS-S	Vector - ITS-S CNIT - ITS-S
2020-07-27 10:00	210	Interop III	CFG_ITS-S-PKI	Savari Networks - ITS-S Crypta Labs - PKI
2020-07-23 10:00	210	Interop III	CFG_ITS-S	LinksFoundation - ITS-S Commsignia - ITS-S
2020-07-23 11:45	105	Interop PKI	CFG_PKI	CTAG - PKI Microsec Ltd. - PKI
2020-07-22 16:15	105	Interop PKI	CFG_PKI	CTAG - PKI Crypta Labs - PKI
2020-07-23 14:30	210	Interop II	CFG_ITS-S-PKI	Commsignia - ITS-S Microsec Ltd. - PKI
2020-07-24 10:00	210	Interop V	CFG_ITS-S	Commsignia - ITS-S Savari Networks - ITS-S
2020-07-24 10:00	210	Interop II	CFG_ITS-S-PKI	CTAG - ITS-S Bosch (Esencrypt) - PKI
2020-07-24 14:30	210	Interop I	CFG_ITS-S-PKI	LinksFoundation - ITS-S CTAG - PKI
2020-07-27 10:00	210	Interop II	CFG_ITS-S-PKI	Commsignia - ITS-S CTAG - PKI
2020-07-24 14:30	105	Interop PKI	CFG_PKI	Microsec Ltd. - PKI BlackBerry - PKI

**Figure 1. Test Reporting Tool – example screen shot**

## 5 Equipment Under Test

The tables below summarise the different EUTs provided by the Plugtests event participants:

### 5.1 C-V2X device vendors

Organisation	Comment
CNIT	–
COMMSIGNIA	–
CTAG	–
LINKS FOUNDATION	–
QUALCOMM	–
SAVARI	–
VECTOR INFORMATIK	–

**Table 1. On Board Units Under Test**

### 5.2 PKI providers

Organisation	Comment
ATOS/IDNOMIC	–
BLACKBERRY	–
BOSCH	
CRYPTA LABS	–
CTAG	–
ESCRYPT	
MICROSEC	
TESKA LABS	

**Table 2. PKI Under Test**

## 6 Test Infrastructure

### 6.1 Local Test Infrastructure

ETSI Hub for Interoperability and Validation (HIVE) to interconnect participants' labs and allow for multi-party interoperability testing. ETSI HIVE infrastructure will be available throughout the year to the C-V2X Plugtests participants for the interoperability testing. The remote Plugtests event testing phase was enabled by the setup as shown in Figure 2:

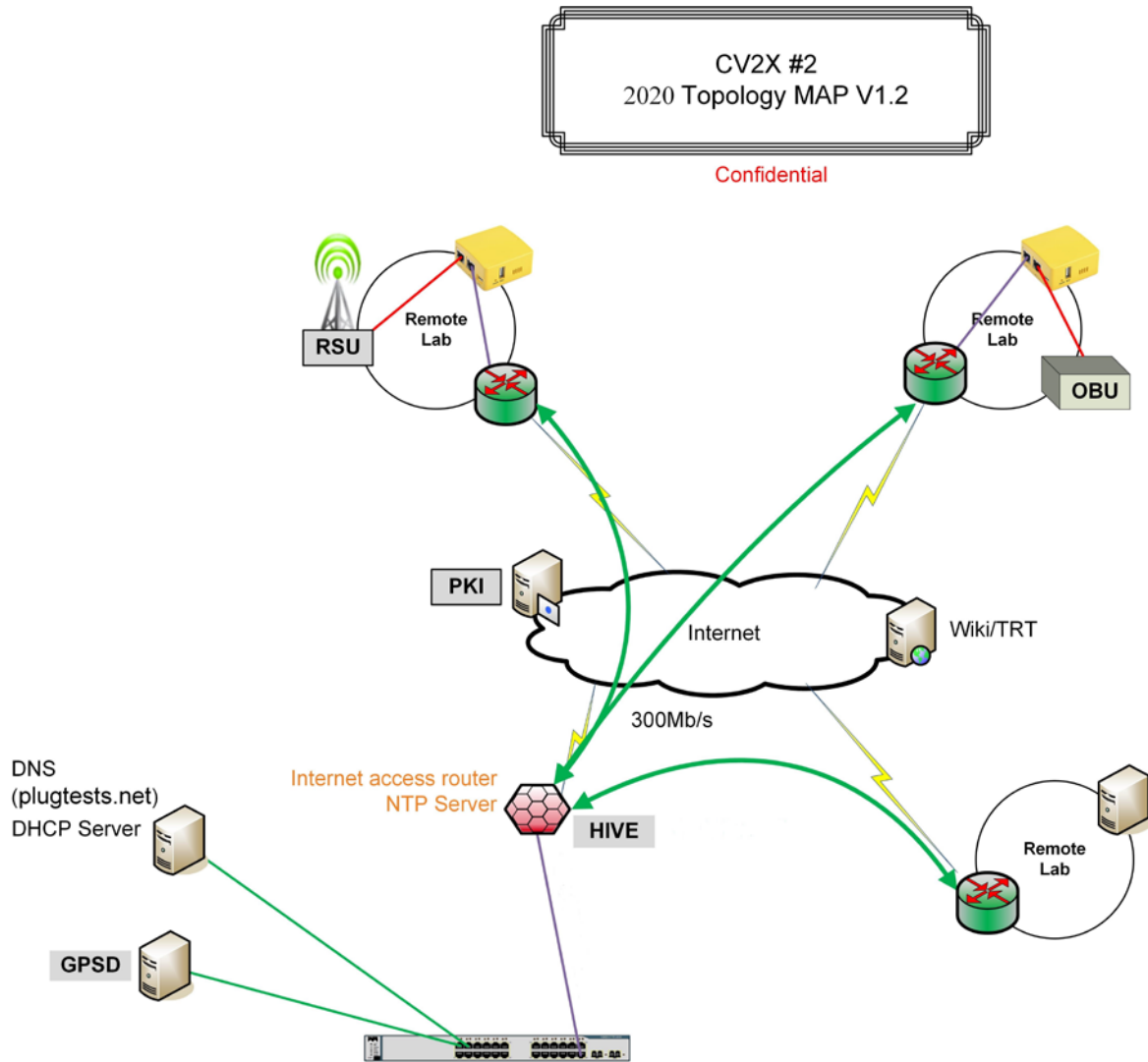


Figure 2. Test Infrastructure

### 6.2 GPSD Server Configuration

The GPSD server emulates the movement of cars to run device-2-device communication use-cases. Participants can use any track provided by the server. All tracks, positions and correspondent port numbers are presented at the [GPSD server web interface](#).

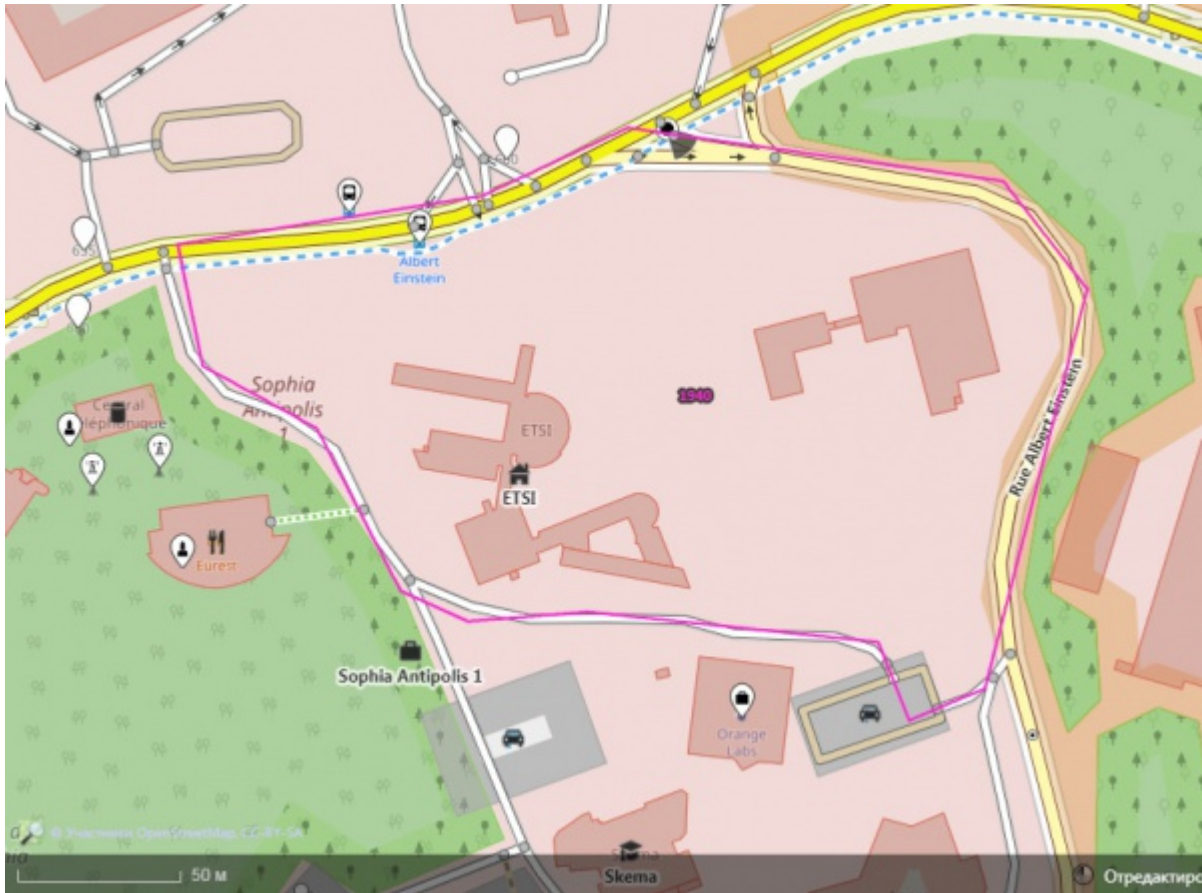


Figure 3. GPSD Web Interface

### 6.3 Conformance Validation Framework

The ETSI ITS Conformance Validation Framework is a test software to assess the base standard compliance of a vendor implementation, as shown in the figure below. The Conformance Validation Framework was used in parallel with the interoperability activity.

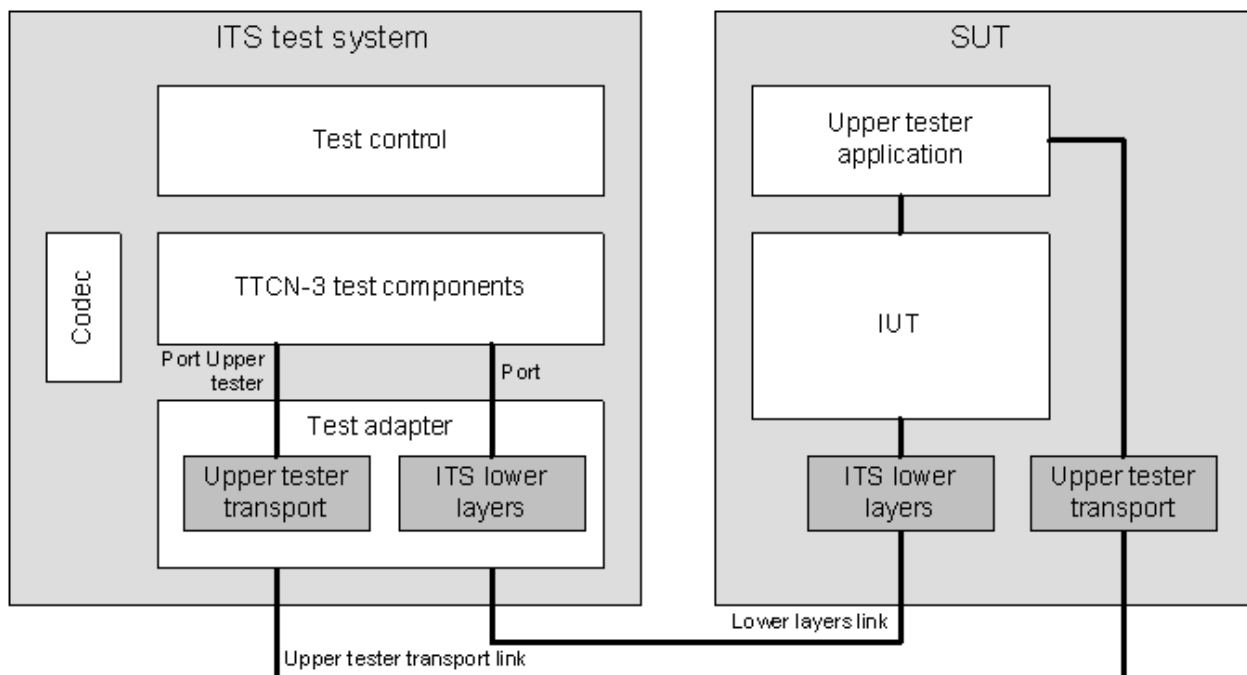


Figure 4: Conformance Validation Framework



## 7 Test Procedures

### 7.1 Interoperability Testing Procedure

During the remote Plugtests event, a daily Test Session Schedule was produced and shared via the email. Test Sessions were organised in several parallel tracks, ensuring that all participants had at least one Test Session scheduled any time. The different test configurations were used for the main event.

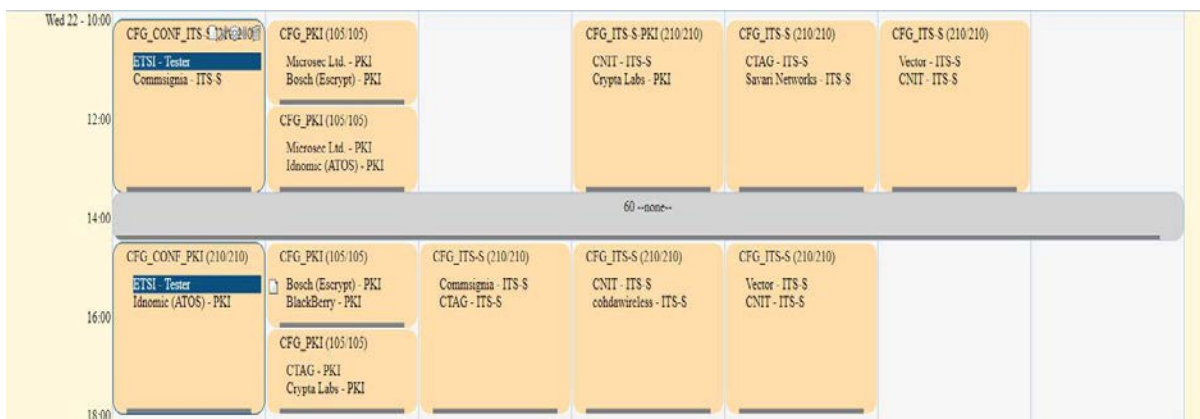


Figure 5. Daily Schedule & Test Sessions – example excerpt

Config Name	Main Test Configuration
CFG_ITS-S	ITS-S + ITS-S
CFG_ITS-S-PKI	ITS-S + PKI
CFG_PKI	PKI + PKI
CFG_PRE_ITS-S	ITS-S + ITS-S
CFG_PRE_ITS-S-PKI	ITS-S + PKI
CFG_PRE_PKI	PKI + PKI
CFG_CONF_ITS-S	ITS-S + Tester
CFG_CONF_PKI	PKI + Tester

Table 3. Main Test Configurations

During each test session, for each tested combinations the Interoperability testing procedure was as follows:

1. The participating vendors opened the Test Session Report and the Test Plan.

This report has been approved. Modifications are not allowed

<b>Configuration</b> CFG_ITS-S-PKI	
<b>Date</b>	2020-07-24 14:30
<b>Duration</b>	210 min
<b>Report Id</b>	<div style="border: 1px solid black; width: 150px; height: 20px;"></div>
<b>Peers</b>	

Test groups:	Test ID	Summary	Result	Comment
CFG_ITS-S-PKI	TD_ITS_SEC_UC3-1	Valid enrolment behaviour	NO NA	
	TD_ITS_SEC_UC3-2	Valid re-enrolment behaviour	NO NA	
	TD_ITS_SEC_UC3-3	Enrolment behaviour when ITS-S is not registered on the EA	NO NA	
	TD_ITS_SEC_UC3-4	Enrolment behaviour when EA is on the CRL	NO NA	
	TD_ITS_SEC_UC4-1	Valid authorization behaviour	NO NA	
	TD_ITS_SEC_UC4-2	Authorization behaviour with optional privacy requirements	NO NA	
	TD_ITS_SEC_UC4-3	Authorization behaviour when AA and EA are from different PKI	NO NA	
	TD_ITS_SEC_UC4-4	Authorization behaviour when AA is on the CRL	NO NA	
	TD_ITS_SEC_UC4-4a	Authorization behaviour with AA from another PKI when AA is on the CRL	NO NA	
	TD_ITS_SEC_UC4-5	Check renewal of expired AT certificates	NO NA	

Figure 6. Test Session Report example excerpt

2. For each Test in the Test Plan:

a. The corresponding Test Description and EUT Configuration were followed for Use-case 1-1 Both ITS-S authorized by the same AA

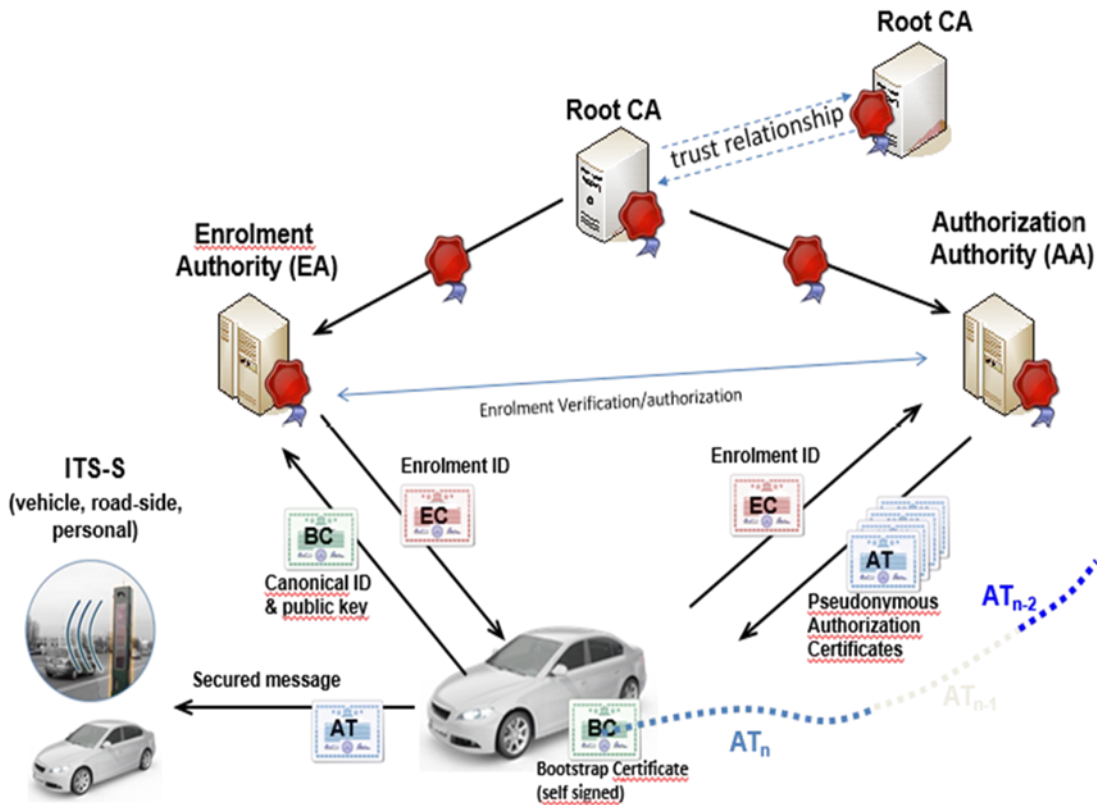


Figure 7. System Under Test (SUT) Configuration



6.2.1.1 Use-case 1-1 - Both ITS-S authorized by the same AA

Interoperability Test Description				
<b>Identifier</b>	TD ITS_SEC_UC1-1			
<b>Objective</b>	Secure communication between ITS-S authorized by the same AA			
<b>Description</b>	Two ITS-S, authorized by the same AA, are sending CAMs and both accept these CAMs.			
<b>Configuration</b>	The CFG_SEC configuration shall be used with additional requirements: <ul style="list-style-type: none"> <li>The ATs of all participating ITS-S are issued by the same AA.</li> </ul>			
<b>Pre-test conditions</b>				
<b>REQ / PICS</b>	<b>Tested Requirements</b>		<b>PICS</b>	
	1.1, 1.2, 1.3, 1.4, 1.8, 1.9			
<b>Test Sequence</b>	<b>Step</b>	<b>Type</b>	<b>Description</b>	<b>Result</b>
	1	Stimulus (by Sender)	The sender is triggered to send valid CAMs	
	2	Verify (by Receiver)	The receiver validates received CAMs	All received CAMs are accepted by the receiving ITS-S

Figure 8. Use-case 1-1 Both ITS-S authorized by the same AA

3. C-V2X equipment providers jointly executed the different steps specified in the test description and evaluated interoperability through the different IOP Checks prescribed in the Test Description
  - b. The C-V2X equipment provider recorded the Test Result in the Test Session Report, as follows:
    - i. OK: all IOP Checks were successful
    - ii. NOK: at least one IOP Check failed. A comment was requested.
    - iii. NA: the feature was not supported by at least 1 of the involved EUTs. A comment was requested.
4. Once all the tests in the Test Session Report were executed and results recorded, the participants reviewed the Report and approved it.

## 7.2 Conformance Testing Procedure

The tests are developed in TTCN-3 (see [www.ttcn-3.org](http://www.ttcn-3.org)) and cover the following ETSI standards:

Table 4: List of available test specifications

Base Standard	ETSI Test Specification
ETSI TS 103 097 V1.3.1 [2]: Security header and certificate formats	ETSI TS 103 096-1,2,3 (V1.4.1) [10]
ETSI TS 102 941 V1.3.1 [3]: ITS Security; Trust and Privacy Management	ETSI TS 103 525-1,2,3 (V1.1.1) [11]

The tests used for the pre-testing activity, are available at:

<https://forge.etsi.org/gitlab/ITS/ITS/tree/STF525>

**Scope – Pre-testing & Conformance Tests:**

- ATS Security (Secured CAM, DENM)
  - 1 company
  - Focused on secured CAM and DENM tests

- using ETSI certificates
- ATS PKI (PKI side)
  - 5 PKI providers
  - Enrolment
  - Authorization
  - Authorization Validation
- ATS PKI (OBU side)
  - 1 company
  - Enrolment / Authorization

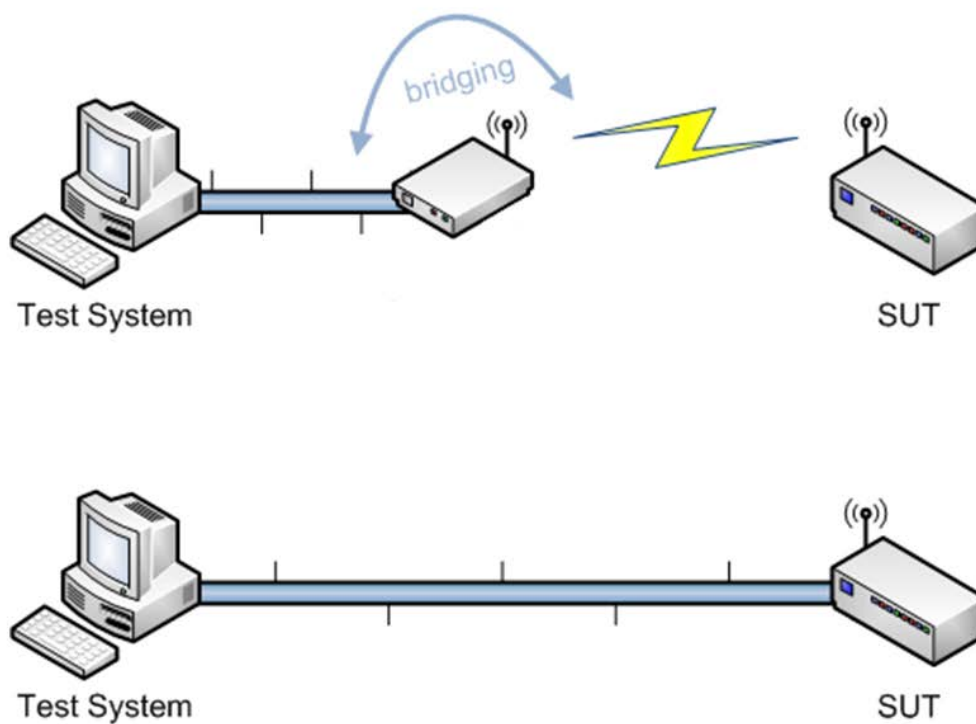


Figure 9: Conformance Validation setup

## 8 Test Plan Overview

### 8.1 Introduction

This 2<sup>nd</sup> C-V2X Plugtests Test Plan was developed following ETSI guidelines for interoperability. It is based on the test plan from the previous ITS CMS Plugtests. There three different test configurations available for testing from [ETSI TS 103 600](#).

- ITS-S to ITS-S secured communication
  - been enrolled in the same PKI
  - using certificates from different PKIs
  - exceptional cases (out of region, expired or not yet valid certificates, revoked AA, ...)
  - usage of ECTL, CTL and CRL.
- ITS-S to PKI communication
  - enrolment, re-enrolment
  - authorization
  - usage of ECTL, CTL and CRL.
- PKI to PKI
  - authorization validation
  - CA certificate request
  - re-keying and revocation of RCA

### 8.2 Group of test cases

As described in the Subclause 4.1 of this document, different test objectives were considered. Please refer to test plans [ETSI TS 103 600](#).

The following tables collect the test cases grouped by test objective following the structure of the test specification document itself.

Test Id	Test Purpose
TD_ITS_SEC_UC1-1	Secure communication between ITS-S authorized by the same AA
TD_ITS_SEC_UC1-2	Secure communication between ITS-S authorized by different but commonly trusted AAs
TD_ITS_SEC_UC1-3	Secure communication between ITS-S authorized by different and initially partially unknown AAs
TD_ITS_SEC_UC1-4	Secure communication between ITS-S authorized by AAs of different RCAs
TD_ITS_SEC_UC2-1	No communication between ITS-S within unauthorized regions
TD_ITS_SEC_UC2-2	Rejected sending of CAMs if no AT with a valid ValidityPeriod is available.
TD_ITS_SEC_UC2-3a	Rejected sending of CAMs if ATs are missing the CAM PSID
TD_ITS_SEC_UC2-3b	Rejected sending of DENMs if ATs are missing the DENM PSID
TD_ITS_SEC_UC2-4	Rejection of CAMs authorized with ATs that are issued by a revoked AA
TD_ITS_SEC_UC2-5	Rejection of messages of ITS-S belonging to an untrusted RCA

Test Id	Test Purpose
TD_ITS_SEC_UC3-1	Valid enrolment behavior
TD_ITS_SEC_UC3-2	Valid re-enrolment behaviour
TD_ITS_SEC_UC3-3	Enrolment behaviour when ITS-S is not registered on the EA
TD_ITS_SEC_UC3-4	Enrolment behaviour when EA is on the CRL
TD_ITS_SEC_UC4-1	Valid authorization behaviour
TD_ITS_SEC_UC4-2	Authorization behaviour with optional privacy requirements
TD_ITS_SEC_UC4-3	Authorization behaviour when AA and EA are from different PKI
TD_ITS_SEC_UC4-4	Authorization behaviour when AA is on the CRL
TD_ITS_SEC_UC4-4a	Authorization behavior with AA from another PKI when AA is on the CRL
TD_ITS_SEC_UC4-5	Check renewal of expired AT certificates
TD_ITS_SEC_UC5-1	Initial CA certificate request
TD_ITS_SEC_UC5-2	Re-keying of CA certificate

**Table 5. Use Cases from Interoperability ETSI TS 103 600**

## 9 Interoperability Results

### 9.1 Overall Results

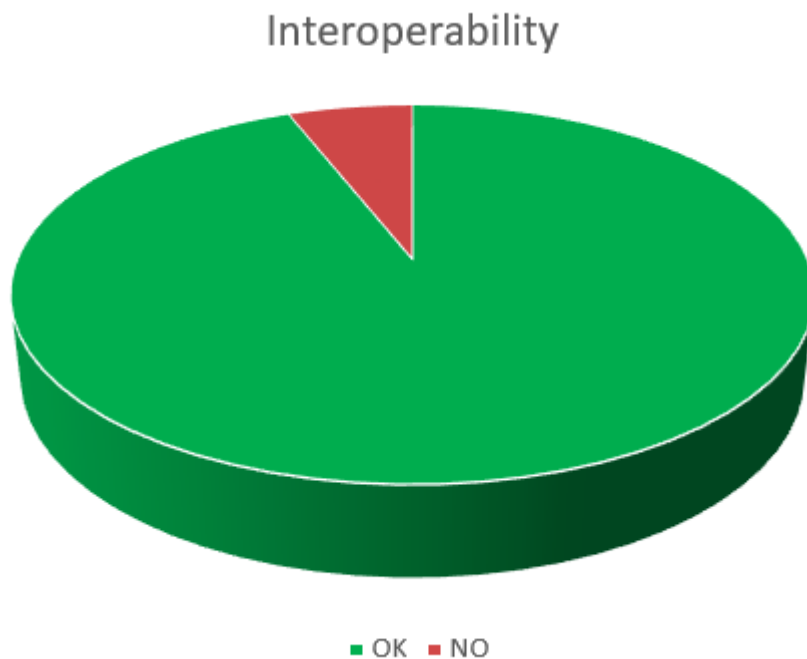
During the remote Plugtests event at, 288 test executions were conducted, and interoperability results were reported in the Test reporting tool.

The table below provides the overall results (aggregated data) from all the Test Cases run during all the Test Sessions with all the different combinations of Equipment Under Test from all the participating companies.

Among the executed Test Cases, the possible results were “OK”, when interoperability was successfully achieved and “NO” (Not OK) when it was not.

Interoperability		Totals
OK	NO	Run
270 (93.8%)	18(6.3%)	288

**Table 6. Overall Results**



**Figure 10. Overall results (%)**

An overall interoperability success rate of 94% was achieved, which indicates a very high degree of compatibility among the participating implementations (EUTs) in the areas of the Test Plan where features were widely supported and the test cases could be executed in most of the Test Sessions. In the next clauses, we will see that this high rate is also a consequence of the good preparation and involvement of participants during the preparation phase of the Plugtests.

## 9.3 Results per Group

The table below provides the results for each test configuration in the scope of the Plugtests event.

Configuration	Interoperability		Total
	OK	NO	Run
CFG_ITS-S	70	6	76
CFG_ITS-S-PKI	172	12	184
CFG_PKI	24	0	24
CFG_PRE_ITS-S	0	0	0
CFG_PRE_ITS-S-PKI	4	0	4
CFG_PRE_PKI	0	0	0

Table 7. Results per Group

## 9.4 Results per Test Case

The table below provides the results for each test case in the scope of the Plugtests event.

Test Case ID	Interoperability		Total
	OK	NO	Results
TD_ITS_SEC_UC1-1	14	0	14
TD_ITS_SEC_UC1-2	9	2	11
TD_ITS_SEC_UC1-3	3	4	7
TD_ITS_SEC_UC1-4	11	0	11
TD_ITS_SEC_UC2-1	1	0	1
TD_ITS_SEC_UC2-2	9	0	9
TD_ITS_SEC_UC2-3a	7	0	7
TD_ITS_SEC_UC2-3b	6	0	6
TD_ITS_SEC_UC2-4	2	0	2
TD_ITS_SEC_UC2-5	8	0	8
TD_ITS_SEC_UC3-1	27	1	28
TD_ITS_SEC_UC3-2	16	2	18
TD_ITS_SEC_UC3-3	22	1	23
TD_ITS_SEC_UC3-4	15	1	16
TD_ITS_SEC_UC4-1	22	2	24
TD_ITS_SEC_UC4-2	18	1	19
TD_ITS_SEC_UC4-3	13	1	14
TD_ITS_SEC_UC4-4	15	1	16
TD_ITS_SEC_UC4-4a	12	1	13
TD_ITS_SEC_UC4-5	16	1	17
TD_ITS_SEC_UC5-1	15	0	15
TD_ITS_SEC_UC5-2	9	0	9
TD_ITS_SEC_UC1-1	14	0	14
TD_ITS_SEC_UC1-2	9	2	11
TD_ITS_SEC_UC1-3	3	4	7
TD_ITS_SEC_UC1-4	11	0	11
TD_ITS_SEC_UC2-1	1	0	1
TD_ITS_SEC_UC2-2	9	0	9
TD_ITS_SEC_UC2-3a	7	0	7

TD_ITS_SEC_UC2-3b	6	0	6
TD_ITS_SEC_UC2-4	2	0	2
TD_ITS_SEC_UC2-5	8	0	8
TD_ITS_SEC_UC3-1	27	1	28

Table 8. Results per Test Case

## 10 Observations

### 10.1 SSP in GN

For conformance test activities the test AT certificates are created from XML 'profiles' by the itscertgen tool.

A typical AT cert profile includes SSPs for CAM, DENM and GN, however according to ETSI EN 302 636-4-1 V1.4.1, GN does not have any SSP, not even a version octet.

Change:

```
<attribute type="its_aid_ssp_list">
  <ssp aid="CAM">01 FF FC</ssp>
  <ssp aid="DENM">01 FF FF FF</ssp>
  <ssp aid="GN-MGMT">00</ssp>
</attribute>
```

To:

```
<attribute type="its_aid_ssp_list">
  <ssp aid="CAM">01 FF FC</ssp>
  <ssp aid="DENM">01 FF FF FF</ssp>
  <ssp aid="GN-MGMT"></ssp>
</attribute>
```

Due to the strictness of the security library checks, the suggestion is to 'simply ignore the SSP for the GN ITS-AID' doesn't seem correct.

### 10.2 HTTP responses

A lot of ITS-S process only HTTP responses with "200 OK" and discard others (such as 4xx). The current set of ETSI TS doesn't prescribe this so PKI may chose to reply with e.g "400 Bad Request" with valid C-ITS payload.

The proposal would be to extend TS with requirement that HTTP response has to be processed regardless the response code as long as it contain prescribed Content-Type. Alternatively, "200 OK" response code should be prescribed in the TS. In case of Response containing a responseCode value not equal to 0 (error value), a statement HTTP 400 Bad Request and HTTP 200 OK are used. A proposal to use HTTP 200 OK only will clarify the situation.

### 10.3 ETSI TS 103 525-2 Change Requests

The following changes shall be applied to the ETSI TS 103 525-2: -

TC\_SECPKI\_EA\_ENR\_RCV\_05\_BI: Expected responseCode value shall be unknownits -

TC\_SECPKI\_EA\_ENR\_RCV\_13\_BI: Expected responseCode value shall be invalidsignature

### 10.4 ETSI TS 102 940/ETSI TS 102 941 clarification proposals

In ETSI ITS Security standard, is it clearly stated that a request containing invalid SSPs or invalid date/lifetime shall be rejected? **If not, the proposal is to update ETSI TS 103 525-1/2 to add a PICS indicating if invalid request rejection is supported by the IUT.**



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## History

<b>Document history</b>		
V0.1.0	05/08/2020	First Draft
V0.2.0	07/08/2020	Stable Draft
V0.3.0	08/08/2020	Minor corrections
V1.0.0	17/08/2020	Final Report
V1.1.0	17/08/2020	Final Report published