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| --- |
| ToR TTF T011 (Ref. Body TC ITS) |
| Version: 0.7 |
| Author: Denis Filatov – Date: 2020-06-23 |
| Last updated by: ETSI Secretariat – Date: 2020-11-30 |
| page 1 of 12 |

Terms of Reference –Testing Task Force Proposal

TTF T011 (Ref. Body TC ITS)

**Updating the test framework from multiple access schemes LTE-V2X**

Summary information

|  |  |  |  |
| --- | --- | --- | --- |
| Approval status | Approved by TC ITS (doc ref: ITS(20)039016r1) | | **YES** |
| Reference Body | Ref. Body TC-ITS | | |
| ETSI Funding | **Maximum budget : 30 000 EUR** | | |
| Minimum of 4 ETSI Members Support | **YES** | | |
| Time scale | **From** | 2021-01-18 | |
| **To** | 2021-12-17 | |
| Work Items | RTR/ITS-213 – TR 103 099  RTR/ITS-214 – TR 103 193  RTS/ITS-215 – TS 103 192-1  RTS/ITS-216 – TS 103 192-2  RTS/ITS-217 – TS 103 192-3  RTS/ITS-366 – TS 102 870-1  RTS/ITS-367 – TS 102 870-2  RTS/ITS-368 – TS 102 870-3  RTS/ITS-369 – TS 102 871-1  RTS/ITS-370 – TS 102 871-2  RTS/ITS-371 – TS 102 871-3  RTS/ITS-372 – TS 102 859-1  RTS/ITS-373 – TS 102 859-2  RTS/ITS-374 – TS 102 859-3  RTS/ITS-565 – TS 103 600 | | |
| TTF Roadmap reference |  | | |

Part I –TTF Technical Proposal

# Rationale & Objectives

## Rationale

On 13 March 2018 the European Parliament adopted its opinion on cooperative intelligent transport systems C-ITS to improve road safety, traffic flow and reduce CO2 emission through instant short-range communication between vehicles, vehicles and the infrastructure and public transport (the report was coordinated by Hungarian MEP, István Ujhelyi and received with broad cross-party support (633 in favour, 43 against, 11 abstention.

Various measures can significantly improve the reliability and interoperability of complex systems such as ITS. The development of test specifications for conformance and interoperability can be coupled with validation activities, such as building prototype test systems. Likewise, the prototype test systems can be used at interoperability events. Consequently, the project contributes to the effort of testing and validation ITS systems with the goal to bring the ITS systems to a stage where end users trust the services provided.

In 2010, TC ITS started together with ETSI CTI a STF project funded by the EC/EFTA to produce conformance test specifications for the Release 1 of TC ITS CAM, DENM, BTP, GN and GN6 protocols. In 2011/2012 a prototype test system (so called Conformance Validation Framework) was designed, built and validated (see <http://portal.etsi.org/stfs/STF_HomePages/STF424/STF424.asp>).The current testing framework is based on the ITS G5 access scheme only.

With the introduction of LTE Vehicle to everything (LTE-V2X) as one of the access schemes used in C-ITS, there is an urgent need to update the testing framework for the conformance testing.

The reference implementation will be used by the testing companies for the conformance activities.

In order to address these new challenges, the proposed action intends to adapt solid and proven ITS testing methodology and tools that were developed over 15 years by ETSI.

The Conformance Validation Framework is a reference implementation and available to all ITS stakeholders. The Conformance Validation Framework enables vendors to assess the level of compliance of their equipment and the Conformance Validation Framework can be used in support of certification schemes. In addition, with its high degree of extensibility, it can be used for company internal testing.

Investigations have shown that C-ITS improves traffic safety and traffic efficiency. However, safety services do not easily provide the needed business cases. Safety is a social aspect and the improvement of safety a common responsibility. The industry takes this responsibility by exploring research and doing developments but can’t do this alone and through this proposal requests for support by the community.

This present document proposes the creation of a new TTF in order to update the ETSI TC ITS test suite to support the LTE-V2X access layer.This action will focus on the extensions for the existing ITS testing specifications developed in response to European mandates M/453 (C-ITS systems) and M/546 (Urban ITS).

## Objectives of the work to be executed

The objective of this action is to extend the ETSI conformance and interoperability testing framework and update the test specifications to include LTE V2X as an access scheme.

## Previous funded activities in the same domain

ETSI has been developing ITS standards since 2008 and has produced a full list of standards for Day-1 services and applications under the European mandate M/453 which are listed in the Release-1 standardisation ETSI report TR 101 607 from 2013 and form the bases for the further development of ITS cooperative services and Automation.

In 2010, TC ITS started together with ETSI CTI a STF project funded by the EC/EFTA to produce conformance test specifications for the Release 1 of TC ITS CAM, DENM, BTP, GN and GN6 protocols. In 2011/2012 a prototype test system (so called Conformance Validation Framework) was designed, built and validated (see <http://portal.etsi.org/stfs/STF_HomePages/STF424/STF424.asp>).

## Consequences if not agreed

ITS equipment is currently being deployed in experimental trials with the progression towards fully operational deployment. Thorough conformance testing will increase the level of confidence that equipment from various suppliers will interoperate. This in turn will reduce implementation and rollout times. Not providing timely validated and reliable test specifications, would ultimately delay the deployment of ITS. The Conformance Validation Framework is essential to be able to execute the actual tests.

# ETSI Members Support

|  |  |  |
| --- | --- | --- |
| **#** | **ETSI Member** | **Supporting delegate** |
| 1 | Intel | Dr. Gomes Baltar Leonardo |
| 2 | Huawei | Reininger Philippe |
| 3 | LG | Jaegal Chan |
| 4 | Qualcomm | Williams David Hugh |

# Deliverables

## Base documents

|  |  |  |  |
| --- | --- | --- | --- |
| **Document** | **Title** | **Current Status** | **Expected date for stable document** |
| ETSI TS 102 894-2 | Intelligent Transport Systems (ITS); Users and applications requirements; Part 2: Applications and facilities layer common data dictionary | Published | Available |
| 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 | Published | Available |
| 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 | Published | Available |
| ETSI EN 302 636-4-1 | Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 4: Geographical addressing and forwarding for point-to-point and point-to-multipoint communications; Sub-part 1: Media-Independent Functionality | Published | Available |
| ETSI TS 103 301 | Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Facilities layer protocols and communication requirements for infrastructure services | Published | Available |
| ETSI TS 103 097 | Intelligent Transport Systems (ITS); Security; Security header and certificate formats | Published | Available |
| ETSI TS 102 941  RTS/ITS-00559 | Intelligent Transport Systems (ITS); Security; Trust and Privacy Management | Under revision | Aug 2020 |
| ETSI EN 303 613 | Intelligent Transport Systems (ITS);  LTE-V2X Access layer specification for Intelligent Transport Systems operating in the 5 GHz frequency band | Published | Available |
| ETSI TS 103 723 | Intelligent Transport Systems (ITS);  Profile for LTE-V2X Direct Communication | Under RC | Aug 2020 |
| 5GAA TR P-200004 | 5G Automotive Association; Working Group Evaluation, Testbeds and Pilots; Recommended LTE-V2X Related Amendments to ETSI ITS Test Specifications  <https://5gaa.org/wp-content/uploads/2020/02/5GAA_P-200004_TR_ETSI-Test_Specs.v2-1.pdf> | Published | Available |

## New deliverables

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Deliv.** | **Work Item code**  **Standard number** | **Working title** | **Current version** | **Expected date for publication** |
| D1 | RTR/ITS-213  ETSI TR 103 099 | Intelligent Transport Systems (ITS); Architecture of conformance validation framework | 1.4.1 (2017-03) | 2021-12-31 |
| D2 | RTR/ITS-214  ETSI TS 103 192-1 | Intelligent Transport Systems (ITS); Testing; Interoperability test specifications for ITS V2X use cases; Part 1: Test requirements and Interoperability Feature Statement (IFS) proforma | 1.1.1 (2018-09) | 2021-12-31 |
| D3 | RTS/ITS-215  ETSI TS 103 192-2 | Intelligent Transport Systems (ITS); Testing; Interoperability test specifications for ITS V2X use cases; Part 2: Test Suite Structure and Test Purposes (TSS & TP) | 1.1.1 (2018-09) | 2021-12-31 |
| D4 | RTS/ITS-216  ETSI TS 103 192-3 | Intelligent Transport Systems (ITS); Testing; Interoperability test specifications for ITS V2X use cases; Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT) | 1.1.1 (2018-09) | 2021-12-31 |
| D5 | RTS/ITS-217  ETSI TS 103 193 | Intelligent Transport Systems (ITS); Testing; Interoperability test specifications for ITS V2X use cases; Architecture of ITS Interoperability Validation Framework | 1.1.1 (2018-09) | 2021-12-31 |
| D6 | RTS/ITS-372  ETSI TS 102 859-1 | Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Transmission of IP packets over GeoNetworking; Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) proforma | 1.2.1 (2014-04) | 2021-12-31 |
| D7 | RTS/ITS-373  ETSI TS 102 859-2 | Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Transmission of IP packets over GeoNetworking; Part 2: Test Suite Structure and Test Purposes (TSS & TP) | 1.2.1 (2014-04) | 2021-12-31 |
| D8 | RTS/ITS-374  ETSI TS 102 859-3 | Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Transmission of IP packets over GeoNetworking; Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT) | 1.2.1 (2014-04) | 2021-12-31 |
| D9 | RTS/ITS-366  ETSI TS 102 870-1 | Intelligent Transport Systems (ITS); Testing; Conformance test specifications for GeoNetworking Basic Transport Protocol (BTP); Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) proforma | 1.1.1  (2011-03) | 2021-12-31 |
| D10 | RTS/ITS-367  ETSI TS 102 870-2 | Intelligent Transport Systems (ITS); Testing; Conformance test specifications for GeoNetworking Basic Transport Protocol (BTP); Part 2: Test Suite Structure and Test Purposes (TSS&TP) | 1.1.1 (2011-03) | 2021-12-31 |
| D11 | RTS/ITS-368  ETSI TS 102 870-3 | Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Geonetworking Basic Transport Protocol (BTP); Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT) | 1.1.1 (2011-03) | 2021-12-31 |
| D12 | RTS/ITS-369  ETSI TS 102 871-1 | Intelligent Transport Systems (ITS); Testing; Conformance test specifications for GeoNetworking ITS-G5; Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) pro forma | 1.4.1 (2017-05) | 2021-12-31 |
| D13 | RTS/ITS-370  ETSI TS 102 871-2 | Intelligent Transport Systems (ITS); Testing; Conformance test specifications for GeoNetworking ITS-G5; Part 2: Test Suite Structure and Test Purposes (TSS & TP) | 1.4.1 (2017-05) | 2021-12-31 |
| D14 | RTS/ITS-371  ETSI TS 102 871-3 | Intelligent Transport Systems (ITS); Testing; Conformance test specifications for GeoNetworking ITS-G5; Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT) | 1.4.1 (2017-05) | 2021-12-31 |
| D15 | RTS/ITS-565  ETSI TS 103 600 | Intelligent Transport Systems (ITS); Testing; Interoperability test specifications for security | 1.1.1 (2019-05) | 2021-12-31 |

# Maximum budget

## Task summary/Manpower Budget

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| --- | --- | --- | --- |
| **Task short description** | CTI effort | Expertise effort | Expertise Budget (EUR) |
| Project Management | 100% |  |  |
| Testing technical specifications update | 75% | 25% | 5 000 |
| Conformance validation framework update | 25% | 75% | 10 000 |
| TTCN-3 code update |  | 100% | 5 000 |
| Validation of the framework |  | 100% | 10 000 |
| Final deliveries update and prepare for publication | 100% |  |  |
| **TOTAL** |  |  | **30 000** |

## Travel budget

N/A

## Other budget line

N/A

Part II – Details on TTF Technical Proposal

# Tasks, Technical Bodies and other stakeholders

## Organization of the work

ETSI CTI will plan the work of the TTF members, ensuring that the timescales of the TTF deliverables are met.

Organising TTF meetings to discuss the drafts, recording any major issues and resolutions of the TTF, identifying and progressing the actions of TTF members

Report to TC ITS and TC ITS Working Groups as appropriate on the work of the TTF.

Represent, or arrange for other TTF members to represent the TTF at other external meetings as appropriate.

## Other interested ETSI Technical Bodies

3GPP

## Other stakeholders

The C2C CC has been an observer of the TC ITS test activities since 2010.

The C-Roads project is going to develop the validation platform using conformance test specifications.

The 5G Automotive Association (5GAA) observes TC ITS test activities.

Part III: Execution of Work

# Work plan, time scale and resources

## Task description

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| --- | --- |
| **Task 1** | **Project Management** |
| **Objectives** | Plan the work of the TTF members, ensuring that the timescales of the TTF deliverables are met |
| **Input** | Take TC ITS and TC ITS Working Groups inputs for the work of the TTF |
| **Output** | Report to TC ITS and TC ITS Working Groups as appropriate on the work of the TTF  Progress report and final report as required |
| **Interactions** | Attending Technical Body, WG and TTF meetings, presentation of the TTF activity |
| **Resources required** | * Ability to lead and manage a team * Project management and communication skills |

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| **Task 2** | **Testing technical specifications update** |
| **Objectives** | Update the ETSI testing technical specifications in order to make it technology neutral and/or include the references to the LTE-V2X access layer. |
| **Input** | Base specification documents, Testing technical specification |
| **Output** | Stable drafts of D1-D15 presented to TC ITS #43 |
| **Interactions** | Report to TC ITS and TC ITS Working Groups as appropriate on the work of the TTF |
| **Resources required** | * knowledge of ETSI EN 303 613, ETSI TC ITS test specifications * expert knowledge of ITS technologies and implementations; * expert knowledge of TTCN-3 (ES 201 873); * expert knowledge in conformance testing; |

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| **Task 3** | **Conformance validation framework update** |
| **Objectives** | Development of the LTE-V2X access layer test adapter. |
| **Input** | Base specification documents |
| **Output** | Source code of the LTE-V2X access layer test adapter |
| **Interactions** | Report to TC ITS and TC ITS Working Groups as appropriate on the work of the TTF |
| **Resources required** | * knowledge of ETSI TS 303 613, ETSI TR 103 099 and other TC ITS test specifications * expert knowledge of ITS technologies and implementations; * expert knowledge of TTCN-3 (ES 201 873); * expert knowledge in conformance testing; * expert knowledge in C/C++ programming |

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| **Task 4** | **Update the TTCN-3 code** |
| **Objectives** | Update the TTCN-3 code in order to include or exclude test purposes related for the LTE-V2X access layer. |
| **Input** | Base specification documents  Test specification documents |
| **Output** | Source code of the ATS |
| **Interactions** | Report to TC ITS and TC ITS Working Groups as appropriate on the work of the TTF |
| **Resources required** | * knowledge of ETSI TS 303 613 and ETSI TC ITS testing technical specifications * expert knowledge of ITS technologies and implementations; * expert knowledge of TTCN-3 (ES 201 873); * expert knowledge in conformance testing; |

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| **Task 5** | **Validation of the Framework** |
| **Objectives** | The ITS Conformance Validation Framework shall be validated against a minimum of at least two DUTs per base protocol. In addition, and beyond the TTF effort, it is expected to get documentation and support from the company providing the DUTs on any issues that may arise. This support shall be limited to reasonable effort. |
| **Input** | Updated Conformance Validation Framework and its specification |
| **Output** | * Extension and maintenance of the ITS Conformance Validation Framework * Provision and installation of SUT(s) * Execution of the tests * Reporting of errors in the ITS Conformance Validation Framework * Validation of test verdicts |
| **Interactions** | Attending Technical Body, WG and TTF meetings, presentation of the TTF activity |
| **Resources required** | * expert knowledge of ITS test specifications * expert knowledge of ITS technologies and implementations; * expert knowledge of TTCN-3 (ES 201 873); * expert knowledge in conformance testing; * expert knowledge in codec and adaptation layer development in Java and C++; |

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| **Task 6** | **Final deliveries update and prepare for publication** |
| **Objectives** | Update ITS test specifications to resolve all issues found during the validation phase. |
| **Input** | Base specification documents  Deliveries D1-D15  Validation results |
| **Output** | Final drafts presented to TC ITS #44 |
| **Interactions** | Report to TC ITS and TC ITS Working Groups as appropriate on the work of the TTF |
| **Resources required** | * knowledge of ETSI TS 303 613 * expert knowledge of ITS test specifications * expert knowledge of ITS technologies and implementations; * expert knowledge of TTCN-3 (ES 201 873); * expert knowledge in conformance testing; |

## Milestones

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| --- | --- | --- |
| **Milestone** | **Description** | **Cut-Off Date** |
| **A** | **Progress Report approved by TC ITS #43 and stable draft of the TR 103 099 made available** | 2021-07-01 |
| TC ITS | Stable drafts made available to TC ITS#43 |
| ETSI Deliverable | Progress Report approved by TC ITS #43 |

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| **Milestone** | **Description** | **Cut-Off Date** |
| **B** | **Final Report and final drafts approved by TC ITS #44** | 2021-10-18 |
| TC ITS | Final drafts made available and approved by TC ITS#44 |
| ETSI Deliverable | Final Report approved by TC ITS #44 |

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| **Milestone** | **Description** | **Cut-Off Date** |
| **C** | **Deliverables published, TTF closed** | 2021-12-17 |
| TC ITS | Deliverables published, TTF closed |
| ETSI Deliverable | Deliverables published, TTF closed |

## Task summary

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| --- | --- | --- | --- | --- | --- | --- |
| **Code** | **Task / Milestone** | Target Date | | CTI effort | Expertise effort | Estimated Cost (EUR) |
| From | To |
|  | Start of work |  |  |  |  |  |
| T1 | Project Management | 2021-01-18 | 2021-12-17 | 100% |  |  |
| T2 | Testing technical specifications update | 2021-01-18 | 2021-06-15 | 75% | 25% | 5 000 |
| T3 | Conformance validation framework update | 2021-01-18 | 2021-06-15 | 25% | 75% | 10 000 |
| T4 | TTCN-3 code update | 2021-01-18 | 2021-06-15 |  | 100% | 5 000 |
| Milestone A | Progress Report approved by TC ITS #43 and stable drafts of D1-D15 made available |  | 2021- 07-01 |  |  |  |
| T5 | Validation of the Framework | 2021-07-01 | 2021-10-15 |  | 100% | 10 000 |
| T6 | Final deliveries update and prepare for publication | 2021-07-01 | 2021-10-15 | 100% |  |  |
| Milestone B | Final Report and final drafts approved by TC ITS #44 |  | 2021-10-18 |  |  |  |
| Milestone  *C* | Deliverables published, TTF closed |  | 2021-12-17 |  |  |  |
|  | | | | |  | **30 000** |

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| **Task/ Mil.** | **D** | **J** | **F** | **M** | **A** | **M** | **J** | **J** | **A** | **S** | **O** | **N** | **D** |  |
| T1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MB |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MC |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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# Expertise required

## Team structure

2 participants to ensure the following mix of competences:

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| --- | --- |
| **Priority** | **Qualifications and competences** |
| High | Expert knowledge of ETSI ITS test specification and test adapter |
| High | Practical experience with ITS equipment testing |
| High | Expert knowledge on Java and C++ |
| High | Knowledge of Eclipse Titan and other test execution tools |
| High | Expert knowledge of TTCN-3 |
|  |  |

ETSI CTI provides resources to cover tasks for 1 participant of the team.

Part IV: TTF performance evaluation criteria

# Performance Indicators

|  |  |
| --- | --- |
| **Quality of deliverables** | |
| Approval of deliverables according to schedule | **X** |
| Respect of time scale, with reference to start/end dates in the approved ToR | **X** |
| Comments from Quality review by Reference Body | **X** |
| Comments from Quality review by ETSI Secretariat | **X** |
| **Contribution from the TTF to ETSI work** |  |
| Contributions to Reference Body meetings (number of documents / meetings / participants) | 2 meetings |

# Document history

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Date** | **Author** | **Status** | **Comments** |
| 0.1 | 2020-06-18 | Denis Filatov | Early draft |  |
| 0.3 | 2020-06-23 | Denis Filatov | Early draft | Add 14 new WI to be updated  Add TTCN-3 update task  Reference to the 5GAA report |
| 0.4 | 2020-07-02 | Denis Filatov | Early draft | WI references |
| 0.5 | 2020-08-18 | Denis Filatov | Early draft | Update base specification status |
| 0.6 | 2020-09-09 | Ultan Mulligan |  | Editorial cleanup before Board#129 |
| 0.7 | 2020-11-30 | ETSI Secretariat | Board Approved | Update before CL publication |