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| --- | --- |
| ETSI_logo_Office_Colour_Small | ***ToR STF DI (TC ITS / WG 1)*** |
| Version: 0.4 |
| Author: ETSI TC ITS – Date:16 Apr 2019 |
| Last updated by: Youssouf Sakho. Date:19 July 2019 |
| page 1 of 9 |

**Terms of Reference – Specialist Task Force STF DI (TC ITS / WG 1)**

**“Update of Infrastructure services test specifications”**

**Summary information**

|  |  |
| --- | --- |
| Approval status | Approved by TC ITS by remote consensus (25 April 2019)  Approved by Board#123 (12-14 June 2019) |
| Funding | **Maximum budget from ETSI FWP split into 3 phases:**  Phase I – 18 000 EUR  *Phase II – 80 000 EUR*  *Phase III – 50 000 EUR*  *Contingency – 18 000 EUR*  ***Total maximum budget: 173 500 EUR***  *Contracted experts: Manpower cost: 166 000 €. Travel cost up to 7 500 €.* |
| Time scale | October 2019 to January 2020 |
| Work Items | See §6.2 (deliverables to be produced) |
| Board priority | Standards enablers/facilitators (e.g. conformance test/interoperability/methodology)  Recommendations: use of TTCN and CTI supervision |

Part I – Reason for proposing the STF

# Rationale

The deployment of ITS systems is a real challenge as it involves collaborative efforts by many stakeholders from regulatory bodies and industry.

The ITS Infrastructures Services (MAPEN, SPATEN, IVIM, SREM, SSEM and RTCEM) protocols have been specified and designed to operate correctly across a wide variety of infrastructures worldwide. The risk profile for ITS systems indicates a high impact of these protocols if their design includes a widespread error or fault. This issue provides evidence that successful testing and interoperability are key factors that enable the deployment of these technologies and their successful global introduction.

The provisioning of application-specific testing and compliance scenarios for ITS applications is essential and allows the EU to maintain its leadership in present and future ITS technology.

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 10 years by ETSI. The project will use TTCN-3 formal notation to improve the quality and the repeatability of test cases and will provide a TTCN-3 test tool environment for test execution. The project will extend previous ITS STFs, which would improve quality and repeatability of tests, reduce the room for interpretation of the test specifications and provide a cost-efficient approach to test solution development.

The ITS Infrastructures Services specification (ETSI TS 103 301) is referenced by ITS Delegated Act and Test Specifications for these protocols shall be conformed to the recent versions of other ITS standards, referenced in the ITS Delegated Act, for example ITS TS 103 097 v1.3.1.

The existing test specification needs to be updated to cover all parts of the ITS Infrastructures Services specification which are not covered yet.

This present document proposes the creation of a new STF in order to align conformance test specifications with the most recent version of ITS Infrastructures Services standards in order to keep the consistency of ETSI ITS packet of standards.

# Objective

The objective of this present STF proposal is:

* to update the current conformance test specifications RTS/ITS-001943 (TS 103 191-1), RTS/ITS-001944 (TS 103 191-2), RTS/ITS-001945 (TS 103 191-3) according to the latest versions of ETSI TS 103 301 RTS/ITS-00181 and ETSI TS 103 097 v1.3.1;
* to make a general review of the test specifications (references, names, abbreviations);
* to update the Test Purposes;
* to update and implement Service Specific Permission TTCN-3 test scripts;
* to compile and validate the TTCN-3 test scripts on at least three TTCN-3 tools

# Relation with ETSI strategy and priorities

The STF will contribute to the following ETSI Strategy:

* keep ETSI effective, efficient and recognised as such;
* create high quality standards for global use and with low time-to-market;
* establish leadership in key areas impacting members’ future activities

This request is in following the priority category:

* standards enablers/facilitators (conformance testing, interoperability, methodology)

# Context of the proposal

## ETSI Members support

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  | | --- | --- | --- | | ETSI Member | Supporting delegate | Motivation | | FSCOM | Peter Schmitting |  | | Anemone Technology | Niels Peter Skov Andersen |  | | Siemens AG | Thomas Ritter | Siemens supports the STF on Conformance Test Specification for TS 103 301 Infrastrure Services | | Filatov DV | Denis Filatov | Conformance test specifications are very important part of the ETSI ITS packet of standards. It shall be aligned with protocol versions and cover all important parts of base standards. | |

## Market impact

With more than 200 million vehicles on the roads in Europe today and some 13 million jobs at stake across the continent, it is essential for Europe’s automotive industry to be at the forefront when it comes to introducing new technologies. However, the next generation of ‘connected cars’ will not work without common technical specifications, for example regarding radio frequencies and messaging formats. The TTCN-3 test specifications must be available for product validation in order to support the product market entry and to keep the consistency of the ETSI ITS packet of standards.

## Tasks for which the STF support is necessary

Experience with the development of other standards has shown that involvement of experts on conformance and interoperability testing of protocols requires highly specialised knowledge in testing methodology. The generation of test specifications requires significant concentrated effort that can only be done by service contractors’ experts on a funded basis. Hence, the involvement of testing experts is needed in order to assure timely completion and high quality deliverables. The service contractors’ experts will use dedicated software tools available at ETSI. Test adapter development and test suite validation are expert tasks, which cannot be provided by a TB.

## Related voluntary activities in the TB

* Delegates within the TC will review the deliverables

## Outcome from previous funded activities in the same domain

TC ITS has benefited of STF support in this domain:

* TC ITS WG1/3: STF424 (2010-2012) EC/EFTA
* TC ITS WG1/3: STF484 (2014/2015) ETSI
* TC ITS WG1,3,5: STF517 (2016/2017) ETSI
* TC ITS WG5: STF538 (2017/2018) ETSI

## 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.

Part II – Execution of the work

# Technical Bodies and other stakeholders

## Reference TB

TC ITS

## Other interested ETSI Technical Bodies

ITS WG 1 / WG 5

## Other stakeholders

ERTICO – ITS Europe and ETSI have a MoU in place which defines amongst other activities the cooperation on ‘Testing support and certification initiative’.

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.

European Commission funded pre-deployment pilots such as AutoNet2030, iGAME, SCOOP@F and Cooperative ITS Corridor Rotterdam – Frankfurt/M. – Vienna, will benefit from the available tests.

# Base documents and deliverables

## Base documents

|  |  |  |  |
| --- | --- | --- | --- |
| **Document** | **Title** | **Current Status** | **Publication date** |
| ETSI TS 103 301 v1.2.1 RTS/ITS-00180 | Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Facilities layer protocols and communication requirements for infrastructure services | published | August 2018 |
| ETSI TS 103 301 v1.3.1 RTS/ITS-00181 | Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Facilities layer protocols and communication requirements for infrastructure services | draft | August 2019 |
| CEN ISO/TS 19321-2015 | “Intelligent transport systems – Cooperative ITS – Dictionary of in-vehicle information (IVI) data structures | published | April 2015 |
| CEN ISO/TS 19091:2017 | Intelligent transport systems – Cooperative ITS – Using V2I and I2V communications for applications related to signalized intersections | published | March 2017 |
| ISO 17427:2014 | Intelligent transport systems – Cooperative systems – Roles and responsibilities in the context of cooperative ITS based on architecture(s) for cooperative systems | outdated | July 2014 |
| ISO 17427-1:2018 | Intelligent transport systems – Cooperative ITS – Part 1: Roles and responsibilities in the context of co-operative ITS architecture(s) | published | June 2018 |
| ETSI TS 103 097 v1.3.1  RTS/ITS-00540 | Intelligent Transport Systems (ITS); Security; Security header and certificate formats | published | October 2016 |

## Deliverables to be produced

|  |  |  |
| --- | --- | --- |
| **Deliv.** | **Work Item code**  **Standard number** | **Working title**  **Scope** |
| D1 | RTS/ITS-001943  TS 103 191-1 | Title: Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Facilities layer protocols and communication requirements for infrastructure services; Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) pro forma. |
| D2 | RTS/ITS-001944  TS 103 191-2 | Title: Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Facilities layer protocols and communication requirements for infrastructure services; Part 2: Test Suite Structure and Test Purposes (TSS&TP). |
| D3 | RTS/ITS-001945  TS 103 191-3 | Title: Intelligent Transport Systems (ITS); Testing; Conformance test specifications for Facilities layer protocols and communication requirements for infrastructure services; Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT). |

## Deliverables schedule:

Not applicable for the Phase I

# Work plan, time scale and resources

## Task description

### Phase I: Feasibility study for a Test Framework of ITS infrastructure services

**Input:** Base documents (see clause 6.1)

**Output:** A STF report containing the feasibility study

* Decision on Test Method
  + Test architecture
  + Upper tester
* Proposal of Test scope
  + List of test groups
  + List of test objectives
* Level of detail of tests
  + example Test Purposes for each protocol
* Recommendations on the continuation of the STF project

Task TI-0: Project Management

* Attending Technical Body, WG and STF meetings, presentation of the STF activity
* Coordination, communication, reporting and leading of activities

Task TI-1: Study of base documents

* Review of all base documents to decide on a feasible Test Method (especially on the ISO base specs for which no test have been defined yet)
* Principal review of recent changes in ETSI base documents and its reflection in conformance test specifications

At least 1 F2F and online drafting sessions shall be arranged for this task.

Task TI-2: Scoping and examples

* Definition of test groups, test objectives and example Test Purposes to cover all necessary parts ITS Infrastructure services specifications
* Identification of Devices Under Test (DUTs) providers

At least 2 F2F and online drafting sessions shall be arranged for this task.

### *Phase II: Test specification development*

*Input: Base documents (see clause 6.1), Phase I STF report.*

*Output: Multi-part test specification containing PICS, TSS&TP and ATS.*

*Task TII-0: Project Management*

* *Attending Technical Body, WG and STF meetings, presentation of the STF activity*
* *Coordination, communication, reporting and leading of activities*

*Task TII-1: PICS, TSS&TP Update*

* *Development of the PICS, TSS&TP according to the scope of Phase I*
* *The TPs will be developed using TDL-TO*

*Task TII-2: ATS Update*

* *Development of the ATS document*
* *Test purposes defined in T1 of this Phase be implemented in TTCN-3 and compiled on three test tools (Elvior, Ttworkbench, Titan)*

### *Phase III: Test specification validation*

*Input: Base documents (see clause 6.1), Phase I STF report, Test Specifications produced in Phase II*

*Output: Validation of the test specifications against at least 2 different implementations of each base protocol.*

*Task TIII-0: Project Management*

* *Attending Technical Body, WG and STF meetings, presentation of the STF activity*
* *Management of Validation Logistics (Availability of Devices Under Test (DUTs), Communication with DUT providers, establishment of VPN connections, etc. )*
* *Coordination, communication, reporting and leading of activities*

*Task TIII-1: Codecs and Test Adapter (TA) development*

* *Update of codec and test adapter features according to base standard revisions:*
  + *Common Data Dictionary (ETSI TS 102 894-2 v1.3.1 and upcoming v1.4.1)*
  + *Infrastructure (ETSI TS 103 301 v1.2.1 and upcoming v1.3.1)*
  + *Security (ETSI TS 103 097 v1.3.1)*
* *Furthermore tests will be updated according to issues found during the validation phase*

*The Codec and TA software shall be delivered as source code including all source code modules needed for the compilation into an executable version of the software. All software shall be accessible from* [*https://forge.etsi.org*](https://forge.etsi.org)

*Task TIII-2: ATS Validation*

*The ITS Conformance Validation Framework shall be validated against a minimum of at least two DUTs per base protocol. In addition and beyond the STF 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.*

*This STF will provide level 2 validation, i.e.:*

* *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*

*1 or 2 F2F and online validation sessions can be organized in order to achieve validation results.*

*Task TIII-3: TS updates*

* *Update of the test specifications according to the validation results*

## Milestones

**Milestone 1 – Draft version of Feasibility study report approved by CTI**

Draft version of Feasibility study report approved by CTI end of November 2019

**Milestone 2 – Phase I finished, Feasibility study Report approved by CTI and TC ITS**

Feasibility study report containing the results of Phase I and Final Report approved by CTI and ITS #37 in January 2020.

Documents must be uploaded on the TC docbox at least two weeks before the start of TC ITS meeting or the TC RC.

Based on the results of the phase I, and CTI recommendations, TC ITS will decide whether to continue the next project phases.

*Milestone 3 – Early draft available*

*Early drafts of deliverables including the result of the tasks TII-1 and TII-2 (Development of PICS, TSS, TP and ATS) available for review.*

*Progress Report to be approved by TC ITS #43 in July 2020.*

*Documents must be uploaded on the TC docbox at least two weeks before the start of TC ITS meeting or the TC RC.*

*Milestone 4 – Stable Drafts and STF Progress Report approved by TC ITS*

*Stable drafts of deliverables including the result of the tasks TII-1 and TII-2 and STF progress report available for approval by TC ITS #44 in October 2020.*

*Documents must be uploaded on the TC docbox at least two weeks before the start of TC ITS meeting or the TC RC.*

*The Phase II of the STF is finished.*

*Milestone 5 – Final Drafts and STF Final Report approved by TC ITS*

*Final draft available for review. Final draft and STF final report to be approved by ITS #45 in January2021.*

*Milestone 6 – Deliverables published, STF closed*

## Task summary

### Phase I: Feasibility study for a Test Framework of ITS infrastructure services

|  |  |  |  |
| --- | --- | --- | --- |
| **N** | **Task / Milestone / Deliverable** | Target date | Estimated cost |
|  | Start of work | Oct 2019 |  |
| TI-1 | Feasibility study for a Test Framework of ITS infrastructure services |  | 18 000 |
| MI-1 | Draft version of Feasibility study report approved by CTI | 29 Nov 2019 |  |
| MI-2 | Feasibility study report and Final Report approved by CTI and TC ITS | 17 Jan 2020 |
| **Total** | | | **18 000** |

### *Phase II: Test specification development*

|  |  |  |  |
| --- | --- | --- | --- |
| *N* | *Task / Milestone / Deliverable* | *Target date* | *Estimated cost* |
| *M II-0* | *Start of work* | *Feb 2020* |  |
| *T II-0* | *Project management, reporting, meeting attendance* | *Feb – Dec 2020* |  |
| *T II-1* | *PICS, TSS and TP Update* | *Feb – June 2020* |  |
| *M II-1* | *Early drafts and Progress Report approved by TC ITS #43* | *Jul 2020* |  |
| *T II-2* | *ATS Updates* | *Apr – Oct 2020* |  |
| *M II-2* | *Stable drafts and Progress Report approved by TC ITS #44* | *Oct 2020* |  |
| *Total* | | | *80 000* |

### *Phase III: Test specification validation*

|  |  |  |  |
| --- | --- | --- | --- |
| *N* | *Task / Milestone / Deliverable* | *Target date* | *Estimated cost* |
| *M III-0* | *Start of work* | *Oct 2020* |  |
| *T III-0* | *Project management, reporting, meeting attendance* | *Oct – Jan 2020* |  |
| *T III-1* | *Codecs and test adapter development* | *Oct 2020* |  |
| *T III-2* | *ATS Validation* | *Oct – Dec 2020* |  |
| *T III-3* | *TS Updates* | *Dec 2020 – Jan 2021* |  |
| *M2* | *Final drafts and STF Final Report approved by TC ITS #45* | *Jan 2021* |  |
| *T III-4* | *TC ITS approval and publication* | *Feb 2021* |  |
| *Total* | | | *50 000* |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Task Milest.** | **Description** | **O** | **N** | **D** | **J** | **F** | **M** | **A** | **M** | **J** | **J** | **A** | **S** | **O** | **N** | **D** | **J** | **F** |
| M I-0 | Start of Phase I |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T I-0 | Project management |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T I-1 | General review |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T I-2 | Test groups and test objective definition |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| M I-1 | Progress Report TC ITS#24 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| M II-0 | Start of Phase II |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T II-0 | Project management |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T II-1 | PICS, TSS and TP Update |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| M II-1 | Progress Report ITS#25 (early draft) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T II-2 | ATS Updates |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| M II-2 | Progress Report ITS#25 (stable draft) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| M III-0 | Start of Phase III |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T III-0 | Project management |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T III-1 | Codecs and test adapter development |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T III-2 | ATS Validation |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T III-3 | TS Updates |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| M III-1 | Final draft approved by ITS WG1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T7.5 | Publication |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| M5 | Deliverables published, STF closed |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

*NOTE: Effort estimate includes margin to take into account uncertainty on the technical difficulties. Contracts will be released under the supervision of ITS WG5 and CTI, in order to ensure that only the amount of resources that are actually required will be spent.*

## Working methods

The work will be performed in common sessions in the ETSI premises.

# Expertise required

### Phase I: Feasibility study for a Test Framework of ITS infrastructure services

Up to 2 persons with the following skills:

* expert knowledge of ETSI TS 103 301, CEN ISO/TS 19321-2015, CEN ISO/TS 19091:2017, ISO 17427:2014 and ISO 17427-1:2018;
* expert knowledge of ETSI TS 103 097 and IEEE 1609.2
* expert knowledge of ITS Security technologies and implementations;
* expert knowledge in conformance testing;

### *Phase II: Test specification development*

*2 persons with the following skills:*

* *knowledge of ETSI TS 103 301, CEN ISO/TS 19321-2015, CEN ISO/TS 19091:2017, ISO 17427:2014 and ISO 17427-1:2018, ETSI TS 103 097 and IEEE 1609.2*
* *expert knowledge of ITS Security technologies and implementations;*
* *expert knowledge of TTCN-3 (ES 201 873);*
* *expert knowledge in conformance testing;*

### *Phase III: Test specification validation*

* *knowledge of ETSI TS 103 301, CEN ISO/TS 19321-2015, CEN ISO/TS 19091:2017, ISO 17427:2014 and ISO 17427-1:2018, ETSI TS 103 097 and IEEE 1609.2*
* *expert knowledge of ITS Security 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++;*

Part III: Financial conditions

# Maximum budget

## Contractors cost

### Phase I: Feasibility study for a Test Framework of ITS infrastructure services

Maximum budget **18 000 €**

### *Phase II: Test specification development*

*Maximum budget 80 000 €*

### *Phase III: Test specification validation*

*Maximum budget 50 000 €*

## Travel Costs

### Phase I: Feasibility study for a Test Framework of ITS infrastructure services

Maximum travel budget **5 000 €**

To attend 1 travel to TC ITS#37 (13-17 Jan 2020)

### *Phase II: Test specification development*

*N/A*

### *Phase III: Test specification validation*

*Maximum travel budget 2 500 €*

## Other Costs

N/A

# Key Performance Indicators

* Quality of deliverables
  + Approval of deliverables from the Reference TB according to schedule
  + Respect of time scale, with reference to start/end dates in the approved ToR

In the course of the activity, the STF Leader will collect the relevant information, as necessary to measure the performance indicators. The result will be presented in the Final Report.

# Document history

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Date** | **Author** | **Status** | **Comments** |
| 0.0 | 15-Apr-2019 |  | First draft |  |
| 0.1 | 16-Apr-2019 |  | Second draft |  |
| 0.2 | 17-Apr-2019 | CTI | Review |  |
| 0.3 | 29-Apr-2019 | Youssouf Sakho | TB Approved | Editorials before Panel Review |
| 0.4 | 19-Jul-2019 | Youssouf Sakho | Board Approved | Editorials before CL publication |