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| --- |
| ToR TTF T003 (Ref. Body MTS) |
| Version: 1.5 |
| Author: Gyorgy.Rethy – Date: 2019-09-02 |
| Last updated by: ETSI – Date: 2020-03-03 |
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Terms of Reference –Testing Task Force Proposal

TTF T003 (Ref. Body MTS)

TTCN-3 Maintenance and Testing 2020

Summary information

|  |  |  |
| --- | --- | --- |
| Approval status | Approved by Ref. Body (doc ref: MTS(19)078002r3) | **YES** |
| Reference Body | Ref. Body MTS |
| ETSI Funding | **Maximum budget : 98 900 EUR** |
| Minimum of 4 ETSI Members Support | **YES** |
| Time scale | **From** | 2020-05-01 |
| **To** | 2021-05-31 |
| Work Items  | See clause 3.2 below |
| TTF Roadmap reference | TTF Budget approved in GA#74 – December 2019 |

Part I –TTF Technical Proposal

# Rationale & Objectives

## Rationale

The TTCN‑3 testing language has intensively been developed by ETSI during the last 15 years. By today, TTCN-3 has become a significantly important testing technology in different domains (see more details at <http://www.ttcn-3.org/index.php/about/references/applicatio-domains>). It is used by standardization bodies as well as by EU research projects and open source initiatives. TTCN-3 reached very high deployment at various ETSI member companies. The language is also endorsed by ITU-T as the Z.16x and Z.17x Recommendation series.

In **standardization TTCN-3** is an enabler technology for several conformance, end-to-end and interoperability test standards. **3GPP** uses it for several UE conformance test suites from Rel. 8 onward, for LTE, VoLTE and lately for NB-IoT. ETSI TBs **INT**, **ERM**. In the **C‑ITS** area several TTCN-3 test suites have been developed and they are playing important roles in ITS PlugtestsTM events, with automated C-ITS interoperability testing being in progress. In 2016 **oneM2M** has started using TTCN-3 for IoT/M2M conformance test development that has been continued in ETSI **smartM2M** from 2017. Other bodies and alliances using TTCN-3 are TCCA, EUROCONTROL, MOST and AUTOSAR (see more details at <http://www.ttcn-3.org/index.php/about/references>).

In **research** at least 12 big projects from different domains are known to use TTCN-3, among them the EU projects **MIDAS**, **IoT.EST**, **ARMOUR, PHANTOM, 5GTANGO** and **SMESEC** (see details in at <http://www.ttcn-3.org/index.php/about/references/projects>). In the smart grid area CEAList has developed a model driven testing solution, using TTCN-3 to implement the user domain of the solution. The **open source** Eclipse project **IoT-Testware** is using TTCN-3 to develop conformance and security test suites for IoT protocols with major contribution from Fraunhofer FOKUS and relayr (<https://projects.eclipse.org/projects/technology.iottestware>). The **Osmocom** project is an open source initiative implementing mobile communication standards, including GSM, DECT, TETRA, 3G and others (<https://osmocom.org/>) and intensively using TTCN‑3 for functional and regression testing. TTCN-3 plays an important role in the **industry** as well. TTCN-3 is used by several ETSI member and non-member companies as an essential test enabler language (e.g. Ericsson, Easy Global Market, Software Radio Systems).

Especially industrial users want low time to market of their new products. For this reason, they have introduced agile ways of working with continuous integration (CI) and continuous delivery (CD) machineries. Agile and CI/CD are heavily relying on automated testing (AT), including TTCN-3 based AT solutions. Resolving new requirements and user requests with **short response time** is important for user satisfaction and for keeping time-to-market low.

Significant number of TTCN-3 test toolsets are available on the market. At least five commercial tools, five free or open source tools and one internal test tool of an industrial ETSI members are known to exist (<http://www.ttcn-3.org/index.php/tools>). This also indicates the high interest and use of the language. TTCN-3, as THE standard test language, serving several domains and application areas, is specified in very detail. For example, the TTCN-3 core language alone is estimated to contain about 5,000 requirements. It is of upmost importance for users of standard test suites as well as for industrial users that the TTCN-3 tools conform to the TTCN-3 language standards. This can be secured by
**TTCN-3 tool conformance** test suites, in a similar way as implementations of other ETSI standards (e.g. protocol specifications) are checked by means of ETSI-developed conformance test suites. In the past, the TTCN-3 tool conformance test suite development process itself has led to several language standard clarifications.

**TC MTS** is committed to keep the language **powerful** still **easy-to-use**, **up-to-date**, well **maintained** and following the changing **user needs**. The series of TTCN-3 standards consists of **24** ETSI standards, altogether comprising almost **1800** pages and **3321** test cases in TTCN-3 code (145895 lines in 3702 modules) today. This commitment very high expertise and experts knowing the standards in detail.

## Objectives of the work to be executed

TTCN-3 language evolution STFs in the past years enabled continuous maintenance and extension of the TTCN-3 standards. In parallel, the STFs developing the TTCN-3 tool conformance test suites have updated and extended the TTCN-3 tool ATS to the latest published version of the language. This has essentially contributed to the success of TTCN-3. Figure 1 picture the volume of the work completed by the TTCN-3 STFs in the past.



Figure 1: Number of pages of the TTCN-3 standards

NOTES: \* Tool conformance test purposes and descriptions are moved to the TTCN-3 code

 \*\* In addition, the standards contain 145895 lines of TTCN-3 source code

The TTCN-3 language evolution part of the work comprises the following tasks:

* Review and resolve change requests reporting technical defects or requesting clarifications and new language features for all existing TTCN-3 language standards.
* Develop proposals for language extensions requested by ETSI TBs, 3GPP, oneM2M, ETSI members and the TTCN-3 community and consent the solution with the contributor(s).
* Implement agreed solutions.
* Manage the change request (CR) process.
* Manage the interim versions of the standard according to 3GPP needs (when requested), and the versions for approval.
* Present the TTCN-3 standards’ status and the work of the TTF (previously STF) at the conference(s) associated with ETSI TB MTS and at ETSI TC MTS meetings.
* Providing input for the updates of the TTCN-3 leaflet and the TTCN-3 web pages.

The TTCN-3 tool conformance tests part of the work comprises the following tasks:

* Analysis of the latest published versions of the relevant TTCN-3 standards and identifying new and changed requirements
* Identifying impacted existing test cases and define new test cases for the new requirements
* Implement changes and additions in the textual part of the deliverables (PICS, TSS&TP, textual part of the ATS)
* Implement changes and additions in the code of the ATS
* Verification of the test cases with test tools.

## Previous funded activities in the same domain

TTCN-3 language development and maintenance has been a continuous ETSI activity for the last 1,5 decades due to unceasing new user requirements and the need to maintain or even further increase where possible the high quality, clarity and unambiguity of the standard.

The demand to ensure the conformance of the TTCN-3 tools to the standard was first raised by TF160 in 2009, followed by TC MTS’s action of establishing STF 409, which covered about 1/3 of the clauses in the main standard with some test cases (which activity has led to the discovery of 19 issues or ambiguities in the TTCN-3 standard version v4.2.1). The TTCN-3 tool conformance test suites are being continuously updated and extended from that time.

##

## Consequences if not agreed

Clause 1.2 contains the achievements of past TTCN-3 language and tool conformance STFs. TC MTS is considering the availability of the language team and the communication with users and tool vendors at least as important as the numerical results.

Experience from recent years showed that quick response to user requests improves efficiency and removes ambiguity both at standardization, in tool implementations and at the industrial users. Without support of the former STFs, TC MTS would not be able to respond in a timely fashion. A few examples from the last years are:

* Several new features, technical improvements and clarifications, requested by STF160 have been resolved in 2014, 2015 and earlier, and interim drafts versions have been produced; STF160 is baselining these interim versions for TTCN-3 tool vendors that allows using them about a year before the publication of the next versions of standards.
* CR 6088: resolving this CR by STF 433 in a few weeks enabled a user to test an XML-based protocol; before this only workaround with a very limited functionality was possible by complex TTCN-3 code constructs.
* Including IMS supplementary services into the scope of STF160, caused finding diversities in different TTCN-3 tool implementations that raised several CRs to Part-9 of the TTCN-3 standard. Existence of STF 430 allowed to resolve the problem until the summer and to provide the interim version v4.3.2 that has been used by STF160 as the baseline for tool vendors.
* Several issues for clarification as well as bug reports have been reported in the spring of 2010, in relation to the development of LTE UE conformance test suites by STF 160. All reported CRs has been resolved by STF 393 at its first sessions and in July 2010 the interim version v4.2.2 has been provided to STF 160 that has been used by STF160 in September as the baseline for tool vendors.

# ETSI Members Support

|  |  |  |
| --- | --- | --- |
| **ETSI Member** | **Supporting delegate** | **Motivation** |
| Telefon AB LM Ericsson | Dr. Gyorgy Rethy | TTCN-3 has an essential role in our product development, both in functional and performance testing, as well as in product deployment. It is essential for Ericsson that new language requirements, requests for clarification and user complaints arising during software development are resolved within a short timeframe. |
| Telecom Italia | Giulio Carmelo Maggiore | TTCN-3 promotion and use for increasing the quality of standards and implementations in the network. |
| Institut fur Informatik, Universitaet Goettingen | Dieter Hogrefe | The University of Gottingen is interested in the further development of TTCN-3, because we are involved in several research and development projects where testing with TTCN-3 plays a central role. TTCN-3 can only keep such a central role, if TTCN-3 is continuously maintained and adapted to the new challenges of testing. |
| Fraunhofer FOKUS | Ina Schieferdecker | TTCN-3 plays a central role in our R&D projects and in our training programs. We run e.g. an automotive IOP test stand for Car2X communication based on TTCN-3 and a reference test system for IHE/HL7-based solutions likewise based on TTCN-3. In addition, our automated test generation methods and tools use TTCN-3 as target test specification so that in various respects a continuously maintained and evolving TTCN-3 is essential for our work |
| Spirent | Stephan Pietsch | For Spirent, being one of the main TTCN-3 tool provider the maintenance is crucial for its success and TTCN-3's success at its customers and users. Continuous development and enhancement of the language is one of its main USPs.From end-users we understand that the compatibility of TTCN-3 tools applied is crucial for the further deployment of TTCN-3, at companies and at standardisation bodies and for gremias. |
| OU Elvior | Andrus Lehmets | Elvior is TTCN-3 tool provider and contributes actively into TTCN-3 evolution. Effective resolving CR-s raised by TTCN-3 users strengthens TTCN-3 position in test automation market and therefore has impact to our business. It is important that different tool vendors interpret all aspects of TTCN-3 language in a similar way, output of this TTF will help to achive this target. |
| Broadbit | Andras Kovacs | Broadbit is using TTCN-3 tools for providing testing and integration services for ITS (Intelligent Transportation Systems) and V2G (Vehicle-to-Grid) technologies. When working with emerging technologies, it is especially important that the testing tool must be reliable and unambiguous. |

# Deliverables

## Base documents

### TTCN-3 base documents

|  |  |  |  |
| --- | --- | --- | --- |
| **Document** | **Title** | **Current Status** | **Expected date for stable document** |
| ETSI ES 201 873-1 V4.11.1 | Part 1: TTCN-3 Core Language | Published | 2019-04 |
| ETSI ES 201 873-4 V4.6.1 | Part 4: TTCN-3 Operational Semantics | Published | 2017-05 |
| ETSI ES 201 873-5 V4.8.1 | Part 5: TTCN-3 Runtime Interface (TRI) | Published | 2017-05 |
| ETSI ES 201 873-6 V4.11.1 | Part 6: TTCN-3 Control Interface (TCI) | Published | 2019-04 |
| ETSI ES 201 873-7 V4.7.1 | Part 7: Using ASN.1 with TTCN-3 | Published | 2018-05 |
| ETSI ES 201 873-8 V4.7.1 | Part 8: The IDL to TTCN-3 Mapping | Published | 2017-05 |
| ETSI ES 201 873-9 V4.10.1 | Part 9: Using XML schema with TTCN-3 | Published | 2019-05 |
| ETSI ES 201 873-10 V4.5.1 | Part 10: TTCN-3 Documentation Comment Specification | Published | 2013-04 |
| ETSI ES 201 873-11 V4.8.1 | Part 11: Using JSON with TTCN-3 | Published | 2018-05 |
| ETSI ES 202 781 V1.7.1 | TTCN-3 Language Extensions: Configuration and Deployment Support | Published | 2019-04 |
| ETSI ES 202 782 V1.3.1 | TTCN-3 Language Extensions: TTCN‑3 Performance and Real Time Testing | Published | 2015-06 |
| ETSI ES 202 784 V1.6.1 | TTCN-3 Language Extensions: Advanced Parameterization | Published | 2017-04 |
| ETSI ES 202 785 V1.6.1 | TTCN-3 Language Extensions: Behaviour Types | Published | 2018-05 |
| ETSI ES 202 786 V1.4.1 | TTCN-3 Language Extensions: Support of interfaces with continuous signals | Published | 2017-05 |
| ETSI ES 202 789 V1.4.1 | TTCN-3 Language Extensions: Extended TRI | Published | 2015-06 |
| ETSI ES 203 022 V1.3.1 | TTCN-3 Language Extensions: Advanced Matching | Published | 2019-04 |
| ETSI ES 203 790 V1.1.1 | TTCN-3 Language Extensions: Object Oriented features | Published | 2019-01 |

NOTE : The work of the TTCN-3 maintenance TTF should always be based on the latest published base documents. If during the TTF work a new version of a base document is published, the TTF can decide to base its work on this new version.

### TTCN-3 conformance test suites

|  |  |  |  |
| --- | --- | --- | --- |
| **Document** | **Title** | **Current Status** | **Expected date for stable document** |
| ETSI TS 102 950-1 V1.7.1 | Methods for Testing and Specification (MTS);TTCN-3 Conformance Test Suite;Part 1: Implementation Conformance Statement (ICS) | Published | 2018-11 |
| ETSI TS 102 950-2 V1.7.1 | Methods for Testing and Specification (MTS);TTCN-3 Conformance Test Suite; Part 2: Test Suite Structure and Test Purposes (TSS&TP) | Published | 2018-11 |
| ETSI TS 102 950-3 V1.7.1 | Methods for Testing and Specification (MTS);TTCN-3 Conformance Test Suite; Part 3: Abstract Test Suite (ATS) and Implementation eXtra Information for Testing (IXIT) | Published | 2018-11 |
| ETSI TS 103 253 V1.4.1 | Methods for Testing and Specification (MTS); Conformance test suite for using XML schema with TTCN-3; Part 1: Implementation Conformance Statement (ICS) | Published | 2018-11 |
| ETSI TS 103 254 V1.4.1 | Methods for Testing and Specification (MTS); Conformance test suite for using XML schema with TTCN-3; Part 2: Test Suite Structure and Test Purposes (TSS&TP) | Published | 2018-11 |
| ETSI TS 103 255 V1.4.1 | Methods for Testing and Specification (MTS); Conformance test suite for using XML schema with TTCN-3; Part 3: Abstract Test Suite (ATS) and Implementation eXtra Information for Testing (IXIT) | Published | 2018-11 |
| DTS/MTS-103663-1(TS 103 663-1) | TTCN-3 Object Oriented extensions Conformance Test Suite - Part 1 : Implementation Conformance Statement | Under development |  |
| DTS/MTS-103663-2(TS 103 663-2) | TTCN-3 Object Oriented extensions Conformance Test Suite - Part 2: Test Suite Structure & Test Purpose | Under development |  |
| DTS/MTS-103663-3(TS 103 663-3) | TTCN-3 Object Oriented extensions Conformance Test Suite - Part 3: Abstract Test Suite & IXIT | Under development |  |

## New deliverables

### New TTCN-3 base deliverables

|  |  |  |  |
| --- | --- | --- | --- |
| **Deliv.** | **Work Item code****Standard number** | **Working title** | **Expected date for publication** |
| D1 |  | Part 1: TTCN-3 Core Language |  |
| D2 |  | Part 4: TTCN-3 Operational Semantics |  |
| D3 |  | Part 5: TTCN-3 Runtime Interface (TRI) |  |
| D4 |  | Part 6: TTCN-3 Control Interface (TCI) |  |
| D5 |  | Part 7: Using ASN.1 with TTCN-3 |  |
| D6 |  | Part 8: The IDL to TTCN-3 Mapping |  |
| D7 |  | Part 9: Using XML schema withTTCN-3 |  |
| D8 |  | Part 10: TTCN-3 Documentation Comment Specification |  |
| D9 |  | Part 11: Using JSON with TTCN-3 |  |
| D10 |  | TTCN-3 Language Extensions: Configuration and Deployment Support |  |
| D11 |  | TTCN-3 Language Extensions: TTCN‑3 Performance and Real Time Testing |  |
| D12 |  | TTCN-3 Language Extensions: Advanced Parameterization |  |
| D13 |  | TTCN-3 Language Extensions: Behaviour Types |  |
| D14 |  | TTCN-3 Language Extensions: Support of interfaces with continuous signals |  |
| D15 |  | TTCN-3 Language Extensions: Extended TRI |  |
| D16 |  | TTCN-3 Language Extensions: Advanced Matching |  |
| D17 |  | TTCN-3 Language Extensions: Object Oriented features |  |

The scope of the work items above is to produce the new versions of the existing standards, containing the changes **coming from** **resolved change requests**. **No new revisions** are produced for documents with no resolved CR.

Upon request of STF160, intermediate versions may be produced for the requested parts. This does not require formal approval by TC MTS and will appear as a draft uploaded to the TC MTS drafts area.

### New TTCN-3 conformance test suite deliverables

|  |  |  |  |
| --- | --- | --- | --- |
| **Deliv.** | **Work Item code****Standard number** | **Working title** | **Expected date for publication** |
| D18 |  | Methods for Testing and Specification (MTS);TTCN-3 Conformance Test Suite;Part 1: Implementation Conformance Statement (ICS) |  |
| D19 |  | Methods for Testing and Specification (MTS);TTCN-3 Conformance Test Suite; Part 2: Test Suite Structure and Test Purposes (TSS&TP) |  |
| D20 |  | Methods for Testing and Specification (MTS);TTCN-3 Conformance Test Suite; Part 3: Abstract Test Suite (ATS) and Implementation eXtra Information for Testing (IXIT) |  |
| D21 |  | Methods for Testing and Specification (MTS); Conformance test suite for using XML schema with TTCN-3; Part 1: Implementation Conformance Statement (ICS) |  |
| D22 |  | Methods for Testing and Specification (MTS); Conformance test suite for using XML schema with TTCN-3; Part 2: Test Suite Structure and Test Purposes (TSS&TP) |  |
| D23 |  | Methods for Testing and Specification (MTS); Conformance test suite for using XML schema with TTCN-3; Part 3: Abstract Test Suite (ATS) and Implementation eXtra Information for Testing (IXIT) |  |
| D24 |  | TTCN-3 Object Oriented extensions Conformance Test Suite - Part 1 : Implementation Conformance Statement |  |
| D25 |  | TTCN-3 Object Oriented extensions Conformance Test Suite - Part 2: Test Suite Structure & Test Purpose |  |
| D26 |  | TTCN-3 Object Oriented extensions Conformance Test Suite - Part 3: Abstract Test Suite & IXIT |  |

# Maximum budget

## Task summary/Manpower Budget

|  |  |
| --- | --- |
| **Task short description** | Budget(EUR) |
| T0: Project Management | 6 000 |
| T1: TTCN-3 maintenance and further development | 50 000 |
| T2.1: Listing of Changes | 800 |
| T2.2: TTCN-3 Part 1 new/changed features | 18 000 |
| T2.3: TTCN-3 Part 9 new/changed features | 4 000 |
| T2.4: TTCN-3 Ext. OO features new/changed features | 4 000 |
| T2.5: Tools/Adaptation | 3 000 |
| T2.6: Validation | 2 000 |
| T2.7: Discussion of validation results | 1 500 |
| T2.8: TTCN-3 Part 1 correction of tests | 3 000 |
| T2.9: TTCN-3 Part 9 correction of tests | 1 000 |
| T2.10: TTCN-3 Ext. OO features correction of tests | 1 000 |
| T2.11: Submission of CRs for TTCN-3 maintenance | 1 000 |
| TOTAL | 95 300 |

## Travel budget

For the presentation of the TTF progress at three regular TB MTS meetings and for the promotion of the TTF work at the ETSU UCAAT conference, the following additional travel budget is needed:

|  |  |
| --- | --- |
| **Event** | Budget (EUR) |
|
| MTS#80 | 800 |
| MTS#81 | 800 |
| MTS#82 | 800 |
| UCAAT | 1 200 |
| **TOTAL** | **3 600** |

Part II – Details on TTF Technical Proposal

# Tasks, Technical Bodies and other stakeholders

## Organization of the work

### General

The work of this TTF is split into two parts. One part deals with the work on the TTCN-3 maintenance and further development. This portion of work is based on the well-established CR resolution process. The other part of work is related to the development TTCN-3 tool conformance tests. It comprises the the usual stages of conformance test suite development.

Both parts of work are carried out in parallel. Experts that contribute to both parts of work will ensure the interaction within the TTF. Further coordination within the TTF may be stimulated by submitting, discussing and resolving CRs.

### Organization of the work on TTCN-3 maintenance and further development

The CR resolution process (see MTS(10)0091) has been discussed and approved by TC MTS. Resolution of each CR comprises the following activities:

* review and technical discussion of the CR (all TTF members);
* agree technical solution (all TTF members);
* if no consensus is reached or the issue raises a backward incompatibility problem, consult with tool vendors and users (e.g. STF 160); if no technical agreement can be reached by the consultation, escalate the issue to the TTCN-3 Steering Group of TC MTS;
* develop initial proposed draft text for resolution (changes needed in the text of the relevant standard(s)) (dedicated TTF member: the CR "responsible");
* iterative review and agree the resolution text (CR " responsible " and one or more reviewers);
* implement CR resolution in the draft(s) of the standard(s) (editor of the relevant ETSI standard(s)).

Joint TTF sessions requiring the TTF members working on language maintenance to be present will be needed at least, to reach the technical agreement on resolving CRs, and to discuss the technical extensions like object orientation. The drafting and reviewing the resolution text does not necessarily need joint sessions, though this phase typically raises technical issues that need joint discussion and agreement of the TTF members.

The implementation of the resolved CRs in the drafts, editorial preparation of drafts for TB approval and handling possible comments during the approval and ETSI publication does not require joint working sessions.

For this reason, the work on TTCN-3 language maintenance and further development will be organized in joint working sessions and “home” sessions, located at premises of the TTF members as agreed by the TTF members at the beginning of the work.

Additionally, the TTF is responsible for the update of the TTCN-3 promotional and educational material (i.e., TTCN-3 leaflet, web pages, and educational slide sets). This update work will be assigned to TTF members and reviewed by the whole TTF team.

### Organization of the work on conformance test suites for TTCN-3 tools

The goal of this portion of work is the updating and extension of conformance test suites for TTCN-3 tools. Therefore, the work is organized around the usual stages of conformance test suite development, i.e. delivery of an early draft, stable draft, and final draft that are defined as milestones M1–M4 below. The TTF consists of just one single phase of development.

Once draft versions of the conformance test suite for TTCN-3 tools become available, they will be sent out to ETSI MTS and tool vendors outside of ETSI for review and feedback. Since there are two milestones M1 and M2 foreseen to solicit feedback, there is sufficient room for delivering an enhanced and improved conformance test suite for TTCN-3 tools that fits the needs of tool vendors.

The existing conformance test suite for TTCN-3 tools will be enhanced by updating and extending it, in order to bring it in line with v4.10.1 (validated) and v4.11.1 (non-validated) of the core language standard.

Effort estimation for the various tasks of the TTF is centered around the number of sessions that can be organized within the timeframe of this TTF and the number of experts involved in each task:

* TTF management performs Tasks 0 and 2.1
* Other tasks are equally shared among involved experts, with Tasks 2.2 to 2.11 comprising the main effort in this TTF.

MTS Committee has established a TTCN-3 Steering Group for the direct steering of STFs and TTFs for TTCN-3 evolution and conformance tests that will closely follow the progress of this TTF. TTF outputs will also be reviewed and approved by TC MTS. It is very likely that some active TC MTS members will apply to be involved in this TTF and will hence be in direct contact with TC MTS via the usual communication means (MTS\_GEN mailing list, MTS face-to-face meetings, conference calls). Support from the CTI department will also be requested and is seen as being vital to the success of this work.

### Creation of a Steering Group

TC MTS has created a TTCN-3 Steering Group (SG). The TTCN-3 SG will summon meetings on demand. Incidents which may require guidance by a steering group are:

* non- backwards compatible changes required to resolve CRs related to TTCN-3 maintenance and further language development, or
* CRs which can be resolved in several ways and where the TTF cannot agree on one way.

## Other interested ETSI Technical Bodies

All ETSI TBs developing or maintaining conformance and end-to-end test suites or interoperability test specifications also defined in TTCN-3 are receivers of the work done by the proposed TTF.

In particular, the TTF is in direct communication with 3GPP STF 160 leader regarding TTCN-3 language questions; ITS conformance and interoperability tests are also being developed in TTCN-3 and using the newest features of the language.

## Other stakeholders

**ITU-T** Study Group 17: ITU-T has endorsed the TTCN‑3 standards produced by ETSI as ITU-T Recommendations in the Z.16x and Z17x series. TB MTS has an agreement with ITU-T SG17 on a "fast track" endorsement of the TTCN-3 standards to minimize the delay between the ETSI and ITU-T publications.

The **oneM2M** global IoT standardization alliance has started developing IoT conformance tests in TTCN-3 in 2016, which activity has also resulted requests for new language feature. This project will continue in 2017 and may result further requests for new features or clarifications.

Other fora like OMA, TCCA, Autosar and the MOST cooperation have also published test specifications in TTCN-3, therefore may use the outcome of the proposed TTF.

Part III: Execution of Work

# Work plan, time scale and resources

## Task description

The task structure of this TTF reflects the structuring of the work in two parts. The work of the TTF is structured into three main tasks:

* Task 0 – Project management
* Task 1 – TTCN-3 maintenance and further development
* Task 2 – Conformance test suites for TTCN-3 tools

Task 2 is structured into several subtasks.

### Task 0 – Project management

|  |  |
| --- | --- |
| **Task 0** | **Project management** |
| **Objectives** | * Planning, organisation, and preparation of TTF meetings
* On-going reporting
* Participation at SG and TC meetings
* Delivery of the TTF reports
 |
| **Input** | * This ToR
* Information from the preparatory meeting
* TTCN-3 CRs in the ETSI Mantis system
* Expertise availability information and other project management data
 |
| **Output** | * Session plan
* Reporting TTF session plan and working progress after sessions to TC MTS
* Materials for SG and TC meetings
* Progress reports
* Final report
 |
| **Interactions** | * The TTF management will interact with the SG and TC MTS
* Communicating with other interested bodies STFs and TTFs, in particular STF160
* Additional support will be provided by the ETSI secretariat
* Progress reports and final report will be presented at TC MTS meetings regular
 |
| **Resources required** | * One or two persons able to manage the TTF
* Costs: 6000 EUR
 |

### Task 1 – TTCN-3 maintenance and further development

|  |  |
| --- | --- |
| **Task 1** | **TTCN-3 maintenance and further development** |
| **Objectives** | * Resolving Mantis CRs in a tool-independent and consistent – with the existing language specification – way
* In case of real or potential backward incompatibility of the preferred solution, initiate consultation with other interested bodies and projects and TTCN-3 tool vendors
* If the TTF doesn’t reach a technical consensus, or the solution – as confirmed by a tool vendor – would cause backward incompatibility with actively used existing code, the issue shall be escalated to the TTCN-3 SG for decision.
* Updating TTCN-3 promotional material (e.g., TTCN-3 leaflet and web pages)
* Updating TTCN-3 educational material (e.g., TTCN-3 slide sets)
 |
| **Input** | * Base documents in clause 3.1.1 of this document
* TTCN-3 CRs in the ETSI Mantis change tracker system (<http://forge.etsi.org/mantis/main_page.php>)
* TTCN-3 promotional material
* TTCN-3 educational material
 |
| **Output** | * New drafts of the documents, which are (a) listed in clause 3.2.1 and (b) has resolved CRs ready for implementation at the end of the last TTF working session.
* Updated TTCN-3 promotional material
* Updated TTCN-3 educational material
 |
| **Interactions** | * TTCN-3 SG of TC MTS, organizations and projects listed in clause 5.2 Other interested ETSI Technical Bodies, clause 5.3 Other interested Organizations outside ETSI and TTCN-3 tool vendors on a need basis
* ETSI CTI will provide additional feedback based on TTF request
 |
| **Resources required** | * 3-5 TTCN-3 experts
* Costs: 50 000 EUR
 |

### Task 2 – Conformance test suites for TTCN-3 tools and sub-tasks

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| **Task 2** | **Conformance test suites for TTCN-3 tools** |
| Objectives | Execute all sub-tasks related to the development and maintenance of Conformance test suites for TTCN-3 tools, i.e., subtasks 2.1 – 2.11. |
| **Input** | See description of sub-tasks. |
| **Output** | See description of sub-tasks. |
| **Interactions** | See description of sub-tasks. |
| **Resources required** | See description of sub-tasks. |

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| **Subtask 2.1** | **Listing of Changes** |
| **Objectives** | * Listing of changes between the previous and last revisions of the following documents:
	+ Part 1: TTCN-3 Core Language (ETSI ES 201 873-1),
	+ Part 9: Using XML schema with TTCN-3 (ETSI ES 201 873-9), and
	+ TTCN-3 Language Extensions: Object Oriented features (ETSI ES 203 790)
* Assignment of work for subtasks 2.2–4.4 to the TTF experts.
 |
| **Input** | * Previous and last revisions of the following documents:
	+ Part 1: TTCN-3 Core Language (ETSI ES 201 873-1),
	+ Part 9: Using XML schema with TTCN-3 (ETSI ES 201 873-9), and
	+ TTCN-3 Language Extensions: Object Oriented features (ETSI ES 203 790)
 |
| **Output** | * List of changes
* Assignment of work
 |
| **Interactions** | None |
| **Resources required** | * TTF management
* Costs: 800 EUR
 |

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| **Subtask 2.2** | **TTCN-3 Part 1 new/changed features** |
| **Objectives** | Extension of the TTCN-3 conformance test suite by writing tests for the new/changed core language features. The tests are divided into* test cases corresponding to the previous version of TTCN-3 Part 1 (to be validated in Subtask 2.6) and
* test cases corresponding to the last revision of TTCN-3 Part 1 (shall remain non-validated in this TTF).
 |
| **Input** | * previous and last revision of Part 1: TTCN-3 Core Language (ETSI ES 201 873-1),
* Output from Task 1, work allocation by TTF leader.
 |
| **Output** | * Extension of the TTCN-3 conformance test suite for TTCN-3 Part 1
 |
| **Interactions** | None |
| **Resources required** | * Experts
* Costs: 18 000 EUR
 |

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| **Subtask 2.3** | **TTCN-3 Part 9 new/changed features** |
| **Objectives** | Extension of the TTCN-3 conformance test suite by writing tests for the new/changed Part 9 language features. The tests are divided into* test cases corresponding to the previous version of TTCN-3 Part 9 (to be validated in Subtask 2.6) and
* test cases corresponding to the last revision of TTCN-3 Part 9 (shall remain non-validated in this TTF).
 |
| **Input** | * previous and last revision of Part 9: Using XML schema withTTCN-3 (ETSI ES 201 873-9),
* Output from Task 1, work allocation by TTF leader.
 |
| **Output** | * Extension of the TTCN-3 conformance test suite for TTCN-3 Part 9
 |
| **Interactions** | None |
| **Resources required** | * TTCN-3 experts
* Costs: 4 000 EUR
 |

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| **Subtask 2.4** | **TTCN-3 Ext. OO features new/changed features** |
| **Objectives** | Extension of the TTCN-3 conformance test suite by writing tests for the new/changed TTCN-3 Ext. OO features. The tests are divided into* test cases corresponding to the previous version of TTCN-3 Ext. OO features (to be validated in Subtask 2.6) and
* test cases corresponding to the last revision of TTCN-3 Ext. OO features (shall remain non-validated in this TTF).
 |
| **Input** | * previous and last revision of TTCN-3 Language Extensions: Object Oriented features (ETSI ES 203 790),
* Output from Task 1, work allocation by TTF leader.
 |
| **Output** | * Extension of the TTCN-3 conformance test suite for TTCN-3 Ext. OO features
 |
| **Interactions** | None |
| **Resources required** | * TTCN-3 experts
* Costs: 4 000 EUR
 |

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| **Subtask 2.5** | **Tools/Adaptation** |
| **Objectives** | Extension of the TTCN-3 conformance test execution tools, as needed, to support changed language features relating to external functions, pre-processing, ports ...etc. |
| **Input** | Feedback from subtasks 2.2–2.4. |
| **Output** | Tooling for testing new/changed TTCN-3 features |
| **Interactions** | None |
| **Resources required** | * TTCN-3 experts
* Costs: 3 000 EUR
 |

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| **Subtask 2.6** | **Validation** |
| **Objectives** | Validation of the extended TTCN-3 conformance test suites with at least two TTCN-3 compilers. |
| **Input** | Feedback from subtasks 2.2–2.4. |
| **Output** | Validation results |
| **Interactions** | None |
| **Resources required** | * Experts
* Costs: 2 000 EUR
 |

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| **Subtask 2.7** | **Discussion of validation results** |
| **Objectives** | Discussion of validation results with involved tool vendors, assignment of TTCN-3 conformance test suite refinement tasks as needed. |
| **Input** | Result from Subtasks 2.6 |
| **Output** | Test correction plan for Tasks 2.8–2.9. |
| **Interactions** | * The TTF management will involve tool vendors
* Issue resolution proposals from participating TTF experts and external tool vendors’ experts will be discussed via iterative issue resolution process.
 |
| **Resources required** | * Experts
* Costs: 1 500 EUR
 |

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| **Subtask 2.8** | **TTCN-3 Part 1 correction of tests** |
| **Objectives** | Correction and refinement of the extended core language conformance test suite, based on the validation feedback. |
| **Input** | Result from Subtasks 2.7 |
| **Output** | Extended, refined an corrected version of the TTCN-3 conformance test suite for TTCN-3 Part 1 |
| **Interactions** | None |
| **Resources required** | * Experts
* Costs: 3000 EUR
 |

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| **Subtask 2.9** | **TTCN-3 Part 9 correction of tests** |
| **Objectives** | Correction and refinement of the extended TTCN-3 Part 9 conformance test suite, based on the validation feedback. |
| **Input** | Result from Subtasks 2.7 |
| **Output** | Extended, refined an corrected version of the TTCN-3 conformance test suite for TTCN-3 Part 9 |
| **Interactions** | None |
| **Resources required** | * Experts
* Costs: 1000 EUR
 |

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| **Subtask 2.10** | **TTCN-3 Ext. OO features correction of tests** |
| **Objectives** | Correction and refinement of the extended TTCN-3 Ext. OO features conformance test suite, based on the validation feedback. |
| **Input** | Result from Subtasks 2.7 |
| **Output** | Extended, refined an corrected version of the TTCN-3 conformance test suite for TTCN-3 Ext. OO features |
| **Interactions** | None |
| **Resources required** | * Experts
* Costs: 1000 EUR
 |

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| **Subtask 2.11** | **Submission of CRs for TTCN-3 maintenance** |
| **Objectives** | Raising of CRs to the TTCN-3 developers over the observed language issues/ambiguities |
| **Input** | Result from subtasks 2.2–2.4 and 2.8–2.10 |
| **Output** | New CRs in Mantis |
| **Interactions** | None |
| **Resources required** | * Experts
* Costs: 1000 EUR
 |

## Milestones

|  |  |  |
| --- | --- | --- |
| **Milestone** | **Description** | **Cut-Off Date** |
| **A** | First progress report to TC MTS | MTS#8012-13/05/2020 |
| ETSI Deliverable | First Progress report to be approved by TC MTS |

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| **Milestone** | **Description** | **Cut-Off Date** |
| **B** | Second progress report to TB MTS | MTS#818-9/09/2020 |
| Reference Body Deliverable | Stable Drafts of deliverables for T2: D18 – D26 |
| ETSI Deliverable | Second Progress report to be approved by TC MTS |

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| **Milestone** | **Description** | **Cut-Off Date** |
| **C** | Final report to TB MTS | MTS#82+ 2 weeks |
| Reference Body Deliverable | Final Drafts of all Deliverables |
| ETSI Deliverable | Final report to be approved by TC MTS#82 |

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| **Milestone** | **Description** | **Cut-Off Date** |
| **D** | Deliverables published, TTF closed | 31/05/21 |

## Task summary

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| --- | --- | --- | --- |
| **Code** | **Task / Milestone**  | Target Date | Estimated Cost (EUR) |
| From | To |
|  | Start of work | 01/05/20 |  |  |
| T0 | Project Management | 01/05/20 | 31/05/21 | 6 000   |
| T1 | TTCN-3 maintenance and further development | 01/05/20 | 10/01/21 | 50 000 |
| T2.1 | Listing of Changes | 01/05/20 | 31/07/20 | 800 |
| Milestone A | First progress report approved by TC MTS#80 (May 20) | MTS#80 | 12-13/05/20 | 0 |
| T2.2 | TTCN-3 Part 1 new/changed features | 01/06/20 | 31/08/20 | 18 000 |
| T2.3 | TTCN-3 Part 9 new/changed features | 01/06/20 | 31/08/20 | 4 000 |
| T2.4 | TTCN-3 Ext. OO features new/changed features | 01/06/20 | 31/08/20 | 4 000 |
| T2.5 | Tools/Adaptation | 01/06/20 | 31/08/20 | 3 000 |
| Milestone B | Second progress report approved by TC MTS #81 (September 20) and Stable Drafts for T2 Deliverables made available | MTS#81 | 8-9/09/20 | 0 |
| T2.6 | Validation | 01/09/20 | 10/01/21 | 2 000 |
| T2.7 | Discussion of validation results | 01/09/20 | 10/01/21 | 1 500 |
| T2.8 | *TTCN-3 Part 1 correction of tests* | 01/09/20 | 10/01/21 | 3 000 |
| T2.9 | *TTCN-3 Part 9 correction of tests* | 01/09/20 | 10/01/21 | 1 000 |
| T2.10 | *TTCN-3 Ext. OO features correction of tests* | 01/09/20 | 10/01/21 | 1 000 |
| T2.11 | *Submission of CRs for TTCN-3 maintenance* | 01/05/20 | 10/01/21 | 1 000 |
| Milestone C | Final Report and final drafts of all deliverables approved by TC MTS#82 | MTS#82 | Jan/Feb 21 | 0 |
| MilestoneD | Deliverables published, TTF closed |  | 31/05/21 |  |
|  | **95 300** |

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| **Task/ Mil.** | **J** | **F** | **M** | **A** | **M** | **J** | **J** | **A** | **S** | **O** | **N** | **D** |  | **J** | **F** | **M** | **A** | **M** |
| T0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2.1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2.2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2.3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2.4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2.5 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MB |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2.6 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2.7 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2.8 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2.9 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2.10 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2.11 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MC |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MD |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

# Expertise required

## Team structure

3-5 participants to ensure the following mix of competences:

|  |  |
| --- | --- |
| **Priority** | **Qualifications and competences** |
| High | Professional skills in the TTCN-3 language and knowing the existing TTCN-3 standards |
| High | ASN.1, IDL, XSD, XML and JSON |
| High | Compiler theory and technology |
| High | TTCN-3 tool implementation skills (knowledge of tool APIs) |
| Medium  | Testing methods (conformance, interoperability, performance and load etc.) is preferred |
| Medium | Knowlegde of communication technologies including mobile, ICT and IoT is appreciated |

Part IV: TTF performance evaluation criteria

# Performance Indicators

|  |
| --- |
| **Select relevant Performance indicators applicable for these ToR (X)** |
| Contribution from ETSI Members to TTF work |
|  |  |
| Steering Group meetings (number of meetings / participants / duration) | X |
| Number of delegates directly involved in the review of the deliverables | X |
| Contributions/comments received from the Reference Bodies | X |
| Contributions/comments received from other Reference Bodies | X |
|  |  |
| **Contribution from the TTF to ETSI work** |
| Contributions to Reference Body meetings (number of documents / meetings / participants) | X |
|  |  |
| **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 |
|  |  |

# Document history

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Date** | **Author** | **Status** | **Comments** |
| 1.0 | 2019-09-02 | Gyorgy Rethy |  |  |
| 1.3 | 2020-02-12 | Ultan Mulligan | DRAFT |  |
| 1.4 | 2020-02-25 | ETSI/FA | Draft | Editorials -Layout modifications- Milestones table modifications |
| 1.5 | 2020-03-03 | ETSI | Final | Update before CL publication |