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| --- |
| ToR TTF T040 (Ref. Body TC MTS) |
| Version: 0.0 |
| Author: Jens Grabowski – Date: 2024-04-19 |
| Last updated by: Jens Grabowski – Date: 2024-05-30 |
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Terms of Reference –Testing Task Force Proposal

TTF T040 (Ref. Body MTS)

Development of a new major revision of the TTCN-3 language   
TTCN-3 tool conformance tests

Summary information

|  |  |  |  |
| --- | --- | --- | --- |
| Approval status | Approved by TC MTS (doc ref: MTS(24)000024r1) | | **YES** |
| Reference Body | Ref. Body TC MTS | | |
| ETSI Funding | **Maximum budget : 150 000 EUR** | | |
| Minimum of 4 ETSI Members Support | **YES** | | |
| Time scale | **From** | 2024-06-15 | |
| **To** | 2025-06-30 | |
| Work Items | **TTCN-3 Migration Guide**  **TTCN-3 Language Specification and Language Extensions:**   * Part 1: TTCN-3 Core Language * Part 4: TTCN-3 Operational Semantics * Part 5: TTCN-3 Runtime Interface (TRI) * Part 6: TTCN-3 Control Interface (TCI) * Part 7: Using ASN.1 with TTCN-3 * Part 8: The IDL to TTCN-3 Mapping * Part 9: Using XML schema with TTCN-3 * Part 10: TTCN-3 Documentation Comment Specification * Part 11: Using JSON with TTCN-3 * TTCN-3 Language Extensions: Configuration and Deployment Support * TTCN-3 Language Extensions: TTCN‑3 Performance and Real Time Testing * TTCN-3 Language Extensions: Advanced Parameterization * TTCN-3 Language Extensions: Behaviour Types * TTCN-3 Language Extensions: Support of interfaces with continuous signals * TTCN-3 Language Extensions: Extended TRI * TTCN-3 Language Extensions: Advanced Matching * TTCN-3 Language Extensions: Object Oriented features   **TTCN-3 Conformance Test Specifications**   * TTCN-3 Conformance Test Suite; Part 1: Implementation Conformance Statement (ICS) * TTCN-3 Conformance Test Suite; Part 2: Test Suite Structure and Test Purposes (TSS&TP) * TTCN-3 Conformance Test Suite; Part 3: Abstract Test Suite (ATS) and Implementation eXtra Information for Testing (IXIT) | | |
| TTF Roadmap reference | TTF Roadmap 2024 | | |

Part I –TTF Technical Proposal

# Rationale & Objectives

## Rationale

The TTCN‑3 testing language has intensively been developed by ETSI during the last 20 years. By today, TTCN-3 has become a significantly important testing technology in different domains, like telecom, automotive, medical, and many more (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, NB-IoT, 5G NR, IMS, Positioning, and lately for MCX (Mission Critical Services). ETSI TBs **INT** and **ERM** also applied TTCN-3 for their test specifications.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, Nokia).

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 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** has set itself the goal of keeping the language **powerful**, yet **easy to use**, **up-to-date** and well **maintained**, and meeting changing **user requirements**. The series of TTCN-3 standards consists of **26** ETSI standards and technical reports that are continuously updated. This commitment requires a very high level of expertise and experts who know the standards in detail.

The last major release of TTCN-3 Core Language was published in 2009 with version 4.1.1. Since then TTCN-3 was constantly maintained and further developed. Further maintenance and further development included the introduction of new language features in the TTCN-3 core language as well as the development of extension packages expressing the wishes and needs of TTCN-3 users and developers.

However, it is known that language maintenance through minor corrections and extensions based on issue tracking leads to a growth of the language specification and is accompanied by a growth in complexity and an erosion of quality. After a while, it is required to modernize and refactor a language specification in order to keep high-quality.

The TTCN-3 language specification has reached the state where modernization and refactoring are required. Currently, language maintenance has become complex, since even small corrections and extensions require changes in many different places in the TTCN-3 language specification and extension packages. Also, TTCN-3 users suffer from this kind of complexity, because specific aspects of a language feature may be spread across different sections and documents. This reduces the learnability, comprehensibility and ultimately the acceptance of the TTCN-3.

In the last years, TTCN-3 maintenance and further development included the development of conformance tests for TTCN-3 tools. The development of a new major revision of the TTCN-3 language will affect these TTCN-3 tool conformance tests. The test suites may have to be restructured and test cases may have to be changed, adapted or may even become obsolete, and quite probably also new test cases may be developed.

For this TTF, work on the TTCN-3 tool conformance tests is limited to validating the most recently published unvalidated test cases (from the previous TTCN-3 maintenance TTF T032). This includes discussing the validation results with TTCN-3 experts and creating CRs to clarify any ambiguities identified. The identification of existing test cases that are still relevant to the new major revision, the restructuring of the conformance test suites, and the adaptation and development of test cases for features of the new major revision will be postponed to a future TTCN-3 TTF.

## Objectives of the work to be executed

TTCN-3 language evolution STFs and TTFs in the past years enabled continuous maintenance and extensions of the TTCN-3 standards. In parallel, the STFs and TTFs developing the TTCN-3 tool conformance test suites have updated and extended the TTCN-3 tool abstract test suite (ATS) to the latest published version of the language standards. This has essentially contributed to the success of TTCN-3.

The development of a new major revision of TTCN-3 including all TTCN-3 extensions will last two years and be split into two TTFs.

The first TTF will

* develop the new structure of the TTCN-3 series of standards,
* identify all features to be included into the new major release,
* identify possible backwards incompatible feature changes
* discuss possible backwards incompatible feature changes with users and tool vendors, and
* provide guidelines for migrating from the existing TTCN-3 version to the new major revision for users and tool vendors.

The results of this work will be published as a migration guide for TTCN-3 users and tool providers in the form of an ETSI Technical Report. The migration guide serves as a stable foundation for TTCN-3 tool providers implementing the new major release and for TTCN-3 users migrating older test suites to the new major release. Furtherhmore, the TTF will promote the new major revision by developing educational materials, participating in conferences and organizing webinars and workshops.

Minor objectives of the first TTF are the handling of urgent TTCN-3 maintenance issues and the validation of testcases developed by TTF T032.

The main objective of the following second TTF is to implement the TTCN-3 language specifications as European Standards.

This ToR defines the work of the first TTF. The work will be split into three tasks:

Task 1 deals with urgent TTCN-3 maintenance issues. Such issues include severe errors or ambiguities, which have to be resolved before the publication of the new major TTCN-3 release. The tasks to be performed follow the well-established CR resolution process as described in clause 5.1.2.

Task 2 deals with the development of the TTCN-3 migration guide.

The work on the migration guide comprises the following subtasks:

* Organization of workshops to discuss the requirements for the new major TTCN-3 release with TTCN-3 users and tool providers.
* Development and evaluation of questionnaires to collect further requirements from TTCN-3 users and tool providers.
* Identification of

(a) which TTCN-3 language specification documents and TTCN-3 extension documents shall remain separate documents

(b) which TTCN-3 language specification documents and TTCN-3 extension documents shall be (partly) combined or united, and

(c) which TTCN-3 language specification documents and TTCN-3 extension documents shall be (partly) declared to be deprecated in the major revision of TTCN-3.

* Identification of TTCN-3 language features which are

(a) supported by TTCN-3 tools, but

(b) are specified in documents that do not remain separate documents in the major revision of TTCN-3.

* Identification of TTCN-3 language features that shall be moved from TTCN-3 extensions to the core language.
* Identification of TTCN-3 language features that shall be moved from the core language to TTCN-3 extensions.
* Identification and handling of new language features documented in Mantis.
* Developing a strategy for the handling of TTCN-3 core language annexes (i.e., update, delete, move to a separate document).
* Identification and handling of harmonization issues (string handling, syntax/style simplification, handling of keywords/reserved words, BNF, etc.)
* Review and decision regarding the removal deprecated features.
* Implementation of the migration guide.

A major change of a well-established standard requires promotional and educational material. The development of such material comprises the following tasks:

* Workshops (if possible, in combination with TB MTS meetings) with TTCN-3 tool vendors and TTCN-3 users to discuss interim results of the TTF work.
* Update of TTCN-3 web pages.
* Update of TTCN-3 leaflet.
* Webinar promoting and describing the new major revision of TTCN-3.
* Conference presentations, e.g., UCAAT 2025.

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

* Validation of the test cases developed by TTF T032 with test tools.
* Discussion of validation outcomes with TTCN-3 experts, and raising CRs for clarification in case of discovered ambiguity

Note: Any changes of test cases and the development of new test cases that may be necessary due to the draft new version, i.e., the major revision, will be postponed to a future TTF. In Task 3, work on the TTCN-3 tool conformance tests is limited to validating the most recently published unvalidated test cases (from the previous TTCN-3 maintenance TTF T032)

## Previous funded activities in the same domain

TTCN-3 language development and maintenance has been a continuous ETSI activity for more than 20 years 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.

A major revision of TTCN-3 has not been funded and developed since 2009.

## Consequences if not agreed

Clause 1.1 contains the achievements of past TTCN-3 language maintenance and tool conformance STFs and TTFs. 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 in recent years has shown that quick reactions to user inquiries increase efficiency and eliminate ambiguities with regard to standardization, tool implementation and industrial users. Without support of the former STFs and TTFs, TC MTS would not be able to respond in a timely fashion.

This TTF aims at developing a new major revision of the TTCN-3 language specifications and all related extension packages. Due to the continuous maintenance since the last major revision in 2009, the TTCN-3 specifications have become large and complex. As a consequence, maintenance has also become complex. Even small corrections and feature extensions require changes in many different places in the TTCN-3 specifications and extension packages. Also, TTCN-3 users suffer from this kind of complexity, because specific aspects of a language feature may be spread across different sections and, even, documents.

Not developing a new major revision of TTCN-3 will increase the efforts for language maintenance and further development. Furthermore, the acceptance of TTCN-3 by the users will decrease.

# ETSI Members Support

|  |  |  |
| --- | --- | --- |
| **ETSI Member** | **Supporting delegate** | **Motivation** |
| Telefon AB LM Ericsson | Lénárd Nagy | 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 | Jens Grabowski | 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 | Axel Rennoch | 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 |
| OU Elvior | Andrus Lehmets | Elvior is a 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 achieve this target. |
| Nokia | Matthias Simon | TTCN-3 is a key technology driving test automation at Nokia. With millions of tests executed every day, it is essential that Nokia stays actively engaged in the standardization and maintenance task force to keep the technology updated and reliable, to quickly address any issues that may arise, and to continuously improve its test automation capabilities. |

# Deliverables

## Base documents

### TTCN-3 base documents

|  |  |  |  |
| --- | --- | --- | --- |
| **Document** | **Title** | **Current Status** | **Expected date for stable document** |
| ETSI ES 201 873-1 V4.16.1 | Part 1: TTCN-3 Core Language | final draft | 2024-06 |
| ETSI ES 201 873-4 V4.6.1 | Part 4: TTCN-3 Operational Semantics | Published | 2017-05 |
| ETSI ES 201 873-5 V4.9.1 | Part 5: TTCN-3 Runtime Interface (TRI) | Published | 2022-04 |
| ETSI ES 201 873-6 V4.14.1 | Part 6: TTCN-3 Control Interface (TCI) | Published | 2023-04 |
| ETSI ES 201 873-7 V4.10.1 | Part 7: Using ASN.1 with TTCN-3 | Published | 2022-04 |
| ETSI ES 201 873-8 V4.8.1 | Part 8: The IDL to TTCN-3 Mapping | Published | 2021-06 |
| ETSI ES 201 873-9 V4.12.1 | Part 9: Using XML schema with  TTCN-3 | Published | 2021-06 |
| ETSI ES 201 873-10 V4.5.1 | Part 10: TTCN-3 Documentation Comment Specification | Published | 2013-04 |
| ETSI ES 201 873-11 V4.10.1 | Part 11: Using JSON with TTCN-3 | Published | 2023-05 |
| ETSI ES 202 781 V1.9.1 | TTCN-3 Language Extensions: Configuration and Deployment Support | Published | 2022-04 |
| ETSI ES 202 782 V1.4.1 | TTCN-3 Language Extensions: TTCN‑3 Performance and Real Time Testing | Published | 2022-04 |
| ETSI ES 202 784 V1.9.1 | TTCN-3 Language Extensions: Advanced Parameterization | Published | 2022-04 |
| ETSI ES 202 785 V1.9.1 | TTCN-3 Language Extensions: Behaviour Types | Published | 2022-04 |
| ETSI ES 202 786 V1.5.1 | TTCN-3 Language Extensions: Support of interfaces with continuous signals | Published | 2022-04 |
| ETSI ES 202 789 V1.6.1 | TTCN-3 Language Extensions: Extended TRI | Published | 2022-04 |
| ETSI ES 203 022 V1.5.1 | TTCN-3 Language Extensions: Advanced Matching | Published | 2022-04 |
| ETSI ES 203 790 V1.4.1 | TTCN-3 Language Extensions: Object Oriented features | Published | 2022-04 |

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 V1.12.1 | Methods for Testing and Specification (MTS);TTCN-3 Conformance Test Suite;Part 1: Implementation Conformance Statement (ICS) | final draft | 2024-06 |
| ETSI TS 102 950-2 V1.12.1 | Methods for Testing and Specification (MTS);TTCN-3 Conformance Test Suite; Part 2: Test Suite Structure and Test Purposes (TSS&TP) | final draft | 2024-06 |
| ETSI TS 102 950-3 V1.12.1 | Methods for Testing and Specification (MTS);TTCN-3 Conformance Test Suite; Part 3: Abstract Test Suite (ATS) and Implementation eXtra Information for Testing (IXIT) | final draft | 2024-06 |

## New deliverables

### New TTCN-3 migration guide

|  |  |  |  |
| --- | --- | --- | --- |
| **Deliv.** | **Work Item code**  **Standard number** | **Working title** | **Expected date for publication** |
| D1 | TR 104 081 | Guide for the Migration to TTCN-3 V5 | 2025-06 |

### New TTCN-3 base deliverables

|  |  |  |  |
| --- | --- | --- | --- |
| **Deliv.** | **Work Item code**  **Standard number** | **Working title** | **Expected date for publication** |
| D2 | ES 201 873-1 | Part 1: TTCN-3 Core Language | 2025-04 |
| D3 | ES 201 873-4 | Part 4: TTCN-3 Operational Semantics | 2025-04 |
| D4 | ES 201 873-5 | Part 5: TTCN-3 Runtime Interface (TRI) | 2025-04 |
| D5 | ES 201 873-6 | Part 6: TTCN-3 Control Interface (TCI) | 2025-04 |
| D6 | ES 201 873-7 | Part 7: Using ASN.1 with TTCN-3 | 2025-04 |
| D7 | ES 201 873-8 | Part 8: The IDL to TTCN-3 Mapping | 2025-04 |
| D8 | ES 201 873-9 | Part 9: Using XML schema with TTCN-3 | 2025-04 |
| D9 | ES 201 873-10 | Part 10: TTCN-3 Documentation Comment Specification | 2025-04 |
| D10 | ES 201 873-11 | Part 11: Using JSON with TTCN-3 | 2025-04 |
| D11 | ES 202 781 | TTCN-3 Language Extensions: Configuration and Deployment Support | 2025-04 |
| D12 | ES 202 782 | TTCN-3 Language Extensions: TTCN‑3 Performance and Real Time Testing | 2025-04 |
| D13 | ES 202 784 | TTCN-3 Language Extensions: Advanced Parameterization | 2025-04 |
| D14 | ES 202 785 | TTCN-3 Language Extensions: Behaviour Types | 2025-04 |
| D15 | ES 202 786 | TTCN-3 Language Extensions: Support of interfaces with continuous signals | 2025-04 |
| D16 | ES 202 789 | TTCN-3 Language Extensions: Extended TRI | 2025-04 |
| D17 | ES 203 022 | TTCN-3 Language Extensions: Advanced Matching | 2025-04 |
| D18 | ES 203 790 | TTCN-3 Language Extensions: Object Oriented features | 2025-04 |

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.

The development of a new major revision of TTCN-3 may require the publication of new deliverables. Work items for these new deliverables will be discussed and created before the TTF starts, i.e., latest at MTS#92.

### New TTCN-3 conformance test suite deliverables

|  |  |  |  |
| --- | --- | --- | --- |
| **Deliv.** | **Work Item code**  **Standard number** | **Working title** | **Expected date for publication** |
| D19 | TS 102 950-1 | Methods for Testing and Specification (MTS); TTCN-3 Conformance Test Suite; Part 1: Implementation Conformance Statement (ICS) | 2025-06 |
| D20 | TS 102 950-2 | Methods for Testing and Specification (MTS); TTCN-3 Conformance Test Suite; Part 2: Test Suite Structure and Test Purposes (TSS&TP) | 2025-06 |
| D21 | TS 102 950-3 | Methods for Testing and Specification (MTS); TTCN-3 Conformance Test Suite; Part 3: Abstract Test Suite (ATS) and Implementation eXtra Information for Testing (IXIT) | 2025-06 |

NOTE: The TTCN-3 maintenance TTF T032 only released a new version of ES 201 873-1. The validation of new and updated test cases for ES 201 873-1 may result in new versions of TS 102 950-1, TS 102 950-2, and TS 102 950-3.

# Maximum budget

## Task summary/Manpower Budget

|  |  |
| --- | --- |
| **Task short description** | Budget (EUR) |
| T0: Project Management | 6 000 |
| T1: Urgent TTCN-3 maintenance issues | 3 000 |
| T2: TTCN-3 migration guide |  |
| T2.1: Organization of workshops and development of  questionnaires | 4 000 |
| T2.2: Requirements for the new major revision of TTCN-3 | 65 000 |
| T2.3: Implementation of the TTCN-3 migration guide | 60 000 |
| T2.4: Development of promotional and educational material for  new major revision of TTCN- | 3 600 |
| T3: Conformance test suites for TTCN-3 tools | 3 000 |
| T3.1: Validation |  |
| T3.2: Discussion of validation results |  |
| T3.3: TTCN-3 Part 1 correction of tests |  |
| **TOTAL** | **144 600** |

## 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 ETSI UCAAT conference, the following additional travel budget is needed:

|  |  |
| --- | --- |
| **Event** | Budget (EUR) |
|
| MTS#93 | 1 200 |
| MTS#94 | 1 200 |
| MTS#95 | 1 200 |
| UCAAT | 1 800 |
| **TOTAL** | **5 400** |

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 three parts:

* Task 1 deals with urgent TTCN-3 maintenance issues. Such issues include severe errors or ambiguities, which have to be resolved before the publication of the new major TTCN-3 release.
* Task 2 deals with the development of the TTCN-3 migration guide and the development of promotional and educational materials for the new major release of TTCN-3. The migration guide will be the reliable basis for implementing and using the new major release of TTCN-3. A follow-up TTF will develop the specific TTCN-3 standards.
* Task 3 deals with the validation of unvalidated test cases developed by TTF T032.

All three tasks are executed in parallel. Experts involved in all the three tasks ensure exchange within the TTF. Further coordination within the TTF should take place through discussions at online and face-to-face meetings.

### Organization of the work on urgent TTCN-3 maintenance issues (Task 1)

The work on Task 1 is based on the CR resolution process. 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. 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 Task 1 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.

In addition, the TTF is responsible for updating the promotional and educational materials for the existing release of TTCN-3 (i.e., TTCN-3 leaflet, web pages, and instructional slide sets). This update work is assigned to TTF members and reviewed by the entire TTF team.

### Organization of the work on the development of the TTCN-3 migration guide (Task 2)

The work on the migration guide is driven by

* the analysis of the TTCN-3 standard documents (see Clause 3.1),
* open CRs in Mantis,
* the analysis of existing TTCN-3 test suites (to be performed by the TTF),
* input from workshops with TTCN-3 tool vendors and users (to be organized by the TTF),
* input from questionnaires for TTCN-3 tool vendors and users (to be developed by the TTF), and
* input from all other TC MTS members.

The work for obtaining the input for the migration guide, e.g., analysing documents, developing questionnaires, or organizing workshops, will be assigned to TTF members. The results of this work are discussed in the TTF and recorded in the migration guide.

Individual TTF members are responsible for drafting and writing each section of the migration guide. The sections will be reviewed by all TTF members before the migration guide is submitted to TC MTS.

The TTF will regularly report to the TC MTS on progress in the development of the migration guide and consider suggestions for improvement from TC MTS for further work.

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

The goal of this portion of work is the validation of unvalidated test cases developed by TTF T032. Validation is done using TTCN-3 test tools. The validation results will be discussed with TTF members, TTCN-3 tool vendors and TTCN-3 users. In case of ambiguities, the CR process is used to clarify and resolve any ambiguities identified.

### 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 that develop or maintain conformance and end-to-end test suites or interoperability test specifications, which are also defined in TTCN-3, are beneficiaries of the work carried out by the proposed TTF.

In particular, the TTF is in direct communication with the 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 features. This project will continue 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 four main tasks:

* Task 0 – Project management
* Task 1 – Urgent TTCN-3 maintenance issues
* Task 2 – Development of the TTCN-3 migration guide
* Task 3 – Conformance test suites for TTCN-3 tools

Task 2 and Task 3 are structured into several subtasks.

### Task 0 – Project management

|  |  |
| --- | --- |
| **Task 0** | **Project management** |
| **Objectives** | * Planning, organisation, and preparation of TTF meetings * Planning, organisation, and preparation of meetings with TTCN-3 users and tool vendors * 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 * Input from questionnaires and workshops organized by the TTF * Information on the availability of TTCN-3 and testing expertise 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 TTCN-3 users and tool vendors, 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 – Urgent TTCN-3 maintenance issues

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| **Task 1** | **Urgent TTCN-3 maintenance issues** |
| **Objectives** | Fixing of urgent TTCN-3 maintenance issues, e.g., severe errors or ambiguities, during the development of the new major TTCN-3 release |
| **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>) |
| **Output** | * If necessary, updates of the documents, which are (a) listed in clause 3.2.2 and for which (b) urgent TTCN-3 maintenance issues have been reported and resolved. |
| **Interactions** | * TTCN-3 SG of TC MTS, organizations and projects listed in clause 5.2, clause 5.3, and TTCN-3 tool vendors on a need basis * ETSI CTI will provide additional feedback based on TTF request |
| **Resources required** | * Experts: 3-5 TTCN-3 experts * Costs: 3 000 EUR |

### Task 2 – Development of the TTCN-3 migration guide

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| **Task 2** | **TTCN-3 migration guide** |
| **Objectives** | Execute all sub-tasks related to the development of the TTCN-3 migration guide, i.e., subtasks 2.1 – 2.4. |
| **Input** | See at description of sub-tasks. |
| **Output** | See at description of sub-tasks. |
| **Interactions** | See at description of sub-tasks. |
| **Resources required** | See at description of sub-tasks. |

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| --- | --- |
| **Task 2.1** | **Organization of workshops and development of questionnaires** |
| **Objectives** | 1. Prepare questionnaires for the collection of additional requirements for the new major TTCN -3 release to TTCN-3 users and tool providers. 2. Prepare workshops (if possible, in combination with TB MTS meetings) for the discussion of requirements and the resolution of ambiguities with TTCN-3 users and tool providers |
| **Input** | * Base documents in clause 3.1.1 of this document * Open CRs in Mantis * Existing TTCN-3 test suites (if provided by users and tool vendors) * Feedback from TC MTS members. |
| **Output** | Technical input for TTCN-3 migration guide including:   * Structure of new major revision of TTCN-3 * Language features to be implemented in TTCN-3 documents * Problems (e.g., handling of non-backwards compatible changes) |
| **Interactions** | * TTCN-3 SG of TC MTS, organizations and projects listed in clause 5.2, clause 5.3, and TTCN-3 tool vendors on a need basis * ETSI CTI will provide additional feedback based on TTF request |
| **Resources required** | * Experts: 3-5 TTCN-3 experts * Costs: 4 000 EUR |

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| **Task 2.2** | **Requirements for the new major revision of TTCN-3** |
| **Objectives** | 1. Conducting surveys and workshops prepared by Task 2.1. 2. Identification of (a) which TTCN-3 language specification documents and TTCN-3 extension documents shall remain separate documents (b) which TTCN-3 language specification documents and TTCN-3 extension documents shall be (partly) combined or united, and (c) which TTCN-3 language specification documents and TTCN-3 extension documents shall be (partly) declared to be deprecated in the major revision of TTCN-3. 3. Identification of TTCN-3 language features which are (a) supported by TTCN-3 tools, but (b) are specified in documents that do not remain separate documents in the major revision of TTCN-3. 4. Identification of TTCN-3 language features that shall be moved from TTCN-3 extensions to the core language. 5. Identification of TTCN-3 language features that shall be moved from the core language to TTCN-3 extensions. 6. Identification and handling of new language features documented in Mantis. 7. Developing a strategy for the handling of TTCN-3 core language annexes (i.e., update, delete, move to a separate document). 8. Identification and handling of harmonization issues (string handling, syntax/style simplification, handling of keywords/reserved words, BNF, etc.) 9. Review and decision regarding the removal deprecated features. |
| **Input** | * Base documents in clause 3.1.1 of this document * Open CRs in Mantis * Existing TTCN-3 test suites (if provided by users and tool vendors) * Results of Workshops with TTCN-3 tool vendors and users * Results from questionnaires for TTCN-3 tool vendors and users * Feedback from TC MTS members. |
| **Output** | Technical input for TTCN-3 migration guide including:   * Structure of new major revision of TTCN-3 * Language features to be implemented in TTCN-3 documents * Problems (e.g., handling of non-backwards compatible changes) |
| **Interactions** | * TTCN-3 SG of TC MTS, organizations and projects listed in clause 5.2, clause 5.3, and TTCN-3 tool vendors on a need basis * ETSI CTI will provide additional feedback based on TTF request |
| **Resources required** | * Experts: 3-5 TTCN-3 experts * Costs: 65 000 EUR |

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| **Task 2.3** | **Implementation of the TTCN-3 migration guide** |
| **Objectives** | * Implement the output of Task 2.1 in the migration guide * Development of migration guidelines for TTCN-3 users   Development of migration guidelines for TTCN-3 tool vendors   * Technical details regarding the implementation of the TTCN-3 standards documents of the new major revision |
| **Input** | * Results from Task 2.1 * Results from guideline related discussions with TTCN-3 tool vendors and users |
| **Output** | TTCN-3 migration guide covering the following aspects:   * Structure of the new major revision of TTCN-3 * Language features in the standard documents of the new major revision * Technical aspects related to the implementation of the new major revision * Migration Guidelines for TTCN-3 users * Migration Guidelines for TTCN-3 tool vendors |
| **Interactions** | * TTCN-3 SG of TC MTS, organizations and projects listed in clause 5.2, clause 5.3, and TTCN-3 tool vendors on a need basis * ETSI CTI will provide additional feedback based on TTF request |
| **Resources required** | * Experts: 3-5 TTCN-3 experts * Costs: 60 000 EUR |

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| **Task 2.4** | **Development of promotional and educational material for new major revision of TTCN-3** |
| **Objectives** | * Update promotional and educational material for the existing version of TTCN-3 * Develop new promotional and educational material for the new major revision of TTCN-3 * Promotion of new major revision of TTCN-3 (e.g., conference participation, webinars) |
| **Input** | * Existing TTCN-3 promotional material (TTCN-3 web pages, TTCN-3 leaflet) * Existing TTCN-3 educational material (webinar) |
| **Output** | * Updated TTCN-3 web pages and TTCN-3 leaflet * New promotional and educational material for the new major revision of TTCN-3 * Webinar promoting and describing the new major revision of TTCN-3 * Submitted UCAAT presentation proposal on the new major revision of TTCN-3 |
| **Interactions** | * ETSI will provide support on TTF request (e.g., for webinar) |
| **Resources required** | * Experts: 3-5 TTCN-3 experts * Costs: 3 600 EUR |

### – Conformance test suites for TTCN-3 tools (Task 3)

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| --- | --- |
| **Task 3** | **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 3.1 – 3.4 |
| **Input** | See description of sub-tasks. |
| **Output** | See description of sub-tasks. |
| **Interactions** | See description of sub-tasks. |
| **Resources required** | * Experts: see description of sub-tasks. * Costs: 3 000 EUR |

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| **Subtask 3.1** | **Validation** |
| **Objectives** | Validation of the extended TTCN-3 conformance test suites with at least two TTCN-3 compilers. |
| **Input** | Unvalidated test cases developed by TTF T032 |
| **Output** | Validation results |
| **Interactions** | None |
| **Resources required** | 2-3 TTCN-3 experts |

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| **Subtask 3.2** | **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 3.1 |
| **Output** | Test correction plan for Tasks 3.3. |
| **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** | 2-3 TTCN-3 experts |

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| **Subtask 3.3** | **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 3.2 |
| **Output** | Extended, refined a corrected version of the TTCN-3 conformance test suite for TTCN-3 Part 1 |
| **Interactions** | None |
| **Resources required** | 2-3 TTCN-3 experts |

|  |  |
| --- | --- |
| **Subtask 3.4** | **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 3.2 and 3.3 |
| **Output** | New CRs in Mantis |
| **Interactions** | None |
| **Resources required** | 2-3 TTCN-3 experts |

## Milestones

|  |  |  |
| --- | --- | --- |
| **Milestone** | **Description** | **Cut-Off Date** |
| **A** | First Progress Report to TB MTS | MTS#93 |
| Reference Body Deliverable | First Progress Report to be approved by TC MTS |
| ETSI Deliverable | * Early Draft of D1 (TTCN-3 migration guide (Table of contents)) |

|  |  |  |
| --- | --- | --- |
| **Milestone** | **Description** | **Cut-Off Date** |
| **B** | Second Progress Report to TB MTS | MTS#94 |
| Reference Body Deliverable | Second Progress report to be approved by TC MTS |
| ETSI Deliverable | * Second Draft of D1 (TTCN-3 migration guide) * Final Drafts for T1, i.e., D2 – D18 |

|  |  |  |
| --- | --- | --- |
| **Milestone** | **Description** | **Cut-Off Date** |
| **C** | Final report to TB MTS | MTS#95 |
| Reference Body Deliverable | Final report to TB MTS |
| ETSI Deliverable | * Final Draft of D1 (TTCN-3 migration guide) * Final Drafts for T2, i.e., D19 – D21 |

|  |  |  |
| --- | --- | --- |
| **Milestone** | **Description** | **Cut-Off Date** |
| **D** | Deliverables published, TTF closed | 15/06/25 |

## Task summary

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Code** | **Task / Milestone** | Target Date | | Estimated Cost (EUR) |
| From | To |
|  | Start of work | 15/06/24 |  |  |
| T0 | Project Management | 15/06/24 | 31/05/25 | 6 000 |
| T1 | Urgent TTCN-3 maintenance issues | 15/06/24 | 31/05/25 | 3 000 |
| T2 | TTCN-3 migration guide | 15/06/24 | 31/05/25 | 132 600 |
| T3 | Conformance test suites for TTCN-3 tools | 15/06/24 | 31/05/25 | 3 000 |
| Milestone A | Progress report#1 (Sept. 24) to be approved by TC MTS | MTS#93 |  |  |
| Milestone B | Progress report#2 and Final drafts for T1 to be approved by TC MTS (Jan/Feb 25) | MTS#94 |  |  |
| Milestone C | Final Report (May/June 25) and Final drafts for T2 and T3 to be approved by TC MTS (May/June 25) | MTS#95 |  |  |
| Milestone D | Deliverables published, TTF closed |  | 15/06/25 |  |
|  | | | | **144 600** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Task/ Mil.** | **J** | **F** | **M** | **A** | **M** | **J** | **J** | **A** | **S** | **O** | **N** | **D** |  | **J** | **F** | **M** | **A** | **M** | **J** | **J** | **A** | **S** | **O** | **N** | **D** |
| T0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MB |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MC |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| MD |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

# Expertise required

## Team structure

(Up to) 7 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 | |
| Direct financial contribution (co-funding) |  |
| Support to the TTF work (e.g., provision of test–beds, organization of workshops, events) |  |
| Steering Group meetings (number of meetings / participants / duration) |  |
| Number of delegates directly involved in the review of the deliverables |  |
| Contributions/comments received from TC MTS | X |
| Contributions/comments received from other Reference Bodies |  |
|  |  |
| **Contribution from the TTF to ETSI work** | |
| Contributions to Reference Body meetings (number of documents / meetings / participants) |  |
| Conduction of surveys on TTCN-3 | X |
| Organisation of TTCN-3 User and Tool Vendor workshops | X |
|  |  |
| **Liaison with other stakeholders** | |
| Presentation at UCAAT | X |
| Cooperation with other standardization bodies |  |
| Potential interest of new members to join ETSI |  |
| Liaison to identify requirements and raise awareness on ETSI deliverables |  |
| Comments received on drafts (e.g. on WEB site, mailing lists, etc.) |  |
|  |  |
| **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** |
| 0.0 | 2024-06-04 | TC MTS | Approved | Approved ToR by TC MTS |

Annex I Response to the Request for Proposals  
CfE – TTF T040 (REFERENCE BODY MTS)  
Deadline: 19 June 2024

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Contractor information \*** | | | | |
|  | | | | |
| **Contractor name \*:**  *Indicate the Company/Organization Name* | |  | | |
|  | | | | |
| **Contact person for the technical aspects** | | **Contact person for Decision on ETSI financial offer to this project (if any)** | | |
| Title |  | Title |  | |
| First name |  | First name |  | |
| Last name |  | Last name |  | |
| Role |  | Role |  | |
| e-mail |  | e-mail |  | |
| Phone |  | Phone |  | |
|  | | | | |
|  | | **Yes** | | **No** |
| Do you or any employee of your Company/Organization hold an elected or appointed position in the Reference Body requesting the TTF T040 creation? | | o  Indicate in which position:  ----------------------------------- | | o |
| **If you are self-employed candidate:**  Do you currently have other contracts in progress with ETSI? | | o | | o |

All fields marked with an asterix (\*) are mandatory

**1.1 Introduction**

A short presentation of the technical structure responsible for this activity, e.g.:

* Business area, number of employees, link to WEB site,
* Department(s)/team(s)/experts in charge of the technical activities related to this Project,
* Reference to products/services of your Company/Organization or supporting Member to which the standards developed by this Project will apply,
* Motivation for your Company/Organization or supporting Member to participate in this Project.

**1.2 Proposed approach**

**Proposed contribution to tasks & related cost**

Identify the tasks to which your Company/Organization is proposing to contribute by filling-in the table below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tasks\_No** | **Tasks\_Description** | **Max\_Budget\_Allocated\_in\_Euro** | **Amount\_in\_Euro\_(mandatory)** | **%\_of\_whole\_Task\_(mandatory)** |
| 00 | Project Management | 6 000 | . | . |
| 01 | Urgent TTCN-3 maintenance issues | 3 000 | . | . |
| 02 | TTCN-3 migration guide | 132 600 | . | . |
| 03 | Conformance test suites for TTCN-3 tools | 3 000 | . | . |
|  | **TOTAL** | **144 600** |  |  |

**Amount in Euro (mandatory)**: Indicate the price offered for your contribution to the task(s)

**% of whole task (mandatory)**: Indicate to which percentage of the execution of the whole task your offer corresponds

Provide a description of the proposed approach, competences, reference to related activities:

* Explain which part of the task is corresponding to the requested percentage that your Company/Organization will handle,
* Explain the scope that your Company/Organization will cover,
* Explain your approach to the management of the quality and,
* Explain your approach to the management of the risks and their mitigation,
* Describe and justify the proposed costs to achieve this project objectives.

Annex II Terms and Conditions  
CfE – TTF T040 (REFERENCE BODY MTS)  
Deadline: 19 June 2024

**2.1 Submission of Proposals**

All proposals in response to this CfE shall be submitted before the deadline indicated in thisCollective Letter, using exclusively the WEB application on the ETSI Portal at the following address: <https://portal.etsi.org/cfe>.

Proposals shall be composed of Curriculum Vitae of the proposed service providers’ personnel and the Annex I of this CfE duly filled-out.

Proposals that will be partial or incomplete at the deadline will not be accepted.

The Terms and Conditions in this Annex will apply.

**2.2 Modification and Withdrawal of Proposals**

Applicants may, without prejudice to themselves, modify or withdraw their proposal by written request, provided that the request is received by ETSI prior to the due date and time, at the address to which their proposal was submitted. The applicant may submit a new proposal provided that such new proposal is received prior to the deadline for responding which is specified in this Collective Letter.

**2.3 Assessment of Proposals**

The ETSI Director-General, in consultation with the Reference Body Chairman, is responsible for the selection of the service providers that will be contracted to perform this Project work. The ETSI Director-General and the Reference Body Chairman may be assisted by a Selection Panel to assess the applications received and make the final decision.

As per article 1.10.4 of the ETSI Directives, the Director-General may discard proposals that could be identified as creating potential conflict of interest.

The ETSI Secretariat will only communicate to the applicants the result of the selection (accepted or not accepted). Should applicants need more information on the rationale for the selection, they must address a formal request to the ETSI Director-General.

The following evaluation criteria will be applied to all proposals, in order of priority:

* Evidence that the applicant has the necessary structure and expertise to ensure delivery
* Reference to current or previous activities in the specific technical domain of this project
* Critical review of the most efficient way to achieve the objectives in this Project ToR
* Effective proposed approach/methodology for the execution of the tasks
* Implementation schedule
* Clear pricing policy

Compliance with the first two (2) criteria is mandatory.

Proposals that are not considered compliant with these criteria will be discarded.

Priority will be given to technical quality of the proposals. Pricing considerations will be taken into account to ensure that the best value for money is achieved. Compatibility with the maximum budget allocated to this Project will be verified before placing a Service Contract.

Following the assessment process, ETSI reserves the right to grant contracts to other than the cheapest proposals, to accept or reject any offer completely or in part, or to reject all proposals, without providing the reasons. If no offer is accepted, ETSI may decide to abandon the work or proceed in any other manner ETSI may select.

**2.4 IPR and confidentiality Agreements**

The information provided in this CfE, as well as the fact that the applicant has received the CfE, is considered confidential and protected under copyright laws. The applicant may not discuss, share, or use the information in this CfE for any purpose other than the response to this CfE.

ETSI will not disclose the content of any proposals to other applicants or any other party, with the exception of the persons involved in the assessment process described in §2.3 above.

However, ETSI reserves the right to make use of the information provided in this proposal to improve this project definition for the purpose of this CfE or any other manner in which ETSI may decide to proceed to select the service providers.

If successful, the applicant will be required to sign a Service Contract, which includes IPR and Confidentiality clauses aligned with the relevant policies in the ETSI Directives.

**2.5 Preparation cost**

ETSI will not be responsible for any costs or expenses that the applicant may incur in preparing and/or submitting the proposal.

**2.6 Service Contract**

A Service Contract will be proposed to the applicants that will be selected to perform the work.

Details on the Terms and Conditions of this contract can be found on the ETSI Portal, at the following address: <https://portal.etsi.org/STF/STFs/Contracts.aspx>