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| ETSI_logo_Office_Colour_Small | ***ToR STF DA (ISG MEC)*** |
| Version: 0.3 |
| Author: Michele Carignani – Date: 26 Nov 2018 |
| Last updated by: Youssouf Sakho Date: 21 Dec 2018 |
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Terms of Reference

Specialist Task Force STF DA  
(ISG MEC) “MEC API Conformance Test Specifications”

**Summary information**

|  |  |
| --- | --- |
| Approval status | To be approved by ISG MEC  Board#121 (30 January 2019) |
| Funding | **Maximum budget: 73 500 € from ETSI FWP** |
| Time scale | Feb 2019 to Dec 2019 |
| Work Items | See §6.2 (deliverables to be produced) |
| Board priority | Standards enablers/facilitators (e.g. conformance test/interoperability/methodology)  Recommendations: use of TDL-TO, Robot Framework, TTCN-3 and CTI supervision. |

Part I – Reason for proposing the STF

# Rationale

ISG MEC started a STF project in September 2018 to produce a MEC Testing Framework defining a methodology for development of interoperability and conformance test strategies, test systems and the resulting test specifications for MEC standards. The MEC Testing Framework is now available as stable draft.

The MEC standards are complex documents and, even that great care has been taken in the drafting stages, ambiguities, incompleteness and even errors may occur. Feedback from validation activities is a very good way to remove these inconsistencies and improve the overall quality of the documents.

Validation should be interleaved with the evolution of the standard itself. The development of standardized conformance test specifications can be considered as a validation activity and is an integral part of the ETSI strategy for ensuring interoperability.

Now that the MEC Testing Framework is stable, it is the right time to start development of test specifications for the MEC APIs, and hence to continue the effort to support ISG MEC in writing high quality standards and to provide a basis for future certification activates.

Moreover, in order to promote adoption and ease deployment of MEC technology, the output of the work will target a broad set of communities involved in the specific context of MEC. This fundamental and specific goal of MEC will be addressed by requiring application of best practices for testing, most relevant for the targeted communities.

# Objective

The objective of this present STF proposal is to:

* Produce Test Requirements and define Implementation Conformance statement (ICS)
* Define a Test Suite Structure and Test Purposes (TSS&TP) in TDL-TO
* Develop Test Scripts into an Abstract Test Suites in order to allow successful testing activities in the industry in the many contexts where MEC technology is relevant. In order to reach this objectives, best practices and tools from both the Telecommunication and IT communities will be applied and the output will contain Tests Scripts in both TTCN-3 and Robot Framework languages.
  + For the case of TTCN-3, this objective may be further refined in the following objectives:
    - Development of an Abstract Test Suite (ATS),
    - Compilation on at least 3 test tools of which at least 1 shall be freely available to the public,
    - Develop a MEC API plugin for the ETSI Conformance Validation Platform
* Validate the test scripts against a target of 3 implementations

The above described test specifications will cover

* the MEC service APIs (MEC 012, 013, 014, 015, 016, 021, 028, 029 and 030)
* and the MEC Application Enablement and Lifecycle APIs (MEC 010-2 and 011)

# Relation with ETSI strategy and priorities

The STF will contribute to the following ETSI Strategy:

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

This request is in following the priority category:

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

# Context of the proposal

## ETSI Members support

The following members support this proposal:

|  |  |  |
| --- | --- | --- |
| **ETSI Member** | **Supporting delegate** | **Motivation** |
| Intel | Dario Sabella | Carrying out the development of Conformance Testing specification for MEC in due time is critical, therefore I support this STF proposal. |
| HPE | Alex Reznik | Carrying out the development of Conformance Testing specification for MEC in due time is critical, therefore I support this STF proposal. |
| Huawei | Sami Kekki | The development of high quality conformance test specification is essential for the edge computing ecosystem to take full benefit of the MEC APIs. |
| Viavi | Walter Featherstone | Carrying out the development of Conformance Testing specification for MEC in due time is critical, therefore I support this STF proposal. |
| ZTE | Yonggang Fang | Carrying out the development of Conformance Testing specification for MEC in due time is critical, therefore I support this STF proposal. |
| Nokia | Pekka Kuure | Carrying out the development of Conformance Testing specification for MEC in due time is critical, therefore I support this STF proposal. |

## Market impact

MEC is now in the phase 2, with the first release of specifications ready. Stakeholders need to understand what they have to implement, what constitutes the minimum set of mandatory functions and capabilities, possibly required by a specific use case, and what is the minimum set of information needed to test the system components for conformance. In addition, interoperability considerations are becoming important issues. This is especially true when targeting specific vertical market segments (e.g. automotive use cases), which introduce multiple stakeholders into the running of the whole system. Putting together different stakeholders in a complex system will require interoperability issues to be addressed to ensure the overall system works. As an example, automotive use cases (treated by 5GAA) involve car makers, OEM suppliers, network infrastructure vendors, MEC vendors, application/content providers, etc. All related interoperability reference points between different players therefore must be well defined.

In order to ensure a wide adoption and usage of the test specification and test scripts developed in the context of the present STF proposal, ISG MEC highlights the importance of providing the test scripts in 2 different flavours of which one formatted in the TTCN-3 language and the other in the Robot Framework language. This approach will succeed in providing two high quality conformance test suites suited to homogeneously support compliant implementations for both the Telecommunications and IoT communities.

The validation activity of the present proposal supports the deployment of MEC technologies and provides a basis for future certification activates.

## Tasks for which the STF support is necessary

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

## Related voluntary activities in the TB

* Delegates within the ISG will review the deliverables
* MEC vendors will provide implementations for the Validation task (see clause 7.1)

## Outcome from previous funded activities in the same domain

N/A

## Consequences if not agreed

MEC equipment is currently being deployed in experimental trials with the progression towards fully operational deployment. Thorough conformance testing will increase the level of confidence that equipment from various suppliers will interoperate. This in turn will reduce implementation and rollout times. Not providing timely validated and reliable test specifications, would ultimately delay the deployment of MEC services.

Part II - Execution of the work

# Technical Bodies and other stakeholders

## Reference TB

ISG MEC

## Other interested ETSI Technical Bodies

N/A

## Other stakeholders

* 5GAA (5G Automotive Association)

# Base documents and deliverables

## Base documents

|  |  |  |  |
| --- | --- | --- | --- |
| **Document** | **Title** | **Current Status** | **Date** |
| DGR/MEC-0025 TestingFramework | Multi-access Edge Computing (MEC); MEC Testing Framework | Stable draft | 2019-11 |
| MEC 010-2 | Mobile Edge Computing (MEC); Mobile Edge Management; Part 2: Application lifecycle, rules and requirements management | Stable draft | 2019-04 |
| MEC 011 | Multi-access Edge Computing (MEC);  Edge Platform Application Enablement | Final draft for approval | 2019-01 |
| MEC 012 | Multi-access Edge Computing (MEC);  Radio Network Information API | Final draft for approval | 2018-11 |
| MEC 013 | Multi-access Edge Computing (MEC);  Location API | Final draft for approval | 2018-12 |
| MEC 014 | Mobile Edge Computing (MEC);  UE Identity API | Published | 2018-02 |
| MEC 015 | Mobile Edge Computing (MEC);  Bandwidth Management API | Published | 2017-10 |
| MEC 016 | Multi-access Edge Computing (MEC);  UE application interface | Stable draft | 2018-10 |
| MEC 021 | Multi-access Edge Computing (MEC); MEC Application Mobility Service API | Early draft | 2018-12 |
| MEC 028 | Multi-access Edge Computing (MEC);  WLAN Information API | Stable draft | 2018-11 |
| MEC 029 | Multi-access Edge Computing (MEC);  Fixed Access Information API | Stable draft | 2018-12 |
| MEC 030 | Multi-access Edge Computing (MEC);  MEC V2X API | Stable draft | 2019-04 |

## Deliverables to be produced

|  |  |  |
| --- | --- | --- |
| **Deliv.** | **Work Item code**  **Standard numb.** | **Working title**  **Scope** |
| D1 | DGS/MEC-0032-1 APIConformance | Multi-access Edge Computing (MEC); Testing; Conformance test specifications for MEC API; Part 1: Test Requirements and Implementation Conformance Statement (ICS) |
| D2 | DGS/MEC-0032-2 APIConformance | Multi-access Edge Computing (MEC); Testing; Conformance test specifications for MEC API; Part 2: Test Suite Structure and Test Purposes (TSS&TP) |
| D3 | DGS/MEC-0032-3 APIConformance | Multi-access Edge Computing (MEC); Testing; Conformance test specifications for MEC API; Part 3: Abstract Test Suite (ATS) |

## Deliverables schedule:

This is for the ETSI WPM only. See more detailed planning in clause 7.

* Start of work 28-Feb-2018
* ToC and scope 25-Mar-2019
* Early draft 25-Mar-2019, MEC#17
* Stable draft 24-May-2019
* Final draft Nov 2019
* WG approval N/A
* TB approval Nov 2019, MEC#20
* Publication Dec 2019

# Work plan, time scale and resources

## Task description

Task T1: Project Management

Objectives

* Coordination, communication, reporting and leading of activities
* Review of deliverables
* Creation and presentation of STF reports

Input

* N/A

Output

* Reports
* Implementations available from MEC vendors for the validation phase

Interactions

* Discussion with STF members
* Discussion with industry stakeholders
* Attending ISG meetings

Resources required

* Under CTI lead

Task T2: Test Requirements and ICS development (D1)

Objectives

* Extraction of testable requirements from base specifications
* Creation of the Implementation Conformance Statements (ICS)
* Requirement and ICS examples created under the umbrella of the ‘Testing Framework’ will be transferred to D1

Input

* all identified MEC base standards, see clause 6.1

Output

* early, stable and final draft versions of D1

Interactions

* Peer-review between STF members
* Review from ISG MEC
* Parts of this task shall be executed in work sessions at the ETSI HQ

Resources required

* 3000 EUR

Task T3: TSS&TP development

Objectives

* Definition of a Test Suite Structure (TSS)
* Development of Test Purposes (TPs) using the standardized notation TDL-TO, see

<https://www.etsi.org/deliver/etsi_es/203100_203199/20311904/01.03.01_60/es_20311904v010301p.pdf>

* The Test Purposes will be developed on the ETSI FORGE platform and converted to WORD format for the review phase and for publication

Input

* all identified MEC base standards, see clause 6.1

Output

* early, stable and final draft versions of D1

Interactions

* Peer-review between STF members
* Review from ISG MEC
* Parts of this task shall be executed in work sessions at the ETSI HQ

Resources required

* 9000 EUR

Task T4: Test Scripts (Test Suite) Development

Objectives

* Implementation of the Test Purposes in with TTCN-3 and the Robot Framework
* All software will be made available on the ETSI FORGE platform
* This task shall review the deliverables of Task T2
* In the case of TTCN-3
  + The test scripts shall be compilable with at least 3 TTCN-3 toolings, among which at least one shall be freely available to the public.

Input

* Test Purposes from task 2

Output

* early, stable and final draft versions of D2

Interactions

* Peer-review between STF members
* Review from ISG MEC
* Parts of this task shall be executed in work sessions at the ETSI HQ

Resources required

* 21000 EUR

Task T5: Test System development

Objectives

* Build an executable test suite, by developing any needed tooling to allow successful execution by third parties for both TTCN3 and Robot Framework.
* All software will be made available on the ETSI FORGE platform
* In case of TTCN-3 scripts:
  + Development of Codec and Test Adapter software
  + All software shall be delivered as source code including all source code modules needed for the compilation into an executable version
  + The ETSI Conformance Validation Platform contains test suites and libraries for the execution of a multitude of conformance test suites, covering technologies such as SIP, IMS, ITS, oneM2m, eCall, NG112 etc. The MEC test software shall be packed as plugin for the ETSI Conformance Validation Platform
* In case of Robot Framework
  + Develop Keywords and supporting Python libraries as needed
* This task shall review the deliverables of Task 3

Input

* Test scripts from task 2

Output

* early, stable and final draft versions of D3

Interactions

* Peer-review between STF members
* Review from ISG MEC
* Parts of this task shall be executed in work sessions at the ETSI HQ

Resources required

* 12000 EUR

**Task T6: Test System Validation**

Objectives

* The test suites in both Robot Framework and TTCN-3 shall be validated against a target of three SUTs/implementations and eventual bugs and issues resolved.
* In case of TTCN-3, This STF will provide level 2 validation as shown in the table below.
* The responsibilities shown in the table below shall be shared by the STF team.
* In addition and beyond the STF effort, it is expected to get documentation and support from the implementation providers on any issues that may arise.
* The validation report will not contain any information on the level of maturity of the tested implementations; it will solely focus on the validation effort of the test scripts. The validation report will be part of the Final STF report.

Table 1: Responsibilities of validation

|  |  |
| --- | --- |
| Basic Validation (Level 1) | Strong Validation (Level 2) |
| Provision of TTCN-3 analysers/compilers |  |
| Compilation of the test suite on at least 3 TTCN-3 compilers |  |
| Reporting and fixing of errors in the TTCN-3 scripts |  |
|  | Installation of / connection to a target of 3 SUT(s) |
|  | Execution of all test suites |
|  | Reporting and fixing of errors in the TTCN-3 scripts |
|  | Validation of test verdicts |
|  | Compilation of a validation report |

Input

* Test Purposes from Task 3 and executable test suite from task 4 and 5

Output

* Validated test specifications

Interactions

* Validation sessions with MEC vendors

Resources required

* 12000 EUR

## Milestones

Milestone 1 – Stable draft of RQS, ICS and TSS&TP available and STF Progress Report approved

Stable drafts including the result of Tasks 2, 3, 4 available for review. A Progress Report shall be produced and approved by ISG MEC in May/Jun 2019.

Milestone 2 – Stable drafts of Test Scripts

Stable drafts including the result of Task 5 available for review.

Milestone 3 – Test System available

The Test Systems are available, i.e. the test scripts are executable against implementations, and hence the validation phase can start.

Milestone 4 – Test System validated

All test suites have been validated.

**Milestone 5 – Deliverables and STF Final Report approved**

Final drafts available for review. Final draft and Final report to be approved by ISG MEC in Nov 2019.

Milestone 6 – Deliverables published, STF closed

## Task summary

|  |  |  |  |
| --- | --- | --- | --- |
| **N** | **Task / Milestone / Deliverable** | Target date | Estimated cost |
| M0 | Start of work | 28 Feb 2019 |  |
| T1 | Project management, reporting, meeting attendance | continuous | 0 |
| T2+T3 | RQs, ICS and TSS&TP development | 28 Feb – 24 May 2019 | 12 000 |
| M1 | Stable draft of RQs, ICS and TSS&TP and STF Progress Report approved | 24 May 2019 |  |
| T4 | Test Suite Development | 14 May – 6 Sep 2019 | 22 000 |
| M2 | Stable draft of Test Scripts | 6 Sep 2019 |  |
| T5 | Test System development | 1 Jul – 6 Sep 2019 | 13 000 |
| M3 | Test System available | 6 Sep 2019 |  |
| T6 | Test System Validation | 9 Sep 2019 – 15 Nov 2019 | 13 000 |
| M4 | Test System validated | 15 Nov 2019 |  |
| M5 | Deliverables and STF Reports approved | Nov 2019 |  |
| M6 | Deliverables accepted by the ETSI Secretariat (ready for publication) | Dec 2019 |  |
| **Total** | | | **60000** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Task Milest.** | **Description** | **F** | **M** | **A** | **M** | **J** | **J** | **A** | **S** | **O** | **N** | **D** |
| T1 | STF Management |  |  |  |  |  |  |  |  |  |  |  |
| T2+T3 | RQs, ICS, TPs |  |  |  |  |  |  |  |  |  |  |  |
| M1 | Stable drafts of RQs, ICS, TPs available and STF Progress Report approved |  |  |  | M1 |  |  |  |  |  |  |  |
| T4+T5 | Test Scripts and Adapter |  |  |  |  |  |  |  |  |  |  |  |
| M2 | Stable drafts Test Scripts |  |  |  |  |  |  |  | M2 |  |  |  |
| M3 | Test System available |  |  |  |  |  |  |  | M3 |  |  |  |
| T6 | Validation |  |  |  |  |  |  |  |  |  |  |  |
| M4 | Test System validated |  |  |  |  |  |  |  |  |  | M4 |  |
| M5 | Deliverable and STF Final Report approved |  |  |  |  |  |  |  |  |  | M5 |  |
| M6 | Deliverables published, STF closed |  |  |  |  |  |  |  |  |  |  | M6 |

# Expertise required

Two to three contractors to ensure the following mix of skills:

* expert knowledge of all base standards mentioned above in clause 6.1;
* proven experience in conformance testing;
* Expertise in TTCN-3, development workflow and tooling
  + expert knowledge of TTCN-3 (ES 201 873);
  + expert knowledge in codec and adaptation layer development in C++/Java.
* Expertise in the Robot Framework language, development workflow and tooling
* Expertise in software development best practices, including Content Version Management using GIT.

Part III: Financial conditions

# Maximum budget

## Contractors cost

Maximum budget **60 000 EUR**

## Travel Costs

Any travel necessary to present the result of the STF will be undertaken by CTI.

Three travels weeks of the STF members for the working sessions at the ETSI HQ.

Amount per STF member: 4 500 EUR.

## Other Costs

N/A

# Part IV: STF performance evaluation criteria

# Key Performance Indicators

* Quality of deliverables
  + Approval of deliverables from the Reference TB according to schedule
  + Deliverables approved by ISG MEC accepted by the ETSI Secretariat for publication
  + Respect of time scale, with reference to start/end dates in the approved ToR

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

# Document history

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Date** | **Author** | **Status** | **Comments** |
| **0.3** | **21-Dec-2018** | **Youssouf Sakho** | **ISG MEC approved** | **Consistency check** |
| 0.2 | 6-Dec-2018 | Michele Carignani | Second draft |  |
| 0.1 | 26-Nov-2018 | Michele Carignani | First draft |  |