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|  | ***ToR STF ZO (TC MTS)*** |
| Version: 1.0 |
| Author: Philip Makedonski – Date: 30 Sep 2014 |
| Last updated by: Philip Makedonski – Date: 08 Oct 2014 |
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Terms of Reference Specialist Task Force

STF ZO (TC MTS) - A Reference Implementation of TDL (Phase 3)

**Summary information**

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| Approval status | Approved by TC MTS by RC |
| Funding overview | Cost of Phase 1 in 2013 (STF454, foundations of TDL design): **81 600 €**  Cost of Phase 2 in 2014 (STF 476, TDL adaptation to users): **103 600 €**  Cost of this STF (Phase 3) A reference implementation platform for TDL: **116 800 €** (112 800 € manpower + 4 000 € travel) = 260 working days, including 47 days (20%) expert voluntary contribution and 25 days CTI support (free of charge) |
| Time scale | Feb 2015 to Jan 2016 |
| Work Items | RES/MTS-203119-1 V1.3.1, DES/MTS-203119-2 V1.2.1, DES/MTS-203119-3 V1.2.1, DES/MTS-203119-4 V1.2.1, DTR/MTS-203119REF V1.1.1 |

Part I – Reason for proposing the STF

# Rationale

## Background information

The process of stepwise development of tests from requirement specifications is well established and used in both, standardization and industry. This process is supported by methods and languages produced by TC MTS. The proposed STF contributes to the work of MTS on the continued development of the “Test Description Language” (TDL), which acts as an intermediator between TPLan for the specification of test purposes and TTCN-3 for the specification of test cases.

TDL bridges the gap between declarative test purpose specifications (what shall be tested?) and imperative test case specifications (how shall it be tested?) by offering a standardized language for the specification of test descriptions. Moreover, TDL contributes to the ongoing activities in MTS to establish model-based testing (MBT) technologies within ETSI.

It is expected that test descriptions in a standardized language ease the development of executable tests because tools can be built to analyze the correctness of test descriptions beforehand and enable their integration into test automation frameworks, e.g. based on TTCN-3. In addition, such test descriptions are easier to review by non-testing experts. All these prospective benefits will improve the general productivity and quality of test development in industry as well as in the standardization process.

## Organization in phases

STF 454 laid the foundation of TDL in 2013 in terms of the basic concepts and their semantics. It also experimented with various syntaxes and demonstrated how TDL could be applied to the domain of 3GPP for the specification of User Equipment conformance test descriptions and IMS interoperability testing. Validation activities within the STF (mainly the creation of TDL editors using different technologies) have shown that the suggested design of TDL is feasible and delivers the requested support for the manual specification of tests.

STF 476 built upon the work of STF 454 within TC MTS, adding the necessary language functionality to integrate TDL test descriptions into test automation frameworks. It also developed a standardized concrete graphical syntax for end-users, a TDL exchange format to be used by tools to foster tool interoperability, as well as an extension to address advanced test objective specification with TDL and ETSI’s specific needs for improving the standardization processes.

Phase 3 of TDL proposed in this ToR for 2015 will accelerate the adoption of TDL by providing a reference implementation of TDL to lower the barrier to entry for both users and tool vendors in getting started with using TDL. The reference implementation comprises graphical and textual editors, as well as validation facilities based on semantics refinements, and a UML profile for TDL to enable its interoperability with and application in UML-based working environments and model-based testing approaches. In addition to the technical report describing the reference implementation, an open internet platform hosting the reference implementation of TDL will be established as a central hub for the community, supporting the concept of software in standards. The work within this STF will contribute to the public launch of TDL as a major milestone in the development of TDL. The launch event is planned for UCAAT 2015 which will take place at ETSI. It will provide an ideal opportunity to further expose TDL in a tangible way to a broader testing community.

# Objective

The final result of this STF will be the delivery of the final draft of the ETSI technical report on the TDL reference implementation as well as the final drafts of the updated ETSI standard ES 203 119 (multi-part document) in December 2015. In more detail it will deliver:

* Technical report on the reference implementation of TDL and the reference implementation itself hosted on an open internet platform serving as a portal for the community;
* Part 1: An adaptation of the current TDL meta-model including the specification of a UML profile for TDL enabling the use of TDL in a UML environment; it addresses also change requests that stem from the work on the reference implementation and from early adopters of TDL from the community;
* Part 2: An adaptation of the TDL graphical syntax according to the changes in Part 1, including change requests addressing challenges from the reference implementation and early adopters;
* Part 3: An adaptation of the TDL exchange format specification according to the changes in Part 1, including change requests addressing challenges from the reference implementation and early adopters;
* Part 4: An adaptation and extension of the capabilities for structured test objective specification to include additional features which are in the interest of ETSI technical bodies as well as implementation of change requests from the reference implementation and other early adopters.

# Relation with ETSI strategy and priorities

The proposed STF relates to the following aspects of the ETSI long term strategy and priorities:

* Keep ETSI effective, efficient and recognised as such
* Create high quality standards for global use and with low time-to-market.
* Stay in tune with changing nature of the global ICT industry (innovation)
* Establish leadership in key areas impacting members' future activities
* Engage in other industry sectors besides telecoms, (cross-sector ICT)
* Innovation in mature domains
* Emerging domains for ETSI
* Standards enablers/facilitators (conformance testing, interoperability, methodology)
* Horizontal activities (quality, security, etc.)

# Context of the proposal

## ETSI Members support

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| --- | --- | --- |
| **ETSI Member** | **Supporting delegate** | **Motivation** |
| Conformiq | Dr. Stephan Schulz | Over the past 10 years industrial testing practice has moved from a programmatic approach to higher level approaches. This work is critical for ETSI to remain at the forefront of testing methods & practice. It is critical to keep the current momentum of TDL specification process in MTS to ensure that the language will actually fill the gap it is trying to fill. Conformiq strongly supports this STF. |
| Elvior | Dr. Andres Kull | Elvior sees TDL as an easy-to-use formal notation for test descriptions that can fill the gap between model-based test design and manual scripting methods such as TTCN-3. TDL should be an easier alternative for those who see model-based and scripting based approaches as too much of a time investment. TDL should also be able to serve as an intermediary between generated test cases and their execution platform. |
| Ericsson | Dr. György Réthy | Over the past decade automated testing and in particular TTCN-3 has gained a major role in our software product development from functional testing to performance and robustness testing. However product development efficiency shall continuously be increased and time-to-market shall be shortened. This requires raising the abstraction level at which testers are working with their test cases and test execution results. Except increasing the efficiency of existing users of test automation technologies, the test description language (TDL) will also open the door to employ automated test systems for users not familiar with programming. Therefore, TDL is a key factor not only in technologies, like model-based testing (MBT), but also in “traditional” test case-based software development, market adaptation of software products and customer support. Ericsson strongly supports the request for this STF. |
| Fraunhofer FOKUS | Prof. Dr. Ina Schieferdecker | Fraunhofer FOKUS is actively involved in both the development of TTCN-3 and the UML Testing Profile. Fraunhofer FOKUS is highly interested to strengthen the methodological links of TDL with TTCN-3 and the UML Testing Profile in order to support interoperability between methods and tools and to prevent incompatible standards. Fraunhofer FOKUS strongly supports the request for this STF. |
| Siemens | Dr. Andreas Ulrich | Siemens endorses TDL as the way forward to establish model-driven software engineering methods in testing. Current model-based testing solutions that rely on elaborated system models often do not live up to their promises since in practice these models are hard to deliver and available tools frequently suffer from intrinsic problems of their generation algorithms. TDL offers a simpler approach by raising the abstraction of individual tests without the costs of system modelling. Based on experiences made with TTCN-3, TDL is a big step forward on the evolution path of test specification languages. It is expected to revive the tool market for a new generation of testing tools based on standards. Therefore Siemens strongly supports the request for this STF. |

Motivation by CTI, Anthony Wiles

CTI strongly supports this STF proposal. TDL offers a *standardized* approach for the systematic *design* of tests before they are coded in TTCN-3. With full tool support, this can lead to an increased efficiency and quality of test suites developed by ETSI STFs. Another benefit is that TDL can be used in applications where TTCN-3 may not be suitable or even needed, for example, as a precise format for the specification of interoperability tests.

## Market impact

The ETSI TTCN-3 standard has been in place for over ten years and can now be considered to be a very mature technology for the handling of test automation of very large software systems. Although TTCN-3 was designed with multiple representation formats in mind, only the textual representation is used in practice. On the other hand, UML has become the ubiquitous modelling notation replacing even well established technologies such as SDL or MSC. However, the imprecise semantics of UML leads to very different tool-dependent solutions, even when the same kind of modelling diagrams are used. This observation extends also to the UML Testing Profile.

TDL provides a precise notation and semantics for the task of specifying test descriptions for black-box tests of communicating and reactive systems. Black-box testing becomes the major testing approach since it offers good support for test-driven and agile software development processes that more and more replace traditional waterfall and iterative processes.

In the standardization of conformance test suites TDL offers a clear way forward from detailing test case specifications in TTCN-3 to the specification of more abstract test descriptions. Also, it enables the potential deployment of model-based testing methods in standardization. Once TDL has been set as a standard, it will have a tremendous impact on the way tests are designed and described in a broad range of application areas beyond telecommunications.

A reference implementation of TDL will accelerate the adoption of TDL by lowering the barrier to entry for interested parties to get started with using TDL. This will benefit users seeking means to apply the language and thus creating an initial user base and demand for commercial support and services. On the other hand, this will also benefit tool vendors providing enhanced capabilities and integration with their existing solutions and services based on the reference implementation while capitalizing on the user base created by the availability of a reference implementation hosted on an open internet platform.

Subsequently:

* TC MTS is convinced that it is highly desirable to develop an established ETSI standard on a common Test Description Language to set the pace for the design of tests for current and future systems. If this work would be delayed, there is the danger that ETSI can lose the grip on the testing market;
* The penetration of ETSI’s TTCN-3 test language has reached a mature state and will not likely progress beyond the current scope of covered domains and applications, most of which are already mature. TDL will offer a clear way forward from that state to a model-driven design of tests;
* 3GPP has a large quantity of test specifications in prose (MS Word format) for 3G and 4G mobiles / UEs. The development of TDL will further provide a methodology for describing these tests and help develop better test standards for 3GPP UE interoperability.
* TDL allows industry to develop automated tests more efficiently and to apply test automation more widely. Leveraging TDL relieves the test engineer from working on details of test implementations and does not require him to use programming languages.
* A reference implementation of TDL will accelerate the adoption of TDL by enabling users to apply TDL while at the same time creating a favourable environment for tool vendors to get into and a solid foundation to build on top of.

## Tasks that cannot be done within the TB and for which the STF support is necessary

The previous STFs 454 and 476 created the foundation for TDL in terms of a well-defined abstract syntax (meta-model), an exemplified application of suggested concrete syntaxes in the context of 3GPP and IMS, a standardized graphical syntax and exchange format, as well as support advanced test objective specification. Further efforts are required to boost the TDL adoption and application in order to create a high impact on the testing and modeling communities by providing a reference implementation for users to get started with applying the language and for tool vendors to build enhanced capabilities and integration with their existing solutions and services on top of.

The mix of expertise needed for language development and its reference implementation is not commonly available in standardization bodies or from industrial members; though such knowledge is available from academic partners, i.e. research institutes and universities that are not in the position of financing voluntary contributions to the development and maintenance of a specification language and its implementation.

The specific focus of this STF requires the development of tools comprising the foundation of the reference implementation enabling the adoption and application of the language concepts. Making these tools available to the community and building a sustainable environment for further development requires expertise generally not available within the TB.

The adoption and application of a new modeling language is a laborious activity, in particular when it needs to cover the different requirements from various stakeholders within their respective working environments. This requires close collaboration with stakeholders involved in both the standardization process, as well as the common use within industry. In particular the application of the TDL default concrete syntax and the advanced test objective specification extension requires close interactions with CTI and other experts at ETSI to ensure the acceptance of TDL by its future users.

## Related voluntary activities in the TB

A steering group within MTS was created already for overseeing and advising the work of the preceding STFs 454 and 476. The steering group will continue to be active in its role during the progress of the new STF and will provide valuable guidance. Besides this activity, additional efforts will be spent to validate the new concepts and features as well as the reference implementation of TDL in the context of the individual partners’ respective work environments.

Other funded activities within the proposed STF will contain 20% of voluntary efforts to meet ETSI’s STF funding guidelines.

## Outcome from previous funded activities in the same domain

The previous STF 454 laid the foundations of TDL by defining the concepts in terms of the abstract syntax, i.e. the meta-model, and the semantics of the various language elements. It also demonstrated how TDL could be applied to the domains of 3GPP and IMS for the specification of user equipment conformance and interoperability test descriptions, respectively. Moreover, validation activities within the STF, mainly the creation of TDL prototypical editors using different technologies, showed that the suggested design of TDL is feasible and delivers the requested support for the manual specification of tests.

The subsequent work within STF 476 addressed adoption requirements from users and tool vendors, by building upon the work of STF 454 in extending the meta-model for the purposes of test automation and defining a standardized graphical syntax and exchange format. Within the scope of STF 476 an extension was defined to support the advanced test objective specification with TDL, thus bringing test purpose specification to the modeling world, consequently unifying the means for both test purpose and test description specification. The extended scope of TDL led to an increasing interest among various stakeholders in adopting TDL, prompting the need for the availability of means to apply TDL in their respective working environments and build on the current momentum of TDL.

## Consequences if not agreed

Establishing this STF as a continuation of the work done within STF 454 and STF 476 will speed up progress in the adoption of TDL. Without this STF, the application of the TDL standard by end users would be delayed. Users will continue with their largely informal solutions that are mainly designed ad-hoc and thus, without proper tool support, tend to be error-prone and expensive. A delay in the availability of tool support will prevent users from adopting TDL, while at the same time tool vendors will be hesitant to invest in a new technology without a sufficient user base or a reference technology to build upon, and will likely stick with their proprietary solutions.

Other standardization bodies, notably OMG, will continue their activities that might gain popularity over the TDL solution and might not be in ETSI’s interests and needs for describing conformance and interoperability test suites. Moreover, ETSI would lose influence in the area of model-driven engineering and model-based testing.

Part II - Execution of the work

# Technical Bodies and other Organizations involved

## Leading TB

The work of this STF is embedded within the ETSI TB MTS.

## Other interested ETSI Technical Bodies

Similar to the maintenance of the TTCN-3 standards, the following ETSI TBs are expected to contribute to the STF by providing feedback on the developed TDL methodology: 3GPP, INT, ITS, ERM.

## Other interested Organizations outside ETSI

The following organizations are expected to be interested in the outcome from this STF: OMA, TCCA (former TETRA Association), oneM2M, IPv6Forum.

Moreover, the automotive industry took already initiative in providing solutions for their specific needs of hardware-in-the-loop testing. These initiatives should be also interested in the results of the proposed ETSI STF.

# Working method/approach

## Organization of the work

The goal of this STF is to speed up the adoption of the existing ETSI standard on the “Test Description Language (TDL)” within ETSI and the industry. Therefore, the work is organized around the activities necessary to enable early adopters and the community at large to get started with using the language in their respective working environments, based on feedback from various interested stakeholders. The activities are focused on delivering a reference implementation lowering the barrier to entry for interested parties to get started with using TDL.

Further activities complementing the work on the reference implementation will deliver a UML profile for TDL enabling its adoption in the growing number of UML-based working environments and model-based testing approaches. A refinement of the semantics specification will enable semantic validation within the reference implementation and streamline the generation of executable test specifications. Adaptations to the existing standards will address challenges encountered due to the needs of the reference implementation and further change requests.

Intermediate early and stable drafts, as well as a final draft will be delivered as milestones at regular intervals, coinciding with plenary sessions of TC MTS. An additional milestone is defined for the TDL launch event at UCAAT 2015.

Once draft versions of the TDL standard become available, they will be sent out to ETSI MTS and parties outside of ETSI for review and feedback. Since there are two milestones M2 and M4 foreseen to solicit feedback, there is sufficient room for delivering an enhanced and improved TDL standard that fits the needs of different organizations and users.

The adoption of the TDL standard ES 203 119 will be accelerated by providing a reference implementation and associated adaptations to the standard defined across the following tasks:

* Task 1: Reference implementation (DTR/MTS-203119REF V1.1.1)
* Task 2: UML profile for TDL (ES 203 119-1)
* Task 3: Adaptations to the MM (ES 203 119-1)
* Task 4: Adaptations to GR, XF, TO (ES 203 119-2/3/4)

Effort estimation for the various tasks of the STF is based on the number of working sessions that can be organized within the timeframe of this STF and the number of experts involved in each task.

Each task is accomplished by 2 experts. We assume in total 6 sessions during the lifetime of the STF. The proposed STF is controlled by a dedicated steering group during dedicated technical sessions.

## Base documents

|  |  |  |  |
| --- | --- | --- | --- |
| **Document** | **Title** | **Current Status** | **Expected date for stable document** |
| ETSI ES 201 873-1 V4.5.1 | Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 1: TTCN-3 Core Language | Published |  |
| ETSI ES 202 553 V1.2.1 | Methods for Testing and Specification (MTS); TPLan: A notation for expressing Test Purposes | Published |  |
| ETSI ES 202 951 V1.1.1 | Methods for Testing and Specification (MTS); Model-Based Testing (MBT); Requirements for Modelling Notations | Published |  |
| ETSI ES 203 119-1 V1.2.1 | Methods for Testing and Specification (MTS); The Test Description Language (TDL); Part 1: Abstract Syntax and Associated Semantics | Stable Draft |  |
| ETSI ES 203 119-2 V1.1.1 | Methods for Testing and Specification (MTS); The Test Description Language (TDL); Part 2: Graphical Syntax | Stable Draft |  |
| ETSI ES 203 119-3 V1.1.1 | Methods for Testing and Specification (MTS); The Test Description Language (TDL); Part 3: Exchange Format | Early Draft | Dec-2014 |
| ETSI ES 203 119-4 V1.1.1 | Methods for Testing and Specification (MTS); The Test Description Language (TDL); Extensions: Advanced Test Objective Specification | Early Draft | Dec-2014 |

## Deliverables

|  |  |  |
| --- | --- | --- |
| **Deliv.** | **Work Item code**  **Standard number** | **Working title**  **Scope** |
| D1 | RES/ES 203 119-1 V1.3.1 | Test Description Language; Meta-Model and Semantics  Scope: common concepts, meta-model, semantics |
| D2 | RES/ES 203 119-2 V1.2.1 | Test Description Language; Graphical Syntax  Scope: TDL graphical concrete syntax for end users |
| D3 | RES/ES 203 119-3 V1.2.1 | Test Description Language; Exchange Format  Scope: TDL exchange format for tool interoperability |
| D4 | RES/ES 203 119-4 V1.2.1 | Test Description Language; Advanced Test Objective Specification  Scope: TDL extension for structured test objectives |
| D5 | DTR/TR 203 119REF V1.1.1 | Test Description Language; Reference Implementation  Scope: TDL reference implementation documentation |

## Deliverables schedule:

The general timeline of this STF is defined as follows:

M1: Start of work: 01-Feb-2015

M2: 1st draft: 01-May-2015 (2 weeks ahead of MTS#65)

M3: Start of work 2: 01-May-2015 (for some tasks of the STF)

M4: 2nd draft: 18-Sep-2015 (2 weeks ahead of MTS#66)

M5: Launch event: 20-Oct-2015 (during UCAAT 2015)

M6: 3rd draft: 18-Dec-2015 (4 weeks ahead of MTS#67)

M7: End of work: 31-Jan-2016

M8: Publication: 31-Mar-2016

RES/ES 203 119-1 Test Description Language (TDL), Meta-Model and Semantics

* Start of work 01-Feb-2015
* Early draft 01-May-2015 MTS#65
* Stable draft 18-Sep-2015 MTS#66
* Final draft 18-Dec-2015
* TB approval 31-Jan-2016 MTS#67
* Publication 01-Mar-2016

RES/ES 203 119-2 Test Description Language (TDL), Graphical Syntax

* Start of work 01-May-2015
* Early draft 18-Sep-2015 MTS#66
* Final draft 18-Dec-2015
* TB approval 31-Jan-2016 MTS#67
* Publication 01-Mar-2016

RES/ES 203 119-3 Test Description Language (TDL), Exchange Format

* Start of work 01-May-2015
* Early draft 18-Sep-2015 MTS#66
* Final draft 18-Dec-2015
* TB approval 31-Jan-2016 MTS#67
* Publication 01-Mar-2016

RES/ES 203 119-4 Test Description Language (TDL), Advanced Test Objective Specification

* Start of work 01-May-2015
* Early draft 18-Sep-2015 MTS#66
* Final draft 18-Dec-2015
* TB approval 31-Jan-2016 MTS#67
* Publication 01-Mar-2016

DTR/TR 203 119 REF Test Description Language (TDL), Reference Implementation

* Start of work 01-Feb-2015
* Early draft 01-May-2015 MTS#65
* Stable draft 18-Sep-2015 MTS#66
* Final draft 18-Dec-2015
* TB approval 31-Jan-2016 MTS#67
* Publication 01-Mar-2016

## Work plan, time scale and resources

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **N** | **Task / Milestone / Deliverable** | From | To | Funded experts (days) | CTI experts (days) |
| M1 | Start of work | 01-Feb-2015 | |  |  |
| T0 | Project management | 01-Feb-2015 | 31-Jan-2016 | 11 |  |
| T1 | Task 1: Reference implementation | 01-Feb-2015 | 31-Dec-2015 | 96 | 10 |
| T2 | Task 2: UML profile for TDL | 01-Feb-2015 | 31-Dec-2015 | 48 | 5 |
| M2 | Early draft for review | 01-May-2015 | |  |  |
| M3 | Start of work 2 | 01-May-2015 | |  |  |
| T3 | Task 3: Adaptations to the MM | 01-May-2015 | 31-Dec-2015 | 40 | 5 |
| T4 | Task 4: Adaptations to GR, XF, TO | 01-May-2015 | 31-Dec-2015 | 40 | 5 |
| M4 | Stable draft for review | 18-Sep-2015 | |  |  |
| M5 | Launch event | 20-Oct-2015 | |  |  |
| M6 | Final draft for TB approval & final report | 18-Dec-2015 | |  |  |
| M7 | End of work | 31-Jan-2016 | |  |  |
| M8 | Publication | 31-Mar-2016 | |  |  |
| **Total** | | | | **235** | **25** |

## Task and milestone description

Task 0 – Project management

**Activities**:

* Planning, organisation, and preparation of STF meetings;
* Ongoing reporting;
* Participation at SG and TC meetings;
* Preparation of technical material for the TDL launch event
* Coordination of the launch event preparation
* Delivery of the STF final report.

**Efforts estimation**: 11 days, i.e. 2 days per milestone M2, M4, M6 for the STF lead and rapporteurs, 5 days for the TDL launch event

Task 1 – Reference implementation

**Activities**:

* Implementation of graphical editors according to TDL part 2 based on the Eclipse platform related technologies (e.g. Sirius or UML), covering essential constructs related to e.g. configurations and behaviour specification;
* Implementation of textual editors based on the Eclipse platform and related technologies (Xtext, EMFText, etc.), covering the advanced test objective specification extension (TDL part 4) and at least the parts of the meta-model not covered in the graphical editor;
* Implementation of the TDL exchange format (TDL part 3);
* Implementation of the UML profile for TDL (extension to TDL part 1) and integration with the open source "Eclipse UML Profiles Repository" project and the open source UML modelling environment Eclipse Papyrus as open TDL UML profile reference implementation platform;
* Identification of change requests for the current TDL standard to address challenges faced during the reference implementation
* Setting up necessary project infrastructure and open-source portal
* User and developer documentation

**Efforts estimation**: 96 + 10 PD; 6 sessions at 5 days + 3 days homework per session for 2 experts + CTI support.

Task 2 – UML profile for TDL

**Activities**:

* Specification of a mapping from the TDL meta-model to TDL stereotypes and UML meta-classes in a semi-formal manner
* Specification of the TDL UML profile abstract syntax according to the mapping
* Automated derivation of UML profile specification in order to reduce maintenance efforts and keep consistency with the TDL meta-model
* Specification of formal constraints and UML superstructure restrictions to prevent invalid application of the TDL profile

**Efforts estimation**: 48 + 5 PD; 6 sessions at 3 days + 1 day homework per session for 2 experts (the amount of effort may vary between milestones with higher amount of effort needed early on) + CTI support.

Task 3 – Adaptations to the MM

**Activities**:

* Formalisation of static semantics by means of e.g. Object Constraint Language (OCL) constraints which can be transferred to the reference implementation
* Addressing change requests arising from challenges during the reference implementation and reports from early adopters

**Efforts estimation**: 40 + 5 PD; 4 sessions at 4 days + 1 day homework per session for 2 experts (the amount of effort may vary between milestones with higher amount of effort needed early on) + CTI support.

Task 4 – Adaptations to GR, XF, TO

**Activities**:

* Extension of the constructs for the specification of test objective at the abstract event level, including for example, parallel events, repeated events, etc.
* Addressing change requests arising from challenges during the reference implementation and reports from early adopters.

**Efforts estimation**: 40 + 5 days; 4 sessions at 4 days + 1 days homework per session for 2 experts (the amount of effort may vary between milestones with higher amount of effort needed later on) + CTI support.

Milestone 2 – Early draft for review

* Delivery of the early draft on Part 1: TDL meta-model and semantics that includes an initial description of the UML profile for TDL;
* Delivery of the early draft on DTR/MTS-203119REF: TDL reference implementation that includes an initial description of the reference implementation and working prototypes;

Milestone 4 – Stable draft for review

* Delivery of the stable draft on Part 1: TDL meta-model and semantics that includes the UML profile for TDL, the formalised semantics description, and adaptations addressing all change requests arising from challenges during the reference implementation.
* Delivery of the stable draft on Part 2: TDL graphical syntax that includes adaptations addressing all change requests arising from challenges during the reference implementation and a mapping to the UML profile for TDL.
* Delivery of the stable draft on Part 3: TDL exchange format that includes adaptations addressing all change requests arising from challenges during the reference implementation.
* Delivery of the stable draft on Part 4: Advanced test objective specification with TDL that includes adaptations addressing all change requests arising from challenges during the reference implementation, as well as additional constructs for e.g. parallel behaviour.
* Delivery of the stable draft on DTR/MTS-203119REF: TDL reference implementation that includes a description of the reference implementation and stable editors implementation

Milestone 5 – Launch event

* Official launch of the TDL standard, including its reference implementation.
* Hosting of the TDL launch event at the UCAAT 2015.

Milestone 6 – Final draft for TB approval and STF Final Report

* Delivery of the final draft on Part 1: TDL meta-model and semantics with complete contents.
* Delivery of the final draft on Part 2: TDL graphical syntax with complete contents.
* Delivery of the final draft on Part 3: TDL exchange format with complete contents.
* Delivery of the final draft on Part 4: Advanced test objective specification with TDL with complete contents.
* Delivery of the final draft on DTR/TR 203 119-5: TDL reference implementation with complete contents.

Milestone 8 – Publication

Publication of the updated and extended ETSI Standard on TDL.

# Required expertise

Up to 5 experts to ensure the following mix of skills:

* Deep understanding of black-box testing and of testing communicating real-time systems;
* Experiences in modelling and description techniques such as TTCN-3, UML, MSC;
* Experiences in UML meta-modelling and UML profiles;
* Experiences in the design of software languages and compiler/transformation techniques, including model-transformation techniques;
* Experiences in the model-based implementation of software languages including concrete graphical and textual syntax implementation, syntactical and semantic model validation.

Part III: Financial conditions

# Estimated cost

## Manpower cost

|  |  |  |  |
| --- | --- | --- | --- |
| **Description** | **Working days** | **Rate €/day** | **Total cost  €** |
| Contracted experts (remunerated) | 188 | 600 | 112 800 |
| Contracted experts (voluntary, 20% from total) | 47 | 0 | 0 |
| CTI staff (voluntary) | 25 | 0 | 0 |
| **Total manpower cost** | **260** |  | **112 800** |

## Travel Costs

|  |  |
| --- | --- |
| **Description** | **Cost estimate** |
| Attending MTS plenary meetings (3 travels within Europe to MTS#65, #66, #67) | 3000 € |
| Presentation at UCAAT 2015 or a related conference (1 travel within Europe) | 1000 € |
| **Total cost** | **4000 €** |

## Other Costs

None.

Part IV: STF performance evaluation criteria

# Key Performance Indicators

In the course of the project, the STF lead will collect the relevant data necessary to calculate the performance indicators used to evaluate the outcome of the STF. The results will be presented in the Final Report. The following indicators will be used:

**Contributions from ETSI Members to STF work**

* Voluntary work of experts directly involved in the STF or outside the STF
* Steering Group meetings
* Delegates attending meetings/events related to STF
* Direct contribution of delegates
* Support to the STF work

**Contributions from STF experts to ETSI work**

* Contributions presented to TB MTS meetings (number, type, comments received)
* Presentations in workshops, conferences, stakeholder meetings (outside ETSI)
* Presentations to other ETSI TBs
* Contributions received from other ETSI TBs

**Liaison with other stakeholders**

* Stakeholder participation in the project
* Comments received on drafts (e.g. from personal communication, mailing lists, etc.)

**Quality of deliverables**

* Availability of a TDL reference implementation featuring all TDL concepts
* Approval of deliverables according to schedule
* Respect of time scale, with reference to start/end dates in the approved ToR
* Quality review by TB
* Quality review by ETSI Secretariat

# Document history

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| --- | --- | --- | --- | --- |
|  | **Date** | **Author** | **Status** | **Comments** |
| 0.1 | 31-Sep-2014 | P. Makedonski | Initial | Creation of document |
| 0.2 | 01-Oct-2014 | A. Ulrich | R1 | Refinements |
| 0.3 | 01-Oct-2014 | P. Makedonski | R2 | Refined task descriptions |
| 0.4 | 07-Oct-2014 | P. Makedonski | R3 | Refinements based on MTS feedback |
| 1.0 | 08-Oct-2014 | P. Makedonski | Final | Submitted for RC after internal review |
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