STF 533 - Final Report for ETSI - EC/EFTA

Grant agreement		Author:	ETSI
EC ETSI-STF2017		Date:	
EFTA		Version	
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STF	533
TB/WG	MTS

STF leader	Jens Grabowski
TB responsible	Emmanuelle Chaulot-Talmon
STF Assistant	Elodie Rouveroux / Lea Belloulou

STF title:	TTCN-3 Evolution 2017

Milestone	D		Status	Covers the period until (cut-off date)	30/06/2018
Objective	Final report of STF 533 and Final draft of D17 DES/MTS-1029507 TTCN3ext_OOed111 to be approved by TB MTS at MTS#74 and accepted by ETSI Secretariat for ETSI Membership Vote				
Achieved	YES				
Remarks					

Achieved dates

Template	Draft report	ETSI approval	Sent to EC	EC approval

1   Executive summary

The TTCN-3 testing language has intensively been developed by ETSI during the last decade and, by today, it consists of 14 ETSI standards, altogether more than 1400 pages. The language is also endorsed by ITU-T as the Z.16x and Z.17x Recommendation series. By now TTCN-3 is the prevalent formal specification language of standardized test suites and has also become an important testing technology at various ETSI member companies and in several industrial domains (http://www.ttcn-3.org/index.php/about/references/applicatio-domains) and standards organizations (http://www.ttcn-3.org/index.php/about/references).

TTCN-3 has an important role in standardization; it is an enabler technology in many areas. Several conformance and end-to-end/interoperability test standards have been developed and being developed by 3GPP, ETSI TBs INT, ERM, and ITS. 3GPP is using TTCN-3 for UE conformance tests from Rel. 8 and onward to LTE and VoLTE, with NB-IoT on horizon. In the ITS area also several TTCN-3 test suites have been developed and they start playing important roles in ITS Plugtest events as well. In 2016 oneM2M has started using it for IoT/M2M conformance test development.

The purpose of STF533 – "TTCN-3 evolution 2017" is to maintain the high quality of the language – that currently consists of 15 ETSI standards - and at the same time keep it harmonized with the new requirements of the users, new application areas and new ways of working like Agile SW development. In addition STF533 produces the new TTCN-3 extension "Object-oriented features" and works on language harmonization issues.

In 2017, the STF team consisted of 6 experts. The expert Julien Deltour, representing PragmaDev, left the STF due to a change of employment. Julien Deltour fulfilled the contractual obligations of PragmaDev by means of additional homework.

During its joint work sessions, the STF implemented and closed 75 CRs in 9 documents. With the exception of the new TTCN-3 extension "Object-oriented features", the remaining 8 documents have been approved by ETSI TB MTS at MTS#73. The new TTCN-3 extension "Object-oriented features" (D17 DES/MTS-1029507 TTCN3ext_OOed111) has been uploaded into the ETSI TB MTS Draft's area and requires approval from TB MTS at MTS#74. 18 CRs will remain open. They have to be resolved the scope of the next TTCN-3 maintenance STF.

2 Introduction

As the use of TTCN-3 expands, users naturally comment on the language, expecting improvements and maintenance issues to be addressed. TB MTS is committed to keep the language powerful, up-to-date and well maintained, hence a change request (CR) procedure has been put in place. At the time of proposing this STF, there were many open TTCN-3 CRs and several CRs have been received during the lifetime of the STF. Details can be found in clause 4.1.

2.1 Scope, major aims of the STF work

The scope of the STF work was to handle TTCN-3 CRs, reporting defects / requesting clarifications and requesting new features and implement the solutions in the related ETSI standards. Furthermore, a new TTCN-3 extension "Object-oriented features" has been produced and the STF has worked on language harmonization issues. See the details in clause 4.1.

2.2 STF activity and expected output

The STF work comprised of the following tasks:
- Review and resolve CRs reporting technical defects, or requesting clarifications and new language features for all existing TTCN-3 language standards.
- Develop proposals for language extensions requested by 3GPP, OMA, ETSI members and the TTCN-3 community and agreed on the solution with the contributor(s).
- Implement agreed solutions.
- Manage the CR process.
- Manage the interim versions of the standard, according to 3GPP needs, and the versions for approval.
- Present the TTCN-3 standards' status and the work of the STF at the conference(s) associated with ETSI TB MTS and at ETSI TB MTS meetings.
- Develop the new TTCN-3 extension "Object-oriented features".

The expected output are the revised versions of the TTCN-3 standard documents, for which one or more CRs have been resolved, and the new TTCN-3 extension "Object-oriented features" (see clause 4.1).

Interim versions of TTCN-3 standard documents were not required by 3GPP and therefore not produced.

2.3 Relation with the reference TB and with other bodies, inside and outside ETSI

The reference TB for the STF is TB MTS. TB MTS supervises the STF work at regular TB meetings. TB MTS has also established a TTCN-3 Steering Group to resolve technical issues escalated by the STF or any ETSI member to the TB. The work status of the STF is reported to TB MTS after each STF session (by mail correspondence on the MTS-GEN mail exploder list) and at each regular TB MTS meeting. STF outputs will also be reviewed and approved by TB MTS. Some active TB MTS members have also been involved in this STF and hence be in direct contact with TB MTS via the usual communication means (e.g., MTS-GEN mailing list, MTS face-to-face meetings, conference calls).

3 Overview of the organization of the activity

3.1 Team composition and experts' qualification

The STF consists of the following 6 experts:

Name	Organization/Company	Qualification
Julien Deltour	PragmaDev	SDL and TTCN-3 tool provider
Jens Grabowski	University of Goettingen	Researcher on test methods and test languages
György Réthy	Ericsson	TTCN-3 user, tool provider
Kristóf Szabados	Ericsson	TTCN-3 user, tool provider
Tomaš Urban	Elvior OU	TTCN-3 tool provider
Jacob Wieland	Spirent	TTCN-3 tool provider

György Réthy does not physically participate in the joint STF sessions, but contributes by following the ongoing work in Mantis and providing useful feedback via Email and telephone.

Due to a change of employment, **Julien Deltour** (representing PragmaDev) left the STF team at the end of 2017.

3.2 STF teamwork, distribution of tasks, working methods

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

- Review and resolve CRs reporting technical defects, or requesting clarifications and new language features for all existing TTCN-3 language standards.
- Develop proposals for language extensions requested by 3GPP, OMA, ETSI members and the TTCN-3 community and agreed on the solution with the contributor(s).
- Implement agreed solutions.
- Manage the CR process.
- Manage the interim versions of the standard, according to 3GPP needs, and the versions for approval.
- Present the TTCN-3 standards' status and the work of the STF at the conference(s) associated with ETSI TB MTS and at ETSI TB MTS meetings.
- Develop the new TTCN-3 extension "Object-oriented features".
- Work on TTCN-3 language harmonization.

For performing these tasks, the STF session plan contained four one-week working sessions in 2017 and one three-day-working session in 2018 with all experts present and three weeks of voluntary homework spent for final CR cleaning and editorial work on the draft deliverables. Face-to-face working sessions of the STF have been:

- W23, 06 - 09 June 2017, Berlin
- W30, 24 - 28 July 2017, Göttingen
- W36, 04 - 08 September 2017, Tallinn
- W43, 23 - 27 October 2017, Budapest

- W17, 16 - 18 April 2018, Berlin (three days)

The homework tasks for the development of the new TTCN-3 extension "Object-oriented features" included the writing of text describing agreed features, the development of BNF and the production of text related to changes and extensions of the TCI and TRI parts of TTCN-3.

During the face-to-face working sessions, the STF work was based on the CR resolution process. Newly identified issues were reported in form of new CRs. The CR resolution process was executed in the following manner:

1. Discussion of the CR within the STF and, where necessary drafting a rough resolution.
2. Assignment of the CR to an STF member for developing a resolution.

3. Development of a CR resolution. The development may require:
    a. Further discussions with individual STF members or with the whole STF,
    b. Perform inquiries to the reporter of the CR in case of ambiguities, or
    c. Raising related CRs if several TTCN-3 language features or documents are affected.
4. Proofreading of the CR resolution by another STF expert. Step 3 is re-entered in case of problems.
5. Implementation of the resolution by the editor of the TTCN-3 standard. The implementation includes another proofreading of the resolution.

Please note:

- The development and writing of the new TTCN-3 extension "Object-oriented features" was also organized as CR resolution procedure. The different features of the extension were reported as CRs dedicated to the new TTCN-3 extension.
- The work on TTCN-3 language harmonization was also organized as CR resolution procedure. Harmonization issues were reported as CRs and resolved as part of the normal CR resolution process.
- Interim version of TTCN-3 language standards were not required by 3GPP and therefore not produced.

As already stated in Clause 3.1, Julien Deltour left the STF team at the end of 2017. By agreement with the other STF team members, the MTS board (chairman, vice-chairmen, and support co-ordinator) and the ETSI Funded Projects Support Director, the tasks assigned to Julien Deltour were adjusted in such a manner that he was able to fulfil the contractual obligations of PragmaDev in form of homework within 2017. During his homework, Julien Deltour concentrated on proofreading of CR resolutions and assembling CRs related to the new TTCN-3 extension package on object-oriented features into one document. As agreed, Julien Deltour finished his work at the end of 2017.

3.3 Liaison with the reference TB and/or the Steering Group

There was no need to liaise.

3.4 Meetings attended on behalf of the STF with the reference TB and other ETSI TBs

Date	Place	TB/Orga	Event description	Reason to attend	Expert(s)
06.04.17	online	TTCN-3 SC	TTCN-3 SC online meeting	Discussing STF working principles	Jens Grabowski, György Réthy
31.05. – 01.06.17	ETSI HQ	TC MTS	MTS#71 regular meeting	Online participation to report STF planning	Jens Grabowski
08.09.17	online	TTCN-3 SC	TTCN-3 SC online meeting at end of the 3rd STF working session	Discussion & Selection of OO-concepts for TTCN-3 and language harmonization	All
26.09 – 27.09.17	University Göttingen	TC MTS	MTS#72 regular meeting	Presentation of progress report (milestone M2)	Jens Grabowski
11.10. – 13.10.17	Berlin	TC MTS	User Conference on Advanced Automated Testing (UCAAT)	Poster presentation of STF work	Jacob Wieland
23.01. – 24.01.18	Siemens Munich	TC MTS	MTS#73 regular meeting	Presentation of progress report (milestone M3)	Jens Grabowski
23.05. – 24.05.18	ETSI HQ	TC MTS	MTS#74 regular meeting	Presentation of final report (milestone M4)	Philip Makedonski

Please note:

- **Philip Makedonski** presents this final report on behalf of Jens Grabowski at MTS#74. Philip Makedonski also works at the University of Goettingen and supported Jens Grabowski in the STF work. The STF team members, the MTS chairman, and the ETSI Funded Projects Support Director agreed to the participation of Philip Makedonski in MTS#74.

3.5 STF communications, presentations, promotion, inside and outside ETSI, WEB pages etc

- STF533 webpage: https://portal.etsi.org/STF/STFs/STFHomePages/STF533

- The work of STF533 has been presented and discussed on the ETSI UCAAT conference (https://ucaat.etsi.org/2017/home) in form of a poster presentation.

- Further external communication has been done via Mantis and emails.

4 Final status of the activity

4.1 Overview of the STF work

STF 533 organized four one-week working sessions in 2017 and one three-day-working session in 2018 with all experts present and three weeks of voluntary homework spent for final CR cleaning and editorial work on the draft deliverables. Face-to-face working sessions of the STF have been:

- W23, 06 - 09 June 2017, Berlin
- W30, 24 - 28 July 2017, Göttingen
- W36, 04 - 08 September 2017, Tallinn
- W43, 23 - 27 October 2017, Budapest

- W17, 16 - 18 April 2018, Berlin (three days)

The work of STF 5533 was based on the resolution of CRs. The progress of the work on CRs can be followed in detail by using ETSI's Mantis system at http://forge.etsi.org/mantis/view_all_bug_page.php. The progress of the work on language harmonization and on the development of the new TTCN-3 extension "Object-oriented features" has also been monitored by using ETSI's Mantis system. For the latter, the different features dedicated to the new extension package were reported as CRs.

- The STF has delivered the final drafts for TB approval of the revised ETSI standards before the deadline:

- RES/MTS-201873-1v4A1 (ES 201 873-1) TTCN-3 Core V4101
- RES/MTS-201873-6 T3ed4A1 (ES 201 873-6) TTCN-3 TCI V491
- RES/MTS-201873-7ed471 (ES 201 873-7) TTCN-3 Edition 4.5.1: the use of ASN.1
- RES/MTS-201873-9 T3ed491 (ES 201 873-9) TTCN-3 XSD V471
- RES/MTS-201873-11ed481 (ES 201 873-11) TTCN-3 ed. V4.7.1: Use of JSON
- RES/MTS-202781ConfDepled161 (ES 202 781) TTCN-3 extension: Configuration & Deployment support
- RES/MTS-202785-ed161 (ES 202 785) TTCN-3 extension: Behaviour Types
- RES/MTS-203022ed121 (ES 203 022) TTCN-3 extension: Advanced Matching

- DES/MTS-203790-00F_ed111 (ES 203 790) TTCN3ext_OOed111 (uploaded May 2018)

Other deliverables in the ToR didn't receive any CR or no CR is resolved, therefore according to the STF's ToR, no new version is published.

The following 75 Change Requests (CRs) have been resolved and closed (i.e., implemented in the mentioned final drafts of the TTCN-3 standard documents):

Part 01: TTCN-3 Core Language (38 CRs)

7445	usage of encode/variant attributes should be enhanced
7491	confusing/incorrect texts related to anytype behaviour
7496	Formal parameters and return values should also be declarable as arrays.
7530	keywords should be escapable to be used as a TTCN-3 identifier.
7590	BNF for select-case is not correct
7593	Part-1, Sec.15.11: Template concatenation drops omit and type restrictions
7598	Invalid restriction on formal template parameters
7599	Rules for actual parameterers with template restriction
7601	Misspelled word in 20.2.c
7602	Three options of handling blocking multicast and broadcast calls
7603	Delete note on template restriction passing table
7605	Logging of constructive values
7606	Operations missing in the list of TTCN-3 elements that can be logged
7607	Additional restriction for the connect operation
7610	Missing rules for return value of the reply operation
7611	Valid port lists for the procedure operations
7620	Constraining of array types
7624	Local declarations should be allowed to be declared everywhere in a statement block
7628	concatenation with wildcards should be allowed also for charstring types
7630	example creating empty template is wrong
7655	mixed list/assignment-notation should also be allowed for record/set types
7669	wording problem in the definitions
7672	Compatibility of enumerated types
7673	dynamic_encoding parameter missing in encvalue_o and decvalue_o
7677	Additional restriction for the disconnect operation
7678	Rename a module
7680	A matching mechanism term for templates containing other matching mechanisms shall be added.
7683	Keywords (from packages) should be reserved in the Core Standard.
7684	Language version string
7688	The rule for loops inside interleave is too restrictive
7689	Unconditional goto in interleave
7707	Port and timer variables and structured types containing ports and timers
7708	Using dot notation with @default union values
7709	Invalid template in the example on enumerated templates
7710	Superfluous record keywords
7712	Errors in the example on retrieving attribute values
7714	Several issues with the setencode operation
7730	"not_a_number" is not listed as a keyword but is used as such

Part 06: TTCN-3 Control Interface (9 CRs)

7512	XML mapping of matching symbols
7519	Ifpresent and length matching attributes not defined in XML mapping
7552	Invalid C# mapping of tliRnd
7553	Invalid return type in java MatchingMechanism.getMatchingType()
7554	Wrong text in the list of C# abstract data type Value mapping
7594	Wrong parameter type in C mapping of the tliRnd function
7681	adapt TCI to the hanges in any2unistr predefined function changes
7694	dynamic encoding (usage of statement port.setencode(type,"EncodingRule1");
7703	the xml schema for the log events is inconsistent with the rest of the specification

Part 07: Using ASN.1 with TTCN-3 (1 CR)

7728	OER support

Part 09: Using XML schema with TTCN-3 (12 CRs)

7562	Clarification of order of XML to TTCN3 type conversion
7631	Typos in the XML specification
7634	Missing prefixes in facet mapping examples
7653	Incorrect mapping of enumerated type in example 1 on element substitution
7654	Invalid encoding instruction in the example on type substitution
7656	Invalid examples on simple content mapping
7657	Name of anyAttribute and anyElement fields are not encoded

7658	Missing support for leap seconds in mapping of XSD time types
7662	Invalid field names in example on nested sequence inside choice
7664	Example on base64Binary mapping
7665	Missing XSD definition in example on QName
7726	Naming rules for unions with default alternative (used in substitutions)

Part 11: Using JSON with TTCN-3   **(5 CRs)**

7719	Errors in examples for "Part 11: Using JSON with TTCN-3", "6.4.2 JSON Strings"
7722	"Part 11: Using JSON with TTCN-3":"B.3.4 Name as" syntax is confusing, does not match examples throughout specification
7723	"Part 11: Using JSON with TTCN-3":"7.2.8 Record and set" invalid JSON syntax in example
7724	"Part 11: Using JSON with TTCN-3":"B.3.5 Number of fraction digits" use 0E0 instead of 0E1
7725	"Part 11: Using JSON with TTCN-3":"B.3.6 Use the Minus sign" assumptions for TTCN-3 Core Language spec

Ext Pack: Config & Deployment Support (ES 202 781)   **(2 CRs)**

7626	editorial: syntactical structure parts are not properly "spaced"/"indented"
7711	editorial: syntactical structure parts are not properly "spaced"/"indented"

Ext Pack: Behaviour Types (ES 202 785)   **(1 CR)**

7625	Harminozation: the behaviour extension package does not mention modifiers when describing compatibility.

Ext Pack: Advanced Matching (ES 203 022)   **(2 CRs)**

7525	allow repetition (and maybe other regular expression syntax) also for binary string types
7629	concatenation of arbitrary present list/string templates should be allowed

Ext Pack: Object Oriented features   **(5 CRs)**

6801	Visibility of component definitions
7561	Allow finally block or shutdown hook
7679	Class Concept to be added
7692	Exception handling with less code and less performance overhead
7731	Draft document for Object-oriented Extension

The following CR is related to the STF harmonization task:

Part 01: TTCN-3 Core Language   **(1 CR)**

7720	Removal of deprecated features from the TTCN-3 core language

As agreed by TB MTS at MTS#73, CR 7720 has been resolved and put into a "resolved" state. It will be implemented in the scope of the next TTCN-3 maintenance STF.

4.2   Technical risk, difficulties encountered and corrective actions taken

During the work of the STF, two technical risks or difficulties have been encountered:

- One team member, Julien Deltour (representing PragmaDev), left the STF team at the end of 2017 due to a change of employment.
- The STF required advice from TB MTS for the work on language harmonization.

Both difficulties have been resolved with the help of TB MTS, the TTCN-3 steering group and the ETSI secretariat. No further technical risks or difficulties have been encountered.

As expected and similar to previous TTCN-3 maintenance STFs, the resolution of 18 CRs, has been left open for a future TTCN-3 maintenance STF. The open CRs are:

Part 01: TTCN-3 Core Language   **(10 CRs)**

7754	Clarify initialization of constants and module parameters
7737	Padding bits in encvalue_o result and decvalue_o input
7729	There seems to be a mistake in Example 4 on Page 108 (v4.9.1)
7721	Possibility to catch any exception of a specified signature
7682	Table with index-operators using keys as indices should be supported
7619	No named interleave construct available.
7618	alternative event headers could allow a boolean combinators
7495	out, inout and return value should be assignable via the done/killed statement redirect
7465	control part should be able to have a runs on clause and call other control parts
7455	The type of formal in parameters of external functions should be allowed to be 'any'

Part 06: TTCN-3 Control Interface   **(1 CRs)**

7738	TriMessage should be enhanced with a stream-like API

Part 09: Using XML schema with TTCN-3   **(1 CRs)**

7757	the mapping of \s in pattern facets uses wrong ASCII code for SPACE

Ext Pack: Advanced Matching (ES 203 022)   **(4 CRs)**

7742	Allow passing instances of templates without parameters/value redirects as specially marked actual template in parameters
7739	Error in the example on dynamic matching
7734	Runs on in dynamic matching
7733	Dynamic match and default parameter values

Ext Pack: Object Oriented features   **(2 CRs)**

7693	component members with visibility and functions inside the components
7187	Allow null-value for all value variables with the same semantics as uninitialized.

5   ETSI deliverables

Deliverable: RES/MTS-201873-1v4A1 Current status: Approved by MTS#73 Working title: TTCN-3 Core V4101	**Achieved date**
Creation of WI by WG/TB	2016-11-04
TB adoption of WI	2016-11-18
Start of work	2017-12-30
Early draft	
Stable draft	
Final draft for approval	2018-01-05
TB approval	2018-01-24
Draft receipt by ETSI Secretariat	2018-02-07
Publication	2018-05-18 (target date)

Deliverable: RES/MTS-201873-6 T3ed4A1 Current status: Approved by MTS#73 Working title: TTCN-3 TCI V481	**Achieved date**
Creation of WI by WG/TB	2016-11-07
TB adoption of WI	2016-11-18
Start of work	2018-01-15
Early draft	
Stable draft	
Final draft for approval	2018-01-15
TB approval	2018-01-24
Draft receipt by ETSI Secretariat	2018-02-06
Publication	2018-05-28 (target date)

Deliverable: RES/MTS-201873-7ed471 Current status: Approved by MTS#73 Working title TTCN-3: the use of ASN.1	Achieved date
Creation of WI by WG/TB	2016-11-07
TB adoption of WI	2016-11-18
Start of work	2017-12-30
Early draft	
Stable draft	
Final draft for approval	2017-12-30
TB approval	2018-01-24
Draft receipt by ETSI Secretariat	2018-02-06
Publication	2018-05-11 (target date)

Deliverable: RES/MTS-201873-9 T3ed491 Current status: Approved by MTS#73 Working title: TTCN-3 XSD V471	Achieved date
Creation of WI by WG/TB	2016-11-07
TB adoption of WI	2016-11-18
Start of work	2017-12-30
Early draft	
Stable draft	
Final draft for approval	2018-01-05
TB approval	2018-01-24
Draft receipt by ETSI Secretariat	2018-02-06
Publication	2018-06-08 (target date)

Deliverable: RES/MTS-201873-11ed481 Current status: Approved by MTS#73 Working title: TTCN-3 ed. V4.7.1: Use of JSON	Achieved date
Creation of WI by WG/TB	2016-11-07
TB adoption of WI	2016-11-18
Start of work	2018-01-05
Early draft	
Stable draft	
Final draft for approval	2018-01-05
TB approval	2018-01-24
Draft receipt by ETSI Secretariat	2018-02-06
Publication	2018-05-18 (target date)

Deliverable: RES/MTS-202781ConfDepled161 Current status: Approved by MTS#73 Working title: TTCN-3 extension: Configuration & Deployment support	Achieved date
Creation of WI by WG/TB	2016-11-07
TB adoption of WI	2016-11-18
Start of work	2018-01-02
Early draft	
Stable draft	
Final draft for approval	2018-01-02
TB approval	2018-01-24
Draft receipt by ETSI Secretariat	2018-02-06
Publication	2018-05-18 (target date)

Deliverable: RES/MTS-202785-ed161 Current status: Approved by MTS#73 Working title: TTCN-3 extension: Behaviour Types	Achieved date
Creation of WI by WG/TB	2016-11-07
TB adoption of WI	2016-11-18
Start of work	2018-01-03
Early draft	
Stable draft	
Final draft for approval	2018-01-03
TB approval	2018-01-24
Draft receipt by ETSI Secretariat	2018-02-06
Publication	2018-05-07

Deliverable: RES/MTS-203022ed121 Current status: Approved by MTS#73 Working title: TTCN-3 extension: Advanced Matching	Achieved date
Creation of WI by WG/TB	2016-11-07
TB adoption of WI	2016-11-18
Start of work	2018-01-03
Early draft	
Stable draft	
Final draft for approval	2018-01-03
TB approval	2018-01-24
Draft receipt by ETSI Secretariat	2018-02-06
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Deliverable: DES/MTS-203790-00F_ed111 Current status: Approved by MTS#74 Working title: TTCN3ext_OOed111	Achieved date
Creation of WI by WG/TB	2016-11-02
TB adoption of WI	2016-11-18
Start of work	2017-09-07
Early draft	2017-09-07
Stable draft	2018-01-19
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TB approval	
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Publication	

The final draft for approval of DES/MTS-203790-00F_ed111 can be downloaded at:

http://docbox.etsi.org/MTS/MTS/07-Drafts/00203790-00F_ed111/MTS-203790-00F_ed111v003.docx

Annex A Performance indicators

A.1. Performance Indicators objectives achieved

Contribution from ETSI Members to STF work

- Voluntary work of experts (free of charge or with partial remuneration)
    - The STF experts provided voluntary work for email discussions between joint work sessions and for implementing resolutions in the TTCN-3 standard documents.
- Steering Group meetings (number of participants/duration)
    - TTCN-3 steering has been done during TB MTS meetings. There was no issue that needed escalation to the SG.
- Direct contribution of delegates (e.g. number of documents/comments/e-mail)
    - CRs have been raised from TTCN-3 users, tool providers and ETSI STFs. All CRs have been treated equally. The number of contributions raised from delegates has not been counted. Experts in STF 533 also work in other STFs and raise CRs in the scope of the other STFs.

Liaison with other stakeholders

- TTCN-3 Change Requests are received in the CR handling tool (Mantis)
    - CRs have been raised from TTCN-3 users, tool providers and ETSI STFs. All CRs have been treated equally.
- The STF may liaise with 3GPP STF 160 and any other users within or outside ETSI
    - The STF has regularly exchanged emails with STF160 to clarify urgency of STF160 CRs; also participated at STF160s TTCN-3 tool vendors meetings.

Quality of deliverables

- Approval of deliverables according to schedule
    - The STF met all deadlines specified in the ToR.
- Respect of time scale, with reference to start/end dates in the approved ToR
    - The STF met all deadlines specified in the ToR.
- Quality review by TB
    - The quality of the work and progress of the STF was monitored by the TB based on the mandatory progress reports and on verbal reports of the STF during the MTS meetings.

Time recording

- The STF experts reported in the days spent for the performance of the services in TAM.

A.2. Performance Indicators objectives not achieved

- Contribution from other ETSI TBs
    - No CR is received directly from other TB (though several CRs received from STF160).
- Contributing the TTCN-3 standards to ITU-T SG17 for endorsement and assisting the endorsement process
    - This issue didn't require any specific action from the STF, it will be handled by TB MTS according to the normal procedure.
- TTCN-3 tools implementing newest TTCN-3 features
    - New features added by this STF will be implemented only after publishing the STF's deliverables. The STF doesn't receive information directly about which language features are implemented by which tool vendor.
- Quality review by ETSI Secretariat
    - The STF is not aware of specific actions required for a quality review by ETSI Secretariat.