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| ETSI_logo_Office_Colour_Small | ***ToR STF BO (TC INT)*** |
| Version: 1.0 - Date: 14th June 2017 |
| Author: TC INT  |
| Last updated by: Y. Sakho – Date 23rd October 2017 |
| page 1 of  |

Terms of Reference - STF BO (TC INT) - Conformance Test Specifications for the Diameter Protocol over the Sh and the Dh reference points

**Summary information**

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| --- | --- |
| Approval status | TC INT approved. Recommendation by STF Review Panel and 10% reduction in budget request. |
| Funding | **Maximum budget: ETSI FWP: 48 060 €** |
| Time scale | Jan 2018 – April 2019 |
| Work Items  | * DTS/INT-00138-1 Diameter Conformance Testing for the Sh/Dh interfacesPart 1: Protocol Implementation Conformance Statement (PICS)
* DTS/INT-00138-2 Diameter Conformance Testing for the Sh/Dh interfacesPart 2: Test Suite Structure (TSS) and Test Purposes (TP)
* DTS/INT-00138-3 Diameter Conformance Testing for the Sh/Dh interfacesPart 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma specification
 |
| Board priority category | Standards enablers/facilitators |

Part I – Reason for proposing the STF

# Rationale

The Diameter protocol was initially developed to provide an Authentication, Authorization, and Accounting (AAA) framework that could overcome the limitations of RADIUS. RADIUS had issues with reliability, scalability, security and flexibility. The Diameter protocol defines a policy protocol used by clients to perform Policy, AAA and Resource Control. Diameter is one of the major protocols within the context of LTE networks and is essential to guarantee reliable user authentication, policy management and charging procedures.

Application Servers (AS) host and execute services, and interface with the S-CSCF using SIP. An AS can be located in the home network or in an external third-party network. If located in the home network, it can query the Home Subscriber Server (HSS). The Open Service Access Service Capability Server (OSA SCS) interfaces SIP to the OSA framework and needs also to access the data stored in the Home Subscriber Server (HSS). The Sh interface that enables transfer of subscriber profile data for authenticating/authorizing user access to applications is located between the Application Server (AS) or the Open Service Access Service Capability Server (OSA SCS) and the Home Subscriber Server (HSS).

In case an Application Server (AS) or an Open Service Access Service Capability Server (OSA SCS) is located within a multi-HSS environment there is the need to find the correct HSS for any connecting user. This is done via the Service Locator Function (SLF). The Dh interface enables the AS or OSA SCS to determine the correct HSS and is located between the Application Server (AS) or the Open Service Access Service Capability Server (OSA SCS) and the Service Locator Function (SLF).

The protocol used on the two above interfaces is the Diameter protocol as defined in IETF RFC3588 and profiled for the Sh and Dh interfaces in ETSI TS 129 328 and ETSI TS 129 329.

In the following figure the named entities and interfaces are highlighted.



Figure 1: IMS logical architecture

# Objective

Given that there are already test specifications related to the Diameter protocol profile for the Rf and the Ro reference points under validation, it seems reasonable to extend the INT set of test specifications to also cover Diameter on the Sh and Dh reference points as similar procedures are covered on those interfaces. This would complete the set of test specifications for the technical area of IMS subscriber authentication and authorization.

Following the methodologies developed and used by ETSI this means the production of a multi-part document covering both the static conformance review (PICS proforma) and the dynamic conformance review (Test Purposes, Abstract Test Suite). The result would be a complete set of Diameter test suites for internal and external Diameter message exchanges.

ETSI members of the above mentioned trials have expressed their interest in test specifications related to the Diameter protocol profile for the Sh and Dh reference point as defined in ETSI TS 129 328 and ETSI TS 129 329 and also declared their willingness to review the outputs of this STF and in a later stage in a potential follow-up project provide ETSI with the possibility to validate the outputs of this STF against their LTE components (i.e. HSS, AS, OSA OCS, SLF). See also list of supporting organisations.

Experience with the development of other testing standards has shown that involvement of experts on conformance testing of protocols requires highly specialised knowledge in testing methodology, TTCN-3 language and dedicated tools. There is an advantage if testing experts are separated from the experts developing the protocol specifications. In addition, the development of this kind of specifications requires significant effort and it cannot be expected that this effort can be provided on a voluntary basis. Hence the involvement of testing expertise is needed in order to assure timely completion and high quality of the Test Specifications. This testing expertise is not available on TC INT level and needs to be recruited on a funded basis. The expertise will use dedicated software tools available at ETSI.

# Relation with ETSI strategy and priorities

This STF is directly related to ETSI strategic objective "Major Strategic Topics - NGN" and “Service level interconnection of IP-Based Services” and corresponds to the “Standards enablers/facilitators (conformance testing, interoperability, methodology)” category.

# Context of the proposal

## ETSI Members support

|  |  |  |
| --- | --- | --- |
| **ETSI Member** | **Supporting delegate** | **Motivation** |
| Telecom Italia | Giulio Maggiore | Tests used to get detailed information from vendors about Interoperability Testing before coming to the market |
| Deutsche Telekom | Gerhard Ott | Tests needed for internal network testing |
| AT&T | Dewayne Sennet | Tests used to promote conformance testing for Public Safety  |
| ZTE | David Huo | Test will be used for quality enhancement of IMS&EPC products |
| Iskratel | Primoz Kocar | Test will be used for quality enhancement of IMS&EPC products |
| Italtel | Diego Saiu | Test will be used for quality enhancement of IMS&EPC products |
| Arcatech | Terry, Simpson | Provide test system for functional and performance test. |
| Spirent  | Theofanis Vassiliou-GiolesNo longer works for Spirent | Provide the Test System for the test cases implementation and execution |
| Fraunhofer Fokus | Axel Rennoch/Marius Corici | Research Institute, advanced automated/standardized test solutions with TTCN-3 for Virtual environment |
| OU Elvior | Andres Kull | Tool Provider, Provide the Test System for the test cases |

## Market impact

The availability of reliable and validated test specifications will allow implementers of LTE components and protocol stacks (for HSS, AS, OSA OCS, SLF) to test the conformance of their products against the protocol specifications. Conformance testing during the whole development phase of all LTE products will significantly reduce the time-to-market of the LTE architecture, as protocol conformant products will be of an enhanced quality level and will hence be less likely to cause interoperability problems with the products of other vendors.

Protocol conformant products will therefore provide the network operators with the means to deliver fully LTE compliant services to their end customers in a continuously high quality, with reliable service functionality, without communication failures and generally with the optimum quality of service for the transported media.

The tests for the Dh and Sh interface will consequently allow a faster rollout of the LTE networks due to well tested and interoperable LTE entities that are responsible for the key functionalities authentication and authorization.

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

* LTE networks are currently being deployed in the telecoms industry. They must operate alongside and interwork correctly with the existing IMS networks already installed.
* Consequently there is the need to allow seamless roaming functionalities between the networks of different operators.
* Field trials showed massive interoperability problems related to Diameter implementations of different vendors. Therefore detailed Abstract Test Suite Specifications are urgently required to complete the overall testing framework.
* To complete the testing work, and to capitalise on the investment done during the field trials, the corresponding Abstract Test Suite is urgently needed.
* The ETSI members do not have sufficient resources to create an Abstract Test Suite on time, and with the high quality that has been experienced with using STF resources for this purpose in the past.
* It is essential that this work is done in a timely manner in order to synchronise with global testing activities, especially in the context of LTE.

## Related voluntary activities in the TB

The ETSI Members supporting the creation of the STF are committed to support this STF in terms of participation in the TC INT meetings, providing input and review to the STF, providing test bed structures and test tools.

## Outcome from previous funded activities in the same domain

STF434 Development of complete Diameter conformance test specification for Diameter on the Rx interface

Resource: 85 remunerated and 15 voluntary effort days, 52 000€

STF443 Development of complete Diameter conformance test specification for Diameter on the Gx interface

Resource: 136 remunerated and 34 voluntary effort days, 81 600€

STF450 Validation of the Diameter conformance test specifications for Diameter on the Rx and Gx interfaces

Resource: 160 remunerated and 40 voluntary effort days, 96 000€

STF466 Development of complete Diameter conformance test specification for Diameter on the S6a and S9 interface

Resource: 160 remunerated and 40 voluntary effort days, 99 000€

STF480 Conformance Test Specifications for the Diameter Protocol over the Cx and the Dx reference points

Resource: 80 remunerated and 20 voluntary effort days, 51 000€

STF482 Validation of the Diameter conformance test specifications for Diameter on the S6a and S9 interfaces

Resource: 120 remunerated and 24 voluntary effort days, 60 600€

STF490 Conformance Test Specifications for the Diameter Protocol over the Rf and the Ro reference points

Resource: 160 remunerated and 40 voluntary effort days, 99 000€

STF500 Validation of the Diameter conformance test specifications for Diameter on the Cx and Dx interfaces

Resource: 60 remunerated and 15 voluntary effort days, 39 000€

STF512 Validation of the Diameter conformance test specifications for Diameter on the Rf and Ro interfaces

Resource: 57 100€

## Consequences if not agreed

LTE networks are currently being deployed in telecoms networks during the progression towards fully LTE compliant network architectures. Thorough conformance testing will increase the level of confidence that equipment from various suppliers will interwork. This in turn will reduce implementation and rollout times. Not providing timely test specifications, would ultimately delay the deployment of LTE.

Part II – Execution of the work

# Technical Bodies and other Organizations involved

## Leading TB

TC INT, Giulio Maggiore

## Other interested ETSI Technical Bodies

* 3GPP CT1
* 3GPP CT3
* 3GPP SA3
* ETSI TC MTS

## Other stakeholders

* GSMA IREG

# Working method/approach

## Base documents

|  |  |  |
| --- | --- | --- |
| **Document** | **Title** | **Current Status** |
| ETSI TS 129 328 Rel. 13 | IP Multimedia (IM) Subsystem Sh Interface; Signalling flows and message contents | Published (V13.6.0) |
| ETSI TS 129 329 Rel. 13 | SH interface based on the Diameter protocol; Protocol details | Published(V13.0.0) |

## Deliverables

|  |  |  |
| --- | --- | --- |
| **Deliv.** | **Work Item code****Standard number** | **Working title****Scope** |
| D1 | DTS/INT-00138-1 | Diameter Conformance testing for Sh/Dh interfaces; Part 1: PICS |
| D2 | DTS/INT-00138-2 | Diameter Conformance testing for Sh/Dh interfaces; Part 2: TSS&TP |
| D3 | DTS/INT-00138-3 | Diameter Conformance testing for Sh/Dh interfaces; Part 3: ATS&PIXIT |

## Deliverables schedule:

DTS/INT-00138-1 Protocol Implementation Conformance Statement (PICS)

* Start of work Jan-2018
* ToC and scope Jan-2018
* Early draft 22-Mar-2018 INT#39
* Stable draft 05-Jul-2018 INT#40
* TB approval 06-Dec-2018 INT#41
* Publication Jan-2019

DTS/INT-00138-2 Test Suite Structure (TSS) and Test Purposes (TP)

* Start of work Jan -2018
* ToC and scope Jan -2018
* Early draft 22-Mar-2018 INT#39
* Stable draft 05-Jul-2018 INT#40
* TB approval 06-Dec-2018 INT#41
* Publication Jan-2019

DTS/INT-00138-3 Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma specification)

* Start of work Mar -2018
* ToC and scope Mar -2018
* Early draft 05-Jul-2018 INT#40
* Stable draft 06-Dec-2018 INT#41
* TB approval Mar-2018 INT#42
* Publication Apr-2019

# Work plan, time scale and resources

## Organization of the work

The work of the STF starts with the analysis of the Diameter Sh/Dh protocol requirements defined in ETSI TS 129 328 on the AS, HSS and SLF. Following the work will follow the three step methodology defined in the ISO/IEC 9646 series on conformance test specifications.

1. Static aspects of the requirements will be converted into PICS items, i.e. into questions demanding whether a requirement is supported or not. One set of PICS items will be created for AS, and one for HSS.
2. Requirements on the dynamic behaviour will lead to test purposes, i.e. textual descriptions of the expected behaviour of the IUT (AS or HSS). Here also, two sets of test purposes for AS and HSS will be the resulting output of the STF.
3. The bulk of the work will lie in the coding of the dynamic behaviour into test cases using the formal notation TTCN-3 and the production of the PIXIT proforma, which contains questions related to the practical aspects of testing.

A feedback loop will be installed to process findings of the later steps into the outputs of the earlier steps. Once the TTCN-3 code and the related PIXIT proforma have been completed, TC INT may request to proceed with the following phases of the project (conformance testing of the Sh/Dh Diameter protocol, validation).

TC INT will follow and manage/monitor all the STF activities and will inform all identified interested bodies via liaison statements at regular intervals.

An administration task will be maintained handling the progress reports of the STF and the representation at the TC INT meetings during the lifetime of the STF.

## Task description

Task 1 – Project Management

Objectives

Provision of progress reports for the TC INT meetings #39 through to #41. Presentation of reports and STF outputs during said meetings. Scheduling of common sessions, administration of STF resources.

Processing of feedback comments received from the stakeholders.

The STF leader will perform all actions required by this task.

Input

None

Output

Two STF progress reports and one final report.

Interactions

Presence at all TC INT meetings during the STF’s lifetime.

Task 2 – PICS

Objectives

Creation of a PICS document for ETSI TS 129 328 and ETSI TS 129 329 containing three PICS proforma, one for AS, one for HSS and one for SLF static conformance review.

Input

ETSI TS 129 328 and ETSI TS 129 329

Output

DTS/INT-00138-1

Interactions

Presentation of an early draft at INT#39 (Mar 2018), a stable draft at INT#40 (Jun 2018) and a final draft for approval at INT#41 (Dec 2018)

Task 3 – TSS&TP

Objectives

Creation of a TSS&TP document for ETSI TS 129 328 and ETSI TS 129 329 containing four sets of test purposes covering all dynamic requirements for AS, HSS and SLF for the dynamic conformance review.

Input

ETSI TS 129 328 and ETSI TS 129 329

Output

DTS/INT-00138-2

Interactions

Presentation of an early draft at INT#39 (Mar 2018), a stable draft at INT#40 (Jun 2018) and a final draft for approval at INT#41 (Dec 2018)

Task 4 – ATS&PIXIT

Objectives

Implementation of all test purposes defined in DTS/INT-00138-2 into TTCN-3 code and production of three PIXIT proforma one for AS, one for HSS and one for SLF.

Input

ETSI TS 129 328 and ETSI TS 129 329

Output

DTS/INT-00138-3

Interactions

Presentation of an early draft at INT#40 (Jun 2018) and a final draft for approval at INT#41 (Dec 2018)

## Milestones

Milestone 1 – Early draft Sh/Dh PICS, Early draft Sh/Dh TSS&TP Progress report

Approval of progress report.

Presentation of an early drafts of DTS/INT-00138-1 and DTS/INT-00138-2 and progress report at INT#39 (Mar 2018).

DTS/INT-00138-1 and DTS/INT-00138-2 have to be made available at least two weeks before the start of INT#39.

Milestone 2 – Stable draft Sh/Dh PICS and TSS/TP, early draft ATS&PIXIT Progress report

Approval of progress report.

Presentation of a stable drafts of DTS/INT-00138-1, and DTS/INT-00138-2 and an early draft of DTS/INT-00138-3, and progress report at INT#40 (July 2018).

DTS/INT-00138-1, -2 and -3 have to be made available at least two weeks before the start of INT#40.

Milestone 3 – Approval of Final drafts Sh/Dh PICS and TSS/TP, stable draft ATS&PIXIT Progress report

Approval of DTS/INT-00138-1, -2 for publication, stable draft of DTS/INT-00138-3 and progress report at INT#41 (Dec 2018).

Final drafts of DTS/INT-00138 -1, -2 and stable draft DTS/INT-00138-3 have to be made available at least two weeks before the start of INT#41.

Milestone 4 – Approval of Final draft Sh/Dh ATS&PIXIT, Final report

Approval of DTS/INT-00138-3 and Final report at INT#42 (Mar 2019).

Final draft of DTS/INT-00138-3 has to be made available at least two weeks before the start of INT#42.

## Task summary

|  |  |  |  |
| --- | --- | --- | --- |
| **N** | **Task / Milestone / Deliverable** | Target date | Max. Budget allocated (EUR) |
| M 0 | Start of work  | Jan 2018 |  |
| T1 | Project Management  | Jan 2018 – Mar 2019 | 2 500 |
| T2 | Sh/Dh PICS | Jan 2018 – Dec 2018 | 5 000 |
| M1 | Progress Report | Mar 2018 |  |
| T3 | Sh/Dh TSS&TP | Jan 2018 – Dec 2018 | 14 000 |
| T4 | Sh/Dh ATS&PIXIT | Mar 2018 – Mar 2019 | 24 000 |
| M 2 | Progress Report | Jun 2018 |  |
| M 3 | Progress report, approval Sh/Dh PICS, TSS&TP | Dec 2018 |  |
| M 4 | Final report, approval of Sh/Dh ATS&PIXIT | Mar 2019 |  |
|  | TOTAL |  | 45 500 |

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| --- | --- | --- |
| **Year** | **2018** | **2019** |
| **Task Milest.** | **Description** | **J** | **F** | **M** | **A** | **M** | **J** | **J** | **A** | **S** | **O** | **N** | **D** | **J** | **F** | **M** | **A** |
| M0 | Start of work | X |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T1 | Project Management |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2 | Sh/Dh PICS |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| M1 | Progress Report |  |  | X |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T3 | Sh/Dh TSS&TP |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| M2 | Progress Report |  |  |  |  |  | X |  |  |  |  |  |  |  |  |  |  |
| T4 | Sh/Dh ATS&PIXIT |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| M3 | Progress report, approval Sh/Dh PICS, TSS&TP |  |  |  |  |  |  |  |  |  |  |  | X |  |  |  |  |
| M4 | Final report, approval of Sh/Dh ATS&PIXIT |  |  |  |  |  |  |  |  |  |  |  |  |  |  | X |  |

## Working methods and travel cost

The work will be performed in a mix of remote sessions and common sessions at ETSI.

Task 1: Ongoing task, no common session needed, travel to INT meetings may be required

Task 2: 100% remote, task

Task 3: One coordination session needed

Task 4: One coordination session needed

Travel cost for working sessions (e.g. Tasks 3, 4) will be included in the contract compensation (manpower cost). Presentation of results to TC INT will be reimbursed as real cost from the travel budget if the meeting takes place outside of ETSI.

# Expertise required

Providers must ensure the following mix of competence:

* Knowledge of of DIAMETER protocols and LTE architecture
* Experience in analysing of protocols and writing of PICS proforma
* Experience in analysing of protocols and writing of test purposes
* Knowledge in implementing Abstract Test Suites in TTCN-3
* Strongly benefit from an awareness of outputs from earlier STFs on Diameter testing (e.g. STFs 434, 443, 450, 466, 480, 490, 500, 512)

The actual number of providers depends on the actual mix of skills in the applications received and will be decided when setting up the STF.

Part III: Financial conditions

# Maximum budget

The total estimated budget for this action is 48 060 €.

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| --- | --- |
|  | **Maximum estimated cost (€)** |
| Service contracts | 45 500 |
| Travels to three INT meetings | 2 560 |
| **Total cost** | **48 060** |

No other cost has been identified.

Part IV: STF performance evaluation criteria

# Key Performance Indicators

Key performance indicators suitable for this kind of STF project are the following:

Contribution from ETSI Members to STF work

* TC INT meetings (number of participants on this issue/duration)
* Direct contribution of delegates (e.g. number of documents/comments/e-mail)
* Support to the STF work (e.g., provision of test–beds)

Contribution from STF participants to ETSI work

* Contributions presented to TB meetings (number, type, comments received)

Liaison with other stakeholders

* Stakeholder participation in the project (category, business area)
* Cooperation with other standardization bodies
* Potential interest of new members to join ETSI/create new/updated agreements
* Liaison to identify requirements and raise awareness on ETSI deliverables
* Comments received on drafts

Quality of deliverables

* 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

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

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| --- | --- | --- | --- | --- |
|  | **Date** | **Author** | **Status** | **Comments** |
| **0.3** | 07-April | Giulio Maggiore | Approved by TC INT | Final draft |
| 0.1 | 08-December-2016 | Giulio Maggiore | Draft | Initial draft |
| 0.2 | 15-December-2016 | Giulio Maggiore | Draft | Updates due to INT#35 comments |
| 0.4 | 3-May-2017 | Gavin Craik | ETSI secretariat | Initial comments |
| 0.5 | 9-May-2017 | Giulio Maggiore | Draft | Update after Secretariat comments |
| 0.6 | 7-June-2017 | G. Craik | Draft | Update after STF Review Panel comments and proposed reduction in resource request. |
| 0.7 | 14-June-2017 | Giulio Maggiore | Draft | Update  |
| 1.0 | 23-October-2017 | Youssouf Sakho | Board#114 | Update for CL Publication |