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| ETSI_logo_Office_Colour_Small | ***ToR STF BA (TC INT)*** |
| Author: TC INT - Date: 08 September 2016 |
| Version: 0.4 |
| Last updated by: ETSI Secretariat– Date 11 Jan 2017 |
| page 1 of 15 |

Terms of Reference - Specialist Task Force

STF BA (TC INT)

”Conformance Test Specifications for the NAS protocol over the S1-MME reference point”

Phase II of STF 519

**Summary information**

|  |  |
| --- | --- |
| Approval status | INT(16)034014r1, approved by TC INT (RC INT(16)DEC045) Approved by Board#109a |
| Funding | **Maximum budget: ETSI FWP**  **59 000€ manpower cost 1 500€ travel cost** |
| Time scale | Feb 2017 – Nov 2017 |
| Work Items | * DTS/INT-00136-1 NAS Conformance Testing for the S1-MME interface Part 1: Protocol Implementation Conformance Statement (PICS) * DTS/INT-00136-2 NAS Conformance Testing for the S1-MME interface Part 2: Test Suite Structure (TSS) and Test Purposes (TP) * DTS/INT-00136-3 NAS Conformance Testing for the S1-MME interface Part 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 Mobility Management Entity (MME) is the key control-node for the VoLTE access-network. It connects via the S1-MME interface with an eNodeB using the S1AP protocol as defined in ETSI TS 136 413.

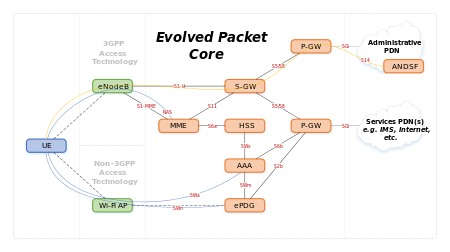
The MME is responsible for

* idle mode User Equipment (UE) paging and tagging
* the bearer activation/deactivation processes
* selection of the Serving Gateway (SGW) for a UE at the initial attach
* authentication of the user (by interacting with the Home Subscriber Server (HSS) via the S6a interface)

The Non Access Stratum (NAS) signalling from the UE also terminates at the MME. The NAS protocols defined in ETSI TS 124 301 form the highest stratum of the control plane between a UE and the MME. NAS protocols support the mobility of the UE and the session management procedures to establish and maintain IP connectivity. NAS messages are transported between the eNodeB and the MME encapsulated in S1AP messages and are transparent for the eNodeB. There the MME is responsible for:

* the generation and allocation of temporary identities to UEs
* checking the authorization of the UE to camp on the service provider’s Public Land Mobile Network (PLMN)
* enforcement of UE roaming restrictions
* handling of the security key managements.

The network architecture is described in figure 1 below.



* Figure 1: Network architecture

This is phase II of the project started to complete the conformance testing scenario for the VoLTE (IMS and EPC) architecture.

The validation of the test specification is not included in this project and it will be handled with a separate request.

There is also a significant difference between the currently active Phase I (S1AP) and Phase II (NAS). This is due to different complexity of the protocols. For example for NAS we only test direction towards MME, and instead for S1AP there are both directions towards MME and eNodeB. Another element of differences between Phase I and Phase II is also that Phase I included the set-up of new data structure that will be completely reused in Phase II. The Phase I is currently verifying also the reuse of STF160 work on NAS done for testing the UE.

# Objective

Recently major efforts have been made by VoLTE component providers to inter-connect complete networks, i.e. connecting the single components that comprise a VoLTE network of different operators to allow seamless roaming for end customers and complete and reliable functionality for network providers. The S1-MME interface is a very important point for testing as it typically connects the radio components of one vendor to the MME of another vendor making flawless interworking of those components essential to the functioning of the network. Beside VoLTE the S1-MME interface is also of high importance for local small cell networks and new emerging technologies such as M2M communications.

Following the methodologies developed and used by ETSI this implies the production of multi-part conformance test specification documents covering the 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 test suites for both the S1AP and the NAS protocols.

Note: For the S1AP protocol tests will be written for testing both the MME and the eNodeB. For the NAS protocol only the MME will act as Implementation Under Test (IUT) as the NAS messages are transparent to the eNodeB. Testing the UE is out of the scope of TC INT.

ETSI members have expressed their interest in test specifications related to the S1AP and NAS protocol as defined in ETSI TS 136 413 and ETSI TS 124 301 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 network components (i.e. eNodeB and MME). 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 disjoint from 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 experts is needed in order to assure timely completion and high quality of the Test Specifications. These testing experts are not available on TC INT level and need to be recruited on a funded basis. The experts 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 Svigeli | 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 | Terence A, Simpson | Provide test system for functional and performance test. |
| Spirent | Theofanis Vassiliou-Gioles | 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 VoLTE components and protocol stacks (for eNodeB and MME) to test the conformance of their products against the protocol specifications. Conformance testing during the whole development phase of all VoLTE products will significantly reduce the time-to-market of the VoLTE 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 VoLTE 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 S1-MME interface will consequently allow a faster rollout of the VoLTE networks due to well-tested and interoperable VoLTE entities that are responsible for key functionalities. Furthermore, the outputs of the present STF will be of high value for the small cell community as those local networks also use the S1AP and NAS protocols.

The emerging technologies of M2M communications will also heavily rely on a high level of conformance between the radio components (eNodeB) and the access components (MME) of the mobile network.

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

* VoLTE 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 between different vendors. Therefore, detailed Abstract Test 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 VoLTE.

## Related voluntary activities in the TB

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

## Outcome from previous funded activities in the same domain

TC INT is currently developing the test specifications for the S1AP protocol on the S1-MME interface. In Phase II the NAS aspects will be covered.

## Consequences if not agreed

VoLTE networks are currently being deployed in telecoms networks during the progression towards fully VoLTE 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 VoLTE.

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
* ETSI OneM2M

## Other stakeholders

* GSMA IREG
* Small Cell Forum

# Working method/approach

## Base documents

|  |  |  |  |
| --- | --- | --- | --- |
| **Document** | **Title** | **Current Status** | **Expected date for stable document** |
| ETSI TS 124 301 V.13.3.0 | Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS) ; Stage 3 | Published 25/08/2016 |  |

## Deliverables

|  |  |  |
| --- | --- | --- |
| **Deliv.** | **Work Item code**  **Standard number** | **Working title**  **Scope** |
| D1 | DTS/INT-00136-1 | NAS Conformance Testing for the S1-MME interface  Part 1: Protocol Implementation Conformance Statement (PICS) |
| D2 | DTS/INT-00136-2 | NAS Conformance Testing for the S1-MME interface  Part 2: Test Suite Structure (TSS) and Test Purposes (TP) |
| D3 | DTS/INT-00136-3 | NAS Conformance Testing for the S1-MME interface  Part 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma specification |

## Deliverables schedule:

### Phase II: NAS Conformance Testing for the S1-MME interface

Note: The tests for the NAS protocol interface cover only the requirements on the MME.

DTS/INT-00136-1 Protocol Implementation Conformance Statement (PICS)

* Start of work 13-Feb-2017
* ToC and scope 28-Feb-2017
* Early draft 30-Mar-2017 INT#36
* Stable draft 30-Jun-2017 INT#37
* TB approval 09-Nov-2017 INT#38
* Publication 09-Dec-2017

DTS/INT-00136-2 Test Suite Structure (TSS) and Test Purposes (TP)

* Start of work 30-Mar-2017
* ToC and scope 30-Mar-2017
* Early draft 30-Jun-2017 INT#37
* Stable draft 08-Oct-2017 INT#38
* TB approval 09-Nov-2017 INT#38
* Publication 09-Dec-2017

DTS/INT-00136-3 Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma specification)

* Start of work 30-Mar-2017
* ToC and scope 30-Mar-2017
* Early draft 30-Jun-2017 INT#37
* Stable draft 08-Oct-2017 INT#38
* TB approval 09-Nov-2017 INT#38
* Publication 09-Dec-2017

# Work plan, time scale and resources

## Organization of the work

### Phase II: NAS Conformance Testing for the S1-MME interface

The work of the STF starts with the analysis of the NAS protocol requirements defined in ETSI TS 124 301 on the MME. 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 the MME.
2. Requirements on the dynamic behaviour will lead to test purposes, i.e. textual descriptions of the expected behaviour of the IUT (MME).
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 phase II of the STF can be launched.

TC INT will act as the steering committee for all STF activities and will also 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 phase II.

## Task description

### Phase II: NAS Conformance Testing for the S1-MME interface

Task II.1 – Project Management

Objectives

Provision of progress reports for the TC INT meetings #36, #37 and #38. 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.

Input

None

Output

One STF progress reports and one final report.

Interactions

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

Resources required

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

The resource needed is estimated as

* Production of three STF reports, one man-day each
* Participation in three TC INT meetings, one man-days each
* Other administration (scheduling, STF management), total of two man-days

Task II.2 – PICS

Objectives

Creation of a PICS document for ETSI TS 124 301 containing one PICS proforma for MME static conformance review.

Input

ETSI TS 124 301

Output

DTS/INT-00136-1

Interactions

Presentation of an early draft at INT#36 (March 2017), a stable draft at INT#37 (June 2017) and a final draft for approval at INT#38 (Nov 2017)

Resources estimate: 15 man days

Task II.3 – TSS&TP

Objectives

Creation of a TSS&TP document for ETSI TS 124 301 containing test purposes covering all dynamic requirements for MME for the dynamic conformance review.

Input

ETSI TS 124 301, DTS/INT-00136-1

Output

DTS/INT-00136-2

Interactions

Presentation of an early draft at INT#37 (June 2017) and a final draft for approval at INT#38 (Nov 2017)

Resources estimate: 35 man days

Task II.4 – ATS&PIXIT

Objectives

Implementation of all test purposes defined in DTS/INT-00136-2 into TTCN-3 code and production of one PIXIT proforma for MME.

Input

ETSI TS 124 301, DTS/INT-00136-1, DTS/INT-00136-2

Output

DTS/INT-00136-3

Interactions

Presentation of an early draft at INT#37 (June 2017) and a final draft for approval at INT#38 (Nov 2017)

Resources estimate: 60 man days

**Task II.5 – TC INT approval, delivery to ETSI Secretariat and publication**

## Milestones

### Phase II: NAS Conformance Testing for the S1-MME interface

**Milestone II.1 – Presentation of early draft NAS PICS, Progress report A**

Approval of progress report A.

Presentation of an early draft of DTS/INT-00136-1 and progress report A at INT#36 (March 2017).

DTS/INT-00136-1 has to be made available at least two weeks before the start of INT#36.

**Milestone II.2 – Presentation of stable draft NAS PICS, Early drafts NAS TSS&TP and ATS&PIXIT, Progress report B**

Approval of progress report B.

Presentation of early drafts of DTS/INT-00136-2 and DTS/INT-00136-2, a stable draft of DTS/INT-00136-1 and progress report B at INT#37 (June 2017).

DTS/INT-00136-1, -2 and -3 have to be made available at least two weeks before the start of INT#37.

**Milestone II.3 – Approval NAS PICS, NAS TSS&TP and NAS ATS&PIXIT, Final phase II report C**

Approval of DTS/INT-00136-1, DTS/INT-00136-2, DTS/INT-00136-3 and final phase II report C.

Presentation of final phase II report C at INT#38 (Nov 2017).

DTS/INT-00136-1, -2 and -3 have to be made available at least two weeks before the start of INT#38.

**Milestones II.4 – Publication**

Publication by ETSI

## Task summary

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **N** | **Task / Milestone / Deliverable** | Target date | Estimated cost | |
| EUR | Days (optional) |
| M II.0 | Start of work phase II | Feb 2017 |  |  |
| T II.1 | Project Management phase II | Feb 2017 – Nov 2017 | 4 000 | 8 |
| T II.2 | NAS PICS | Feb 2017 – Nov 2017 | 7 500 | 15 |
| M II.1 | Progress Report A | Mar 2017 |  |  |
| T II.3 | NAS TSS&TP | Mar 2017 – Nov 2017 | 17 500 | 35 |
| M II.2 | Progress Report B | Jun 2017 |  |  |
| T II.4 | NAS ATS&PIXIT | Mar 2017 – Nov 2017 | 30 000 | 60 |
| M II.3 | Final phase II report C, approval NAS PICS, TSS&TP and ATS&PIXIT | Nov 2017 |  |  |
| T II.5 | Delivery to ETSI Secretariat and publication | 9 Nov – 09 Dec |  |  |
| M II.4 | Publication | 09 Dec 2017 |  |  |
| **Total phase II** | | | **59 000** | **118** |

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| **Task Milest.** | **Description** | **F** | **M** | **A** | **M** | **J** | **J** | **A** | **S** | **O** | **N** | **D** |
| M II.0 | Start of work phase II | X |  |  |  |  |  |  |  |  |  |  |
| T II.1 | Project Management phase II |  |  |  |  |  |  |  |  |  |  |  |
| T II.2 | NAS PICS |  |  |  |  |  |  |  |  |  |  |  |
| M II.1 | Progress Report A |  | X |  |  |  |  |  |  |  |  |  |
| T II.3 | NAS TSS&TP |  |  |  |  |  |  |  |  |  |  |  |
| T II.4 | NAS ATS&PIXIT |  |  |  |  |  |  |  |  |  |  |  |
| M II.2 | Progress Report B |  |  |  |  | X |  |  |  |  |  |  |
| M II.3 | Final phase II report C, approval NAS PICS, TSS&TP and ATS&PIXIT |  |  |  |  |  |  |  |  |  | X |  |
| M II.4 | Publication |  |  |  |  |  |  |  |  |  |  | X |

## Working methods and travel cost

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

* Task II.1: Ongoing task, no common session needed, travel to INT meetings may be required
* Task II.2: 100% remote
* Task II.3: One coordination session needed (assumed)
* Task II.4: Two coordination sessions needed (assumed)

Travel cost for working sessions (e.g. Tasks II.3 and II.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

## Team structure

The following expertise is required to perform the work. The actual number of providers may depend on the mix of skills of the actual applications received and will be decided when setting up the STF.

Number of providers required: 3-4

Relevant expertise required*:*

* Expert knowledge of S1AP and NAS protocols and VoLTE architecture
* Experience in analysing of protocols and writing of PICS proforma
* Experience in analysing of protocols and writing of test purposes
* Expert knowledge in implementing Abstract Test Suites in TTCN-3
* Awareness of outputs from earlier INT STFs on VoLTE

Part III: Financial conditions

# Maximum budget

## Manpower cost

The manpower cost is detailed in the table in clause 7.4

59 000€ for approximately 118 man days

## Travel cost

About every second INT meeting is held outside of ETSI. The table gives an estimation based on that ratio where location inside of Europe are assumed. For meetings at ETSI no travel cost will be reimbursable.

|  |  |
| --- | --- |
| **Expected travels** | **Cost estimate** |
| Phase II: Travel to three INT meetings outside of ETSI | 1 500€ |
| **Total cost** | **1 500**€ |

## Other Costs

No other cost has been identified.

[[1]](#footnote-2)Part IV: STF performance evaluation criteria

# Key Performance Indicators

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

Contribution from ETSI Members to STF work

* Steering Group meetings (number of participants/duration)
* Delegates attending meetings/events related to STF (number of participants/duration)
* Direct contribution of delegates (e.g. number of documents/comments/e-mail)
* Support to the STF work (e.g., provision of test–beds, organization of workshops, events)
* Contributions/presentations to other ETSI TBs
* Contributions received from other ETSI TBs

Contribution from STF experts to ETSI work

* Contributions presented to TB/WG meetings (number, type, comments received)
* Presentations in workshops, conferences, stakeholder meetings

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
* Liaison to identify requirements and raise awareness on ETSI deliverables
* Comments received on drafts (e.g. on WEB site, mailing lists, etc.)

Quality of deliverables

* Approval of deliverables according to schedule
* 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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Date** | **Author** | **Status** | **Comments** |
| 0.1 | 08-Sep-2016 | Giulio Maggiore | Draft | Initial draft |
| 0.2 | 02-Nov-2016 | Alberto Berrini | Board Approval | Editorials |
| 0.3 | 23-Nov-2016 | Youssouf Sakho | CfE | Editorials |
| 0.4 | 11-Jan-2017 | ETSI Secretariat | Board#109a Approved | Editorials |

1. [↑](#footnote-ref-2)