



**Core Network and Interoperability Testing (INT);
Diameter Conformance testing for S6a interface;
(3GPP Release 10);
Part 3: Abstract Test Suite (ATS) and partial Protocol
Implementation eXtra Information for Testing (PIXIT)
proforma specification**

Reference

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Core Network and Interoperability Testing (INT).

The present document is part 3 of a multi-part deliverable covering the test specifications for the Diameter protocol on the S6a interface, as identified below:

- Part 1: "Protocol Implementation Conformance Statement (PICS)";
- Part 2: "Test Suite Structure (TSS) and Test Purposes (TP)";
- Part 3: "Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma specification".**

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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1 Scope

The present document specifies the Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) proforma for the test specifications for Diameter protocol on the S6a interface as specified in ETSI TS 129 272 [1] in compliance with the relevant requirements and in accordance with the relevant guidance given in ISO/IEC 9646-7 [5] and ETSI ETS 300 406 [6].

The test notation used in the ATS is TTCN-3 (see ETSI ES 201 873-1 [7]).

The following test specification and design considerations can be found in the body of the present document:

- the overall test suite structure;
- the testing architecture;
- the test methods and port definitions;
- the test configurations;
- TTCN styles and conventions;
- the partial PIXIT proforma;
- the modules containing the TTCN-3 ATS.

Annex A provides the Partial Implementation Extra Information for Testing (PIXIT) Proforma.

Annex B provides the Abstract Test Suite (ATS) part of the ATS.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

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The following referenced documents are necessary for the application of the present document.

- [1] ETSI TS 129 272 (V10.8.0): "Universal Mobile Telecommunications System (UMTS); LTE; Evolved Packet System (EPS); Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) related interfaces based on Diameter protocol (3GPP TS 29.272 version 10.8.0 Release 10)".
- [2] ETSI TS 103 261-2: "Core Network and Interoperability Testing (INT); Diameter Conformance testing for S6a interface; (3GPP Release 10); Part 2: Test Suite Structure (TSS) and Test Purposes (TP)".
- [3] ISO/IEC 9646-1: "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 1: General concepts".
- [4] ISO/IEC 9646-6: "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 6: Protocol profile test specification".
- [5] ISO/IEC 9646-7: "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 7: Implementation Conformance Statements".

- [6] ETSI ETS 300 406: "Methods for testing and Specification (MTS); Protocol and profile conformance testing specifications; Standardization methodology".
- [7] ETSI ES 201 873-1: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 1: TTCN-3 Core Language".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

Not applicable.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ISO/IEC 9646-7 [5] and ETSI TS 129 272 [1] apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ISO/IEC 9646-1 [3], ISO/IEC 9646-6 [4], ISO/IEC 9646-7 [5] and ETSI TS 129 272 [1] apply.

4 Abstract Test Method (ATM)

4.0 Introduction

This clause describes the ATM used to test the Diameter protocol on the S6a interface at the MME side and at the HSS side.

4.1 Test architecture

4.1.1 Test method

The test method chosen is the remote test method. Remote test method means that the test tool (the test machine + the executable test suite) shall behave as an MME when the IUT is an HSS and shall behave as an HSS when the IUT is an MME. As the exchange between the test system and the IUT is at the diameter message level, the lower layers of the test machine shall be totally conformant with the corresponding lower layers specifications to use the remote test method.

4.1.2 Test machine configuration

4.1.2.0 Introduction

In a real operating network the different Diameter nodes would not connect directly to each other. The connection is usually proxied through one or more Diameter Agents. In the following test architecture figures the Diameter Agent is not explicitly depicted as it is seen as a transparent message handler for conformance testing purposes.

4.1.2.1 Test configurations for MME testing

The S6a interface is located between HSS and the SUT.

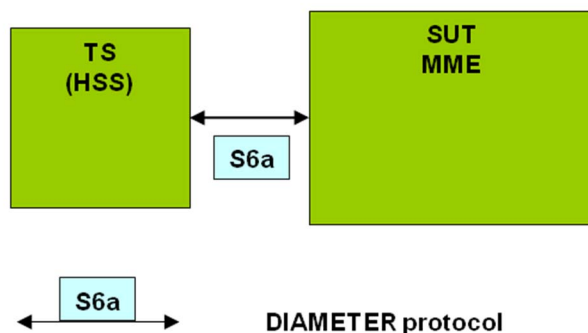


Figure 1: Test architecture with MME as SUT

4.1.2.2 Test configurations for HSS testing

The S6a interface is located between MME and the SUT. For a number of tests a second S6a interface is used when the TS acts as two separate MMEs.

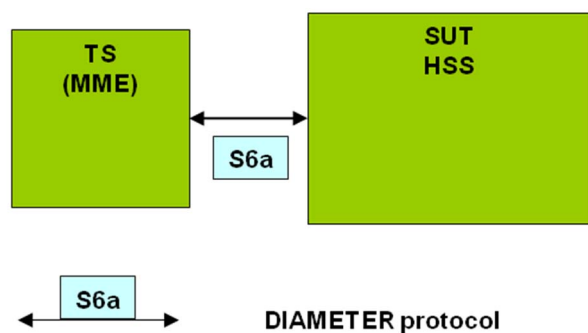


Figure 2: Test architecture with HSS as SUT

4.1.3 Interconnection of TS and SUT

4.1.3.1 MME Role

Figure 3 shows the interconnection of TS and SUT in terms of signalling message flows. Diameter messages are transferred over the DIAMP port.

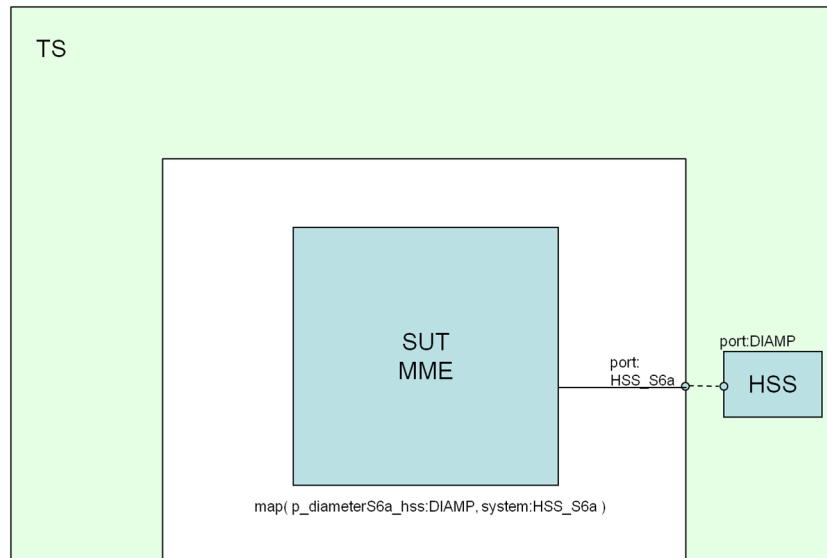


Figure 3: Interconnection for MME role

4.1.3.2 HSS Role

Figure 4 shows the interconnection of TS and SUT in terms of signalling message flows. Diameter messages are transferred over the DIAM port.

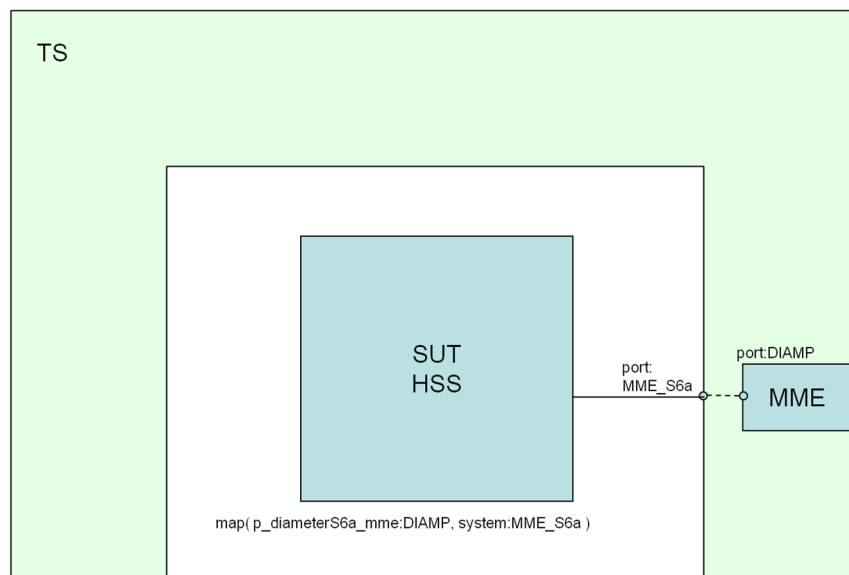


Figure 4: Interconnection for HSS role

4.1.3.3 Test Adapter

For execution of the tests the Test Adapter (TA) shall be developed. There are two possibilities to communicate over TA:

- ATS provides only Diameter messages; or
- ATS provides Diameter messages and LL primitives.

5 ATS conventions

5.0 Introduction

The ATS conventions are intended to give a better understanding of the ATS but they also describe the conventions made for the development of the ATS. These conventions shall be considered during any later maintenance or further development of the ATS.

The ATS conventions contain two clauses, the naming conventions and the implementation conventions. The naming conventions describe the structure of the naming of all ATS elements. The implementation conventions describe the functional structure of the ATS.

To define the ATS, the guidelines of the document ETSI ETS 300 406 [6] were considered.

5.1 Testing conventions

5.1.1 Test cases Preamble and Postamble

As described in the test method clause the test tool shall behave as an HSS when the IUT is an MME and shall behave as an MME when the IUT is an HSS. For that reason the test case preambles and postambles are named as follows:

IUT is a HSS (example TC_HSS_UL_01)

`f_preamble_MME`

`f_postamble_MME`

NOTE 1: The tester also behaves as a Diameter Client.

IUT is a MME (example TC_MME_UL_01)

`f_preamble_HSS`

`f_postamble_HSS`

NOTE 2: The tester also behaves as a Diameter Server.

5.2 Naming conventions

5.2.1 General guidelines

The naming conventions are based on the following underlying principles:

- In most cases, identifiers should be prefixed with a short alphabetic string (specified in table 1) indicating the type of TTCN-3 element it represents.
- Suffixes should not be used except in those specific cases identified in table 2.
- Prefixes and suffixes should be separated from the body of the identifier with an underscore ("_"):

EXAMPLE 1: `c_sixteen, t_wait_max.`

- Only module names, data type names and module parameters should begin with an upper-case letter. All other names (i.e. the part of the identifier following the prefix) should begin with a lower-case letter.
- The start of second and subsequent words in an identifier should be indicated by capitalizing the first character. Underscores should not be used for this purpose.

EXAMPLE 2: `f_authenticateUser.`

Table 1 specifies the naming guidelines for each element of the TTCN-3 language indicating the recommended prefix, suffixes (if any) and capitalization.

Table 1: TTCN-3 naming convention

Language element	Naming convention	Prefix	Suffix	Example	Notes
Module	Use upper-case initial letter	DiameterS6a_	<i>none</i>	DiameterS6a_Steps	
TSS grouping	Use all upper-case letters	<i>none</i>	<i>none</i>	TP_PCEFRole_IPS	
Message template	Use lower-case initial letter	m_	<i>none</i>	m_authApplicationId	
Message template with wildcard or matching expression	Use lower-case initial letters	mw_	<i>none</i>	mw_subscriptionId	
Port instance	Use upper-case initial letter	<i>none</i>	<i>none</i>	DiameterPort	
Constant	Use lower-case initial letter	c_	<i>none</i>	c_maxRetransmission	
Function	Use lower-case initial letter	f_	<i>none</i>	f_authentication()	
Altstep	Use lower-case initial letter	a_	<i>none</i>	a_receive()	
Variable	Use lower-case initial letter	v_	<i>none</i>	v_basicId	
PICS values	Use all upper case letters	PC_	<i>none</i>	PC_PCRF_DATA_CON	Note
PIXIT values	Use all upper case letters	PX_	<i>none</i>	PX_DIAMETER_IP_ADDR	Note
Parameterization	Use lower-case initial letter	p_	<i>none</i>	p_macId	
Enumerated Value	Use lower-case initial letter	e_	<i>none</i>	e_synCpk	

NOTE: In this case it is acceptable to use underscore as a word delimiter.

5.2.2 Test case grouping

The ATS structure is based on the Test Purposes for the Diameter protocol on the S6a interface as defined in ETSI TS 103 261-2 [2].

5.2.3 Test case identifiers

The test cases have been divided according to the functionalities into several groups.

The test case names are built up according to the following scheme:

Table 2: TC identifier naming convention scheme

Identifier: "<tc>"_ "<iut>"_ "<scope>"_ "<number>"			
<tc>	=	Test Case	fixed to "TC"
<iut>	=	type of IUT:	MME or HSS
<scope>	=	group	UL Update Location
			CL Cancel Location
			PUE Purge UE
			ISD Insert Subscriber Data
			DSD Delete Subscriber Data
			AIR Authentication Information Retrieval
			RES Reset
			NOT Notification
<number>	=	sequential number	(01-99)

NOTE: This naming scheme results into a one-to-one correspondence between the test purpose identifiers as defined in ETSI TS 103 261-2 [2] and the test case identifiers.
The TP identifier of the test case TC_xxx_01 is TP_xxx_01.

Annex A (normative): DIAMETER S6a Partial PIXIT proforma

A.0 Introduction

Notwithstanding the provisions of the copyright clause related to the text of the present document, ETSI grants that users of the present document may freely reproduce the Partial PIXIT proforma in this annex so that it can be used for its intended purposes and may further publish the completed Partial PIXIT.

The PIXIT Proforma is based on ISO/IEC 9646-6 [4]. Any additional information which may be needed can be found in this international standard document.

A.1 Identification summary

Table A.1

PIXIT Number:	
Test Laboratory Name:	
Date of Issue:	
Issued to:	

A.2 ATS summary

Table A.2

Protocol Specification:	ETSI TS 129 272 [1] (3GPP TS 29.272 version 10.8.0 Release 10)
Protocol to be tested:	
ATS Specification:	ETSI TS 103 261-2 [2]
Abstract Test Method:	ETSI TS 103 261-3, clause 4

A.3 Test laboratory

Table A.3

Test Laboratory Identification:	
Test Laboratory Manager:	
Means of Testing:	
SAP Address:	

A.4 Client identification

Table A.4

Client Identification:	
Client Test manager:	
Test Facilities required:	

A.5 SUT

Table A.5

Name:	
Version:	
SCS Number:	
Machine configuration:	
Operating System Identification:	
IUT Identification:	
PICS Reference for IUT:	
Limitations of the SUT:	
Environmental Conditions:	

A.6 Protocol layer information

A.6.1 Protocol identification

Table A.6

Name:	ETSI TS 129 272 [1] (3GPP TS 29.272 version 10.8.0 Release 10)
Version:	
PICS References:	

A.7 PIXIT items

A.7.0 Introduction

Tables in this clause need to be filled by the IUT Manufacturer to specify how the IUT needs to be configured with IUT specific values or describe IUT specific procedures required for complete testing of the IUT.

Each PIXIT item corresponds to a Module Parameter of the ATS.

A.7.1 Port and Address items

Table A.7: Test system ports and addresses

It.	Identifier	Type	Description
1	PX_DIAMETER_S6a_ETS_IPADDR	Charstring	IP address of the test system
2	PX_DIAMETER_S6a2_ETS_IPADDR	Charstring	IP address of the second test system
3	PX_DIAMETER_S6a_ETS_PORT	Integer	Port number of the test system
4	PX_DIAMETER_S6a2_ETS_PORT	Integer	Port number of the second test system

Table A.8: SUT ports and addresses

It.	Identifier	Type	Description
1	PX_DIAMETER_S6a_SUT_IPADDR	Charstring	IP address of the system under test
2	PX_DIAMETER_S6a_SUT_PORT	Integer	Port number of the system under test

A.7.2 S6a interface items

Table A.9: S6a interface

It.	Identifier	Type	Description
1	PX_SESSION_ID	UTF8String	The Session-Id identifying a specific session
2	PX_SESSION_ID2	UTF8String	The Session-Id identifying second specific session
3	PX_ORIGIN_HOST	Diameter_Identity	The Origin-Host identifying the endpoint that originates the Diameter messages
4	PX_ORIGIN_HOST2	Diameter_Identity	The Origin-Host identifying the second endpoint that originates the Diameter messages
5	PX_ORIGIN_HOST_SGSN	Diameter_Identity	The Origin-Host identifying the SGSN endpoint that originates the Diameter messages
6	PX_ORIGIN_REALM	Diameter_Identity	The Origin-Realm identifying the Realm of the originator of any Diameter messages
7	PX_DESTINATION_HOST	Diameter_Identity	The Destination-Host identifying the endpoint to which the Diameter messages are destined
8	PX_DESTINATION_REALM	Diameter_Identity	The Destination-Realm identifying the Realm of the destination of any Diameter messages
9	PX_MIP6_AGENT_IP_ipv4	IpAddress	MIP6 agent IP V4 address
10	PX_MIP6_AGENT_IP_ipv6	IpAddress	MIP6 agent IP V6 address
11	PX_MIP6_AGENT_DEST_REALM	Diameter_Identity	MIP6 agent destination realm
12	PX_MIP6_AGENT_DEST_HOST	Diameter_Identity	MIP6 agent destination host

A.7.3 AVP field items

Table A.10: AVP fields

It.	Identifier	Type	Description
1	PX_USR_NAME	UTF8String	The user name
2	PX_INVALID_USR_NAME	UTF8String	An invalid user name
3	PX_NO_APN_USR_NAME	UTF8String	A user name with no APN configured
4	PX_NO_EPSGPRS_USR_NAME	UTF8String	A user name with no EPSGPRS configured
5	PX_CONTEXT_ID	UInt32	The context Id
6	PX_SERVICE_SEL	Charstring	The service selection
7	PX_VISITED_NTW_ID	Octetstring	A visited network identifier
8	PX_VISITED_PLMN_ID	Oct3	A visited PLMN identifier
9	PX_NEW_VISITED_PLMN_ID	Oct3	Other visited PLMN identifier
10	PX_NOT_ALLOWED_VISITED_PLMN_ID	Oct3	Not allowed visited PLMN identifier
11	PX_CANCELLATION_TYPE	Cancellation_Type_Code	Indicates the type of cancellation
12	PX_SGSN_NUMBER	Octetstring	The SGSN number
13	PX_ReSYNCHRONISATION_INFO	Octetstring	Contains the concatenation of RAND and AUTS
14	PX_RAT_TYPE	RAT_Type	Radio access technology

Annex B (normative): DIAMETER S6a Abstract Test Suite (ATS)

This ATS has been produced using the Testing and Test Control Notation (TTCN-3) according to ETSI ES 201 873-1 [7].

The TTCN-3 library modules corresponding to the ATS are contained in archive ts_10326103v010201p0.zip which accompanies the present document.

History

Document history		
V1.1.1	July 2014	Publication
V1.2.1	June 2015	Publication