



**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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ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

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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**", "**may not**", "**need**", "**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 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 ETS 300 406 [6].

The test notation used in the ATS is TTCN-3 (see 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

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>.

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

2.1 Normative references

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

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 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 TS 129 272 [1] apply.

4 Abstract Test Method (ATM)

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

4.1.2.1 Test configurations for MME testing

The S6a interface is located between HSS and the SUT.

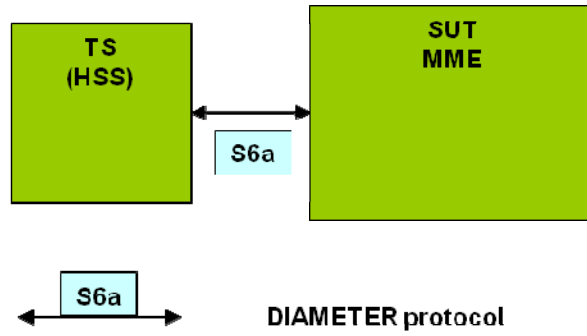


Figure 1: Test architecture with MME as SUT

4.1.2.2 Test configurations for HSS testing

The S6a interface is located between MME and the SUT.

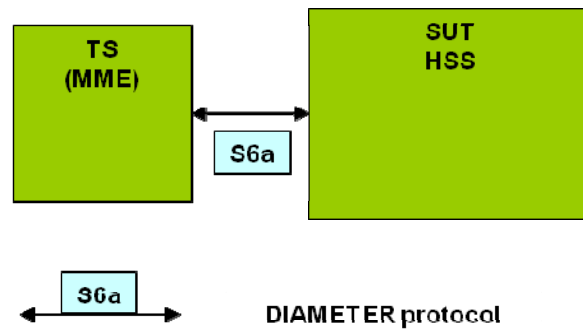


Figure 2: Test architecture with HSS as SUT

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.

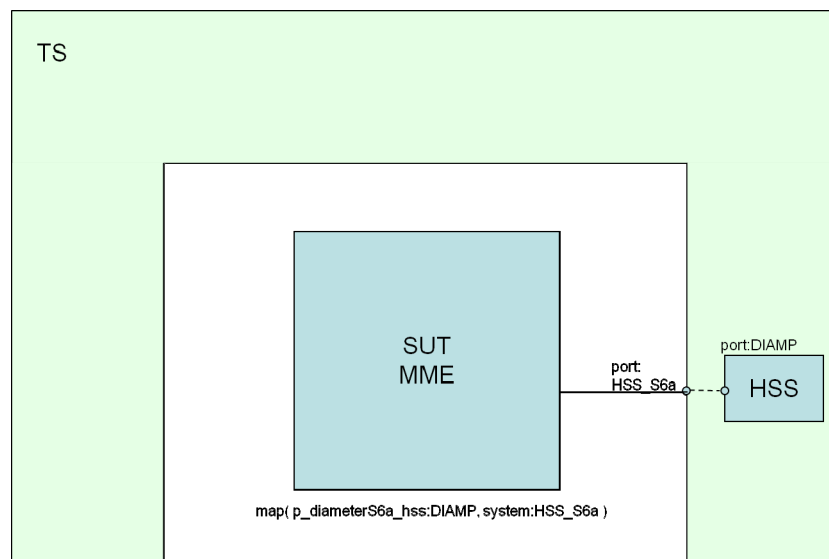


Figure 3: Interconnection for MME role

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.

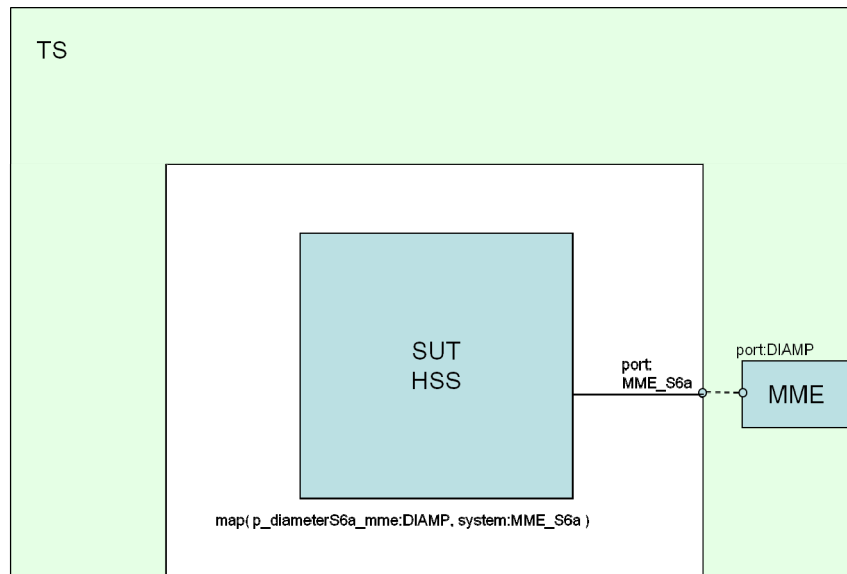


Figure 4: Interconnection for HSS role

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

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 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_	none	DiameterS6a_Steps	
TSS grouping	Use all upper-case letters	none	none	TP_PCEFRole_IPS	
Message template	Use lower-case initial letter	m_	none	m_authApplicationId	
Message template with wildcard or matching expression	Use lower-case initial letters	mw_	none	mw_subscriptionId	
Port instance	Use upper-case initial letter	none	none	DiameterPort	
Constant	Use lower-case initial letter	c_	none	c_maxRetransmission	
Function	Use lower-case initial letter	f_	none	f_authentication()	
Altstep	Use lower-case initial letter	a_	none	a_receive()	
Variable	Use lower-case initial letter	v_	none	v_basicId	
PICS values	Use all upper case letters	PC_	none	PC_PCRF_DATA_CON	Note
PIXIT values	Use all upper case letters	PX_	none	PX_DIAMETER_IP_ADDR	Note
Parameterization	Use lower-case initial letter	p_	none	p_macId	
Enumerated Value	Use lower-case initial letter	e_	none	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 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 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

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.
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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:	TS 129 272 [1] (3GPP TS 29.272 version 10.8.0 Release 10)
Protocol to be tested:	
ATS Specification:	TS 103 261-2 [2]
Abstract Test Method:	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:	TS 129 272 [1] (3GPP TS 29.272 version 10.8.0 Release 10)
Version:	
PICS References:	

A.7 PIXIT items

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_S6a_ETS_PORT	Integer	Port number of the 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_ORIGIN_HOST	Diameter_Identity	The Origin-Host identifying the endpoint that originates the Diameter messages
2	PX_ORIGIN_REALM	Diameter_Identity	The Origin-Realm identifying the Realm of the originator of any Diameter messages
3	PX_DESTINATION_HOST	Diameter_Identity	The Destination-Host identifying the endpoint to which the Diameter messages are destined
4	PX_DESTINATION_REALM	Diameter_Identity	The Destination-Realm identifying the Realm of the destination of any Diameter messages
5	PX_MIP6_AGENT_IP_ADDRESS MIP6	IpAddress	MIP6 agent IP address
6	PX_MIP6_AGENT_DEST_REALM	Diameter_Identity	MIP6 agent destination realm
7	PX_MIP6_AGENT_DEST_HOST	Diameter_Identity	MIP6 agent destination host
8	PX_SESSION_ID	UTF8String	The Session-Id identifying a specific session

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_STORED_MME_SGSN	UTF8String	Stored MME identity and stored SGSN identity
6	PX_STORED_MME_NOT_SGSN	UTF8String	Stored MME identity and not stored SGSN identity
7	PX_STORED_SGSN_NOT_MME	UTF8String	Not stored MME identity and stored SGSN identity
8	PX_CONTEXT_ID	UInt32	The context Id
9	PX_SERVICE_SEL	Charstring	The service selection
10	PX_VISITED_NTW_ID	Octetstring	A visited network identifier
11	PX_VISITED_PLMN_ID	Oct3	A visited PLMN identifier
12	PX_NEW_VISITED_PLMN_ID	Oct3	Other visited PLMN identifier
13	PX_NOT_ALLOWED_VISITED_PLMN_ID	Oct3	Not allowed visited PLMN identifier
14	PX_CANCELLATION_TYPE	Cancellation_Type_Code	Indicates the type of cancellation
15	PX_SGSN_NUMBER	Octetstring	The SGSN number
16	PX_ReSYNCHRONISATION_INFO	Octetstring	Contains the concatenation of RAND and AUTS
17	PX_RAT_TYPE	RAT_Type	Radio access technology
18	PX_DSR_FLAGS	UInt32	Default DSR-Flags: all flags unset
19	PX_ULR_FLAGS	UInt32	Default ULR-Flags: all flags unset
20	PX_ULA_FLAGS	UInt32	Default ULA-Flags: all flags unset
21	PX_ULR_FLAGS_S6a_SINGLE_REG	UInt32	ULR-Flags with bit0 set
22	PX_ULR_FLAGS_S6a_IND_SET	UInt32	ULR-Flags with bit1 set
23	PX_ULR_FLAGS_S6a_SKIP_SUBSCRIBER_DATA	UInt32	ULR-Flags with bit2 set
24	PX_ULR_FLAGS_S6a_GPRS_SUBSCRIPTION_DATA	UInt32	ULR-Flags with bit3 set

It.	Identifier	Type	Description
25	PX_ULR_FLAGS_S6a_GPRS_NODE_TYPE_IND	UInt32	ULR-Flags with bit4 set
26	PX_ULR_FLAGS_S6a_INITIAL_ATTACH	UInt32	ULR-Flags with bit5 set
27	PX_ULA_FLAGS_SEP_IND_SET	UInt32	ULA-Flags with bit0 set
28	PX_PUER_UE_IN_MME	UInt32	PUER-Flags with bit0 set
29	PX_PUER_UE_IN_SGSN	UInt32	PUER-Flags with bit1 set
30	PX_PUER_FREEZE_M_TMSI	UInt32	PUER-Flags AVP with Freeze M-TMSI bit set
31	PX_PUER_FREEZE_P_TMSI	UInt32	PUER-Flags AVP with Freeze P-TMSI bit set
32	PX_IDR_T_ADS_DATA_REQUEST	UInt32	IDR-Flags with bit1 set
33	PX_IDR_EPS_USER_STATE_REQUEST	UInt32	IDR-Flags with bit2 set
34	PX_IDR_EPS_LOCATIONINFO_REQUEST	UInt32	IDR-Flags with bit3 set
35	PX_IDR_CURRENT_LOCATION_REQUEST	UInt32	IDR-Flags with bit4 set
36	PX_DSR_COMPLETE_APN_CONF_PROFILE_WITHDRAWAL	UInt32	DSR-Flags with bit1 set

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 ES 201 873-1 [7].

B.1 The TTCN-3 Module

The TTCN-3 library modules corresponding to the ATS are contained in archive `ts_10326103v010101p0.zip` which accompanies the present document.

History

Document history		
V1.1.1	July 2014	Publication