ETSI TS 103 571-3 V2.1.1 (2021-01)

TECHNICAL SPECIFICATION

**Core Network and Interoperability Testing (INT);
Diameter Conformance testing for Sh/Dh interfaces;
(3GPP™ Release 15);
Part 3: Abstract Test Suite (ATS) and partial Protocol
Implementation eXtra Information for Testing (PIXIT)
pro forma specification**

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. Full details of the entire series can be found in part 1 [3].

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) pro forma for the test specifications for Diameter protocol on the Sh/Dh interfaces as specified in ETSI TS 129 328 [1] and ETSI TS 129 329 [2] in compliance with the relevant requirements and in accordance with the relevant guidance given in ISO/IEC 9646-7 [i.2] and ETSI ETS 300 406 [8].

The test notation used in the ATS is TTCN-3 (see ETSI ES 201 873-1 [9]).

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 pro forma;

- the modules containing the TTCN-3 ATS.

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

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 referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://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.

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

[1]   ETSI TS 129 328 (V15.8.0): "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; 5G; IP Multimedia (IM) Subsystem Sh interface; Signalling flows and message contents (3GPP TS 29.328 version 15.8.0 Release 15)".

[2]   ETSI TS 129 329 (V15.2.0): "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; Sh interface based on the Diameter protocol; Protocol details (3GPP TS 29.329 version 15.2.0 Release 15)".

[3]   ETSI TS 103 571-1: "Core Network and Interoperability Testing (INT); Diameter Conformance testing for the Sh/Dh interfaces; (3GPPTM Release 15); Part 1: Protocol Implementation Conformance Statement (PICS)".

[4]   ETSI TS 103 571-2: "Core Network and Interoperability Testing (INT); Diameter Conformance testing for Sh/Dh interfaces; (3GPP™ Release 13); Part 2: Test Suite Structure (TSS) and Test Purposes (TP)".

[5]   Void.

[6]   ISO/IEC 9646-6: "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 6: Protocol profile test specification".

[7]   Void.

[8]   ETSI ETS 300 406: "Methods for testing and Specification (MTS); Protocol and profile conformance testing specifications; Standardization methodology".

[9]   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 referenced document (including any amendments) applies.

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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.

[i.1]   ISO/IEC 9646-1: "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 1: General concepts".

[i.2]   ISO/IEC 9646-7: "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 7: Implementation Conformance Statements".

3   Definition of terms, symbols and abbreviations

3.1   Terms

For the purposes of the present document, the terms given in ISO/IEC 9646-7 [i.2], ETSI TS 129 328 [1] and ETSI TS 129 329 [2] apply.

3.2   Symbols

Void.

3.3   Abbreviations

For the purposes of the present document, the abbreviations given in ISO/IEC 9646-1 [i.1], ISO/IEC 9646-6 [6], ISO/IEC 9646-7 [i.2], ETSI TS 129 328 [1] and ETSI TS 129 329 [2] apply.

4   Abstract Test Method (ATM)

4.1   Introduction

This clause describes the ATM used to test the Diameter protocol on the Sh/Dh interfaces at the AS/OSA SCS side and at the HSS/SLF side.

4.2   Test architecture

4.2.1   Test machine configuration

4.2.1.1   Test configurations using Sh interface

The Sh interface is located between an AS or OSA SCS and the HSS.
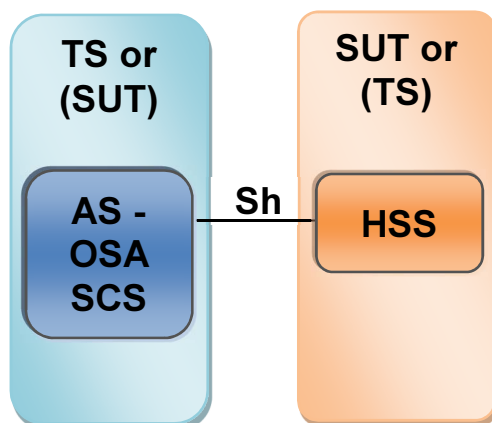
NOTE: Sh interface (DIAMETER protocol) is located between an HSS and AS or between an HSS and OSA SCS.

Figure 1: Test configuration CF_1Sh
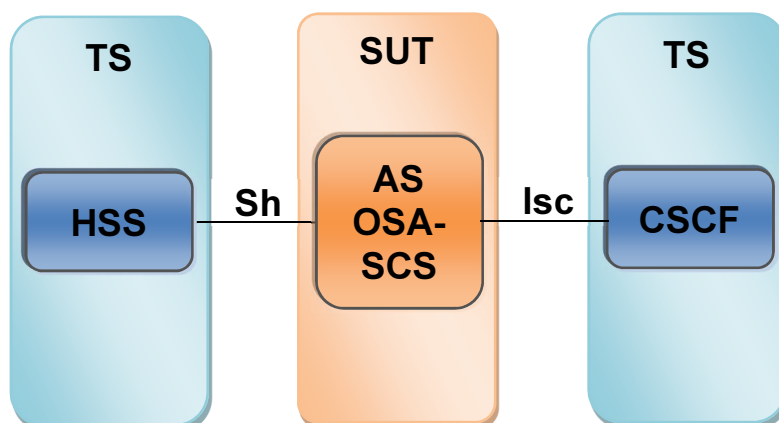
NOTE: Within figure 2 CSCF represents S-CSCF component. Isc interface (SIP protocol) is located between a AS and S-CSCF. Sh interface (DIAMETER protocol) is located between an HSS and an AS or between an HSS and OSA_SCS.

Figure 2: Test configuration CF_1Sh1Isc

4.2.1.2   Test configurations using Dh interface

The Dh interface is located between an AS or OSA SCS and the SLF.
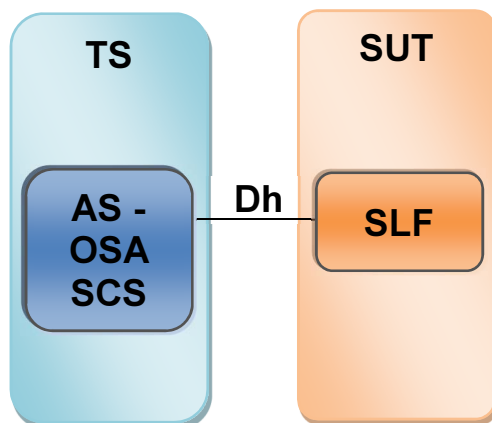
Figure 3: Test configuration CF_1Dh
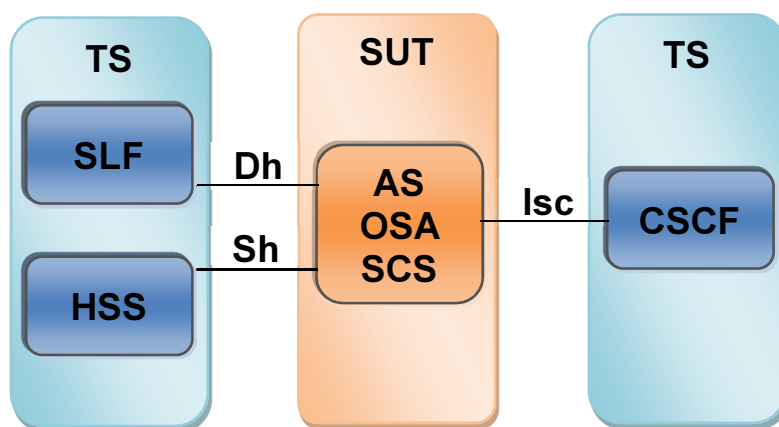
NOTE: Within figure 4 CSCF represents S-CSCF component. Isc interface (SIP protocol) is located between an
           AS and S-CSCF. Sh interface (DIAMETER protocol) is located between an HSS and AS or between an
           HSS and OSA-SCS. Dh interface (DIAMETER protocol) is located between an SLF and AS or between an
           SLF and OSA-SCS.

Figure 4: Test configuration CF_1DhSh or CF_1Dh1Sh1Isc

4.2.2   Interconnection of TS and SUT

4.2.2.1   HSS Role

Figure 5 shows the interconnection of TS and SUT in terms of Diameter message flows. Diameter messages are
transferred over the DIAM port.
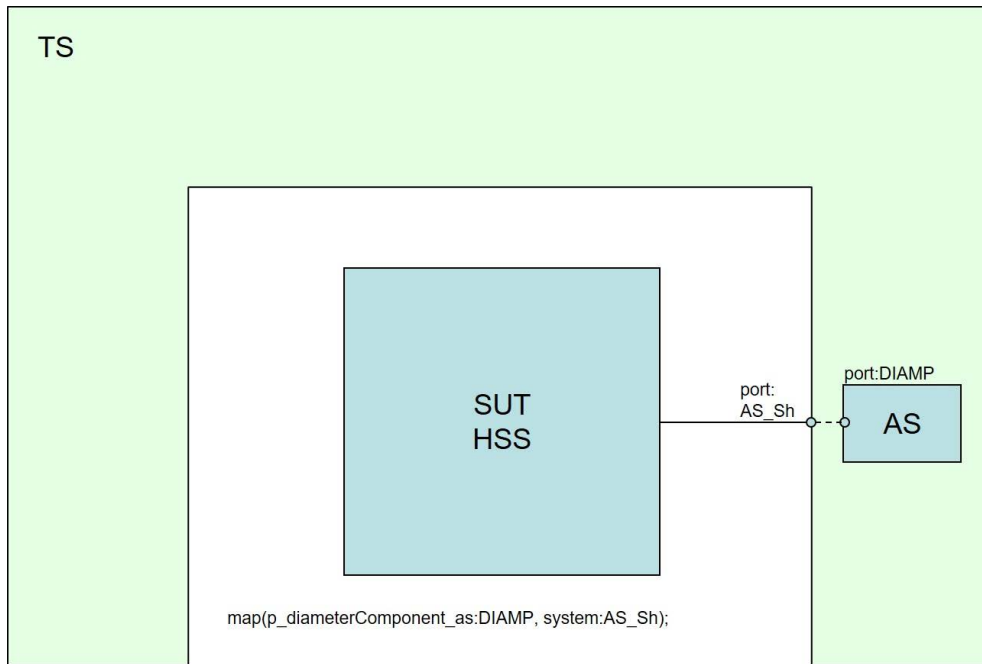
Figure 5: Interconnection for HSS role

4.2.2.2 AS Role

If SUT has the role of AS figure 6 shows the interconnection of TS and SUT in terms of signalling message flows. Diameter messages are transferred over the DIAM port. IMS messages are transferred over the Isc. The use of the Dh port depends on the selected test suite group.
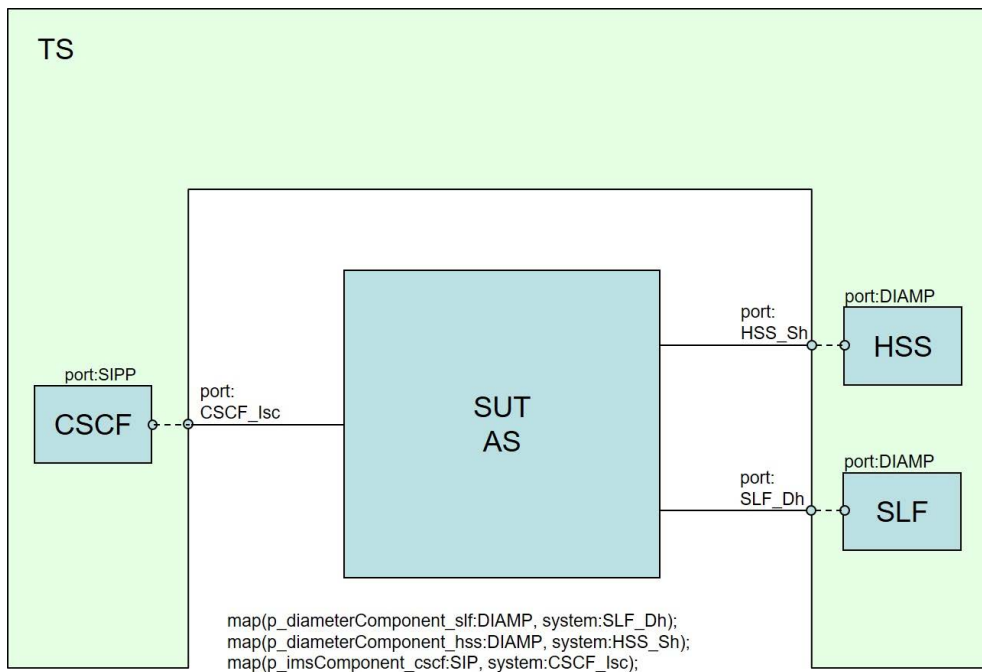
Figure 6: Interconnection for AS role

4.2.2.3 SLF Role

If SUT has the role of SLF figure 7 shows the interconnection of TS and SUT in terms of signalling message flows. Diameter messages are transferred over the DIAM port.
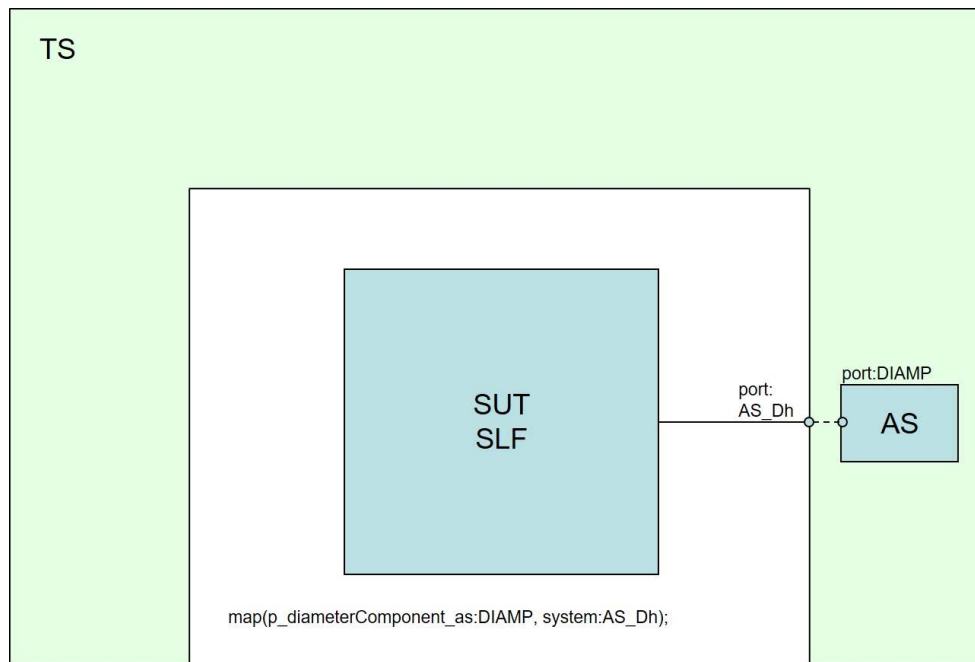
Figure 7: Interconnection for SLF role

4.2.2.4   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 SIP messages.

5   ATS conventions

5.1   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 testing conventions and the naming conventions. The naming conventions describe the structure of the naming of all ATS elements.

To define the ATS, the guidelines of the document ETSI ETS 300 406 [8] were considered.

5.2   Testing conventions

5.2.1   Test cases Preamble and Postamble

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

IUT is an Sh/AS (example TC_SH_AS_MS_01)

        f_preamble_Sh_HSS

        f_postamble_Sh_HSS

IUT is a Sh/HSS (example TC_SH_HSS_MS_01)

        f_preamble_Sh_AS

        f_postamble_Sh_AS

5.3   Naming conventions

5.3.1   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 1.

- 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	DiameterRfRo_	*none*	DiameterShDh_Steps	
TSS grouping	Use all upper-case letters	*none*	*none*	TP_SH_HSS_MS	
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	*PICS_*	*none*	PICS_SH_HSS_IUT	See note
PIXIT values	Use all upper case letters	*PX_*	*none*	PX_OriginHost	See 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.					

5.3.2   Test case grouping

The ATS structure is based on the Test Purposes for the Diameter protocol on the Sh/Dh interfaces as defined in ETSI TS 103 571-2 [4].

5.3.3   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>_<nn>**		
<tp>	=	Test Case:	fixed to "TC"
<interface>		Interface:	SH or DH
<iut>	=	type of IUT:	AS, OSA SCS or HSS, SLF
<scope>	=	group	MS Message Syntax
			UD User Data
			PU Profile Update
			SN Subscription to Notification
			PN Push Notification
<nn>	=	sequential number	(01 to 99)

NOTE: This naming scheme results into a one-to-one correspondence between the test purpose identifiers as
defined in ETSI TS 103 571-2 [4] and the test case identifiers.
The TP identifier of the test case TC_xxx_01 is TP_xxx_01.

Annex A (normative):
DIAMETER Sh/Dh Partial PIXIT pro forma

A.1   The right to copy

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 pro forma in this annex so that it can be used for its intended purposes and may further publish the completed Partial PIXIT.

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

A.2   Identification summary

Table A.1

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

A.3   ATS summary

Table A.2

Protocol Specification:	ETSI TS 129 328 (3GPP TS 29.328 version 15.8.0 Release 15) ETSI TS 129 329 (3GPP TS 29.329 version 15.2.0 Release 15)
Protocol to be tested:	
ATS Specification:	ETSI TS 103 571-2
Abstract Test Method:	ETSI TS 103 571-3, clause 4

A.4   Test laboratory

Table A.3

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

A.5   Client identification

Table A.4

Client Identification:	
Client Test manager:	
Test Facilities required:	

A.6 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.7 Protocol layer information

A.7.1 Protocol identification

Table A.6

Name:	ETSI TS 129 328 (3GPP TS 29.328 version 15.8.0 Release 15) ETSI TS 129 329 (3GPP TS 29.329 version 15.2.0 Release 15)
Version:	
PICS References:	ETSI TS 103 571-1

A.8 PIXIT items

A.8.1 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.8.2 Port and Address items

Table A.7: Test system ports and addresses

It.	Identifier	Type	Description
1	PX_DIAMETER_SH_ETS_IPADDR	Charstring	Sh IP address of the test system
2	PX_DIAMETER_SH_ETS_PORT	Integer	Sh Port number of the test system
3	PX_DIAMETER_DH_ETS_IPADDR	Charstring	Dh IP address of the test system
4	PX_DIAMETER_DH_ETS_PORT	Integer	Dh Port number of the test system
5	PX_CSCF_ISC_ETS_IPADDR	Charstring	IP address of the test system CSCF
6	PX_CSCF_ISC_ETS_PORT	Integer	Port number of the test system CSCF

Table A.8: SUT ports and addresses

It.	Identifier	Type	Description
1	PX_DIAMETER_SH_SUT_IPADDR	Charstring	Sh IP address of the system under test
2	PX_DIAMETER_SH_SUT_PORT	Integer	Sh Port number of the system under test
3	PX_DIAMETER_DH_SUT_IPADDR	Charstring	Dh IP address of the system under test
4	PX_DIAMETER_DH_SUT_PORT	Integer	Dh Port number of the system under test

A.8.3   Sh/Dh interface items

Table A.9: Sh/Dh interfaces

It.	Identifier	Type	Description
1	PX_SessionID	UTF8String	The Session-Id
2	PX_OriginHost	Charstring	The Origin-Host
3	PX_OriginHost_2nd	Charstring	The second Origin-Host
4	PX_OriginRealm	Charstring	The Origin-Realm
5	PX_DestinationHost	Charstring	The Destination-Host
6	PX_DestinationRealm	Charstring	The Destination-Realm
7	PX_PublicUserIdentity	UTF8String	Valid Public User Identity
8	PX_PublicPSIIdentity	UTF8String	Public User Identity containing a distinct Public Service Identity for Data-Reference = PSIActivation
9	PX_NotRelatedPrivateIdentity	UTF8String	Not related (not existing) Private Identity
10	PX_PublicUser_MSISDN	UTF8String	Public User MSIDSN identity, see table 7.6.1, item 17, ETSI TS 129 328 [1]
11	PX_IMSPublicUserIdentity	UTF8String	Public User IMS identity, see table 7.6.1, item 32, ETSI TS 129 328 [1]
12	PX_IUT_SIP_URL	UTF8String	SIP URL for UD-Request with Server-Name AVP
13	PX_DSAI_TAG	Octetstring	DSAI-Tag AVP for a UD-Request
14	PX_Private_Identity	Charstring	Valid Private Identity
15	PX_HSS_IDENTITY	Charstring	Valid HSS identity (used in SLF testing)
16	PX_Service_Data_unexpected	TServiceData	Service Data element that is greater than the HSS is prepared to accept.
17	PX_DIAMETER_EXP_TImer	Float	Default value for waiting an expiration period
18	PX_SIPsupport	Boolean	Boolean indicator that is true if the Gm interface (SIP protocol) is accessible to trigger Diameter events at the Sh/Dh interfaces
19	PX_USER_IDENTITY	Integer	Selection of user identity AVP for sending in UDR, PUR and SNR (1: PX_PublicUserIdentity, 2: PX_PublicUser_MSISDN)
20	PX_NotExistingUserIdentity	UTF8String	Not existing Public User Identity
21	PX_UnavailableUserIdentity	UTF8String	Unavailable Public User Identity
22	PX_NotRelatedPrivateIdentity_MSISDN	UTF8String	Not related (not existing) Private MSISDN Identity
23	PX_Data_Reference_Type	DataReferenceType	Used for UDR and PUR messages
24	PX_Data_Reference_Type_NotificationAllowed	DataReferenceType	Used for SNR messages (value supported and allowed by SUT)
25	PX_Data_Reference_Type_NotificationNotAllowed	DataReferenceType	Used for SNR messages (value not supported or not allowed by SUT)

A.8.4   LibCommon items

Table A.10: PIXIT for LibCommon

It.	Identifier	Type	Description
1	PX_TSYNC_TIME_LIMIT	Float	Default time limit for a sync client to reach a synchronization point
2	PX_TSHUT_DOWN_TIME_LIMIT	Float	Default time limit for a sync client to finish its execution of the shutdown default

Annex B (normative):
DIAMETER Sh/Dh Abstract Test Suite (ATS)

B.1 The TTCN-3 Module

This ATS has been produced using the Testing and Test Control Notation (TTCN-3) according to ETSI ES 201 873-1 [9].

The TTCN-3 library modules corresponding to the ATS are contained in archive ts_10357103v020101p0.zip which accompanies the present document.

History

Document history		
V1.1.1	June 2019	Publication
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