



**Core Network and Interoperability Testing (INT);
Diameter Conformance testing for S9 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 S9 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 S9 interface as specified in TS 129 215 [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 129 215 (V10.6.0): "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Policy and Charging Control (PCC) over S9 reference point; Stage 3 (3GPP TS 29.215 version 10.6.0 Release 10)".
- [2] ETSI TS 103 262-2: " Core Network and Interoperability Testing (INT); Diameter Conformance testing for S9 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 129 215 [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 129 215 [1] apply.

4 Abstract Test Method (ATM)

This clause describes the ATM used to test the Diameter protocol on the S9 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 H-PCRF when the IUT is a V-PCRF and shall behave as a V-PCRF when the IUT is an H-PCRF. 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 H-PCRF testing

The S9 interface is located between Test System acting as V-PCRF and the H-PCRF SUT.

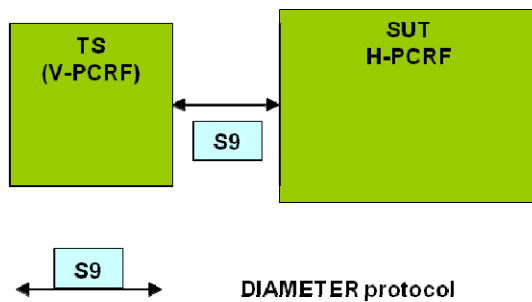


Figure 1: Test architecture with H-PCRF as SUT

4.1.2.2 Test configurations for V-PCRF testing

The S9 interface is located between Test System acting as H-PCRF and the V-PCRF SUT.

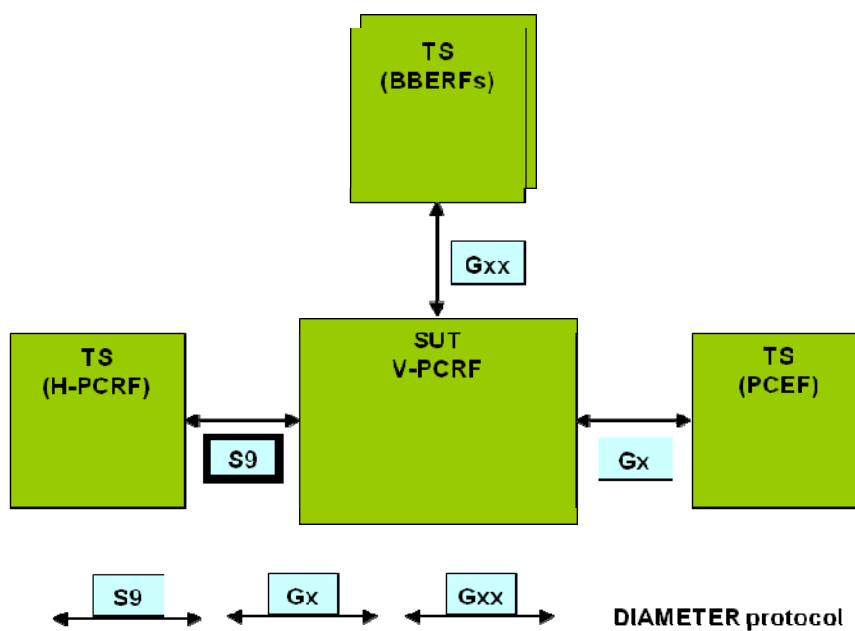


Figure 2: Test architecture with V-PCRF as SUT

4.1.3 Interconnection of TS and SUT

4.1.3.1 H-PCRF Role

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

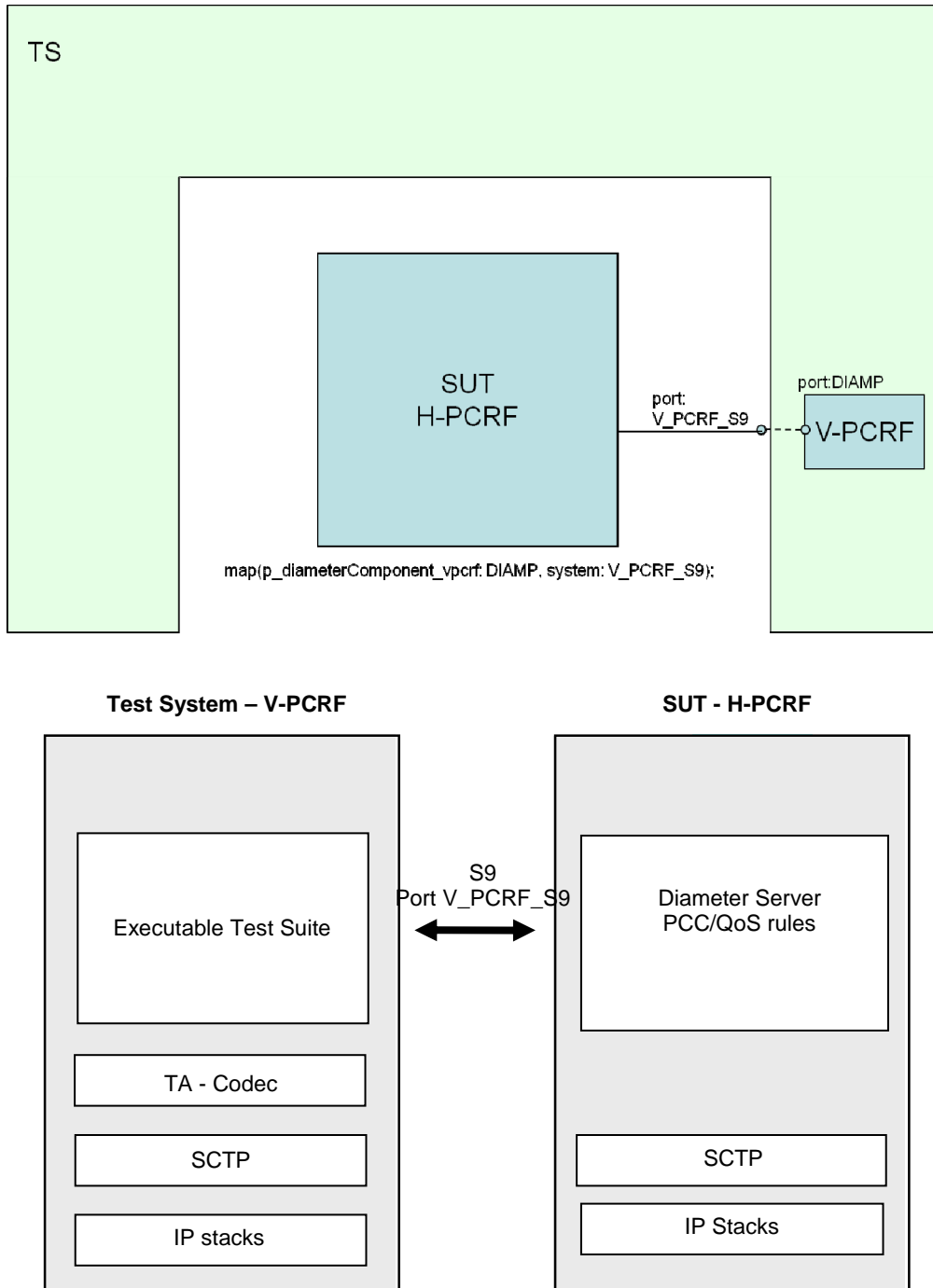


Figure 3: Interconnection for H-PCRF role

4.1.3.2 V-PCRF Role

Figures 4 and 5 show the interconnection of TS and SUT in terms of signalling message flows. Diameter messages are transferred over the DIAMP port. Some V-PCRF tests may require additional triggering via the Gx or Gxx ports. The configuration can be enabled or disabled by using PIXIT parameters "Gxsupport" and "Gxxsupport".

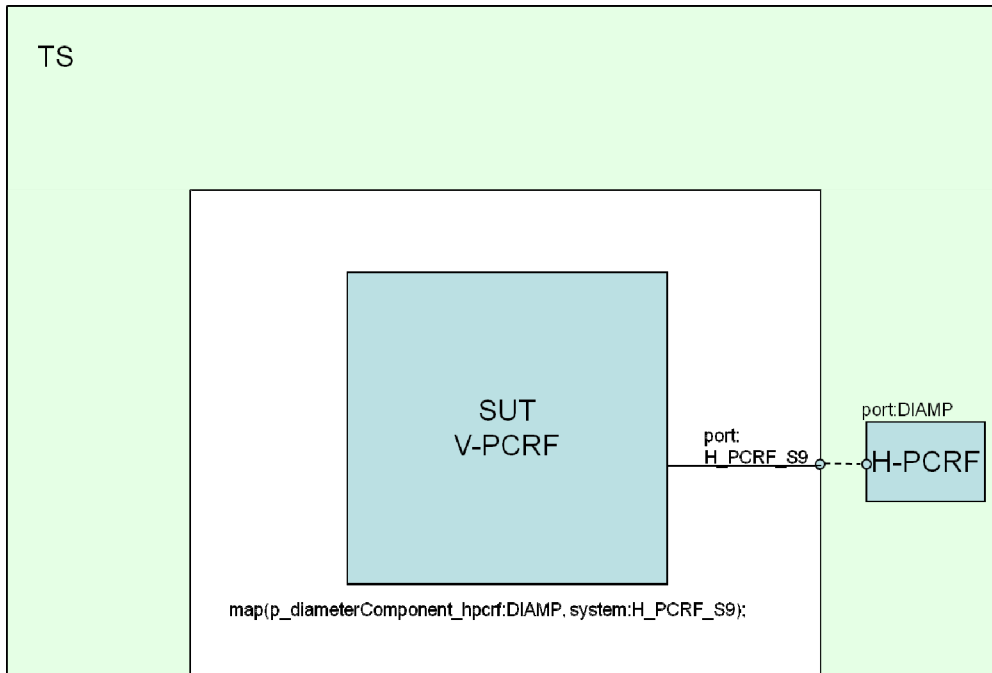


Figure 4: Interconnection for V-PCRF role without Gx and Gxx interfaces

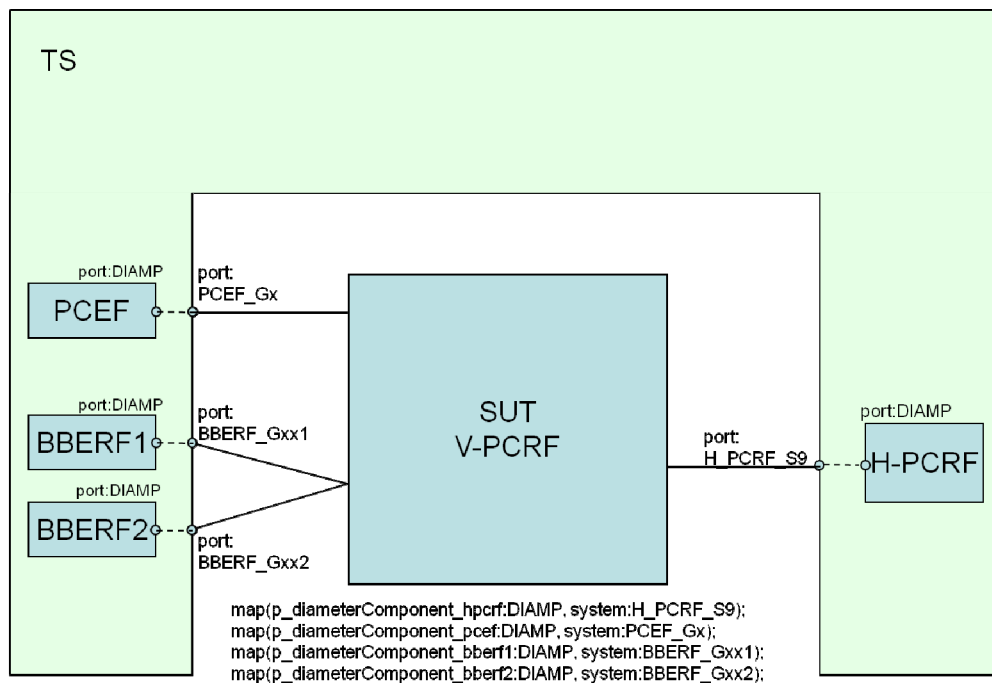


Figure 5: Interconnection for V-PCRF role with Gx and Gxx interfaces

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 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 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 H-PCRF when the IUT is a V-PCRF and shall behave as a V-PCRF when the IUT is an H-PCRF. For that reason the test case preambles and postambles are named as follows:

IUT is a H-PCRF (example TC_HPCRF_HSE_01)

`f_preamble_VPCRF`

`f_postamble_VPCRF`

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

IUT is a V-PCRF (example TC_VPCRF_HSE_01)

`f_preamble_HPCRF`

`f_postamble_HPCRF`

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	DiameterS9_	<i>none</i>	DiameterS9_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 S9 interface as defined in TS 103 262-2 [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:	HPCRF or VPCRF
<scope >	= group	MS S9 Message Syntax
		HSE Home Access/S9 Session Establishment
		HSM Home Access/S9 Session Modification
		HPQ Home Access/Provision of QoS Rules
		HST Home Access/S9 Session Termination
		HMB Home Access/Multiple BBERF Handling
		HDS Home Access/Deferred Session Linking Handling
		HSL Home Access/Session Linking Handling When Multiple PDN Connection to a single APN
		VQR Visited Access/QoS and PCC Rules
		VPQ Visited Access/Provision of QoS and PCC Rules
		VST Visited Access/S9 Session/Subsession Termination
		VMB Visited Access/Multiple BBERF Handling
		VRS Visited Access/Rx over S9
		VEH Visited Access/Event Handling
		VDS Visited Access/Deferred Session Linking Handling
		VSL Visited Access/Session Linking Handling When Multiple PDN Connection to a single APN
		VIF Visited Access/IP Flow mobility support
<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 103 262-2 [2] and the test case identifiers.

The TP identifier of the test case TC_XXX_01 is TP_XXX_01.

Annex A (normative): DIAMETER S9 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 129 215 [1] (3GPP TS 29.215 version 10.6.0 Release 10)
Protocol to be tested:	
ATS Specification:	TS 103 262-2 [2]
Abstract Test Method:	TS 103 262-3, 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 129 215 [1] (3GPP TS 29.215 version 10.6.0 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_S9_ETS_IPADDR	Charstring	IP address of the test system
2	PX_DIAMETER_S9_ETS_PORT	Integer	Port number of the test system
3	PX_DIAMETER_GX_ETS_IPADDR	Charstring	IP address of the test system PCEF
4	PX_DIAMETER_GX_ETS_PORT	Integer	Port number of the test system PCEF
5	PX_DIAMETER_GXX1_ETS_IPADDR	Charstring	IP address of the test system BBERF1
6	PX_DIAMETER_GXX1_ETS_PORT	Integer	Port number of the test system BBERF1
7	PX_DIAMETER_GXX2_ETS_IPADDR	Charstring	IP address of the test system BBERF2
8	PX_DIAMETER_GXX2_ETS_PORT	Integer	Port number of the test system BBERF2

Table A.8: SUT ports and addresses

It.	Identifier	Type	Description
1	PX_DIAMETER_S9_SUT_IPADDR	Charstring	S9 IP address of the system under test
2	PX_DIAMETER_S9_SUT_PORT	Integer	S9 Port number of the system under test
3	PX_DIAMETER_GX_SUT_IPADDR	Charstring	Gx IP address of the system under test
4	PX_DIAMETER_GX_SUT_PORT	Integer	Gx Port number of the system under test
5	PX_DIAMETER_GXX_SUT_IPADDR	Charstring	Gxx IP address of the system under test
6	PX_DIAMETER_GXX_SUT_PORT	Integer	Gxx Port number of the system under test

A.7.2 S9 interface items

Table A.9: S9 interface

It.	Identifier	Type	Description
1	PX_SessionID	UTF8String	The Session-Id
2	PX_OriginHost	charstring	The Origin-Host
3	PX_OriginRealm	charstring	The Origin-Realm
4	PX_DestinationHost	charstring	The Destination-Host
5	PX_DestinationRealm	charstring	The Destination-Realm
6	PX_UE1_framedIpAddress	octetstring	The Framed-IP-Address
7	PX_UE1_framedIp6Address	octetstring	The Framed-IPv6-Prefix
8	PX_SUBSCRIPTION_ID_TYPE	Subscription_Id_Type	A subscription ID type
9	PX_SUBSCRIPTION_ID_DATA	UTF8String	A subscription ID data
10	PX_IP_CAN_TYPE	IP_CAN_Type	A connectivity access type for the IP-CAN
11	PX_RAT_TYPE	RAT_Type	A Radio access technology
12	PX_QOS_RULE_NAME	octetstring	The QoS_Rule_Name
13	PX_QOS_RULE_NAME_NOT_ACCEPTABLE	octetstring	A QoS_Rule_Name Not acceptable
14	PX_CALLED_STATION_ID_PDN	UTF8String	A PDN For the Called-Station-Id
15	PX_PDN_CONNECTION_ID_DATA	octetstring	An Identity for the PDN-Connection-ID
16	PX_SGW_AGW_ipv4	IPv4Addr	The SGW/AGW in IPv4Addr format
17	PX_SGW_AGW_ipv6	IPv6Addr	The SGW/AGW In type IPv6Addr format
18	PX_max_Requested_Bandwidth_UL	UInt32	The Max QoS bandwidth
19	PX_SUBSESSION_ID	UInt32	The subsession Id
20	PX_CHARGING_RULE_NAME_DATA	octetstring	First Charging rule name
21	PX_PCC_RULE_STATUS	PCC_Rule_Status	A Status value for PCC-Rule

A.7.3 Gx interface items

Table A.10: Gx interface

It.	Identifier	Type	Description
1	PX_Gxsupport	Boolean	Gx interface accessible (TRUE) or not
2	PX_GX_SessionID	UTF8String	The Gx Session-Id
3	PX_GX_OriginHost	Charstring	The Gx Origin-Host
4	PX_GX_OriginRealm	Charstring	The Gx Origin-Realm
5	PX_GX_DestinationHost	Charstring	The Gx Destination-Host
6	PX_GX_DestinationRealm	Charstring	The Gx Destination-Realm

A.7.4 Gxx interface items

Table A.11: Gxx interface

It.	Identifier	Type	Description
1	PX_Gxxsupport	Boolean	Gxx interface accessible (TRUE) or not
2	PX_GXX_SessionID	UTF8String	The Gxx Session-Id
3	PX_GXX1_OriginHost	Charstring	The Gxx BBERF1 Origin-Host
4	PX_GXX1_OriginRealm	Charstring	The Gxx BBERF1 Origin-Realm
5	PX_GXX2_OriginHost	Charstring	The Gxx BBERF2 Origin-Host
6	PX_GXX2_OriginRealm	Charstring	The Gxx BBERF2 Origin-Realm
7	PX_GXX_DestinationHost	Charstring	The Gxx Destination-Host
8	PX_GXX_DestinationRealm	Charstring	The Gxx Destination-Realm
9	PX_ROUTING_RULE_IDENTIFIER_VALUE	Octetstring	An IP flow mobility routing rule
10	PX_QOS_EXCEEDING_SUBSCRIBER_BANDWIDTH	UInt32	QoS value exceeding the subscriber bandwidth

Annex B (normative): DIAMETER S9 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_10326203v010101p0.zip` which accompanies the present document.

History

Document history		
V1.1.1	July 2014	Publication