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Core Network and Interoperability Testing (INT);
GTPv2-C Conformance Testing for S11 Interface;
(3GPP™ Release 10);
Part 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) pro forma specification

Reference
DTS/INT-00092-3

Keywords
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Contents

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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 [9].

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 GTPv2-C protocol on the S11 interface as specified in ETSI TS 129 274 [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 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 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.

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

[1] ETSI TS 129 274 (V10.14.0): "Universal Mobile Telecommunications System (UMTS); LTE; 3GPP Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3 (3GPP TS 29.274 version 10.14.0 Release 10)".

[2] ETSI TS 103 202-2: "Core Network and Interoperability Testing (INT); GTPv2-C Conformance Testing for S11 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".

[8] ETSI ES 202 553: "Methods for Testing and Specification (MTS); TPLan: A notation for expressing Test Purposes".

[9] ETSI TS 103 202-1: "Core Network and Interoperability Testing (INT); GTPv2-C Conformance Testing for S11 Interface; (3GPP Release 10); Part 1: Protocol Implementation Conformance Statement (PICS)".

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.

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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.

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 129 274 [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 129 274 [1] apply.

4 Abstract Test Method (ATM)

4.1 Introduction

This clause describes the ATM used to test ETSI TS 129 274 [1].

4.2 Test architecture

4.2.1 Test method

The S11 interface is located between the MME and the S-GW. 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 S-GW and shall behave as an S-GW when the IUT is an MME. As the exchange between the test system and the IUT is at the GTPv2-C 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.

4.2.2 Test machine configuration

4.2.2.1 Test configurations for testing the MME

The first MME test configuration in the figure below shows a simple test architecture with just one peer-to-peer connection between the MME (SUT) and the S-GW (TS) where no further interfaces are taken into account.

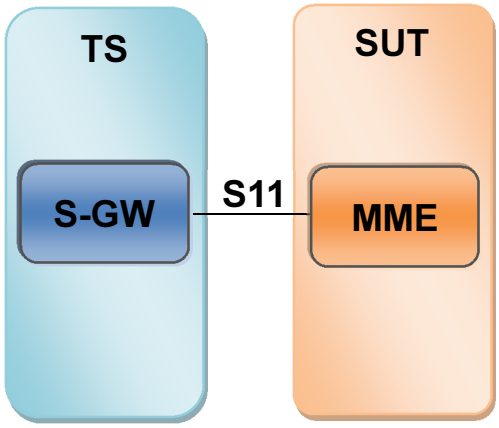


Figure 1: Test configuration CF_MME

The second MME test configuration in the figure below assumes a more complex test architecture where the actions at the S1-MME interface towards the eNB are needed to trigger message exchanges at the S11 interface.

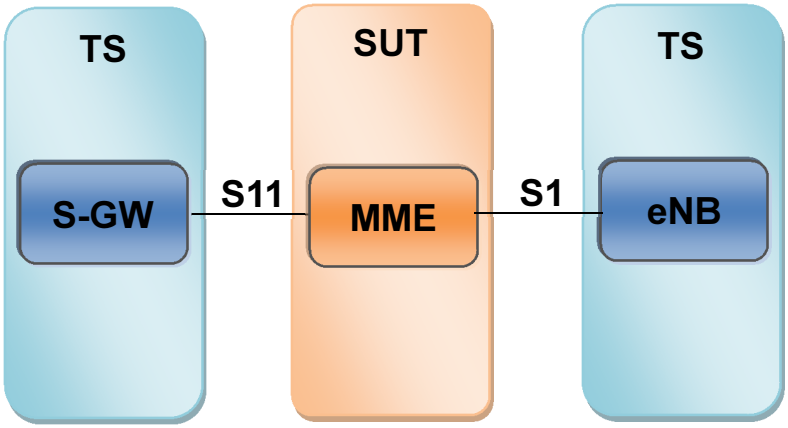
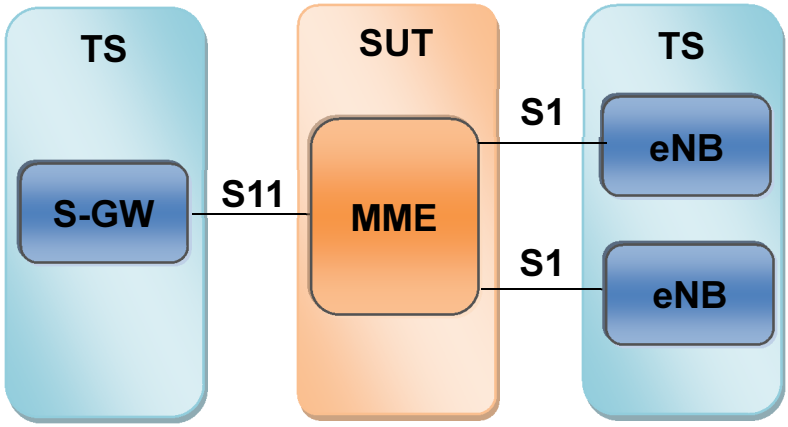


Figure 2: Test configuration CF_MME_ENB

The third MME test configuration in the figure below assumes an even more complex test architecture where the actions at two S1-MME interfaces towards the eNB are needed to trigger message exchanges at the S11 interface.



NOTE: The S1 protocol functionality may not be fully modelled in the TTCN-3 code.

Figure 3: Test configuration CF_MME_2ENB

4.2.2.2 Test configurations for testing the S-GW

The first S-GW test configuration in the figure below shows a simple test architecture with just one peer-to-peer connection between the MME (TS) and the S-GW (SUT) where no further interfaces are taken into account.

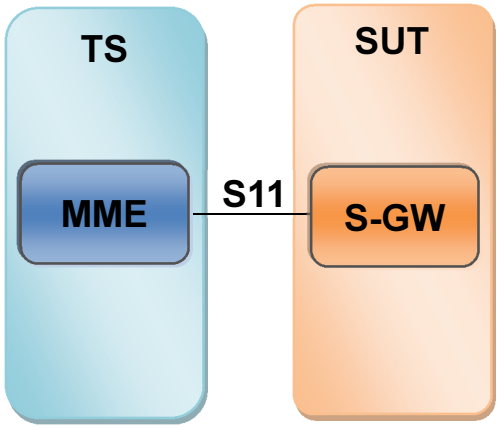
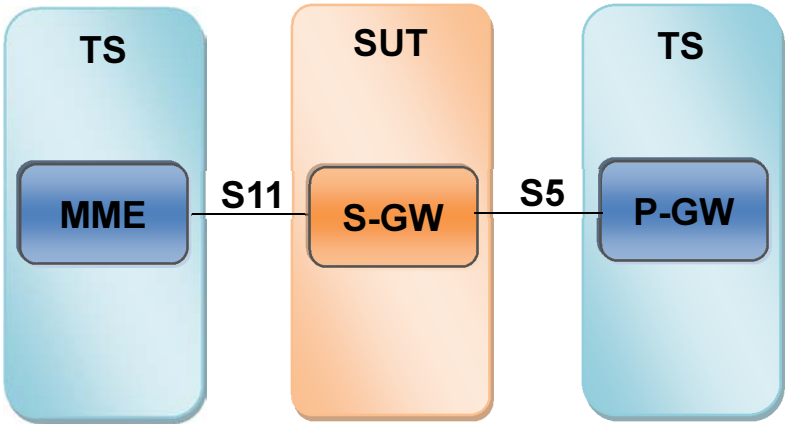


Figure 4: Test configuration CF_SGW

The second S-GW test configuration in the figure below assumes a more complex test architecture where the actions at the S5 interfaces towards the P-GW are needed to trigger message exchanges at the S11 interface.



NOTE: The S5 protocol functionality may not be fully modelled in the TTCN-3 code.

Figure 5: Test configuration CF_SGW_PGW

The third S-GW test configuration in the figure below assumes an even more complex test architecture where the actions at the S4 and S5 interfaces towards the SGSN and the P-GW are needed to trigger message exchanges at the S11 interface.

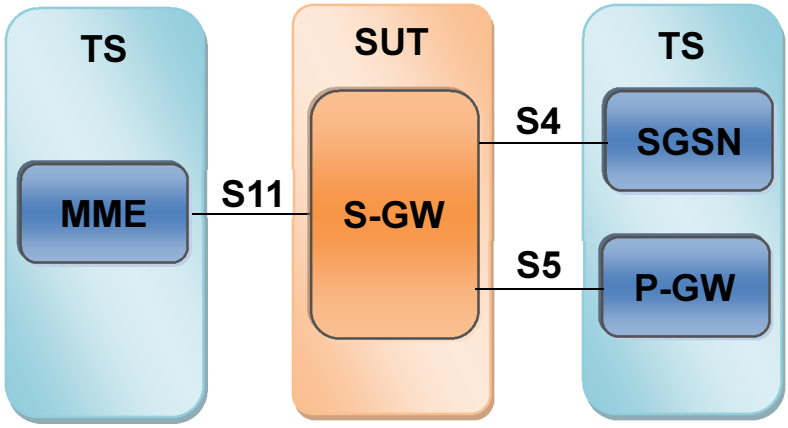
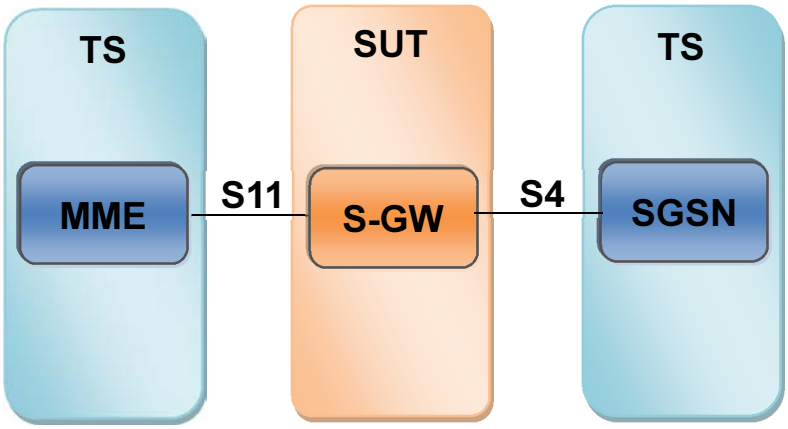


Figure 6: Test configuration CF_SGW_PGW_SGSN

The fourth S-GW test configuration in the figure below assumes a more complex test architecture where the actions at the S4 interface towards the SGSN are needed to trigger message exchanges at the S11 interface.



NOTE 1: The S4 protocol functionality may not be fully modelled in the TTCN-3 code.
NOTE 2: The S5 protocol functionality may not be fully modelled in the TTCN-3 code.

Figure 7: Test configuration CF_SGW_SGSN

4.2.3 Interconnection of TS and SUT

4.2.3.1 MME Role

4.2.3.1.1 Configuration f_cf01_S11Up_MME

Figure 8 shows the interconnection of TS and SUT in terms of GTPv2-C message flows. GTPv2-C messages are transferred over the s11Port port.

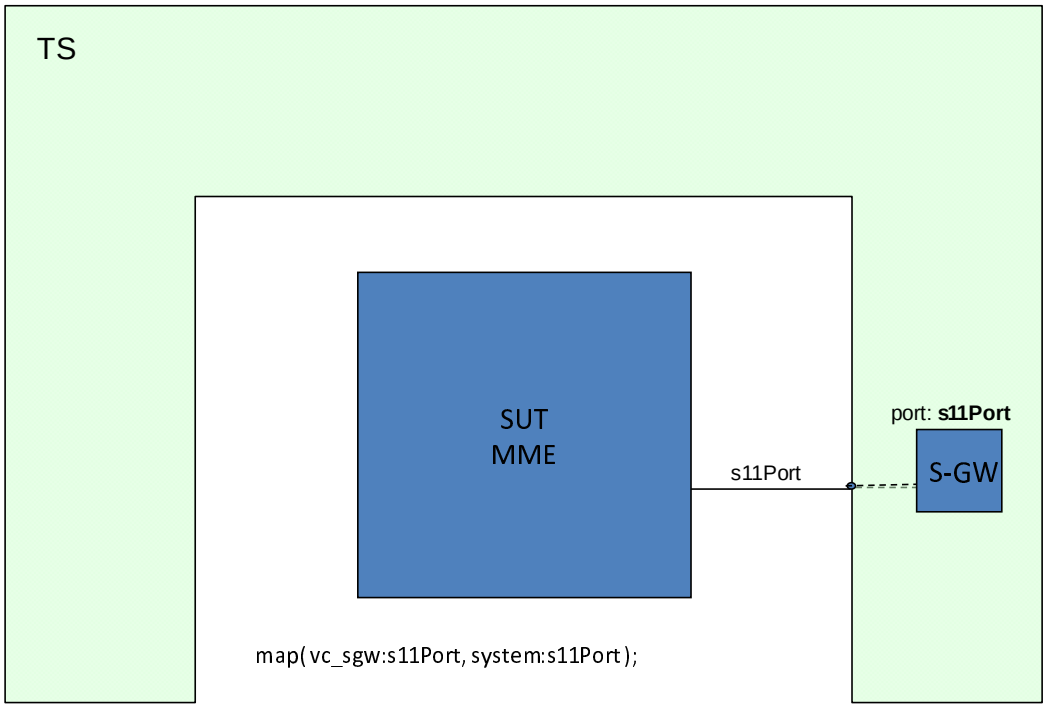


Figure 8: Interconnection for MME role

4.2.3.1.2 Configuration f_cf02_S11Up_MME

Figure 9 shows the interconnection of TS and SUT in terms of GTPv2-C message flows. GTPv2-C messages are transferred over the s11Port port. GTPv2-C messages transferred over the s5Port port are used for message triggering.

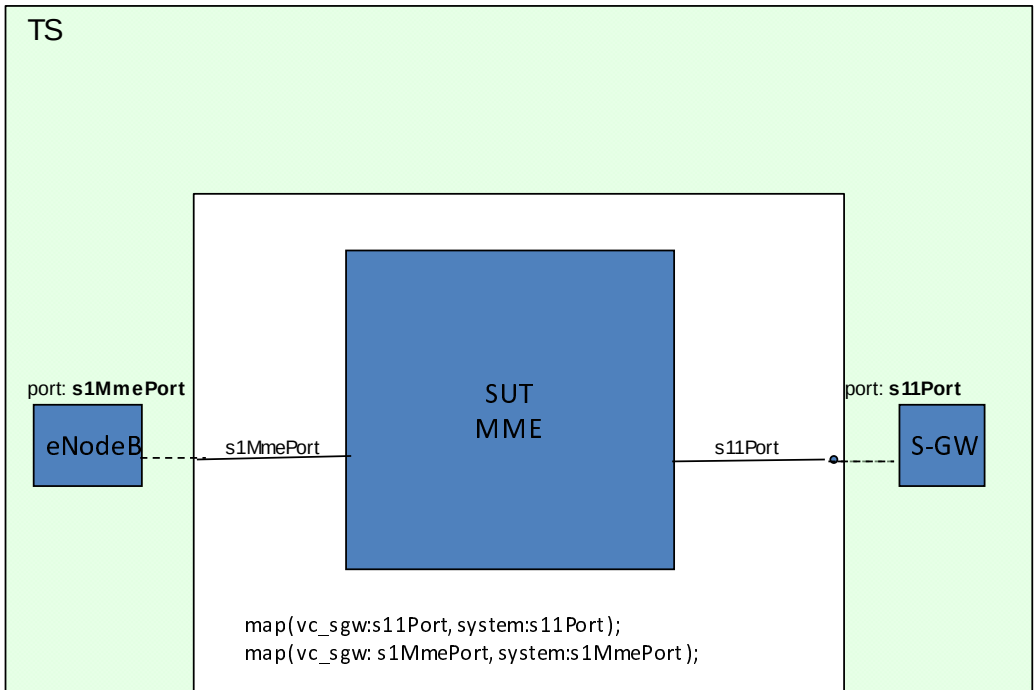


Figure 9: Interconnection for MME role

4.2.3.2 S-GW Role

4.2.3.2.1 Configuration f_cf01_S11Up_SGW

Figure 10 shows the interconnection of TS and SUT in terms of GTPv2-C message flows. GTPv2-C messages are transferred over the s11Port port.

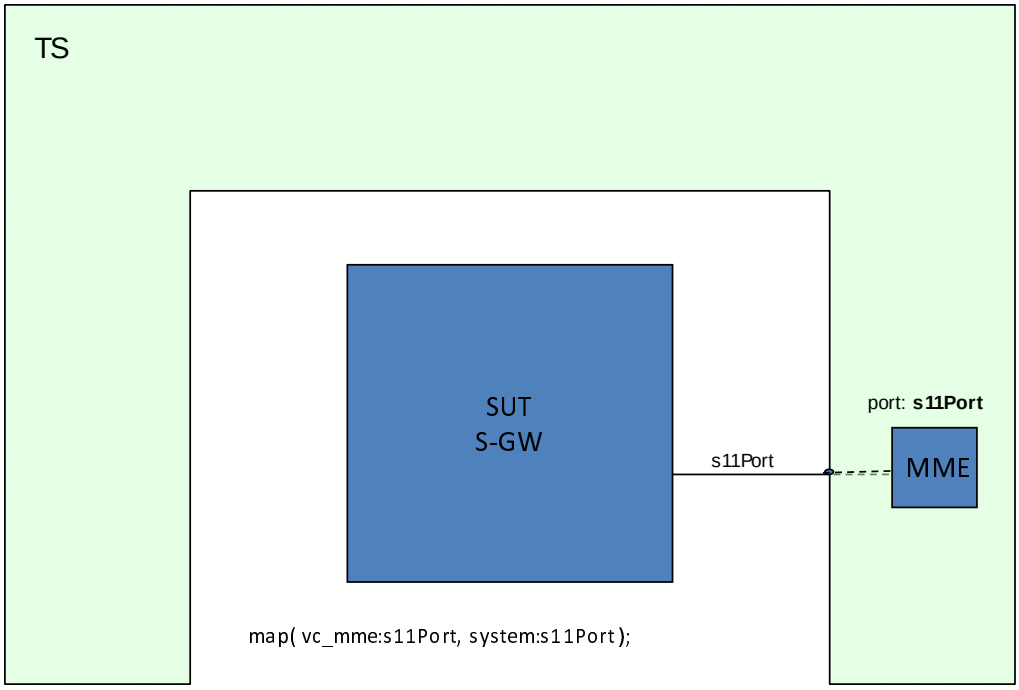


Figure 10: Interconnection for S-GW role

4.2.3.2.2 Configuration f_cf02_S11Up_SGW

Figure 11 shows the interconnection of TS and SUT in terms of GTPv2-C message flows. GTPv2-C messages are transferred over the s11Port port. GTPv2-C messages transferred over the s5Port port are used for message triggering.

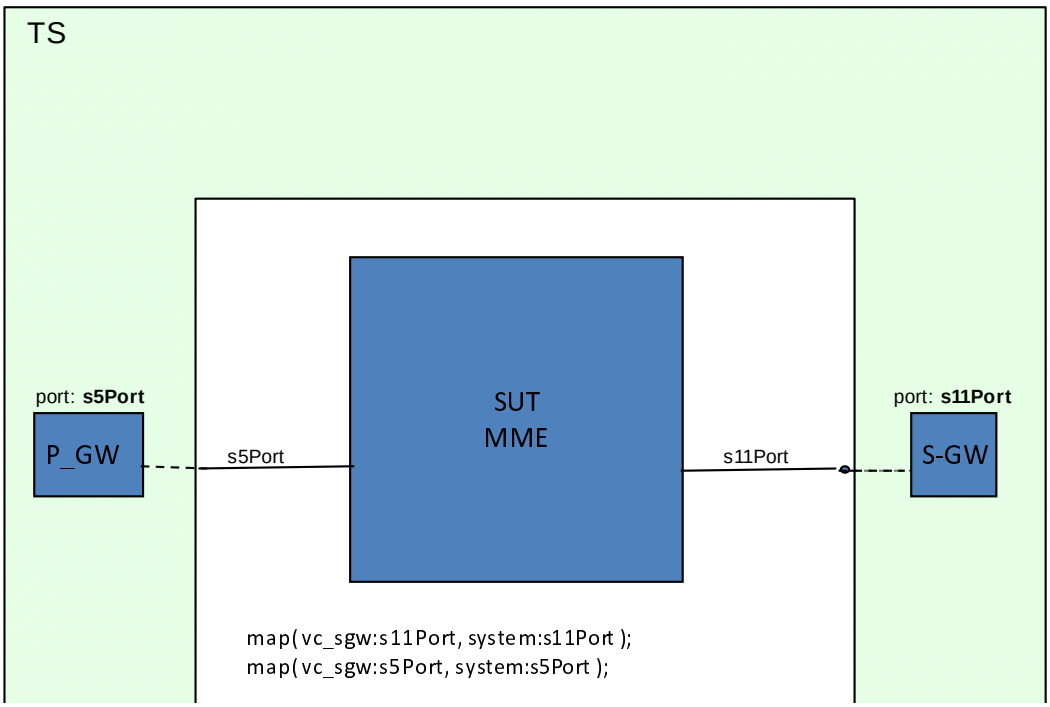


Figure 11: Interconnection for S-GW role

4.2.3.2.3 Configuration f_cf03_S11Up_SGW

Figure 12 shows the interconnection of TS and SUT in terms of GTPv2-C message flows. GTPv2-C messages are transferred over the s11Port port. GTPv2-C messages transferred over the s4Port and s5Port port are used for message triggering.

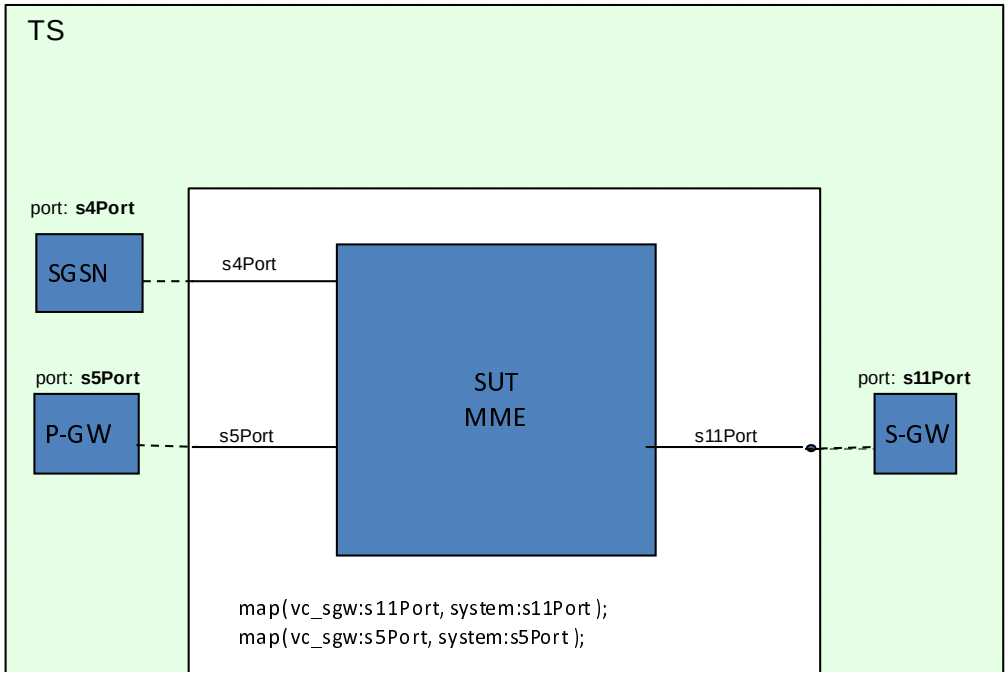


Figure 12: Interconnection for S-GW role

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 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.

5.2 Testing conventions

5.2.1 Test cases Preamble and Postamble

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

IUT is a MME, tested interface is S11

```
f_cf01_S11Up_MME
```

```
f_cf01_S11Down_MME
```

IUT is a S-GW, tested interface is S11

```
f_cf01_S11Up_SGW
```

```
f_cf01_S11Down_SGW
```

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 2.
- Prefixes and suffixes should be separated from the body of the identifier with an underscore ("_"):

EXAMPLE 1: `c_requestMessagesDone, 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_ f_cf01_S11Up_MME`.

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	S11_	*none*	S11_Steps	
TSS grouping	Use all upper-case letters	*none*	*none*	TP_S11_MME	
Message template	Use lower-case initial letter	m_	none	m_accessPointName	
Message template with wildcard or matching expression	Use lower-case initial letters	mw_	none	mw_accessPointName	
Port instance	Use lower-case initial letter	*none*	*none*	s11Port	
Constant	Use lower-case initial letter	c_	*none*	c_commandMessagesDone	
Function	Use lower-case initial letter	f_	*none*	f_getNextSequenceNumber ()	
Altstep	Use lower-case initial letter	a_	*none*	a_sgw_default ()	
Variable	Use lower-case initial letter	v_	*none*	v_gtpv2Ind	
PICS values	Use all upper case letters	*PC_ _*	*none*	PICS_S11_IUT_IS_MME	Note
PIXIT values	Use all upper case letters	*PX_*	*none*	PX_GTPC_S11_ETS_MME_IPADDR	Note
Parameterization	Use lower-case initial letter	p_	*none*	p_bearer_context	
Enumerated Value	Use lower-case initial letter	e_	*none*	e_modifyBearerCommand	
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 GTPv2-C protocol on the S11 interface as defined in ETSI TS 103 202-2 [2]. As all the test purposes describe the behaviour at both the MME and the S-GW, two test cases have been derived from each test purpose.

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>"_"<interface>"_"<iut >"_"<scope >"_"<number>"		
<tc>	=	Test Case:	fixed to "TC"	
<interface>	=	target interface:	S11	
<iut>	=	type of IUT:	MME or SGW	
<scope>	=	group	PM	Path Management
			TM	Tunnel Management
			CSF_SRVCC	CS Fallback and SRVCC Related Messages
			N3GPP_AR	Non-3GPP Access Releated Messages
			RR	Restoration and Recovery
			TMM	Trace Management Messages
<number>	=	sequential number	(01-99)	
NOTE: This naming scheme results into a one-to-two correspondence between the test purpose identifiers as defined in ETSI TS 103 202-2 [2] and the test case identifiers. The TP identifier of the test cases TC_S11_MME_<scope>_01 and TC_S11_SGW__<scope>_01 is TP__<scope>_01.				

Annex A (normative): DIAMETER S11 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 [4]. Any additional information which may be needed can be found in the present 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 129 274 [1]
Protocol to be tested:	GTPv2-C
ATS Specification:	ETSI TS 103 202-3, annex B
Abstract Test Method:	ETSI TS 103 202-3, 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 129 274 [1]
Version:	V10.14.0
PICS References:	ETSI TS 103 202-1 [9]

A.8 PIXIT items

A.8.1 S11 related 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.

Table A.7: PIXIT for the S11 interface

No	PIXIT Identifier	Description
1	PX_GTPC_S11_ETS_MME_IPADDR	Charstring, PIXIT item IP address of the test system acting as MME
2	PX_GTPC_S11_ETS_MME_PORT	Charstring, PIXIT item port number of the test system acting as MME
3	PX_GTPC_S11_ETS_SGW_IPADDR	Charstring, PIXIT item IP address of the test system acting as S-GW
4	PX_GTPC_S11_ETS_SGW_PORT	Charstring, PIXIT item port number of the test system acting as S-W
5	PX_GTPC_S11_SUT_MME_IPADDR	Charstring, PIXIT item IP address of the system under test acting as MME
6	PX_GTPC_S11_SUT_MME_PORT	Charstring, PIXIT item port number of the system under test acting as MME
7	PX_GTPC_S11_SUT_SGW_IPADDR	Charstring, PIXIT item IP address of the system under test acting as S-GW
8	PX_GTPC_S11_SUT_SGW_PORT	Charstring, PIXIT item port number of the system under test acting as S-GW
9	PX_GTPC_S11_ETS_PGW_IPADDR	IP address of the test system acting as P-GW
10	PX_GTPC_S11_ETS_ PGW_PORT	Port number of the test system acting as P-GW
11	PX_GTPC_S11_ETS_SGSN_IPADDR	IP address of the test system acting as SGSN
12	PX_GTPC_S11_ETS_ SGSN_PORT	Port number of the test system acting as SGSN
13	PX_WRONG_PROTOCOL_VERSION	Echo request/response invalid protocol number
14	PX_EBI	EPS Bearer ID

No	PIXIT Identifier	Description
15	PX_EBI_HANDOVER	Second EPS Bearer ID
16	PX_VISITED_APN	Access Point Name to be visited by the UE
17	PX_CALLER_IMSI	International Mobile Subscriber Identity (IMSI) for the caller
18	PX_CALLER_MSISDN	Mobile Station ISDN Number (MSISDN) for the caller
19	PX_CALLER_MEI	Mobile Equipment Identity (MEI) for the caller
20	PX_CALLER_MCC	Mobile Country Code (MCC) for the caller
21	PX_CALLER_MNC	Mobile Network Code (MNC) for the caller
22	PX_CALLER_TAC	Tracking Area Code (TAC) for the caller
23	PX_CALLER_EUTRAN_CELL_ID	E-UTRAN Cell Identifier (ECI) for the caller
24	PX_CALLER_CELL_IDENTITY	Cell Identity (CI) for the caller
25	PX_CALLER_LOCATION_AREA_CODE	Location Area Code (LAC) for the caller
26	PX_CALLEE_IMSI	International Mobile Subscriber Identity (IMSI) for the callee
27	PX_CALLEE_MSISDN	Mobile Station ISDN Number (MSISDN) for the callee
28	PX_CALLEE_MEI	Mobile Equipment Identity (MEI) for the callee
29	PX_CALLEE_MCC	Mobile Country Code (MCC) for the callee
30	PX_CALLEE_MNC	Mobile Network Code (MNC) for the callee
31	PX_CALLEE_TAC	Tracking Area Code (TAC) for the callee
32	PX_CALLEE_EUTRAN_CELL_ID	E-UTRAN Cell Identifier (ECI) for the callee
33	PX_CALLEE_CELL_IDENTITY	Cell Identity (CI) for the callee
34	PX_CALLEE_LOCATION_AREA_CODE	Location Area Code (LAC) for the callee
35	PX_ENTERPRISE_ID	Enterprise identifier (Refer to IANA web site (http://www.iana.org/assignments/enterprise-numbers))
36	PX_SENDER_F_TEID_IPv4ADDRESS	S11 MME F-TEID (IPv4)
37	PX_S11S4_SGW_F_TEID_IPv4ADDRESS	S11/S4 S-GW F-TEID (IPv4)
38	PX_S5S8_PGW_F_TEID_IPv4ADDRESS	S5/S8 P-GW F-TEID (IPv4)
39	PX_PAA_IPV4ADDRESS	PDN Address and Prefix (IPv4)
40	PX_S1_U_eNodeB_F_TEID_IPv4ADDRESS	S1-U eNodeB GTP-U interface F-TEID (IPv4)
41	PX_S1_U_SGW_F_TEID_IPv4ADDRESS	S1-U SGW GTP-U interface F-TEID (IPv4)
42	PX_S5S8_U_PGW_F_TEID_IPv4ADDRESS	S5/S8 PGW GTP-U interface F-TEID (IPv4)
43	PX_AMBR_UL	Aggregate Maximum Bit Rate for Uplink (AMBR Uplink)
44	PX_AMBR_DL	Aggregate Maximum Bit Rate for Downlink (AMBR Downlink)
45	PX_NODE_ID	Global unicast address
46	PX_CSIDS	PDN Connection Set Identifier list
47	PX_CSIDS_NUM	Number of item in the PDN Connection Set Identifier list
48	PX_MME_MAC_ADDRESS	MAC address of the system under test acting as MME
49	PX_SGW_MAC_ADDRESS	MAC address of the system under test acting as S-GW
50	PX_PGW_MAC_ADDRESS	MAC address of the P-GW, the system under test acting as S-GW
51	PX_SGSN_MAC_ADDRESS	MAC address of SGSN, the system under test acting as S-GW

Table A.8: PIXIT for LibCommon

No	PIXIT Identifier	Description
1	PX_TSYNC_TIME_LIMIT	Default time limit for a sync client to reach a synchronization point
2	PX_TSHUT_DOWN_TIME_LIMIT	Default time limit for a sync client to finish its execution of the shutdown default
3	PX_TWAIT	Time to control that IUT reacts prior to Upper Tester action
4	PX_TAC	Time to control the reception of a message
5	PX_TNOAC	Time to control that IUT sends nothing

Annex B (normative): GTPv2-C on S11 interface 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_10320203v010101p0.zip which accompanies the present document.

Annex C (informative): GTPv2-C on S11 interface Test Purpose Language (TPLAN) descriptions

The test purposes in ETSI TS 103 202-2 [2] have been written in a way where one TP describes both the behaviour of the MME and the SGW. Consequently, to obtain pure conformance test cases, two TCs have been produced per TP. For each of these TCs a test purpose representation has been written using the TPLan notation according to ETSI ES 202 553 [8].

The TPLan descriptions corresponding to the ATS are contained in archive ts_10320203v010101p0.zip which accompanies the present document.

History

Document history		
V1.1.1	December 2015	Publication