ETSI TS 103 653-3 V2.1.1 (2022-01)

Core Network and Interoperability Testing (INT);
VoLTE/ViLTE interoperability test description over 4G/early 5G in physical/virtual environments;
(3GPP™ Release 15);
Part 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) for VoLTE/ViLTE interoperability

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. Full details of the entire series can be found in part 1 [11].

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).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document specifies the Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for Testing (PIXIT) pro forma for the VoLTE/ViLTE interoperability test description over 4G/early 5G in physical/virtual environments in compliance with the relevant requirements and in accordance with the relevant guidance given in ISO/IEC 9646-7 [i.3] and ETSI ETS 300 406 [i.4].

The test notation used in the ATS is TTCN-3 (see ETSI ES 201 873-1 [i.5]).

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.

The present version of the document contains modifications made based on findings during the validation of the test specification against live and recorded network traffic.

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 124 229: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; 5G; IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3 (3GPP TS 24.229 Release 15)".

[2] ETSI TS 129 165: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; 5G; Inter-IMS Network to Network Interface (NNI) (3GPP TS 29.165 Release 15)".

[3] ETSI TS 129 228: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; IP Multimedia (IM) Subsystem Cx and Dx Interfaces; Signalling flows and message contents (3GPP TS 29.228 Release 15)".

[4] ETSI TS 129 229: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; Cx and Dx interfaces based on the Diameter protocol; Protocol details (3GPP TS 29.229 Release 15)".

[5] ETSI TS 129 214: "Universal Mobile Telecommunications System (UMTS); LTE; 5G; Policy and charging control over Rx reference point (3GPP TS 29.214 Release 15)".

[6] ETSI TS 129 212: "Universal Mobile Telecommunications System (UMTS); LTE; 5G; Policy and Charging Control (PCC); Reference points (3GPP TS 29.212 Release 15)".

[7] ETSI TS 129 272: "Universal Mobile Telecommunications System (UMTS); LTE; 5G; Evolved Packet System (EPS); Mobility Management Entity (MME) and Serving GPRS Support Node (SGSN) related interfaces based on Diameter protocol (3GPP TS 29.272 Release 15)".

[8] ETSI TS 129 215: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; Policy and Charging Control (PCC) over S9 reference point; Stage 3 (3GPP TS 29.215 Release 15)".

[9] ETSI TS 129 328: "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 Release 15)".

[10] ETSI TS 129 329: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; 5G; Sh interface based on the Diameter protocol; Protocol details (3GPP TS 29.329 Release 15)".

[11] ETSI TS 103 653-1: "Core Network and Interoperability Testing (INT); VoLTE/ViLTE interoperability test description over 4G/early 5G in physical/virtual environments; (3GPP™ Release 15); Part 1: Test Purposes (TP) and Protocol Implementation Conformance Statement (PICS) for VoLTE/ViLTE interoperability".

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

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.

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.

[i.1] ETSI TS 132 299: "Digital cellular telecommunications system (Phase 2+) (GSM); Universal Mobile Telecommunications System (UMTS); LTE; Telecommunication management; Charging management; Diameter charging applications (3GPP TS 32.299 Release 15)".

[i.2] ISO/IEC 9646-1: "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 1: General concepts".

[i.3] ISO/IEC 9646-7: "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 7: Implementation Conformance Statements".

[i.4] ETSI ETS 300 406: "Methods for testing and Specification (MTS); Protocol and profile conformance testing specifications; Standardization methodology".

[i.5] 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".

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.3], ETSI TS 124 229 [1], ETSI TS 129 165 [2], ETSI TS 129 228 [3], ETSI TS 129 229 [4], ETSI TS 132 299 [i.1], ETSI TS 129 214 [5], ETSI TS 129 212 [6], ETSI TS 129 272 [7], ETSI TS 129 215 [8], ETSI TS 129 328 [9] and ETSI TS 129 329 [10] apply.

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in ISO/IEC 9646-1 [i.2], ISO/IEC 9646-6 [12], ISO/IEC 9646-7 [i.3], ETSI TS 124 229 [1], ETSI TS 129 165 [2], ETSI TS 129 228 [3], ETSI TS 129 229 [4], ETSI TS 132 299 [i.1], ETSI TS 129 214 [5], ETSI TS 129 212 [6], ETSI TS 129 272 [7], ETSI TS 129 215 [8], ETSI TS 129 328 [9] and ETSI TS 129 329 [10] apply.

4 Abstract Test Method (ATM)

4.1 Introduction

The following clauses describes the ATM used to test the VoLTE/ViLTE interoperability over 4G/early 5G in physical/virtual environments.

4.2 Test architecture

The test architecture foreseen is a complex system of all involved components. The following figures give an overview. Figure 1 shows the network entities involved in the interoperability testing and the mapping to test components. Figure 2 adds a more technical view of the implementation plans for the test system components.

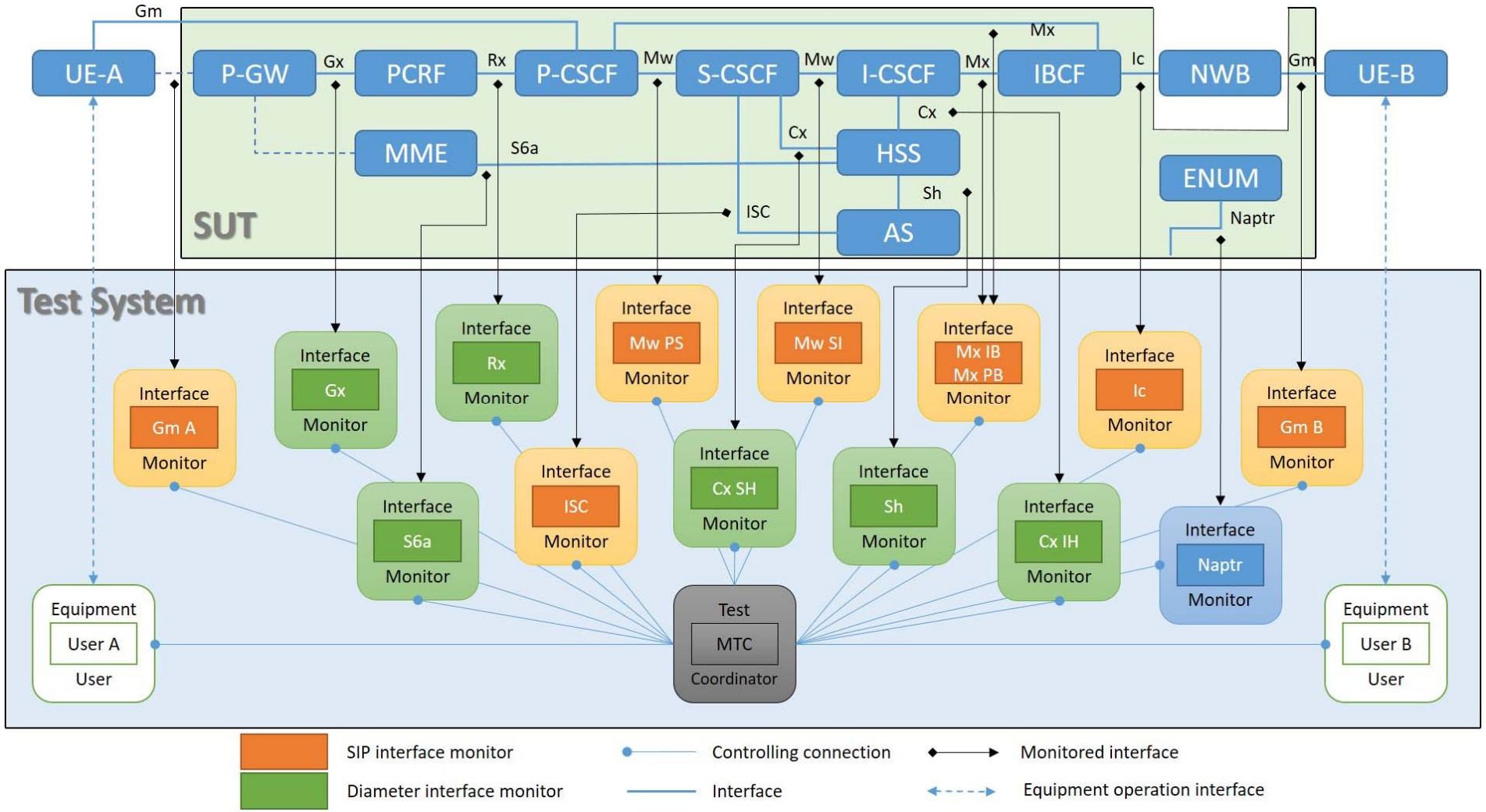

Figure 1: VxLTE interoperability test system configuration

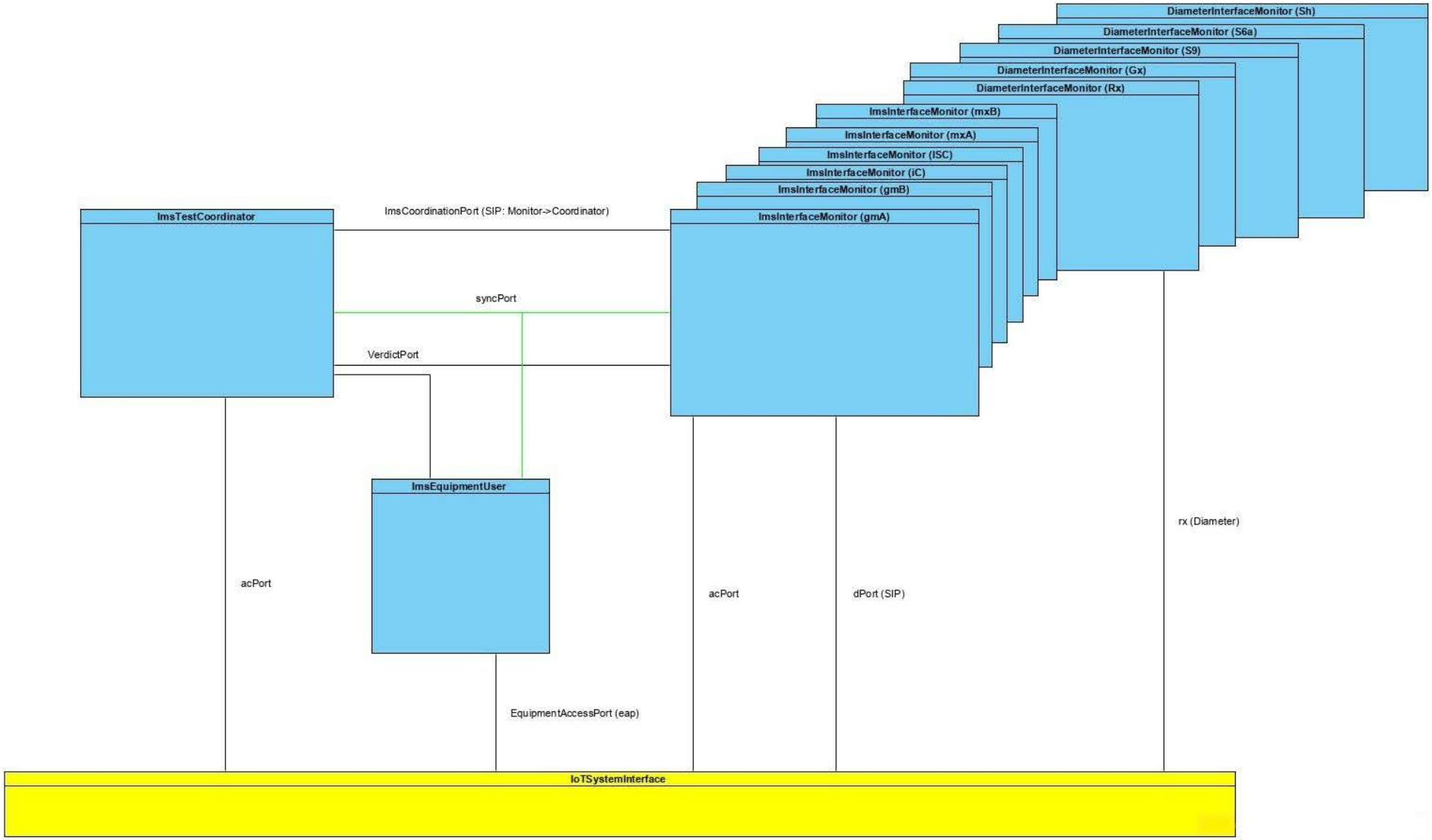

Figure 2: VxLTE interoperability test component view

4.3 Interconnection of TS and SUT

The interconnection of the Test System (TS) and the System Under Test (SUT) is depicted in figure 2.

The ImsTestCoordinator controls the overall test execution by coordinating the ImsInterfacesMonitor components on the SIP and Diameter interfaces under observation. It synchronizes those test components and receives individual test verdicts from them which are processed for the determination of the final overall test verdict.

ImsTestCoordinator and the ImsInterfacesMonitor components connect through the IoTSystemInterface to the SUT. The ImsEquipmentUser entity is responsible for the connection and management of external equipment.

4.4 Implementation of TS

The implementation of the TS in TTCN-3 is depicted in figure 3 which gives the names of all test components and the related TTCN-3 ports, variables and timers. It also shows the connections between the test components via ImsCoordinationPort, VerdictPort and SyncPort and the connections to the IotSystemInterface via SipPort, DiameterPort, eaPort and acPort.

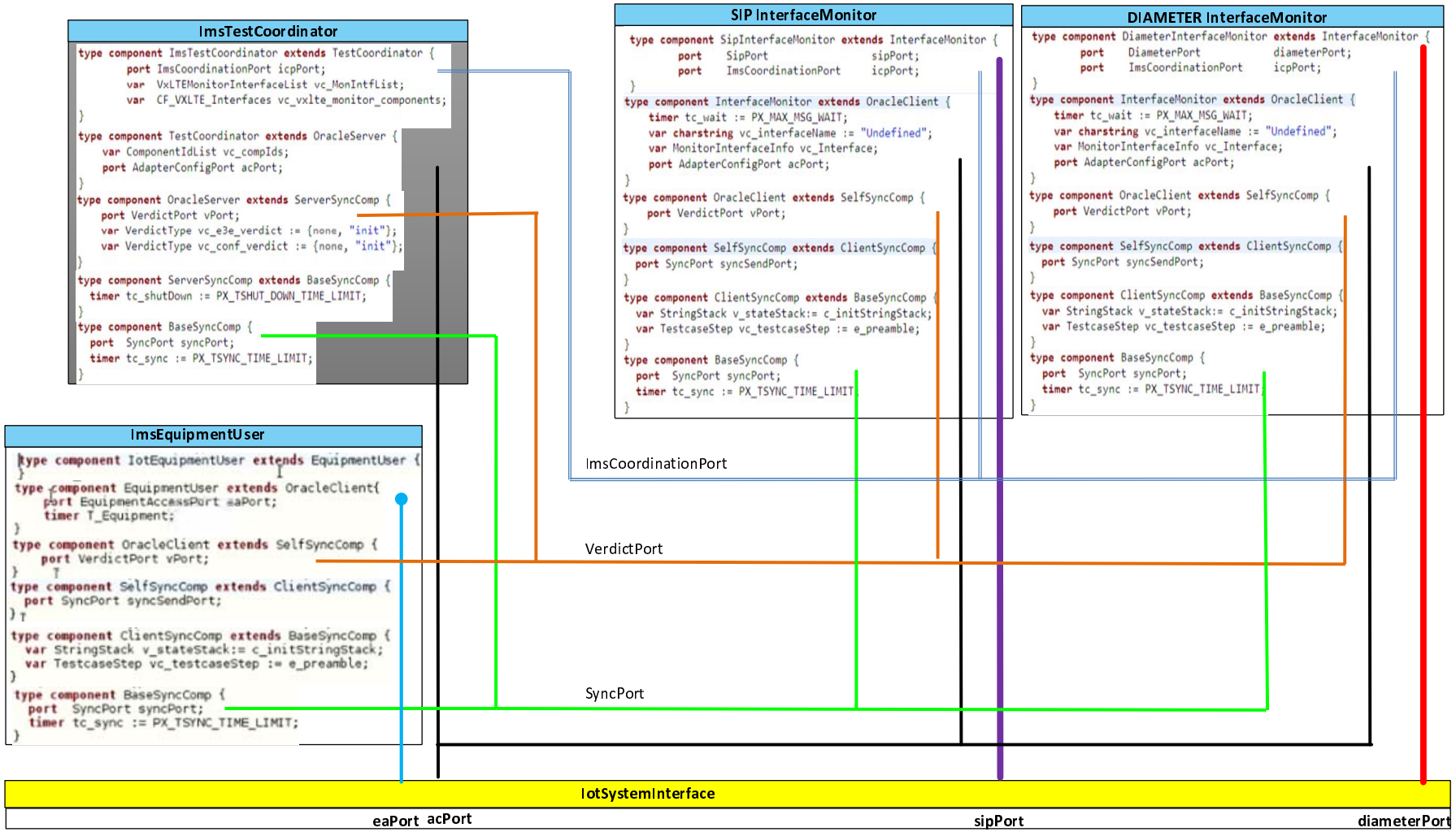

Figure 3: VxLTE interoperability test component implementation

4.5 Test Adapter

For execution of the tests the Test Adapter (TA) will be developed. For the Diameter interfaces there are two possibilities for communicating over the TA that have to be considered:

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

Annex A (normative): VoLTE/ViLTE interoperability over 4G/early 5G in physical/virtual environments 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 [12]. 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:	This interoperability test specification covers several protocol specifications for the SIP and DIAMETER protocols. In the below tables, references are given to the protocol specifications in force per interface.
Protocol to be tested:	
ATS Specification:	ETSI TS 103 653-3, annex B
Abstract Test Method:	ETSI TS 103 653-3, 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

The protocol identification is presented in the clauses below per interface.

The PICS reference for all interfaces is: ETSI TS 103 653-1 [11].

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.

The present document describes interoperability testing spanning several interfaces. For a better understanding, namely in cases where not all interfaces are under observation, the PIXIT tables are presented per interface under test.

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

A.8.2 PIXIT items for the Gm Interface

The Gm interface connects a UE with a P-CSCF using the SIP and SDP protocols as defined in ETSI TS 124 229 [1].

Table A.6: Gm interface ports and addresses for network A

It.	Identifier	Type	Description
1	PX_SIP_GMA_UE_IPADDR	Charstring	Gm IP address of UE
2	PX_SIP_GMA_UE_PORT	Integer	Gm Port number of UE
3	PX_SIP_GMA_PCSCF_IPADDR	Charstring	Gm IP address of P-CSCF
4	PX_SIP_GMA_PCSCF_PORT	Integer	Gm Port number of P-CSCF
5	PX_SIP_GMA_MONITORENABLED	Boolean	Is monitoring of the Gm interface at network A enabled?
6	PX_SIP_GMA_INTERFACENAME	Charstring	Gm interface name

Table A.7: Gm interface ports and addresses for network B

It.	Identifier	Type	Description
1	PX_SIP_GMB_UE_IPADDR	Charstring	Gm IP address of UE
2	PX_SIP_GMB_UE_PORT	Integer	Gm Port number of UE
3	PX_SIP_GMB_PCSCF_IPADDR	Charstring	Gm IP address of P-CSCF
4	PX_SIP_GMB_PCSCF_PORT	Integer	Gm Port number of P-CSCF
5	PX_SIP_GMB_MONITORENABLED	Boolean	Is monitoring of the Gm interface at network B enabled?
6	PX_SIP_GMB_INTERFACENAME	Charstring	Gm interface name

A.8.3 PIXIT items for the Ic Interface

The Ic interface connects an IBCF with another IBCF using the SIP and SDP protocols as defined in ETSI TS 129 165 [2].

Table A.8: Ic interface ports and addresses

It.	Identifier	Type	Description
1	PX_SIP_IC_IBCF_A_IPADDR	Charstring	Ic IP address of IBCF of network A
2	PX_SIP_IC_IBCF_A_PORT	Integer	Ic Port number of IBCF of network A
3	PX_SIP_IC_IBCF_B_IPADDR	Charstring	Ic IP address of IBCF of network B
4	PX_SIP_IC_IBCF_B_PORT	Integer	Ic Port number of IBCF of network B
5	PX_SIP_IC_MONITORENABLED	Boolean	Is monitoring of the Ic interface enabled?
6	PX_SIP_IC_INTERFACENAME	Charstring	Ic interface name

A.8.4 PIXIT items for the Mw Interface

The Mw interface connects an x-CSCF with another x-CSCF or an IBCF using the SIP and SDP protocols as defined in ETSI TS 124 229 [1].

Table A.9: Mw interface ports and addresses

It.	Identifier	Type	Description
1	PX_SIP_MW_P_CSCF_IPADDR	Charstring	Mw IP address of P-CSCF
2	PX_SIP_MW_P_CSCF_PORT	Integer	Mw Port number of P-CSCF
3	PX_SIP_MW_I_CSCF_IPADDR	Charstring	Mw IP address of I-CSCF
4	PX_SIP_MW_I_CSCF_PORT	Integer	Mw Port number of I-CSCF
5	PX_SIP_MW_S_CSCF_IPADDR	Charstring	Mw IP address of S-CSCF
6	PX_SIP_MW_S_CSCF_PORT	Integer	Mw Port number of S-CSCF
7	PX_SIP_MW_IBCF_IPADDR	Charstring	Mw IP address of IBCF
8	PX_SIP_MW_IBCF_PORT	Integer	Mw Port number of IBCF
9	PX_SIP_MW_PI_MONITORENABLED	Boolean	Is monitoring of the Mw/PI interface enabled?
10	PX_SIP_MW_PS_MONITORENABLED	Boolean	Is monitoring of the Mw/PS interface enabled?
11	PX_SIP_MW_IS_MONITORENABLED	Boolean	Is monitoring of the Mw/IS interface enabled?
12	PX_SIP_MW_IB_MONITORENABLED	Boolean	Is monitoring of the Mw/IB interface enabled?
13	PX_SIP_MW_PI_INTERFACENAME	Charstring	Mw/PI interface name
14	PX_SIP_MW_PS_INTERFACENAME	Charstring	Mw/PS interface name
15	PX_SIP_MW_IS_INTERFACENAME	Charstring	Mw/IS interface name
16	PX_SIP_MW_PB_INTERFACENAME	Charstring	Mw/PB interface name
17	PX_SIP_MW_IB_INTERFACENAME	Charstring	Mw/IB interface name

A.8.5 PIXIT items for the ISC Interface

The ISC interface connects an S-CSCF with an AS using the SIP and SDP protocols as defined in ETSI TS 129 165 [2].

Table A.10: Ic interface ports and addresses

It.	Identifier	Type	Description
1	PX_SIP_ISC_S_CSCF_IPADDR	Charstring	Ic IP address of S-CSCF
2	PX_SIP_ISC_S_CSCF_PORT	Integer	Ic Port number of S-CSCF
3	PX_SIP_ISC_AS_IPADDR	Charstring	Ic IP address of AS
4	PX_SIP_ISC_AS_PORT	Integer	Ic Port number of AS
5	PX_SIP_ISC_MONITORENABLED	Boolean	Is monitoring of the ISC interface enabled?
6	PX_SIP_ISC_INTERFACENAME	Charstring	Is interface name

A.8.6 PIXIT items for the Cx Interface

The Cx interface connects an I- or S-CSCF with an HSS using the Diameter protocol as defined ETSI TS 129 228 [3] and ETSI TS 129 229 [4].

Table A.11: Cx interface ports and addresses

It.	Identifier	Type	Description
1	PX_DIAMETER_CX_I_CSCF_IPADDR	Charstring	Cx IP address of I-CSCF
2	PX_DIAMETER_CX_I_CSCF_PORT	Integer	Cx Port number of I-CSCF
3	PX_DIAMETER_CX_S_CSCF_IPADDR	Charstring	Cx IP address of S-CSCF
4	PX_DIAMETER_CX_S_CSCF_PORT	Integer	Cx Port number of S-CSCF
5	PX_DIAMETER_CX_HSS_IPADDR	Charstring	Cx IP address of HSS
6	PX_DIAMETER_CX_HSS_PORT	Integer	Cx Port number of HSS
7	PX_DIAMETER_CX_IH_MONITORENABLED	Boolean	Is monitoring of the Cx/Sh interface enabled?
8	PX_DIAMETER_CX_SH_MONITORENABLED	Boolean	Is monitoring of the Cx/Ih interface enabled?
9	PX_DIAMETER_SINGLE_INTERFACE	Boolean	Can both CX_IH and CX_SH interfaces be treated as one interface?
10	PX_DIAMETER_CX_IH_INTERFACENAME	Charstring	Cx/Ih interface name
11	PX_DIAMETER_CX_SH_INTERFACENAME	Charstring	Cx/Sh interface name

A.8.7 PIXIT items for the Gx Interface

The Gx interface connects a PCRF with a PGW using the Diameter protocol as defined in ETSI TS 129 212 [6].

Table A.12: Gx interface ports and addresses

It.	Identifier	Type	Description
1	PX_DIAMETER_GX_PCRF_IPADDR	Charstring	Gx IP address of PCRF
2	PX_DIAMETER_GX_PCRF_PORT	Integer	Gx Port number of PCRF
3	PX_DIAMETER_GX_PGW_IPADDR	Charstring	Gx IP address of PGW
4	PX_DIAMETER_GX_PGW_PORT	Integer	Gx Port number of PGW
5	PX_DIAMETER_GX_MONITORENABLED	Boolean	Is monitoring of the Gx interface enabled?
6	PX_DIAMETER_GX_INTERFACENAME	Charstring	Gx interface name

A.8.8 PIXIT items for the Rx Interface

The Rx interface connects a P-CSCF with a PCRF using the Diameter protocol as defined in ETSI TS 129 214 [5].

Table A.13: Rx interface ports and addresses

It.	Identifier	Type	Description
1	PX_DIAMETER_RX_P_CSCF_IPADDR	Charstring	Rx IP address of P-CSCF
2	PX_DIAMETER_RX_P_CSCF_PORT	Integer	Rx Port number of P-CSCF
3	PX_DIAMETER_RX_PCRF_IPADDR	Charstring	Rx IP address of PCRF
4	PX_DIAMETER_RX_PCRF_PORT	Integer	Rx Port number of PCRF
5	PX_DIAMETER_RX_MONITORENABLED	Boolean	Is monitoring of the Rx interface enabled?
6	PX_DIAMETER_RX_INTERFACENAME	Charstring	Rx interface name

A.8.9 PIXIT items for the S6a Interface

The S6a interface connects an MME with an HSS using the Diameter protocol as defined in ETSI TS 129 272 [7].

Table A.14: S6a interface ports and addresses

It.	Identifier	Type	Description
1	PX_DIAMETER_S6A_MME_IPADDR	Charstring	S6a IP address of MME
2	PX_DIAMETER_S6A_MME_PORT	Integer	S6a Port number of MME
3	PX_DIAMETER_S6A_HSS_IPADDR	Charstring	S6a IP address of HSS
4	PX_DIAMETER_S6A_HSS_PORT	Integer	S6a Port number of HSS
5	PX_DIAMETER_S6A_MONITORENABLED	Boolean	Is monitoring of the S6a interface enabled?
6	PX_DIAMETER_S6A_INTERFACENAME	Charstring	S6a interface name

A.8.10 PIXIT items for the S9 Interface

The S9 interface connects an H-PCRF with a V-PCRF using the Diameter protocol as defined in ETSI TS 129 215 [8].

Table A.15: S9 interface ports and addresses

It.	Identifier	Type	Description
1	PX_DIAMETER_S9_H_PCRF_IPADDR	Charstring	S9 IP address of H-PCRF
2	PX_DIAMETER_S9_H_PCRF_PORT	Integer	S9 Port number of H-PCRF
3	PX_DIAMETER_S9_V_PCRF_IPADDR	Charstring	S9 IP address of V-PCRF
4	PX_DIAMETER_S9_V_PCRF_PORT	Integer	S9 Port number of V-PCRF
5	PX_DIAMETER_S9_MONITORENABLED	Boolean	Is monitoring of the S9 interface enabled?
6	PX_DIAMETER_S9_INTERFACENAME	Charstring	S9 interface name

A.8.11 PIXIT items for the Sh Interface

The Sh interface connects an AS with an HSS using the Diameter protocol as defined in ETSI TS 129 328 [9] and ETSI TS 129 329 [10].

Table A.16: Sh interface ports and addresses

It.	Identifier	Type	Description
1	PX_DIAMETER_SH_AS_IPADDR	Charstring	Sh IP address of AS
2	PX_DIAMETER_SH_AS_PORT	Integer	Sh Port number of AS
3	PX_DIAMETER_SH_HSS_IPADDR	Charstring	Sh IP address of HSS
4	PX_DIAMETER_SH_HSS_PORT	Integer	Sh Port number of HSS
5	PX_DIAMETER_SH_MONITORENABLED	Boolean	Is monitoring of the Sh interface enabled?
6	PX_DIAMETER_SH_INTERFACENAME	Charstring	Sh interface name

A.8.12 Interface independent PIXIT items

Table A.17: Interface independent PIXIT items

It.	Identifier	Type	Description
1	PX_MAX_MSG_WAIT	Float	Maximum time limit used by monitor components for waiting for expected incoming messages
2	PX_EUT_TRIGGER_RESPONSE	Float	Maximum time limit used by trigger component for waiting for EUT response after command has been sent

A.8.13 LibCommon items

Table A.18: 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): 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 [i.5].

The TTCN-3 library modules corresponding to the ATS are contained in archive ts_10365303v020101p0.zip which accompanies the present document.

Annex C (informative): Bibliography

- ETSI TS 103 653-2: "Core Network and Interoperability Testing (INT); VoLTE/ViLTE interoperability test description over 4G/early 5G in physical/virtual environments; (3GPP™ Release 15); Part 2: Test Descriptions for VoLTE/ViLTE interoperability".

History

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