ETSI TS 102 760-3 V1.1.1 (2014-06)

Intelligent Transport Systems (ITS);
Communications Access for Land Mobiles (CALM);
Test specifications for Access Technology Support
(ISO 21218);
Part 3: Abstract Test Suite (ATS) and partial PIXIT proforma

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
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Contents

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Intelligent Transport Systems (ITS).

The present document is part 3 of a multi-part deliverable covering the test specifications for ITS access technology support (service access points and related procedures) ISO 21218 [1] as identified below:

Part 1: " Implementation Conformance Statement (ICS) proforma";

Part 2: "Test Suite Structure and Test Purposes (TSS & TP)";

Part 3: "Abstract Test Suite (ATS) and partial PIXIT proforma".

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 provides the Abstract Test Suite (ATS) and partial PIXIT proforma for the protocols specified in ISO 21218 [1] based on the related TSS & TP specification ETSI TS 102 760-2 [3] and the PICS proforma ETSI TS 102 760-1 [2], and in accordance with the relevant guidance given in ISO/IEC 9646-1 [4], ISO/IEC 9646-2 [5], ETSI ETS 300 406 [6] and ETSI EG 202 798 [i.1].

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 referenced 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] ISO 21218:2013: "Intelligent Transport Systems - Communications access for land mobiles (CALM) - Access technology support".

[2] ETSI TS 102 760-1 (V1.2.1): "Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for access technology support (ISO 21218); Part 1: Protocol implementation conformance statement (PICS) proforma".

[3] ETSI TS 102 760-2 (V1.2.1): "Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for access technology support (ISO 21218); Part 2: Test Suite Structure and Test Purposes (TSS & TP)".

[4] ISO/IEC 9646-1 (1994): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 1: General concepts".

[5] ISO/IEC 9646-2 (1994): "Information technology -- Open Systems Interconnection -- Conformance testing methodology and framework -- Part 2: Abstract Test Suite specification".

[6] ETSI ETS 300 406 (1995): "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 201 873-7: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 7: Using ASN.1 with TTCN-3".

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.

[i.1] ETSI EG 202 798: "Intelligent Transport Systems (ITS); Testing; Framework for conformance and interoperability testing".

[i.2] ISO 21217:2014: "Intelligent transport systems -- Communications access for land mobiles (CALM) -- Architecture".

[i.3] ISO 24102-3:2013: "Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 3: Service access points".

[i.4] ISO 24102-4:2013: "Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 4: Station internal management communications".

[i.5] ISO 21215:2010: "Intelligent transport systems -- Communications access for land mobiles (CALM) -- M5".

[i.6] ETSI TR 103 099 (V1.1.1): "Intelligent Transport Systems (ITS);Architecture of conformance validation framework".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ISO 21218 [1], ETSI TS 102 760-1 [2], ETSI TS 102 760-2 [3], ISO 24102-4 [i.4], ISO/IEC 9646-1 [4], ISO/IEC 9646-2 [5], ETSI ETS 300 406 [6], ETSI ES 201 873-1 [7], ETSI ES 201 873-7 [8], ETSI EG 202 798 [i.1], ISO 21217 [i.2], ISO 24102-3 [i.3] and ISO 21215 [i.5] apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ISO 21218 [1], ETSI TS 102 760-1 [2], ETSI TS 102 760-2 [3], ISO 24102-4 [i.4], ISO/IEC 9646-1 [4], ISO/IEC 9646-2 [5], ETSI ETS 300 406 [6], ETSI ES 201 873-1 [7], ETSI ES 201 873-7 [8], ETSI EG 202 798 [i.1], ISO 21217 [i.2], ISO 24102-3 [i.3] and ISO 21215 [i.5] apply.

4 Abstract test method

4.1 Abstract protocol tester

In general, the conformance test system architecture as illustrated in the ITS testing framework ETSI EG 202 798 [i.1] applies. This ITS testing framework is extended by a cnPort and the related configuration / event notification transport as illustrated in figure 1.

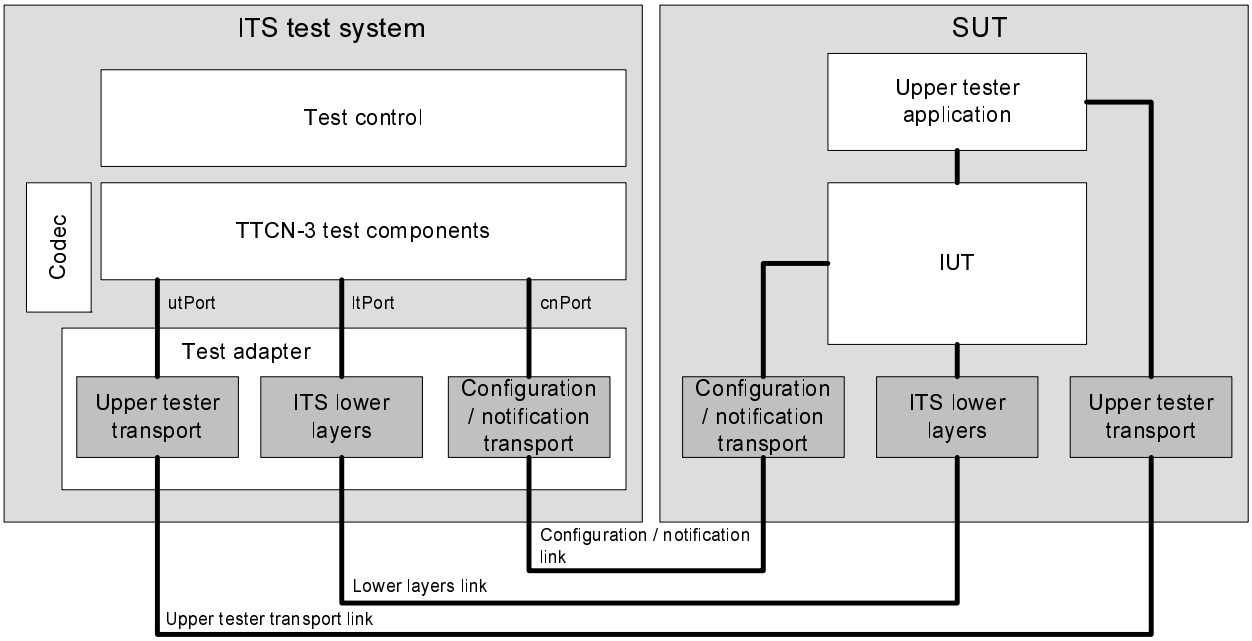

Figure 1: Abstract protocol tester - General approach

For the present document, the IUT is the ATSP. The upper tester application allows accessing the IN-SAP of the IUT. Lower layer protocols indicated by the block "ITS lower layers" are not existent, as the ATSP constitutes the lowest layer (ITS-S access layer) of the ITS-S station and communication architecture ISO 21217 [i.2]. The configuration and event notification access allows to access the IUT via the MI-SAP.

NOTE 1: The ITS-S access layer corresponds to the OSI layers 1 and 2. ISO 21218 [1] specifies how to use any kind of access technology in an ITS station (ITS-S). Thus ISO 21218 does not contain details of this variety of possible access technologies. Testing of ISO 21218 thus needs to apply the ATSPs to a specific access technology.

An "Implementation Under Test" IUT contained in a "System Under Test" (SUT) is connected to the ITS test system via a lower layers link and an upper tester transport link and a configuration / notification link. These links allow accessing the points of control and observation (PCO) of the IUT. These three links between ITS test system and SUT may be realized differently, such that there might be one or two or three physical links.

NOTE 2: The lower layers link is the link of a specific access technology, e.g. 802.11(p) radio link as specified in ISO 21215 [i.5].

Accessing the IUT is performed with the "ITS station-internal management communications protocol" (IICP) specified in ISO 24102-4 [i.4] as illustrated in figure 2. Further on an auxiliary ITS station unit (AITS-SU) with a communication interface (CI) of same access technology as used in the IUT is needed for the lower layers link. For this purpose, the ITS test system, the AITS-SU and the SUT together behave as parts of an ITS station unit, where each of these three units constitutes an ITS station communication unit (ITS-SCU) as specified in ISO 21217 [i.2] and ISO 24102-4 [i.4]. The unique address of the ITS test system ITS-SCU is ITS-SCU-ID = 3 as specified in ISO 24102-4 [i.4]. The unique address of the CI ITS-SCU is ITS-SCU-ID = 4 as specified in ISO 24102-4 [i.4]. The unique address ITS-SCU-ID of the SUT is in the range of 8 through 66 534 and may be selected by different means, e.g. using the initialization procedure of IICP specified in ISO 24102-4 [i.4].

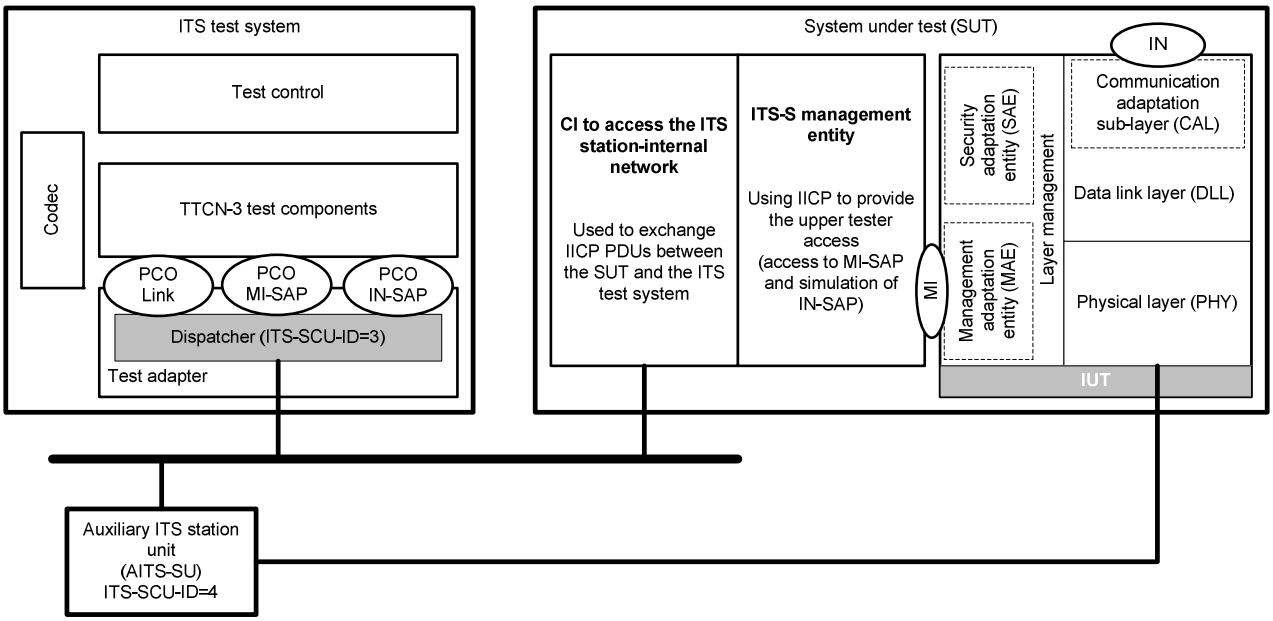

Figure 2: Abstract protocol tester - IUT located in the ITS-S access layer - IICP approach for upper tester and configuration / notification access

The test system simulates valid and invalid protocol behaviour, and analyses the reaction of the IUT upon a given stimulation.

4.2 Test architecture

The present document implements the general TTCN-3 test architecture described in ETSI EG 202 798 [i.1], clause 6.3.2 and clause 8.3.1.

Figure 3 shows the TTCN-3 test architecture used for the ATSP ATS.

- The MTC is of type ItsATSP and communicates with the SUT over atspPort (PCO Link) in order to exchange access technology specific PDUs between the ATSP test component and the ATSP IUT. The "ITS lower layers transport" system adapter connects to the AITS-SU containing the same access technology as used in the SUT. This connection uses PDUs which are equivalent to the IN-SAP service primitives specified in ISO 21218 [1].

- The MTC communicates with the SUT over the utPort (PCO IN-SAP) in order to trigger ATSP functionalities by simulating service primitives from the IN-SAP services. It is required to trigger the ATSP in the SUT to send frames. Furthermore, receiving frames may result for the ATSP in sending primitives to the upper layer, which is the ITS-S networking & transport layer. The "Upper tester transport" system adapter is used to adapt to the upper tester application implementation of the SUT.

NOTE 1: A special upper tester application is needed in the SUT only in case the SUT has not implemented IICP ISO 24102-4 [i.4].

- The MTC communicates with the SUT over the cnPort (PCO MI-SAP) in order to perform settings in the SUT, and in order to receive notifications from the SUT. The "Configuration / notification transport" system adapter is used to adapt to the configuration / notification access implementation of the SUT.

NOTE 2: A special configuration / notification access implementation is needed in the SUT only in case the SUT has not implemented IICP ISO 24102-4 [i.4].

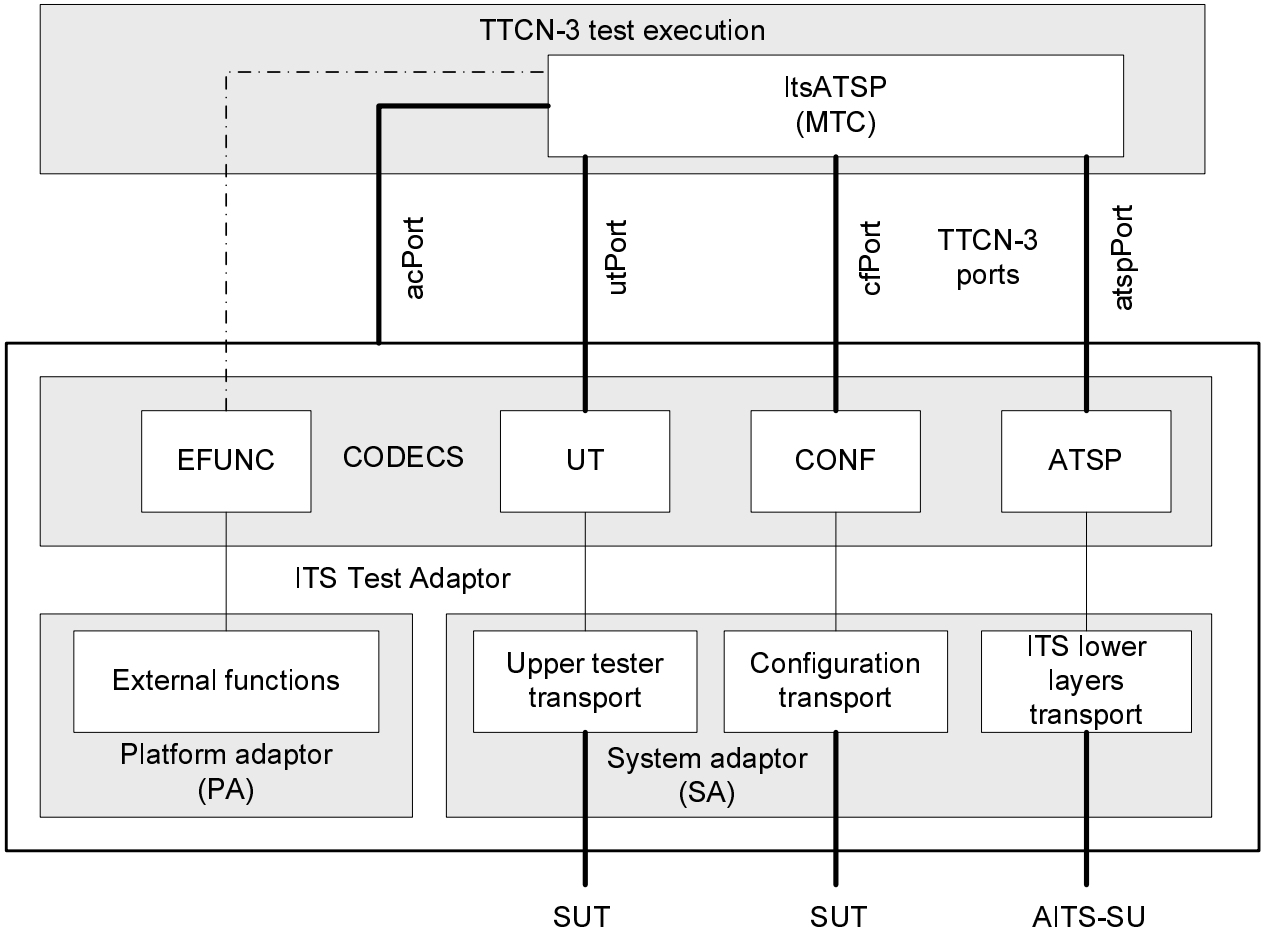

Figure 3: Test system architecture

4.3 Ports and abstract service primitives

4.3.1 Overview

The following TTCN-3 ports are used by the ATSP ATS:

- The atspPort of type AtspPort is used to receive messages from and transmit messages to the IUT (via the AITS-SU which provides IN-SAP service primitives as PDUs to the SA).
- The utPort of type UpperTesterPort is used to receive service data units from and transmit service data units to the IUT (via IN-SAP).
- The cfPort of type CfPort is used to configure the ATSP and to receive notifications from the ATSP (via MI-SAP).
- The acPort of type AdapterControlPort is not used.

Every port provides "Abstract Service Primitives" (ASPs) as specified in clause 4.3.2, clause 4.3.3 and clause 4.3.4.

4.3.2 ASPs of the atspPort

Two ASPs are used in the atspPort:

- The INsapPrimitivesUp primitive used to receive notifications of received frames sent by the IUT.
- The INsapPrimitivesDown primitive used to request transmission of frames to the IUT.

These primitives use the IN-UNITDATA-request, IN-UNITDATA-indication, and IN-UNITDATA-STATUS-indication types, which are declared in the CALMllsap module, following the ASN.1 definition from the base standard ISO 21218 [1].

4.3.3 ASPs of the utPort

The following ASPs are used in the utPort:

- The UtInitialize primitive is used to initialize IUT.
- The UtAtspEvent primitive is used to send IN-SAP service primitives to the IUT.
- The UtAtspEventInd is used to receive IN-SAP service primitives from the IUT.

4.3.4 ASPs of the cfPort

The following ASPs are used in the cnPort:

- The CfAtspInd primitive is used to monitor at the MI-SAP notifications from the IUT.

5 ATS conventions

5.1 Testing conventions

5.1.1 Testing states

5.1.1.1 Initial state

All test cases start with the function f_prInitialState. This function brings the IUT in an "initialized" state by invoking the upper tester primitive UtInitialize.

5.1.1.2 Final state

All test cases end with the function f_poDefault. This function brings the IUT back in an "idle" state. As no specific actions are required for the idle state in the base standard ISO 21218 [1], the function f_ poDefault does not invoke any action.

As necessary, further actions may be included in the f_poDefault function.

5.1.2 Message types - ASN.1 definitions

Message types are defined in ASN.1. ASN.1 definitions from the base standard ISO 21218 [1] are directly imported in TTCN-3 using the ASN.1 import method specified in ETSI ES 201 873-7 [8].

The following example shows the TTCN-3 import statement used to import ASN.1 definitions from ISO 21218 [1] in the TTCN-3 modules:

```
import from CAMllsap language "ASN.1:1997" all;
```

5.2 Naming conventions

5.2.1 General guidelines

The present document follows the naming convention guidelines provided in ETSI EG 202 798 [i.1].

5.2.2 Usage of Log statements

All TTCN-3 log statements use the following format:

- Three asterisks followed by a blank character.
- The TTCN-3 test case or function identifier in which the log statement is defined followed by a colon and a blank character.
- One of the possible log categories: INFO, WARNING, ERROR, PASS, FAIL, INCONC, TIMEOUT followed by a colon and a blank character.
- Free text.
- A blank character followed by three asterisks.

EXAMPLE: log("*** TC_ATSP_SE_BV_01: INFO: Waiting for power-on of IUT ***");

Furthermore, the following rules are applied for the Atsp ATS:

- Log statements are used in the body of the functions, so that invocation of functions is visible in the test logs.
- All TTCN-3 setverdict statements are combined with a log statement following the same above rules.

5.2.3 Test Case (TC) identifier

Table 1 shows the test case naming convention, which follows the test purposes ETSI TS 102 760-2 [3] naming convention.

Table 1: TC naming convention

TC_<root>_<gr>_<sgr>_<x>_<nn>		
<root> = root	ATSP	Access Technology Support Protocols
<gr> = group	SE	State event transitions
	MB	MIB I-Parameters
	HC	Handling of CIs
	DP	Handling of data plane
<x> = type of testing	BV	Valid Behaviour tests
	BI	Invalid Syntax or Behaviour Tests
<nn> = sequential number		01 to 99

EXAMPLE: TP identifier: TP/ATSP/SE/BV/01
TC identifier: TC_ATSP_SE_BV_01.

Annex A (normative): Partial PIXIT proforma for ATSP

A.1 Identification summary

Table A.1

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

A.2 ATS summary

Table A.2: Summary

Protocol Specification:	ISO 21218 [1] with access technology according to:
Protocol to be tested:	ATSP
ATS Specification:	ETSI TS 102 760-3
Abstract Test Method:	Clause 4

A.3 Test laboratory

Table A.3: Test laboratory

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

A.4 Client identification

Table A.4: Client identification

Client Identification:	
Client Test manager:	
Test Facilities required:	

A.5 SUT

Table A.5: SUT identification

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: Protocol identification

Name:	ISO 21218 [1] with access technology according to:
Version:	
PICS References:	ETSI TS 102 760-1 [2]

A.6.2 IUT information

Table A.7: Atsp Pixits

Identifier	Description	
PX_ITS_SCU_ID	Comment	Expected ITS-SCU-ID of the IUT CI
	Type	ITS_scuId
	Def. value	8
PX_Med_ID	Comment	Expected MedID of the IUT CI
	Type	MedID
	Def. value	0
PX_CI_MED_TYPE	Comment	Expected MedType of the IUT CI
	Type	MedType
	Def. value	5
PX_CI_INTERFERER_MED_TYPE	Comment	MedType of potential interferer
	Type	MedType
	Def. value	5
PX_CI_UNKNOWN_PARAM_NO	Comment	Unknown I-Parameter No
	Type	I_ParamNo
	Def. value	255
PX_CI_NO_SUPPORT_PARAM	Comment	Not supported I-Parameter
	Type	I_Param

	Def. value	{
		paramNo := PX_CI_NO_SUPPORT_PARAM_NO,
		parameter := {UserPriority := 0}
		}

PX_CI_NO_SUPPORT_PARAM_NO	Comment	Number of not supported I-Parameter
	Type	I_ParamNo
	Def. value	c_ciIParamNoMinPrioCrossCI (34)
PX_CI_SUPPORT_PARAM_WR	Comment	Supported I-Parameter with write or read/write access
	Type	I_Param

	Def. value	{
		paramNo := PX_CI_SUPPORT_PARAM_WR_NO,
		parameter := {DataRate := 60000}
		}

PX_CI_SUPPORT_PARAM_WR_NO	Comment	Number of supported I-Parameter with write or read/write access
	Type	I_ParamNo
	Def. value	c_ciIParamNoDataRate (39)
PX_CI_SUPPORT_NO_WRITE_ACCESS_PARAM	Comment	Supported Read-Only or Notify-Only I-Parameter
	Type	I_Param

	Def. value	{
		paramNo := PX_CI_SUPPORT_NO_WRITE_ACCESS_PARAM_NO,
		parameter := {CIstatus := 0}
		}

PX_CI_SUPPORT_NO_WRITE_ACCESS_PARAM_NO	Comment	Number of supported Read-Only or Notify-Only I-Parameter
	Type	I_ParamNo
	Def. value	c_ciIParamNoCiStatus (13)
PX_TIMER_DUMMYAckReq	Comment	T_DummyAckReq timer for prioritization procedure
	Type	float
	Def. value	0.1
IN_SAPaddress PX_IN_SAP_ADDRESS	Comment	Expected IN-SAP address
	Type	IN_SAPaddress
	Def. value	186

Identifier	Description	
PX_VCI_SERIAL_NUMBER	Comment	Expected VCIserialNumber of the IUT UC-VCI
	Type	VCIserialNumber
	Def. value	0
PX_VCI_SERIAL_NUMBER_MC	Comment	Expected VCIserialNumber of the IUT MC-VCI
	Type	VCIserialNumber
	Def. value	0
PX_LEGACY_VCI_MC_GROUP_ID	Comment	MultiCast group ID of the IUT legacy CI
	Type	UInt6
	Def. value	1
PX_WAIT_FOR_IUT_READY	Comment	Wait until the IUT is in a stable situation
	Type	float
	Def. value	1.0
PX_DATA_UNITDATA	Comment	Data in UnitData
	Type	DataUnitData
	Def. value	'ABCDEF'O
PX_PARAMETER_UNITDATA	Comment	Parameter in UnitData
	Type	ParameterUnitData
	Def. value	'012345'O
PX_REMOTE_CIID_LOCAL_CI	Comment	Identifies RemoteCIID of local VCI
	Type	EUI64
	Def. value	PX_LOCAL_CIID
PX_LOCAL_CIID	Comment	Identifies the VCI localCIID on ITS-S router (e.g. It coud be the G5 radio MAC address of the IUT)
	Type	EUI64
	Def. value	'0A0B0CFFFE0D0E0F'O
PX_TESTER_REMOTE_CIID_LOCAL_CI	Comment	Identifies RemoteCIID of VCI on ITS test system
	Type	EUI64
	Def. value	PX_TESTER_LOCAL_CIID
PX_TESTER_LOCAL_CIID	Comment	Identifies the VCI localCIID on ITS test system (e.g. It coud be the G5 radio MAC address of the IUT)
	Type	EUI64
	Def. value	'FFFFFFFFFEFFFFFF'O (=DNI)
PX_REMOTE_CIID_BC	Comment	Identifies the VCI for broadcast on ITS-S router
	Type	EUI64
	Def. value	'FFFFFFFFFEFFFFFF'O
PX_REMOTE_CIID_MC	Comment	Identifies the VCI for multicast on ITS-S router
	Type	EUI64
	Def. value	'EF0008FFFE011234'O
PX_REMOTE_CIID_UC	Comment	Identifies the VCI for unicast on ITS-S router (peer station)
	Type	EUI64
	Def. value	'030008FFFE010001'O
PX_TESTER_REMOTE_CIID_UC	Comment	Identifies the VCI for unicast transmission to the IUT)
	Type	EUI64
	Def. value	'030008FFFE010001'O

Annex B (normative): TTCN-3 library modules

B.1 Electronic annex, zip file with TTCN-3 code

This ATS has been produced using the Testing and Test Control Notation (TTCN) according to ETSI ES 201 873-2 [7]. The ATS was developed on a separate TTCN software tool.

This test suite has been compiled error-free using three different commercial TTCN-3 compilers.

The TTCN-3 library modules, which form parts of the present document, are contained in archive ts_10276003v010101p0.zip which accompanies the present document.

History

Document history		
V1.1.1	June 2014	Publication