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Technical Specification

Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for non-IP networking (ISO 29281); Part 2: Test Suite Structure and Test Purposes (TSS & TP)

Reference
RTS/ITS-00270

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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 2 of a multi-part deliverable covering Communications Access for Land Mobiles (CALM); Test specifications for non-IP networking (ISO 29281), as identified below:

Part 1: "Protocol Implementation Conformance Statement (PICS) proforma";

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

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

1 Scope

The present document provides the test suite structure and test purpose specification for the ISO protocols specified in ISO 29281-1 [1] in compliance with the relevant requirements, and in accordance with the relevant guidance given in 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 reference document (including any amendments) applies.

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2.1 Normative references

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

[1] ISO 29281-1:2013: "Intelligent transport systems -- Communication access for land mobiles (CALM) -- Non-IP networking -- Part 1: Fast networking & transport layer protocol (FNTP)".

[2] ETSI TS 102 985-1: "Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for non-IP networking (ISO 29281); Part 1: Protocol Implementation Conformance Statement (PICS) proforma".

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] Void.

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

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

[i.5] ISO 21217: "Intelligent transport systems -- Communications access for land mobiles (CALM) -- Architecture".

[i.6] Void.

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ISO 29281-1 [1], TS 102 985-1 [2] and EG 202 798 [i.1] apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ISO 29281-1 [1], TS 102 985-1 [2], EG 202 798 [i.1] and the following apply:

FNTP	Fast Networking & Transport Protocol
IUT	Implementation Under Test
SUT	System Under Test

4 Test suite structure

In general, the conformance test system architecture presented in the ITS testing framework [i.1] extended as illustrated in Figure 1 applies.

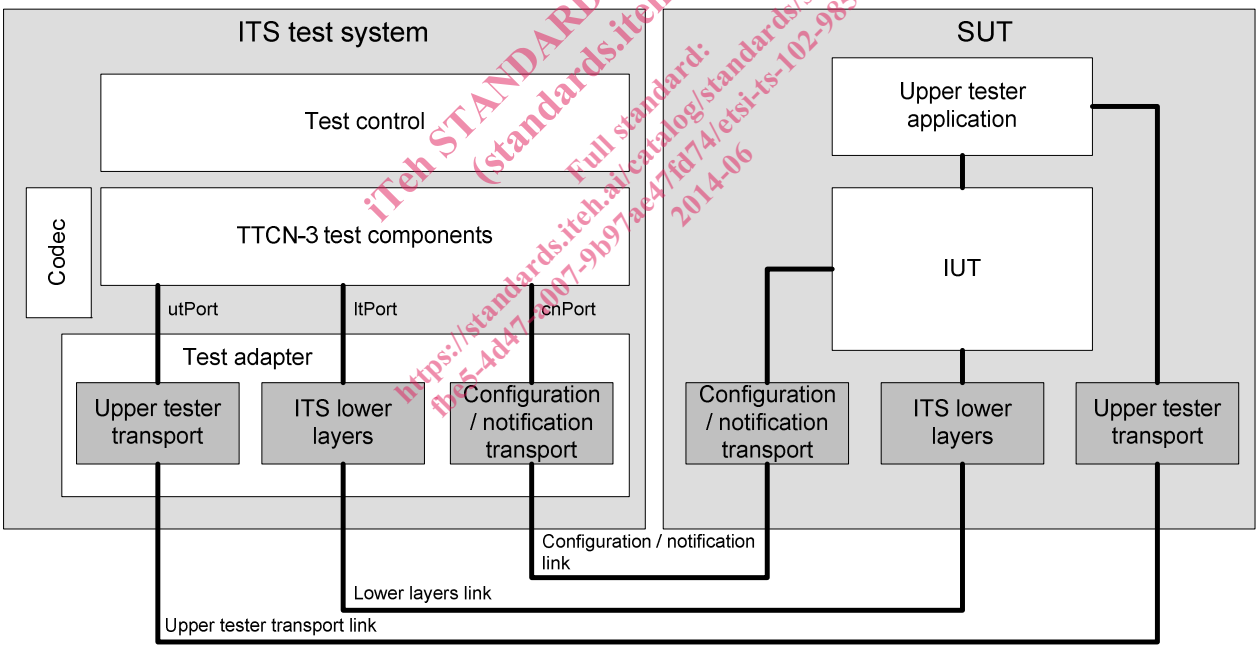

Figure 1: General conformance test system architecture for SUTs

Such SUTs which support ITS station-internal management communications [i.4] may benefit from the conformance test system architecture illustrated in Figure 2, where the access to the IUT from top, i.e. in general via the "Upper tester application", is performed via the MN-SAP.

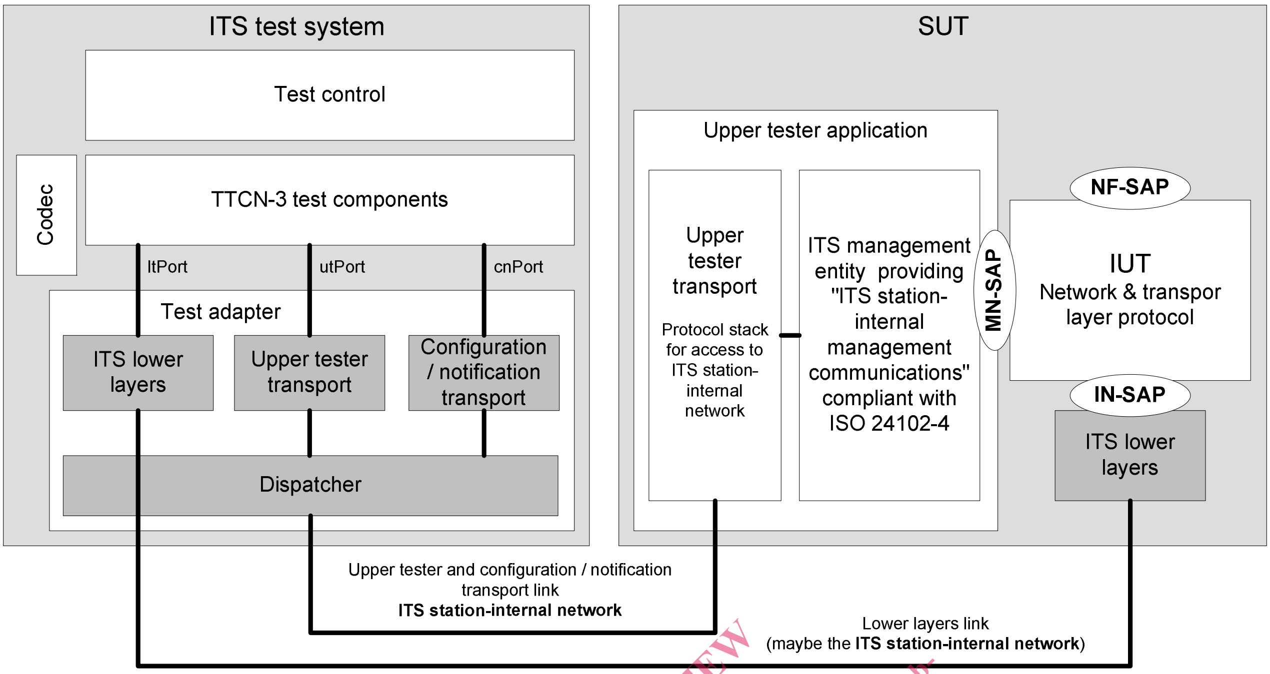

Figure 2: Conformance test system architecture for SUTs compliant with [i.4]

In general, the upper tester application [i.1] allows to access the NF-SAP of the IUT. Access to the full functionality of the NF-SAP is also possible via the MN-SAP, applying the MN-Command "SimNFcmd". Similarly, access of the networking and transport layer protocol to the ITS facilities layer (Upper tester application) is possible via MN-SAP, applying the MN-Request "SimNFreq". Similarly, as specified in [i.3] and [i.4], access to the IN-SAP can be simulated with functions of the MN-SAP; this allows avoiding the ITS lower layers.

5 TP basics

5.1 TP definition conventions

The TP definition is built according to the guidelines provided in the ITS testing framework [i.1], applying a formalized language with pre-defined keywords for the behaviour description.

5.2 TP identifier naming conventions

The identifier of the TP is built according to Table 1 as recommended in the ITS testing framework [i.1].

Table 1: TP naming convention for FNTP [1]

TP/<root>/<gr>/<sgr>/<x>/<nn>		
<root> = root	FNTP	Fast Networking & Transport Layer Protocol
<gr> = group	TXP	Transmit Packets
	RXP	Receive Packets
	CIP	CIP Management
	SEC	Secure Communications
<sgr> = sub-group	BP	Basic Procedure
	EP	Extended Procedure
	FP	Forwarding Procedure
<x> = type of testing	BV	Valid Behaviour Tests
	BI	Invalid Syntax or Behaviour Tests
<nn> = sequential number		01 to 99
NOTE 1: CIP management is only tested in the TPs of group "CIP". NOTE 2: The groups TXP and RXP are restricted to "transmit to / receive from an ITS peer station", i.e. the group TXP also includes TPs to test reception of an FNTP station-internal forwarding NPDU from another local ITS-SCU, and the group RXP also includes TPs to test transmission of an FNTP station-internal forwarding NPDU to another local ITS-SCU. NOTE 3: A sub-group may not apply for all groups.		

TPs for FNTP are specified in clause 6.

5.3 Rules for behaviour description

The description of the TP is built according to the guidelines provided in the ITS testing framework [i.1].

5.4 Sources of TP definitions

All TPs are specified according to [1].

5.5 TP proforma

[i.1] proposes a TP proforma which is used in the present document. The fields of this proforma as used in the present document are explained in table 2.

Table 2: TP proforma field description

TP Header	
TP ID	The TP ID is a unique identifier according to the TP naming conventions in Table 1.
Test objective	Short description of test purpose objective according to the requirements from the base standard.
Reference	The reference indicates the clauses of the reference standard specifications in which the conformance requirement is expressed.
PICS selection	Reference to the PICS statement involved for selection of the TP. Contains a Boolean expression. May contain PICS acronyms specified in Table 3. This section is only used in case an optional or conditional behaviour needs to be selected. Mandatory behaviour is not identified here.
TP Behaviour	
Initial conditions (optional)	The initial conditions define in which initial state the IUT has to be to apply the actual TP. In the corresponding "Test Case" (TC), when the execution of the initial condition does not succeed, it leads to the assignment of an Inconclusive verdict.
Expected behaviour (TP body)	Definition of the events, which are parts of the TP objective, and the IUT are expected to perform in order to conform to the base specification. In the corresponding TC," Pass" or "Fail" verdicts can be assigned there.

5.6 PICS mnemonics

The PICS mnemonics presented in Table 3 are used in the TP proforma.

Table 3: PICS mnemonic for ISO 29281-1 [1]

Mnemonic	PICS item
PICS_ROLE_RONLY	[2] A.2/1
PICS_ROLE_HONLY	[2] A.2/2
PICS_ROLE_RH	[2] A.2/3
PICS_EXT	[2] A.3/2
PICS_ITS_S_INW	[2] A.4/1
PICS_SEC	[2] A.4/2
PICS_NHOPBC	[2] A.4/3
PICS_LPP	[2] A.4/4
PICS_CIP	[2] A.4/5
PICS_15628	[2] A.5/1

6 TPs for FNTP

6.1 Transmit packets

6.1.1 Basic Procedure

6.1.1.1 Valid behaviour tests

TP Id	FNTP/TXP/BP/BV/01
Test objective	Single hop broadcast transmission request with known VCI
Reference	ISO 29281-1 [1], clause 7.6.1 and clause 7.6.2
PICS Selection	PICS_ROLE_RH
Initial conditions	

with {
the IUT having an FNTP forwarding table with proper entry in support of the local port number of the ITS-S application
}	

Expected behaviour	

ensure that {
when {
the IUT having received a correctly formatted single hop BC transmission request
}
then {
the IUT generates a basic FNTP NPDU, and forwards it to the BC-VCI(s) for transmission
}
}	

TP Id	FNTP/TXP/BP/BV/02
Test objective	Single hop unicast transmission request with known VCI
Reference	ISO 29281-1 [1], clause 7.6.1 and clause 7.6.2
PICS Selection	PICS_ROLE_RH
Initial conditions	

with {
    the IUT having an FNTP forwarding table with proper entry in support of the requested local port number of the ITS-S application
}	

Expected behaviour	

ensure that {
    when {
        the IUT having received a correctly formatted single hop UC transmission request
    }
    then {
        the IUT generates a basic FNTP NPDU, and forwards it to the proper UC-VCI for transmission
    }
}	

6.1.1.2 Invalid behaviour tests

Invalid test purposes will be defined once ISO has implemented the concept of path and flow management in the architecture standard ISO 21217 [i.5] and subsequently in ISO 29281-1 [1].

6.1.2 Extended Procedure

6.1.2.1 Valid behaviour tests

TP Id	FNTP/TXP/EP/BV/01
Test objective	N- hop broadcast transmission request with known VCI
Reference	ISO 29281-1 [1], clause 7.6.3
PICS Selection	PICS_EXT AND PICS_ROLE_RH AND PICS_NHOPBC
Initial conditions	

with {
    the IUT having an FNTP forwarding table with proper entry in support of the requested local port number of the ITS-S application
}	

Expected behaviour	

ensure that {
    when {
        the IUT having received a correctly formatted N-hop BC transmission request
    }
    then {
        the IUT generates an extended FNTP NPDU, and forwards it to the BC-VCI(s) for transmission
    }
}	