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Intelligent Transport Systems (ITS);
Communications Access for Land Mobiles (CALM);
Test specifications for ITS station management (ISO 24102);
Part 2: Test Suite Structure and Test Purposes (TSS & TP)

Reference

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Keywords

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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 ITS station management (ISO 24102), as identified below:

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

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 test suite structure and test purpose specification for the ISO protocols specified in ISO 24102-4 [1] and ISO 24102-5 [2] 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.

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

[2] ISO 24102-5:2013: "Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 5: Fast service advertisement protocol (FSAP)".

[3] ETSI TS 102 797-1 (V1.2.1): "Intelligent Transport Systems (ITS); Communications Access for Land Mobiles (CALM); Test specifications for ITS station management (ISO 24102); Part 1: Protocol Implementation Conformance Statement (PICS) specification".

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".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in ISO 24102-4 [1], ISO 24102-5 [2] and EG 202 798 [i.1] apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ISO 24102-4 [1], ISO 24102-5 [2] and EG 202 798 [i.1] apply.

4 Test suite structure

In general, the conformance test system architecture presented in the ITS testing framework EG 202 798 [i.1] extended as illustrated in figure 1 applies.

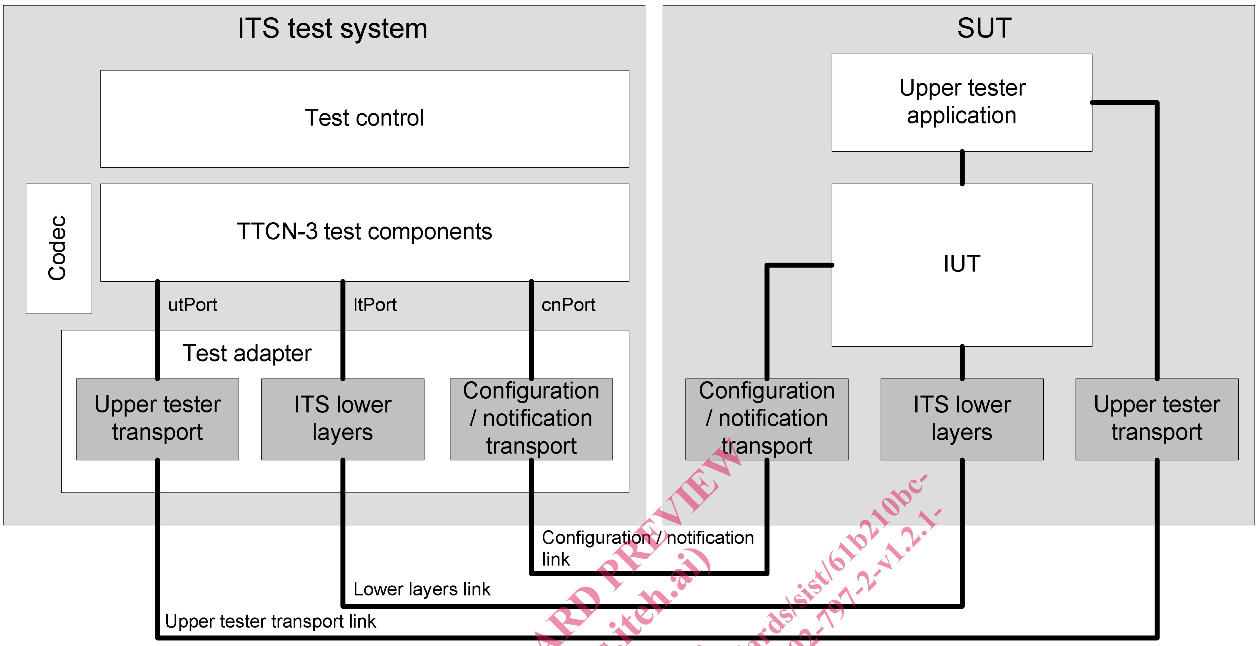
ITS test system
Test control
Codec
TTCN-3 test components
utPort
ltPort
cnPort
Test adapter
Upper tester transport
ITS lower layers
Configuration / notification transport
SUT
Upper tester application
IUT
Configuration / notification transport
ITS lower layers
Upper tester transport
Configuration / notification link
Lower layers link
Upper tester transport link

Figure 1: General conformance test system architecture for SUTs

Such SUTs which support the "ITS station-internal Management Communications Protocol" (IICP) ISO 24102-4 [1] may benefit from the conformance test system architecture illustrated in figure 2, where the access to the IUT is performed via remote access to the management SAPs applying IICP. This may be applied in general for all three ports (utPort, ltPort, cnPort). In case of testing IICP itself, the ITS lower layers end up in the ITS station-internal network.

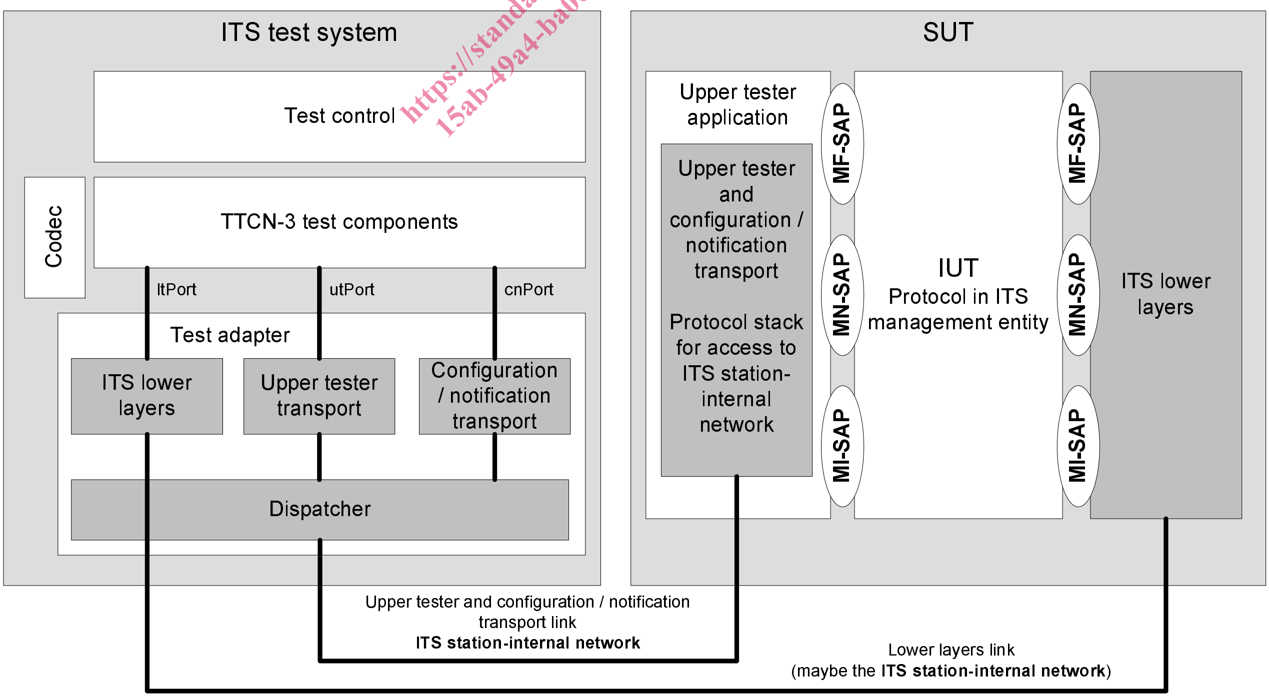
ITS test system
Test control
Codec
TTCN-3 test components
ltPort
utPort
cnPort
Test adapter
ITS lower layers
Upper tester transport
Configuration / notification transport
Dispatcher
SUT
Upper tester application
Upper tester and configuration / notification transport
Protocol stack for access to ITS station-internal network
MF-SAP
MN-SAP
MI-SAP
IUT
Protocol in ITS management entity
MF-SAP
MN-SAP
MI-SAP
ITS lower layers
Upper tester and configuration / notification transport link
ITS station-internal network
Lower layers link
(maybe the ITS station-internal network)

Figure 2: Conformance test system architecture for SUTs compliant with ISO 24102-4 [1]

Testing a protocol which resides inside the ITS management entity does not follow strictly the illustrations given in the ITS testing framework EG 202 798 [i.1]. Nevertheless the principles outlined there apply also. The essential difference is, that the access from the "upper tester application" and from the "ITS lower layers" to the IUT is via the management SAPs.

Note that for testing of FSAP and IICP, the ITS lower layers connect to the IUT via MF-SAP only.

5 Test purpose basics

5.1 TP definition conventions

The TP definition is built according to the guidelines provided in the ITS testing framework EG 202 798 [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 tables 1 and 2 as recommended in the ITS testing framework EG 202 798 [i.1].

Table 1: TP naming convention for the ITS station-internal management communications protocol (IICP) specified in ISO 24102-4 [1]

TP/<root>/<gr>/<x>/<nn>		
<root> = root	IICP	ITS station-Internal management Communication Protocol
<gr> = group	MGM	Management
	COM	Communication
<x> = type of testing	BV	Valid Behaviour tests
	BI	Invalid Syntax or Behaviour Tests
<nn> = sequential number		01 to 99

TPs for the IICP are specified in clause 6.

Table 2: TP naming convention for the Fast Service Advertisement Protocol (FSAP) specified in ISO 24102-5 [2]

TP/<root>/<gr>/<sgr>/<x>/<nn>		
<root> = root	FSAP	Fast Service Advertisement Protocol
<gr> = group	SP	Service provider
	SU	Service user
<sgr> = sub-group	HR	Combined ITS-S host and ITS-S router
	HO	ITS-S host only
	RO	ITS-S router only
<x> = type of testing	BV	Valid Behaviour tests
	BI	Invalid Syntax or Behaviour Tests
<nn> = sequential number		01 to 99

TPs for FSAP are specified in clause 7.

5.3 Rules for behaviour description

The description of the TP is built according to the guidelines provided in the ITS testing framework EG 202 798 [i.1].

5.4 Sources of TP definitions

All TPs are specified according to ISO 24102-4 [1] and ISO 24102-5 [2].

5.5 TP proforma

EG 202 798 [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 3.

Table 3: TP proforma field description

TP Header	
TP ID	The TP ID is a unique identifier according to the TP naming conventions in tables 1 and 2.
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 tables 4 and 5. This section is only used in case an optional or conditional behaviour needs to be selected. Mandatory behaviour is identified by an empty field.
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 tables 4 and 5 are used in the TP proforma.

Table 4: PICS mnemonics for FSAP

Mnemonic	PICS item
PICS_FSAP_ROLE_SP	TS 102 797-1 [3] B.2/1
PICS_FSAP_ROLE_SU	TS 102 797-1 [3] B.2/2
PICS_ITS_S_INW	TS 102 797-1 [3] B.6/1
PICS_ROLE_HONLY	TS 102 797-1 [3] B.5/1
PICS_ROLE_RH	TS 102 797-1 [3] B.5/3
PICS_ROLE_RONLY	TS 102 797-1 [3] B.5/2
PICS_SIP_N_CTX	TS 102 797-1 [3] B.4/2
PICS_SIP_W_CTX	TS 102 797-1 [3] B.4/1
PICS_SUT_AT_CHG	TS 102 797-1 [3] B.1/2
PICS_SUT_CH_CHG	TS 102 797-1 [3] B.1/1

Table 5: PICS mnemonics for IICP

Mnemonic	PICS item
PICS_IICP_MGM	TS 102 797-1 [3] A.8/1
PICS_ROLE_HONLY	TS 102 797-1 [3] A.1/1
PICS_ROLE_RH	TS 102 797-1 [3] A.1/3
PICS_ROLE_RONLY	TS 102 797-1 [3] A.1/2

6 TPs for IICP

6.1 Management

6.1.1 Valid behaviour tests

TP Id	IICP/MGM/BV/01
Test objective	Generation of ITS-SCUalive message after power on - no other ITS-SCU in the SUT
Reference	ISO 24102-4 [1], clauses 9.1 and 9.2
PICS Selection	PICS_IICP_MGM
Initial conditions	

with {
the IUT having no knowledge about other ITS-SCUs in the SUT
}	

Expected behaviour	

ensure that {
when {
the IUT starting
}
then {
the IUT generates an ITS-SCUalive (new) message with DestinationITS-SCU-ID=65535 and with SourceITS-SCU-ID equal to the own ITS-SCU ID, indicating its IST-SCUtype, and forwards this with MF-COMMAND IICrequestTX to the IICA
}
}	

TP Id	IICP/MGM/BV/02
Test objective	Reception of ITS-SCUalive (new) message with no address conflict
Reference	ISO 24102-4 [1], clauses 9.1 and 9.2
PICS Selection	PICS_IICP_MGM
Initial conditions	

with {
the IUT having its own ITS-SCU-ID allocated
}	

Expected behaviour	

ensure that {
when {
the IUT having received an ITS-SCUalive (new) message without address conflict
}
then {
the IUT shall acknowledge this with ErrorStatus = 0 using MF-COMMAND IICresponseTX
}
}	

TP Id	IICP/MGM/BV/03
Test objective	Reception of ITS-SCUalive (new) message with address conflict
Reference	ISO 24102-4 [1], clauses 9.1 and 9.2
PICS Selection	PICS_IICP_MGM
Initial conditions	

with {
the IUT having its own ITS-SCU-ID allocated
}	

Expected behaviour	

ensure that {
when {
the IUT having received an ITS-SCUalive (new) message with address conflict, i.e. from an ITS-SCU having the same ITS-SCU-ID
}
then {
the IUT shall acknowledge this with ErrorStatus = 2 using MF-COMMAND IICresponseTX for transmission to all ITS-SCUs
}
}	

TP Id	IICP/MGM/BV/04
Test objective	Reception of ITS-SCUalive (alive) message with no address conflict
Reference	ISO 24102-4 [1], clauses 9.1 and 9.3
PICS Selection	PICS_IICP_MGM
Initial conditions	

with {
the IUT having its own ITS-SCU-ID allocated
}	

Expected behaviour	

ensure that {
when {
the IUT having received an ITS-SCUalive (alive) message without address conflict
}
then {
the IUT does not show any visible reaction
}
}	

TP Id	IICP/MGM/BV/05
Test objective	Periodic transmission of ITS-SCUalive (alive) message
Reference	ISO 24102-4 [1], clauses 9.1 and 9.3
PICS Selection	PICS_IICP_MGM
Initial conditions	

with {
the IUT having its own ITS-SCU-ID allocated
}	

Expected behaviour	

ensure that {
when {
the IUT having transmitted an ITS-SCUalive (alive) message with DestinationITS-SCU-ID=65535 and with SourceITS-SCU-ID equal to its own ITS-SCU ID, which does not result in an address conflict
}
then {
the IUT transmits the next ITS-SCUalive (alive) message after the time span given in parameter Talive.
}
}	

TP Id	IICP/MGM/BV/06
Test objective	Transmission of ITS-SCUalive (delete) message
Reference	ISO 24102-4 [1], clauses 9.1 and 9.4
PICS Selection	PICS_IICP_MGM
Initial conditions	

with {
the IUT having its own ITS-SCU-ID allocated
}	

Expected behaviour	

ensure that {
when {
the IUT wants to shut down and stop operation
}
then {
the IUT transmits an ITS-SCUalive (delete) message with DestinationITS-SCU-ID=65535 and with SourceITS-SCU-ID equal to its own ITS-SCU ID using MF-COMMAND IICrequestTX
}
}	

6.1.2 Invalid behaviour tests

TP Id	IICP/MGM/BI/01
Test objective	Reception of ITS-SCUalive (alive) message with address conflict
Reference	ISO 24102-4 [1], clauses 9.1 and 9.3
PICS Selection	PICS_IICP_MGM
Initial conditions	

with {
the IUT having its own ITS-SCU-ID allocated
}	

Expected behaviour	

ensure that {
when {
the IUT having received an ITS-SCUalive (alive) message with address conflict , i.e. from an ITS-SCU having the same ITS-SCU-ID
}
then {
the IUT shall acknowledge this with ErrorStatus = 2 using MF-COMMAND IICresponseTX for transmission to all ITS-SCUs,
the IUT shall delete its own ITS-SCU-ID and shall register newly by sending an ITS-SCU (new) message indicating a new ITS-SCU-ID with MF-COMMAND IICrequestTX to the IICA for transmission to all ITS-SCUs
}
}	

TP Id	IICP/MGM/BI/02
Test objective	Reception of ITS-SCUalive message with unknown AliveMessage
Reference	ISO 24102-4 [1], clause 9
PICS Selection	PICS_IICP_MGM
Initial conditions	

with {
the IUT having own ITS-SCU-ID
}	

Expected behaviour	

ensure that {
when {
the IUT having received an ITS-SCUalive message with unknown AliveMessage
}
then {
the IUT acknowledges the message with ErrorStatus 3
}
}	