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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 3: Abstract Test Suite (ATS) and partial PIXIT proforma**

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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 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".**

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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 29281-1 [1] based on the related TSS & TP specification [3] and the PICS proforma [2], and in accordance with the relevant guidance given in ISO/IEC 9646-1 [4], ISO/IEC 9646-2 [5], ETS 300 406 [6] and 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.

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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".
- [3] ETSI TS 102 985-2: "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)".
- [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".
- [9] ETSI ES 201 873-2: "Methods for Testing and Specification (MTS); The Testing and Test Control Notation version 3; Part 2: TTCN-3 Tabular presentation Format (TFT)".

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: "Intelligent transport systems -- Communications access for land mobiles (CALM) -- Architecture".
- [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 21218: "Intelligent transport systems -- Communications access for land mobiles (CALM) -- Access technology support".
- [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 29281-1 [1], TS 102 985-1 [2], TS 102 985-2 [3], ISO/IEC 9646-1 [4], ISO/IEC 9646-2 [5], ETS 300 406 [6], ES 201 873-1 [7], ES 201 873-7 [8], EG 202 798 [i.1], ISO 21217 [i.2], ISO 24102-3 [i.3], ISO 24102-4 [i.4] and ISO 21218 [i.5] apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in ISO 29281-1 [1], TS 102 985-1 [2], TS 102 985-2 [3], ISO/IEC 9646-1 [4], ISO/IEC 9646-2 [5], ETS 300 406 [6], ES 201 873-1 [7], ES 201 873-7 [8], EG 202 798 [i.1], ISO 21217 [i.2], ISO 24102-3 [i.3], ISO 24102-4 [i.4] and ISO 21218 [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 [i.1], see figure 1, applies. For the present document, the IUT is the FNTP. The upper tester application allows accessing the NF-SAP of the IUT. Lower layer protocols indicated by the block "ITS lower layers" allow access to the IUT from the lower side.

NOTE 1: There is also the need and possibility to configure the IUT by the ITS test system. This feature is not illustrated in figure 1, but is presented in figure 5.

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

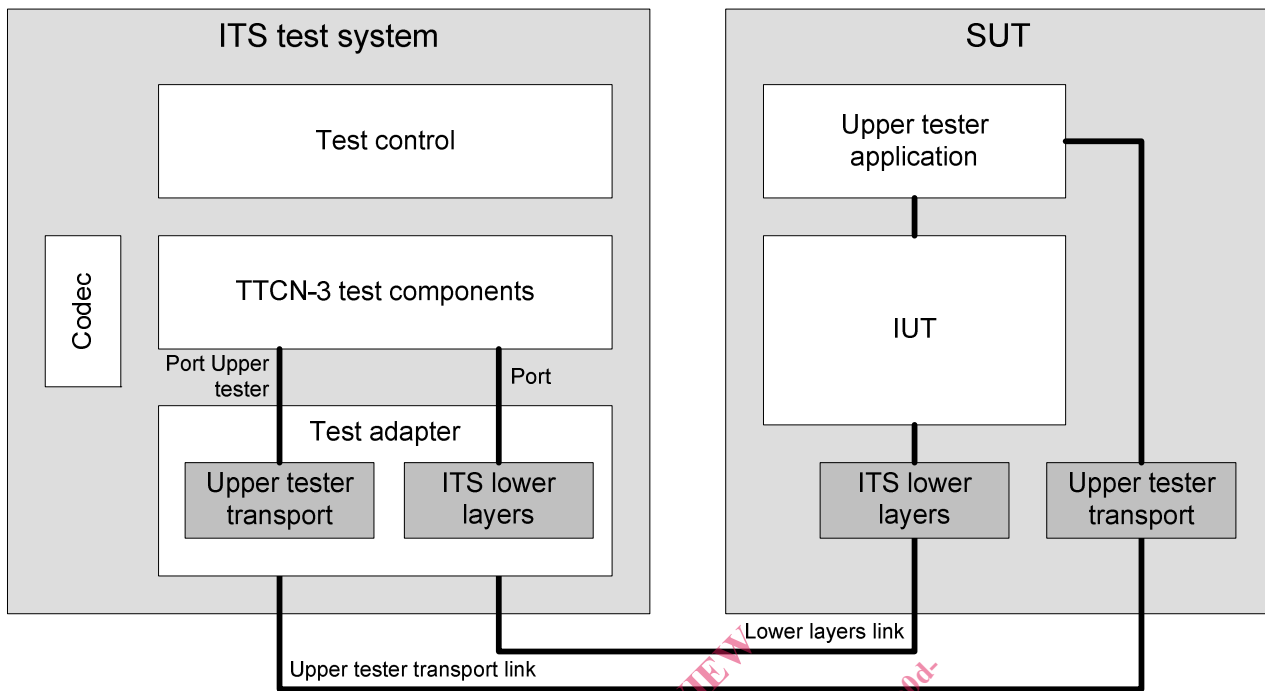


Figure 1: Abstract protocol tester - General approach

SUTs which support the "ITS station-internal management communications protocol" (IICP) [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 applying the MN-Command "UpTest_NF_Cmd" [i.3]. Similarly, access of the networking & transport layer protocol to the ITS facilities layer (Upper tester application) is possible via MN-SAP applying the MN-Request "UpTest_NF_Req" [i.3].

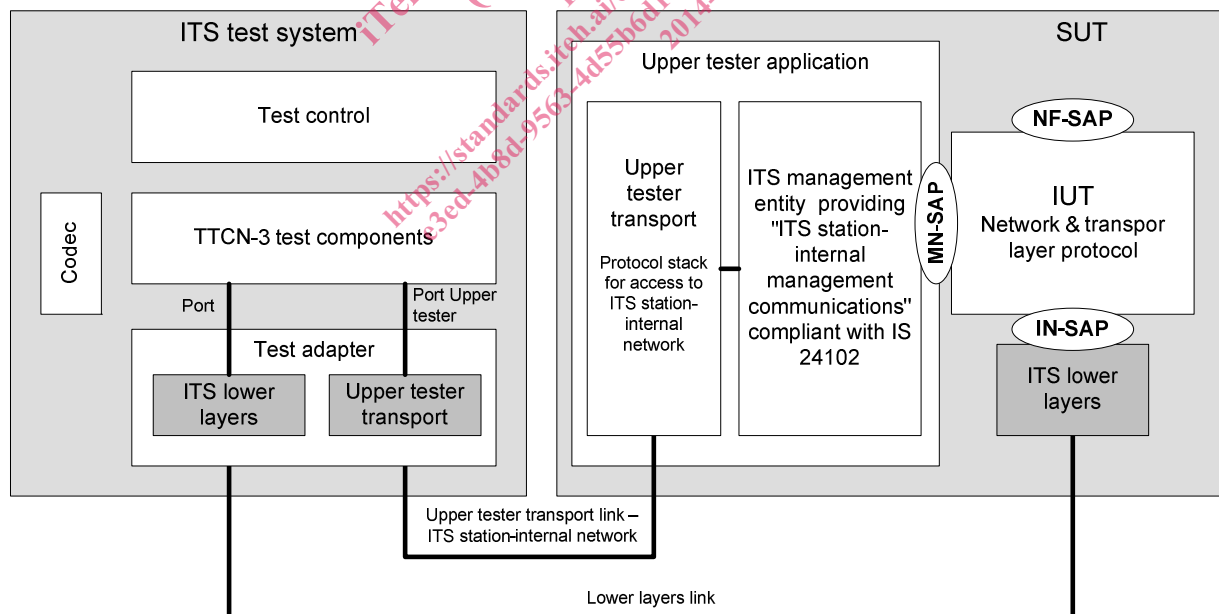


Figure 2: Abstract protocol tester - IICP approach

NOTE 2: In CALM-compliant implementations, in addition to the upper tester access, configuration of the IUT by the ITS test system is also done via the ITS station-internal network. This feature is illustrated in figure 5.

4.2 Test configurations

4.2.1 Roles of an ITS-SCU

This test suite uses two test configurations in order to cover the different test scenarios. Distinction between the two configurations is given by the two possible implementation scenarios for an ITS station, i.e. a single-unit implementation, or an implementation with several "ITS station communication units" (ITS-SCU) which are interconnected via an ITS station-internal network [1] and [i.2]. These ITS-SCUs can take over the roles of an ITS-S host, or an ITS-S router, or the combined role of ITS-S host and ITS-S router. These two identified testing configurations are referred to as CF01 for the single unit implementation illustrated in figure 3, and CF02 for the multi-unit implementation illustrated in figure 4, and are described in clause 4.2.2 and clause 4.2.3.

4.2.2 Test configuration CF01: No ITS station-internal network

In test configuration CF01, the roles of ITS-S host and ITS-S router are implemented in a single ITS-SCU as illustrated in figure 3. Consequently the whole supported functionality of FNTTP is given in a single ITS-SCU, and no station-internal forwarding between ITS-S host and ITS-S router is needed.

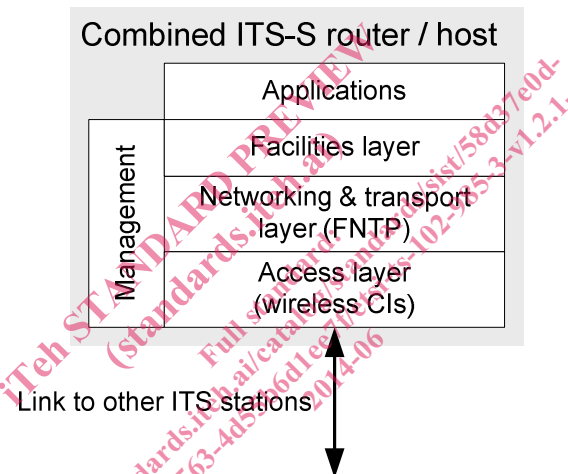


Figure 3: Test configuration CF01 architecture

In this test configuration, the FNTTP is connected only to communication interfaces (CI) which establish a link to another instance of an ITS station. Such CIs provide "virtual communication interfaces" (VCIs) for MAC broadcast communications, multicast communications and unicast communications. Details on VCIs, and how the ITS-S access layer is connected to the ITS-S networking & transport layer via the IN-SAP are specified in [i.5]. The following address elements contained in the element LinkID specified in [i.5] are used:

- LocalCIID, identifying uniquely a CI, specified in the following PIXIT variable:

PX_WL_LOCAL_CIID.

- RemoteCIID, identifying VCI for broadcast communications in destination_address.RemoteCIID of the IN-UNITDATA.request service primitive, specified in the following PIXIT variable:

PX_WL_REMOTE_CIID_BC

- RemoteCIID, identifying VCI for multicast communications in destination_address.RemoteCIID of the IN-UNITDATA.request service primitive, specified in the following PIXIT variable:

PX_WL_REMOTE_CIID_MC

- RemoteCIID, identifying a VCI for unicast communications in destination_address.RemoteCIID of the IN-UNITDATA.request service primitive / source_address.RemoteCIID of the IN-UNITDATA.indication service primitive, specified in the following PIXIT variable:

PX_WL_REMOTE_CIID_UC.

Note that for every known peer ITS station, a distinct VCI identified by `destination_address.RemoteCIID` of the `IN-UNITDATA.request` service primitive / `source_address.RemoteCIID` of the `IN-UNITDATA.indication` service primitive is given.

This configuration is used in the cases listed below [3]:

- ITS-S station internal-network PICS (`PICS_S_INW`) is set to false.
- The roles PICS (`PICS_ROLE_RH`) is set to true.

4.2.3 Test configuration CF02: ITS station-internal network

In test configuration CF02, the roles of ITS-S host and ITS-S router may be implemented in different ITS-SCUs as illustrated in figure 4. It is considered for testing that the functionality of FNTTP is separated into two parts, one part available in an ITS-SCU with the role of an ITS-S host, and one part available in an ITS-SCU with the role of an ITS-S router. Further on, presence of an ITS station-internal network is required.

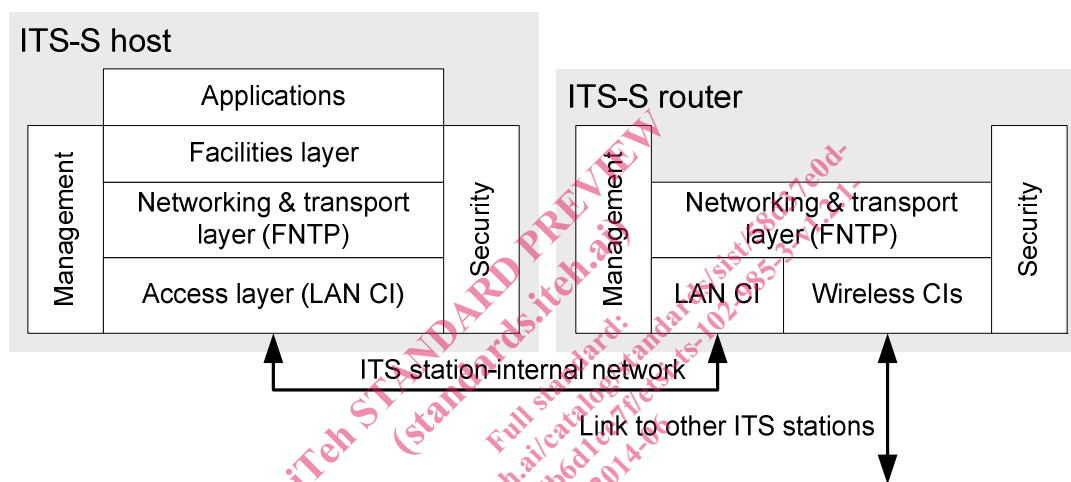


Figure 4: Test configuration CF02 architecture

In this test configuration, the FNTTP part located in the ITS-SCU with role of an ITS-S router is connected to communication interfaces (CI) which establish a link to another instance of an ITS station, and to a communication interface which establishes the connection to the ITS station internal network. The following address elements contained in the element `LinkID` specified in [i.5] are used:

- To connect to the ITS station-internal network with `IN-UNITDATA.request` service primitive:
 - `LocalCIID`, identifying uniquely a CI to connect to another ITS station, specified in the following PIXIT variable:

`PX_LAN_LOCAL_CIID`

- `RemoteCIID`, identifying VCI for broadcast communications in `destination_address.RemoteCIID` of the `IN-UNITDATA.request` service primitive, specified in the following PIXIT variable:

`PX_LAN_REMOTE_CIID_BC`

- `RemoteCIID`, identifying VCI for unicast communications in `source_address.RemoteCIID` of the `IN-UNITDATA.indication` service primitive, specified in the following PIXIT variable:

`PX_LAN_REMOTE_CIID_UC`

Note that communications on the ITS station-internal network could also be unicast communications.

- To connect to another ITS station, see test configuration CF01.

Note that for every known peer ITS station, a distinct VCI is given.