

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



Technical Specification

**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**

*PREVIEW*  
*https://standards.itec.int/standards/60c286aa-3174-44a7-93e3-110a210414014/etsi-ts-102-760-3-v1.1.1-*



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**Reference**

DTS/ITS-0020021

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**Keywords**

ATS, CALM, ITS, testing, TTCN

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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".**

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## Modal verbs terminology

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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].

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# 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 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".

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## 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

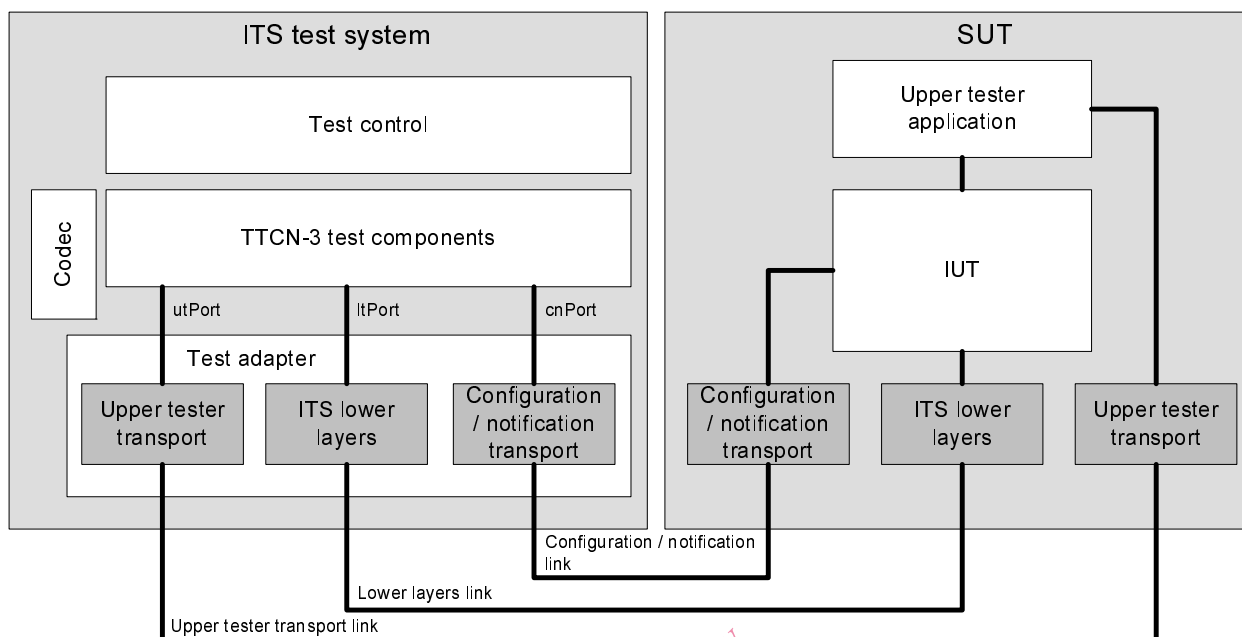
For the purposes of the present document, the abbreviations given in ISO 21218 [1], ETSI TS 102 760-1 [2], ETSI TS 102 760-2 [3], ISO 24102-4 [i.4], ISO/IEC 9646-1 [4], ISO/IEC 9646-2 [5], ETSI ETS 300 406 [6], ETSI ES 201 873-1 [7], ETSI ES 201 873-7 [8], ETSI EG 202 798 [i.1], ISO 21217 [i.2], ISO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

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## 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**

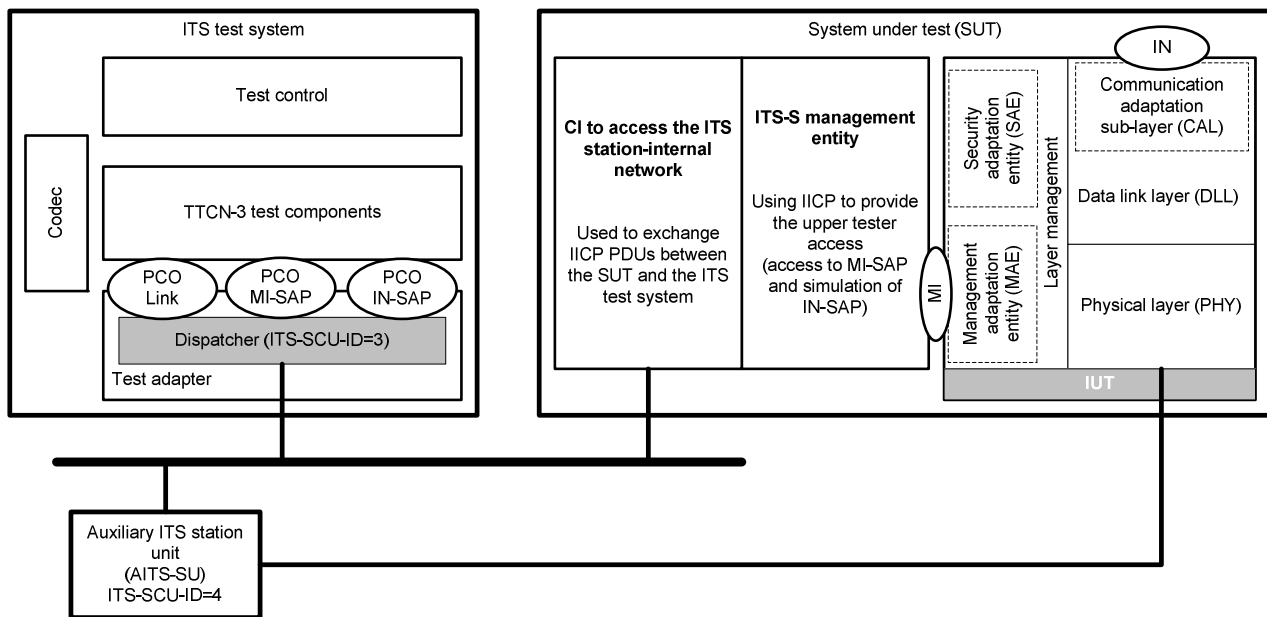
For the present document, the IUT is the ATSP. The upper tester application allows accessing the IN-SAP of the IUT. Lower layer protocols indicated by the block "ITS lower layers" are not existent, as the ATSP constitutes the lowest layer (ITS-S access layer) of the ITS-S station and communication architecture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



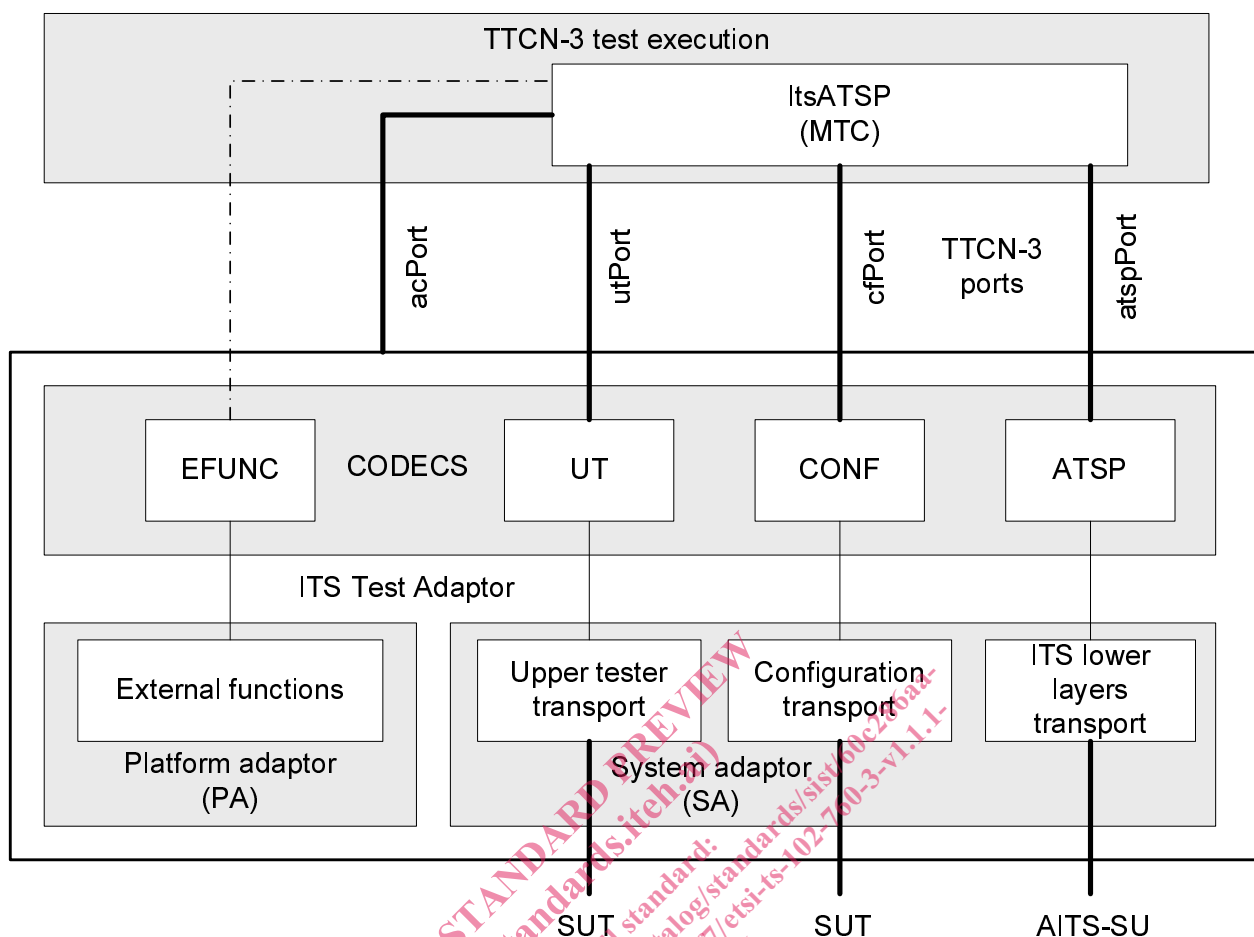


Figure 3: Test system architecture

## 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.