TECHNICAL SPECIFICATION

ISO/TS 20026

First edition
2017-05

Intelligent transport systems — Cooperative ITS — Test architecture

Systèmes intelligents de transport — SIT coopératifs — Architecture d'essai

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/TS 20026:2017
https://standards.iteh.ai/catalog/standards/sist/1f47f093-9580-4913-b66f-c575e3ad5fe2/iso-ts-20026-2017

Reference number
ISO/TS 20026:2017(E)

© ISO 2017

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/TS 20026:2017
https://standards.iteh.ai/catalog/standards/sist/1f47f093-9580-4913-b66f-c575e3ad5fe2/iso-ts-20026-2017

COPYRIGHT PROTECTED DOCUMENT

© ISO 2017, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

 © ISO 2017 – All rights reserved

Contents

Page

Foreword ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **1**
4 Abbreviated terms ... **1**
5 Conventions ... **2**
6 Test system architecture ... **2**
6.1 General ... 2
6.2 IICP test system architecture without test CI ... 4
6.3 IICP test system architecture with test CI ... 5
6.4 IICP reference architecture ... 5
7 IICP usage for conformance testing ... **7**
7.1 General ... 7
7.2 IUT in an ITS-S communications layer ... 7
7.2.1 ITS-S access layer ... 7
7.2.2 ITS-S networking and transport layer ... 8
7.2.3 ITS-S facilities layer ... 9
7.3 IUT in the ITS-S management entity ... 10
7.4 IUT in the ITS-S security entity ... 10
8 Setting to test mode ... **11**
9 Message types and formats ... **14**
9.1 Unaligned PER ... 14
9.2 utPort ... 14
9.3 ltPort ... 15
9.4 cnPort ... 15
9.5 IICP management ... 16
10 Dispatcher ... **17**
Annex A (normative) **IICP conformance test** ... **19**
Annex B (informative) **Binary presentation of test message** ... **22**
Bibliography ... **26**

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/TS 20026:2017
https://standards.iteh.ai/catalog/standards/sist/1f47f093-9580-4913-b66f-c575e3ad5fe2/iso-ts-20026-2017

© ISO 2017 – All rights reserved

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

This document was prepared by Technical Committee ISO/TC 204, *Intelligent transport systems*.

ISO/TS 20026:2017
https://standards.iteh.ai/catalog/standards/sist/1f47f093-9580-4913-b66f-c575e3ad5fe2/iso-ts-20026-2017

 © ISO 2017 – All rights reserved

Introduction

For conformance testing in C-ITS, ETSI developed a generic initial test architecture, published in Reference [6]. Considering the ITS station and communication architecture for C-ITS specified in ISO 21217 and implementations of ITS station units being compliant with the ITS-S station-internal management communications protocol (IICP) specified in ISO 24102-4, conformance testing can be simplified and related effort and cost can be reduced by applying the extended test architecture specified in this document. IICP enables remote access to all points of control and observation (PCO) of the implementation under test (IUT) without the need to implement IUT-specific upper tester applications and lower tester access.

Understanding of this document requires knowledge of:

— the ITS station and communication architecture specified in ISO 21217,

— the IICP specified in ISO 24102-4, and

— the related MX-SAP service primitive functions specified in ISO 24102-3.

Further knowledge of standards related to conformance testing with TTCN-3 is also recommended, for example:

— Reference [6] on the framework on C-ITS conformance testing, and

— Reference [7] on the TTCN-3 core language.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/TS 20026:2017
https://standards.iteh.ai/catalog/standards/sist/1f47f093-9580-4913-b66f-c575e3ad5fe2/iso-ts-20026-2017

© ISO 2017 – All rights reserved

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/TS 20026:2017
https://standards.iteh.ai/catalog/standards/sist/1f47f093-9580-4913-b66f-c575e3ad5fe2/iso-ts-20026-2017

Intelligent transport systems — Cooperative ITS — Test architecture

1 Scope

This document specifies an extension of the ETSI C-ITS test architecture for conformance testing of protocols and applications in ITS station units. It specifies usage of the ITS station-internal management communication protocol (IICP) for the purpose of connecting an ITS test system to an implementation under test (IUT) residing in a system under test (SUT).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 21217:2014, *Intelligent transport systems — Communications access for land mobiles (CALM) — Architecture*

ISO 24102-3, *Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management — Part 3: Service access points*

ISO 24102-4, *Intelligent transport systems — Communications access for land mobiles (CALM) — ITS station management — Part 4: Station-internal management communications*

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/TS 20026:2017
https://standards.iteh.ai/catalog/standards/sist/1f47f093-9580-4913-b66f-c575e3ad5fe2/iso-ts-20026-2017

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp/

3.1
implementation under test
IUT
part of a real system which is to be studied by testing

3.2
system under test
SUT
real system in which an *IUT* (3.1) resides

4 Abbreviated terms

CI	communication interface
IIC	ITS-S internal management communications
IICA	IIC agent

© ISO 2017 – All rights reserved

IICM	IIC manager
IICP	IIC protocol
ITS	intelligent transport systems
ITS-SCU	ITS station communication unit
ITS-SCU-ID	ITS-SCU identifier
PCO	point of control and observation
PDU	protocol data unit
TTCN-3	testing and test control notation version 3

5 Conventions

In this document, text presented in `Courier` font indicates ASN.1 codes.

6 Test system architecture

6.1 General

iTeh STANDARD PREVIEW
(standards.iteh.ai)

The general test system architecture is illustrated in Figure 1. It shows how 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.

ISO/TS 20026:2017
https://standards.iteh.ai/catalog/standards/sist/1f47f093-9580-4913-b66f-c575e3ad5fe2/iso-ts-20026-2017

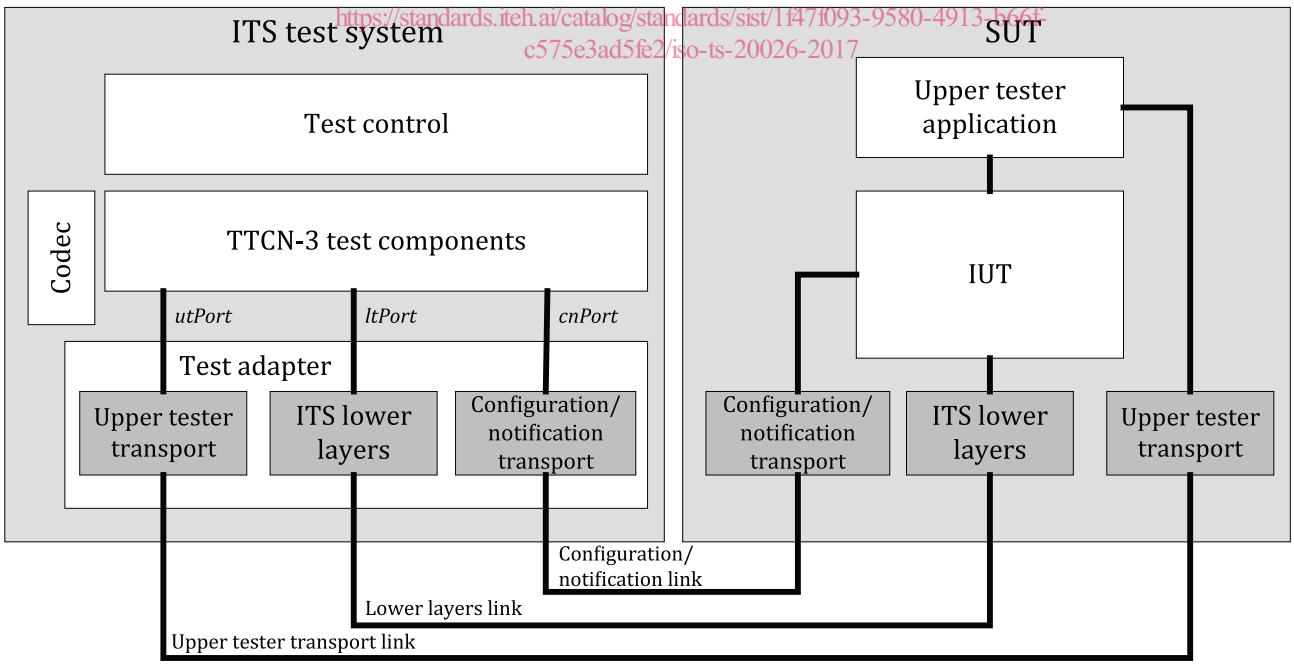


Figure 1 — General conformance test system architecture

The lower layers link may end up in the SUT at the block "ITS lower layers", in case lower layers are used during testing, or directly at the lower interface of the IUT. The upper tester transport link ends up in the SUT at the block "upper tester transport". This "upper tester transport" block together with the "upper tester application" block provides the test access to the upper interface of the IUT. The configuration

© ISO 2017 – All rights reserved

and event notification link is needed for testing of some IUTs, e.g. to set initial conditions and to retrieve status information, allowing remote access to the management/security SAPs in the SUT.

The links shown in Figure 1 between the ITS test system and the SUT indicate connectivity between entities in the two systems and the physical implementation of these links is implementation dependent. For example, the three logical links shown may be implemented on a single physical communication medium such as a single Ethernet connection between the ITS test system and the SUT.

Following the ITS station and communication architecture specified in ISO 21217 (see Figure 2), an IUT can be a protocol or an ITS-S application process located in the

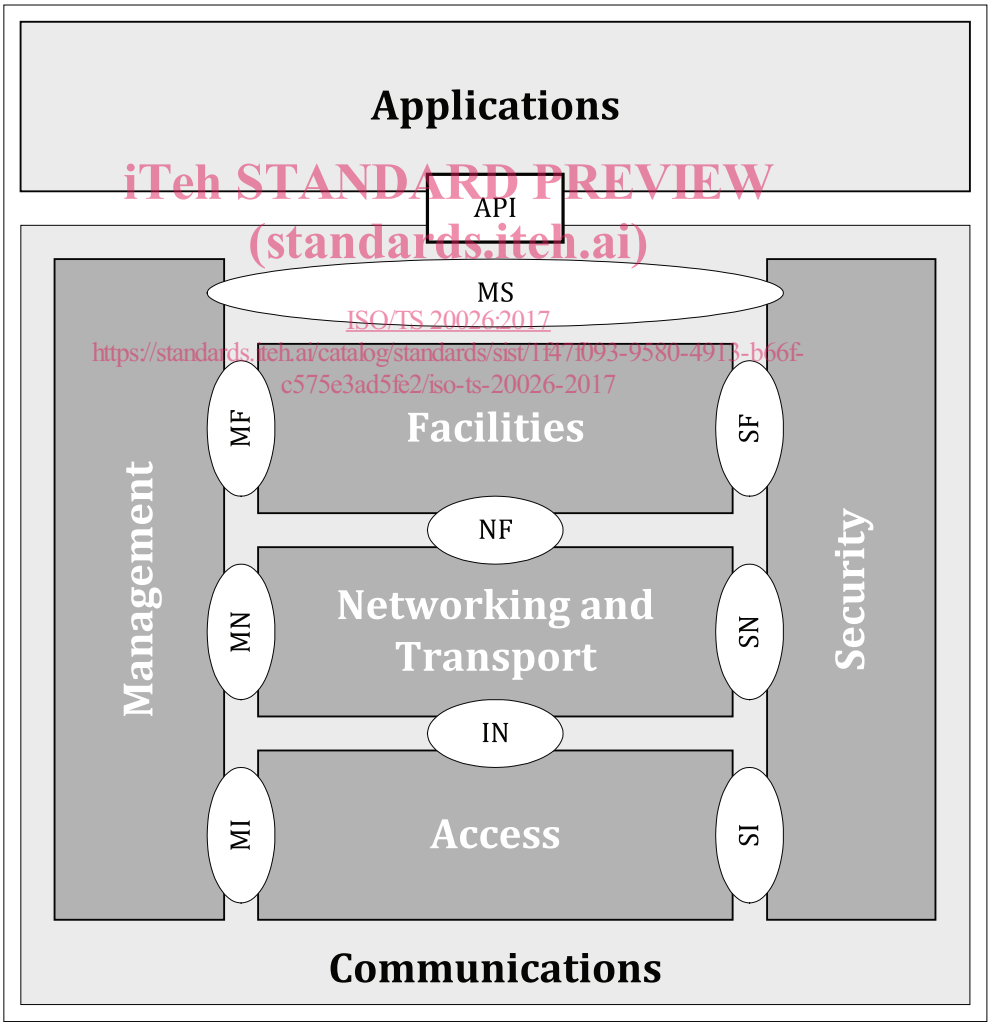
— ITS-S access layer (e.g. ITS-M5 specified in ISO 21215/ISO 21218),

— ITS-S networking and transport layer (e.g. FNTP specified in ISO 29281-1),

— ITS-S facilities layer (e.g. the LDM specified in ISO 18750),

— ITS-S management entity, or

— ITS-S security entity.



iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/TS 20026:2017
https://standards.iteh.ai/catalog/standards/sist/1147f093-9580-4913-b66f-c575e3ad5fe2/iso-ts-20026-2017

Figure 2 — ITS station architecture

An IUT may include functionalities in more than one architectural layer, for example, functionality in the:

— ITS-S access layer and the ITS-S networking and transport layer;

© ISO 2017 – All rights reserved

— ITS-S networking and transport layer and the ITS-S facilities layer;

— ITS-S facilities layer and the ITS-S applications entity;

— ITS-S access layer and the ITS-S networking and transport layer and the ITS-S facilities layer;

— ITS-S networking and transport layer and the ITS-S facilities layer and the ITS-S applications entity;

— ITS-S access layer and the ITS-S networking and transport layer and the ITS-S facilities layer and the ITS-S applications entity.

Additionally, an IUT may also include functionality in the ITS-S management entity and the ITS-S security entity.

Regardless of the functionalities under test, the IUT in principle has these three PCOs shown in Figure 1.

The IUT may be accessed using the ITS station-internal management communications protocol (IICP) specified in ISO 24102-4, as illustrated in 6.2 and 6.3. 6.2 describes the general IICP test architecture, while 6.3 describes the extention of 6.2 needed in case the ITS-S access layer is used in the SUT. The general IICP reference architecture is illustrated in 6.4.

6.2 IICP test system architecture without test CI

When the IUT does not involve access layer functionality, and applying IICP, the three links in Figure 1 are reduced to one physical link, e.g. an Ethernet cable with RJ45 connectors, as illustrated in Figure 3. The ITS test system and the SUT, together, act as parts of a "virtual" ITS station unit (ITS-SU) where each of these two units constitutes an ITS station communication unit (ITS-SCU) as specified in ISO 21217. The ITS-SCU-ID (address of an ITS-SCU) of the ITS test system has the value 3 as specified in ISO 24102-4. The ITS-SCU-ID of the SUT for the purpose of conformance testing is within the valid range specified in ISO 24102-4.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/TS 20026:2017
https://standards.iteh.ai/catalog/standards/sist/1f47f093-9580-4913-b66f-e575e3ad5fe2/iso-ts-20026-2017

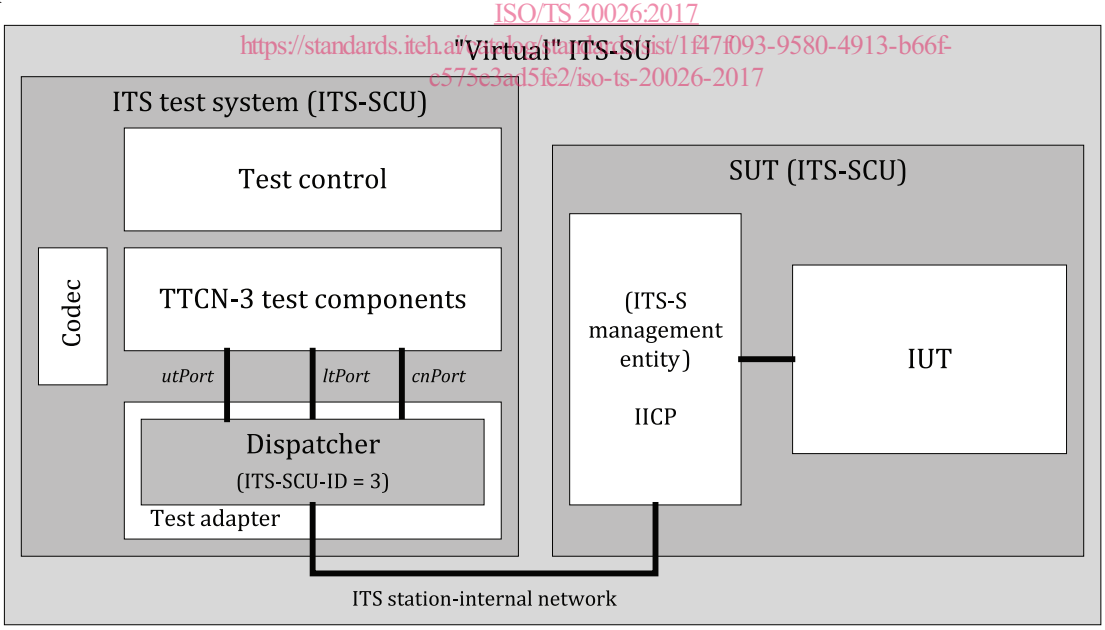


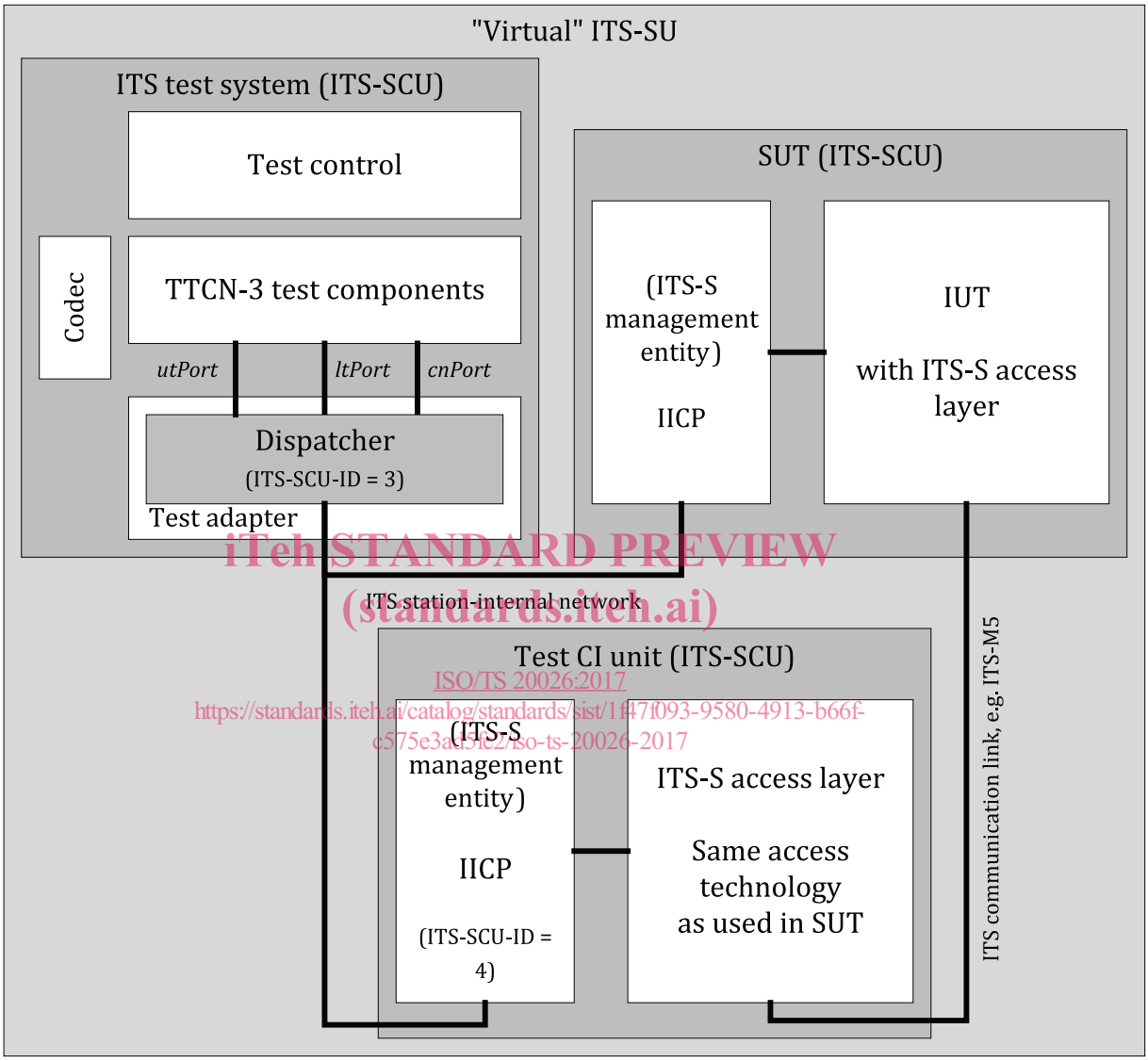
Figure 3 — IICP-based simple conformance test system architecture

The dispatcher in Figure 3 needs to know the actually valid configuration of the ITS-SCU and the IUT in order to properly establish the three links between SUT and ITS test system. Details of the dispatcher are specified in Clause 10.

© ISO 2017 – All rights reserved

6.3 IICP test system architecture with test CI

For some conformance tests (e.g. testing of an ITS-S access technology or using an ITS-S access technology as "lower layer" below an IUT), a separate test CI is used as illustrated in Figure 4. This test CI constitutes a third ITS-SCU of the "virtual" test ITS-SU. The ITS-SCU-ID of the test CI has the value 4 as specified in ISO 24102-4.



iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO/TS 20026:2017
https://standards.iteh.ai/catalog/standards/sist/1f47f093-9580-4913-b66f-c575e3a...5fe2/iso-ts-20026-2017

Figure 4 — IICP-based conformance test system architecture with test CI

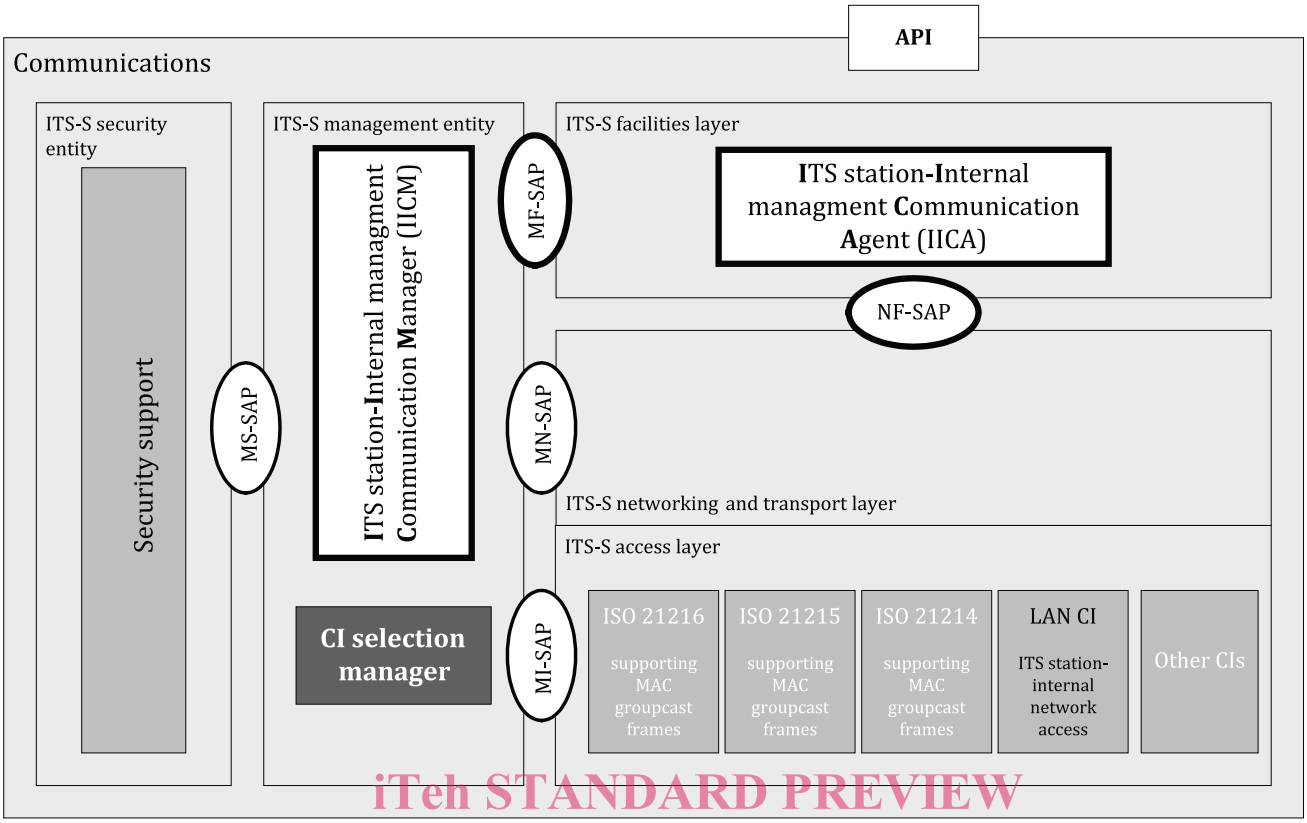
The *ltPort* connects to the test CI using IICP. The test CI connects to the IUT using the respective ITS communication link. Thus, the test CI just performs a conversion between the ITS-S access layer stream and the ITS-ASDU of the IN-SAP (see ISO 21217:2014, Figure 12). The test CI is considered to be a "golden device" that does not introduce any errors that could lead to a wrong result in conformance testing.

The dispatcher in Figure 4 needs to know the actual valid configuration in order to properly establish the three links between the SUT and ITS test system. By detecting ITS-SCU-ID=4, the dispatcher knows that a test CI is involved.

6.4 IICP reference architecture

The IICP reference architecture specified in ISO 24102-4 is illustrated in Figure 5.

© ISO 2017 – All rights reserved



iTeh STANDARD PREVIEW
(standards.iteh.ai)

Figure 5 — IICP reference architecture

ISO/TS 20026:2017
https://standards.iteh.ai/catalog/standards/sist/...

The IICP essentially is performed in the IICM presented in Figure 5. The IICA just performs forwarding of IICP PDUs between the MF-SAP and the NF-SAP. IICA uses a link between the SUT and the ITS test system, e.g. UDP/IP with dynamically assigned UDP port numbers or FNTP with the ITS port number PORT_IIC = 32764 specified in ISO 24102-4.

IICP, in general, provides four different groups of functions as specified in ISO 24102-4:

a) simulation of a communication SAP (IN-SAP, NF-SAP, FA-SAP) in a management SAP for upper and lower tester access;

b) remote access to a management SAP (MX-SAP):

   — MA-SAP: for an IUT in the ITS-S applications entity;

   — MF-SAP: for an IUT in the ITS-S facilities layer;

   — MN-SAP: for an IUT in the ITS-S networking and transport layer;

   — MI-SAP: for an IUT in the ITS-S access layer;

   — MS-SAP: for an IUT in the ITS-S security entity;

c) general commands to be executed in a remote ITS-S management entity;

d) IICP-internal commands used to maintain IICP.

Two types of IICP messages to be exchanged between ITS-S management entities of ITS-SCUs are defined in ISO 24102-4, i.e. IIC-Request and IIC-Response. IICP messages are exchanged between the dispatcher in the test adapter and the ITS-S management entities in the SUT and the test CI via the station-internal network of the “virtual” ITS-SU constituted by the two or three ITS-SCUs, i.e. the ITS test system, the SUT and optionally, the test CI as illustrated in Figures 3 and 4.

 © ISO 2017 – All rights reserved