
**Electronic fee collection —
Evaluation of equipment for
conformity to
ISO 17575-3 —**

**Part 2:
Abstract test suite**

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*Perception du télépéage — Évaluation de la conformité de
l'équipement à l'ISO 17575-3 —*

Partie 2: Suite d'essais abstraite

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ISO 16410-2:2018

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Published in Switzerland

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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.

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

This first edition of ISO 16410-2 cancels and replaces ISO/TS 16410-2:2012, which has been technically revised. The following changes have been made:

- conversion from a Technical Specification to an International Standard;
- amendments to reflect changes to the underlying base standards, especially ISO 17575;
- major changes regarding:
 - data element changes introduced by ISO 17575-1:2016 and ISO 17575-3:2016;
- new test cases related to:
 - protocol version handling;
 - toll context partitions;
 - fee calculation algorithm;
 - rounding rules;
 - alternative currency;
- removed test cases related to:
 - communications services;
 - rules with respect to support of context data which are not anymore required by ISO 17575-3:2016;
- revised terms and definitions;

— editorial and formal corrections as well as changes to improve readability.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

This document is part of a series standards that supports interoperability of autonomous EFC-systems. Autonomous systems use satellite positioning, often combined with additional sensor technologies such as gyroscopes, odometers, and accelerometers, to localise the vehicle and to find its position on a map containing the charged geographic objects, such as charged roads or charged areas. From the charged objects, the vehicle characteristics, the time of day and other data that are relevant for describing road use, the tariff and ultimately the road usage fee is determined.

Autonomous on-board equipment (OBE) operates without relying on dedicated road-side infrastructure by employing wide-area technologies such as Global Navigation Satellite Systems (GNSS) and Cellular Communications Networks (CN). Therefore, autonomous systems may also be referred to as GNSS/CN systems.

Within the ISO 16410 series this document defines tests for conformity evaluation of Front End and Back End that comply with the requirements towards the context data specified in ISO 17575-3.

ISO 16410-2 is based on ISO 16410-1.

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Electronic fee collection — Evaluation of equipment for conformity to ISO 17575-3 —

Part 2: Abstract test suite

1 Scope

The ISO 16410 series provides a suite of tests in order to assess the Front End (FE) and Back End (BE) behaviour's compliancy towards the requirements listed in ISO 17575-3. This document contains the definition of such tests in the form of test cases, reflecting the required individual steps listed in specific test purposes defined in ISO 16410-1. The test cases are written in Testing and Test Control Notation version 3 (TTCN v3).

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 16410-1, *Electronic fee collection — Evaluation of equipment for conformity to ISO 17575-3 — Part 1: Test suite structure and test purposes*

ISO 17575-1:2016, *Electronic fee collection — Application interface definition for autonomous systems — Part 1: Charging*

ISO 17575-3:2016, *Electronic fee collection — Application interface definition for autonomous systems — Part 3: Context data*

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 <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1

Back End

part of a back office system interfacing to one or more Front Ends

[SOURCE: ISO 17575-1:2016, 3.4]

3.2

conformance testing

assessment to determine whether an implementation complies with the requirements

3.3

Front End

part of a tolling system consisting of an OBE, and possibly a proxy where tolling information and usage data are collected and processed for delivery to the Back End

[SOURCE: ISO/TS 19299:2015, 3.17, modified — “road” was deleted and “Back End” is capitalized.]

3.4

implementation under test

implementation of one or more open systems interconnection (OSI) protocols in an adjacent user/provider relationship, being part of a real system which is to be studied by testing

3.5

system under test

real system in which the implementation under test resides

Note 1 to entry: Adapted from ISO/IEC 9646-1:1994, definition 3.3.103.

3.6

test case

description of test purpose, unique test case identifier, test inputs, test execution conditions, test steps, and the results required to pass the test

[SOURCE: ISO/IEC 18013-4:2011, 4.1]

4 Abbreviated terms

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For the purposes of this document, the following abbreviated terms apply.

ASN.1	Abstract Syntax Notation One	ISO 16410-2:2018
ATM	Abstract Test Method	https://standards.iteh.ai/catalog/standards/sist/00541f61-4f3d-482e-8842-53e668af0bb8/iso-16410-2-2018
ATS	Abstract Test Suite	
BE	Back End	
DUT	Device Under Test	
FE	Front End	
IUT	Implementation Under Test	
PIXIT	Protocol Implementation Extra Information for Testing	
SCS	Semiconductor Characterization System	
SUT	System Under Test	
TC	Test Case	
TTCN-3	Testing and Test Control Notation version 3	

5 Abstract test method (ATM)

5.1 Introduction

This clause describes the abstract test method (ATM) used to test the layers at the Front End (FE) side and at the Back End (BE) side.

5.2 Test architecture

The *implementation under test (IUT)* is either the FE or the BE. The *system under test (SUT)* comprises also the communication sub-layer, which is necessary to perform the IUT tests.

The tester shall execute the testing and test control notation version 3 (TTCN-3) *test cases* of the present document as specified in [Annex A](#), running on an emulated communication sub-layer.

[Figure 1](#) describes the test architecture.

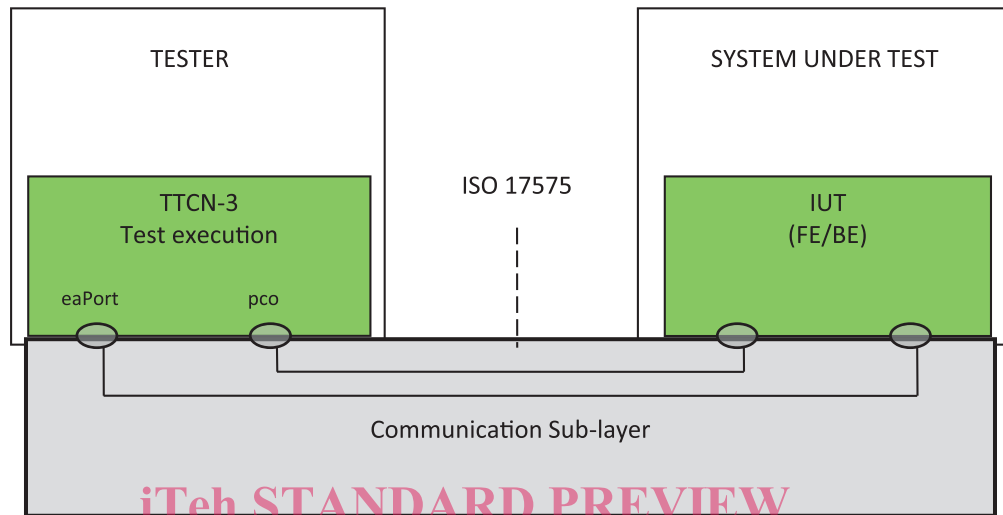


Figure 1 — Test system architecture

5.2.1 Security <https://standards.iteh.ai/catalog/standards/sist/00541f61-4f3d-482e-8842-53e668af0bb8/iso-16410-2-2018>

Test Purposes defined in ISO 16410-1 cover the following security aspects which are explicitly specified by ISO 17575-3:

- verification that APDUs are embedded into secure packets;
- usage of authenticated usage statement;
- usage of authenticated Charge Report;
- usage of authenticated ISO17575-3Adu.

However, security aspects identified in ISO 17575-3 and ISO 17575-1 which are referenced to their normative references (e.g. ISO/TS 19299:2015, ISO/IEC 8825-2:2015, ISO/IEC 9594-8:2017 and IETF RFC 5035:2007-08) are out of scope of this document and not covered by the Test Purpose definition.

For this reason, the abstract syntax notation one (ASN.1) security modules AuthenticationFramework and ExtendedSecurityServices-2006 have been replaced by abridged (dummy) definitions (AbridgedAuthenticationFrameworkv6.asn and AbridgedExtendedSecurityServices-2006.asn).

To execute the test suite, the Test System shall fully support the security mechanisms as specified in original ASN.1 files.

In order to execute the test cases which include underlying security aspects, appropriate test adapters between SUT and Tester are needed.

5.3 Protocol Implementation Extra Information for Testing (PIXIT)

The supplier of the Front End and Back End, respectively, is responsible for providing the Protocol Implementation Extra Information for Testing (PIXIT).

The supplier of the Front End and the Back End shall complete a PIXIT; see [Annex B](#) for a proforma.

6 Untestable test purposes (TPs)

This clause gives a list of test purposes (TPs) in [Table 1](#), which are not implemented in the abstract test suite (ATS) due to the chosen Abstract Test Method or other restrictions.

Table 1 — Untestable TPs

Test purpose	Reason
(empty)	(empty)

NOTE Currently no untestable TPs have been identified.

7 ATS data structures

7.1 ASN.1 description

The ATS is based on the following ASN.1 description:

- EfcAutonomousContextData: it provides the ASN.1 description for ContextData support, including ISO 17575-3 ADU descriptions;
- EfcAutonomousCharging: it provides the ASN.1 description for charging support, including AuthenticatedChargeReport and ChargeReportResponse;
- LacModule: it provides the ASN.1 description for Localisation augmentation communication for autonomous systems;
- EfcCcc: it provides the ASN.1 description for Compliance check communication for autonomous systems;
- EfcDsrcGeneric and EfcDsrcApplication: they provide the ASN.1 description for dedicated short-range communication;
- AVIAEINumberingAndDataStructures: it provides the ASN.1 description for Automatic vehicle and equipment identification;
- AuthenticationFramework: it provides the ASN.1 description for security support.

7.2 Parameterized support

Several definitions of data elements, according to the abstract syntax definition one (ASN.1), (see [Table 2](#) for the full list of concerned data elements) use the parametrisation feature of ASN.1. At the time of writing this document, such a feature is not yet supported by TTCN-3 standards. In order to provide a functional and compilable test suite, all the data elements defined in parametrised way in ASN.1 have been manually defined directly in TTCN code, using TTCN-3 advanced parametrisation feature (see EXAMPLE). This measure does not have any implications on the testing procedure, however in order to compile the TTCN-3 code, the software tool to be used for such purpose has to support the TTCN-3 advanced parametrisation feature.

NOTE Such a workaround is considered temporary.

In case of an update of related requirement standards, the TTCN code should be revised as well in case the update concerns data elements listed in the Table 2 — List of parametrised ASN.1 data elements using advanced parametrisation and their declarations in TTCN-3.

EXAMPLE Below is an example of re-definition of the data element (using ASN.1 parameterisation in TTCN with advanced parameterisation):

ASN.1 definition with advanced parameterization (syntactically indicated by {...}):

-- Adoption of T-APDUs for LAC

```
LAC-T-APDUs ::= CHOICE {
  action-request      [0] Action-Request{LacContainer},
  action-response     [1] Action-Response{LacContainer},
  event-report-request [2] Event-Report-Request{LacContainer},
  event-report-response [3] Event-Report-Response,
  set-request         [4] Set-Request{LacContainer},
  set-response        [5] Set-Response,
  reserved4           [6] NULL,           -- get-request
  reserved5           [7] NULL,           -- get-response
  initialisation-request [8] Initialisation-Request,
  initialisation-response [9] Initialisation-Response
}
```

TTCN-3 declaration with parameterization (syntactically indicated by <...>):

// -- Adoption of T-APDUs for LAC

```
type union LAC_T_APDUs <in type Container> {
  Action_Request<Container>      action_request,
  Action_Response<Container>     action_response,
  Event_Report_Request<Container> event_report_request,
  Event_Report_Response         event_report_response,
  Set_Request<Container>        set_request,
  Set_Response                 set_response,
  Initialisation_Request        initialisation request,
  Initialisation_Response       initialisation response
}
```

Table 2 — List of parametrised ASN.1 data elements using advanced parametrisation and their declarations in TTCN-3

ASN.1 data elements	TTCN-3 data elements
Data elements defined in ISO 13141	
EfcLac {iso(1) standard(0) 13141 version2(2)}	
LAC-T-APDUs	type union LAC_T_APDUs <in type Container>
LacContainer	type union LacContainer <in type Container>
Data elements defined in ISO 12813	
efcCcc {iso(1) standard(0) 12813 version2(2)}	
	type union CCC_T_APDUs <in type Container>
	type union CccContainer <in type Container>
Data elements defined in ISO 14906	
EfcDsrcGeneric {iso(1) standard(0) 14906 generic(1) version5(5)}	
Action-Request {Container}	type record Action_Request <in type Container>
Action-Response {Container}	type record Action_Response <in type Container>
Attributes {Container}	type record Attributes <in type Container>
AttributeList {Container}	type set of Attributes<Container> AttributeList<Container>
Event-Report-Request {Container}	type record Event_Report_Request <in type Container>
Get-Response {Container}	type record Get_Response <in type Container>
Set-Request {Container}	type record Set_Request <in type Container>
T-APDUs	type union T_APDUs_Generic <in type Container>
T-APDUs-Generic {EfcContainer}	type T_APDUs_Generic<octetstring> T_APDUs
EfcContainer	type union EfcContainer <in type Container>
ApplicationContextMark	type EfcContainer<octetstring> ApplicationContextMark
ApplicationList	type record ApplicationList_