INTERNATIONAL STANDARD

ISO 16407-2

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Electronic fee collection — Evaluation of equipment for conformity to ISO 17575-1 —

Part 2: Abstract test suite

Perception de télépéage — Évaluation de conformité de l'équipement à l'ISO 17575-1 —

Partie 2: Suite de test abstraite

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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 ISO/TC 204, *Intelligent transport systems*.

This first edition of ISO 16407-2 cancels and replaces ISO/TS 16407-2:2012, 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 the ISO 17575 series;
- major changes regarding:
  - data element changes introduced by ISO 17575-1:2016 and ISO 17575-3:2016;
  - new test cases related to:
    - authentication support in Charge Report;
    - authentication support in Usage Statement;
    - DUT responses behavior;
  - removed test cases related to:
    - communicatons services;
    - rules with respect to support of charging which are no longer required by ISO 17575-1:2016;
- 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.

Introduction

This document is part of a series of 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 equiment (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.

This document defines tests for conformity evaluation of Front End and Back End that comply with the requirements towards the charging specified in ISO 17575-1.

ISO 16407-2 is based on ISO 16407-1.

Electronic fee collection — Evaluation of equipment for conformity to ISO 17575-1 —

Part 2:
Abstract test suite

1 Scope

The ISO 16407 series provides a suite of tests in order to assess the Front End (FE) and Back End (BE) behaviour compliancy towards the requirements listed in ISO 17575-1. 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 16407-1. 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 16407-1:2017, *Electronic fee collection — Evaluation of equipment for conformity to ISO 17575-1 — Part 1: Test suite structure and test purposes*

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

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 — “front end” and “back end” have been 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

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

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

ASN.1	Abstract Syntax Notation One
ATM	Abstract Test Method
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 Front End or the Back End. 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.

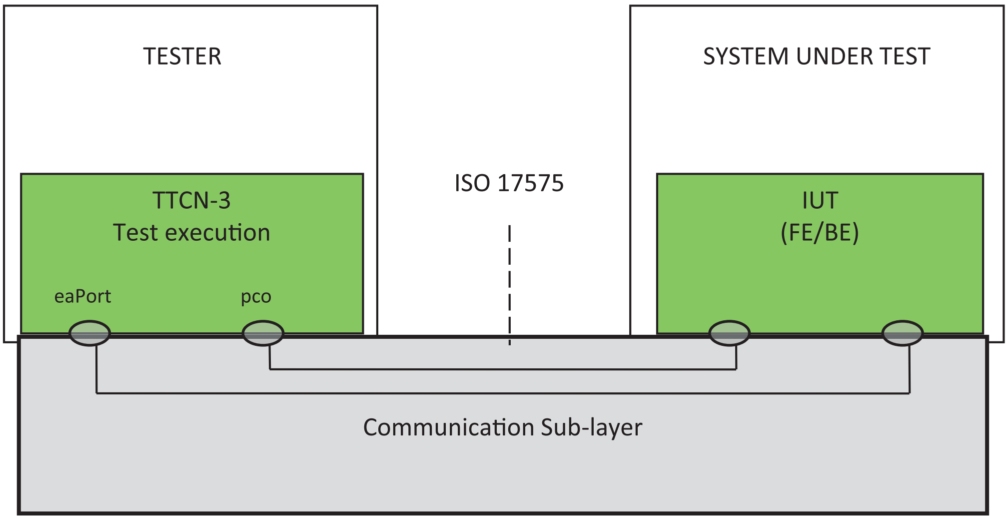

Figure 1 — Test system architecture

5.2.1 Security

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

The security aspects, which are explicitly specified in ISO 17575-1 and 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 ATM 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 parameterization 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 parameterization 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 purposes has to support the TTCN-3 advanced parameterization feature.

NOTE Such a workaround is considered temporary.

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

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

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 <...>):

