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Elektronische Gebührenerhebung - Konformitätsevaluierung von Implementierungen nach CEN/TS 16986 - Teil 1: Struktur der Testfolge und Testabsichten

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European foreword

This document (CEN/TS 17154-1:2019) has been prepared by Technical Committee CEN/TC 278 “Intelligent transport systems”, the secretariat of which is held by NEN.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

CEN/TS 17154, *Electronic fee collection — Evaluation of implementation for conformity to CEN/TS 16986*, consists of two parts:

— *Part 1: Test suite structure and purposes* (this document); and

— *Part 2: Abstract test suite*.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

The standard on information exchange between service provision and toll charging (i.e. EN ISO 12855) is a so-called toolbox standard. It provides the foundation for interoperability, but is not sufficient to achieve technical interoperability. The interoperable application profile specified in CEN/TS 16986 makes choices amongst the options which EN ISO 12855 provides and defines a coherent set of transactions, triggers and data elements for an interoperable data exchange at the interface between toll service providers and toll chargers. The interoperable application profile supports both:

— dedicated short-range communication (DSRC)-based systems; and

— global navigation satellite systems /cellular network (GNSS/CN)-based – autonomous systems.

This document provides the specification for testing the conformity of technical implementations to CEN/TS 16986. Technical implementations which can be tested using the specifications included in this document are:

— central equipment of toll chargers; and

— central equipment of toll service providers.

While this Part of CEN/TS 17154 describes the tests on a higher abstract level (TSS&TP) which is human readable, CEN/TS 17154-2 uses the test notation TTCN-3 to provide a test specification that can be compiled and executed in test environments.

For the presentation of the test purposes the formal test purpose language (TPLan) is used. TPLan is standardized by ETSI (e.g. in ETSI ES 202 553 and in the ETSI ES 203 119 series) for the explicit purpose of applying a harmonized notation for test purpose descriptions.

The associated requirements specification CEN/TS 16986 supports the implementation of interoperability in general and of European electronic toll service (EETS) in particular. The technical requirements defined in CEN/TS 16986 correspond to requirements listed in Commission Decision 2009/750/EC. CEN/TS 16986:2016, Table D.1 provides a list that outlines how requirements in CEN/TS 16986:2016 relate to essential requirements in European legislation. Consequently, the CEN/TS 17154 series supports the EETS in terms of providing a set of standardized test specifications to evaluate conformance of implementation of toll chargers and toll service providers – including implementations that provide interoperability.

1 Scope

This document specifies the test suite structure (TSS) and test purposes (TP) to test conformity of central equipment of both toll chargers and toll service providers versus CEN/TS 16986.

It further provides templates for the protocol conformance test reports (PCTR) for the implementation under tests (IUT) for both the toll charger and the toll service provider.

This document contains the technical provisions to perform conformance testing of functional and dynamic behaviour of implementations conforming to CEN/TS 16986.

NOTE The specifications in this Part provide the base for the tree and tabular combined notation (TTCN) of the test cases and steps which are provided in CEN/TS 17154-2.

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.

CEN/TS 16986:2016, *Electronic Fee Collection - Interoperable application profiles for information exchange between Service Provision and Toll Charging*

EN ISO 12855:2015, *Electronic fee collection - Information exchange between service provision and toll charging (ISO 12855:2015)*

ETSI ES 202 553 (V1.2.1:2009-06), *Methods for Testing and Specification (MTS), TPLan: A notation for expressing Test Purposes*

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
attribute
addressable package of data consisting of a single data element or structured sequences of data elements

[SOURCE: EN ISO 17575-1:2016, 3.2]

3.2
authentication
security mechanism allowing verification of the provided identity

[SOURCE: EN 301 175 V1.1.1 (1998-08), Clause 3]

3.3
authenticator
data, possibly encrypted, that is used for authentication

[SOURCE: EN 15509:2014, 3.3]

3.4
base standard
approved international standard, technical specification or ITU-T Recommendation

Note 1 to entry: This includes but is not limited to approved standard deliverables from ISO, ITU, CEN, CENELEC, ETSI and IEEE

[SOURCE: ISO/IEC TR 10000-1:1998, 3.1.1, modified — The bit "technical specification" and Note 1 to entry were added.]

3.5
billing detail
information needed to determine or verify the amount due for the usage of a given service

[SOURCE: EN ISO 12855:2015, 3.1]

3.6
channel
information transfer path

[SOURCE: ISO 7498-2:1989, 3.3.13]

3.7
conformance testing
assessment to determine whether an implementation complies with the requirements

3.8
data element
coded information, which might itself consist of lower level information structures

[SOURCE: EN ISO 17575-1:2016, 3.9]

3.9
electronic fee collection
fee collection by electronic means

[SOURCE: EN ISO 12855:2015, 3.6]

3.10
evaluation
systematic process of determining how individuals, procedures, systems or programs have met formally agreed objectives and requirements

[SOURCE: ISO 10795:2011, 1.90]

3.11
implementation conformance statement
statement of capabilities and options that have been implemented defining to what extent the implementation is compliant with a given specification

[SOURCE: CEN ISO/TS 14907-2:2016, 3.6]

3.12
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

3.13
interoperability
ability of systems to exchange information and to make mutual use of the information that has been exchanged

[SOURCE: ISO/IEC TR 10000-1:1998, 3.2.1, modified — The beginning of the definition was slightly altered.]

3.14
payment claim
recurring statement referring to concluded billing details made available to the payer by the payee indicating and justifying the amount due

[SOURCE: EN ISO 12855:2015, 3.10]

3.15
profile
set of requirements and selected options from base standards or international standardized profiles used to provide a specific functionality

[SOURCE: ISO/IEC TR 10000-1:1998, 3.1.4, modified — The whole wording of the definition was modified and shortened and the original Note 1 to entry was left out.]

3.16
role
set of responsibilities

[SOURCE: ISO 17573:2010, 3.13]

3.17
test
procedure designed to measure characteristics of a component or system in specified conditions

[SOURCE: CEN ISO/TS 14907-1:2015, 3.20]

3.18
toll
charge, tax or duty levied in connection to using a vehicle in a toll domain

[SOURCE: CEN ISO/TS 19299:2015, 3.42, modified — "Any" was deleted at the start of the definition and "in relation with" was replaced with "in connection to".]

3.19
toll charger
entity which levies toll for the use of vehicles in a toll domain

[SOURCE: ISO 17573:2010, 3.16, modified — The wording of the definition was alted and the original Note 1 to entry was left out.]

3.20
toll context
logical view as defined by attributes and functions of the basic elements of a toll scheme consisting of a single basic tolling principle, a spatial distribution of the charge objects and a single behaviour of the related Front End

[SOURCE: EN ISO 17575-1:2016, 3.17]

3.21
toll context data
information defined by the responsible toll charger necessary to establish the toll due for using a vehicle on a particular toll context and to conclude the toll transaction

[SOURCE: EN ISO 12855:2015, 3.15]

3.22
toll declaration
statement to declare the usage of a given toll service to a toll charger

[SOURCE: CEN ISO/TS 19299:2015, 3.44]

3.23
toll domain
area or a part of a road network where a certain toll regime is applied

[SOURCE: ISO 17573:2010, 3.18, modified — "Certain" was added.]

3.24
toll regime
set of rules, including enforcement rules, governing the collection of toll in a toll domain

[SOURCE: ISO 17573:2010, 3.20]

3.25
toll service provider
entity providing toll services in one or more toll domains

[SOURCE: ISO 17573:2010, 3.23 modified]

3.26
transaction
whole of the exchange of information between two physically separated communication facilities

[SOURCE: EN ISO 17575-1:2016, 3.21]

3.27
transaction type
identifier of a set of transactions that adhere to the same rules for the exchanged application protocol data units in terms of triggers, timings, content and sequence

[SOURCE: CEN/TS 16986:2016, 3.8]

3.28
trust object
information object that is exchanged between entities to ensure mutual trust

[SOURCE: ISO 17573:2010, 3.28]

4 Abbreviations

For the purpose of this document, the following abbreviations apply throughout the document unless otherwise specified.

ADU	Application Data Unit (EN ISO 14906)
APCI	Application-Protocol Control Information
APDU	Application Protocol Data Unit (EN ISO 14906)
BI	Behaviour Invalid (EN 15876-1)
BV	Behaviour Valid (EN 15876-1)
DSRC	Dedicated Short-Range Communication
EETS	European Electronic Toll Service
EFC	Electronic Fee Collection (ISO 17573)
GNSS	Global Navigation Satellite Systems
IAP	Interoperable Application Profile (EN ISO/IEC 9646-6)
ICS	Implementation Conformance Statement (ISO/IEC 9646-7)
IUT	Implementation Under Test (CEN ISO/TS 14907-1)
PCTR	Protocol Conformance Test Report (EN 15876-1)
TC	Toll Charger
TP	Test Purpose
TPID	Test Purpose Identification
TPLan	Test Purpose Notation
TSP	Toll Service Provider
TSS	Test Suite Structure
TTCN	Tree and Tabular Combined Notation

5 Test suite structure (TSS)

5.1 Structure

The test suite structure (TSS) is made of two main groups of test purposes, depending on the role of the implementation under test (IUT) in the overall architecture as to either the toll charger or the toll service provider. These two main groups of test purposes are listed and specified in Annex A for the IUT of the role of toll charger, and Annex B for the role of toll service provider. Each group is further divided in subgroups that correspond to the transaction types specified in CEN/TS 16986, plus one subgroup that collects all test purposes of a general usage. Finally, each subgroup is divided into test purposes to check valid behaviours and test purposes to check invalid behaviours of the IUT. A general overview of the TSS is provided in Table 1. For any of the subgroups listed in Table 1 test purposes for both valid and invalid behaviour are specified in Annexes A and B.

Table 1 — Test Suite Structure

TP Group	TP Subgroup
TC (IUT role is Toll Charger)	Base TPs
	USERDETAILS
	LISTOFUSERS
	EXCEPTIONLIST
	TRUSTOBJECTS
	PAYMENTCLAIM
	DSRC.CONTRACTISSUERLIST
	DSRC.EFCCONTEXTDATA
	DSRC.BILLINGDETAILS
	DSRC.REPORTABNORMALOBE
	GNSS.TOLLDECLARATIONS
	GNSS.BILLINGDETAILS.TSP
	GNSS.BILLINGDETAILS.TC
	GNSS.PAYMENTANNOUNCEMENT
TSP (IUT role is Toll Service Provider)	Base TPs
	USERDETAILS
	LISTOFUSERS
	EXCEPTIONLIST
	TRUSTOBJECTS
	PAYMENTCLAIM
	DSRC.CONTRACTISSUERLIST
	DSRC.EFCCONTEXTDATA
	DSRC.BILLINGDETAILS
	DSRC.REPORTABNORMALOBE
	GNSS.TOLLDECLARATIONS
	GNSS.BILLINGDETAILS.TSP
	GNSS.BILLINGDETAILS.TC
	GNSS.PAYMENTANNOUNCEMENT

5.2 Test Purposes (TP)

5.2.1 TP naming conventions

Each TP is given a unique identification. This unique identification is built up to contain the following string of information:

TP_<iut>_<subgroup>_<x>-<nn>

The literal "TP" indicates that it is a Test Purpose while values used for the variable fields (enclosed in <>) are as described in Table 2.

Table 2 — TP naming conventions

Identifier	Values	Meaning
<iut>	TC	central equipment of the toll charger
	TSP	central equipment of the toll service provider
<subgroup>	BASE	base test purpose
	USERDETAILS	USERDETAILS transaction type
	LISTOFUSERS	LISTOFUSERS transaction type
	EXCEPTIONLIST	EXCEPTIONLIST transaction type
	TRUSTOBJECTS	TRUSTOBJECTS transaction type
	PAYMENTCLAIM	PAYMENTCLAIM transaction type
	DSRC_CONTRACTISSUERLIST	DSRC.CONTRACTISSUERLIST transaction type
	DSRC_EFCCONTEXTDATA	DSRC.EFCCONTAXTDATA transaction type
	DSRC_BILLINGDETAILS	DSRC.BILLINGDETAILS transaction type
	DSRC_REPORTABNORMALOBE	DSRC.ABNORMALOBE transaction type
	GNSS_TOLLDECLARATION	GNSS.TOLLDECLARATION transaction type
	GNSS_BILLINGDETAILS_TSP	GNSS.BILLINGDETAILS.TSP transaction type
	GNSS_BILLINGDETAILS_TC	GNSS.BILLINGDETAILS.TC transaction type
	GNSS_PAYMENTANNOUNCEMENT	GNSS.PAYMENTANNOUNCEMENT transaction type
<x>	BV	valid behaviour tests
	BI	invalid behaviour tests
<nn>	01 to NN	test purpose number

5.2.2 TP definition format conventions

The TPs are formatted according to harmonized rules shown in Table 3. All TPs are defined with their details in Annex A and Annex B.

Table 3 — TP definition structure

TPID: The TPID is a unique identifier. It shall be specified according to the TP naming conventions defined in 5.2.1.	**Title:** Short and meaningful description of Test Purpose objective.
Reference	Referenced clause(s) of CEN/TS 16986:2016 in which those requirements are specified that are specifically tested in this TP
TP validity condition	Logical expression defining if test cases corresponding to the TP shall be executed based on values in the referenced table rows in CEN/TS 16986:2016, Annex A
Repetitions	
Specification of potential repetitions of the TP with changed parameters or values of parameters.	
	Initial conditions
	The conditions that define in which initial state the IUT has to be to apply the actual TP. The description shall use the TP notation TPLan as specified in ETSI ES 202 553 (V1.2.1) (2009-06), 11.2.
Transaction sequence #	**Expected behaviour**
Individual step in the transaction according to numbering used in CEN/TS 16986	Description of the required behaviour of the IUT or tester in this transaction step. The description shall use the TP notation TPLan as specified in ETSI ES 202 553 (V1.2.1) (2009-06), 11.3. and 11.4.

NOTE The TP definition structure in general allows for an additional element named “Final conditions”. As final conditions are not used in the TPs specified in this document this element is never present.

5.2.3 Symbols and keywords applied in TP definitions

Symbols and keywords which are particularly used in the description of the TPs shall be understood with meanings according to Table 4.