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**Elektronische Gebührenerhebung –
Systemarchitektur für fahrzeugbezogene Maut –
Teil 1: Referenzmodell (ISO 17573-1:2019);
Englische Fassung EN ISO 17573-1:2019**

Electronic fee collection –
System architecture for vehicle-related tolling –
Part 1: Reference model (ISO 17573-1:2019);
English version EN ISO 17573-1:2019

Perception électronique du télépéage –
Architecture de systèmes pour le péage lié aux véhicules –
Partie 1: Modèle de référence (ISO 17573-1:2019);
Version anglaise EN ISO 17573-1:2019

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Nationales Vorwort

Dieses Dokument (EN ISO 17573-1:2019) wurde vom technischen Komitee CEN/TC 278 „Intelligente Transportsysteme“ ausgearbeitet, dessen Sekretariat von NEN (Niederlande) gehalten wird.

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Die Norm liefert eine Beschreibung der Architektur für die Mautsystemumgebung aus Unternehmenssicht. Zusätzlich liefert diese Norm die Grundlagen des Informationsblickwinkels durch die Identifizierung von Informationsinteraktionen und allgemeinen Informationsobjekten.

Dieses Dokument enthält unter Berücksichtigung des DIN-Präsidialbeschlusses 1/2004 nur die Englische Fassung von EN ISO 17573-1:2019.

Nationaler Anhang NA (informativ)

Begriffe

Die Benennungen der folgenden Begriffe sind identisch mit den Benennungen in der englischen Fassung.

3 Begriffe

Für die Anwendung dieses Dokuments gelten die Begriffe in ISO/IEC 7498-1:1994, ISO/IEC 10746-2, ISO/IEC 10746-3, ISO 14813-5 und ISO/IEC 15414 und die folgenden Begriffe.

ISO und IEC stellen terminologische Datenbanken für die Verwendung in der Normung unter den folgenden Adressen bereit:

- IEC Electropedia: verfügbar unter <http://www.electropedia.org/>
- ISO Online Browsing Platform: verfügbar unter <http://www.iso.org/obp>

3.1

automatische Nummernschilderkennung

(en: automatic number plate recognition)

Technologie, welche optische Zeichenerkennung auf Abbildungen verwendet, um Fahrzeugnummernschilder zu lesen

3.2

Artefakt

(en: artefact)

physisches materielles Object oder physische Teilinformation oder ein System oder Subsystem, welches in einem ITS-System verwendet wird

3.3

Rechnungsdetail

(en: billing detail)

Information, die benötigt wird, um die Gebührenhöhe zur Verwendung eines gegebenen Dienstes zu bestimmen oder zu prüfen

3.4

Kontextdaten

(en: context data)

Information, welche vom verantwortlichen Mauterheber als notwendig festgelegt wurde, um eine Mautgebühr für ein Fahrzeug in einem bestimmten Mautgebiet zu ermitteln und um die Mautübertragung abzuschließen

3.5

elektronische Gebührenerhebung

(en: electronic fee collection)

Gebührenerhebung mit elektronischen Mitteln

Anmerkung 1 zum Begriff: Die eigentliche Bezahlung (Gebührenerhebung) kann außerhalb eines Mautsystems stattfinden.

3.6

Vollstreckung

(en: enforcement)

Maßnahmen oder Aktionen, die durchgeführt werden, um die Befolgung von Gesetzen, Bestimmungen oder Regeln sicherzustellen

Anmerkung 1 zum Begriff: In diesem Zusammenhang: Der Prozess zur zwingenden Einhaltung eines Mautregimes.

3.7

Interoperabilität

(en: interoperability)

Fähigkeit eines Systems, Informationen auszutauschen und die Informationen, die ausgetauscht wurden, gegenseitig zu nutzen

BEISPIEL Maut-Interoperabilität bezweckt, dass damit Fahrzeuge durch verschiedene Mautgebiete fahren können und dabei nur eine fahrzeuginterne Einrichtung (OBE) mit nur einem Vertrag eines Maut-Diensteanbieters haben.

3.8

Lokalisierungsverbreitung

(en: localisation augmentation)

Information, die von der Straßenrand- zur fahrzeuginternen Einrichtung gesendet wird, um die Position für autonome Systeme zu verbreiten

3.9

fahrzeuginterne Einrichtung

OBE

(en: on-board equipment)

alle notwendigen Einrichtungen im Fahrzeug, um geforderte Funktionen und Kommunikationsdienste für die elektronische Gebührenerhebung (EFC) auszuführen

3.10

Straßenrandeinrichtung

(en: roadside equipment)

entweder stationäre oder mobile Einrichtung entlang einer Straße

3.11

Rolle

(en: role)

Menge von Verantwortlichkeiten

3.12

Nahbereichskommunikation

(en: short-range communication)

Mauttechnik, basierend auf Informationsübertragung mittels Funkverbindung zwischen einer Straßenrandeinrichtung und einer fahrzeuginternen Einrichtung

Anmerkung 1 zum Begriff: Dieses beinhaltet 5.8 GHz DSRC sowie ITS-G5 und RFID.

3.13

Tarifübersicht

(en: tariff scheme)

Menge von Regeln zur Gebührenfestsetzung für ein Fahrzeug in einem Mautgebiet

3.14

Maut

(en: toll)

Gebühr, Steuer oder Verpflichtung, erhoben in Verbindung mit einer Fahrzeugbenutzung innerhalb eines Mautgebiets

3.15

Mauterheber

(en: Toll Charger)

Instanz, die Maut für die Nutzung von Fahrzeugen in einem Mautgebiet erhebt

3.16

Mautbuchungsnachweis

(en: toll declaration)

Erklärung zur Anmeldung der Nutzung eines gegebenen Mautdienstes an einen Mauterheber

3.17

Mautgebiet

(en: toll domain)

Bereich oder Teil eines Straßennetzwerks, in dem ein bestimmtes Mautregime angewendet wird

3.18

Mautregime

(en: toll regime)

Menge von Regeln, einschließlich Vollstreckungsregeln, welche die Erhebung von Maut in einem Mautgebiet regeln

3.19

Mautschema

(en: toll scheme)

organisatorischer Blick auf ein Mautregime, inklusive der Akteure und deren Beziehungen

3.20

Mautdienst

(en: toll service)

Dienst, welcher Nutzern die Bezahlung von Maut ermöglicht

3.21

Mautdienstanbieter

(en: Toll Service Provider)

Instanz, welche Mautdienste in einem oder mehreren Mautgebiet(en) anbietet

3.22

Transportdienst

(en: transport service)

auf die Transportinfrastruktur bezogener Dienst, welcher Nutzern angeboten wird

3.23

vertrauenswürdige Objekt

(en: trust object)

Informationsobjekt, welches zwischen zwei Instanzen ausgetauscht wird, um gegenseitiges Vertrauen sicherzustellen

BEISPIEL Eine elektronische Signatur oder ein elektronisches Zertifikat.

— Leerseite —

English Version

Electronic fee collection - System architecture for vehicle-
related tolling - Part 1: Reference model
(ISO 17573-1:2019)

Perception électronique du télépéage - Architecture de
systèmes pour le péage lié aux véhicules - Partie 1:
Modèle de référence (ISO 17573-1:2019)

Elektronische Gebührenerhebung -
Systemarchitektur für fahrzeugbezogene Maut -
Teil 1: Referenzmodell (ISO 17573-1:2019)

This European Standard was approved by CEN on 7 July 2019.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

This document (EN ISO 17573-1:2019) has been prepared by Technical Committee ISO/TC 204 "Intelligent transport systems" in collaboration with Technical Committee CEN/TC 278 "Intelligent transport systems" the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2020, and conflicting national standards shall be withdrawn at the latest by March 2020.

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.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

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

Endorsement notice

The text of ISO 17573-1:2019 has been approved by CEN as EN ISO 17573-1:2019 without any modification.

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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 of 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 www.iso.org/iso/foreword.html.

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

This first edition of ISO 17573-1, cancels and replaces ISO 17573:2010, which has been technically revised.

The main changes compared to ISO 17573:2010 are as follows:

- update of the normative references, terms and definitions and abbreviated terms clauses and the Bibliography;
- relocation of previous Clause 8 (Information schemata and basic information types) to informative Annex B;
- removal of Clauses 9 (interfaces and computational objects) and 10 (Points of observation and view point correspondences), Annex A (Short Open Distributed Processing (ODP) description), Annex B (Comparison with ISO/TS 17573:2003), Annex C (Relations with this International Standard and IFMSA), Annex D (Relation with the European Electronic Tolls Service) and Annex E (Example of the Japanese electronic toll system);
- addition of the new informative Annex A (Mapping of the EFC architecture onto the C-ITS architecture) and Annex C (Enterprise objects within roles).

A list of all parts in the ISO 17573 series can be found on the ISO website.

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

The widespread use of tolling also requires provisions for users of vehicles that are roaming through many different toll domains. Users should be offered a single contract for driving a vehicle through various toll domains and those vehicles require on-board equipment (OBE) that is interoperable with the toll systems in the various toll domains. In Europe, for example, this need has been recognised and legislation on interoperability has been adopted (Directive 2004/52).

In addition to specialised standards there is also a need for a system architecture that:

- provides an architectural “umbrella” for other EFC standards in terms of a common definition of terms and concepts, basic system functionalities, and structure;
- provides a common terminology which supports its users to improve the quality of specifications to be used in an international market,
 - to reduce the risk for conflicting interpretations of specifications (purchaser) and descriptions (supplier),
 - to simplify the communication between experts from different continents, and
 - to enhance the potential use of other EFC standards;
- defines a common framework, which enables both:
 - identification of potential activities subject to standardization, and
 - maintaining a common and consistent view of the whole area;
- defines the boundaries between the EFC and external domains;
- identifies all architectural objects that lay inside the EFC boundaries;
- provides a basic understanding of EFC, EFC interoperability, and the EFC services being offered.

Toll systems conforming to this document may be used for various purposes including measured distance toll, road segment toll, closed network toll, cordon toll, area toll, time-based toll and collecting fees for the use of bridges, tunnels, ferries, or for parking.

ISO 17573:2010 was based on a conceptual model defined in ISO/TR 14904 (withdrawn standard). Since then ideas on conceptual models have evolved in several regional projects and implementations, e.g. in Japan and Europe. Those new models have been detailed to a further extent compared to ISO 17573:2010 and are closer to real life implementations. This document is based on these new conceptual models and uses the associated terms and definitions.

Although there are many differences, collecting a toll for vehicles can, to some extent, be compared with collecting a fare for public transport. Architectural harmonisation of the collection of fee and fare may be desirable from a policy and from a user point of view. In the past, ISO 24014-1 prepared by ISO TC 204 used ISO 17573:2010 as a starting point. This document has benefited from that and has also taken ISO 24014-1 into account.

In this document, the Open Distributed Processing (ODP) standard is used for the description of the architecture.

The ODP standard gives a vocabulary and modelling tools to see the architecture of a system from different perspectives (the viewpoints), in order to cover, e.g. hardware components as well as network protocols or interfaces or roles and general policies of the system itself. This is accomplished using different sets of concepts and terminologies, each one of those expressed as a viewpoint language. A complete description of a real system can only be achieved when all viewpoint models are designed. This allows for a clear separation of concerns and an easier way to define a system.

In more recent years, the development of concepts and standards in the field of Cooperative ITS (C-ITS, ISO TC 204 and CEN TC 278) led to the definition of a general enterprise viewpoint architecture for C-ITS (ISO 17427-1) that, by following the same approach of using the ODP architecture to model a complex system, defined concepts and terms for the more general realm of C-ITS.

This document gives a description of the architecture of the toll systems environment from the enterprise viewpoint, by refining and extending what had been already done in ISO 17573:2010. Correspondences between concepts and terms in this document and those in ISO 17427-1 are shown in Annex A. In addition, this document gives in Annex B the foundations of the information viewpoint by identifying information interactions and general information objects. With respect to ISO 17573:2010, this document removes all security requirements on interfaces, which are better and more generally dealt with in ISO 19299.

This document is Part 1 of a multipart standard that is made up of the following parts:

- ISO 17573-1, *Electronic fee collection — System architecture for vehicle related tolling — Part 1: Reference model* (this document)
- ISO/TR 17573-2¹⁾, *Electronic fee collection — System architecture for vehicle related tolling — Part 2: Terminology*

1) Under development. Current stage: 30.99

Electronic fee collection — System architecture for vehicle-related tolling —

Part 1: Reference model

1 Scope

This document defines the architecture of electronic fee collection (EFC) system environments, in which a customer with one contract may use a vehicle in a variety of toll domains with a different toll charger for each domain.

EFC systems conforming to this document can be used for various purposes including road (network) tolling, area tolling, collecting fees for the usage of bridges, tunnels, ferries, for access or for parking. From a technical point of view the considered toll systems may identify vehicles subject to tolling by means of electronic equipment on-board in a vehicle or by other means (e.g. automatic number plate recognition, ANPR).

From a process point of view the architectural description focuses on toll determination, toll charging, and the associated enforcement measures. The actual collection of the toll, i.e. collecting payments, is outside of the scope of this document.

The architecture in this document is defined with no more details than required for an overall overview, a common language, an identification of the need for and interactions among other standards, and the drafting of these standards.

This document as a whole provides:

- the enterprise view on the architecture, which is concerned with the purpose, scope and policies governing the activities of the specified system within the organization of which it is a part;
- the terms and definitions for common use in an EFC environment;
- a decomposition of the EFC systems environment into its main enterprise objects;
- the roles and responsibilities of the main actors. This document does not impose that all roles perform all indicated responsibilities. It should also be clear that the responsibilities of a role may be shared between two or more actors. Mandating the performance of certain responsibilities is the task of standards derived from this architecture;
- identification of the provided services by means of action diagrams that underline the needed standardised exchanges;
- identification of the interoperability interfaces for EFC systems, in specialised standards (specified or to be specified).

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/IEC 7498-1:1994, *Information technology — Open Systems Interconnection — Basic Reference Model: The Basic Model — Part 1*

ISO/IEC 10746-2, *Information technology — Open distributed processing — Reference model: Foundations — Part 2*

ISO/IEC 10746-3, *Information technology — Open distributed processing — Reference model: Architecture — Part 3*

ISO 14813-5, *Transport information and control systems — Reference model architecture(s) for the TICS sector — Part 5: Requirements for architecture description in TICS standard*

ISO/IEC 15414, *Information technology — Open distributed processing — Reference model — Enterprise language*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 7498-1:1994, ISO/IEC 10746-2, ISO/IEC 10746-3, ISO 14813-5 and ISO/IEC 15414, and the following apply.

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

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

3.1 automatic number plate recognition

technology that uses optical character recognition on images to read vehicle registration plates

3.2 artefact

physical object of material or physical piece of information or a system or subsystem that is used in an ITS system

3.3 billing detail

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

3.4 context data

information defined by the responsible toll charger necessary to establish the toll due for circulating a vehicle on a particular toll domain and to conclude the toll transaction

3.5 electronic fee collection

fee collection by electronic means

Note 1 to entry: The actual payment (collection of the fee) may take place outside the toll system.

3.6 enforcement

measures or actions performed to achieve compliance with laws, regulations or rules

Note 1 to entry: In this context: the process of compelling observance of a toll regime.

3.7 interoperability

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

EXAMPLE Tolling interoperability aims at enabling a vehicle to drive through various toll domains while having only one OBE operating under one contract with a toll service provider.

3.8

localisation augmentation

information sent by the roadside equipment to the on-board equipment to augment the positioning for autonomous systems

3.9

on-board equipment

all required equipment on-board a vehicle for performing required electronic fee collection (EFC) functions and communication services

3.10

roadside equipment

equipment located along the road, either fixed or mobile

3.11

role

set of responsibilities

3.12

short-range communication

tolling technique based on transfer of information via a radio connection between a roadside equipment and an on-board equipment

Note 1 to entry: This includes 5,8 GHz DSRC as well as ITS-G5 and RFID.

3.13

tariff scheme

set of rules to determine the fee due for a vehicle within a toll domain

3.14

toll

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

3.15

Toll Charger

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

3.16

toll declaration

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

3.17

toll domain

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

3.18

toll regime

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

3.19

toll scheme

organizational view of a toll regime, including the actors and their relationships

3.20

toll service

service enabling users to pay a toll

3.21

Toll Service Provider

entity providing toll services in one or more toll domains

3.22

transport service

transport infrastructure related service which is offered to the user

3.23

trust object

information object that is exchanged between entities to ensure mutual trust

EXAMPLE Electronic signature or an electronic certificate.

4 Symbols and abbreviated terms

4.1 Symbols

In action diagrams, the following graphical conventions apply:



Rounded corner boxes indicate responsibilities and related activities within roles



Arrows crossing borders between roles indicate information exchanges between roles as activities performed within responsibilities



Vertical arrows within activities represent execution steps



Solid circles represent start of activities



Partially coloured circles represent end of activities



Solid horizontal bars represent decision gates

4.2 Abbreviated terms

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

ANPR	Automatic Number Plate Recognition
CE	Central Equipment
C-ITS	Cooperative ITS
DSRC	Dedicated Short-Range Communication
EETS	European Electronic Toll Service
EFC	Electronic Fee Collection
GNSS	Global Navigation Satellite Systems

ID	Identity
IFMSA	Interoperable Fare Management System Architecture
ITS	Intelligent Transport Systems
OBE	On-board Equipment
ODP	Open Distributed Processing
RFID	Radio Frequency Identification
RSE	Roadside Equipment
SAM	Secure Application Module
SLA	Service Level Agreement
SRC	Short Range Communication
TC	toll charger
TSP	toll service provider

5 The EFC community: roles and objectives

5.1 General

Electronic fee collection (EFC) is an ITS service enabling the user of a vehicle-related transport service to pay for the related transport service, e.g. the use of a tolled road, without manual intervention. The ITS application providing the ITS service will usually be implemented in equipment installed in the vehicle, at the roadside and in central systems. In some scenarios, it also includes personal equipment, e.g. smartphones.

The EFC architecture can be described by a community of external and internal enterprise objects with the objective of providing an EFC service with its benefits regarding traffic safety, traffic efficiency, comfort and mobility to the EFC service user. External enterprise objects are involved in the provision of the EFC service but are not set up for the sole purpose of EFC. This document only includes the definition of the internal enterprise objects, but the external enterprise objects are shortly described in this clause to give the complete picture of the EFC community. Figure 1 shows the external objects in the EFC community.