

	DIN EN ISO 12813	
ICS 03.220.20; 35.240.60	Ersatz für DIN EN ISO 12813:2020-03	
Elektronische Gebührenerhebung – Kommunikation zur Übereinstimmungsprüfung für autonome Systeme (ISO 12813:2024); Englische Fassung EN ISO 12813:2024 Electronic fee collection – Compliance check communication for autonomous systems (ISO 12813:2024); English version EN ISO 12813:2024 Perception de télépéage – Communication de contrôle de conformité pour systèmes autonomes (ISO 12813:2024); Version anglaise EN ISO 12813:2024		
Gesamtumfang 77 Seiten		
DIN-Normenausschuss Auto und Mobilität (NAAutomobil) DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE		

Nationales Vorwort

Dieses Dokument (EN ISO 12813:2024) wurde vom Technischen Komitee ISO/TC 204 „Intelligent transport systems“ in Zusammenarbeit mit dem Technischen Komitee CEN/TC 278 „Intelligente Verkehrssysteme“, dessen Sekretariat von NEN (Niederlande) gehalten wird, erarbeitet.

Das zuständige deutsche Normungsgremium ist der Gemeinschaftsarbeitsausschuss NA 052-00-71 GA „Gemeinschaftsarbeitsausschuss NAAutomobil/DKE: Intelligente Verkehrssysteme“ im DIN-Normenausschuss Auto und Mobilität (NAAutomobil).

Dieses Dokument enthält unter Berücksichtigung des DIN-Präsidialbeschlusses 1/2004 nur die Englische Fassung von EN ISO 12813:2024.

Fahrzeuginterne Einrichtungen (OBE), die auf satellitengestützter Positionierung zur Datensammlung für Gebührenerhebung zur Straßennutzung dienen, werden autonom gegenüber der Straßenrandinfrastruktur betrieben. Die OBE zeichnet dabei die gefahrene Entfernung in einem mautpflichtigen Gebiet auf.

Dieses Dokument definiert Anforderungen an die DSRC (en: dedicated short-range communication) zwischen OBE und einem Fragesteller zur Einhaltungsprüfung der Straßennutzung in einem Mautregime. Es basiert auf einer Gebührenerhebungsarchitektur nach ISO 17573-1.

Für die in diesem Dokument zitierten Dokumente wird im Folgenden auf die entsprechenden deutschen Dokumente hingewiesen:

ISO 14906:2022	siehe	DIN EN ISO 14906:2023-04
ISO 17573-1	siehe	DIN EN ISO 17573-1
ISO/TS 17574	siehe	DIN CEN ISO/TS 17574
ISO 19299	siehe	DIN EN ISO 19299
ISO/IEC 27000	siehe	DIN EN ISO/IEC 27000

Aktuelle Informationen zu diesem Dokument können über die Internetseiten von DIN (www.din.de) durch eine Suche nach der Dokumentennummer aufgerufen werden.

Änderungen

Gegenüber DIN EN ISO 12813:2020-03 wurden folgende Änderungen vorgenommen:

- a) Überarbeitung einiger Begriffe basierend auf ISO/TS 17573-2 als primäre Quelle;
- b) einige Datenfestlegungen wurden, basierend auf ISO/TS 17573-3 als primäre Quelle, angepasst.

Frühere Ausgaben

DIN CEN ISO/TS 12813 (DIN SPEC 91160): 2011-07
DIN EN ISO 12813: 2016-04, 2017-10, 2020-03

Nationaler Anhang NA (informativ)

Begriffe

Reihenfolge und Inhalt der folgenden Begriffe sind identisch mit denen im Abschnitt Begriffe der Englischen Fassung.

Für die Anwendung dieses Dokuments gelten die folgenden Begriffe.

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

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

3.1

Zugriffsbeglaubigung

en **access credentials**

vertrauliche Bescheinigung oder sicheres Modul, welches die geforderte Identität eines Objektes oder einer Anwendung schafft

[QUELLE: ISO/TS 17573-2:2020, 3.4]

3.2

Attribut

en **attribute**

adressierbares Datenpaket, welches aus einem einzelnen Datenelement oder strukturierten Sequenzen von Datenelementen besteht

[QUELLE: ISO/TS 17573-2:2020, 3.13]

3.3

Authentifizierung

en **authentication**

Sicherheitsmechanismus, welcher die Überprüfung der bereitgestellten Identität ermöglicht

[QUELLE: EN 301 175 V1.1.1:1998, 3]

3.4

Authentifikator

en **authenticator**

Daten, wenn möglich verschlüsselt, die zur *Authentifizierung* (3.3) verwendet werden

[QUELLE: ISO/TS 17573-2:2020, 3.16]

3.5

Back End

Teil eines Backoffice-Systems, welches mit einem oder mehreren *Front Ends* (3.8) verbunden ist

[QUELLE: ISO/TS 17573-2:2020, 3.22]

3.6

Datenintegrität

en **data integrity**

Eigenschaft, dass Daten nicht in unautorisierter Art und Weise verändert oder vernichtet wurden

[QUELLE: ISO 7498-2:1989, 3.3.21]

3.7

feste straßenseitige Einrichtung

en **fixed roadside equipment**

an einer festen Position installierte *straßenseitige Einrichtung* (3.11)

[QUELLE: ISO/TS 17573-2:2020, 3.81]

3.8

Front End

Teil eines elektronischen Gebührenerhebungssystems, bestehend aus einer *fahrzeuginternen Einrichtung* (OBE) (3.10) und möglicherweise einem Vertreter mit dem Straßenmautinformationen und Benutzungsdaten gesammelt, verarbeitet und an das *Back End* (3.5) übermittelt werden

[QUELLE: ISO/TS 17573-2:2020, 3.85]

3.9

mobile straßenseitige Einrichtung

en **mobile roadside equipment**

Einrichtung, die in einer mobilen Einheit oder in einem mobilen Endgerät montiert ist, die entlang der Straße verwendet wird

[QUELLE: ISO/TS 17573-2:2020, 3.119]

3.10

fahrzeuginterne Einrichtung

en **on-board equipment**

alle erforderlichen Einrichtungen im Fahrzeug, die zur Durchführung notwendiger EFC-Funktionen (en: electronic fee collection, EFC) und Kommunikationsdienste benötigt werden

[QUELLE: ISO/TS 17573-2:2020, 3.126]

3.11

straßenseitige Einrichtung

en **roadside equipment**

feste oder mobile Einrichtung zur elektronischen Gebührenerhebung (EFC) entlang oder an einer Straße

[QUELLE: ISO/TS 17573-2:2020, 3.161]

3.12

Dienstprimitive

en **service primitive**

elementarer Kommunikationsdienst, der durch die Anwendungsschicht den Anwendungsprozessen zur Verfügung gestellt wird

[QUELLE: ISO/TS 17573-2:2020, 3.173]

3.13**Maut**en **toll**

Gebühren, Steuer oder Verpflichtungsabgabe in Verbindung einer Fahrzeugbenutzung innerhalb eines *Mautgebietes* (3.16)

[QUELLE: ISO/TS 17573-2:2020, 3.193]

3.14**Mauterheber**en **toll charger**

Instanz, die *Maut* (3.13) erhebt, um ein Fahrzeug in einem *Mautgebiet* (3.16) zu nutzen

[QUELLE: ISO/TS 17573-2:2020, 3.194]

3.15**Mautkontext**en **toll context**

logischer Blick auf ein Mautschema, das anhand von *Attributen* (3.2) und Funktionen eines Basiselements definiert ist und aus einem einzelnen Basismautprinzip, der räumlichen Verteilung eines Abrechnungsobjektes und dem einzelnen Verhalten des betroffenen *Front Ends* (3.8) besteht

[QUELLE: ISO/TS 17573-2:2020, 3.196]

3.16**Mautgebiet**en **toll domain**

Bereich oder Teil eines Straßennetzwerks, in dem ein bestimmtes *Mautregime* (3.17) angewendet wird

[QUELLE: ISO/TS 17573-2:2020, 3.201]

3.17**Mautregime**en **toll regime**

Regelwerk, einschließlich Regeln zur Kontrolle, für die Erhebung von *Maut* (3.13) in einem *Mautgebiet* (3.16)

[QUELLE: ISO/TS 17573-2:2020, 3.203]

3.18**Mautdienstanbieter**en **toll service provider**

Organisation, die Mautdienste in einem oder mehreren *Mautgebieten* (3.16) anbietet

[QUELLE: ISO/TS 17573-2:2020, 3.206]

3.19**Transaktion**en **transaction**

Gesamtheit eines Informationsaustausches zwischen zwei physisch getrennten Kommunikationseinheiten

[QUELLE: ISO/TS 17573-2:2020, 3.211]

Nationaler Anhang NB (informativ)

Abkürzungen

AC_CR	Zugriffsbeglaubigung (en: access credentials)
ADU	Anwendungsdateneinheit (en: application data unit)
AID	Anwendungsbezeichner (en: application identifier)
ASN.1	abstrakte Syntaxnotation 1 (en: abstract syntax notation one)
BST	Bakendienst-Tabelle (en: beacon service table)
CCC	Kommunikation zur Überprüfung der Einhaltung der Vorschriften (en: compliance check communication)
CN	zellulares Netzwerk (en: cellular network)
DSRC	dedizierte Nahbereichskommunikation (en: dedicated short-range communication)
EFC	elektronische Gebührenerhebung (en: electronic fee collection)
EID	Element-Bezeichner (en: element identifier)
GNSS	globale Satellitennavigationssysteme (en: global navigation satellite systems)
HMI	Mensch-Maschine-Schnittstelle (en: human-machine interface)
IID	Aufrufer-Bezeichner (en: invoker identifier)
MAC	Nachrichten-Authentifizierungs-Code (en: message authentication code)
OBE	fahrzeuginterne Einrichtung (en: on-board equipment)
PICS	Protokollimplementierungs-Konformitätserklärung (en: protocol implementation conformance statement)
PSC	Anbieter-Dienst-Kontext (en: provider service context)
RSE	straßenseitige Einrichtung (en: roadside equipment)
SAM	sicheres Anwendungsmodul (en: secure application module)
TC	Mauterheber (en: toll charger)
TSP	Mautdienstanbieter (en: toll service provider)
VST	Fahrzeug-Service-Tabelle (en: vehicle service table)
WGS84	geodätisches Weltsystem 1984 (en: World Geodetic System 1984)
WSA	WAVE-Dienstanzeige (en: WAVE service advertisement)

Nationaler Anhang NC (informativ)

Literaturhinweise

DIN EN ISO 14906:2023-04, *Elektronische Gebührenerhebung — Anwendungsschnittstelle zur dezidierten Nahbereich-Kommunikation (ISO 14906:2022); Englische Fassung EN ISO 14906:2023*

DIN EN ISO 17573-1, *Elektronische Gebührenerhebung — Systemarchitektur für fahrzeugbezogene Maut — Teil 1: Referenzmodell*

DIN CEN ISO/TS 17574, *Elektronische Gebührenerhebung — Leitfaden für Sicherheitsprofile*

DIN EN ISO 19299, *Elektronische Gebührenerhebung — Sicherheitsgrundstruktur*

DIN EN ISO/IEC 27000, *Informationstechnik — Sicherheitsverfahren — Informationssicherheitsmanagementsysteme — Überblick und Terminologie*

— Leerseite —

English Version

Electronic fee collection - Compliance check
communication for autonomous systems (ISO
12813:2024)

Perception de télépéage - Communication de contrôle
de conformité pour systèmes autonomes (ISO
12813:2024)

Elektronische Gebührenerhebung - Kommunikation
zur Übereinstimmungsprüfung für autonome Systeme
(ISO 12813:2024)

This European Standard was approved by CEN on 25 December 2023.

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

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European foreword

This document (EN ISO 12813:2024) 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 September 2024, and conflicting national standards shall be withdrawn at the latest by September 2024.

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 supersedes EN ISO 12813:2019.

Any feedback and questions on this document should be directed to the users' national standards body/national committee. A complete listing of these bodies can be found on the CEN website.

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Endorsement notice

The text of ISO 12813:2024 has been approved by CEN as EN ISO 12813:2024 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 document 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).

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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*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 278 *Intelligent transport systems*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 12813:2019), which has been technically revised.

The main changes are as follows:

- Clause 6 has been added, concerning conformance requirements;
- Clause 3 has been updated and ISO/TS 17573-2 has been made the primary source for terms and definitions;
- data definitions have been updated, including making reference to ISO 17573-3 as the primary source;
- Annex A has been restructured;
- temporary optional support of legacy encoding in some data types in OBE and RSE in CEN countries has been added;
- a second level of version identifier (i.e. minor version) of the abstract syntax notation one (ASN.1) module has been added in order to provide enhanced support to standards that import data types from this document (imported ASN.1 types are used to be subsequent editions, including all future minor versions).

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

On-board equipment (OBE) that uses satellite-based positioning technology to collect data required for charging for the use of roads operates in an autonomous way (i.e. without relying on dedicated roadside infrastructure). The OBE will record the amount of road usage in all toll charging systems it passes through.

This document specifies requirements for dedicated short-range communication (DSRC) between OBE and an interrogator for the purpose of checking compliance of road use with a local toll regime. It assumes an electronic fee collection (EFC) services architecture according to ISO 17573-1 (see Figure 1).

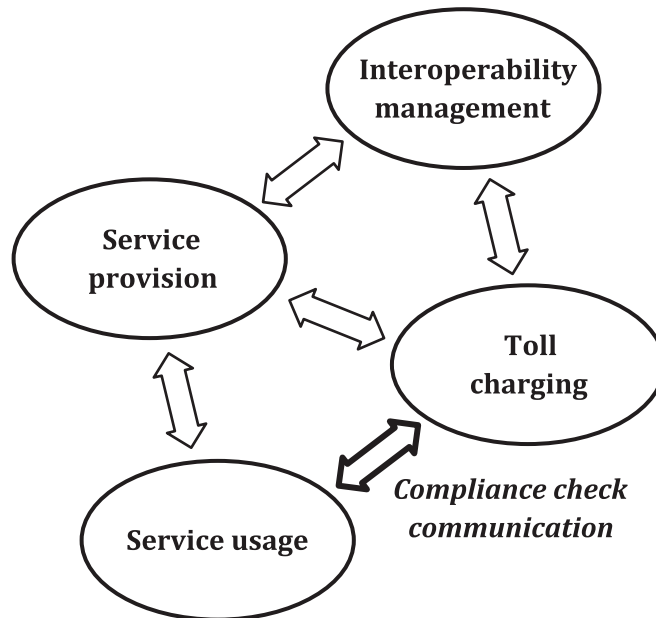


Figure 1 — Compliance check communication in EFC architecture according to ISO 17573-1

Toll chargers (TCs) need to check whether or not the road is used in compliance with the rules in the local toll regime. One way of checking compliance is to observe a passing vehicle and to interrogate the OBE. This interrogation happens under control of an entity responsible for toll charging (see Figure 1), accomplished via short-range communication between an interrogator at the roadside or in another vehicle (operated by a competent enforcement agency) and the OBE. In an interoperable environment, it is essential that this interrogation communication be standardized such that every operator of compliance checking equipment can check all passing OBE. For that purpose, this document defines attributes required on all OBE for reading by an interrogator.

This document has been prepared to fulfil the following statements:

- Collected evidence can be used as court proof. Data is indisputable and secured such that the operator of the compliance checking interrogator can prove the integrity and authenticity of the data in case of dispute.
- The data required for compliance checking is read only, since the operator of the interrogator does not interfere with the working of the OBE.
- All attributes, standardized at the time of personalization of the OBE, are present in the OBE such that an operator of an interrogator can essentially read the same data from all OBE, independent of the type and make. In case an attribute does not make sense in a certain OBE implementation, a value assignment for “not applicable” or “not defined” is provided in each case. An OBE compliant to the first edition of this document will not answer with such a response for new attributes introduced in the current edition of this document.
- The attributes, derived from the individual toll regime are of general importance for all toll system types (motorway tolling, area tolling, tolls for ferries, bridges, tunnels, cordon pricing, etc.).

- e) The attributes apply to all OBE architectures, and especially to both thin (edge-light) and fat (edge heavy) client architectures. The interrogator is intended to receive essentially the same information, irrespective of the type of OBE.

It is assumed that the prime objective of the operator of the compliance checking interrogator is to check whether the user has fulfilled its obligations, in particular:

- whether the OBE is mounted in the correct vehicle;
- whether the classification data transmitted by the OBE are correct; and
- whether the OBE is in operational condition, both in a technical and a contractual sense.

Regarding the last point of the above list, on the operational status of OBE, the following model is assumed.

As long as the OBE signals the correct operational status to the user (“go” / “green”), the toll service provider (TSP) takes full responsibility for the correct operation of the OBE and for the payment by the user. Hence, as long as the OBE signals “green” and the user fulfils its other obligations (e.g. entering correct classification data and not tampering with the OBE), the user can expect the OBE to serve as a valid payment means. As soon as the OBE signals an invalid operational status (“no go” / “red”) — either set by the central system of the TSP (e.g. because the user account is negative), by internal mechanisms of the OBE itself (e.g. because of a detected defect or an outdated data set) or a user manipulation with such result — the user knows that the OBE is no longer a valid payment means. The user then uses alternative means of toll declaration or payment until the problem is remedied and the OBE indicates “green” again.

NOTE In this case, “red” and “green” are used in the abstract, symbolic sense, and do not imply any physical implementation. The design of the user interface of the OBE is implementation-dependent, and several methods for signalling “red” or “green” are conceivable.

Ultimately, the policy of when to signal “green” or “red” is specified by the TSP in accordance with the requirements specified by the TC(s).

In the case where the OBE status turns “red”, the user takes action, declares road usage subject to fees or pays by some alternative means as soon as practicable. Until the user does this, they are in a potentially non-compliant situation. To allow a judgment to be made as to whether or not a user has taken the appropriate action within an acceptable period of time, information is provided by this document not only on the “green/red” operational status but also on the length of time that the OBE has been in its current status.

Different toll contexts can overlap geographically. A user could be liable in several toll contexts at once, e.g. for a nationwide distance-dependent road tax and a local city access pricing scheme — a fact of which the user might not in all cases be aware. This document builds on the concept that regarding compliance, as far as possible, there is no notion of toll context (see 5.4). It is within the responsibility of the TSP to resolve issues with overlapping toll contexts and to distil all information into a binary “red/green” message to the user.

A secondary objective of the operator of the compliance checking interrogator can be to collect data on the performance of the OBE, e.g. in order to check for the correct technical functioning. Since different OBE can work according to quite different principles, the possibilities for doing this in a standardized way are quite limited. This document contains some provisions for this task (e.g. the attributes `CommunicationStatus`, `GnssStatus`, `DistanceRecordingStatus`), but otherwise assumes that TCs monitor correct recording by comparing observed traffic (e.g. with cameras) with usage data received from TSPs.

This document has been prepared with the intention to be “minimalist” in the sense that it covers what is required by operational and planned systems.

This document is complemented by ISO 13143, which specifies how to evaluate on-board and roadside equipment for conformity to ISO 12813 (this document).

Electronic fee collection — Compliance check communication for autonomous systems

1 Scope

This document specifies requirements for short-range communication for the purposes of compliance checking in autonomous electronic fee collecting systems. Compliance checking communication (CCC) takes place between a road vehicle's on-board equipment (OBE) and an interrogator [fixed and mobile roadside equipment (RSE) or hand-held unit] and serves to establish whether the data that are delivered by the OBE correctly reflect the road usage of the corresponding vehicle according to the rules of the pertinent toll regime.

The operator of the compliance checking interrogator is assumed to be part of the toll charging role as defined in ISO 17573-1. The CCC permits identification of the OBE, vehicle and contract, and verification of whether the driver has fulfilled their obligations and the checking status and performance of the OBE. The CCC reads, but does not write, OBE data.

This document is applicable to OBE in an autonomous mode of operation. It is not applicable to compliance checking in dedicated short-range communication (DSRC)-based charging systems.

It specifies data syntax and semantics, but not a communication sequence. All the attributes specified herein are required in any OBE claimed to be compliant with this document, even if some values are set to "not specified" in cases where a certain functionality is not present in an OBE. The interrogator is free to choose which attributes are read in the data retrieval phase, as well as the sequence in which they are read. In order to achieve compatibility with existing systems, the communication makes use of the attributes specified in ISO 17573-3 wherever useful.

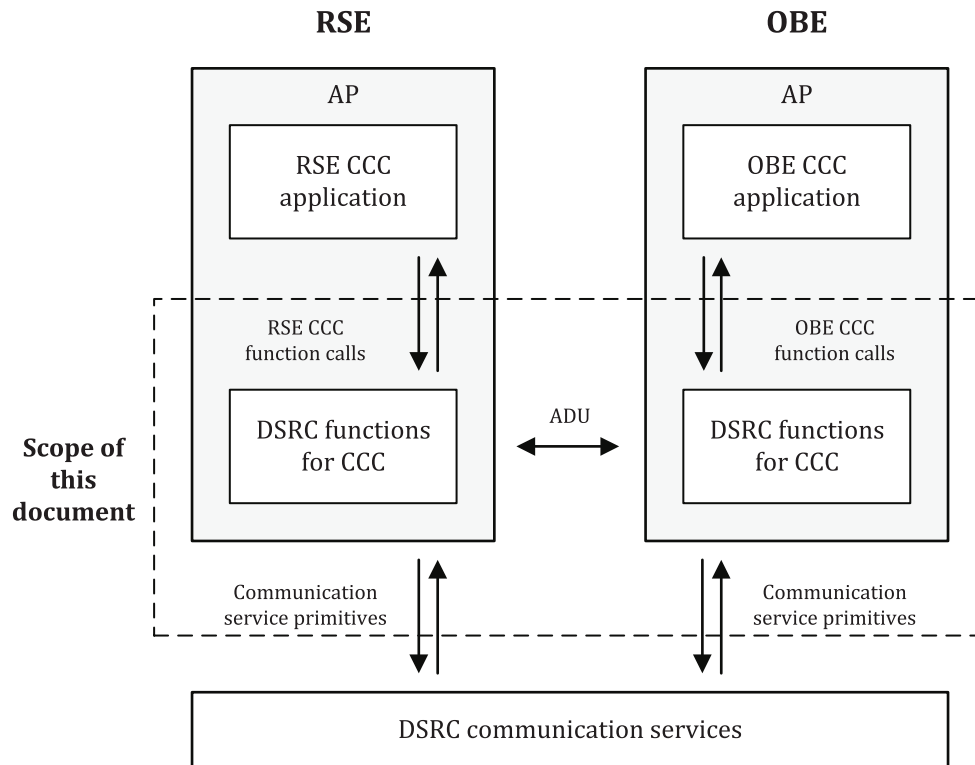
The CCC is suitable for a range of short-range communication media. Specific definitions are given for the CEN-DSRC as specified in EN 15509, as well as for the use of ISO CALM IR, the Italian DSRC as specified in ETSI ES 200 674-1, ARIB DSRC, and WAVE DSRC as alternatives to the CEN-DSRC. The attributes and functions specified are for compliance checking by means of the DSRC communication services provided by DSRC application layer, with the CCC attributes and functions made available to the CCC applications at the RSE and OBE. The attributes and functions are specified on the level of application data units (ADUs).

The definition of the CCC includes:

- the application interface between OBE and RSE (as depicted in Figure 2);
- use of the generic DSRC application layer as specified in ISO 15628 and EN 12834;
- CCC data type specifications given in Annex A;
- a protocol implementation conformance statement (PICS) proforma is given in Annex B;
- use of the CEN-DSRC stack as specified in EN 15509, or other equivalent DSRC stacks as described in Annex C, Annex D, Annex E and Annex F;
- security services for mutual authentication of the communication partners and for signing of data (see Annex H);

In addition, an example CCC transaction is presented in Annex G and Annex I highlights how to use this document for the European Electronic Toll Service (EETS).

Test specifications are not within the scope of this document.



Key

ADU	application data unit
AP	application process
CCC	compliance check communication
DSRC	dedicated short-range communication
OBE	on-board equipment
RSE	roadside equipment

Figure 2 — CCC application interface

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 8825-2, *Information technology — ASN.1 encoding rules — Part 2: Specification of Packed Encoding Rules (PER)*

ISO/IEC 9646-7, *Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 7: Implementation Conformance Statements*

ISO 12855, *Electronic fee collection — Information exchange between service provision and toll charging*

ISO 14906:2022, *Electronic fee collection — Application interface definition for dedicated short-range communication*

ISO 15628:2013, *Intelligent transport systems — Dedicated short range communication (DSRC) — DSRC application layer*

ISO 17573-3:2023, *Electronic fee collection — System architecture for vehicle-related tolling — Part 3: Data dictionary*

EN 12834, *Road transport and traffic telematics — Dedicated Short Range Communication (DSRC) — DSRC application layer*

EN 15509:2023, *Electronic fee collection — Interoperability application profile for DSRC*

NIMA Technical Report TR8350.2 version 3 — *Department of Defense World Geodetic System 1984, Its Definition and Relationships With Local Geodetic Systems*

3 Terms and definitions

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

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

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

3.1

access credentials

trusted attestation or secure module that establishes the claimed identity of an object or application

[SOURCE: ISO/TS 17573-2:2020, 3.4]

3.2

attribute

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

[SOURCE: ISO/TS 17573-2:2020, 3.13]

3.3

authentication

security mechanism allowing verification of the provided identity

[SOURCE: EN 301 175 V1.1.1:1998, 3]

3.4

authenticator

data, possibly encrypted, that is used for *authentication* (3.3)

[SOURCE: ISO/TS 17573-2:2020, 3.16]

3.5

back end

part of a back-office system interfacing to one or more *front ends* (3.8)

[SOURCE: ISO/TS 17573-2:2020, 3.22]

3.6

data integrity

property that data has not been altered or destroyed in an unauthorized manner

[SOURCE: ISO 7498-2:1989, 3.3.21]

3.7

fixed roadside equipment

roadside equipment (3.11) located at a fixed position

[SOURCE: ISO/TS 17573-2:2020, 3.81]

3.8

front end

part of an electronic fee collection (EFC) system which consists of *on-board equipment (OBE)* (3.10) and possibly of a proxy where road tolling information and usage data are collected and processed for delivery to the *back end* (3.5)

[SOURCE: ISO/TS 17573-2:2020, 3.85]

3.9

mobile roadside equipment

equipment mounted on a mobile unit or handheld equipment to be used along the road

[SOURCE: ISO/TS 17573-2:2020, 3.119]

3.10

on-board equipment

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

[SOURCE: ISO/TS 17573-2:2020, 3.126]

3.11

roadside equipment

fixed or movable electronic fee collection (EFC) equipment located along or on the road

[SOURCE: ISO/TS 17573-2:2020, 3.161]

3.12

service primitive

elementary communication service provided by the application layer protocol to the application processes

[SOURCE: ISO/TS 17573-2:2020, 3.173]

3.13

toll

charge, tax or duty levied in connection to using a vehicle in a *toll domain* (3.16)

[SOURCE: ISO/TS 17573-2:2020, 3.193]

3.14

toll charger

entity which levies *toll* (3.13) for the use of vehicles in a *toll domain* (3.16)

[SOURCE: ISO/TS 17573-2:2020, 3.194]

3.15

toll context

logical view as defined by *attributes* (3.2) 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* (3.8)

[SOURCE: ISO/TS 17573-2:2020, 3.196]

3.16

toll domain

area or a part of a road network where a certain *toll regime* (3.17) is applied

[SOURCE: ISO/TS 17573-2:2020, 3.201]

3.17

toll regime

set of rules, including enforcement rules, governing the collection of *tolls* (3.13) in a *toll domain* (3.16)

[SOURCE: ISO/TS 17573-2:2020, 3.203]

3.18

toll service provider

entity providing toll services in one or more *toll domains* (3.16)

[SOURCE: ISO/TS 17573-2:2020, 3.206]

3.19

transaction

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

[SOURCE: ISO/TS 17573-2:2020, 3.211]

4 Abbreviated terms

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

AC_CR	access credentials
ADU	application data unit
AID	application identifier
ASN.1	abstract syntax notation one
BST	beacon service table
CCC	compliance check communication
CN	cellular network
DSRC	dedicated short-range communication
EFC	electronic fee collection
EID	element identifier
GNSS	global navigation satellite systems
HMI	human-machine interface
IID	invoker identifier
MAC	message authentication code
OBE	on-board equipment
PICS	protocol implementation conformance statement
PSC	provider service context
RSE	roadside equipment
SAM	secure application module
TC	toll charger

TSP	toll service provider
VST	vehicle service table
WGS84	World Geodetic System 1984
WSA	WAVE service advertisement

5 Application interface architecture

5.1 General

This clause gives an insight into the CCC architecture. It identifies the services provided to CCC applications and the functions that implement these services. It also defines principles regarding attributes and the use of DSRC communication service primitives. A detailed description of the functions is given in Clause 7, whilst the detailed list of the attributes is given in Clause 8.

The CCC application interface has been designed to make use of the CEN-DSRC communication stack, via the application layer specified in ISO 15628 and EN 12834. For other identified DSRC communication media, detailed mappings to corresponding services are given in annexes.

From a general addressing viewpoint, it should be noted that only one CCC context is used, as compliance checking attributes are independent of context.

5.2 Services provided

The CCC application interface offers the following services to CCC applications:

- retrieval of compliance significant attributes, in order for RSE to assess OBE compliance,
- mutual authentication of RSE and OBE by means of exchange of credentials and authenticators, and
- a command to the OBE to signal to the user the result of the compliance check.

NOTE 1 The policy on whether the result of the compliance check or the fact that a transaction has taken place is signalled to the user is decided by the entity operating the CCC interrogator and is outside the scope of this document.

The above services are realized by means of protocol exchanges performed by means of communication services and transactions as described in Clause 9.

The services are provided by the following functions:

- the “initialise communication” function, which shall be used to establish the CCC communication link between RSE and OBE;
- the “data retrieval” function, which shall be used to retrieve CCC attributes;
- the “authenticated data retrieval” function, which shall be used to retrieve data with an authenticator from the OBE;
- the “driver notification” function, which shall be used to invoke a human-machine interface (HMI) function (e.g. signal “OK” via a buzzer sound);
- the “terminate communication” function, which shall be used to terminate the CCC communication;
- the “test communication” function, which shall be used for testing and localizing the OBE.

NOTE 2 A “write” service is not provided, since the writing of data into the OBE is not foreseen.

5.3 Attributes

The attributes available on the OBE for a CCC application at roadside for checking the compliance of a vehicle are given in detail in Clause 8.

All attributes specified in this document shall be available on the OBE.

The RSE is free to decide to read any combination of attributes from the OBE. The attributes shall be identified and retrieved using the mechanisms specified in ISO 14906. More specifically, the addressing of the CCC application data implemented by the OBE and RSE shall conform to the rules specified in ISO 14906:2022, 5.3.

Multiple instances of attributes are not supported.

5.4 Toll context

An OBE may be located in more than one tolling contexts at once.

NOTE This can occur, e.g. in situations where a motorway toll geographically overlaps with an area-based charging system.

In these different tolling contexts, the OBE can potentially run different charging applications or several instances of one charging application in parallel.

This document builds on the concept that for compliance checking, there is basically no need to distinguish between tolling contexts. In certain circumstances and in the cases specified in the semantic definition, the toll service provider (TSP) shall ensure that the attribute content complies with the specifications of the toll charger (TC) (e.g. for local vehicle classes).

The OBE should hold only one CCC context, represented by a single element as specified in ISO 14906. However, for backwards compatibility reasons, one additional CCC context, represented by a second element may be used to support ISO 12813:2015, the previous edition of this document (see also 9.2.3).

5.5 Use of lower layers

5.5.1 Supported DSRC communication stacks

The CCC application interface makes use of the CEN-DSRC communication stack as defined in Table 1. Other communication media can be used as listed in Table 1 if an equivalent mapping to corresponding services is provided. Detailed examples are provided in informative annexes.

Table 1 — Supported short-range communication stacks

Medium	Application layer	Lower layers	Detailed specifications
CEN-DSRC	ISO 15628 EN 12834	EN 12795 EN 12253	Specification in 5.5.2
Italian DSRC	ETSI ES 200 674-1 (Clause 11 and Annex D)	ETSI ES 200 674-1 (Clauses 7 to 10 and Annex D)	Implementation example in Annex C
ISO CALM IR	ISO 15628 EN 12834	ISO 21214	Implementation example in Annex D
ARIB DSRC	ARIB STD-T75 ISO 15628	ARIB STD-T75 ITU-R.M1453-2	Implementation example in Annex E
WAVE DSRC	IEEE 1609.11-2010 ISO 15628	IEEE 1609.3-2010 IEEE 1609.4-2016 IEEE 802.11	Implementation example in Annex F
NOTE EN 12795 and EN 12253 have been adopted in ITU-R.M 1453-2.			

If more than one communication medium is implemented in an OBE, then the OBE shall respond to RSE interrogations on the same medium that the RSE has initiated the CCC interrogation.

5.5.2 Use of the CEN-DSRC stack

The following requirements apply to the CCC application when used with the CEN-DSRC communication stack.

The OBE shall conform to EN 15509:2023, 6.1.2.

Fixed RSE shall conform to EN 15509:2023, 6.2.2.

Mobile RSE shall conform to EN 15509:2023, 6.2.2, except for *Downlink Parameter D4a* (not applicable to mobile RSE).

NOTE EN 15509 specifies the CEN-DSRC communication stack for fixed RSE only.

6 Conformance

6.1 Conformance requirements

The following requirements apply to OBE and RSE:

- functions (including security functions), as specified in Clause 7;
- application data, as specified in Clause 8 and supplemented by Annex A; and
- transaction model, as specified in Clause 9.

6.2 Conformance statement

A supplier of OBE that claims conformity of its OBE to the requirements specified in this document shall provide a statement of conformance by completing the PICS proforma as provided in B.4.

A supplier of RSE that claims conformity of its RSE to the requirements specified in this document shall provide a statement of conformance to this document by completing the PICS proforma as provided in B.5.

6.3 Conformance evaluation and testing

Suppliers of OBE or RSE claiming conformity of their equipment to this document for the communication medium CEN-DSRC can perform their conformity tests according to specifications laid down in ISO 13143.

NOTE The use of ISO 13143 implies the use of other referenced underlying test standards for evaluation of conformance to this document.

7 Functions

7.1 Functional requirements

7.1.1 Minimum supported functions

All functions specified in Clause 7 shall be available on the OBE.

For CEN-DSRC, the OBE shall provide the following functions:

- INITIALISATION, GET and RELEASE application layer services according to ISO 15628 and EN 12834;
- GET_STAMPED, SET_MMI and ECHO EFC functions according to ISO 14906.