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Elektronsko pobiranje pristojbin - Interoperabilnost profila aplikacije za DSRC

Electronic fee collection - Interoperability application profile for DSRC

Elektronische Gebührenerhebung - Anwendungsprofil für DSRC Interoperabilität

Perception de télépéage - Profil d'application d'interopérabilité pour DSRC

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Electronic fee collection - Interoperability application profile for DSRC

Perception de télépéage - Profil d'application
d'interopérabilité pour DSRC

Elektronische Gebührenerhebung - Anwendungsprofil
für DSRC Interoperabilität

This European Standard was approved by CEN on 30 January 2023.

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[SIST EN 15509:2023](https://standards.iteh.ai/catalog/standards/sist/a53de203-d2c5-43f4-8c95-ec0a4b4780ba/sist-en-15509-2023)

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COMITÉ EUROPÉEN DE NORMALISATION
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European foreword

This document (EN 15509:2023) has been prepared by 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of an identical text or by endorsement, at the latest by September 2023, and conflicting national standards shall be withdrawn at the latest by September 2023.

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 15509:2014.

The main changes compared to the previous edition are as follows:

- updated data definitions to reflect changes made to the underlying base standards, notably in EN ISO 14906, whilst seeking to ensure backward compatibility with previous editions of this document;
- use of imported ASN.1 types with successors (i.e. including all future minor versions);
- updated terms, to take into account the harmonized terms across electronic fee collection standards, as specified in ISO/TS 17573-2;
- deletion of the normative annex on “Security calculations”, which has been moved to EN ISO 14906;
- updated informative Annex G on the “Use of this document for the European electronic toll service” (EETS), to reflect the recast of the EETS legislation (i.e. Directive (EU) 2019/520^[21] and the corresponding Commission Delegated and Implementing Regulations ^[22] ^[23]).

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

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

According to the CEN-CENELEC Internal Regulations, the national standards organisations 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, Türkiye and the United Kingdom.

Introduction

CEN/TC 278 has produced a set of standards that supports interoperable dedicated short-range communication (DSRC)-based electronic fee collection (EFC) systems (e.g. EN ISO 14906, a “toolbox” for definition of EFC-DSRC transactions). However, these standards provide necessary but not sufficient support for technical interoperability between EFC-DSRC-systems.

This document specifies an Interoperable Application Profile (IAP) to support EFC-DSRC transactions, with a coherent set of requirements. The main objective is to support technical interoperability between EFC-systems within the scope of this document (as described in Clause 1). A basic description of the EFC-service and an EFC System can be found in EN ISO 17573-1.

This document specifies a basic level of technical interoperability for EFC equipment, i.e. on-board unit (OBU) and roadside equipment (RSE) using DSRC. It does not provide a full solution for interoperability, nor does it specify other parts of the EFC-system, other services, other technologies and non-technical elements of interoperability.

The elaboration of this document is based on the experiences from a considerable number of implementations and projects throughout Europe. This document makes use of the results from European projects such as CARDME, PISTA and CESARE, as they represent fruits of European EFC harmonization and have been used as the basis for several national implementations.

The development of a common European electronic toll service (EETS) as a part of the European Directive (2004/52/EC^[19]) also calls for the definition of an interoperable EFC-service. The first edition of this document was referenced as a mandatory element in the service definition of the EETS, in the EC decision 2009/750/EC^[20].

The revision of the EETS legislation (recast in EU legal parlance) resulted in the adoption of Directive 2019/520/EC^[21] on *the interoperability of electronic road tolling systems and facilitating cross-border exchange of information on the failure to pay road fees in the Union*, which refers to the second edition of this document (EN 15509:2014) as a mandatory element for the EETS. Further technical and procedural characteristics of the EETS were laid down in the associated Commission Delegated Regulation (EU) 2020/203^[22] and Commission Implementing Regulation (EU) 2020/204^[23].

Although there are standards and specifications, there are specific needs that motivate this document:

- Definition of the necessary and sufficient EFC-DSRC requirements to underpin technical interoperability;
- Choice of data elements including vehicle data;
- Extended definition of the use of some data elements, including semantics and coding;
- Choice of security measures;
- It facilitates a complementing test specification with clear relations between the conformance requirements and evaluation tests;
- The provisions laid down in Directive 2019/520/EC and the associated Commission Regulations;
- Support for procurements.

The Application Profile is described using the concept of “International Standardized Profiles (ISP)” as specified in ISO/IEC TR 10000-1^[15]. The ISP-concept is specifically suited for defining interoperability specifications where a set of base standards can be used in different ways. This is exactly the case in EFC, where a set of base standards allows for different choices that are not interoperable.

The principles of the ISP-concept can be summarized as follows:

- An ISP makes references only to base standards or other ISPs;
- The profile restricts the choice of base standard options to the extent necessary to maximize the probability of interoperability (e.g. chosen classes, conforming subsets, options and parameter values of base standards);
- The ISP does not copy content of the base standards to ensure consistency with the base standards;
- The profile does not specify any requirements that would contradict or cause non-conformance to the base standards;
- The profile may contain conformance requirements that are more specific and limited in scope than those of the base standards;
- Conformance to a profile implies conformance to a set of base standards, whereas conformance to that set of base standards does not necessarily imply conformance to the profile.

The use of the Application Profiling concept also provides for a flexible framework towards adoption, migration and use of this document. Toll Chargers (TCs), Toll Service Providers (TSPs) and Manufacturers may use this IAP as a basis for interoperable use of their equipment, without having to interfere with or otherwise affect any EFC-system used locally.

The general requirements of this document are set out in Clause 5, whilst the specific conformance requirements are given in Clause 6. For ease of referencing, testing and look-up, these specific requirements are divided into two parts; on-board unit (OBU) requirements and roadside equipment (RSE) requirements.

For future use, it is envisaged that other IAPs may be defined using the same structure as is defined in Clause 6. Annex C contains IAP taxonomy and numbering.

In addition, this document includes various annexes that provide further detailed specifications as well as background, motivation and examples for the conformance requirements. These are intended to enhance the readability and understanding of the document.

This document is complemented by standard EN 15876 that specifies how to evaluate on-board and roadside equipment for conformity to EN 15509 (this document).

EN 15509:2023 (E)

1 Scope

The scope of this document is limited to:

- payment method: central account based on EFC-DSRC;
- physical systems: on-board unit (OBU), roadside equipment (RSE) and the DSRC interface between them (all functions and information flows related to these parts);
- DSRC-link requirements;
- EFC transactions over the DSRC interface;
- data elements to be used by OBU and RSE used in EFC-DSRC transactions;
- security mechanisms for OBU and RSE used in EFC-DSRC transactions.

It is outside the scope of this document to specify:

- contractual and procedural interoperability requirements;
- conformance procedures and test specifications;
- setting-up of operating organizations e.g. toll charger (TC), toll service provider (TSP), trusted third party, etc.;
- other payment methods in DSRC-based EFC (e.g. on-board accounts using integrated circuit cards);
- other basic technologies (e.g. GNSS/CN or video registration-based EFC);
- non-EFC transactions over the DSRC interface (e.g. compliance check communication and localization augmentation communication, which are specified in other standards);
- other interfaces or functions in EFC-systems than those specified above (i.e. information flows and data exchange between operators or personalization, initialization and customization of the OBU).

NOTE Some of the issues that are outside the scope of this document are subject of separate standards prepared by CEN/TC 278, ISO/TC 204 and ETSI ERM.

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.

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

EN 13372:2004, *Road Transport and Traffic Telematics (RTTT) - Dedicated short-range communication - Profiles for RTTT applications*

EN ISO 14906:2023, *Electronic fee collection - Application interface definition for dedicated short-range communication*

ETSI/TS 102 486-1-1 V1.1.1 (2006-03), *Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment; Part 1: DSRC data link layer: medium access and logical link control; Sub-Part 1: Protocol Implementation Conformance Statement (PICS) proforma specification*

ETSI/TS 102 486-2-1 V1.2.1 (2008-10), *Intelligent Transport Systems (ITS); Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment; Part 2: DSRC application layer; Sub-Part 1: Protocol Implementation Conformance Statement (PICS) proforma specification*

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

EN ISO 17573-3:—,¹ *Electronic fee collection — System architecture for vehicle-related tolling — Part 3: Data dictionary*

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 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 authenticator

data, possibly encrypted, that is used for authentication

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

¹ Under preparation. Stage at time of publication: ISO/DIS 17573-3:2022

EN 15509:2023 (E)**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/TS 17573-2:2020, 3.23]

3.5**data group**

class of closely related *attributes* (3.2)

[SOURCE: ISO/TS 17573-2:2020, 3.55]

3.6**EFC service**

service for electronic payment offered by a payment service provider

[SOURCE: ISO/TS 17573-2:2020, 3.54]

3.7**Element**

DSRC directory containing application information in the form of *attributes* (3.2)

[SOURCE: EN ISO 14906:2023, 3.8]

3.8**integrity**

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

[SOURCE: ISO/TS 17574:2009, 3.9]

3.9**international standardized profile**

internationally agreed-to, harmonized document which describes one or more *profiles* (3.14)

[SOURCE: ISO/TS 17573-2:2020, 3.102]

3.10**interoperability**

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

[SOURCE: ISO/TS 17573-2:2020, 3.103]

3.11**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]

3.12**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, 3.127, modified – Note 1 to entry has been added]

3.13**on-board unit**

electronic unit on-board a vehicle for performing specific electronic fee collection (EFC) functions and for communication with external systems

Note 1 to entry: An OBU always includes, in this context, at least the support of the DSRC interface.

[SOURCE: ISO/TS 17573-2:2020, 3.127]

3.14**profile**

set of requirements and selected options from *base standards* (3.3) or international standardized profiles used to provide a specific functionality

[SOURCE: ISO/TS 17573-2:2020, 3.146]

3.15**roadside equipment**

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

Note 1 to entry: Movable RSE can be mounted temporarily along the road or in a vehicle.

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

3.16**session**

exchange of information and interaction occurring at a specific EFC station between the *roadside equipment* (3.15) and the user/vehicle

3.17**toll charger**

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

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

EN 15509:2023 (E)**3.18****toll service provider**

entity providing toll services in one or more toll domains

Note 1 to entry: In other documents, the terms issuer or contract issuer may be used.

Note 2 to entry: The toll service provider may provide the OBE or may provide only a magnetic card or a smart card to be used with OBU provided by a third party (like a mobile telephone and a SIM card can be obtained from different parties).

Note 3 to entry: The toll service provider is responsible for the operation (functioning) of the OBE with respect to tolling.

[SOURCE ISO/TS 17573:2020, 3.206, modified – Notes to entry have been added]

3.19**transaction**

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

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

3.20**transaction counter**

data value in the on-board unit that is incremented by the roadside equipment at each *transaction* (3.19)

[SOURCE: ISO/TS 17573-2:2020, 3.212]

3.21**transaction model**

functional model describing the general structure of electronic payment *transactions* (3.19)

[SOURCE: ISO/TS 17573-2:2020, 3.213]

4 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

| | |
|-------|-------------------------------------|
| AC_CR | Access Credentials |
| ADU | Application Data Unit |
| AP | Application Process |
| APDU | Application Protocol Data Unit |
| ASN.1 | Abstract Syntax Notation One |
| AuK | AuKey |
| BST | Beacon Service Table |
| CCC | Compliance Check Communication |
| DEA | Data Encryption Algorithm |
| DES | Data Encryption Standard |
| DSRC | Dedicated Short-Range Communication |

| | |
|-------------------|--|
| EETS | European Electronic Toll Service |
| e [key] (value) | encryption of the value using the key |
| ede [key] (value) | chained encryption, decryption and encryption of the value using the key |
| EFC | Electronic Fee Collection |
| EID | Element Identifier |
| GNSS | Global Navigation Satellite Systems |
| IAP | Interoperable Application Profile |
| ICS | Implementation Conformance Statement |
| ISP | International Standardized Profile |
| IUT | Implementation Under Test |
| L1 | Layer 1 of DSRC (Physical Layer) |
| L2 | Layer 2 of DSRC (Physical Layer) |
| L7 | Layer 7 of DSRC (Application Layer Core of DSRC) |
| LAC | Localisation augmentation communication |
| LID | Logical Link Control identifier |
| LLC | Logical Link Control |
| LSDU | Link Service Data Unit |
| MAC | Media Access Control |
| MMI | Man-Machine Interface |
| OBE | On-Board Equipment |
| OBU | On-board Unit |
| PICS | Protocol Implementation Conformance Statement |
| RL | Requirements List |
| RSE | Roadside Equipment |
| TC | Toll Charger |
| TSP | Toll Service Provider |
| T-APDU | Transfer-Application Protocol Data Unit |
| VST | Vehicle Service Table |

5 Conformance

5.1 General

This clause describes in general terms what it means for an implementation to be in conformity with the profile in this document applicable to the DSRC link between OBU and RSE, as illustrated in Figure 1 as the area within the box delimited with a dotted line.

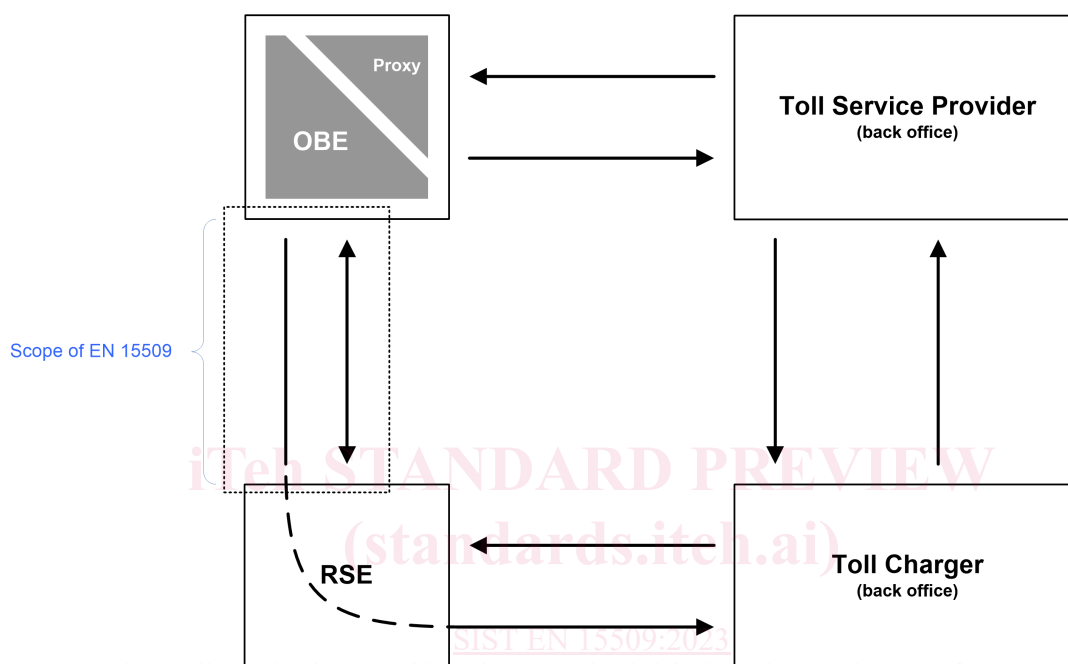


Figure 1 — Scope of this document

5.2 Base standards

This document specifies one Application Profile based on the ISP-concept. It is based on the following base standards:

- EN ISO 14906 on EFC application interface definition for DSRC

NOTE 1 This implies an indirect reference to EN ISO 14816 on “Numbering and data structure”.

- EN 12834 on DSRC application layer (L7),
- EN 13372 on DSRC profiles

NOTE 2 This implies indirect references to EN 12253 (“DSRC L1”), EN 12795 (“DSRC L2”) and EN 12834 (“DSRC L7”).

The relationship and references between base standards and this document are illustrated in Figure 2.

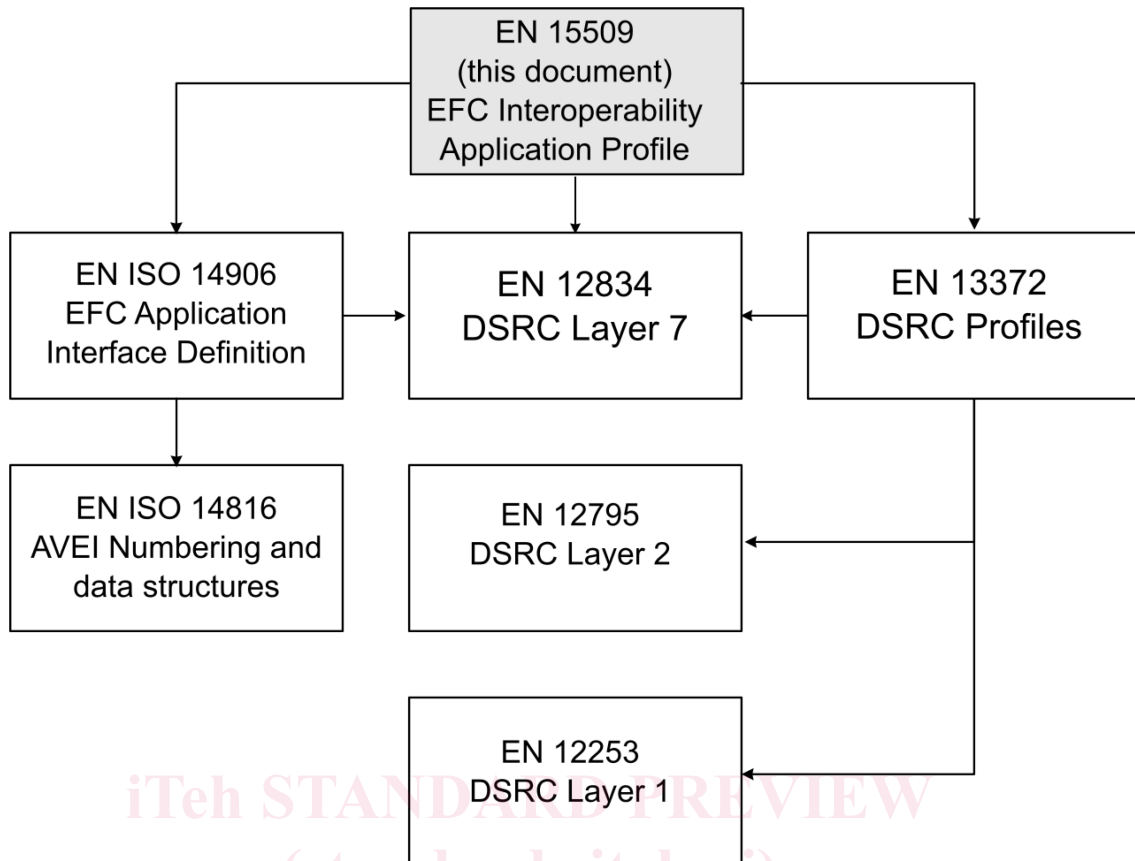


Figure 2 — Relationship and references between base standards and this document

All requirements specified in this document are either choices made from these base standards or are more specific requirements based on the general provisions of these standards.

The organization of the DSRC-stack and the link with the profile are illustrated in Figure 3.