International Standard

ISO 16785

Electronic fee collection — Application interface definition between dedicated short-range communication on-board equipment (DSRC-OBE) and external in-vehicle devices

Perception de télépéage — Définition de l'interface entre l'équipement de bord à communications dédiées à courte portée (DSRC-OBE) et des dispositifs externes embarqués

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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*.

This first edition cancels and replaces the second edition (ISO/TS 16785:2020), which has been technically revised.

The main changes are as follows:

— Clause 3 has been updated and ISO 17573-2 has been made the primary source for terms and definitions;

— addition of information regarding the application data units (ADUs) for information exchange between dedicated short-range communication on-board equipment (DSRC-OBE) (see Clause 6);

— modification of information regarding the external in-vehicle device (see 5.2.1);

— modification of the ASN.1 code; see Annex A and attached ASN.1 file;

— revision of data elements related to compliance checking communication imported from ISO 12813 (see 5.2.3);

— deletion of the charge report and reference to ISO 17575-1.

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.

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Introduction

0.1 Background and motivation

For sustainable road environment, the road tolling policy in different regions of the world has spread from conventional road tolling, such as funding for road infrastructure management and maintenance, environmental measures, and traffic management, to other aspects. Specifically, to accommodate the widespread use of low-fuel-consumption and electric vehicles, introduction of road user charging instead of fuel tax, congestion tolling on urban roads and inter-urban roads is planned and implemented.

In the countries where dedicated short-range communication (DSRC) based electronic fee collection (EFC) systems are widely deployed, upgrading and extension of the schemes, to include roads that are currently not tolled become a significant issue to consider.

This document describes how DSRC-based EFC systems, especially on-board equipment (OBE), can be enhanced to meet these needs.

There are three cases of introducing EFC systems to cope with these situations:

— Case-1: An existing DSRC-based EFC system is extended and introduced on new roads.

— Case-2: An autonomous EFC system is introduced on both new roads and the existing toll roads.

— Case-3: A DSRC-based EFC system continues to operate on existing toll roads, and an autonomous EFC system is introduced on new toll roads.

For Case-1 and Case-2, the interface definitions and the test procedures are defined by existing EFC standards. For Case-3 as shown in Figure 1, the OBE used for DSRC-based EFC can also be used for the autonomous EFC system covering new roads and existing toll roads.

A DSRC-OBE can be applied in new EFC environments consisting of DSRC-based EFC and the autonomous EFC system by expanding its functionality by interfacing with the external in-vehicle devices that includes a global navigation satellite system (GNSS) module, cellular network communication (CN) module and other related modules.

Consequently, an application interface definition between DSRC-OBE and the external in-vehicle devices is described in this document.

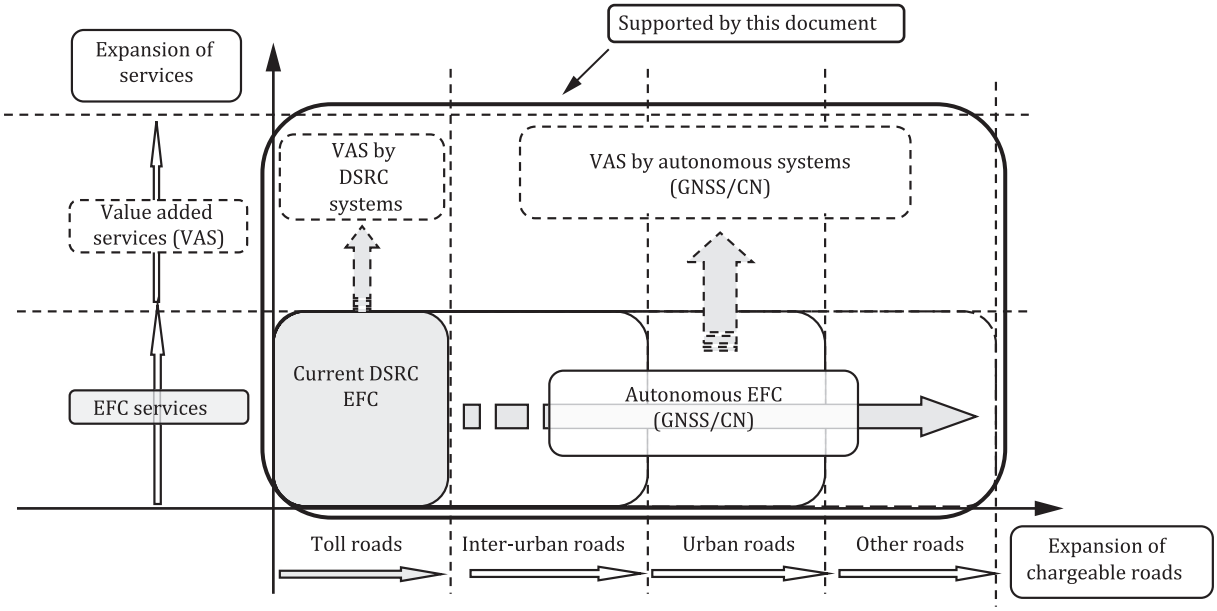


Figure 1 — Image of expanding toll roads and services (Case-3)

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0.2 Purpose of this document

The purpose of this document is to provide support for enhanced functionalities of DSRC-OBE by means of external in-vehicle devices.

This document intends to define:

— a tolling model with the external in-vehicle devices (see in subclause 5.2);

— data groups and data elements (see Clauses 5 and 6);

— data types and the protocol implementation conformance statement (PICS) proforma (in Annexes A and B).

0.3 Applicable dedicated short-range communication on-board equipment (DSRC-OBE)

There are five major DSRC standards currently being deployed for EFC around the world: CEN-DSRC, UNI-DSRC, ARIB-DSRC, TTA-DSRC and GB-DSRC. In standardizing an application interface between DSRC-OBE and an external in-vehicle devices, the interface should be applied for every type of DSRC as shown in Figure 2.

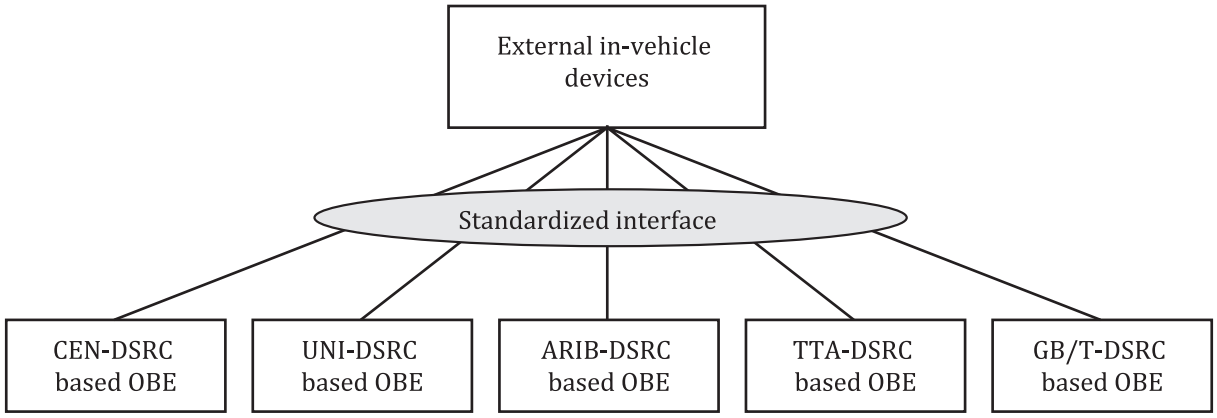


Figure 2 — Applicable DSRC-OBE

Due to its operational reliability, DSRC-OBE is suitable for EFC. On the other hand, each component of an external in-vehicle devices typically has a shorter product life than DSRC-OBE to meet changing user demands for multi-functional and high-performance components.

Once an application interface has been standardized, DSRC-OBE can be used seamlessly in a variety of EFC environments with an enhanced new external in-vehicle devices as shown in Figure 3.

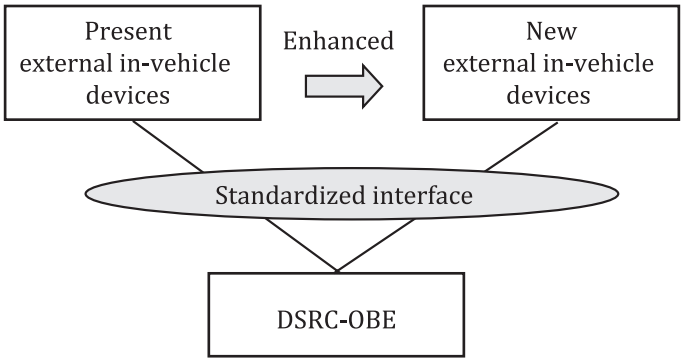


Figure 3 — Applicability for future upgrading

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Electronic fee collection — Application interface definition between dedicated short-range communication on-board equipment (DSRC-OBE) and external in-vehicle devices

1 Scope

This document specifies requirements for an application interface between dedicated short-range communication on-board equipment (DSRC-OBE) and external in-vehicle devices to make DSRC-OBE applicable for diversified electronic fee collection (EFC) systems.

This document applies to:

— definitions of the application interface between DSRC-OBE and external in-vehicle devices;

— definitions of data groups and data elements.

The scope of this document is illustrated in Figure 4:

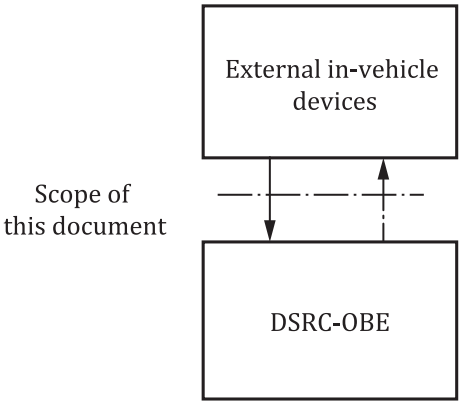


Figure 4 — Scope of this document

This document is not applicable to:

— definitions of hardware components in the external in-vehicle devices such as GNSS receiver, CN mobile device;

— definitions of the physical interface between DSRC-OBE and the external in-vehicle devices;

— definition of value-added services (VAS);

— definition of algorithms for authentication, encryption and key management for security aspect.

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)*

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ISO 12813, *Electronic fee collection — Compliance check communication for autonomous systems*

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

ISO 13141, *Electronic fee collection — Localization augmentation communication for autonomous systems*

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

ISO 17573-2, *Electronic fee collection — System architecture for vehicle related tolling — Part 2: Vocabulary*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17573-2 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/

4 Symbols and abbreviated terms

ADU	application data unit
APDU	application protocol data unit
ARIB	Association of Radio Industries and Businesses
	NOTE 1 ARIB is a communication standardization organization in Japan.
ASN.1	abstract syntax notation one
CAN	controller area network
CCC	compliance check communication
CN	cellular network
DSRC	dedicated short-range communication
EFC	electronic fee collection
GB	Guojia Biaozhun
	NOTE 2 GB is a national standard published by Standardization Administration of China.
GNSS	global navigation satellite system
HMI	human-machine interface
IUT	implementation under test
LAC	localization augmentation communication
OBE	on-board equipment
OBD	on-board diagnostics

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