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Electronic fee collection — Localization augmentation communication for autonomous systems

Perception de télépéage — Communications d'augmentation de localisations pour systèmes autonomes

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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~~www.iso.org/directives).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO ~~[had/~~had not~~]~~ received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at ~~www.iso.org/patents.~~www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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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 second edition cancels and replaces the first edition (ISO 13141:2015), which has been technically revised. It also incorporates the Amendment ISO 13141:2015/Amd. 1:2017.

The main changes are as follows:

— ~~Clause 6 on~~Clause 6 has been added, concerning conformance requirements ~~has been added~~;

— ~~in Clause 3, terms have been~~ Clause 3 has been updated~~, including reference to~~ and ISO/TS 17573-2[5] ~~as~~ has been made the primary source for terms and definitions;

— ~~Clause 8~~Clause 8 have been updated, including ~~the~~making reference to ISO 17573-3 as the primary source;

— imported ASN.1 types with successors (i.e. including all future minor versions) have been used;

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— ~~— Annex G~~Annex G has been revised to align with the evolution of the European Electronic Toll Service (EETS);

— ~~—~~various editorial changes have been made to improve readability.

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~~www.iso.org/members.html.

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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. generally without relying on dedicated roadside infrastructure). However, these autonomous systems can, in some places, need some roadside infrastructure support for proper identification of charge objects. Such assistance can be required at places where satellite-based localization accuracy or availability is insufficient or at places where the OBE is directly informed about the identity of the relevant charge object.

In an interoperable environment, it is essential that this localization information be available in a standardized way. This document specifies requirements for localization augmentation by dedicated short-range communication (DSRC) between roadside equipment (RSE) and OBE. This document makes no assumptions about the operator of the RSE, in terms of its role according to ISO 17573-1, i.e. whether the RSE is operated by an entity in the service provision role or in the toll charging role.

This document has been prepared considering the following points:.

— — theThe localization augmentation communication (LAC) serves to transmit localization information to passing OBE without identifying individual OBE;.

— — theThe localization information contains both geographical location independent of charging context, and context-dependent identification of charge objects;.

— — aA single roadside installation is able to provide localization augmentation for several overlapping electronic fee collection (EFC) contexts;.

— — thisThis document is based on the EFC architecture specified in ISO 17573-1;.

— — theThe communication applies to all OBE architectures;.

— — thisThis document is applicable to various DSRC media, especially the CEN DSRC stack;.

— — theThe communication supports security services for data origin authentication, integrity and non-repudiation.

This document specifies an attribute, LacData, which is communicated from the RSE to the OBE by means of an acknowledged writing service, which is implemented through the SET service of DSRC Layer 7 (ISO 15628 and EN 12834). The LAC application is specified as a self-contained DSRC application with its own application identifier (AID). Regarding the DSRC communications stack, this document provides specific definitions regarding the CEN DSRC stack as specified in EN 15509;. Annexes C, D and Annexes C, D and EE provide for use of the Italian DSRC as specified in ETSI/ES 200 674-1;,[9] ISO CALM IR;,[3] ARIB DSRC[10][10] and WAVE DSRC.

All data relevant for the LAC application have been put into the attribute LacData, to create a single standard communications content which is transmitted by LAC RSE; and always signed as a whole. LacData can transport both the geographic coordinates (latitude, longitude and altitude) and the identification of a specific charge object. All elements of LacData are mandatory, but Null values are specified to allow LAC installations to transmit only a selection of all specified data elements.

Access credentials are mandatory for writing LacData to protect OBE from non-authentic RSE. LacData are critical for charge determination and for providing evidence. For these purposes, the authenticators which are specified can be used to provide for data origin authentication, data integrity and non-

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repudiation for LacData. There are two separate authenticator fields specified to allow for separate authentication and non-repudiation, if required by the institutional arrangements of a toll system.

This document is “minimalist” in the sense that it covers what is required by operational systems and systems planned in the foreseeable future.

A test suite for checking an OBE or RSE implementation for conformance with ISO 13141:2015 is specified edition 1 of ISO 13140-1:2016. This test suite will be updated to reflect the changes incorporated into this second edition of ISO 13141.

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Electronic fee collection — Localization augmentation communication for autonomous systems

1 Scope

This document establishes requirements for short-range communication for the purposes of augmenting the localization in autonomous electronic fee collection (EFC) systems. Localization augmentation serves to inform on-board equipment (OBE) about geographical location and the identification of a charge object. This document specifies the provision of location and heading information and security means to protect fromagainst the manipulation of the OBE with false RSE.

The localization augmentation communication (LAC) takes place between an OBE in a vehicle and fixed RSE. This document is applicable to OBE in an autonomous mode of operation.

This document specifies attributes and functions for the purpose of localization augmentation, by making use of the dedicated short-range communications (DSRC) communication services provided by DSRC Layer 7, and makes these LAC attributes and functions available to the LAC applications at the RSE and the OBE. Attributes and functions are specified on the level of Application Data Units (ADUs; see Figure 1).Figure 1).

As depicted in Figure 1,Figure 1, this document is applicable to:

— ——the application interface definition between OBE and RSE;

— ——the interface to the DSRC application layer, as specified in ISO 15628 and EN 12834;

— ——the use of the DSRC stack.

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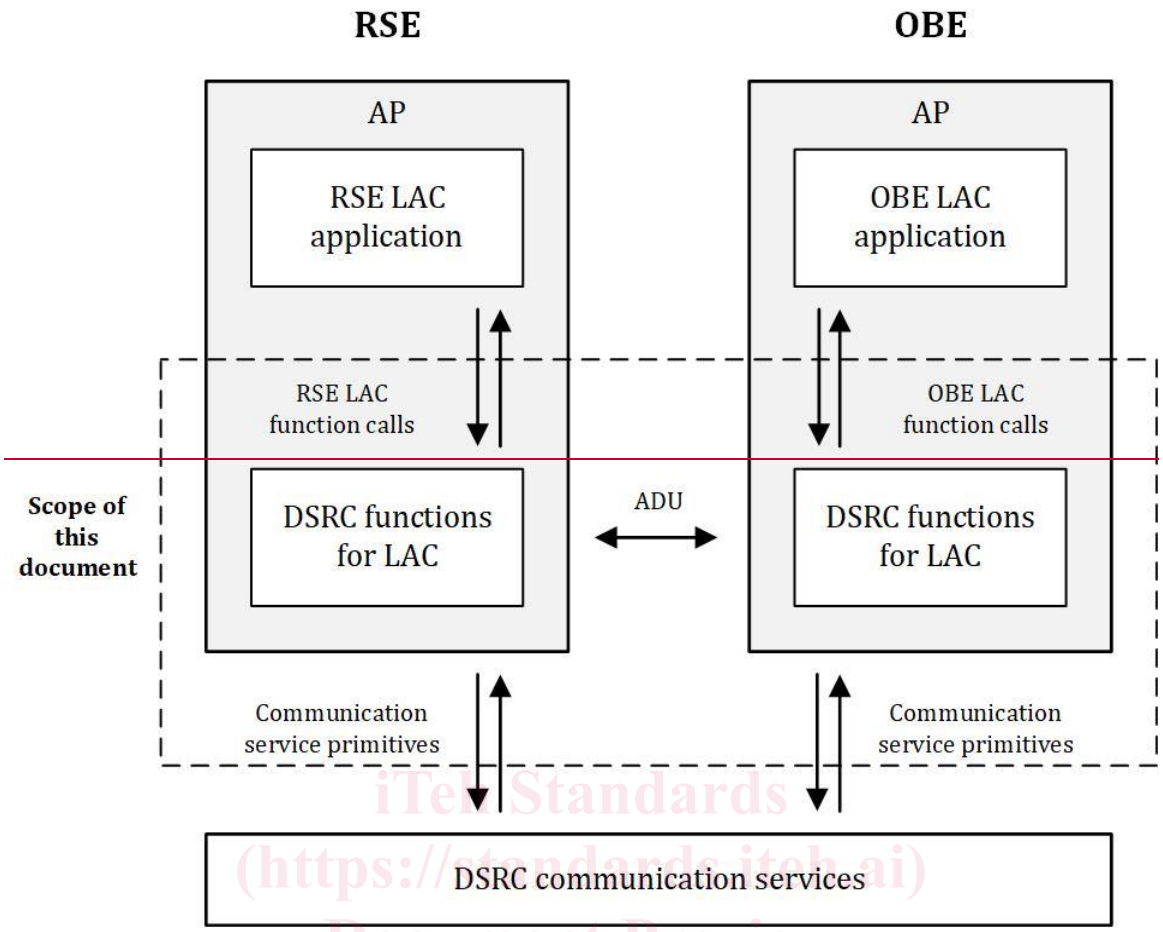
The LAC is suitable for a range of short-range communication media. This document gives specific definitions regarding the CEN-DSRC stack as specified in EN 15509, and Annexes C, DAnnexes C, D and EE give the use of the Italian variant of DSRC as specified in ETSI/ES 200 674-1,[9] ISO CALM IR,[3] and ARIB DSRC.[10]

This document contains a protocol implementation conformance statement (PICS) proforma in Annex BAnnex B and transaction examples in Annex F. Annex GAnnex F. Annex G highlights how to use this document for the European Electronic Toll Service (EETS).

Test specifications are not within the scope of this document.



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