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Electronic fee collection - Guidelines for EFC applications based on in-vehicle ITS stations

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Electronic fee collection - Guidelines for EFC applications based on in-vehicle ITS stations

Perception de télépéage - Lignes directrices pour les applications de télépéage installées dans les stations de systèmes de transport intelligents (ITS) embarquées dans les véhicules

Elektronische Gebührenerhebung - Richtlinien für Anwendungen der Elektronischen Gebührenerhebung basierend auf fahrzeuginternen IVS Geräten

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Foreword

This document (CEN/TR 16690:2014) has been prepared by Technical Committee CEN/TC 278 “Intelligent transport systems”, the secretariat of which is held by NEN.

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

A CEN Technical Report is a document adopted by CEN/CENELEC containing informative material not suitable for publication as a European Standard or a Technical Specification.

This document has been prepared by CEN/TC 278/WG 1, Project Team 136. The work done by the project team has been governed by the Technical Committee CEN/TC 278 “Intelligent transport systems”, the secretariat of which is held by NEN, and by CEN/TC 278/WG 1, Electronic fee collection and access control (EFC).

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.

Introduction

Increasingly, tolling systems are becoming automated and electronic fee collection (EFC) is becoming a pervasive service in Europe. The widespread deployment of EFC systems requires provisions to allow users to employ a single contract and a single OBE to circulate through many different toll domains. In Europe, for example, this need has been officially recognized and legislation on interoperability has already been adopted in the form of the Interoperability Directive 2004/52/EC and the EETS Decision 2009/750/EC.

Standardization in the context of Electronic Fee Collection has been active since the early '90s with the aim of providing the architecture and the definition of interoperable interfaces for interoperable tolling systems. Interoperable interfaces allow tolling systems to exchange information and make mutual use of it. Specifications of such interfaces have been provided in the form of Application Interface Definitions, which are to be considered as toolboxes for defining application protocols and application data exchanged. In many cases, interoperable application profiles have been defined to narrow down the options and provide a sound basis for interoperability.

The standardization results have major relevance for the future of the EETS. Some standards are directly referenced by the EETS Decision and are hence of mandatory application. Other standards provide open and interoperable definitions which are likely to be employed to fulfil the requirement that: “EETS equipment shall be designed in such a manner that its interoperability constituents utilise open standards”.

EFC is one of the intelligent transport systems (ITS) applications with the widest deployment. Currently EFC equipment is mostly dedicated to one or a few applications only. On the one hand, EFC equipment is also becoming more capable and EFC OBE may provide platforms for delivering selected Value Added Services as analysed in CEN/TR 16219. On the other hand, future ITS Stations may in principle deliver the EFC Service to users, if certain requirements are fulfilled.

This Technical Report mainly provides a view on how “both worlds”, the established and wide-spread EFC services and the emerging ITS services and platforms, could be combined to future solutions in which EFC services are considered as one service amongst others offered by ITS. The Report provides information to designers of ITS about the nature and specialities in the EFC services to be taken into account. It also provides EFC stakeholders with guidance how an integration of EFC into the set of services provided in the ITS environment may be achieved.

In order to identify the guidelines how EFC applications can be provided on ITS in-vehicle stations, the following approach is chosen:

— provide a view and understanding of both EFC and cooperative ITS in terms of available architectures, definitions, specifications, stakeholders and operational experiences (commercially available projects as well as research and trial activities);

— identify major EFC requirements that will have an impact to the ITS Station;

— provide a view as to how EFC roles and functionalities (according to ISO 17573) shall be enabled and supported in the cooperative ITS context (in different phases of the entire life cycle of an EFC service);

— identify a base technical architecture that enables EFC services in an ITS context;

— analyse stakeholders in a business architecture and provide an example of a business architecture for EFC services in an ITS environment; and

— emphasize on particular key areas like conformance and certification, potential synergies in the context of the ITS Station, areas of major concern, governance, critical elements.

This approach could be chosen as the EFC environment is seen very mature in terms of architectural, technical and operational requirements and processes. EFC as a service is already in use in various

commercial projects in many countries throughout the world. Operational experiences have already been taken into account in refining the landscape of existing specifications in EFC. This can be seen as an extraordinary condition compared to other (future) ITS services for which such mature environmental and context is not yet available

ETSI TC ITS has defined a Basic Set of Applications in ETSI/TR 102 638 which is expected to be deployed relatively swiftly after completion of standardization of C-ITS. EFC is directly addressed in this Basic Set of Applications and considered as a primary application. Standardization of the EFC application requirements is, however, within the scope of CEN/TC 278/WG 1, which is in charge of defining the requirements for the EFC use cases in accordance with the set of standards developed by this Working Group.

1 Scope

This Technical Report (TR) contains an analysis of the technical and operational feasibility of using a generic ITS Station as specified in ETSI EN 302 665, *Intelligent Transport Systems (ITS); Communications Architecture*, for EFC applications compliant to the requirements specified in ISO 17573, EN ISO 12855, CEN ISO/TS 17575 (all parts), EN ISO 14906, EN 15509, CEN ISO/TS 12813, CEN ISO/TS 13141 and CEN/TS 16439.

The scope of this Technical Report includes:

— description of the context of Cooperative ITS and the ITS Stations;

— providing details of the context of EFC applications;

— outlining the basic architectural concepts and role model of both EFC and Cooperative ITS;

— identification of core requirement areas for operation of an EFC application on an ITS Station;

— specification of a set of recommendations for functional, operational and security requirements to the ITS Station supporting the EFC application(s);

— description of a possible role model in which the roles known in EFC applications make use of the roles in the C-ITS system in order to provide EFC services in an C-ITS context;

— provision of considerations in particular areas of EFC like certification and governances;

— guideless and recommendations for further standardization work in this area;

— emphasizing on security related elements of EFC that need to be considered in a C-ITS environment.

The scope of this Technical Report is limited to in-vehicle ITS Stations. However, an EFC service always requires the involvement of in-vehicle and central functionalities. Furthermore, for enforcement purposes as well as in DSRC based toll domains for toll charging purposes also, it is essential that road-side based functions are provided and operated. In order to facilitate EFC services a set of functionalities, tasks and responsibilities are defined and specified in an EFC role model (ISO 17573). These functionalities, tasks and responsibilities are shared between the roles Toll Charger, Toll Service Provider, Road User and Interoperability Management. All these roles interact with each other. As a consequence this Technical Report provides in various areas explanations that are beyond the in-vehicle environment. This is required in order to present the full environment and context. It keeps the readability of this document at a sound level and provides valuable information to those readers which are not yet familiar with EFC in detail.

Outside the scope of this Technical Report is:

— detailed technical specifications for EFC services and applications on C-ITS systems;

— implementation specific elements.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 15509, *Road transport and traffic telematics - Electronic fee collection - Interoperability application profile for DSRC*

CEN ISO/TS 12813, *Electronic fee collection - Compliance check communication for autonomous systems (ISO/TS 12813)*

EN ISO 12855:2012, *Electronic fee collection - Information exchange between service provision and toll charging (ISO 12855:2012)*

CEN ISO/TS 13141, *Electronic fee collection - Localisation augmentation communication for autonomous systems (ISO/TS 13141)*

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

CEN ISO/TS 17575-1:2010, *Electronic fee collection - Application interface definition for autonomous systems - Part 1: Charging (ISO/TS 17575-1:2010)*

CEN ISO/TS 17575-2, *Electronic fee collection - Application interface definition for autonomous systems - Part 2: Communication and connection to the lower layers (ISO/TS 17575-2)*

CEN ISO/TS 17575-3:2011, *Electronic fee collection - Application interface definition for autonomous systems - Part 3: Context data (ISO/TS 17575-3:2011)*

CEN ISO/TS 17575-4:2011, *Electronic fee collection - Application interface definition for autonomous systems - Part 4: Roaming (ISO/TS 17575-4:2011)*

ISO 17573:2010, *Electronic fee collection — Systems architecture for vehicle-related tolling*