

European Standardization in support of Electronic Fee Collection



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Road user charging in transport is used across Europe for raising revenue, dealing with congestion and internalising transport costs. Concerns over the sustainability of road transport, including congestion, pollution and carbon dioxide issues, put even more emphasis on fair road pricing schemes in Europe.

Electronic fee collection (EFC) is an overall notion used to designate solutions that automatically collect road user charges. EFC systems allow effective charging of road vehicles and support a broad variety of pricing policies.

Standards have an important role to play in providing appropriate technical tools for easier and more robust systems, from the perspective of stakeholders across Europe. CEN/TC 278/WG 1 is responsible for the development of EFC standards in Europe, which support interoperable and effective EFC systems. CEN and ISO have joined forces and set up a joint working group with experts from Europe and other regions to address the issues of global nature of the technologies and processes involved.

The European Committee for Standardization (CEN) produces standards that underpin agreements between stakeholders on the market and European policies and legislation, among others in the field of electronic fee collection.

CEN seeks to provide standards that seize opportunities and reduce technical barriers to support continued development and deployment of road toll systems for European road networks and road access control schemes in the 21st century.

European regulations have been adopted (i.e. Directive EU 2019/520 and the associated

implementing and delegated regulations) to support the setting up of a European Electronic Toll Service (EETS). They provide the essential legal foundation for interoperability of EFC systems throughout the EU. A user equipped with an EETS on-board equipment can use it to access toll road infrastructure and as a payment guarantee in the EU.

The European Commission (EC) recognises the role of EFC standards and the EETS legislative acts incorporate several of them as legal requirements.



MAIN TOLLING TECHNOLOGIES USED IN EUROPE: DSRC, GNSS AND ANPR

There are three main EFC technologies used in Europe today:

- dedicated short-range communication (DSRC)
- global navigation satellite system (GNSS), such as GALILEO, GPS or GLONASS
- automatic number plate recognition (ANPR)

DSRC systems are based on two key components, the on-board equipment (OBE) generally fitted behind the windscreen in the vehicle, and radio transceiver interrogators installed along or above the road infrastructure.

The OBE in a GNSS-based system locates the vehicle by means of a GNSS receiver and communicates the recorded positions to the central system via mobile communications (typically cellular network-based technology).

Video-tolling systems are based on the licence plate information of vehicles. ANPR technology and the associated equipment mounted along or above the road infrastructure capture images of the passing vehicles, including of the licence plates whose numbers are automatically recognised. These pieces of information are stored, processed and used by the toll charger's system.

For both the DSRC- and GNSS-based systems, DSRC and ANPR are deployed for compliance checking and enforcement purposes, on fixed or/and mobile devices.

Today, many EFC systems are in operation across Europe and worldwide. These systems, deployed locally or on a national basis, encompass about 150 million regular equipped users.

Large EFC systems use OBE, whether national DSRC systems for light or heavy vehicles or GNSS-based toll collection for heavy vehicles, and are accepted by a large number of toll chargers (more than 200).

In order to reap the full benefits of EFC systems, they must be interoperable, allowing users to pay road charges in different countries through a single OBE and a single contract.

The interoperability of these systems has become a reality through the role assumed by the EETS Providers.

“*Toll chargers have always supported the EETS in Europe, as it brings added value to customers. With a full interoperable payment system, customers have their travel simplified when using their road networks all over Europe. Standardized equipment and products are of utmost importance to ease the implementation and operation of the EETS. A robust and secure tolling process that relies on European and international standards is a key element for toll chargers as any hindrance may turn into loss of revenues for toll chargers or traffic congestion for customers at tolling points. Standardization is the mostly invisible work that enables efficient processes for the benefit of users, EETS providers and toll chargers.*”

Mr. Christophe Boutin
President, ASECAP - The European Association of Operators of Toll Road Infrastructures



STANDARDS

EFC STANDARDIZATION

CEN/TC 278/WG1 is responsible for European EFC application-related standards, whilst other standardization groups develop relevant technology-related standards (such as GNSS, communication protocols and associated test procedures). Most EFC standards are developed as joint work items with ISO (TC 204/WG 5).

The scope of standardization includes

- reference architecture
- information flows between EFC operators
- application interfaces between equipment
- security
- conformity assessment and testing standards
- OBE personalization
- performance indicators
- user compliance checking and enforcement support

The three main tolling technologies currently used form part of the scope - DSRC, GNSS-based tolling and ANPR.

Other EFC developments are closely monitored in order to prepare suitable standards for new technical trends, emerging in this sector.

CEN is working closely together with the EC on standards that underpin the EETS. CEN develops the standards that form the main technical building blocks for defining the EETS interoperable service, and supports the Notified Bodies EETS Coordination Group (NB EETS CG). Much of the standardization work undertaken builds on results from European EFC projects, such as CARDME, CESARE, PISTA and REETS.

CEN produces standards and guidelines relevant in the design, implementation and operation of EFC systems, notably of interoperable systems. These publications are prescriptive, explanatory or informative. Some include tools intended for use by EFC professionals.

Several EFC standards are used in the design, testing and certification of toll products or systems. They also provide means for verification of the correct implementation of the requirements, and thus the assurance of a correct and robust implementation.

IMPLEMENTATION & CERTIFICATION

- The certification of equipment is an essential step for the commissioning of interoperable equipment and systems. This certification is based on the conformity of the equipment to specifications that are extensively supported by standards. The certification process and testing laboratories therefore rely on standards for the assessment of conformity and interoperability.
- Several CEN EFC standards have been incorporated into European EETS legislation and, in this context, made mandatory.

BENEFITS

- CEN EFC standards are broadly accepted in Europe and around the world. EFC standards pave the way for interoperable systems and ensure an open and competitive market.

“ *European EFC standards, maintained to keep abreast with market developments, underpin agreements and the European EETS legislation. A great benefit of the EFC standards is that they provide solid support for interoperability of technical innovations across Europe and beyond, whilst offering flexibility to meet local needs.* ”

Mr. Jesper Engdahl
Convenor of CEN/TC 278/WG 1 on Electronic fee collection and access control
& Convenor of ISO/TC 204/WG 5 on Fee and toll collection



INTEROPERABILITY SUPPORT FOR THE EETS LEGISLATION AND DEPLOYMENT

EFC standards provide a basis for the implementation of the European EETS legislation on the interoperability of electronic

road toll systems and the design of service and product offers by private actors.

BENEFITS

- EFC standards give real support to EETS deployment by establishing a common technical framework for interoperability rules, including common architecture, procedures, data definition and interfaces and associated conformity assessment test procedures.
- They provide practical support to agreements between stakeholders and a basis for interoperability between EFC systems. In addition, by adopting standards in their system design, scheme owners avoid the risk of vendor lock-in.
- CEN periodically carries out a systematic review and updates standards as necessary, e.g. to account for market developments, new technologies or technological progress, in order to ensure that they remain fit for purpose. Current issues that are addressed include the evolution of supported security mechanisms, the use of video-based tolling techniques and the convergence of GNSS-based tolling models.

FUTURE EFC STANDARDS

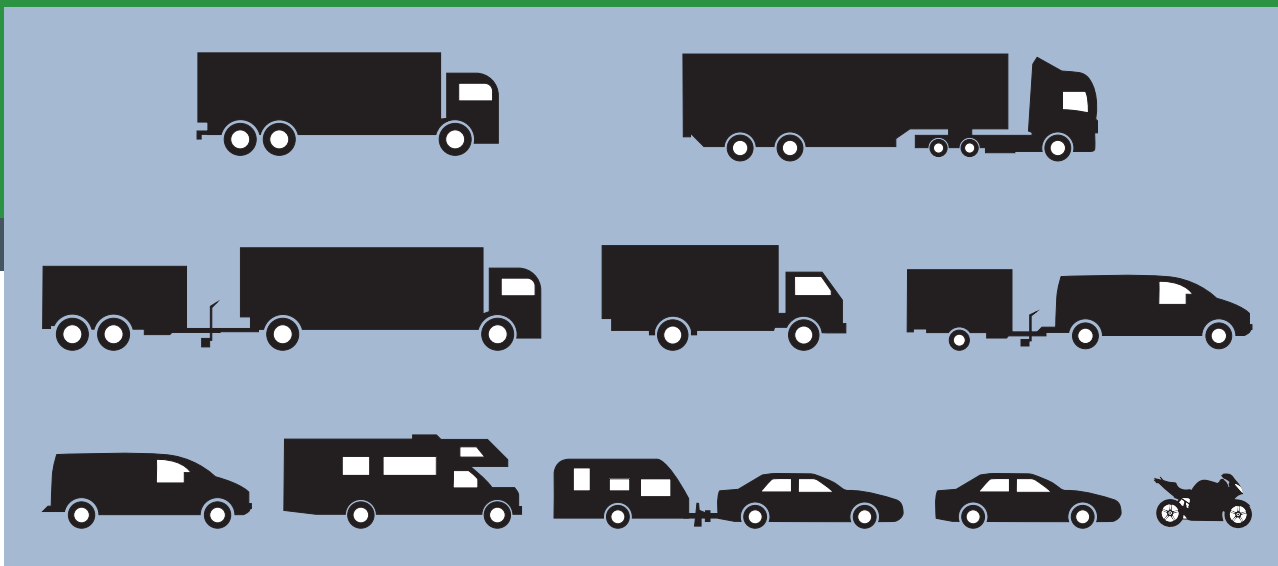
- Use of EFC should foster the development and deployment of sustainable solutions in order to promote environmentally friendly solutions such as free-flow or GNSS-based tolling systems.
- A coordinated cross-border use of the OBE with other navigation and communication systems would increase user acceptance of such EFC systems.
- Compatibility of on-board devices and interfaces within a vehicle would make the implementation of EETS even easier. New measures need to be interoperable with existing EFC schemes.
- Future development of EFC standards will seek to take advantage of, and converge with, the latest ITS trends, including cooperative, connected and automated mobility solutions.

“ *The EETS aims to facilitate the payment of road tolls throughout the EU by road users with a single on-board unit. Harmonised and regularly updated European standards are a prerequisite for achieving this, together with the interoperability of tolling services on the European Union road network. Eight CEN EFC standard deliverables are incorporated and referenced in the recast of the EETS legislation.* ”

Mr. Eddy Liégeois
European Commission, DG MOVE, Head of Road Transport Unit

“ *Standardization is key to the success of EETS in Europe. The tasks of EETS Providers are complicated enough already, we need further harmonization and – where possible – simplification of standards, especially with regard to roadside equipment and certification tests. AETIS Members welcome the work of CEN and are ready to support the initiatives leading to further standardization in the area of road charging interoperability.* ”

Ms. Eva Tzoneva
Chair, AETIS - the Association of Electronic Toll and Interoperable Services



OVERVIEW OF EFC STANDARDS

CEN/TC 278/WG 1 has, jointly with ISO/TC 204/WG 5, produced a series of EFC standards, technical specifications and technical reports, which can be purchased from CEN, ISO or national standardization bodies.

The table below provides an overview of the EFC standards and technical specifications. For a preview of the documents or downloading of the standardised data definitions (in ASN.1) or test cases (in TTCN), click on the hyperlinks in the table.

	DSRC-based EFC	EFC technology independent	GNSS-based EFC
Frameworks	CEN ISO 21719-1 OBE personalization	EN ISO 17573 -1 Architecture ISO/TS 17573-2 Vocabulary CEN ISO/TS 17573-3 Data dictionary CEN ISO/TS 17574 Security profiles EN ISO 19299 Security framework	
Toolboxes	EN ISO 14906 DSRC application interface [ASN.1] EN SO 25110 ICC application interface ISO/TS 16785 Interface between DSRC-OBE and external in-vehicle devices [ASN.1] CEN ISO/TS 21719-2 OBE personalization using DSRC	EN ISO 12855 Information exchange between Toll Service Providers and Toll Chargers [ASN.1] CEN ISO/TS 17444 Charging performance [part 1] [part 2] ISO/TS 21192 EFC for traffic management [ASN.1] ISO/TS 21193 EFC using common media [ASN.1]	EN ISO 17575 Application interface definition for autonomous systems [part 1] [part 2] [part 3] CEN/TS 16702 Secure monitoring [part 1] [part 2] [ASN.1]
Profiles	EN 15509 Interoperability application profile for DSRC	CEN/TS 16986 Interoperable application profiles for information exchange between Service Provision and Toll Charging [WSDL]	CEN/TS 16331 Interoperable application profiles for autonomous systems EN ISO 12813 Compliance check communication (CCC) [ASN.1] EN ISO 13141 Localisation augmentation communication (LAC) [ASN.1]
Tests	EN ISO 14907-1 Test procedures for user and fixed equipment EN ISO 14907-2 OBU tests against 14906 standard EN 15876 Tests against 15509 standard [part 1] [part 2] [TTCN]	CEN/TS 17154 Tests against 16986 standard [part 1] [part 2] [TTCN]	EN ISO 16407 Tests against 17575-1 standard [part 1] [part 2] [TTCN] EN ISO 16410 Tests against 17575-3 standard [part 1] [part 2] [TTCN] EN ISO 13143 Tests against 12813 standard [part 1] [part 2] [TTCN] EN ISO 13140 Tests against 13141 standard [part 1] [part 2] [TTCN]

The standards are maintained to keep pace with market developments, stakeholders' needs and technological advances. For more information see <https://www.itsstandards.eu/25-2/wp-1/>.

BENEFITS

- A comprehensive set of standards that is fit for purpose and supports EFC agreements and deployment



HOW TO GET INVOLVED

Participation in the standardization process allows stakeholders to have a say on the content of draft standards, and enable them to be better informed about developments relating to standards that may be relevant to their area of interest or sector of activity.

Companies, public bodies and other (national) organizations wishing to participate in CEN or CENELEC activities should contact the CEN Member (National Standardization Organization - NSO) or CENELEC Member (National Committee - NC) in their country. Through the NSO or NC, they can participate in the national mirror committee which is responsible for providing input to the relevant Technical Committee (TC) at European level, or be put forward by their NSO to be an active member of a Standardisation Committee/Working Group.

A full list of CEN Members can be found on the CEN website: www.cen.eu

A full list of CENELEC Members can be found on the CENELEC website: www.cenelec.eu

European or international organizations and other stakeholders wishing to participate in standardization activities at European level may apply to become a Partner or Liaison Organization of CEN and/or CENELEC. For further information, please contact: partners@cencenelec.eu



ABOUT CEN

CEN (European Committee for Standardization) is recognized by the EU and EFTA as one of the European Standardization Organization responsible for developing standards at European level. These standards set out specifications and procedures for a wide range of materials, processes, products and services.

The members of CEN are the National Standardization Bodies of 34 European countries. European Standards (ENs) and other standardization deliverables adopted by CEN are accepted and recognized in strengthening the European Single Market.

European Standards contribute to enhancing safety, improving quality, facilitating cross-border trade and strengthening the European Single Market. They are developed through a process of collaboration between experts nominated by business and industry, research institutes, consumer and environmental organisations and other stakeholders.

CEN works to promote the international alignment of standards in the framework of the technical cooperation agreement with ISO (International Organization for Standardization).

CEN – European Committee for Standardization
Rue de la Science, 23 | B - 1040 Brussels – Belgium | info@cencenelec.eu www.cen.eu
www.cencenelec.eu