



DIRECTORATE GENERAL FOR INTERNAL POLICIES
POLICY DEPARTMENT B: STRUCTURAL AND COHESION POLICIES

TRANSPORT AND TOURISM

TECHNOLOGY OPTIONS FOR THE EUROPEAN ELECTRONIC TOLL SERVICE

EXECUTIVE SUMMARY

Abstract

This study has been prepared to review current and future technological options for the European Electronic Toll Service. It discusses the strengths and weaknesses of each of the six technologies currently in existence. It also assesses on-going technological developments and the way forward for the European Union.

This document was requested by the European Parliament's Committee on Transport and Tourism.

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LINGUISTIC VERSIONS

Original: EN

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Manuscript completed in April 2014.
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This document is available on the Internet at:
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EXECUTIVE SUMMARY

THE EUROPEAN ELECTRONIC TOLL SERVICE

In 2012, road user charges were levied on private vehicles in twelve Member States and on heavy goods vehicles in twenty-two. In total, the tolled road network was approximately 72,000 kilometres long of which 60% was equipped with electronic toll systems. These systems are, at best, interoperable at a national level but not at EU level. This creates barriers to the operation of the internal market.

Directive 2004/52/EC was adopted to remedy this fragmentation by creating a European Electronic Toll Service (EETS) to enable road users to pay tolls and charges throughout the EU through a contract with a single EETS Service Provider and with a single on-board unit. Commission Decision 2009/750/EC set the general requirements necessary to achieve interoperability between the EETS providers and the toll chargers' equipment and procedures. Pursuant to the above Directive, EETS should have been available to heavier vehicles from October 2012 at the latest, and should be offered all other types of vehicles by October 2014. It appears however that EETS deployment remains an issue.

CURRENT TECHNOLOGY

Six main electronic fee collection systems are currently in use:

- (1) Automatic Number Plate Recognition (ANPR) - a mature technology that use video cameras for vehicle identification.
- (2) Dedicated short-range communications (DSRC) technology - based on bidirectional radio communication between fixed roadside equipment (RSE) and a mobile device (OBU) installed in a vehicle.
- (3) Radio Frequency Identification (RFID) - the most used Toll Collection system in the United States (US), relying on radio waves to identify devices.
- (4) Global Navigation Satellite Systems (GNSS) technology for toll collection purposes - an emerging technology that uses the vehicle's position data to measure the use of the road in order to determine the charge.
- (5) Tachograph-based tolling - the system used in Switzerland - records the mileage driven by the user through an OBU connected electronically to the vehicle's odometer.
- (6) Mobile communications (GSM and smartphones) tolling systems - still in an embryonic stage but having significant potentials going forward.

These technologies differ in performance, enforcement, accuracy, cost evaluation and interoperability. Options other than the tachograph and GSM/smartphone tolling can guarantee a level of accuracy of over 99%. Another issue is data protection: ANPR and GNSS may allow the recognition or continuous tracking of drivers, while DSRC, RFID and tachograph-based technology does not seem to affect user privacy.

The costs of options vary significantly. DSRC, which is the most widely adopted Electronic Toll Collection (ETC) technology in Europe, requires the installation of costly roadside equipment. ANPR necessitates “less costly” roadside equipment and no OBUs. RFID has not been widely implemented in the EU and its installation costs would therefore be higher than other solutions. GNSS and GSM option are less costly from the infrastructure point of view although GNSS would require a higher level of investment during the start-up phase and, in particular, in relation to establishing an expensive back office system.

DSRC has a low level of adaptability even though it is the most widely adopted ETC technology and is the only solution with CEN standards available. ANPR is a flexible system that has already been combined with other ETC options for enforcement purposes, but the lack of licence plate standardisation and the challenges for Member State cooperation in setting up an international licence plate database mean that video tolling is not an appropriate technology for achieving international interoperability. GNSS and GSM are flexible and adaptable options but their low penetration rate and privacy concerns also limit their potential.

DSRC, GNSS and GSM/GPRS are the only technologies put forward for the EETS by Directive 2004/52/EC. ANPR, RFID and tachograph cannot currently be considered compliant with EETS.

EMERGING TECHNOLOGIES

In order to best assess which technologies could play a role in future EETS, a series of questions need to be asked to understand if existing technologies are obsolete, if there are opportunities for cost reduction, improved interoperability, and improved performances and accuracy, and what is the state of art of the other technologies in the same sphere.

DSRC, GNSS and ANPR do not present any signs of possible early obsolescence. Improvements in camera technology may render some of the specific components of ANPR obsolete, but units can be upgraded on life expiry. GSM may become obsolete in the near future: by 2017, 40% of mobile subscribers in Western Europe are expected to be on 4G Long Term Evolution with the vast majority of other users on 3G.

Costs relating to OBU and traditional roadside equipment are not expected to fall significantly in the near future, whereas the migration to 3G and 4G provides lower unit costs per data packet transmitted, increasing the potential for using WiFi-based technologies at least in urban areas. The cost of enforcement could also be reduced by pan-European sharing of vehicle and driver registration data and common standards for the data required as evidence.

No currently envisaged technologies would increase interoperability in the EU. Opportunities may come from related technologies, such as Cooperative Vehicle Information Systems (CVIS) and Communications Access for Land Mobiles (CALM) areas, and applications such as telematics for vehicle and driver management, eCall, and usage-based insurance (UBI) using Event Data Recorders (EDRs).

Substantial advances are expected in payment methods, with digital payment channels using mobile internet being adopted as they become the primary medium for customer payments and communications in Europe. Contactless payments through a mobile phone using Near Field Communication (NFC) enable better cashless transactions, as a person's

identity does not need to be disclosed during the transaction. By removing cash handling and reducing transaction costs of micro-payments, this technology could enable users to pay per use at a physical location without the need for a tolling account. Many experts claim that, by using NFC technology, smartphones will facilitate the switch to all-electronic toll collection.

THE WAY FORWARD

The following wider policy objectives should be considered in the coming years:

- Generalised and harmonised implementation of road charging across the EU.
- Make the ETC the most common means of payment for tolls and road charges within Europe.
- Set up one single contract and one single OBU valid throughout the EU.
- Minimise the life-cycle cost of toll collection systems.

Policymakers should consider:

- A suitable implementation of EETS requires an egalitarian and harmonised introduction of tolling devices to users.
- Making the installation of an in-vehicle device, either during the manufacturing or registration process of the vehicle, both an attractive option for the end-user and potentially compulsory to facilitate EETS take-up.
- The coordination of all on-board devices, and interfaces for retro-fitting, within a car would make EETS implementation easier.
- The coordinated use of the OBU with other navigation and communication systems would facilitate users' acceptance of ETC.
- To ensure a harmonised approach to data privacy, agreements are needed on what information should be made available and what should remain confidential.
- The potential constraints of existing ETC standards on future measures should be considered on a case-by-case basis; not all solutions may continue to be compatible, though it is desirable that new measures should be interoperable with existing ETC systems.

The following practical aspects should be reviewed:

- The current technologies (including ANPR) can meet most of the requirements for charging roads in Europe at a technical level, but are not all equally cost-effective.
- Operators and users should have the right to choose the simplest and most economical technology to pay tolls electronically throughout the EU.
- Efficient back office, inter-operator settlement and enforcement systems to guarantee toll payments need to be implemented without generating significant additional collection costs for toll operators or EETS service providers.

WEAKNESSES AND RECOMMENDATIONS TO OVERCOME THEM

From the analysis conducted in this report, we have identified the following weaknesses:

- Most vehicles in Europe do not have devices installed for paying tolls electronically.
 - Recommendation: promote a generalised introduction of ETC devices across the EU.
- Even though current ETC technologies are compatible with EETS requirements, additional factors need to be addressed to reach interoperability throughout the EU.
 - Recommendation: promote a liberalised market for the manufacture and distribution of ETC technologies. This should be accompanied by promoting a more coherent standard for suppliers to follow.
- ETC technologies still require the implementation of reliable enforcement mechanisms to identify toll evaders and guarantee the payment of electronic tolls within the EU.
 - Recommendation: promote sharing of data on registration and evasion through a secure pan-European registration database with evader/nonpayer details, secured through measures set out in the EFC Security Framework.