

Achieving interoperability of road user charging systems across Europe

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<< Session title >>

1 Summary

This paper looks at the current developments across Europe in the area electronic charging for road use. There are many motorway toll schemes which already offer users the opportunity to be charged by means of an on-board unit (OBU). These offer users benefits in terms of time saved and convenience. Operators of the scheme achieve benefits through higher capacities of toll lanes and reductions in operating cost.

There is a strong current political interest from governments in charging Heavy Goods Vehicles. Several countries (Switzerland, Austria and Germany) have operational schemes. Others, including the UK, are developing such schemes.

The European Commission has adopted a new Directive to require Member States to provide a common European Electronic Toll Service. The intention is that users who drive vehicles across Europe will be able to obtain an OBU which will support all the electronic charging schemes which come within the scope of the directive.

This paper reviews the European market for electronic tolls. It then considers the driving forces for the introduction of HGV charging. It describes the recent schemes which have been introduced and the plans for other new schemes. It then describes the actions being taken by the European Commission and Member States working together to implement the directive. Other initiatives are briefly mentioned.

The paper concludes with some observations of the issues involved in achieving interoperability of European electronic road user charging schemes in the coming years.

2 Introduction

This paper is concerned with electronic charging for road use in Europe. There are already over 8 million subscribers and the market is expected to grow rapidly. The OBUs in use for cars are mostly small and are battery powered, so are very straightforward to install in the vehicle. Indeed, some operators allow the users to move the OBU between vehicles. They provide the means of payment, usually being linked to a pre-paid account held on board or post-paid account held centrally.



The OBUs being designed and introduced for HGVs tend to be much more complex. They have a greater functionality and power consumption. They usually contain information relating to the vehicle and the tariff to be paid. As a consequence they require permanent connection to the vehicle. Most of these OBUs work only with a single charging scheme and are not interoperable with any other scheme. The European Commission has become increasingly concerned with the issues raised by the prospect of long-distance and cross-border vehicles requiring several different OBUs. It has been active in persuading countries to work towards interoperability.

3 Background to charging for road use in Europe

Any consideration of interoperability in Europe must take account of the present situation. While the political interest appears to be strongly focused on charging of Heavy Goods Vehicles, there is already a very well established market for electronic charging. Figure 2 shows the network of tolled roads operated by members of the ASECAP, the European Association of Tolled Motorway Operators.



Figure 1: Map of tolled roads in Europe.

ASECAP represents 121 organisations, operating 23,000 kilometres of motorway in 16 countries. Most of the tolls are collected at toll plazas, such as that shown in Figure 2



Figure 2: Toll plaza at Florence (Autostrade)

Toll plazas generally offer a wide range of payment methods, most of which require the driver to stop and pay. Increasingly non-stop lanes are being provided. Drivers of vehicles equipped with suitable OBUs may drive through the designated lane. The picture illustrates the Telepass system in Italy. The OBU communicates with roadside equipment; the barrier is raised if the OBU is accepted. The charge is added to the account for the OBU.

There are now over 8 million subscribers in Europe using OBUs for non-stop charging.

4 Interest in charging from National governments

4.1 Reasons for new interest in charging schemes

Most of the operational toll schemes in Europe are run under concessions awarded to commercial operators by their governments. In recent years, governments of countries which have not previously had national tolling schemes have become interested in charging for the use of roads. There are several reasons for this development.

4.2 Fair pricing

European countries, and particularly those in Central Europe, are experiencing significant increases in “transit” traffic, particularly by HGVs. HGVs cause the majority of road damage and air pollution. National vehicles contribute towards the cost of operation and maintenance of the road network through vehicle registration tax and fuel duty. Foreign HGVs do not pay this tax or fill up and therefore are not seen to contribute their fair share to the cost of maintenance of the road infrastructure.

4.3 New finance for road infrastructure

The European Commission budget for road investment was considered inadequate for the needs of the 15 Member States. Now that the EU has expanded to 25 Member States there are further pressing needs for investment in road infrastructure. The EC is seeking a way to raise new funds for road infrastructure. One of the mechanisms which might provide additional funds is through the spread of charging systems. The EC is pressing for these to offer non-stop electronic payment and to be interoperable across Europe.

4.4 Need to replace taxes based on fuel duty

Fuel duty is one of the main sources of revenue which is related to vehicle use. However, it is increasingly unpopular as a tax. It is also becoming less and less efficient as a source of tax revenue due to improvements in vehicles efficiency.

5 National initiatives

Switzerland, Austria and Germany have already introduced national charging schemes for HGVs. The UK Lorry Road-User Charging Scheme is in the procurement phase. France is planning to extend the current national non-stop electronic payment service to HGVs. Belgium, the Czech Republic, and the Slovak Republic are developing HGV charging policies.

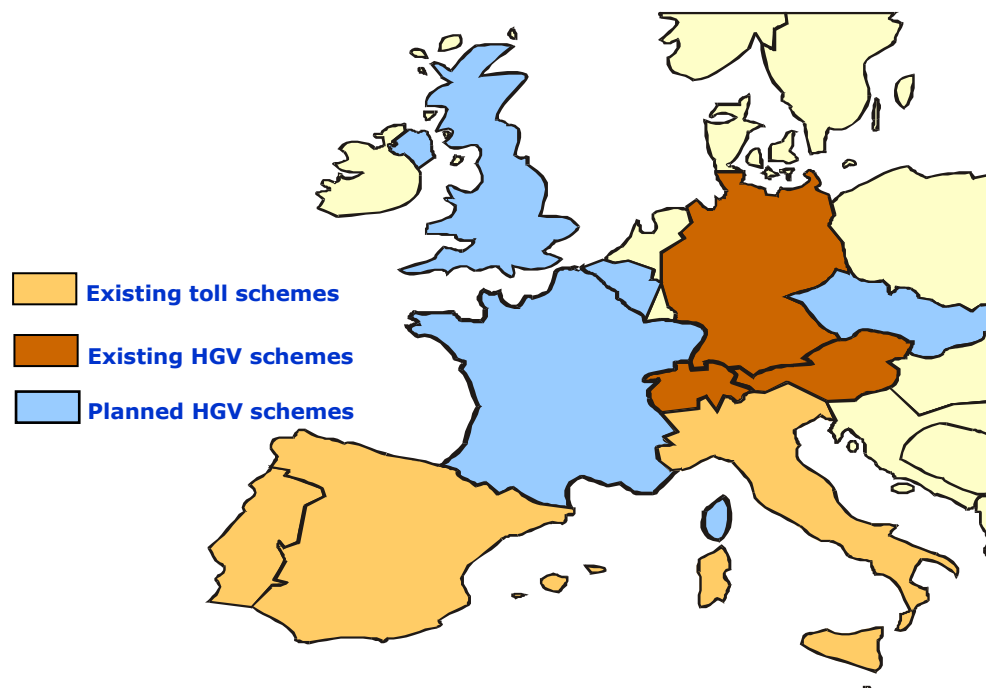


Figure 3: European countries with interest in HGV charging schemes

Figure 3 shows the increase in interest in HGV charging schemes within Central Europe. The following sections provide some further information on each of these schemes. The Rapp website (www.rapp.uk.com) provides links to the websites for all these schemes.

5.1 Switzerland

The legal basis for the Swiss scheme was the 1997 Federal Law for the Distance-related Heavy Vehicle Fee. All HGVs above 3.5 tons maximum permissible are eligible for the charge, which is based on all distance travelled within Switzerland. The tariff is per kilometre driven and per ton maximum permissible weight, and is emission class dependent. The scheme is operated by the Swiss Customs Authority. The



total road network of Switzerland is approximately 70,000 km, of which 2,000 kilometres are motorways. There are around 54,000 domestic vehicles. So far 470,000 foreign vehicles have registered for the scheme. The OBU called TRIPON is mandatory for Swiss vehicles and optional for foreign registered vehicles. Drivers of non-equipped foreign vehicles are required register the details of their vehicle with the scheme. On entry to Switzerland, they are required to stop and declare the odometer/tachograph reading, trailer status and to provide a payment method. There are about 100 equipped border stations. They receive a paper receipt. On exit, the odometer/tachograph reading is declared again and the receipt signed as a declaration of the charge due.

The system has worked smoothly from the start of operation in 2001.

In average there are approximately 4000 vehicles entering Switzerland with an OBU and about 6000 vehicles entering without an OBU per working-day.

The Swiss OBU can be used to levy of the Heavy vehicle toll in Austria as well. This is worldwide the first cross-board interoperability.

5.2 Austria

The Austrian bus and truck tolling system is the responsibility of ASFINAG, the State Motorway Operator in Austria. It is run by EUROPPASS, a private company which has been granted a toll collection concession by ASFINAG. All the revenue is passed to ASFINAG.

All heavy vehicles (incl. busses) over 3.5 tonnes maximum permissible are eligible for fee. The charge is levied for each motorway and dedicated expressway links used and is based on the number of axles on the vehicle (2,3 4 or more). All eligible heavy vehicles must have an OBU, which takes the form of a microwave transponder. A handling-charge of just €5 is



made for the “GO-Box” which is battery powered and can easily be installed in the vehicle by the driver. There are gantries equipped with microwave DSRC beacons on each Motorway link, of which there are 800, 100 of which are designed for charging and enforcement purpose.

To date around 450,000 GO-Boxes have been issued. Of those, 80% are for post payment and 20% are issued with pre-payment functionality. They are available at over 200 points of sale.



Figure 4: Enforcement station for Austrian HGV toll scheme

The Austrian scheme has generally been successful. It was introduced by an experienced operator with strong contract management by the owner. The mandatory scheme for all vehicles with a low-cost OBU proved feasible. The system went live within 18 months of contract signature. This involved the installation of 800 gantries in 6 months and distribution of more than 200,000 OBUs by the start of operation.

There are inevitably a few problems. Some heavy vehicle traffic chooses to use local roads to avoid paying the toll. This has caused an adverse reaction. There have also been problems with dealing with some of the user queries by the Call Centre. There have been several adaptations of the Tolling Ordinance to improve efficiency and the user friendliness of the tolling system.

5.3 Germany

This scheme is the responsibility of the German Ministry of Transport, Building and Housing. The previous paper-based Eurovignette scheme was discontinued in August 2003, to be replaced by a new toll scheme, to be operated by Toll Collect. The new scheme encountered numerous problems and did not start operation until 1st January 2005.

The tariff applies HGVs over 12 tonnes permissible weight travelling on the motorways only and is based on the distance travelled, the number of axles on the vehicle (up to 3, 4 or more) and on the emission class.

The OBU based on satellite positioning and cellular communications, so is quite complex. It is optional for vehicles, the alternative being for drivers to manually book journeys, either on the internet, via call-centre, or at terminals located at service areas and other stopping places. To date around 350,000 OBUs have been installed.



The German scheme has raised many issues. There was originally a low involvement by the Ministry, placing all the risk with the toll operator. When the system failed to be available, the Ministry was required to get more closely involved. Toll Collect proved to be rather inexperienced in both OBU design and in toll operation. There were many aspects which were not sufficiently planned by Toll Collect, including the use of the scheme by foreign users, and the availability of OBUs. Hauliers were reluctant to register and to install OBU after series of delays, leading to further problems. Toll Collect also accepted unrealistic targets for delivery of the scheme. The technology did not work as well as initially expected. The implementation of software for updating the network information and software has been postponed until 2006.

Although the scheme has only been in operation for a few weeks at the time of writing, it seems to be working at last. The presentation will provide an update on the latest news.

5.4 France

France has an extensive network of tolled motorways. The electronic charging service, known as Liber-t is currently available for cars only. The scheme is being extended to HGVs from around 2006.

5.5 Czech Republic

The Czech Republic has published a plan to implement a Heavy Vehicles Toll system. This will involve HGVs over 12 tonnes in first phase. The scheme may be extended to HGVs over 3.5 tonnes in a later phase. The charge will apply to motorways and other major roads - a total of 3,000 kilometres. The scheme will be operated on behalf of the State Infrastructure Fund (SFDI)

5.6 Slovak Republic

The Slovak Republic expects to create a national motorway company in 2005. The present time-based vignette system is expected to be replaced by electronic toll collection for all vehicles. The scheme will apply to motorways and principal roads 400 kilometres. There is currently no target for implementation.

5.7 Belgium

The Belgium Government is in the early stages of work on a new HGV charging scheme.

5.8 UK

There are several initiatives in the UK.

5.8.1 Lorry Road User Charge (LRUC)

The LRUC scheme was a Government response to Haulage Industry following the fuel duty rebate dispute in 2001. It will apply to all HGVs over 3.5 tonnes. The charge will be based on distance travelled in the UK, maximum permissible weight, and number of axles. There are expected to be different rates by type of road, such as motorway, and other roads, and different rates by time of day.

There are charging schemes, a Main scheme for those vehicles travelling more than a minimum distance, and an Occasional User Scheme for the others.

There is also a fuel-duty repayment scheme. The policy is that there will be no increase on the tax burden of the haulage industry as a whole when the charge is introduced

The technology has not been prescribed. The procurement has started. There are three procurement packages,

- Charging Data Services
- Enforcement Services
- Central Services

The Final Invitation to Negotiate was issued to Shortlisted bidders in February 2005, with a view to contract award by end of 2005. Operation of the scheme is scheduled for 2008

5.8.2 Interoperability of urban congestion charging schemes

The Transport Act 2000 gave local authorities the power to introduce congestion charging schemes. UK Department for Transport has a responsibility to ensure that any OBUs used in such schemes are interoperable.

The DIRECTS project is currently undergoing trials in Leeds. The project aims to demonstrate the DfT business model and involves several suppliers of OBUs, roadside equipment and back office functions.

6 European Directive on interoperability

6.1 Scope of the directive

The European Commission has responded to all these developments by issuing Directive 2004/52/EC on "The interoperability of electronic road toll systems in the Community" which was adopted in April 2004.

This Directive announced the creation of an European Electronic Toll Service (EETS). This service is intended to enable users to pay for all types of road fees on the entire community road network by means of a single set of On-Board Equipment. Article 3 requires Member States to ensure that operators and/or issuers offer the EETS to their customers in accordance with the following timetable:-

- (a) for all vehicles exceeding 3.5 tonnes and for all vehicles which are allowed to carry more than nine passengers (driver+8) at the latest three years after the decision of the EETS, referred to in Article 4, has been taken;
- (b) for all other types of vehicle, at the latest five years after the decisions on the definition of the EETS, referred to in Article 4, has been taken.

The directive applies to the electronic collection of all types of road fees, on the entire Community road network, urban and interurban, motorways, major and minor roads, and various structures such as tunnels, bridges and ferries.

The directive does not apply to :

- (a) road toll systems for which no electronic means of collection exists
- (b) electronic road toll systems which do not require the use of on-board equipment
- (c) small, strictly local road toll systems for which the cost of compliance with the requirements of this directive would be disproportionate to the benefits

The directive requires that all new national charging systems should be based on one or more of the following technologies:-

- (a) GPS (satellite positioning)
- (b) DSRC (microwave communications)
- (c) GPRS (Cellular communications)

The interoperable OBUs will therefore be required to offer all these technologies.

6.2 Governance

The European Commission has established two committees to oversee the implementation of the directive. The formal committee is the Comité Télépéage. This is the Regulatory Committee which take the necessary decisions relating to the European Electronic Toll Service. That Regulatory Committee consists of 25 member states. Voting will be by a qualified majority.

The second committee is the EFC Expert Group. In addition to representatives from the 25 Member States, this committee will also include Iceland, Norway, Switzerland, Croatia, Romania, Bulgaria, Turkey, ACEA¹, ASECAP, IRU, and IRF. The purpose of this committee will be to discuss the various submissions on interoperability and to make recommendations for decision at the formal Comité Télépéage.

6.3 Activities to support the directive

The European Commission has established six Expert Groups to provide recommendations to the EFC Expert Group

Group 0: Management Group

Group 1: DSRC specification

Group 2: Vehicle Classification

¹ ACEA = Association des Constructeurs Européens d' Automobiles, ASECAP = Association Européenne des Concessionnaires d'autoroutes et d'ouvrages à péage, IRU = International Road Union, IRF = International road Federation.

Group 3: Charging based on GNSS/CN²

Group 4: Enforcement

Group 5: Certification

Group 6: Integration of the OBU into the vehicle

To date, Group 2 is the only group to have made recommendations to the EFC Expert Group.

7 Other Interoperability initiatives

7.1 Standards activities

Standards activities on DSRC communications (microwave) are almost complete. Activity is focused on the interface standard for systems based on satellite positioning and cellular communications - ISO 17575.

7.1.1 MISTER

The EC funded a project to facilitate the completion of the drafting of the ISO 17575 standard and also to produce a draft specification for an interoperable European system

7.1.2 VERA II

VERA II is a European funded project which has been dealing with the issues of cross-border enforcement.

7.1.3 PISTA

PISTA was a European funded project to test interoperability between various operators across Europe, with a strong focus on Spain. The emphasis was on operational interoperability. The OBUs were based on CESARE II and CARDME.

7.1.4 CESARE III

CESARE is a European funded project dealing with the contractual framework required to achieve interoperability. The third phase of the project will start soon and will deal with the impact of new charging policies and authorities.

7.1.5 RCI

RCI is a new project which will develop and test equipment based on the technologies listed in the directive. It is funded by the EC.

7.1.6 MLU

The aim of MLU project is to investigate and define the functionality, constraints and system architecture, and assess the benefits of a telematics platform, integrated within the vehicle or as a single core vehicle unit.

7.1.7 MEDIA

MEDIA is a private initiative between operators in Austria, Switzerland, France, Slovenia and Italy. The project aims to provide practical solutions to users to achieve interoperability between the schemes in these countries.

² GNSS = Global Navigation Satellite System (=GPS, Gallileo etc), CN = Cellular Networks (ie GSM etc)

8 Conclusions

Interest in charging systems is growing across Europe and there are many national initiatives. The number of OBUs in operation is increasing and the political interest in achieving interoperability is strong.

However, there are many national and commercial interests in the charging developments and the business case for providing interoperable OBUs has not yet been proven.

There are still many obstacles to overcome. Nevertheless, there is a directive in place and all Member States are actively participating. Commercial operators are also working toward the achievement of interoperability.

The next few years will be an interesting time for road user charging in Europe.