M/338 MANDATE ON ELECTRONIC FEE COLLECTION

FINAL REPORT

PREPARED BY

CEN EDITOR

KEN PERRETT

RAPP UK

Document status

Doc name and version:	m-338_final report-issue5
Status:	Final report
Date of preparation:	4 April 2006
Document Preparation and Use	The full report, and the present summary information provided on the world-wide web, have been prepared by a project editor appointed and supervised by the Intelligent Transport Standards Steering Group (ITSSG) of the ICT Standards Board in response to a request by the European Commission, and under contractual arrangements administered by CEN. The ITSSG signed off the document as meeting the terms of the contract on 8 March. The report's conclusions do not necessarily reflect the opinions of the ICT Standards Board's Individual Members or of other individual organizations who participated. In any case any recommendations for new work need to be submitted to the usual procedures within the European Standards Organisations (ESOs).

Author:	Ken Perrett	Rapp UK
Contact details:	Ken Perrett E: ken.perrett@rapp.uk.com Tel: +44(0)118 925 5441 Mob: +44(0)7966 584748 Fax: +44(0)118 925 5450	

Change control

Date produced	Version	Changes
30th November 2005	Issue 1	First issue of the final report
13th December 2005	Issue 2	Second issue of the report, following comments received from members of ITSSG
20th December 2005	Issue 3	Third issue of the report, following comments received from ETSI
4 April 2006	Issue 4	Fourth issue of the report, following signing off by ITSSG on 8 March 2006
16 June	Issue 5	Fifth issue of the report, following the change to section 14.11 required by the Commission during the meeting on 8 June and agreed by ITSSG on 16 June

Table of Contents

Abbreviations

Abbreviation	Meaning
ACEA	European Automobile Manufacturers Association
ASECAP	Association Européennes des Concessionnaires d'Autoroutes et d'Ouvrages à Péage
CALM	Communications, Air Interface, Long and Medium Range
CEN	Comité Européen de Normalisation – European Committee for Standardisation
CENELEC	Comité Européen de Normalisation Electrotechnique -European Committee for Electro technical Standardization
CN	Cellular Networks – includes GSM/GPRS, but may include other protocols, such as UMTS.
DSRC	Dedicated Short Range Communications
DGTREN	Directorate General Transport and Energy, European Commission
EETS	European Electronic Toll Service
EFC	Electronic Fee Collection
EFTA	European Free Trade Association
EOBE	OBE which is designed to support the requirements of the EETS, and which is accepted for payment by participating operators.
ESO	European Standards Organisations
ETSI	European Telecommunications Standards Institute
GNSS	Global Navigation Satellite Systems
GPRS	General Packet Radio Service
GNSS	Global Positioning System
GSM	Global System of Mobile communications
HGV	Heavy Goods Vehicle
IRF	International Road Federation
IRU	International Road Transport Union
ITCSB	Information and Communications Standards Board
ITSSG	The ITS Steering Group (appointed by the ICT Board)
LSVA	Leistungsabhaengige Schwerverkehrsabgabe (Distance related Heavy Vehicle Fee)
OBE	On-board Equipment installed in the vehicle for the purpose of supporting a toll collection system
VAT	Value Added Tax

0. Summary

This report has been commissioned by the European Standardisation Organisations (ESOs) in response to Mandate 338 issued collectively by DG Enterprise of the European Commission and EFTA. Mandate 338 requires the ESOs to develop a programme of work on standardisation activities designed to support the requirements of Directive 2004/52/EC on the interoperability of Electronic road toll systems.

The first part of this work resulted in an interim report. This was published in July 2005 and is available on the CEN website at www.cenorm.be/isss/efc. Comments were received from a wide variety of stakeholders.

This report is the final report of Phase 1 of the work. It provides recommendations on a programme of work on standardisation, and is intended to encourage a debate within the ESOs, in order to reach agreement on the work programme. That debate will hopefully provide further opportunities for refinement of these proposals.

It is anticipated that the recommendations will be considered by relevant CEN, ETSI and CENELEC committees and working groups, after which the ESOs are expected to consider the commissioning of Phase 2 of the work which involves the implementation of the proposed programme.

Implementation of a European Electronic Toll Service (EETS) involves many stakeholders with a wide range of different interests. This work has raised many issues, only some of which are within the scope of the ESOs to resolve. It is hoped that this report will also provide a basis for engaging some of the wider stakeholders who, while not being involved in the development of the standards, nevertheless have a strong interest in the implementation of the new service.

This report presents the scope and objectives for the work in Section 2.

Section 3 provides a brief introduction to the European Electronic Toll Service.

Directive 2004/52/EC deals with the interoperability of European electronic toll systems. Section 4 lists the key requirements which impact on the standardisation activities.

Section 5 considers some of the major issues in the delivery of the EETS.

Section 6 provides a wider context in which the EETS is to be implemented and considers the role of all the stakeholders.

There are many uncertainties in the EETS programme as a whole. It was necessary for the Author to make some assumptions. These are set out in Section 7.

Section 8 presents some provisional results from the CESARE III project on the business model for the EETS. This has been a recent and valuable input to the work. The results of CESARE III are not yet formally available and may be subject to change. Nevertheless, they are important when considering the way in which the EETS will be delivered.

In Section 9, the Author proposes an approach to the standardisation work programme. This has been modified compared with the Interim report, to take account of comments received.

Section 10 provides an audit trail to the ideas presented in the Interim report, to provide continuity for readers of the earlier work.

Section 11 contains a list of existing standards, which are considered to be inside the scope of the proposed work programme.

Section 12 contains a list of existing standards, which are considered to be outside the scope of the proposed work programme.

Section 13 picks up the recommendations from the Interim report and reviews these in the light of comments received.

Section 14 sets out the final recommendations and proposed work programme.

Finally, Section 15 provides a few key references.

Annex A provides a description of the consultation process. Annexes B and C contain current work programmes of CEN and ETSI respectively.

1. Introduction

1.1. The Interoperability Directive

Directive 2004/52/EC[1] on the interoperability of road toll systems across Europe was adopted in April 2004. The Directive includes a range of activities intended to lead to agreement on the definition of the European Electronic Toll Service (EETS) by July 2006. Implementation of the service is scheduled to begin within three years of agreement.

The Directive includes a requirement that the European Standardisation Organisations provide the necessary technical standards for the EETS. Mandate M/338 was issued by the EC (DG Enterprise) and EFTA to the three European Standards Organizations (ESOs) CEN, CENELEC and ETSI.

1.2. Mandate M/338

This report has been commissioned by CEN on behalf of the European Standards Organisations[2] (ESOs) in response to Mandate M/338.

Mandate M/338 defined two phases:-

- Phase 1: Preparation of a European Standardisation work programme to support the Directive 2004/52/EC on interoperability of Electronic Toll Collection systems
- Phase 2: Implementation of that work programme

1.3. Completion of Phase 1

This report marks the end of the first phase of the work under the Mandate. It has been prepared by Ken Perrett on behalf of the ESOs, taking account of a wide range of input from stakeholders. It is offered to those organisations as a basis for the forward work.

The author would like to gratefully acknowledge the support and guidance of the ITS Steering Group, chaired by Cathy Jenkins, and the CEN project officer, James Boyd, during the preparation of this report. CEN TC278 WG1 was particularly helpful, allowing time for presentations and feedback at two plenary meetings. Jesper Engdahl, the chair and Johan Hedin, the secretary of that group have provided valuable support and feedback. The author has received many other comments. They have all been read and considered and incorporated wherever possible. It would be surprising if everyone was completely happy with the outcome. My apologies if you feel you are one of those people.

1.4. Next steps

The report is intended to encourage a debate within the ESOs, in order to reach agreement on the work programme. That debate will hopefully provide further opportunities for refinement of these proposals.

Implementation of a European Electronic Toll Service (EETS) involves many stakeholders with a wide range of different interests. This work has raised many issues, only some of which are within the scope of the ESOs to resolve. It is hoped that this report will also provide a basis for engaging some of the wider stakeholders who, while not being involved in the development of the standards, nevertheless have a strong interest in the implementation of the new service.

---

1 Directive 2004/52/EC of the European Parliament and of the Council of 29 April 2004 on the Interoperability of electronic road toll systems in the Community.

2 CEN, CENELEC and ETSI

2. Scope and objectives for this report

2.1. Mandate M/338

The European Standardization System complements and supports regulation with technical standards. Both the EU and EFTA apply the same regulation according to the EEA agreement in their geographical area. The same is applicable to their standardization policies where the ESOs may be mandated to provide standards for a given purpose.

Through Mandate M/338, the European Commission and EFTA invited the ESOs to "prepare a coherent set of standards, specifications and guidelines in support of the requirements of the Directive".

The ITS Steering Group (ITSSG) was established by the ICT Standards Board (ICTSB) to steer and coordinate at a strategic level the development and deployment of ITS standards.

ITSSG has taken responsibility for this task and has, through CEN, commissioned Ken Perrett of Rapp UK to prepare the first phase of the response to Mandate 338.

2.2. The work programme for Phase 1

The first phase of the work has involved:-

- Preparation of a draft Interim Report[3], which provides an analysis of the state-of-affairs
- Presentation of the draft Interim Report at an Open Meeting held on 28th June, 2005
- Submission of the Interim Report by 15th July 2005
- Submission of the final report (by 30th November 2005), including
    - Clear objectives
    - Task assignments
    - Timetables for the delivery of standards

The Interim Report and report of the Open Meeting can be found at www.cenorm.be/isss/efc.

The second phase will be for the ESOs to implement the programme prepared during Phase 1.

2.3. Scope of European standardisation

It should be noted that products (goods and services) developed by industry and qualified for the support of European regulation are not restricted to use in Europe. It is a common understanding that those products should also be exploited on the global market.

There is a potential mismatch between the objectives of the European Commission in respect of the EETS and the wider remit of the ESOs. This report is necessarily focused on the EETS and therefore may not fully reflect the wider scope of the work of the ESOs.

[3] M/338 mandate on electronic fee collection: Interim report of the CEN editor

3. Description of the European Electronic Toll Service

The European Standards Organisations are charged with preparing a coherent set of standards, specifications and guidelines **in support of the requirements of the Directive**. For the benefit of readers who may not be familiar with the requirements of the Directive, this section provides an introductory explanation of the European Electronic Toll Service (EETS).

The Directive places some constraints on the technologies which may be used in the future to support new electronic road toll systems. It requires toll operators across Europe to make available to interested users on-board equipment (OBE) which is suitable for use with all electronic toll systems across Europe.

As Member States will be at liberty to use any of the listed technologies, this implicitly means that the interoperable on-board equipment will need to include **all the technologies** listed In the Directive, i.e.

- satellite positioning
- mobile communications using GSM-GPRS
- 5.8 GHz microwave technologies

The on-board equipment designed to support all charging schemes should enable users to avoid the need to have multiple OBE within the vehicle, which indeed can be encountered in the field today. This is a major user requirement, and is the driving force for the Directive.

Another advantage to the user is that the OBE from a particular supplier will operate in a consistent way when used with different schemes. This is analogous to mobile phones which operate in the same way for a given user when used with different operators, although the different makes and models work quite differently.

The Directive states that the national charging policies and individual toll schemes will not be affected by the EETS. Operators will continue to charge vehicles according to the rules of their scheme, at rates determined nationally. It is forbidden by the European Treaty to discriminate against particular types of user. This means that the tolls charged for an EETS user in a given system must be consistent with the treatment of other users. In some case the user pays the same amount, irrespective of the means of payment, for example, whether the user pays in cash, by credit card, or by means of on-board equipment. This requirement does not rule out the possibility of the user paying a service charge for the convenience of paying all the tolls through one device.

In order to implement the EETS, suppliers will need to provide OBE which meets the need of all the operators. This report addresses that process. Operators then need to have a means of accepting OBE for use with their system. This implies either that the OBE is tested by each operator, or that there is some form of certification of OBE use in Europe. The term "European On Board Equipment" (EOBE) is used in this report to describe the OBE which is designed to support the EETS, and which is accepted for payment by participating European operators. (The term is not intended to refer to the scope of the standardisation upon which it is based.)

The Directive is not intended to have any direct impact on the operation of any existing toll infrastructure. The OBE will be expected to work in mono-lane configurations, such as at motorway toll plazas. The OBE will also be expected to work in free-flow conditions, such as that in Austria. And it will need to operate with schemes which have no "roadside" charging infrastructure, such as that in Germany. Users with interoperable on-board equipment will be required to conform to all the operational requirements of each scheme, such as the maximum speed of passage through the toll plaza. These requirements may vary from scheme to scheme. In practice, some existing roadside

equipment require some modification in situations where the local security mechanisms may not be appropriate for the EETS service.

Users of the service will be provided with on-board equipment which will be accepted for payment of tolls by all the participating operators. In order to achieve this, a contractual framework will be established between all the entities involved. The "Issuer" of the OBE will, on behalf of the user, provide a guarantee of payment to all the participating operators. The user will, in turn, be required to enter into a contract with the Issuer, which enables the Issuer to collect all the charges incurred on terms and conditions as defined by the contract.

The aim is to provide the user with a single invoice covering all the incurred charges. Some of the toll charges attract VAT and the rates will vary across Member States. Commercial users will wish to recover the VAT. It is quite a complex process to provide a single invoice covering charges across several countries.

The user may be required to pay a service charge to the Issuer for the provision of the EETS service.

The requirements of the Directive will now be explained in rather more detail.

4. Requirements of Directive 2004/52/EC

4.1. The legal framework for inter-operable EFC

European Directive (2004/52/EC) on the interoperability of electronic road toll systems in the community was adopted in April 2004. Article 2 of the Directive states:

> "All new electronic toll systems brought into service on or after 1 January 2007 shall, for carrying out electronic toll transactions, use one or more of the following technologies:
> (a) satellite positioning;
> (b) mobile communications using the GSM GPRS standard;
> (c) 5.8 GHz microwave technology"

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:

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

Article 2 of the Directive defines a European Electronic Service (EETS) which encompasses the entire road network in the Community on which tolls and road usage fees are collected electronically.

The EETS is expected to be established through:-
- A contractual framework
- Technical standards
- The offer of a single contract to users which will cover the use of all charging systems within the scope of the Directive
- On-board Equipment (OBE) which is suitable for use with all electronic toll systems within the scope of the Directive.

The Directive states that *Operators* will be obliged to offer the EETS to users. The term "operator" is not defined within the Directive. There are already several different organisational structures set up to deliver electronic toll collection; the precise obligation on each party is not always clear.

The Directive sets a target of 1st July 2006 for agreement on the definition of the EETS.

Decisions relating to the EETS are taken by the Regulatory Committee (also referred to as The Comité Télépéage). Membership is restricted to the representatives of the 25 Member States and voting is by qualified majority.

The Regulatory Committee is supported by an EFC Expert Group. The EFC Expert Group consists of nominated representatives from the 25 Member States and from other Countries and European Bodies (e.g. Iceland, Norway, Switzerland, Croatia, Romania, Bulgaria, Turkey, ASECAP, ACEA, IRU, and IRF). Papers are received and discussed at this group and recommendations (will be) passed to the Regulatory Committee.

If the Regulatory Committee approves the recommendation, it becomes part of the EETS service definition. If there is no agreement, then the matter is passed to the Council of Ministers for determination.

This process is most suitable for major decisions. However, the Regulatory Committee has not yet voted on any EETS proposals, despite the fact that some reports have been available for almost one year. Given the target date of July 2006, it seems unrealistic to expect that all the necessary documents can be prepared, discussed and agreed in that timescale.

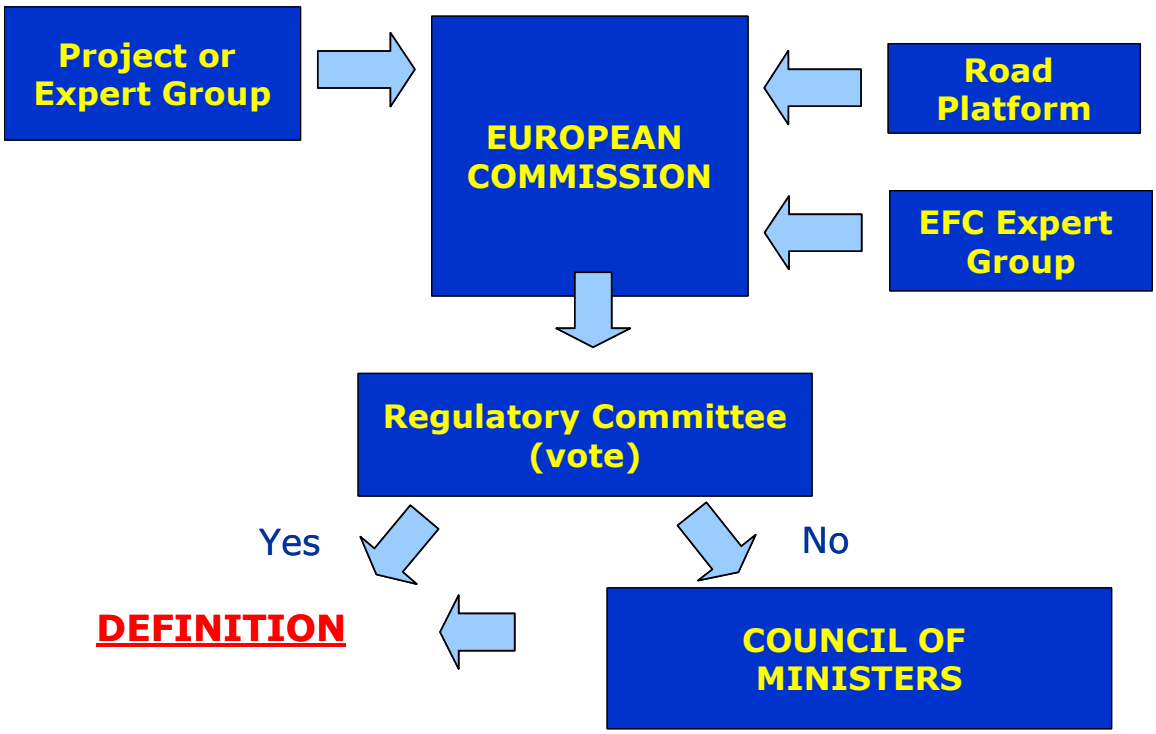

Figure 1: The process for defining the EETS

4.2. Requirements of the European Electronic Toll Service

4.2.1 Requirements in the Directive

The following table lists legal requirements in the Directive which are relevant to the Standardisation process.

Reference	Requirement	Comment
Article 2(1)	All new electronic toll systems brought into service after January 1st, 2007 shall use **one or more** of the following technologies: • Satellite positioning • Mobile communications using GSM-GPRS • 5.8 GHz microwave technology	(a) Any EOBE intended for use with all systems must therefore use **all these technologies.** (b) There are several significant technologies which may be required, but which are absent from this list e.g. UMTS, infra red communications, tachograph, movement sensors.

Reference	Requirement	Comment
Article 4(7)	Standards Bodies are to make every necessary effort to adopt standards applicable to electronic toll systems with regard to the technologies listed in Article 2(1)	This paper is part of that effort.
Article 4 (8)	EOBE shall comply with the RTTE Directive (1999/5/EC)	Accepted. The RTTE Directive relies on vendor self-declaration of conformity with harmonised standards and the opinion of so-called Notified Bodies
Article 4 (8)	EOBE shall comply with the Directive 1989/336/EEC on electromagnetic compatibility	This is covered by the RTTE Directive Article 3.1b.
Article 4 (1)	The EETS will be based on the following items:- • Description of the functions of on-board equipment and ground based equipment • Standards, certification procedures and constraints to be observed • Procedures for the verification of technical performance of on-board equipment, roadside equipment and the way equipment is installed in vehicles.	This paper focuses on these aspects.

4.2.2 Member State Requirements

The following requirements arise from the expectations of Member States.

Subsidiarity principle

Each Member State and/or operator remains free to define:

- the objectives of a charging scheme
- the vehicles subject to the charge
- the roads subject to the charge
- the allocation of vehicles to tariff classes
- the tariff to be applied to each class of vehicle

EETS is mandatory for operators

All operators of schemes within the scope of the Directive are obliged to offer the EETS.

EETS is an additional service

The European Electronic Toll Service (EETS) may be an additional service to those offered locally.

Local and national charging schemes are permitted to continue alongside the EETS. It is expected that some countries may wish to adopt a single solution which will provide interoperability at both the national and international level. This is not assumed to be the case in all countries.

The service is optional for users

Users are free to take advantage of the local and/or European service.

Subscribers to the EETS will be provided with interoperable OBE (EOBE) which will be accepted as a means of payment by all the operators offering the EETS service.

Non-discrimination

All users must be treated equally within a Member State. This is an essential requirement contained in the European Treaty. In particular, this may mean some limitations on the charges which can be made to users with different types of OBE .

Ease of use

It is desirable that the user has a single contract for the EETS and receives a single invoice for the charges incurred.

Acceptability by operators and users

Operators will wish to ensure that the EOBE which is being used has been authorised. Users will wish to be assured that they are being charged by an authorised operator, and that any information provided is properly protected.

This means that the EETS must provide the data integrity, authentication and access protection of sensitive user data suitable for a European multi-operator environment.

Equal access

A principle in European public procurement (see 2004/17/EC and 2004/18/EC or www.europa.eu.int/eur-lex) is that equal access should be ensured, either by reference to technical specification or in order of preference to national standards transposing European standards, European technical approvals, common technical specification, international standards, or other technical reference systems created by the ESOs, and when these do not exist, national standards, national technical approvals or technical specification.

If the EETS were to cover any identified intellectual property right (IPR) / patent rights then it needs to be ensured that the holder would be willing to negotiate European-wide licences under his rights on reasonable and non-discriminatory terms and conditions.

5. Issues to be addressed in delivering the EETS

5.1. Obligations for delivering EETS

There is, as yet, no agreed business model for the delivery of the EETS. CESARE III is currently engaged in defining the EETS service and the obligations of all the parties in providing that service.

There are two very different scenarios emerging. For toll systems based on microwave communications, the obligations are relatively straightforward, being a natural progression from the present services. Many toll operators currently have arrangements with Issuers of transponder-based OBE. The operational procedures are known and the business relationships already exist. The DSRC standards are open and available for competitive procurement with many competing suppliers. The final step is the common European application and this is being worked on now.

For systems based on Global Navigation Satellite Systems (GNSS) and Cellular Network (CN) technologies, there is no common understanding of the obligations of different parties. Each of the present schemes has been designed as an integrated whole. In each scheme the OBE is unique and in some cases the specifications are proprietary. Little or no continuous competition exists between OBE suppliers. There is little stated about how to overcome these "monopolies", some of which also subject to IPRs, and who has this responsibility. The Directive must be transposed into national law and is therefore a legal instrument. However, the obligations are placed on operators. There is no mention in the Directive of new service providers - how will they be created?

5.2. Specifying the requirements

There are two strategic approaches to the design of OBE.

One way is to start working from the existing toll operations and to define the obligations of EETS Provider and Toll Charger in respect of GNSS/CN systems. Given that these are few in number, it should be possible to define a set of common requirements. The problem with this approach is that each new scheme may introduce new requirements. The Directive provides for this. Unless some limitation is placed on new schemes, then it might be necessary to reengineer all existing systems to accommodate a new scheme. This is not a feasible approach.

The other way is to write enabling standards which encompass all possible solutions. This was the approach taken for the work on CEN ISO TS 17575 by necessity, as there was no possibility at the time the work started to take any other route. There are major drawbacks to this approach. These are:-

(a) the resulting standard is so flexible that new Toll Chargers may be able to develop incompatible systems which are conformant to the standard - this happened with DSRC standards

(b) the standard is so complex that the cost of designing and certifying the equipment becomes extremely costly

(c) there is no guarantee that purchasers of major national charging systems will mandate the use of the resulting standards. It is almost certain that OBE meeting just the national requirements will be cheaper than OBE meeting all European requirements, at least in the early stages of deployment

It is still not clear which approach should be used.

5.3. Certification of equipment

There appears to be common agreement that the certification route is preferred to others. This means that suppliers would have the responsibility of verifying that their OBE operates according to the specification of the EETS.

Given the freedom of Member States to introduce new charging schemes without reference to current standards, the certification task appears extremely difficult at present, due to the complexity of the possible specification and uncertainty about adherence of future schemes.

5.4. Implementing the service

The new actor is the EETS Provider. In order for the EETS to be implemented, entities have to be found that are willing to offer the service. This means having a network of service outlets around Europe.

Initial indications are that existing operators are willing to accept the use of "new" OBE issued by EETS Providers, providing that certain commercial requirements are met, such as the level of commission being reasonable.

Indeed there are also some expressions of interest in the role of EETS Provider. However, for companies to undertake that role, they will need to have contractual agreements covering every aspect of the service. While CESARE III is working on the requirements for these contracts, it is only a short term project. It is not clear who will undertake the huge contractual process to establish these service agreements across Europe.

5.5. Reaching agreement on the EETS definition

The starting point for the standards process should be to have an agreed definition of the EETS service. The CESARE project is working on this. The recommendations of that project will need to be discussed and agreed across all Member States. It is not expected that this will be achieved until early 2006.

Even then, the service definition for systems based on GNSS/CN technologies may not be adequately covered as there is currently only one and it is not known how future systems might operate.

5.6. Reaching agreement on the functional requirement

The existing charging schemes across Europe are operated by different types of organisation (e.g. public and private sector). They operate with different objectives, charge different types of vehicles, and have different payment arrangements. The levels of security required by the schemes vary considerably.

The EETS is required to support **all** the requirements of **all** the charging schemes. By the principle of Subsidiarity, each Member State remains free to define a national scheme. Operators have not discussed or agreed on the functional requirements against which a supplier can provide suitable On-Board Equipment (OBE), that is, OBE which will support the EETS; we refer to this as European On-Board Equipment (EOBE). Furthermore, any future, as yet undefined, scheme must also be supported.

This is very challenging, especially as some requirements appear to be contradictory. For example, the user is able to "switch off" the German OBU is the vehicle configuration is below 12 tonnes. Other countries may require that the OBU cannot be switched off. One might imagine a technical solution whereby the OBU responds in a different way when operating with each scheme. It is difficult to capture such requirements.

A key issue to decide when designing the technical concept for interoperability is whether it is more effective:

- to update the RSEs providing them with additional application and communication capabilities to handle the existing and mixed population of OBUs, or

- to define a new "enhanced" OBU that is supported by all existing RSEs in Europe, or
- to agree on a common European solution, based on the CEN standards, that is associated with the ETTS that should be supported by all RSEs in Europe, not precluding the OBUs and RSEs to support additional services locally at their own discretion.

It is of course also possible to combine the approaches above. Expert Group 1 addressed this issue in its investigation of suitable concepts for microwave based systems. Expert Group 9 is looking at the situation of systems based on GNSS/CN.

It should be noted that CEN TC278 WG1 SG5 has developed a draft technical specification which contains some proposed functions. However, there has been **no acceptance, or ownership of these functions by operators** as a basis for supporting all current and future charging schemes. It would be a high risk strategy for suppliers to build equipment based on such specifications without acceptance by the operators.

In the light of the lack of common requirements, or common approach to the specification, it is a highly complex task to design a set of standards to support the EETS.

5.7. Commercial business case for the EETS

The costs of establishing the EETS are significant. A new range of OBE must be designed, procured and maintained.

If there is a single specification of EOBE designed to meet all requirements, then the EOBE is likely to be much more complex and costly than the vast majority of existing on-board equipment. Most existing OBE can be easily installed by the user. The EOBE would probably need to be installed by a qualified fitter, especially in HGVs. This is due to the requirement for several antennas, a power connection and possibly a tachograph connection. This is a further additional cost.

The international clearing of charges and payment will be a new service which will cost money.

Against these costs, the user will expect to pay the same level of toll as at present. The benefits are simply the fact that there are fewer pieces of equipment in the vehicle and that the user has all charges on a single invoice.

While no detailed business case analysis has been done, there is a general view that there is a real issue about the commercial case for the EETS based on a single EOBE. The lack of progress by the market was part of the reason why the European Commission chose a regulatory approach.

There may be a commercial case for some relatively local traffic which regularly crosses borders. In such cases the benefits are more tangible and the operational savings for operators may be more significant. Interest in such "regional" inter-operability has already been demonstrated, for example by the PISTA and MEDIA projects.

5.8. Creation of a new market

The crucial point is that there is currently a limited market for complex OBE of the type envisaged in the Directive. All the present systems are monopolies. As an example, Switzerland has chosen a new supplier for the 2nd generation of OBE, leaving the original supplier without a market for their product. There appears to be no activity to evolve the situation to one where there can be multiple suppliers for the national system. Until this is achieved, it is difficult to see how this can be extended to acceptance of international service providers.

Suppliers do not yet know how the EOBE will be procured and this means that they will be cautious. The investment required to develop EOBE is substantial and the market for

the EOBE is uncertain. Under these circumstances, it is understandable that effort to develop common specifications or standards is sometimes lacking.

5.9. National requirements for acceptance of EETS OBE

The systems operating in Switzerland and Germany have unique requirements for the OBE. In the case of Switzerland, the specification is government owned and designed to support the secure collection of a tax. The Swiss government is likely to expect that any OBE designed for EETS will meet its requirements. However, those requirements are not yet public. The Swiss government could require that EOBE meet the full Swiss specification, including a tachograph connection, or might to some extent relax the requirements. In a similar way, the German OBE is a proprietary design which meets the German government requirements for charging. This specification is not available to other suppliers. More relevant, the requirements for different OBE to work in Germany are not yet known. This makes the task of developing standards and designing equipment for use with these systems very difficult.

5.10. Role of standards in the delivery of EETS

Ideally, there would be standards covering all the technical aspects of the EETS. These would ensure technical and procedural interoperability, and be subject to regular review and updating (typically every five years). Contractual interoperability would then be provided through agreements between all the entities involved.

For this to work, all procurers of OBE would need to adhere to these standards. There is considerable uncertainty about the willingness of Member States to mandate the use of standards, especially before they are finally approved. This results in a lack of confidence in the standards as a means of delivering the EETS.

5.10.1 Scope of the standards

Several people commented on the Interim Report about the scope of the standards. The standards being developed on EFC are normally intended to be applied in a wider context than that of the EETS, and possibly on a worldwide scale. This does introduce some issues. It is important that there is a recognition that the standards may need to be written in this wider context and the EETS requirements specified with an EETS specification (e.g. by selection of options within referenced standards).

5.10.2 Health of standardisation activities related to EETS

The benefits from standardisation depend on the cooperation between different stakeholders . Governments, EFC operators and industry all have a part to play:-

- central government: to regulate the market for establishment of key principles (foster development of standards that enable large scale national deployment)
- EFC operators: fostering of best practice, reducing risk and complexity of delivery programmes; solid basis for compatibility / interoperability ensuring continuous competitive procurement
- industry- increased market for products and systems

However, work on the development of standards is a process generally led by industry. The incentive for involvement is normally expected to arise from the benefits of being able to produce cheaper products and to achieve an increased market for products. To date, each charging scheme using CN and GNSS technologies has been a bespoke purchase and the standards have played no role. This indicates that central governments may not be fulfilling the expected role. It would appear that the supply industry as a whole does not have a high level of confidence in the likelihood that standards will be mandated by new procurers and therefore the level of resources allocated to these activities is relatively low.

The European Commission has already recognised this deficiency and has allocated some resources to the formation of a project team to complete the work on the essential standards. This is not necessarily an ideal answer as the processes for agreement and approval of work for the European Commission is radically different from that for standards activity.

5.11. EETS Programme Management

At present the EETS programme is "managed" at the European level by Philippe Hamet, working on a part-time basis. He has no support staff. He has initiated a programme of support by contracting teams of experts and consultants to undertake some of the work. However, the rules affecting the involvement of experts and the rules for the tendering of projects means that the work is, at best, fragmentary and inconsistent. There is no overall procedure for control and issue of documents. The EETS is a major European commercial service and, as such, requires a significant level of resource at the European level. This might be done by enlisting nationally funded experts, or by creating a team within DGTREN.

5.12. Serving different markets

There are two distinct markets for the EETS- Heavy Goods Vehicles (HGVs) and other vehicles.

Heavy Goods Vehicles

The first is for Heavy Goods vehicles (HGVs) travelling across Europe. These travel great distances and currently pay substantial amounts in toll charges. Some of the toll charges are subject to value added tax (VAT). Commercial vehicle operators are able to reclaim such VAT and already have complex services and procedures for doing this. Table 1 shows that the total number of HGVs is around 21 million. Of course, most of these will not undertake international haulage activities.

Table 1: Total registered vehicles in the 15 European Member States in 2001

Vehicle type		
Cars	**184 million**	**87.5%**
Commercial Vehicles ≤ 3.5 tonnes	**21 million**	**10.0%**
Commercial Vehicles >3.5 tonnes	**4.8 million**	**2.3%**
Buses	**0.5 million**	**0.2%**
Total	**210 million**	**100%**

Vehicle operators and Freight Associations are pressing for a single OBE for safety reasons, ease of operation and cost of administration. The single invoice for transport services is already largely achieved through use of fuel cards. These services already include the payment of tolls. Many international vehicle operators would find it helpful to have such a service for electronic payment, and this would reduce the delay for their vehicles at toll plazas.

Other vehicles

The vast majority of the remaining vehicles are cars. Most of these will be privately operated. The main interest in the interoperable service is likely to come from two types of user. Firstly, those people living close to the borders of several countries may find it helpful to have a single OBE for use in different schemes, especially where they regularly travel across the borders. Secondly, people living in countries where there are currently several different schemes may find it useful to have a single OBE.

6. Involvement of EETS stakeholders

There are many stakeholders involved in the EETS. Some of these are:-

- European Commission
- Financial Institutions
- Government Departments
- Ministries of Transport
- Payment Service Providers (Issuers)
- Road administrations
- European Standards Organisations
- Road Operators
- Suppliers
- Test houses and Certification Bodies
- Vehicle Manufacturers
- Toll operators
- Tax Administrations
- Service users

This is a complex mix of (inter-)government and commercial organisations. If the EETS definition is to be acceptable, then all of these stakeholders will need to be able to work together.

Suppliers should not attempt to dictate solutions to operators as this is not consistent with public procurement rules.

Similarly inter-operability will not be achieved if governments insist on unique requirements for each scheme.

The process of achieving interoperability is one of building mutual understanding and flexibility in acceptance of OBE offering the required functionality.

Many stakeholders need to play a role in the solution, for example:-

- Road Operators – to define the contractual/commercial framework, including the technical requirements for the EOBE
- Governments – to organise the national approaches, legal frameworks and procurement processes
- ESOs – to define the necessary standards
- Suppliers – to build the EOBE
- Certification Bodies – to verify the correct operation of the EOBE
- Contract Issuers and Payment Service Providers – to guarantee payment

Any approach which does not consider the needs of all stakeholders will fail.

The users do not appear prominently in discussions about the EETS. This is due to the fact that a political decision has been made to provide the service (whether users will subscribe or not). The requirements of the users have been embodied in the Directive. The other stakeholders now have to consider how to implement the service.

7. Working assumptions for the development of standards

There are considerable uncertainties about the way in which the EETS will be defined and deployed. In order to develop the standardisation programme, it has been necessary to make some assumptions. These are set out below:-

7.1. The EETS must not require operators to make significant changes to existing Central and Roadside Equipment

There is a substantial investment in roadside and central equipment by operators across Europe. The intention of the Directive is to enable users to make use of existing charging systems. This implies that the existing systems should be retained if possible. The costs and timescale of upgrading central and roadside equipment is likely to be significant and we therefore conclude that we should seek for a solution which retains the present investment.

7.2. EOBE issued for use with the new service must support the requirements of all charging systems

It is a well established European principle that each Member State and operator may determine the objectives of any charging scheme, the vehicles to be charged and the tariffing principles to be applied. The EETS must support any such scheme. This creates quite a challenge.

7.3. Some (public) operators will use competitive tendering for procurement of the EOBE

Specifications for the EOBE must be produced to ensure equal access and support competitive tendering processes across the EU and EFTA.

7.4. The required functionality of the EOBE must be managed

Given that operators will need to procure EOBE and that these cannot be significantly changed once the procurement process has started, the functionality of the EOBE must be defined at the outset and then managed through a change control process. If the functionality is fixed, how does the EOBE support new charging systems?

7.5. The EOBE must all have an agreed common functionality capable of supporting all schemes

The recommended approach is to fix the functionality of the EOBE, based on agreement by all Member States on a set of core functions which will be used to support all charging systems. The minimum set of functions (i.e. the core functions), once agreed, becomes a maximum, as no new charging system can introduce new functions. However, the freedom of each operator to use the functions to define the national requirements is preserved. Of course, there must be a process for this functionality to be reviewed and evolved, allowing for backwards compatibility and graceful evolution.

7.6. Acceptance of conformant EOBE

Operators should agree on a process to guarantee that any EOBE which is fully compliant with the requirements should be accepted for inclusion in the EETS. This is the open market which suppliers require to provide confidence to invest in the development of new products.

The biggest issue concerns the application software and the scheme data (if required). Each EETS operator will have an application in the back office and will expect the EOBE to have the matching software and data to support that application. For that reason the application and scheme data elements have been shown as matching the EETS operator. The requirement is for the EOBE to support **"all charging applications".** For charging based solely on 5.8 GHz microwave communications, this has almost been achieved. For

charging based on other technologies (for example, distance measurement and cellular communications) this is still a major issue.

8. EETS business model

8.1. The need for a business model

There is, at yet, no agreed business model for the delivery of the EETS service. This is a serious issue, as the development of standards depends on knowing the way in which the service will be provided.

CESARE III is working on proposals for the EETS business model. The following section provides an indication of the latest thinking within CESARE III. However, this has not yet been finalised, or approved. Nevertheless, it is a considerable advance on the assumptions which were made within the Interim Report.

Even if the CESARE III model should develop further, it is probably helpful to consider whether the current proposal assists in the development of the necessary standards.

8.2. CESARE business model

Figure 2 shows the high-level model which is expected to be proposed by CESARE III. There are four "actors". These are deliberately designed to be generic as there are many different ways in which the actual organisation structure can operate. This is a European high-level view which allows for considerable variation across Member States.

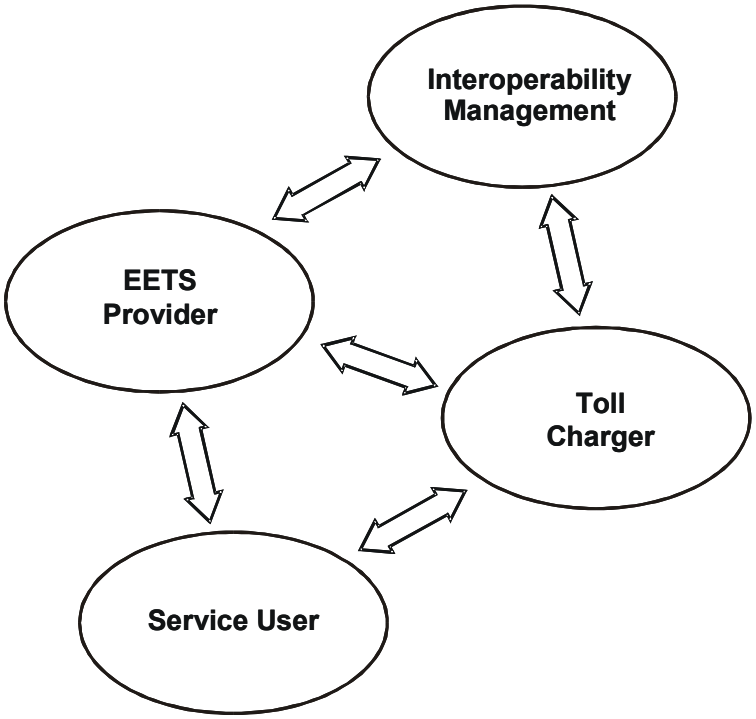

Figure 2: CESARE business model

Toll Charger

The Toll Charger is responsible for the levying of the toll in a particular network or area. There will be some form of electronic toll collection system which operates to collect the money from service users.

The Toll Charger may be a public authority or a commercial road operator. In either case, under the requirements of the Directive, he is obliged to accept users with vehicles which are fitted with European approved OBE and a valid contract. The Toll Charger collects evidence of use of the service and claims payment from the EETS Providers for the consumption of that service. The Toll Charger is guaranteed payment by the EETS Provider.

EETS Provider

The EETS Providers offer the EETS service to users. This involves the provision, and possibly installation, of suitable OBE. The user will be asked to sign a contract and provide a suitable means of paying the EETS provider. Providing the user adheres to the terms and conditions of the contract, the EETS Provider will guarantee payment of the services consumed by their customers. The EETS Provider will expect to be able to verify that the claims from the Toll Chargers are genuine. The EETS Provider will then pay the Toll Charger. The charges incurred by the user will be debited to the user's account and an invoice sent at agreed periods, such as monthly. Payment will be collected from the users by means of the offered payment means. This will normally be a financial institution.

Service User

The Service User signs a contact for the EETS Service. The user will agree to pay the charges for the use of the tolled networks operated by the Toll Charger. Users will be able to use the interoperable EFC service in all the tolled networks within the scope of the Directive.

Interoperability Management

The Interoperability Management sets the rules for the interoperable service and is therefore the regulatory body of the interoperability scheme.

The setting of rules can be on the regulatory level if (parts of) the service definition is integrated in (European or national) law – e.g. the Directive. Some of the rules can also be agreed between the participants upon a contractual relation like an MoU.

The contractual framework for the operation of the service will be "owned" by the Interoperability Management. This will determine the business rules by which the EETS Provider and Toll Charger operate. It is expected that there will be a standard contract, which all parties would sign. This would define the service, and obligations of all the parties, including the exchange of information, such as black lists and security keys. The commercial arrangements between the parties are likely to be agreed on a bilateral basis.

8.3. New aspects of the EETS service

Currently, the roles of the EETS Provider and Toll Charger are usually fulfilled by the same entity. This is typically what is called the Transport Service Provider, or TSP. The TSP issues the user with a contract and OBE. The TSP also operates the toll collection system.

The separation of these roles as proposed for the implementation of the new EETS service is highly significant. Many questions are raised about the way in which OBE will operate and particularly about the arrangements for security, given that a large number of entities will be involved in the service.

These questions are particularly problematic for systems based on GNSS/CN technologies. There is only one such system operating in Europe - and this does not currently operate using the model above. However, it is not yet known exactly how it will operate in the future. This raises real problems for those trying to devise stable technical standards and associated certification procedures.

Taking the German situation as an example, let us consider that the EETS is operating. A user based in France signs an EETS contract with a French-based EETS Provider and gets suitable OBE. The user drives into Germany and uses the toll motorway. The Toll Charger, which is Toll Collect, will expect the OBE to operate in such a way that the toll can be paid. It is not yet clear what this means. For example, is the French OBE required to incorporate infrared communications as required for the German enforcement system? If the OBE is then taken to Switzerland, does it require a connection to the tachograph as required for Swiss OBE. These questions are now being asked and it is too early to have definitive answers. The work programme for standards will need to recognise these uncertainties.

8.4. Reason for focusing on the OBE

The Interim Report concluded that the key element of the new service is the OBE and the way in which it communicates. This has been challenged by several people. It is therefore worthy of further thought.

The Toll Charger, as the actor who is responsible for collecting tolls, already exists. It is what is commonly known as the "Operator". Although this role can be fulfilled in a variety of ways, there are many examples of Toll Chargers. The toll systems which they currently operate are not expected to change significantly to support the EETS.

One might expect that some roadside equipment may need to be adapted to adopt European-wide security mechanisms and the software and procedures dealing with the exchange of data and financial information will probably need some degree of standardisation. Signing of the new service for the benefit of the road user will be required. The impact of the EETS on existing toll systems should obviously be minimised.

The EETS Provider role is new and will need to be defined carefully. It is an extension of the role of Issuer. Many of the toll systems have Issuers of the on-board equipment. The EETS Provider will need to guarantee payment of tolls and the instrument for collecting the charging data is the OBE. The OBE is the interface between the EETS Provider and the Toll Charger. The Toll Charger will not know the identity of the user and will not be able to contact that user. This is why there is a strong focus on the OBE.

According to the Directive, the OBE must be suitable for use with all toll systems. In general, technical interoperability can be achieved through:

- updating of the RSEs providing them with additional application and communication capabilities to handle the existing and mixed population of OBEs, or
- definition and development of a new "enhanced" OBE that is supported by all existing RSEs in Europe, or
- agreement on a common European solution, based on the harmonised best practice solutions, that is associated with the EETS that should be supported by all RSEs in Europe, not precluding the OBEs and RSEs to support additional services locally at their own discretion.

A combination of the above-mentioned approaches.

In this report, we have assumed that any changes to roadside infrastructure should be minimised.

The implication is that the OBE must adapt to the different toll systems, not the other way round. The process whereby the Toll Charger deems that an EETS OBE is "suitable" is generally assumed to be subsumed within the certification process, but this will not be sufficient.

Requirements of toll systems must be known in advance, especially if there are some "unique" requirements, such as a tachograph connection.

9. Use of standards to support the EETS

Figure 3 provides an overview of an analysis of the potential use of standards in relation to the EETS.

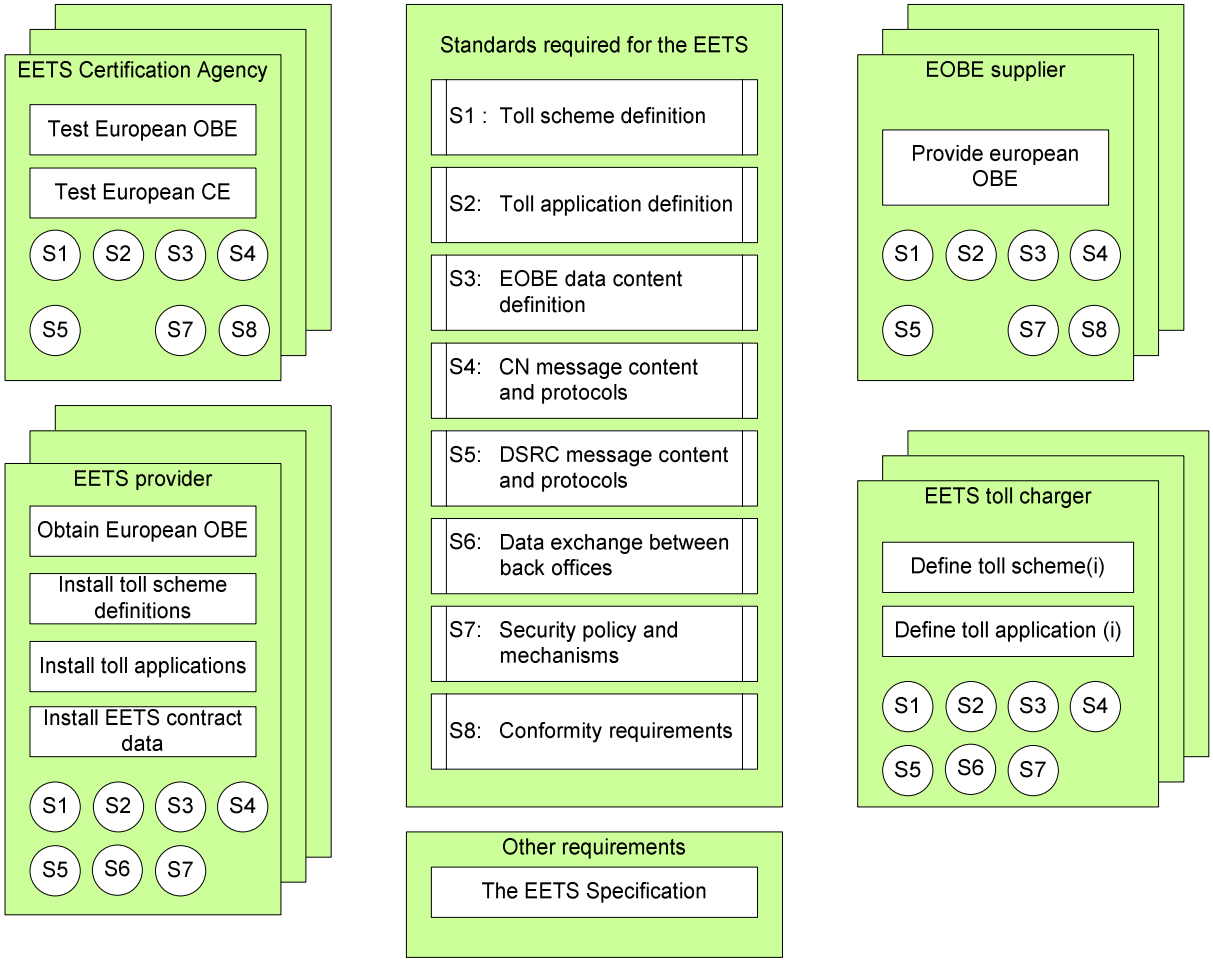

Figure 3: Expected use of standards in support of the EETS

The diagram shows the two major actors in the delivery of the EETS – the EETS Provider, and the Toll Charger. It also shows the EOBE supplier and EETS Certification Agency. In the following text we deal with each of these in turn and consider what is required to set up the EETS service. The operation of the service will be dealt with separately.

9.1. The EETS Provider

It is expected that there will be several (if not many) EETS providers. Each of these will wish to provide on-board equipment to their users which will "be suitable for use" with all toll schemes within the scope of the Directive. While some of the EETS Providers will also be EOBE suppliers, it is assumed that at least some of these EETS Providers will wish to go to the market for the provision of EOBE which meet all the requirements of the Directive. It is obviously of great benefit if such equipment can be defined in such a way that it is feasible to have a healthy competitive market.

The EETS Provider will need to ensure that the EOBE to be used will support all the toll schemes. There are several ways to approach this. We propose that the most cost effective way is as follows:-

- Specify a common method (i.e. standard) to be used for defining toll schemes
- Specify a common method (i.e. standard) to be used for defining toll applications

- Build EOBE to support any scheme and application defined using these standards
- Specify each toll scheme and toll application using the common approach
- Certify that each EOBE operates with each defined toll scheme and application
- Offer certified EOBE to the EETS Providers

9.2. The EOBE Supplier

Suppliers wishing to provide EOBE will need to be able to meet all the requirements of the Toll Chargers. This process would be extremely complex if every Toll Charger defined their requirements without any constraints. This could lead to many enhancements and changes to suppliers' equipment to provide the necessary range of requirements. If a new toll scheme is introduced, the Toll charger may introduce further requirements which require an upgrade of all the existing equipment.

In order to minimise the additional work and therefore cost for the suppliers, we propose that there is an agreed common method of defining toll schemes and applications. The EOBE can then be built to support any such scheme.

In order to provide Toll Chargers with assurance that any specific EOBE will operate correctly, it is proposed that the EOBE is certified for use with each toll scheme.

These EOBE can then be offered on the market to all EETS Providers.

9.3. The Toll Charger

There will be many Toll Chargers across Europe who will be required to offer users the EETS service. In the past, the Toll chargers have (with a few exceptions) exercised full control over the approval of OBE intended for use with their scheme. Under the EETS arrangements, Toll Chargers will have less control, particularly over the EOBE to be used with their system.

The Toll Charger wishes to ensure that any EOBE intended for use with their scheme will operate properly. It is necessary to avoid the need for the Toll Charger to be involved in a great deal of work to verify the correct operation of every EOBE product on the market. We propose that the most efficient way to do this is as follows:-

- All Toll Chargers agree to use a common method (i.e. standard) to define toll schemes and toll applications
- Each Toll Charger defines their scheme and application using the common method. These definitions are provided to potential suppliers of EOBE. The suppliers are responsible for certifying the operation of their EOBE with the toll scheme and application.
- Toll Chargers will be able to pass some responsibility to the market to ensure that EOBE operate properly with their system.
- EETS providers provide users with a certified EOBE containing
    - The contact details
    - The definition of the Toll scheme
    - The charging application
    - Vehicle data

9.4. The EETS Specification

In order to completely define all required elements of the EETS, it will be necessary to prepare the EETS specification. This is expected to incorporate all available standards, where relevant and will be the mechanism for ensuring that procurers do support the

standardisation process. Apart from the standards, the specification would include requirements, such as:-

- Technologies to be included in the EOBE, for example,
  - 5.8 GHz microwave
  - GSM/GPRS
  - GNSS
  - Movement sensors
  - Tachograph connection
- Operational requirements
  - Driver input
  - Audio/visual signals to the driver
- Construction requirements, such as:-
  - Robustness to tampering
  - Use of additional technologies for verifying compliance
- Security requirements
- Installation requirements.

It is expected that the European Commission will coordinate and co-finance the production of the specification. Some work has already been done within the MISTER report, and this can be used as a basis for the work.

In cases where the standards are not yet finalised, and the timescale to reach full agreement is not consistent with the timescale for the EETS, it may be necessary for decisions to be made for the purposes of the EETS specification which will have an impact on the development of those standards.

This report identifies several areas where the timescale of the EETS is likely to dictate the necessity for decisions to be made on aspects which are within the scope of the standards, but on which no agreement has yet been reached. Any such decisions should be taken in the full knowledge of potential impacts on the standardisation activities and with due consultation between the European Commission and the ESOs.

9.5. EETS Certification Agency

There is a clear intention of the European Commission and expectation of other stakeholders that the EOBE will need to be certified for use with toll schemes across Europe.

It may not be necessary to have a network of certification agencies. The New Approach Directive introduces an approach which relies largely on self-declaration and the opinion of a Notified Body and Market Surveillance delegated to the national authority responsible for Legal and Surveillance. One of the recommendations of this report is that the ESOs should work with the European Commission to determine the appropriate approach to certification.

If the approach to conformity were to use certification agencies, there are likely to be several certification agencies in different countries. Any network of such centres would need to have available a common test procedure. This in turn requires a strong specification against which to certify the conformance. The suggested standards would provide a set of generic technical requirements, in the sense that they could be used to support any toll system. Any certification agency would then be able to devise tests to verify conformity to the basic functionality as defined by the standards

Two further levels of certification are likely to be necessary. The EETS specification will place further requirements on any EOBE. Examples of such requirements are given in the previous section. The certification of EOBE would probably need to cover these aspects as well.

The third level of certification is to ensure that the EOBE supports each toll scheme. As mentioned earlier, in order for this to be feasible, it is expected that each Toll Charger would need define their scheme and the toll application using a standard approach. EOBE which passed the first two levels could then be certified to work with particular schemes. This is rather more complex as it would probably need to involve the central systems of each Toll Charger.

This report has assumed that a network of accredited EETS Certification Agencies will be used.

10. Review of the Interim Report proposals

10.1. Overview

The Interim Report considered a number of possible approaches to the development of the EETS. The report concluded that, apart from the complex contractual and commercial issues, one of the essential elements is the development of the EOBE. The Interim Report concluded that the EOBE should be based on a common design. The elements for any EOBE as proposed by the Interim Report are shown in Figure 4.

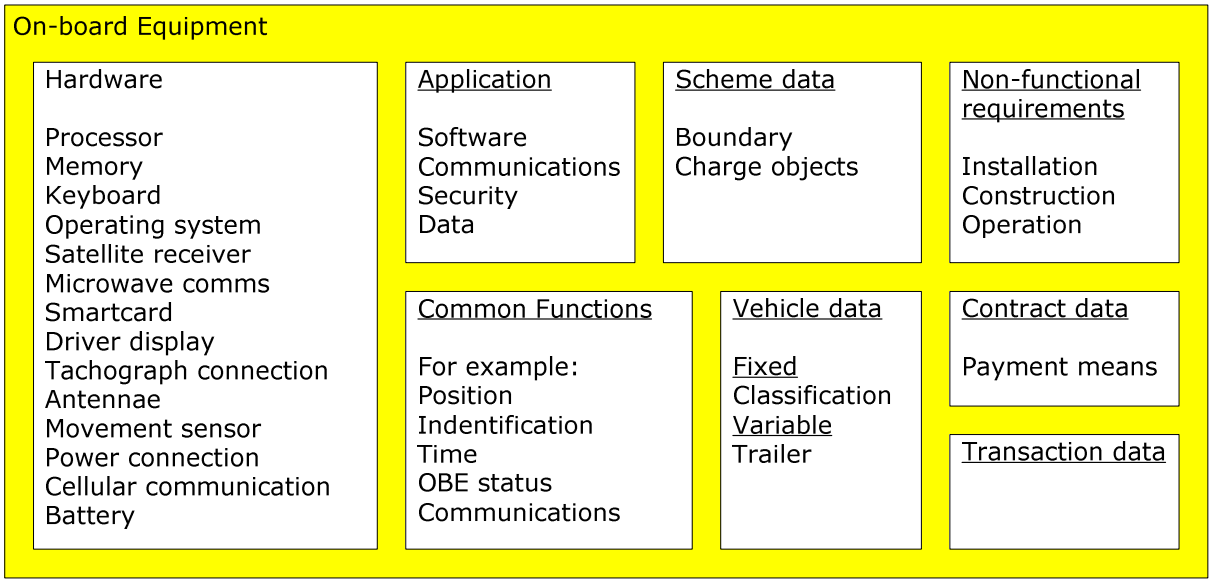

Figure 4: Elements in the OBE

This is a schematic analysis of the elements which may be contained in OBE.

These are divided into the following eight elements:-

- Hardware
- Application
- Scheme data
- Non-functional requirements
- Vehicle data
- Contract data
- Common functions
- Transaction data

10.2. Hardware

The elements listed in Figure 4 as hardware cover all existing OBE. The Directive makes reference only to satellite receivers, microwave communications and cellular communications. These are not sufficient to support all charging schemes. For example the Swiss LSVA OBE uses a movement sensor as part of the internal verification of the correct operation of the vehicle. Not all systems require all these elements. The EOBE probably will require all of these elements if it is to support all charging schemes. This suggests that, once this list is finalised, no further technologies will be allowed, as the cost of upgrading all existing EOBE would be prohibitive.

10.3. Non-functional requirements

Any OBE which is intended for European use will be constrained by the requirements of operators. For example, the EOBE for HGVs is likely to need to be fixed to a particular vehicle. It will probably need a power connection and installation of aerials. All these things must be agreed across the contractual framework and apply to all EOBE equally.

Non-functional requirements are those requirements which are related to the:-

- construction,
- installation and
- operation of the EOBE.

For existing monolithic OBE using 5.8GHz microwave communications for charging at toll stations, these requirements are fairly well known. These devices are usually quite small and do not require a power connection. Installation is a matter of simply attaching the OBE to the centre of the windscreen at the top. Some OBE require some operational interaction with the driver, such as the declaration of a trailer, or the number of axles on the vehicle. Some contracts allow users to transfer OBE between vehicles.

For the more complex OBE, these requirements are extensive. The construction of the OBE may be prescribed to deter tampering with the device. The installation will probably require power, fitting of external antennas, and possibly a connection to the tachograph. The installation might need to be done by accredited fitters, especially where the OBE is being installed in HGVs.

10.4. Application

The first and driving requirement for the design of the OBE is the application(s) which it is intended to support. The application comprises:-

- Software
- Communications
- Security
- Data

With OBE based solely on DSRC these four elements are the basis of the standards and the work on achieving interoperability. These are quite stable and already the basis for an open market for the provision of such OBE. Almost the only element that is required is the definition of the EETS DSRC transaction - this work is already under way.

In the case of the EETS EOBE, there are many applications, each owned by the individual charging scheme. Each of these defines the data which must be transferred, and the communications media. Each one of these has data security. The software to support each application is currently bespoke and runs on different operating systems and hardware.

One of the issues we have to overcome is how to make available the appropriate application for use with each scheme supported by the OBE. This is a key issue which is addressed in the next main section.

10.5. Scheme data

The scheme data supports the application and provides all the general data describing the scheme which is required by the application to be stored in the OBE. This may include definitions of geographic objects, such as boundaries of charge schemes, or charge points.

This element has been proposed in the draft ISO PDTS 17575 technical specification. It relates to the case where the OBE is provided with some autonomy to undertake the

charging process without direct control from the back office. For example, the OBE might charge on the basis of motorway links used. The scheme data provides the OBE with a description of the "charge objects". This might be in the form of charge points, lines, or areas. The charge might be applied according to distance travelled within an area, or as a flat rate for entering the area. Apart from the draft standard, there is no common approach to the use of scheme data. In some cases, the application and scheme data might not be clearly distinguished.

One particular issue is that the scheme data might be of a considerable size. For example, it might include a digital map, or a boundary of the country.

10.6. Vehicle data

Vehicle data provides toll operators with information with which to classify the vehicle. While many toll systems measure the characteristics of each vehicle and classify them accordingly, some systems involve the use of parameters which cannot easily be measured, such as the maximum gross laden weight of the vehicle. Work has been done for the European Commission within Expert Group 2. The recommendations of that group have been accepted and can be incorporated into the definition of the EETS.

The data will need to be stored securely and provide assurance of accuracy to each operator, as the data may be used in determining the vehicle class and therefore the tariff.

10.7. Contract data

This element defines the information which is required to be stored within the EOBE and which relates to the contract between the issuer and the user. This data will need to be agreed across all the contractual parties. The data elements have been defined in EN 14906 for schemes based solely on DSRC. Further work may be required to determine whether the list of data elements in EN 14906 is sufficient for the EETS.

10.8. Common functions

In a bespoke integrated OBE, the application software may make direct calls to the hardware components. If new EFC applications are to be accepted by other toll operators, then they will need to be assured that the algorithms are correct. One way to do this is to have some standard functions which can be used by the applications. For example, application software for charging applications based solely on DSRC has 16 functions defined in the standards. The hardware will be specified only in terms of the performance of these functions, which can be certified independently of any particular application, thus providing all operators with assurance that the required functionality is present as specified in the OBE. Application software will then use the common functions rather than making direct calls to the hardware.

New applications based on other technologies have introduced the need for such algorithms to measure position and distance.

Another driving force for the use of standard functions is that vehicle technology is progressing and vehicle manufacturers can envisage a wide range of location-based services. One might expect that vehicles will, in the future, come already equipped with satellite positioning and communications.

There is an active programme of work on CALM which aims to make in-vehicle applications independent of the media chosen for communications. At present the communications are an integral part of the application. In future, it may be feasible to use an architecture which uses available communications technologies as appropriate.

The following functions might well be provided to support charging:-

- Position

- Distance
- Time
- OBE status
- Communications
- Other (e.g. e-call)

10.9. Transaction data

During the operation of a charging scheme, the OBE will normally collect a set of transaction data. This data is collected during the use of each scheme. The content and event trigger for the creation of each data record is application dependent. The data will be communicated to the back office of each charging scheme as and when defined by that scheme.

The content of this data set and the events which cause the OBE to create a transaction record are scheme dependent.

10.10. Response to comments on the Interim Report

10.10.1 Modification of approach

While the general approach outlined in the Interim Report was supported, several experts found the "pseudo" architecture to be rather confusing. Some thought that a more formal architectural approach would be more appropriate. Others felt that the approach should be more focused on the interfaces.

The Author recognises these comments. The use of the EOBE diagram was not intended to represent a formal architectural approach, but simply a diagram illustrating the elements to be standardised. By placing these "inside" the EOBE, the impression was given that the focus was on the internal aspects. This is a wrong impression. The author has therefore decided to present the ideas in a rather different way, with less emphasis on the EOBE itself and more on the interfaces.

10.10.2 Mapping between the old and new approaches

There were eight elements identified in the old approach. The following table shows how seven of these are closely related to the new approach.

New approach	Old approach
S1 – Toll Scheme definition	Scheme definition
S2 – Toll application definition	Application
S3 – EOBE data content definition	Vehicle data Contract data Transaction data
S4 – CN message content and protocols	
S5 – DSRC message content and protocols	
S6 – Data exchange between back offices	
S7 – Security policy and mechanisms	
S8 – Conformity Requirements	
EETS Specification	Hardware Non-functional requirements

The old approach did deal with communications between the EOBE and the Central Equipment, and with data exchange between back offices, but not in the same diagram. The new approach brings these into the common list.

One item included in the old approach, but apparently not included in the new approach is the “common functions”. It was envisaged that part of the development of the standards would be based on a set of common functions which would be included in all EOBE.

Further investigation following the production of the Interim Report and further analysis of the draft ISO 17575 TS suggests that it is extremely difficult to define such a set of functions. The new approach spreads the requirements for functionality across all the sets of standards S1-S7.

For example, the toll scheme definition must include a common method of defining charge objects. Any EOBE will need to be able to recognise any charge object and to take appropriate action. It seems that industry can be left to deal with the mechanism for doing this.

There has been a recent debate about the extent to which processing of charge data should be done within the EOBE or within the Central Equipment. This report seeks to support that debate, but not to take a view on which approach is “correct”. Both approaches are feasible and should be allowed by the standards, whereas it is possible that the EETS eventually "favours" the one or the other. The list of seven sets of standards does not dictate whether the processing is done within the EOBE or in the Central Equipment – both should be enabled.

The old approach did not include consideration of security. This was mentioned by several reviewers. The author acknowledges this omission and has included security as a major set of standards to be developed.

11. Existing standards within the scope of the work

The following standard deliverables are considered to be within the scope of the EETS work programme:-

ENV ISO 14904	Interface specification for clearing between operators (adopted 2002, revision of ENV ISO 14904:1997)
EN ISO 14906	EFC application interface definition for DSRC (adopted on 29 March 2004, revision of ENV ISO 14906:1998)
ENV ISO 14907-1	EFC Test procedures user and fixed equipment - Part 1: Description of test procedures (published 2005, revision of ENV ISO 14907-1:1999)
CEN ISO/TS 14907-2	EFC Test Procedures user and fixed equipment - Part 2: Conformance test specification for onboard units (approved on 2005-01-28)
CEN ISO/TS 17573	EFC System architecture for vehicle related transport services (adopted on 2002-10-25)
CEN ISO/TS 17574	EFC security services framework – guidelines for EFC security protection profiles (published 2004)
CEN ITR	Integration of payment systems for transport services (CEN/TC278 N278, 1994-03-17)
CEN ITR	EFC requirements for DSRC (CEN/TC278 N318, 1994-08-24)
CEN ITR	Electronic Fee Collection - Requirements for Integrated Circuit Cards (CEN/TC278 N779, 1997-10-03)
CEN ITR	Definition of Threats and Security Controls for the Charging Interface in Electronic Fee Collection (CEN/TC278 N780, 1997-10-03)
CEN ITR	Application requirements for EFC systems based on GNSS/CN (CEN/TC278 N798, 1997-11-07)
EN 300 674 DEN/ERM-RP08-0105	ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Technical characteristics and test methods for Dedicated Short Range Communication (DSRC) transmission equipment (500 kbit/s / 250 kbit/s) operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band
EN 300 674-1 REN/ERM-TG29-0105	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Dedicated Short Range Communication (DSRC) transmission equipment (500 kbit/s / 250 kbit/s) operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band; Part 1: General characteristics and test methods for Road Side Units (RSU) and On-Board Units (OBE)
EN 300 674-2-1 DEN/ERM-TG29-001-2-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Dedicated Short

	Range Communication (DSRC) transmission equipment (500 kbit/s / 250 kbit/s) operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive; Sub-part 1: Requirements for the Road Side Units (RSU)
EN 300 674-2-2 DEN/ERM-TG29-001-2-2	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Dedicated Short Range Communication (DSRC) transmission equipment (500 kbit/s / 250 kbit/s) operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive; Sub-part 2: Requirements for the On-Board Units (OBE)
ES 200 674-1 DES/ERM-RP08-0105-A	ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Part 1: Technical characteristics and test methods for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band
ES 200 674-2 DES/ERM-RP08-0105-B	ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Part 2: Technical characteristics and test methods for Low Data Rate (LDR) data transmission equipment operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band
TS DTS/ERM-TG37-001-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment; Part 1: DSRC data link layer: medium access and logical link control; Sub-Part 1: Protocol Implementation Conformance Statement (PICS) proforma specification
TS DTS/ERM-TG37-001-2	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT);Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment; Part 1: DSRC data link layer: medium access and logical link control; Sub-Part 2: Test Suite Structure and Test Purposes (TSS&TP)
TS DTS/ERM-TG37-001-3	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment; Part 1: DSRC data link layer: medium access and logical link control; Sub-Part 3: Abstract Test Suite (ATS) and partial PIXIT

	proforma
TS DTS/ERM-TG37-002-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment; Part 2: DSRC application layer; Sub-Part 1: Protocol Implementation Conformance Statement (PICS) proforma specification
TS DTS/ERM-TG37-002-2	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment; Part 2: DSRC application layer; Sub-Part 2: Test Suite Structure and Test Purposes (TSS&TP)
TS DTS/ERM-TG37-002-3	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment; Part 2: DSRC application layer; Sub-Part 3: Abstract Test Suite (ATS) and partial PIXIT proforma

12. Areas of standards not included in the work programme

The following areas have been considered and have not been included in the programme to support EETS.

12.1. EFC Systems architecture

This is of wide applicability and is an important piece of work. However, the requirements of the EETS should not unduly influence this work, but should be consistent with the outcome. This current standard EFC System architecture for vehicle related transport services (CEN/ISO TS 17573) was approved in 2003. There is a new work item in CEN to revise the technical specification

12.2. Interface definition for on-board account using ICC

CESARE III has confirmed that the EETS will be based on a post-payment central account. There will, therefore be no requirement for a payment card within the EETS.

12.3. Geographic data files

The set of standards (S1) on the EETS Toll Scheme Definition will involve the use of geographic data files. Reference can be made there to the GDF standards. It is not considered necessary for the EETS programme to get involved in the standardisation of GDF. However, it might be necessary to make a decision on which formats and protocols to use for the EETS if the standards are not available. This would be included in the EETS specification.

12.4. Wide area communications (CALM)

The CALM standards are complex and wide ranging. It is assumed that the chosen DSRC and CN/GNSS protocols will be capable of migration to a CALM platform when this is available and deemed suitable. The EETS work should not depend on the outcome of CALM.

12.5. CEN TC278 WG2: Freight and Fleet Management Systems

The architecture, data models and information exchange for freight and fleet management are not considered to be within the scope of the EETS work programme.

12.6. CEN TC278 WG3: Public transport

Scheduling and control systems, passenger information and ticketing is not considered to be within the scope of the EETS programme.

12.7. CEN TC278 WG4 and ISO TC204 WG10: Traffic and traveller information

Messages providing traveller information using different technologies are not considered to be within the scope of the EETS programme.

12.8. CEN TC278 WG5: Traffic Control Systems

Traffic control terminology is not considered to be within the scope of the EETS programme.

12.9. CEN TC278 WG8: Road Traffic Data – elaboration, storage, distribution

Data exchange for traffic and travel information services is not considered to be within the scope of the EETS programme.

12.10. CEN TC278 WG12: Automatic Vehicle Identification

While there is a great interest in the development of AVI standards, the EETS definition process does not currently encompass directly the stakeholders for AVI. Inclusion of AVI into the EETS programme would greatly complicate the process and possibly delay delivery of the service. It is therefore considered outside the scope of the work on the EETS[4].

12.11. CEN TC278 WG14: After theft recovery for stolen vehicles

Architecture, messages, communications and test procedures are not considered to be within the scope of the EETS programme.

12.12. ISO TC204 WG1: Architecture

Covers various aspects of ITS architecture including terminology, reference model architecture, data modelling, data dictionaries, and software. These are considered to be of a wider scope than the EETS programme.

12.13. ISO TC204 WG7: Fleet Management

Tracking and tracing of goods in transit are not considered to be within the scope of the EETS programme.

12.14. ISO TC204 WG8: Public transport and emergency vehicles

Data, communications, interfaces, and architectures for managing and giving priority to, public transport and emergency vehicles are not considered to be within the scope of the EETS programme.

12.15. ISO TC204 WG9: Integrated transport, information management and control

Data exchange, dictionaries and interfaces for transport information and control systems are not considered to be within the scope of the EETS programme.

12.16. ISO TC204 WG11: Dynamic TICS information

Messages and information for in-vehicle dynamic route guidance systems are not considered to be within the scope of the EETS programme.

12.17. ISO TC204 WG13: Human Factors and Man-Machine Interface

Human Machine Interface for various in-vehicle systems are not considered to be within the scope of the EETS programme. The requirements should be included in the EETS specification.

12.18. ISO TC204 WG14: Vehicle Roadway Warning and Control

In-vehicle driver assistance systems are not considered to be within the scope of the EETS programme.

[4] It should be noted that the EFC related standards incorporate relevant AVI standards outputs, such as the AVI/AEI Numbering and Data Structures standard (EN ISO 14816).

13. Review of the interim recommendations

The Interim report listed 10 recommendations on the approach to be used for the final report. These are listed below, together with some conclusions following the receipt of comments.

[IR 1] Scenario 4: Harmonisation of System Design should form the basis for taking the process forward, providing greater opportunity for stakeholder engagement and agreement than either the pure market approach or harmonising national OBE requirements.

The general approach of focusing on the functionality of the EOBE was generally supported. However, the "pseudo" architecture approach using a diagram of the EOBE was felt to be insufficiently rigorous. It also tended to give the impression of a focus on the EOBE itself, rather than on the interfaces. The final report uses a different form of presentation, although the content is very similar.

[IR 2] The EOBE should provide for multiple scheme definitions rather than multiple applications.

The final report provides for multiple scheme definitions. It also provides for several toll applications to be stored within the EOBE, although there would be a single set of software. The particular applications would be driven by a table of comments and associated parameters.

[IR 3] Roaming should be treated as a lower level technical issue, to be resolved when the approach has been agreed by all the relevant stakeholders.

Roaming is not considered to be necessary for the initial implementation of the EETS.

[IR 4] The standards work programme should focus on:-
(a) elements of the EOBE (scheme data, common functions, contract data, vehicle data, transaction data and security features)
(b)communications between the EOBE and the Back Office
(c) information exchanged between operators and issuers

This report follows this recommendation.

[IR 5] All hardware and application requirements should be specified by means of Common Functions

The common functions proved to be very difficult to define. The role of the common functions has been spread across the other functional requirements.

[IR 6] Operators should be responsible for the definition of the non-functional requirements as part of the EETS specification.

This report follows this recommendation.

[IR 7] Operators should define a process for ensuring that EOBE meeting the agreed requirements can be accepted by all operators.

This report assumes that this will be done.

[IR 8] DSRC functionality should be embedded within the EOBE

This report follows this recommendation.

[IR 9] The EOBE will be limited to setting certain data elements within the transponder and to retrieving receipts from the DSRC.

This report follows this recommendation.

[IR 10] If the high-level analysis of the key elements is accepted, then the EOBE "design" should be refined to form the basis of a common understanding of the key elements.

The high-level analysis was not entirely accepted and has been refined.

14. The final recommendations and proposed Work Programme

This section discusses the recommendations and proposed standards, and then concludes with an Action Plan.

14.1. Requests to the European Commission

Section 0 raises the issue of whether it is necessary to have a network of accredited certification agencies to certify the EOBE. Further work is required to resolve this issue.

[R 1] ***It is up to the European Commission to decide whether the approach to certification will be by means of self-declaration, or by a rather a network of accredited certification agencies working on common test requirements.***

The ESOs are being asked to support the European Directive. The Author considers that it is reasonable for the European Commission to provide a greater level of support than at present – the present level of resources does not provide any confidence that the EETS can be delivered in the foreseeable future.

[R 2] ***The ESOs should ask the European Commission to provide more resources for the management of the EETS deployment and for supporting activities. There is a need for a dedicated, full-time project team with greater continuity and involvement in the development of programme documentation.***

Some aspects of the EETS requirements cannot be done within a reasonable timescale by means of the voluntary programme and consensus building approach applied within the ESOs. In particular:-

[R 3] ***The ESOs should consider asking the European Commission to include the definition of suitable CN protocol stacks in the specification of the EETS. This is a short-term measure which is required due to the lack of suitable GSM/GPRS standards for supporting European EFC interoperability. Migration to other CN protocols in the future should also be considered.***

Some aspects of the EETS are outside the control of the ESOs, yet have a deep impact in the development of standards. For example, the business model and architecture selected for the EETS. One of the current issues is whether the EOBE should communicate with the Toll Charger, or the EETS Provider.

[R 4] ***The ESOs should consider asking the European Commission to facilitate wide discussion among stakeholders on the relative merits of the Central Equipment for CN communications being the Toll Charger or EETS Provider.***

Some aspects of the EETS should be tackled by those involved in the business of delivering the EETS. The current arrangements for the presentation of reports from Expert Groups does not provide sufficient opportunity for EETS Toll Chargers and EETS Providers to be fully engaged in the process. The European Commission should consider setting up some more permanent mechanism to engage with the stakeholders. The CESARE III project is an example of the stakeholders working together, but this is a limited project which will come to an end during 2006.

[R 5] ***The ESOs should consider asking the European Commission to establish a mechanism for the greater involvement of the ESOs and their participants in the development of the EETS.***

The business architecture for the EETS is needed urgently. Many other tasks depend on the business architecture, including the Security Policy, which logically should proceed

some of the more detailed work on the standards. The Security Policy should be followed by a risk assessment, based on the EETS business model. The definition of security requirements should follow from this assessment. We conclude that this requires an overall EETS programme and management, with governance and management of the specifications suite.

[R 6] ***The ESOs should ask the European Commission to develop an overall EETS programme with adequate management, and governance and management of the specifications suite. An important and immediate part of this work should be the business architecture to support the EETS.***

The target date for agreement on the definition of the EETS is just 7 months away, yet there is no basis for the production of the EETS specification, other than the MISTER report. This is not accepted by major stakeholders.

[R 7] ***The ESOs should ask the European Commission about the process and timescale for the production and agreement of the EETS Specification, and encourage it to adopt an open and transparent process in order to build trust and acceptance of the key stakeholders. It is proposed that the programme of standards described in this report forms a key part of that specification.***

It should be stressed that all work within the European Standards is voluntary. It is therefore not straightforward to set deadlines and targets for completion of standards. If the European Commission wishes to meet certain deadlines then it must provide the resources to undertake the work within the required timescale. Such work will need to focus on the EETS specification, rather than on the standards, although these should be developed together wherever possible.

[R 8] ***The ESOs should ask the European Commission to reference standards, including selection of options within referenced standards, whenever applicable in order to ensure consistency with established standards and to take advantage of the defined revision and updating process deployed by the ESOs.***

14.2. Considerations when presenting the proposed programme

The author is concerned about the lack of strategic management of the EETS programme, and the lack of satisfactory arrangements for real stakeholder involvement in the development of the EETS. There is no real-time process for resolving many of the issues. This lack of process is likely to greatly hinder the standardisation process. For example, on one current issue, there are at least six different groups looking at the problem, with no means of resolving the issue at the European level.

The Author considered that the people working in the standardisation groups are highly competent and aware of the issues. The apparent lack of progress is due to the standardisation process being voluntary and consensual in nature. It is not possible to deliver standards to a given timetable as the outcome depends on reaching agreement, not making a management decision.

Thirdly, the level of resources currently being devoted to the standardisation activities is less than ideal. The reason for this has been described. The industry does not yet have sufficient confidence that the standardisation process will provide benefits through sales of standard products. If there is an increase in the work on management of the EETS development, on the specification and on the decision making, then a revival in the interest in completing the standards might occur.

The author has concluded that the best approach to the action plan is to highlight the areas which are fundamental to the EETS. If the specification of the EETS is to be produced in a relatively short timescale, then certain decisions will need to be taken whether or not the standards are in place. The European Commission and Member States will, as has been done with all earlier charging schemes, have to make choices and decisions at a more rapid rate than is possible in the standardisation process. Rather than criticise the ESOs for being slow, there is a need for a specification process which can reach decisions and adopt the latest work in the standards domain.

The programme is therefore presented partly as a strategic programme of work for the European Commission, as well as for the ESOs. The speed of the work and oversight will depend on the urgency of the results.

The areas of work are shown in the following table:-

Area	Description	Assignment
S1	Toll Scheme definition	CEN TC278 WG1
S2	Toll application definition	CEN TC278 WG1
S3	EOBE data content definition	CEN TC278 WG1
S4	CN message content and protocols	CEN TC278 WG1
S5	DSRC message content and protocols	CEN TC278 WG1
S6	Data exchange between back offices	CEN TC278 WG1
S7	Security policy and mechanisms	EC?
S8	Conformity requirements	ESOs
	EETS Specification	DG TREN

Table 2: Areas of work for standardisation

Most of the standard sets appear to fall within the remit of CEN TC278 WG1. A great deal of work is already underway in this WG. The following proposals aim to make that work more manageable and focused.

Many of the elements in the work programme are covered currently by CEN TC278 WG1 SG5. It is considered that the work required to complete this programme is too great for the available resources in SG5, even with the additional funding from DG Enterprise which has recently been requested.

[R 9] ***It is recommended that ICTSB/ITSSG maintain the strategic overview from the perspective of the ESOs and their stakeholders of the implementation of the recommendations in this report, and that ITSSG should ensure the active co-ordination of CEN and ETSI in the standards work programme. It is also recommended that, in liaison with ETSI/ERM, CEN TC278 WG1 be asked to co-ordinate the proposed programme of work at the technical level, and asked to recommend to ITSSG and its participants how best to implement it using the available resources and structures of the WG.***

14.3. S1 – Toll Scheme definition

This set of standards deals with the way in which any Toll Charger in Europe would define their toll scheme. In order to be successful, Toll Chargers will need to be involved in the process of:-

(a) defining their requirements

(b) providing scheme definitions according to a common standard

(c) agreeing to accept EOBE which meet those requirements

This is particularly relevant for those countries using a system based on GNSS and/or GSM technologies, i.e. Germany and Switzerland. It is difficult to see how progress can be made in the standardisation process until there is a commitment from these countries on items (b) and (c) above.

This set of standards refers to the potential need for EOBE to store characteristics of a toll scheme. These characteristics would be stored in the EOBE. Such characteristics might be:-

- Geographic boundary of the scheme
- Geographic definition of charge locations and roads – charge objects
- Mechanism for calculating the charge associated with each charge object
- Parameters defining the way in which the charges will be applied

The Directive requires that all European electronic charge schemes are supported. It is a complex task to ensure that all existing systems are supported. This requirement implies that all future electronic systems should be supported. It is not feasible to allow a future system to introduce a requirement which requires all existing EOBE to be upgraded.

The only feasible way to do this is to ensure that EOBE which are certified for use with the EETS will work with future systems. There are several approaches which might be followed. These were analysed in the Interim Report. The author concluded that the only acceptable approach to all the stakeholders is to have a common method of defining toll schemes and toll applications.

Under this approach, each existing (and future) Toll Charger would need to use the standard to define their schemes. The standard must ensure that all existing schemes can be satisfactorily defined using the standards. Future Toll Chargers would be somewhat constrained in their definition of future toll schemes – they would also need to use the same standards.

It is acknowledged that this places some constraints on the freedom of Toll Chargers to define charging schemes. However, it provides a mechanism to generate an open market for the supply of all future on-board equipment, whether used solely for local charging schemes or for the EETS. This should bring massive price savings and reduce the risk for new schemes, as the on-board equipment will be available “off-the-shelf” subject to certification of the particular application.

There is the basis for this work with "Application Interface Definition for CN/GNSS based EFC" standard (CEN ISO/TS 17575). A great deal of fundamental work has been done. The current draft is designed to meet all possible requirements. It would seem that the complexity of the document makes it extremely difficult for Toll Chargers to engage. It is recommended that this element of the work is separated, greatly simplified and given high priority.

Fundamental to the feasibility of this approach is the acceptance by all Toll Chargers that they will work together on the requirements for these standards and, once agreed, will mandate the use of the standards in any future procurement. This undertaking, if given, is likely to generate strong interest from the industry in completing the work.

Given the fact that this work is closely related to the political acceptance of the approach, the initial work might be undertaken within the context of the Member States and European Commission. Once the strategic requirements are defined, the work could be passed to the industry for completion and adoption as a standard or set of standards.

14.3.1 Application to DSRC systems

The OBE used for DSRC system contains no toll scheme definition data and therefore this set of standards is not relevant for such systems.

Every DSRC scheme works in a similar way. The roadside equipment is always in control. The EFC application is held in the roadside equipment, the OBE only being used to read and write data. Whenever an equipped vehicle passes through the communication zone of the beacon, the "application" in the roadside equipment communicates with the OBE by means of 16 common functions defined within the DSRC standards.

14.3.2 Application to CN/GNSS systems

This set of standards is designed specifically to support "autonomous" toll schemes, where the EOBE will be expected to determine where and how the charges are to be applied for each toll scheme.

Examples:-

a) The German scheme uses a set of charge points situated on the motorway network. A vehicle passing through these points is deemed to have used the associated motorway link. A pre-determined "distance-based" charge is associated with each road link.

b) The Swiss scheme is based on all distance travelled within Switzerland. This is defined by a geographic boundary. Entering and leaving the country is confirmed by DSRC communication at border crossings.

Much good work has been done in CEN TC278 WG1 SG5 on CEN ISO TS 17575 in this area. However, the various approaches cannot be resolved without some Toll Charger ownership and input.

[R 10] ***The European Commission should be asked to work on getting Member State involvement and agreement on using standards to define toll schemes and in providing requirements for schemes based on GSM and GNSS.***

The Author considers that there is sufficient expertise and commitment within SG5 to work successfully on the completion of this task given the necessary Member State commitment and input. There is no shortage of material – just a lack of a decision making process.

14.4. S2 – Toll application definition

While the S1 set of standards refers to a common method of defining data about each scheme, this set deals with the way in which the application software will work. It is proposed that a common set of application functions is defined.

Each Toll charger will then prepare their charging application as a set of function calls and parameters. EOBE can be designed and built to support all the functions. These functions can then be verified against "standard" applications and certified.

Toll Chargers would provide the details of their application to EOBE suppliers and could test offered EOBE to verify that they operate correctly. Limiting the Toll Charger involvement to the testing of already certified EOBE should greatly reduce the potential cost compared with testing all EOBE against all schemes.

14.4.1 Application to DSRC systems

The OBE used for DSRC system contains no toll specific application and therefore this set of standards is not relevant for such systems.

OBE supporting the DSRC standards are designed to support 16 fixed functions. The low-level software for these is hard-wired into the OBE. While many OBE have been

customised for specific use with a single scheme, the possibility of having OBE which will support all DSRC based toll schemes is almost a reality.

14.4.2 Application to CN/GNSS systems

Some charging schemes will rely on the EOBE to operate autonomously. EOBE could store the Toll Scheme definition and Toll Scheme application for each scheme. The EOBE would contain software which would select the applicable Toll Scheme and process the relevant application according to the function calls and parameters. The software would be common to any Toll Scheme and therefore could be certified. The alternative approach of downloading software is impractical to certify.

This area is very similar to S1. The same comments and recommendations apply. This set of standards will encompass both DSRC and GSM/GNSS based systems. However, most of the work on DSRC systems has been done – it just needs to be included and harmonised with the work on GSM/GNSS to provide a common approach covering EOBE which have all the required technologies.

14.5. S3 – EOBE data content definition

This set is an extension of CEN ISO 14906 to provide a practical implantation of the data sets appropriate for EOBE. Much of the content of ISO 14906 is still relevant. It needs to be supplemented by the equivalent data required for GSM/GNSS systems.

Each EOBE is expected to be able to store certain data required for the operation of the toll schemes. The Interim Report identified the following:-

- Vehicle data
- Contract data
- Transaction data

This set does not include the scheme data. That is assumed to be included in the S1 set.

14.5.1 Application to DSRC systems

These sets of data have already been defined for DSRC systems in ISO 14906.

14.5.2 Application to CN/GNSS systems

It is possible that further data sets are required for CN/GNSS systems. These should be elaborated within ISO 17575 TS.

14.6. S4 – CN message content and protocols

The work on this standard derives from the content in CEN ISO TS 17575. However, there are a number of issues to be resolved. It would appear necessary for the European Commission to take some action to determine the GSM/GPRS protocols to be used for the EETS, as it seems unlikely that this will be resolved by SG5. This probably involves setting up an industry expert group.

The work on defining the message set will depend critically on the resolution of S1 and S2, and particularly S2 as this is the toll application.

The ISO TS 17575 deals with communication between the EOBE and Central Equipment. It is written in a generic way to support any charging scheme based on CN/GNSS technologies. For application to the EETS, the Central Equipment might refer to either the EETS Provider, or the Toll Charger. Work is currently underway within Expert Group 9 to investigate different scenarios involving the EOBE in communicating with either the Toll Charger, or the EETS Provider. The outcome of these discussions could have a profound impact in the requirements for standards.

If the EOBE communicates with each Toll Charger, as is the case with DSRC systems, then it is necessary to fully standardise the interface between the EOBE and the Central

Equipment. This has proved extremely difficult to date. On the other hand, if the EOBE communicates with the EETS Provider and the EETS Provider provides information to the Toll Charger, then there is no need to fully standardise this interface. EETS Providers will be free to select slightly different CN solutions as long as they work everywhere in Europe.

Work has been in progress on the definition of cellular network message sets and protocols for the past eight years. This has been hampered by several factors. Firstly the GSM protocol stack has not been fully standardised above layer 3. The world of voice over GSM operates entirely satisfactorily. However, the view of the standards experts in this area (CEN TC278 WG1 SG5) is that the EFC world makes greater demands on the technology and that interoperable EFC operation over GPRS cannot yet be delivered.

The EFC standards group does not have a sufficiently wide remit to undertake the completion of the standardisation of the complete protocol stack for GPRS. On the other hand, it is reluctant to propose am "EFC" specific protocol stack for GPRS, especially given that the ISO 17575 TS is intended to support other medium-range wireless communications media.

There appears to be no easy resolution of this problem. It is proposed that, as a short-term measure to achieve the EETS, the European Commission include the definition of the GPRS protocol stack within the specification of the EETS. It may be necessary to obtain some specialist communications skills.

14.7. S5 – DSRC message content and protocols

Almost all the work on DSRC message content and protocols has already been done. The current CEN work on DSRC Interoperable Application Profiles (IAP) should be completed as soon as possible, and is currently out for reviewing (i.e. TC278 commenting).

14.8. S6 – data exchange between back offices

The current standards relating to data exchange between back offices (CEN ISO / TS 14904) were approved in 2002, but have not generally been applied by Toll Chargers. Work on the revision of this standard has started. This is a vital aspect for the development of the EETS, as all Toll Chargers will need to communicate with all EETS Providers. The CESARE III project is looking at the business requirements for this interchange and hopefully this will support the new standardisation work. New work in this area has just been initiated within CEN TC278 WG1.

14.9. S7 – Security policy and requirements

This is a new area of work. Security Guidelines for EFC have been prepared and were agreed in 2003 (CEN ISO / TS 17574). It is proposed that these guidelines are used to prepare a security policy for the EETS. It may be appropriate to consider whether this work should initially be undertaken by the standardisation bodies, or whether the EFC business community might wish to address this issue. In view of the close association with the operators and the commercial operation of the EETS, it is concluded that this may be an area which the European Commission might lead.

[R 11] ***It is recommended that the ESOs discuss with the EC the possibilities for working on the creation of a security policy for the EETS. This might be the subject of an Expert Group with input from standards experts.***

14.10. S8 – Conformity Requirements

CEN ISO TS 14907 Part 1 defines test procedures and a test plan for DSRC-based systems. This was approved in 2004. Part 2 provides conformance testing for an OBE application interface. This was approved in 2005.

Work has recently been started the preparation of the "Conformance evaluation and test specification for OBU and RSE", i.e. the test specification for the "EFC IAP for DSRC".

ETSI standard EN 300 674 covers the Electro-magnetic compatibility and radio spectrum matters for DSRC transmission operating in the 5.8GHz band. Part 1 specifies general characteristics and test methods of road-side equipment and on-board equipment.

[R 12] ***It is recommended that ETSI consider the approach described in this report as a basis for defining a set of test procedures which will:-***
(a) certify the generic functionality of an EOBE
(b) certify that an EOBE works according to the EETS specification
(c) certify that an EOBE works specified toll schemes and applications

The test procedures would be implemented by the network of certification centres which is being considered by the European Commission. ETSI has developed a set of test specifications dealing with the Layers 1-7 of the DSRC 5.8GHz microwave standards.

Further test specifications will be required to cover the areas S1 – S5 described above.

14.11. Proposed Work Programme

Number	Task Title	Task Description	Proposed Responsible Body	Proposed Deadlines
S0	ETSI programme	It is recommended that ETSI consider the approach described in this report as a basis for defining a set of test procedures which will:- (a) certify the generic functionality of an EOBE (b) certify that an EOBE works according to the EETS specification (c) certify that an EOBE works specified toll schemes and applications	ETSI	Mar 2006
S1	Toll Scheme definition	Set of standards defining the particular characteristics of a toll scheme to be recognized by all EOBE. These characteristics would be stored in the EOBE.	CEN TC278 WG1	
S.1.1	Geographic boundary of the scheme	This is a basic common feature of the current schemes. It should be possible to make a concrete proposal for the way in which scheme boundaries are defined.	CEN TC278 WG1	Dec 2006
S1.2	Geographic definition of charge locations	This is a basic common feature of the current schemes. It should be possible to make a concrete proposal for the way in which charge locations are defined.	CEN TC278 WG1	Dec 2006
S1.3	Define the other scheme parameters	There has been a great deal of work in this area by CEN TC278 WG1 SG5. Most of the required text is available in the draft of ISO CEN TC 17575.	CEN TC278 WG1	July 2007

Number	Task Title	Task Description	Proposed Responsible Body	Proposed Deadlines
S2	Toll Application definition	This standard defines the way in which a Toll Charger can define the required charge application. It should include everything required on the EOBE from the Toll Charger, including the security mechanisms and any compliance requirements. Draft ISO CEN TS 17575 contains some of the required elements. However, it is too broad and theoretical. There is a need to focus on a common core.	CEN TC278 WG1	Dec 2007

Number	Task Title	Task Description	Proposed Responsible Body	Proposed Deadlines
S2.1	CN/GNSS charging	This proposal is consistent with the route map for ISO CEN TS 17575. The route map proposes splitting the TS into four main parts. This is the part concerned with the toll application For example, the following elements are not required:- • module list download • on request toll data • on request software update • set up contract • update contract • on request update information • transfer token • settle account Given the complexity of this task and its relationship to stakeholders, it is considered that CEN would not be able to complete with work until the end of 2007.	CEN TC278 WG1	Dec 2007
S2.2	DSRC charging	Work on the toll application definition is being done in the "EFC Interoperable Application Profile for DSRC" standard and by Expert Group 11.	CEN TC278 WG1	May 2007[5]
S3	EOBE data content definition	This is the equivalent of the annexes to the DSRC application interface definition. Energies should be devoted to defining the information needed to be stored in the EOBE. This is expected to be:- • contract data • vehicle data • transaction data	CEN TC278 WG1	Dec 2006

[5] EFC Interoperable Application Profile for DSRC is currently subject to reviewing (TC278 commenting). Another formal round of CEN members reviewing (the 5 months so–called CEN Enquiry) is foreseen in the process of acceptance building preceding the publication of the approved standard, targeted for May 2005.

Number	Task Title	Task Description	Proposed Responsible Body	Proposed Deadlines
S4	CN message content definition	The set of messages to be exchanged between the EOBE and the Toll Charger/EETS Provider should be defined.	CEN TC278 WG1	
S4.1	Communications architecture	The Business architecture for the EETS should be used to develop a definition of the required CN communications flows between actors/entities involved in the EETS. The responsible body is difficult to define until the business architecture has been defined.	CEN TC278 WG1	
S5.1	DSRC message content and protocols - IAP for DSRC	The set of standards is complete. DSRC-layer 1 defined by EN 12253:2004 DSRC-layer 2 defined by EN12795: 2002 DSRC-layer 7 defined by EN12834: 2002 DSRC-Profiles EN 13372:2004 DSRC-Application interface definition EN 14906:2004 The IAP will define the interoperable options within the enabling DSRC suite.	CEN TC278 WG1	May 2007
S5.2	Conformity Evaluation for DSRC	Conformity Evaluation for IAP for DSRC. Part 1 on test suite structure and test purposes – ready for formal vote March 2007. Part 2 on abstract test suite, ready for formal vote Sep 2007. (assuming use of EC funded project teams) IAP for DSRC	CEN TC278 WG1	The current target is Nov 2007
S5.3	Urban DSRC solution	There is work in the UK of the development of urban DSRC solution. It has been considered as a possible work item for CEN TC278 WG1 at some future date.	CEN TC278 WG1 to monitor	No set target date yet

Number	Task Title	Task Description	Proposed Responsible Body	Proposed Deadlines
S6	Information flows between Operators of EFC Systems	Work Item has been adopted. The objectives are to:- • Support cost-effective integration of back-office systems • Support the EETS Directive The standard will define procedures for exchange of information between systems, the data formats and semantics (e.g. transaction list, security keys, data clearing and exception handling data)	CEN TC278 WG1	Formal voting expected Sep 2008 (Draft for TC comment planned for June 2007)
S7	Security Policy and requirements	This is a new area of work. It should be set within an agreed business architecture and programme governance in which decisions on security issues. There is a need for "ownership" of the business processes. These are issues which cannot be left to the ESOs alone.	European Commission and ESOs to resolve approach	April 2006
S7.1	Security Policy	Define the overall Security Policy for the EETS	To be decided	July 2006
S7.2	Risk assessment	Undertake a Business model threat analysis for the EETS	To be decided once the EETS Business Model is "mature"	Dec 2006
S7.3	Security requirements	Define the Security Requirements and countermeasures for the EETS, based on the Risk assessment	To be decided once the EETS Business Model is "mature"	July 2007
S8	Conformity Requirements	There is a need to define the approach to conformity evaluation for the EETS. Functions and requirements need to be defined, then the conformity test specifications can be defined.	To be allocated by ESOs	

Number	Task Title	Task Description	Proposed Responsible Body	Proposed Deadlines
S8.1	Conformity approach	Define the approach to be used for the conformity evaluation	To be discussed between the ESOs and DGTREN	
S8.2	Conformity of dual-mode DSRC	The Italian national specification for DSRC is expected to be deployed with the CEN DSRC standards in dual-mode DSRC transponders intended for use with the EETS. Conformity tests should be developed to ensure that the dual mode transponders are interoperable	CEN/TC278	Dec 2006
S8.3	Aperture in windscreen	Standardise an aperture of non-metallization in the windscreen, based on the "ERTICO report", in order to ensure effective reception of GNSS signals and wireless communication through the windscreen.	CEN/TC278	Dec 2006[6]
S8.4	EOBE functionality tests	Certifying the general functionality of an EOBE against the standards. Given the expected time to prepare the EETS specification, this work could not start until 2007. It might take 2 years	To be allocated by ESOs	Dec 2008
S8.5	EETS tests	Certifying that an EOBE works according to the EETS specification and will support the EETS service.	To be allocated by ESOs	Dec 2008
S8.6	Toll scheme tests	Certifying that an EOBE works with a specified toll applications. It might take one further year to develop the specific toll application tests.	To be allocated by ESOs	Dec 2009

[6] It is recommended to consider using CEN's so-called Unique Acceptance Procedure as it is reasonable to suppose that the content of the existing "ERTICO report" is acceptable at European level and in order to prevent further delays.

15. References

(1) Report of Expert Group 2: Recommendations on parameters to be stored in on-board equipment designed for use with the European Electronic Toll Service, 2005.

(2) Progress report of the CEN editor, including report of the open meeting. July 2005. Report available at www.cenorm.be/isss/efc

(3) MISTER – Final Report on the project to develop the Standardisation of Electronic Fee Collection Applications using GNSS and GPRS technologies under contract reference ETU-B27040B-E4-12-2003 S-7.26279 EFCA. November 2004

ANNEX A Results of the consultation process

A.1 The consultation process

The consultation process for the Interim Report included the following:

- Discussion of draft at ITSSG meeting
- Presentation of revised version to:
    - EC's EFC Expert Group meeting
    - CEN TC278 WG 1 meeting
    - Open Meeting
- Interactions with specific projects
- Open invitation via CEN web site
- Direct approach by email (with invitation to Open Meeting) to:
    - ETSI
    - CENELEC
    - Convenors of CEN Working Groups and
    - Convenor of ISO TC 224 WG 11
- Copy for comment sent to members of EFC Expert Group and TC278 WG1
- Consultation period ended 31st August 2005

A first draft of the report was circulated to ITSSG members and discussed by the ITSSG at their meeting on 17th May. It was then revised in the light of that discussion.

An overview of the work was presented to the EFC Expert Group on 9th June. The report was sent by the European Commission to all members of the group on 29th June.

The report was posted on the CEN web site on 13th June, with information about the Open Meeting and an invitation to provide comments. A link to this was provided on the home page of the Dutch normalisation web site.

Ken Perrett attended the WG1 meeting on 16th/17th June and made a short presentation at the Plenary Meeting. The group were invited to send comments by the end of August. The group invited Ken to attend their next meeting in October, to make a more detailed presentation of the comments received and the proposed final work programme.

Invitations to the Open Meeting were sent directly to individuals involved in the European standardisation process, ITSSG members, and those working on relevant activities and initiatives. The Open Meeting was also advertised prominently on the CEN web site and the Dutch national standards web site. The meeting was attended by 33 delegates. These included representatives from the European Commission, European and national standards organisations, Member State transport ministries, equipment suppliers, motor manufacturers, motorway operators, electronic fee collection schemes, and key projects in this area.

The report was presented to the Open Meeting in Brussels on 28th June, which provided an opportunity for further discussion and feedback.

A.2 Report on the comments received

The comments on the Interim Report were provided in two ways:

- Presentations and discussion during the Open Meeting

- Correspondence with the CEN Editor during the consultation period

The discussions at the Open Meeting were recorded in a report of the meeting, and this document was analysed to identify comments on the report.

Seven organisations responded through direct correspondence. In addition, CENELEC reported that they had declined the Mandate.

The comments recorded at the Open Meeting and in the correspondence were entered in a database to support the process of analysing comments and identifying actions for the Work Programme. The following table (Table 3) shows the details of the organisations providing comments.

- 20 organisations contributed comments, either through the Open Meeting or by correspondence
- 9 organisations provided comments which supported various elements of the approach adopted
- 9 organisations provided suggestions and comments on points of principle
- The responses included a large number of detailed comments.
-

Table 3 Sources of responses to consultation

Name	Organisation
Andras Kovacs	EfKon
António Athias da Cunha Leal	Estradas de Portugal, EP
Christian Heinrich	CEN TC278 WG 10
Gerd Ochel	ETSI
Henk Stoelhorst	CEN TC278
Ian Catling	ISO 157575 & MISTER
Jacob Trondsen	Statens Vegvesen
Jan Vis	Ministerie van Verkeer en Waterstaat - AVV
Jaques de Kegel	IBM
Johan Hedin	(personal comments)
Johan Hedin	Representing Hybris Konsult at Open Meeting
Juhani Jääskeläinen	DG INFSO
Klaus Philipp	AGES
Lars Olsson	Kapsch
Mike Hollingsworth	ACEA
Oene Keerstjens	ERTICO
Philippe Hamet	DG TREN
Robert Fleurbaey	Siemens
Wolfgang Beier	Daimler Chrysler
Pim van der Eijk	OASIS

A.3 Analysis of comments received

The main themes covered in the responses to the consultation included the following:

A.3.1 Scope of the work

Some people proposed that the focus of the work should be on interoperability of EFC in Europe, not just EETS.

It is accepted that the ESOs and standards deal with EFC in Europe and indeed worldwide. However Mandate 338 issued by the Commission deals only with support for the EETS. The Commission has no remit outside the EETS and therefore this report is constrained by that scope. This is not to say that standards can not have a wider scope.

A.3.2 Focus on the EOBE

Some people felt that there the apparent focus on the OBE/EOBE was incorrect.

This point is accepted and the presentation of the standards in this final report has been modified to take into account this comment.

A.3.3 Chain of activities

Some people suggested that the standards should cover entire 'chain' of activities, including procedures, testing etc, not just the EETS system.

The EETS is complex and there are many stakeholders. In particular, the service offered and procedures are expected to be subject to commercial agreements. These are not therefore standards as such.

It was not considered appropriate to attempt to widen the scope to aspects which are not within the remit of the technical standards, such as the EETS specification.

A.3.4 Enforcement should be included

This is a difficult area. It is being widely discussed within CESARE. There is also an Expert Group looking at technologies for enforcement of the EETS. It is accepted that there is a requirement for compliance within the standards.

A.3.5 Security should be included

This is accepted and has been included.

A.3.6 Ability to upgrade in future to take account of new developments is important

This is an important aspect. There appears to be no current upgrade path in that the technologies are specified. This is an issue yet to be addressed.

A.3.7 Support for the approach focusing on functionality

This approach is retained in the final report.

A.3.8 Specific suggestions for other standards to include, e.g. e-commerce, e-call

The programme of standards addressed in this report is concerned with the EETS. This is an additional service for most Toll Chargers and EETS Providers. It is assumed that there will be minimal change to the existing back offices. For that reason, the scope of the work has been confined to the new interfaces and back office exchanges. It is possible that e-commerce might be appropriate for the back office exchange – this is left to the standards WG to consider.

A.3.9 Detailed points seeking clarification or amendment to the text

These have been addressed in the text wherever possible.

A.4 Database of comments

Comments were summarised in a database which enabled the comments to be analysed according to the issues addressed, the nature of the comments, and how they related to the recommendations for the Work Programme.

ANNEX B CEN/ISO EFC work items

The following **published** standard deliverables are considered to be within the scope of the EETS work programme:-

ENV ISO 14904	Interface specification for clearing between operators (adopted 2002, revision of ENV ISO 14904:1997)
EN ISO 14906	EFC application interface definition for DSRC (adopted on 29 March 2004, revision of ENV ISO 14906:1998)
ENV ISO 14907-1	EFC Test procedures user and fixed equipment - Part 1: Description of test procedures (published 2005, revision of ENV ISO 14907-1:1999)
CEN ISO/TS 14907-2	EFC Test Procedures user and fixed equipment - Part 2: Conformance test specification for onboard units (approved on 2005-01-28)
CEN ISO/TS 17573	EFC System architecture for vehicle related transport services (adopted on 2002-10-25)
CEN ISO/TS 17574	EFC security services framework – guidelines for EFC security protection profiles (published 2004)
CEN ITR	Integration of payment systems for transport services (CEN/TC278 N278, 1994-03-17)
CEN ITR	EFC requirements for DSRC (CEN/TC278 N318, 1994-08-24)
CEN ITR	Electronic Fee Collection - Requirements for Integrated Circuit Cards (CEN/TC278 N779, 1997-10-03)
CEN ITR	Definition of Threats and Security Controls for the Charging Interface in Electronic Fee Collection (CEN/TC278 N780, 1997-10-03)
CEN ITR	Application requirements for EFC systems based on GNSS/CN (CEN/TC278 N798, 1997-11-07)

The following **work items** are currently **under development** and are considered to be within the scope of the EETS work programme:

prCEN ISO/TS 17575	Application Interface Definition for CN/GNSS based EFC
CEN PNWI 17573	EFC System architecture for vehicle related transport services
PNWI CEN	Information flows between Operators of EFC Systems
CEN EN	Interoperable Application Profile for DSRC (CEN 00278187-EN)
CEN EN	Conformity evaluation of on-board and roadside equipment to EN 00278187 (CEN 00278188-EN)

ANNEX C ETSI work items

Document id	Title	**Publication** target date **achieved date**
EN 300 674 DEN/ERM-RP08-0105	ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Technical characteristics and test methods for Dedicated Short Range Communication (DSRC) transmission equipment (500 kbit/s / 250 kbit/s) operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band	22 January 1999 **16 February 1999**
EN 300 674-1 REN/ERM-TG29-0105	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Dedicated Short Range Communication (DSRC) transmission equipment (500 kbit/s / 250 kbit/s) operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band; Part 1: General characteristics and test methods for Road Side Units (RSU) and On-Board Units (OBE)	01 August 2004 **06 August 2004**
EN 300 674-2-1 DEN/ERM-TG29-001-2-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Dedicated Short Range Communication (DSRC) transmission equipment (500 kbit/s / 250 kbit/s) operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive; Sub-part 1: Requirements for the Road Side Units (RSU)	01 August 2004 **06 August 2004**
EN 300 674-2-2 DEN/ERM-TG29-001-2-2	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Dedicated Short Range Communication (DSRC) transmission equipment (500 kbit/s / 250 kbit/s) operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive; Sub-part 2: Requirements for the On-Board Units (OBE)	01 August 2004 **06 August 2004**
ES 200 674-1 DES/ERM-RP08-0105-A	ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Part 1: Technical characteristics and test methods for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band	15 January 1999 **12 February 1999**
ES 200 674-2 DES/ERM-RP08-0105-B	ElectroMagnetic Compatibility and Radio Spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Part 2: Technical characteristics and test methods for Low Data Rate (LDR) data transmission equipment operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band	15 January 1999 **12 February 1999**
TS DTS/ERM-TG37-001-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment; Part 1: DSRC data link layer: medium access and logical link control; Sub-Part 1: Protocol Implementation Conformance Statement (PICS) proforma specification	30 December 2005

Document id	Title	**Publication** target date **achieved date**
TS DTS/ERM-TG37-001-2	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT);Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment; Part 1: DSRC data link layer: medium access and logical link control; Sub-Part 2: Test Suite Structure and Test Purposes (TSS&TP)	30 December 2005
TS DTS/ERM-TG37-001-3	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment; Part 1: DSRC data link layer: medium access and logical link control; Sub-Part 3: Abstract Test Suite (ATS) and partial PIXIT proforma	30 December 2005
TS DTS/ERM-TG37-002-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment; Part 2: DSRC application layer; Sub-Part 1: Protocol Implementation Conformance Statement (PICS) proforma specification	30 December 2005
TS DTS/ERM-TG37-002-2	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment; Part 2: DSRC application layer; Sub-Part 2: Test Suite Structure and Test Purposes (TSS&TP)	30 December 2005
TS DTS/ERM-TG37-002-3	Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment; Part 2: DSRC application layer; Sub-Part 3: Abstract Test Suite (ATS) and partial PIXIT proforma	30 December 2005