



BSI Standards Publication

Electronic Fee Collection — Value added services based on EFC on-board equipment

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National foreword

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**Electronic Fee Collection - Value added services based on EFC
on-board equipment**

Perception du télépéage - Services à valeur ajoutée basé
sur l'équipement embarqué de télépéage

Elektronische Gebührenerfassung - Zusätzliche Funktionen
basierend auf den fahrzeugbasierenden
Gebührenerfassungssystemen

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Foreword

This document (CEN/TR 16219:2011) has been prepared by Technical Committee CEN/TC 278 “Road Transport and Traffic Telematics”, the secretariat of which is held by NEN.

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

This document has been prepared by CEN/TC 278 WG1 Project Team 31 on Value Added Services. The work done by the project team has been governed by the Technical Committee CEN/TC 278 “Road Transport and traffic telematics”, the secretariat of which is held by NEN and by CEN/TC 278 Working Group 1: Electronic Fee Collection.

Introduction

This Technical Report (TR) analyses the technical feasibility of using EFC OBE for delivering additional services, commonly called value added services (VAS). These VAS may either be delivered on board to the driver of the vehicle, or off board to the road operator, to a freight company or to the general public. The report only analyses the situation where EFC is considered to be the core application, with VAS applications as add-ons, not the reverse situation, namely whether an EFC application can be added to telematics platforms with other core applications, such as EFC that might be delivered as an add-on to a navigation device.

Currently, the interaction between services based on EFC OBE without any additional equipment and comfort service platforms is not clearly visible. Therefore, the scope of this TR includes investigation of the suitability of the available sensor information, data elements, communication media and HMI features for supporting the envisaged mass services such as; fleet management, hazardous goods / livestock management and eCall. This relates to the expectations mentioned in the interoperability directive, Directive 2004/52/EC. It is expected that with the advent of the European Electronic Tolling Service EETS as mandated by Directive 2004/52/EC, VAS will benefit from widespread deployment of capable multi-technology telematics platforms. Commercial transport might achieve efficiency improvements and competitive advantages through a wider take-up of fleet management and related applications that might be offered as VAS to EFC equipment.

The TR identifies potential applications and groups them into application classes for the purpose of a more compact analysis. The application classes are

- Fleet management;
- Entertainment;
- Payment;
- Cooperative road safety;
- Driver assistance;
- Communications;
- Navigation & traffic information;
- Traffic data collection;
- Vehicle usage recording;
- Regulatory applications.

The methodology in this TR is firstly to compile the specific requirements of the applications in each class, then to establish the requirements of EFC applications, and finally to analyse potential synergies and prerequisites for joint delivery. The analysis strives to encompass two viewpoints, namely the business and the technical perspectives.

The TR also analyses how these services can be implemented without jeopardising the security requirements of the EFC Service Provider responsible for the OBE and the charging process. The possibilities and constraints, including privacy requirements as defined in Directive 2006/24/EC and Commission Decision 2008/597/EC, related to the integration of the OBE into a wider open platform for delivery of other public or private added value services form part of the investigation, as well as the required standards and anticipated road map.

The analysis results in a set of recommendations as to how the preconditions for a joint delivery of VAS with EFC might be improved. The analysis in the report shows that certain preconditions required for VAS are not available in current EFC standards and might need to be taken into account for future work.

1 Scope

1.1 Definition of VAS

Value Added Services, VAS, is a term that was coined in the telecommunications industry for services that go beyond core service, such as mobile voice communications. Such additional services are intended to add value for the consumers in order to encourage them to use the telecommunications service more often and to add an additional revenue stream for the Service Provider.

In the context of EFC, a VAS in this strict sense is a telematics service offered to the Service User by means of an EFC OBE. This service might directly be consumed by the driver in the vehicle, or might, particularly in the case of heavy vehicles, be targeted at the freight operator and be consumed in a back office. Such services can be fleet management services like track-and-trace, payment services such as paying petrol automatically at the pump, or regulatory applications such as Electronic Licence Plate or access control. Such additional services and applications create additional value to the user, either by the value the new service creates to him, or in the case of regulatory services, by combining several functionalities in a single device, thus removing the need to install and maintain several pieces of equipment simultaneously.

In a wider sense, the operator of the EFC service can draw additional benefit from the data collected by the EFC system. Data from EFC OBE gives a good account of the traffic situation on the charged network, and may be utilised for statistical purposes, for traffic planning or even in real-time for traffic information purposes.

The scope of this TR covers both the original meaning of VAS, namely both additional services to the user of the core EFC service and additional value created for the operator of the charging system.

1.2 Coverage

The TR analyses all telematics applications that have the potential to be delivered as a VAS to EFC. The analysis covers the requirements of the VAS applications and the fit to the resources offered by the EFC system. It also analyses prerequisites in terms of business and technical system architecture in order to enable VAS to be delivered, including questions of control and governance, security aspects and privacy issues.

The TR does not analyse commercial viability. Cost to benefit ratio and market potential for VAS are considered to be out of scope.

The TR analyses the potential and pre-conditions for EFC equipment to serve as platforms for a diverse range of VAS. The VAS are considered to be add-ons to EFC equipment. The TR does not analyse the reverse situation, namely the situation where an EFC application is added to a telematics platform that has been deployed for another core service, such as the suitability of navigation systems to serve as platforms for EFC.

2 Normative references

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

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

CEN ISO/TS 12813, *Electronic fee collection — Compliance check communication for autonomous systems (ISO/TS 12813:2009)*

CEN ISO/TS 13141, *Electronic fee collection — Localisation augmentation communication for autonomous systems (ISO/TS 13141:2010)*

EN ISO 14906, *Road transport and traffic telematics — Electronic fee collection — Application interface definition for dedicated short-range communication (ISO 14906:2004)*

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

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

CEN ISO/TS 17575-3, *Electronic fee collection — Application interface definition for autonomous systems — Part 3: Context data (ISO/DTS 17575-3:2010)*

ISO 14813-1, *Intelligent transport systems — Reference model architecture(s) for the ITS sector — Part 1: ITS service domains, service groups and services*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17573:2010 and the following terms and conditions all apply.

3.1 business architecture

the structure of the relationship between the actors involved in the VAS and EFC services, including the roles of the actors, their contractual relationship, the allocation of responsibilities, and system control and governance

3.2 EFC platform for VAS

an EFC platform for telematics service delivery comprises a set of one or more in-vehicle components, commonly termed OBE, potentially roadside and central equipment, but also a set of business rules and a legal framework. Business rules include an institutional setup, with defined responsibilities, ownership, governance, certification, and contractual relationships

3.3 technical architecture

the concept of the technical delivery platform in terms of technical components, their interfaces and interactions

3.4 Value Added Service

an additional value that is created in an EFC system to Service Users or the system operator beyond the core service, payment for road use

3.5 On-road Service Integrator

the On-road Service Integrator provides to the Service User both tolling services and VAS offers and as such incorporates the role and responsibilities of the EFC Service Provider as defined in ISO 17573 plus the additional responsibilities as provider of VAS

3.6 vehicle-related data

any kind of data related to the vehicle's characteristics (including any trailer), its movements, the vehicle driver or the vehicle's cargo

4 Abbreviations

For the purposes of this document, the following abbreviations apply throughout the document unless otherwise specified.

AEI	Automatic Equipment Identification
AVI	Automatic Vehicle Identification
CALM	Communications Access for Land Mobiles (a set of ISO communications standards)
CESARE	Common Electronic Fee Collection System for a Road Tolling European Service (acronym of a European research project)
CN	Cellular Network communications
COOPERS	COoperative SystEms for Intelligent Road Safety (acronym of a European research project)
CVIS	Cooperative Vehicle Infrastructure Systems (acronym of a European research project)
DSRC	Dedicated Short Range Communications
EC	European Commission
EFC	Electronic Fee Collection
EETS	European Electronic Toll Service
ETSI	European Telecommunications Standards Institute
EURIDICE	EUROpean Inter-Disciplinary research on Intelligent Cargo for Efficient, safe and environment-friendly logistics (acronym of a European research project)
FCD	Floating Card Data
GALILEO	Name of the European satellite localisation system
GNSS	Global Navigation Satellite Systems (a generic term used for satellite localisation system such as GPS and GALILEO)
GPS	Global Position System (acronym for the satellite localisation system operated by the United States of America)
GST	Global System for Telematics (acronym of a European research project)
GSC	GNSS enabled Services Convergence (acronym of a European research project)
HMI	Human to Machine Interface
IAP	Intelligent Access Programme
ICT	Information and Communication Technologies
ISO	International Standards Organisation
ITS	Intelligent Transport Systems

NCR	Non-Compliance Report
OBE	On-Board Equipment
ORSI	On-road Service Integrator
PDA	Personal Digital Assistant
PSAP	Public Safety Answering Point
RCI	Road Charging Interoperability (acronym of a European research project)
SMS	Short Message Service
SP	Service Provider
TC	Toll Charger
TCA	Transport Certification Australia
UOBU	Universal On-Board Unit (acronym of a European research project)
VAS	Value Added Service
V2I	Vehicle to Infrastructure (communication)
V2V	Vehicle to Vehicle (communication)
WG	Working Group (of a CEN or ISO Technical Committee)
WI	Work Item

5 Background and Context

5.1 Starting Point and Aims

5.1.1 Motivation for VAS

Tolling systems are becoming increasingly automated and EFC is becoming a pervasive service. EFC is the ITS application with the widest deployment. Since payment for road use is mandatory and imposed upon the user, EFC is not perceived by the user as a service.

EFC equipment is also becoming more capable. Since modern approaches to road financing and demand management require more accurate assessment of individual road use, involving more differentiation according to vehicle characteristics, road type and time of day, EFC systems have developed from single purpose object tolling into sophisticated charging systems employing a wide range of technologies, including on-board processing, satellite-based localisation, mobile communications, DSRC, digital maps and cryptographic security services. This technical report focuses mainly on interoperable EFC OBE, which support both DSRC and autonomous tolling, and could therefore, in principle, deliver a wide range of ITS applications. However, more dedicated CEN DSRC OBEs may also provide platforms for delivering selected VAS applications.

These core facts, namely wide deployment, unfavourable user perception and availability of capable ITS platforms, have motivated the services industry to investigate the potential for delivering additional value through EFC equipment.

Motivation for developing a VAS offer can stem from several areas:

- For toll chargers, based on the desire to increase take up of EFC equipment: Toll chargers have an interest in automating processes and increasing the number of equipped users. The availability of VAS might be an additional motivation for users to equip themselves.
- For toll chargers to create value out of the available user movement data: EFC systems collect information about vehicle movements that can be made anonymous and then become a valuable resource beyond the mere tolling purposes. Movement data is especially valuable for planning purposes, for traffic management and even for providing real time traffic information.
- For Service Providers to create an additional revenue stream: Especially in the discussions around the development of the EETS legal background (Directive 2004/52/EC and Commission Decision 2009/750/EC) it has been found that the business case for Service Providers to deliver interoperable EFC services is marginal at best and additional revenue streams will probably be necessary to justify the required investments.
- For the Service Users from the request to have all services delivered through a single channel: Especially for heavy vehicles, the numbers of different EFC OBE, equipment for regulated applications such as Tachograph, eCall and hazardous goods tracking, plus commercial ITS devices for fleet management and navigation are becoming a nuisance. All devices and applications require attention and maintenance, require different hardware, installation, contracts and operation. Owing to the pervasiveness and capability of EFC OBE, these might become the ideal platform for delivering many telematics services through a single channel.
- For policy makers to develop the telematics market in general: For several years it has been the policy of the European Commission and of the Member States to modernise road transport and manage traffic efficiently through the widespread deployment of telematics or ITS technologies. This has recently been underlined in the ITS Action Plan of the Commission which promotes deployment of a universal ITS platform in the vehicle (see ITS Action Plan in the Bibliography). EFC OBE may provide an ideal platform for delivering multiple telematics services through a single channel, based on their increasing capability and growing prevalence across Europe.

5.1.2 Experiences with VAS

For a long time toll chargers have been making use of the rich data provided by EFC systems. For examples see the descriptions provided in Annex A involving national VAS implementation. In EFC systems, road usage data is essentially free for additional use and requires only minimal investment in processing and analysis to create large incremental value. Early uses of this data have been for statistical purposes, e.g. for predicting the revenue flow and for planning investments into road infrastructure renewal. More sophisticated systems can produce very detailed data, including origin-destination information, which is very difficult and costly to produce by other means. EFC OBE equipped vehicles can be considered probe vehicles for the traffic stream. This fact is put to use in Floating Car Data (FCD) applications that use information provided by probe vehicles to produce a picture of the traffic situation. Ideally, this information can be processed and distributed in real time to give road users information on bottlenecks, congestion and expected travel time.

While this field of additional exploitation of EFC equipment has been thriving, VAS in their original sense, namely additional services delivered to the Service User, have seen only limited uptake and deployment. Annex A again gives some examples. Several reasons have been identified as to why the market for VAS to the Service User has not developed as anticipated by many:

- Only comparatively recently have truly capable EFC platforms been deployed.
- EFC is a sensitive application in the sense that toll chargers are not prepared to take any risk in losing revenue due to complications arising from VAS competing for on-board resources.
- EFC systems are often controlled by an operator in a monopoly situation. Delivery of VAS in such an environment will normally put the operator at an advantage that is not allowed by European anti-competition legislation.

- Providers of telematics services have chosen to develop their own dedicated equipment in order to free themselves from the constraints imposed by the toll chargers and in order to be able to serve all types of customers, including those without EFC equipment.
- The market for ITS applications for commercial vehicles is extremely fragmented. No single application has been found that would create significant benefits for a large segment of the market. Especially in the freight sector, the needs of different vehicle operators differ widely, depending on the nature of the transport task speciality they offer.

5.1.3 Objectives

The TR strives to establish the preconditions for delivering VAS on EFC platforms, firstly by identifying which requirements of different VAS are also met by EFC OBE, and which adaptations might be required to make certain VAS possible. The reverse is then also considered, namely the influence of VAS on the core EFC service, mainly with regard to minimisation of the risk of compromising the revenue collection process in any way, and in particular, with respect to security and privacy.

An EFC platform for telematics service delivery comprises a set of one or more in-vehicle components, commonly termed OBE, potential roadside and central equipment, as well as a set of business rules and a legal framework. Business rules include an institutional setup with defined responsibilities, ownership, governance, certification, and contractual relationships.

The objective is to analyse the required preconditions for joint delivery of EFC and VAS on a common platform both from a technical perspective and from the perspective of governance and control over the applications. The analysis of the preconditions leads to a set of recommendations for measures that might improve the environment within which VAS may be exploited via EFC systems.

As detailed below in the discussion of the EFC context, the objective of improving the preconditions for VAS on EFC OBE has to be seen against the background of the development of EETS, which creates new opportunities and challenges both technically and commercially for widespread deployment of VAS.

5.2 EFC Context

5.2.1 Role model for interoperability

For several decades, toll collection was a bilateral relationship between a toll charger and the user. This remained essentially the same with the advent of EFC. Only with efforts to establish interoperability among toll systems did it become obvious that a new relationship model needs to be found. As a result of the series of CESARE projects in particular, a new paradigm of business model was developed that shall form the basis of interoperability in a European context.

This model foresees a new explicit role, Service Provision, and an associated actor, the Service Provider which is the main contact for the user, as shown in Figure 1. A Service User has a contract with a Service Provider and receives all necessary equipment, payment means and information enabling the user to freely roam through the toll domains of all Toll Chargers participating in the interoperability arrangement. Service Users are free to make contact with the Service Provider of their choice. The traditional bilateral relationship between user and charger has been replaced by a multilateral, open, and market based arrangement.

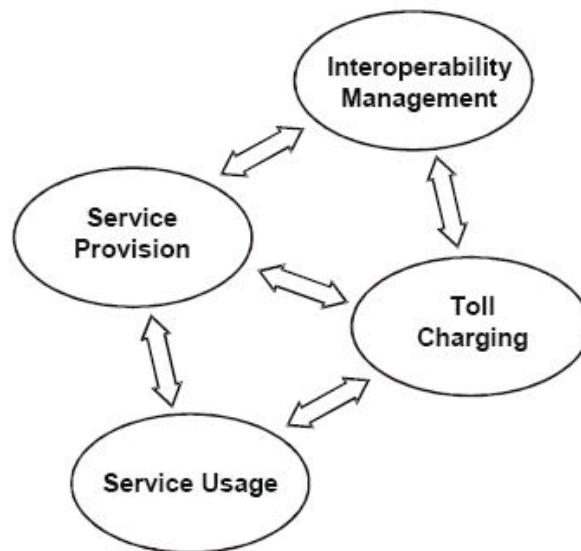


Figure 1 — Role model developed in CESARE, prescribed in Decision 2009/750/EC and standardised in ISO 17573

This business model is underlying the European Electronic Toll Service EETS as mandated by Directive 2004/52/EC and detailed in Decision 2009/750/EC (see EETS Directive and EETS Decision in the Bibliography). The Directive also prescribes a minimum set of technologies that needs to be supported, namely DSRC, GNSS and CN.

The EETS shall be introduced by October 2012 for heavy vehicles and by October 2014 for light vehicles. Its deployment is mandatory for all Member States of the European Community that have EFC systems of sufficient size to fall under the EETS Directive. It is expected that the development and deployment of the EETS will lead to increased availability of telematics platforms with VAS delivery potential. OBE capable of EETS will offer unrivalled capabilities and the potential for a wide range of applications, given that some barriers to deployment are removed. Such barriers might especially stem from issues of governance, control and security.

The EETS requires very capable technical platforms in the vehicle since all European electronic tolling systems need to be served. The suitability of such OBE platforms is established in a certification process that consists of two separate steps:

- In a first step, equipment suppliers will have to prove conformity to standards in a CE marking process.
- In a second step, Service Providers have to prove suitability of their OBE and their back end processes for toll collection in all systems. In principle, such a suitability process has to be performed for every individual toll system separately.

It is unclear how the provision of VAS is influenced by this certification process. It is a prerequisite of VAS delivery that OBE does not lose EETS certification as soon as certain VAS are enabled.

Another peculiarity of the EETS business model that will influence VAS deployment is the fact that the Service Providers have an unconditional payment obligation against the Toll Chargers for all tolls incurred by their Service Users. Hence the core of the EETS is a far reaching payment service arrangement that might well lead to VAS in other payment related domains.

The potential of the EETS to form the basis of a widespread uptake of telematics services through VAS on EETS OBE has not gone unnoticed. Article 13 (2) of Commission Decision 2009/750/EC reads:

Article 13 (2): In addition to tolling, the EETS on-board equipment should enable implementation of future other location-based services. The use of EETS on-board equipment for the purpose of other services shall not interfere with toll operations on any toll domain.

5.2.2 EFC standardisation

Standards have been essential for the success of EFC in Europe. Initially, standards were important to road operators, affirming the investment they were making in EFC infrastructure. Standards are a prerequisite for the development of a competitive multi-supplier market. Hence, in the early times of EFC deployment, standards for technical interfaces, such as the set of 5.8 GHz DSRC standards, have been the focus of European standardisation. Only later did the element of interoperability become important, driving the need for application-level standards such as EN 15509.

CEN has developed more than 20 standards for EFC, most of them in cooperation with ISO as joint work items. For the purposes of this document, four standards are most relevant, namely the ones regarding basic EFC systems architecture (ISO 17573), basic EFC data structures (EN ISO 14906), the interoperable application standard for DSRC-based EFC (EN 15509) and the fundamental set of standards for GNSS based systems (CEN ISO/TS 17575 series):

- ISO 17573 on the *Systems architecture for vehicle related tolling*. This standard defines the architecture for EFC systems and as such is the fundamental basis both for DSRC and for GNSS based systems. ISO 17573 defines amongst other standards, a role model and the core processes of EFC systems but does not foresee provisions for the inclusion of VAS. The architecture is specific to EFC and has not been opened for the inclusion of VAS.
- EN ISO 14906 on the *Application interface definition for dedicated short-range communication*. This standard defines basic attributes for tolling. It has been devised specifically for DSRC based systems, but the basic attributes, e.g. regarding vehicle data or payment, are of a very general nature and are imported into most EFC application-related standards in the field, including the ones for GNSS/CN systems. Since the data defined in EN ISO 14906 is of a general nature, it is also applicable to a number of VAS. Most VAS require data regarding the vehicle or require some means of payment, such as provided by EN ISO 14906. Thanks to the availability of data definitions of a sufficiently generic nature for several road traffic related telematics applications, to a limited extent EN ISO 14906 already provides for synergies between EFC implementations and VAS. The examples provided in Annex A clearly demonstrate that this type of synergy is already being exploited in some EFC systems.
- EN 15509 on an *Interoperability application profile for DSRC*. This profile standard defines an interoperable EFC application for EFC systems and is already widely deployed in Europe. It will be one of the core building blocks of the EETS. EN 15509 does not foresee any specific elements for VAS, but the examples given in Annex A show that the standard is already being used for VAS, such as providing for an extended scope of the payment means including parking lots and ferries. Vehicles equipped with DSRC OBE are also being used as probe vehicles for traffic status monitoring. Processing DSRC transactions can provide information on traffic density but also on travel times. Since such an application involves an element of tracking and tracing the vehicle, it is crucial that the privacy of the user is respected. In its current form, EN 15509 does not offer explicit support for such applications.
- CEN ISO/TS 17575 on the *Application interface definition for autonomous systems* comes in four parts, where part 1 on *Charging* and part 3 on *Context data* is most relevant for the purpose of this TR. This series of documents defines the basic data exchange messages between the back-end and front-end systems in GNSS/CN based EFC systems. While CEN ISO/TS 17575 does not explicitly make provisions for VAS, the basic data exchange mechanisms might easily be adapted for several conceivable VAS. The availability of GNSS location information and of a wide-area communication resource in particular, makes GNSS/CN OBE platforms for delivering VAS very promising.

In summary, EFC standards have the potential to be useful platforms for defining VAS services, but no explicit reference to VAS is currently made.

5.3 ITS Applications Context

5.3.1 Beneficiaries of the services

Many diverse ITS applications are operational and many more are envisaged for introduction in the near future. Clause 6 lists the most relevant applications and, for convenience, groups them into classes.

In order to understand the context of the diversity of ITS applications, Figure 2 might be helpful. This figure classifies the domain of ITS applications from the perspective of "who benefits", i.e. from the perspective of the ultimate beneficiary.

- Several ITS applications are mandated by a **regulator** for the general benefit of society, especially with regard to **heavy vehicles**. Such applications include the digital Tachograph, eCall, diverse access control regimes to inner cities, and tolling for internalising the external costs of heavy vehicle traffic. **Light vehicles** are far less regulated. Manual toll payment is an option on all current systems. The automatic emergency call service eCall will most likely be the first regulatory application for light vehicles.
- ITS applications for the benefits of the road or EFC **operator** have low visibility since they are delivered in the back office. Nevertheless, the value generated can be comparatively large. Although heavy vehicles are usually better equipped with OBE, data from light vehicles is of more value to road operators for monitoring traffic, for traffic flow analysis and statistics, for the purpose of prediction and infrastructure planning and for real time traffic information provision. Real time traffic information in particular, is an added value that can be deployed to the Service User as a visible benefit from his toll payments.
- ITS applications that address the **road user** cannot be considered as being directed at a single homogeneous user group. Users might be drivers of private cars, truck drivers or even operators of vehicle fleets, be it a fleet of internationally operating trucks, a fleet of regional delivery vans, or a taxi fleet. Obviously, this segment of the market is quite fragmented. Clause 6 will define application classes that make further analysis more practical than looking at individual applications.

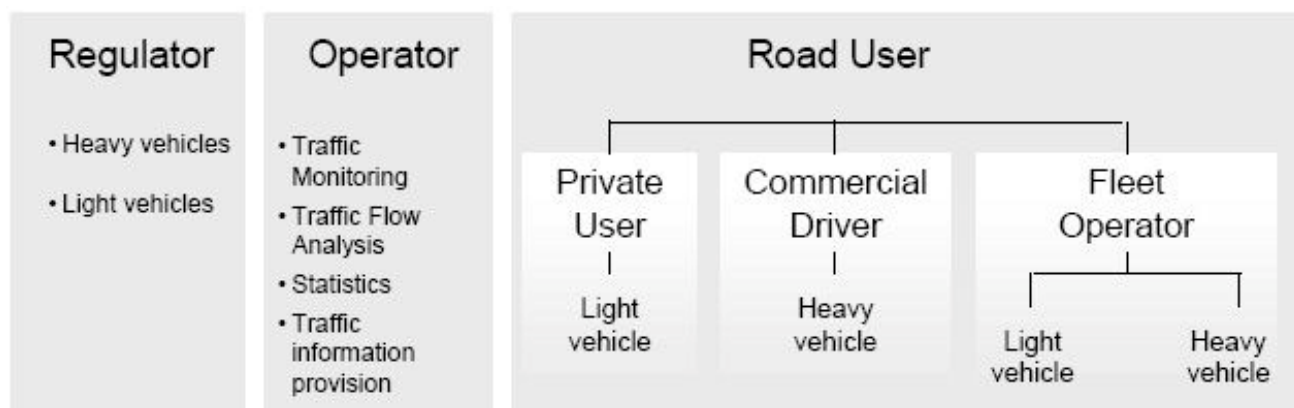


Figure 2 — Classification of OBE-based ITS Applications by user type

5.3.2 ITS Action Plan

In December 2008, the European Commission issued an Action Plan on the deployment of ITS in Europe (see ITS Action Plan in the Bibliography). The Action Plan aims "to accelerate and coordinate the deployment of Intelligent Transport Systems in road transport, including interfaces with other transport modes."

The Action Plan outlines six priority areas for action. For each area, a set of specific actions and a timetable are identified. Fulfilling these by setting a framework to define procedures and specification will call for the mobilisation of Member States and other stakeholders.

The main policy objectives to be achieved are "for transport and travel to become:

- cleaner,
- more efficient, including energy efficient,
- safer and more secure."

Several of these actions are of immediate relevance to the topic of VAS in EFC system. The analysis in this TR is set against this policy background. Conclusions drawn from the analysis shall lead to the support of specific actions defined in the Action Plan.

Especially noteworthy are Actions 4.1 and 4.4 which request the development of an open in-vehicle platform architecture for the provision of ITS services and applications, where the outcome of the activity would be submitted to the relevant standardisation bodies.

The detailed actions set out in the six priority areas are listed in Table 1.

Table 1 — Action areas defined in the ITRS Action Plan

1 Action Area 1: Optimal use of road, traffic and travel data		Target date
1.1	Definition of procedures for the provision of EU-wide real-time traffic and travel information services , addressing notably the following aspects: – provision of traffic information services by the private sector – provision of traffic regulation data by the transport authorities – guaranteed access by public authorities to safety-related information collected by private companies – guaranteed access by private companies to relevant public data	2010
1.2	Optimisation of the collection and provision of road data and traffic circulation plans, traffic regulations and recommended routes (in particular for heavy goods vehicles)	2010
1.3	Definition of procedures for ensuring the availability of accurate public data for digital maps and their timely updating through cooperation between the relevant public bodies and digital map providers, taking into account the results and recommendations of the eSafety Digital Maps Working Group	2011
1.4	Definition of specifications for data and procedures for the free provision of minimum universal traffic information services (including definition of the repository of messages to be provided)	2012
1.5	Promotion of the development of national multimodal door-to-door journey planners , taking due account of public transport alternatives, and their interconnection across Europe	2009 to 2012
2 Action Area 2: Continuity of traffic and freight management ITS services on European transport corridors and in conurbations		
2.1	Definition of a set of common procedures and specifications to ensure the continuity of ITS services for passenger and freight in transport corridors and in urban/interurban regions. This work should include benchmarking and standardisation on door-to-door information flows, interfaces, traffic management and travel planning, and, in particular, event and emergency planning	2011
2.2	Identification of ITS services to be deployed in support of freight transport (eFreight) and development of appropriate measures to progress from concept to realisation. Particular attention will be given to applications for goods tracking and tracing using state-of-the-art technologies such as RFID and EGNOS/Galileo-based location devices	2010
2.3	Support for the wider deployment of an updated multimodal European ITS Framework architecture for intelligent transport systems and definition of an IST framework architecture for urban transport mobility , including an integrated approach for travel planning, transport demand, traffic management, emergency management, road pricing, and the use of parking and public transport facilities	2010
2.4	Implementation of the interoperability of electronic road toll systems	2012 / 2014
3 Action Area 3: Road safety and security		
3.1	Promotion of deployment of advanced driver assistance systems and safety and security-related ITS systems, including their installation in new vehicles (via type approval) and, if relevant, their retrofitting in a used one	2009 to 2014
3.2	Support the Implementation Platform for the harmonised introduction of pan-European eCall , including awareness campaigns, upgrading Public Service Access Points' infrastructures and an assessment of the need for regulation	2009
3.3	Development of a regulatory framework on a safe on-board Human-Machine-Interface and the integration of nomadic devices, building on the European Statement of Principle	2010

	on safe and efficient in-vehicle information and communication systems	
3.4	Development of appropriate measures including best practice guidelines concerning the impact of IST applications and services on the safety and comfort of vulnerable road users	2014
3.5	Development of appropriate measures including best practice guidelines on secure parking places for trucks and commercial vehicles and on telematics-controlled parking and reservation systems	2010
4 Action Area 4: Integration of the vehicle into the transport infrastructure		
4.1	Adoption of an open in-vehicle platform architecture for the provision of ITS services and applications, including standard interfaces. The outcome of this activity would then be submitted to the relevant standardisation bodies.	2011
4.2	Development and evaluation of cooperative systems in view of the definition of a harmonised approach; assessment of deployment strategies, including investments in intelligent infrastructure	2010-2013
4.3	Definition of specifications for infrastructure-to-infrastructure (I2I), vehicle-to-infrastructure (V2I) and vehicle-to-vehicle (V2V) communication in co-operative Systems	2010 (I2I) 2011 (V2I) 2013 (V2V)
4.4	Definition of a mandate for the European Standardisation Organisations to develop harmonised standards for ITS implementation, in particular regarding cooperative systems.	2009-2014
5 Action Area 5: Data security and protection, and liability issues		
5.1	Assess the security and personal data protection aspects related to the handling of data in ITS applications and services and propose measures in full compliance with Community legislation.	2011
5.2	Address the liability issues pertaining to the use of IST applications and notably in-vehicle safety systems	2011
6 Action Area 6: European ITS cooperation and coordination		
6.1	Proposal for a legal framework for European coordination on the Europe-wide deployment of ITS	2008
6.2	Development of a decision-support toolkit for investment decisions in ITS applications and services. This should include a quantified evaluation of the economic, social, financial and operational impact and cover aspects such as user acceptance, life-cycle cost/benefit as well as the identification and evaluation of best practice for facilities procurement and deployment	2011
6.3	Development of guidelines for the public funding from both EU (e.g. TEN-T and Structural Funds) and national sources of ITS facilities and services based on an assessment of their economic, social and operational value	2010
6.4	Set-up of a specific ITS collaboration platform between Member States and regional/local governments to promote ITS initiatives in the area of urban mobility	2010

5.4 European Projects

5.4.1 General

Several European research projects have addressed the topic of multi-application platforms, open ITS architectures, and role models for joint service delivery.

The most relevant projects are

- Universal On-Board Unit (UOBUnit)
- Global System for Telematics (GST)
- GNSS enabled Services Convergence (GSC)

Some further projects, especially with respect to cooperative systems, also have some relevance for the topic of VAS.

5.4.2 Universal On-Board Unit Project (UOBUnit)

Universal On-Board Unit has been a project sponsored by the European Commission. Its objective has been to investigate the options to create a universal in-vehicle platform capable of delivering a wide variety of telematics services. In 2006, the project has published a final report with concrete conclusions (see UOBUnit 2006 in the Bibliography).

By means of the UOBUnit project, the EC has been assessing the need and scope for consolidation of the in-vehicle applications of particular interest to public authority objectives. This would be carried out with a view to bringing the essential harmonised features of location, identification and time in every vehicle. The ultimate goal is to consolidate the common requirements of the in-vehicle applications into one secure on-board unit, the Universal On Board Unit (UOBUnit), using open standards and ensuring interoperability.

The fundamental concept of a UOBUnit is as a platform which:

- is installed on-board the vehicle; and
- provides low-level (elemental) services, such as vehicle location and identification, universal time, and communications, to a range of applications (such as eCall, EFC, digital Tachograph, amongst others) in an open, safe and appropriately secure architecture.

The core work of the UOBUnit project shows that:

- It is possible to consider the concept as a platform to be installed on-board a vehicle that provides elemental services of location, time, identification and off-vehicle communications to higher-level applications.
- It is possible to define the system level requirements for the UOBUnit platform, encompassing performance requirements for the provision of the elemental services as well as security requirements for the system to ensure data is handled appropriately. Furthermore, mature and emerging technologies can be used to implement this unit at reasonable cost.
- An architecture can be considered, which is inclusive, catering for those users who require only one application (potentially mandated), as well as users who seek the use of several applications. Furthermore, this architecture promotes the concept of on-board telematics service provision and the associated institutions involved.

5.4.3 Global System for Telematics Project (GST)

GST is an EU-funded Integrated Project that has been coordinated by ERTICO. GST has created an open and standardized end-to-end architecture for automotive telematics services. It is an open telematics system concept for vehicles, their drivers and passengers but also targets nomadic devices such as PDA's and mobile phones.

The purpose of GST is to create an environment in which innovative telematics services can be developed and delivered in a cost-effective manner, and hence to increase the range of economic telematics services available to manufacturers and consumers. The focus of GST is on developing "open systems"; the openness relates to the ability of the architecture to support common mechanisms for the removal, updating and installation of new services and applications. Standards are necessary for the key interfaces such that the complexity and heterogeneousness of the supporting technologies are hidden.

The vision of the GST project is that an open market for telematics services will emerge (see Figure 3). This market will be easily accessible:

- for Service Providers to offer their services
- for end-users to consume the services.

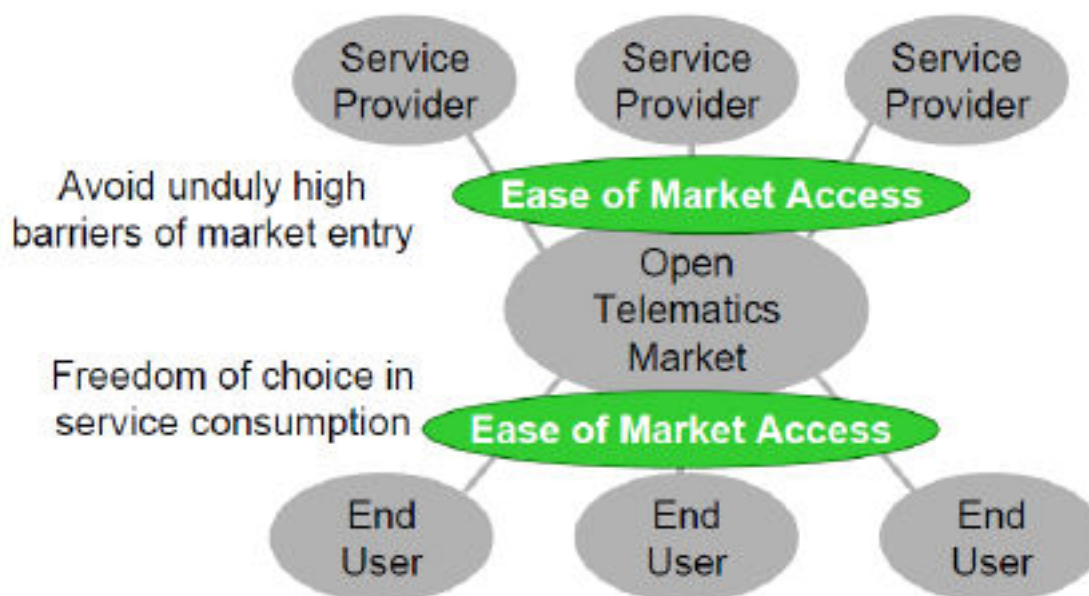


Figure 3 — An open market for telematics services

The GST role model

The project analysed and summarised the GST roles as follows (see also Figure 4)

The **Service Provider** is the entity who constructs, deploys, and operates a Service Centre, which offers one or more ITS Value Added Services (VAS), delivering more value to Service Users. For certain services, the Service Provider requires content, which is delivered by his Content Providers. These content providers are incorporated into the business processes of the Service Provider itself.

The **Service Aggregator** manages from its Control Centre multiple end-users and their platforms. The Service Aggregator is responsible for registration of users (platforms), authentication, service provisioning, subscription and the subsequent download of service applications, service updates, remote administration and all other required management procedures on a platform.

A **Service User** is the person using the services on a platform in the vehicle. The Service User pays a fee for the consumed service to the Service Provider. The Service Aggregator is the enabler for this service.

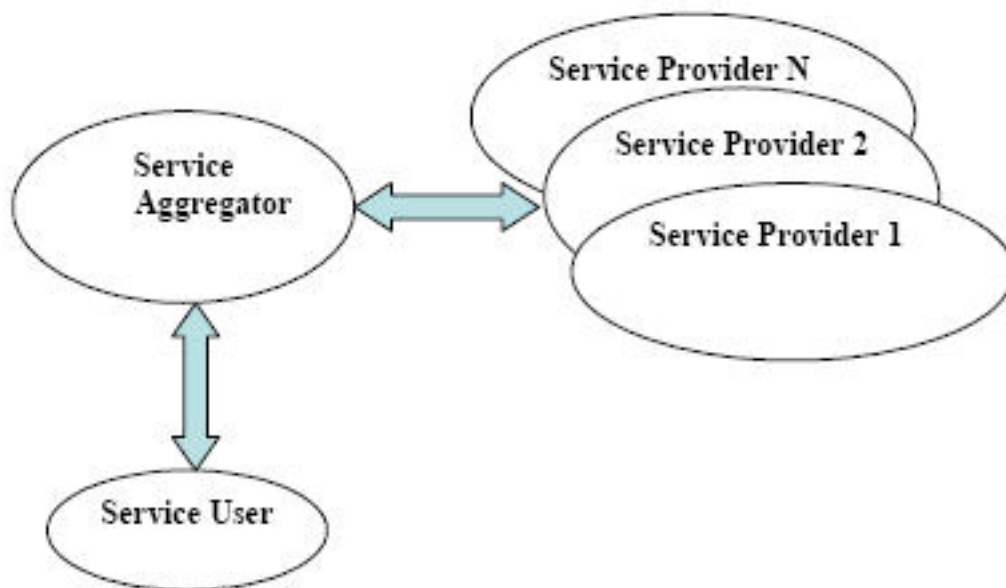


Figure 4 — GST/CVIS high-level role model

Technical view

GST is based on the idea of an open market for servicing, constructed via four processes:

- Content delivery: the activity of providing the content via a Service Application;
- Service deployment: the activity of transferring the Service Application from Service Provider to Service Aggregator (Control Centre User), registering it in the Control Centre and its various administrative systems and publishing it for the end-user to select, and/or subscribe to and execute a service;
- Service provisioning: the activities of providing end-users with all necessary means to consume a service. This usually involves registering users for the service, issuing the appropriate authorization, making the necessary adjustments in the respective registries and control systems and application download. Application download is the activity of downloading the Service Application from the Control Centre to the Client System or platform;
- Service execution.

See also Figure 5 for the GST roles and relations. For more details see the GST project and especially GST Del. 1.3, see Bibliography.

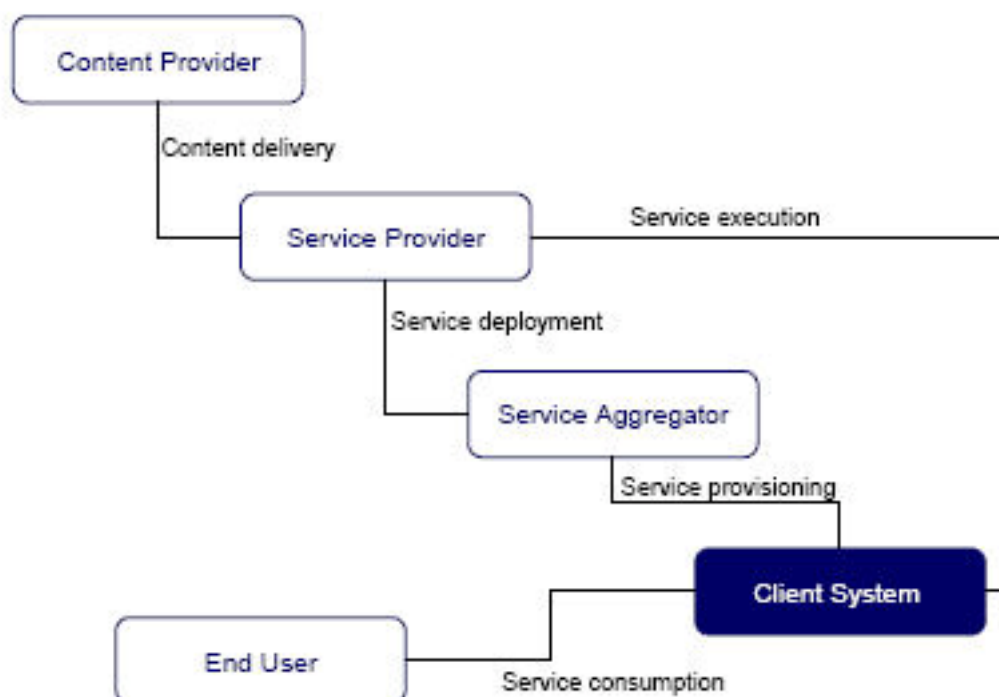


Figure 5 — GST roles and relations

5.4.4 GNSS enabled Services Convergence Project (GSC)

GNSS enabled Services Convergence is a European research project funded through the Galileo Supervisory Authority under the 7th Framework Programme. This project started in March 2009 and is scheduled to end in February 2011. The goal of GSC is to bring existing results of the following projects together into a single context in order to overcome the real world challenge of co-existence of multiple services:

- Road user charging: the CESARE and RCI projects;
- Telematics based services: the GST and CVIS projects.

The GSC project establishes conditions for an open and competitive mass market of GNSS-enabled road transport services. The project identifies the specifications and requirements for GNSS-enabled converged tolling and ITS VAS services that run on the same in-vehicle equipment.

The GSC project not only demonstrates the technical feasibility of the 'multiple services platform' but also presents an analysis and recommendations with respect to the feasibility of market deployment.

Role Model

The following main roles have been identified:

- Service Generator (VAS or Toll Charger)
- Service Aggregator (for VAS and EETS)
- Service User

The (RCI) Toll Charger is the equivalent of the (GST) Service Provider. In order to prevent conflicts the more generic name **Service Generator** is used.

The (RCI) Toll Service Provider / EETS Provider is the equivalent of the (GST) Service Aggregator; both make services available for the driver by offering a payment method for this service. The more generic term **Service Aggregator** is therefore used.

The (RCI) Service User is the equivalent of the (GST) Service User. In both cases, the Service Users make use of a service. Payment in GST could however differ with the payment methods of RCI; the term **Service User** is therefore retained.

Figure 6 shows the GSC role model. For greater transparency, the EETS Provider is shown within the bubble "Service Aggregator". At the top of the figure, the service generators are shown, comprising commercial and public services (ITS services) as well as the Toll Charger. The Service User is the client, consuming a public or commercial service, or driving along tolled infrastructure (tolling business). The Service Aggregator is the enabler of both public and commercial services, as well as the Toll Service.

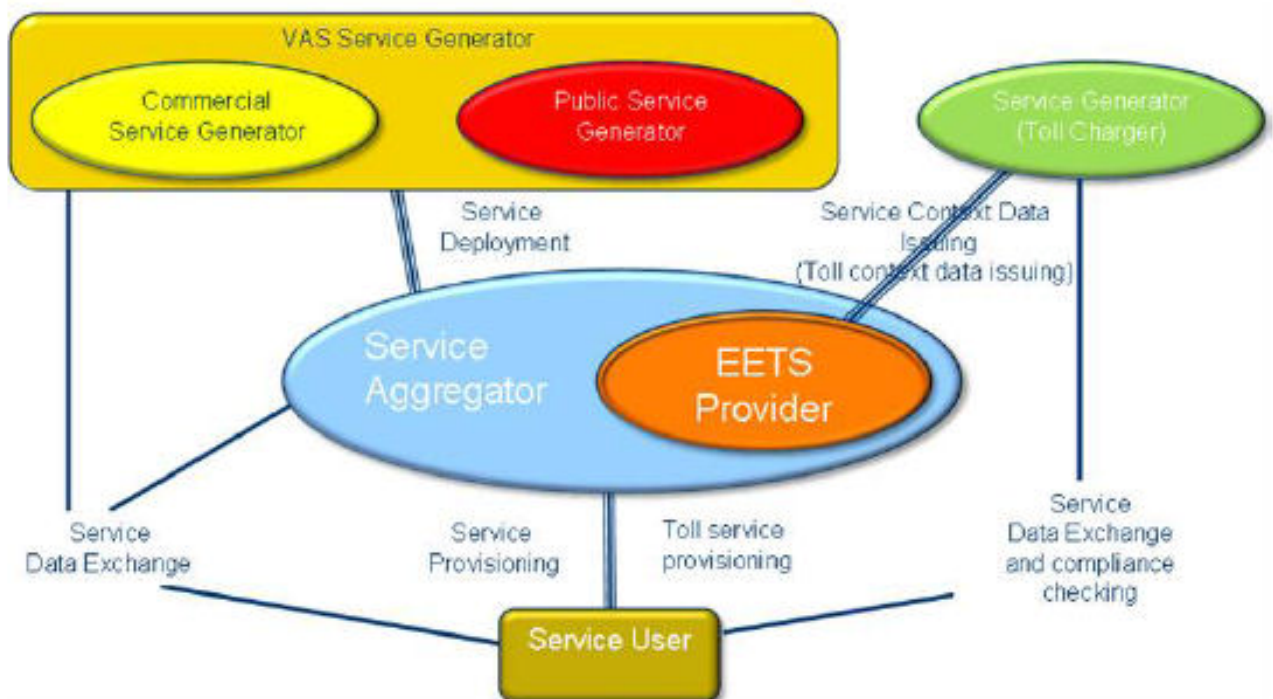


Figure 6 —GSC Role Model (from GSC Del 2.1)

Comparison of the RCI/CESARE and GST/CVIS projects indicates that the EETS Provider of the CESARE /RCI or EETS world involves heavy responsibilities, in contrast to the GST / CVIS where responsibilities are light and not stringently defined.

The main conclusion is that the responsibility of the Service Aggregator is at least identical with the responsibility of the EETS Provider (ETSP).

Business Model

For VAS, the relations between Service Generator, Service Aggregator and Service User depend on the different business models that have to be considered. GSC will evaluate the following business models:

Business model 1 ("App Store" type): The Service Aggregator hosts all services and provides the Service User with information about available services. The Service Generator is responsible for creating a contract

with the Service User in order to provide service content data and payment information. Contracts also exist between Service Generator and Service Aggregator, Service Aggregator and Service User, Service Generator and Service User. This results in a “Multiple contracts, multiple invoices” scenario.

Business model 2 (EETS type): The Service Generator deploys a service to the Service Aggregator. The Service Aggregator hosts all services and provides the Service User with information about available services. The Service Aggregator is responsible for provision of a service whenever a Service User subscribes for a service. There are contracts between the Service Generator and the Service Aggregator, the Service Aggregator and the Service User. From the Service User perspective, this results in a “one contract, one invoice” model.

For more details, see Bibliography, GSC Del 2.1. “GNSS-enabled Services Convergence WP2 System Requirements and Role Model High level Role Model Deliverable D2.1”.

5.4.5 Further European Projects

One strategy objective of the research programme of the European Commission is the improvement of the free exchange of persons and goods through the development and deployment of traffic telematics applications. Besides the aforementioned projects, focussed on different aspects of a future multi-application telematics architecture, further projects within this strategic scope are also relevant to this technical report.

COOPERS (CO-Operative Systems for Intelligent Road Safety)

COOPERS is a European research, development and innovation activity within the Call 4 (Co-operative Systems and in-vehicle integrated safety systems) of the 6th Framework Programme by the European Commission Information Society and Media. COOPERS focuses on the development of innovative telematics applications for road infrastructure with the long-term goal of a “Co-operative Traffic Management” between vehicle and infrastructure, to mitigate any emerging gaps in the development of telematics applications between the car industry and infrastructure operators. The goal of the project is to enhance road safety via direct and up-to-date traffic information, and communication between infrastructure and motorised vehicles on a motorway section. COOPERS started in February 2006 with a planned duration of 48 months.

CVIS (Cooperative Vehicle Infrastructure Systems)

The CVIS objectives are to create a unified technical solution allowing all vehicles and infrastructure elements to communicate with each other in a continuous and transparent way using a variety of media and with enhanced localisation; to enable a wide range of potential cooperative services to run on an open application framework in the vehicle and roadside equipment; to define and validate an open architecture and system concept for a number of cooperative system applications, and develop common core components to support cooperation models in real-life applications and services for drivers, operators, industry and other key stakeholders; to address issues such as user acceptance, data privacy and security, system openness and interoperability, risk and liability, public policy needs, cost/benefit and business models, and roll-out plans for implementation.

Within the main blocks of Core Technologies, Cooperative Applications, Test Sites and Deployment Enablers, the CVIS sub-projects will produce the following key results:

- a multi-channel terminal capable of maintaining a continuous Internet connection over a wide range of carriers, including cellular, mobile Wi-Fi networks, infra-red or short-range microwave channels, ensuring full interoperability in the communication between different makes of vehicle and of traffic management systems;
- an open architecture connecting in-vehicle and traffic management systems and telematics services at the roadside, which can be easily updated and scaled up to allow implementation for various client and back-end server technologies;
- techniques for enhanced vehicle positioning and the creation of local dynamic maps, using satellite positioning, radio triangulation and the latest methods for location referencing;