SEVENTH FRAMEWORK PROGRAMME
THEME 7 - TRANSPORT

Project acronym: SAFETRIP
Project full title: Satellite Applications For Emergency handling, Traffic alerts, Road safety and Incident Prevention
Grant agreement no.: 233976 (SCP8-GA-2009-233976)
Grant agreement for: Large-scale integrating project

User Requirements - Initial

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### Versions

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## Glossary

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<td>Accident</td>
<td>An accident is a reported incident</td>
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<tr>
<td>Aftermarket</td>
<td>Refers to the addition of non-factory parts, accessories and upgrades to a motor vehicle</td>
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<td>CNIL</td>
<td>Commission Nationale de l'Informatique et des Libertes</td>
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<td>DAB+</td>
<td>Digital Audio Broadcasting standard</td>
</tr>
<tr>
<td>End-User</td>
<td>Any individual, organisation or company that will be using the SafeTRIP platform</td>
</tr>
<tr>
<td>GPU</td>
<td>Graphics Processing Unit</td>
</tr>
<tr>
<td>Incident</td>
<td>A road incident is any event which an interaction between any combination of vehicle, pedestrian, animal and infrastructure causes damage to the entities involved</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Any external entity which can communicate with the vehicle such as operation centre, control centre and emergency response centre.</td>
</tr>
<tr>
<td>LPG</td>
<td>Liquified Petroleum Gas</td>
</tr>
<tr>
<td>OBU</td>
<td>On-board Unit</td>
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<td>Partner-User</td>
<td>Partner in the SafeTRIP consortium who will equally be users of the SafeTRIP platform</td>
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<tr>
<td>S-Band</td>
<td>Communication band between 2 to 4 GHz and used for satellite communication</td>
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<td>Stakeholder</td>
<td>Any individual, organisation or company – excluding the partner-users, who will benefit from the SafeTRIP platform</td>
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<td>TMC</td>
<td>Traffic Message Channel</td>
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<td>V2I</td>
<td>Vehicle to Infrastructure communication (as defined in SafeTRIP DoW)</td>
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<td>V2V</td>
<td>Vehicle to Vehicle communication (as defined in SafeTRIP DoW)</td>
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<td>VCall</td>
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Executive Summary

The SafeTRIP project’s overall objective is to improve the safety, security and environmental sustainability of road transport infrastructures. SafeTRIP uses S-band satellite technology, which is optimized for two-way communication for on-board vehicle units. This deliverable presents the initial set of user requirements for SafeTRIP to deliver towards the overall objective.

D 2.1.1 presents the requirements based on the needs put forward by partners within the consortium who will also be users of the SafeTRIP platform, henceforth referred to as partner-users. They are Eurolines, Abertis, IMA and Sanef: Eurolines provides low-cost coach travel across Europe, Abertis and Sanef are road operators in Spain and France respectively; and IMA, an assistance company, develops and offers road safety services to individual drivers through its parent companies MACIF and MAIF. Additionally, the experiences and unmet needs of individuals (vehicle drivers and passengers) and organisations outside the SafeTRIP consortium have been collected. So far the individual user needs have been collected through interviews, onsite observations and discussions at Eurolines, Abertis, IMA and Sanef, coupled with 21 semi-structured interviews with individual drivers listed in Annex 1.

The following is a short list of most commonly expressed and important needs:

1. To have an always-available communication link for requesting assistance for any kind of emergency (including medical, road assistance, accident) and subsequent communication
2. To reliably retrieve the geographical location of the vehicle (for providing assistance or tracking vehicles (e.g. hazardous goods vehicle, coaches))
3. To receive relevant, useful and timely traffic information in the vehicle
4. To have access to information about the vehicle including passenger information, cargo carried (if any), vehicle specifics (dimensions, type) and car sensors

Both the partner-user and stakeholder needs have been analysed, and form the basis of an initial set of requirements for the safety-emergency chain, to define the Systems Requirements (D 2.3.1) of the SafeTRIP platform.

A second strand of requirements has been developed through review and critical analysis of competing technology and services in Section 2, to ensure the SafeTRIP platform will benefit from their strength by being compatible – when feasible, but also stand out by offering innovative, higher quality, or better value features. In this section, 19 services and technologies have been reviewed, leading to an analysis about SafeTRIP’s positioning within the current market and a set of requirements have been formulated. With the innovative use of the satellite communication channel, SafeTRIP will be able to minimise the impact of expensive roaming charges on services supported by the SafeTRIP platform – therefore increasing its attractiveness. The maturity of V2V communication technologies is also seen to further strengthen SafeTRIP positioning as a platform with a reliable and resilient hybrid communication system.

The third strand (Section 3) examines the economic, regulatory and social context in which SafeTRIP will operate. The success of the SafeTRIP platform will depend equally on influences arising from economic trends, and EU policies and political trends in member countries. This is discussed in the last section, along with a state of the art report on transport system – that will keep the innovations in SafeTRIP grounded and relevant to the intelligent transport system community. It also presents the analysis of completed/ongoing transport and communication projects predominantly funded by the European Commission which can have a synergy with SafeTRIP.

Each strand presents a list of requirements that should be considered for the design, implementation, deployment and support of the Green Box and the development of applications.
that will be supported by the SafeTRIP platform by all other SafeTRIP work packages. The unique reference numbers assigned to each requirement will to be used in subsequent deliverables.
Introduction

The SafeTRIP project’s general objective is to improve the use of road transport infrastructures and the alert chain (information/prevention/intervention) in case of incidents by offering an integrated system for data collection to service provisioning. SafeTRIP benefits from the S-band satellite technology which is optimized for two-way communication for on-board vehicle units.

D 2.1.1 summarises the requirements elicited from those partners within the consortium who will also be users of the SafeTRIP platform, from here on referred to as partner-users. Additionally, the experiences and unmet needs of individual users (vehicle drivers and passengers) have been collected. Both types of needs have been analysed, and form the basis of an initial set of requirements for the safety-emergency chain, to define the Systems Requirements (D 2.3.1) of the SafeTRIP platform. A second strand of requirements has been developed through review and critical analysis of competing technology and services in Section 2, to ensure the SafeTRIP platform will benefit from their strength by being compatible – when feasible, but also stand out by offering innovative, higher quality, or better value features. And finally, Section 3 discusses the economic, regulatory, social and R&D context in which SafeTRIP will operate.

Section 1 of this document focuses on the User Needs. The user needs at this stage consists mainly of partner-user needs (subsection 1.1) and stakeholder needs (subsection 1.2). The partner-user needs reflect the prime motivation for partner’s involvement in the SafeTRIP project. The partner-users are Eurolines, Abertis, IMA and Sanef: Eurolines provides low-cost coach travel across Europe, Abertis and Sanef are road operators in Spain and France respectively; and IMA develops and offers road safety services to individual drivers. So far these have been collected through interviews, onsite observations and discussions at Eurolines, Abertis and IMA, coupled with semi-structured with individual drivers listed in Annex 1. The stakeholder needs (subsection 1.2) present the unmet needs of all those who can benefit from the SafeTRIP platform. The stakeholders – as discussed in this document - are the individual-users (vehicle drivers and passengers), organisations and businesses which are not part of the SafeTRIP consortium. The subsection 1.3 maps the aggregated user needs into functional requirements. The last subsection 1.4 represents the functional, non-functional requirements, an initial set of user interface recommendations, as well as insights about the design, development and operation of Intelligent Transport Systems (ITS) based on discussion and observations undertaken as part of the user requirements capture. Additional contributions have come from the experience and expertise within the consortium in designing, implementing and deploying integrated systems to deal with road incidents. For instance, IMA has been involved in the development and commercialisation of the VCall emergency and alert system; road operators Abertis and Sanef deal with road incidents as part of their operations; and Masternaut designs and develops OBUs for emergency solutions.

Section 2 presents an analysis of the Competing Technologies and Services. This will allow SafeTRIP to position itself with regards to complementary and competing technology and services which are either operational or being developed through other projects. By learning from their merits and limitations, the SafeTRIP platform can be designed to be better in terms of interoperability, functionality and benefits to the road users. The review of 19 technologies and services supports the need for vehicle connectivity over Europe and provide relevant information about pricing plans offered by current service providers which will feed into the business models in Work Package WP2.4. Finally, through this analysis, a better understanding of the difficulties faced by existing systems is achieved, which is reflected in a set of requirements, to avoid those difficulties, listed at the end of this section.
Section 3 lists the factors that are likely to influence the design and adoption of the SafeTRIP platform from a non-technical perspective. This section is divided into three sections – namely political and macro economics, state of the art for transport systems and other EU funded projects. Subsection 3.1 “Political and macro-economical issues” summarizes the relevant directives and initiatives of the European Commission that can affect the operational requirements of SafeTRIP. Subsection 3.2 aims to give an overview of the state-of-the-art transportation management technologies and methods. It describes the recently used traffic monitoring and controlling technologies, distinguishing urban and motorway traffic control methods, and sensors, technologies aim to improve road safety. Subsection 3.3 gives an overview of the main ongoing or finished EU projects that might have relate to SafeTRIP's objectives. Beside the general introductions, the projects are studied considering the differences, possible synergies with SafeTRIP and according to EC policies, evaluation includes the discussion of avoidance of overlapping and redundancies.
1 User Needs

In this section, the core element of the document, a set of initial user requirements are presented. The requirements have been elicited from partner-user needs (subsection 1.1) and stakeholder needs (subsection 1.2). The partner-user needs have been expressed directly by the partners and reflect the prime motivation for partner’s involvement in the SafeTRIP project. These needs have been further refined through discussions, interviews and observations carried out on-site as part of the user requirement capture as listed in Annex 1. The stakeholder needs presents the needs of users spanning across the entire spectrum of users that are connected to road networks in different roles, they form part of the alert chain in case of road incidents – these include individuals, organisations and businesses – excluding partner-users.

The subsection 1.3 maps the aggregated user needs into functional requirements and the last subsection 1.4 presents recommendations based on experience and expertise within the consortium in designing, implementing and deploying integrated systems to deal with road incidents.

The partner-user and stakeholder needs have been classified into the following categories.

<table>
<thead>
<tr>
<th>Category</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Navigation</td>
<td>NAV</td>
<td>This category aggregates the navigational needs – contributing to both planning and the actual navigation during the trip. It includes issues about maps, traffic information and points of interest</td>
</tr>
<tr>
<td>Comfort</td>
<td>CMF</td>
<td>This category groups the comfort needs. These needs are related to making the road trip pleasant and includes references to entertainment systems within the vehicle</td>
</tr>
<tr>
<td>Safety</td>
<td>SAF</td>
<td>This category groups the needs related to Road Safety and includes aspects pertaining to breakdown, road side assistance and emergency responses</td>
</tr>
<tr>
<td>Security</td>
<td>SEC</td>
<td>This category brings together needs related to the security of information related to the occupants of a vehicle and to the vehicle itself.</td>
</tr>
<tr>
<td>Environment</td>
<td>ENV</td>
<td>This category groups together needs related to the impact of the vehicle on the environment.</td>
</tr>
<tr>
<td>Communication</td>
<td>COM</td>
<td>This category groups together needs related to information exchange which do not fall into any of the previous categories</td>
</tr>
<tr>
<td>Other</td>
<td>OTH</td>
<td>All other needs</td>
</tr>
</tbody>
</table>

Table 1: Needs Categories
1.1. Partner-User Needs

This section describes the needs expressed by the partner-users. Each need is classed into one of the following three categories.

Core Needs: From the partner-user’s perspective, these needs hold the highest importance. They are central to user’s involvement in SafeTRIP. If the SafeTRIP platform does not meet these requirements it will not be accepted by the users.

Should-Have Needs: These are the needs which partner-users feel should be met by the platform. If they are not met, it is uncertain that the users will adopt SafeTRIP. These needs address pertinent operational issues faced by the user.

Desirable Needs: Requirements that have been mentioned but have not been rated as high priority for the partner-users. If met, they will help to increase the value of the SafeTRIP platform proposition, but are not critical to the user’s acceptance of the platform.

The partner-users who have participated in this study are listed below:

<table>
<thead>
<tr>
<th>Partner’s Business</th>
<th>Partners</th>
<th>Subsection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Transport Operator</td>
<td>Eurolines</td>
<td>1.1.1</td>
</tr>
<tr>
<td>Road Operator</td>
<td>Abertis/Acesa</td>
<td>1.1.2</td>
</tr>
<tr>
<td>Sanef</td>
<td></td>
<td>1.1.4</td>
</tr>
<tr>
<td>Insurance</td>
<td>IMA, MAIF, MACIF</td>
<td>1.1.3</td>
</tr>
</tbody>
</table>

The needs of the partners have been established through discussions, observations, presentations and meetings. These activities are described in the Annex 1. For the purposes of this report, each activity has been assigned a unique code. This code is referenced for each of the partner-user needs listed in the subsequent subsections. A schedule of the site visits undertaken over the first and second quarter of the project is as shown in Figure 1: Site Visits.

The site visits included:
- guided visits to various departments within the organisation
- presentation and discussion of the operational problems and needs
- semi-structured interviews conducted with emergency technicians, operators, operation managers, technologists, drivers, project managers and the management
Reading the needs table

The following is a fragment of a needs table. The meaning of each column heading is explained subsequently.

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need</th>
<th>Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN101</td>
<td>SAF</td>
<td>The user EUR-MG requires that the geographical position of the coaches is known at all times</td>
<td>In the event of delays, breakdowns and accidents, if the exact position of the coaches is known remedial action can be taken. Beneficial to EUR-CS, EUR-OP</td>
<td>DOP002</td>
</tr>
</tbody>
</table>

Example Table

<table>
<thead>
<tr>
<th>Column Heading</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ref No</td>
<td>This is a unique identifier for the need. The first two letters refer to the type of the need and can be CN – Core Need, SHN – Should-Have Need, DN – Desirable Need</td>
</tr>
<tr>
<td>Type</td>
<td>This is one of the categories listed in the Table 1: Needs Categories i.e. NAV, CMF, SEC, SAF, ENV, COM, OTH</td>
</tr>
<tr>
<td>Need</td>
<td>This is a short description of the need of the user</td>
</tr>
<tr>
<td>Description and Comments</td>
<td>This gives a longer descriptive about the particular need, for e.g., explaining why the need is important to the user</td>
</tr>
<tr>
<td>Src Ref</td>
<td>The Src Ref is a unique reference to a specific activity as listed in the Annex 1 of the document</td>
</tr>
</tbody>
</table>

Each needs table is then followed by a more detailed description of each of the needs.

Partner Profiles

It is important to highlight that this section presents the needs of diverse partner-users. Eurolines (Section 1.1.1) is an end-user of the SafeTRIP platform and a detailed study of their processes has been carried out in order to identify their needs. The road operators Sanef (Section 1.1.4) and Abertis/Acesa (Section 1.1.3) are also end-users of the platform. However, some of their needs were expressed as a result of limitations identified by previous projects. An analysis of their existing processes has also been carried out to identify other needs. The insurance companies IMA/MACIF/MAIF will be developing services for the SafeTRIP platform and offer them to individuals who are the end-users. They have identified certain services they would like to offer and those will be discussed in work package WP2.4. In Section 1.1.3, the needs expressed are based on problems identified from an analysis of existing services they offer and the needs of individuals to whom they plan to offer SafeTRIP based services.
1.1.1. EUROLINES

Profile
The Eurolines network serves 32 countries and more than 1500 destinations from 110 French cities. Eurolines allows anyone to travel very easily to Lisbon, Stockholm, Bratislava, Rome, Berlin, etc. For routes like Paris-Brussels, 11 journeys per day are available. Eurolines France owns 21 sales offices and benefits from more than 1200 travel agencies in France.

Roles within Eurolines

<table>
<thead>
<tr>
<th>User Role</th>
<th>Code</th>
<th>Description and Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management</td>
<td>EUR-MG</td>
<td>Eurolines Management and member of SafeTRIP consortium</td>
</tr>
<tr>
<td>Check-in</td>
<td>EUR-CI</td>
<td>User who works in the Check-in section of the coach station and deals with</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sale of ticket</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Check-in Registration of passengers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Verification of Visa/Passport/Id Card (only for UK and Italy)</td>
</tr>
<tr>
<td>Call Centre</td>
<td>EUR-CC</td>
<td>User working at the Call Centre deals with</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ticket sales on the phone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Queries from customers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Refund of tickets</td>
</tr>
<tr>
<td>Control Centre</td>
<td>EUR-CS</td>
<td>• Controls the setting up of coaches at departure and arrival gates</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Edits and controls the list of passengers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Guarantees the gathering and distribution of information to other services and clients (including problems occurred during the trip)</td>
</tr>
<tr>
<td>Operations Centre</td>
<td>EUR-OP</td>
<td>• Monitors the sales of tickets and adapts the coach capacity (number of seats) accordingly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Intervenes also – following alerts – on problems incurred during the trip (accident, breakdown)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and are responsible to find a solution</td>
</tr>
<tr>
<td>Coach Driver</td>
<td>EUR-CD</td>
<td>Driver of Eurolines coaches</td>
</tr>
<tr>
<td>Passenger</td>
<td>EUR-PS</td>
<td>Passenger of Eurolines coaches</td>
</tr>
</tbody>
</table>

Table 2: Eurolines – User Roles
## Core Needs

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need</th>
<th>Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN101</td>
<td>SAF</td>
<td>The user EUR-MG requires that the geographical position of the coaches is known and updated at regular intervals</td>
<td>In the event of delays, breakdowns and accidents, if the exact position of the coaches is known remedial action can be taken. Beneficial to EUR-CS, EUR-OP</td>
<td>DOP002</td>
</tr>
<tr>
<td>CN102</td>
<td>SAF</td>
<td>The user EUR-MG requires to know who is on the coach</td>
<td>Beneficial to user EUR-CS, EUR-OP, EUR-CC</td>
<td>DOP002</td>
</tr>
<tr>
<td>CN103</td>
<td>SAF</td>
<td>The user EUR-MG and EUR-CD require a navigation application adapted to the needs of the coach</td>
<td>The system should allow drivers to plan routes, including drop-off and pick-up points for passengers</td>
<td>DOP030</td>
</tr>
<tr>
<td>CN104</td>
<td>SAF</td>
<td>Emergency Call with configurable call routing</td>
<td>An emergency call button to allow drivers to call for assistance without raising alarm</td>
<td>DOP030</td>
</tr>
</tbody>
</table>

Table 3: Eurolines – Core Needs

**CN101 - Where the coaches are?**
Eurolines would like to know the position of each coach. They want real time position information with regular updates. The user can tolerate up to 10-15 minutes intervals between updates but ideally, they require an update every minute.

**Handling Delays**: In the event of delays - caused by traffic congestion, adverse weather conditions or other factors - an exchange of information takes place between the coach drivers and the Control Centre (EUR-CS) at the station through mobile phone network, which leads to an update in the status of the coach service within the Regulatory Centre’s system. The information is then used in announcements within the station, in the scheduling of the next service by the same coach, and by the call-centre when answering queries from the general public. Automatic and timely tracking of the coaches will improve each of these services.

**Handling Breakdowns and Accidents**: When there is a breakdown or accident, the driver typically informs the Operations Centre (EUR-OP) at the closest station using his mobile phone. There is a 24 hour on-call service for this service that operates at the station. The insurance scheme that affects coaches within France provides an emergency rescue and repair service. On receipt of the emergency call, this service is dispatched to the vehicle. For the most part, professional coach drivers are able to accurately describe their position on the motorway using landmarks and other metrics. However, if the coaches deviate from planned routes due to situations arising on the motorway, or if they are in an area with low or no terrestrial network coverage, it can take a long time before they can be located – if at all.

**CN102 - Who is on the coach?**
Eurolines requires knowing who is on the coach at all times. The information is typically maintained by the driver (EUR-CD) through a passenger list that is kept on the coach. However, this information may not be available to other departments of Eurolines who need to know about who is on the coach. Currently bar codes are printed on most tickets and would extend to cover all types of Eurolines ticket in the near future. It is important to note that any solution would need to account
for the existing process which requires the driver to be outside the coach while validating tickets and loading the passengers’ luggage.

**Accidents:** In the event of an accident, the user is responsible for informing the next-of-kin of the passengers. Therefore, it is crucial for User to have up-to-date information about the passengers on board.

**Passengers left behind:**
In certain situations passengers are left behind by the coach midway during the journey. This can happen at border crossings when passenger does not have required documents. It can also happen at places where coaches stop during breaks in rest areas. Driver typically counts the number of passengers before departing. In cases where passengers cannot be found in time, they are left behind. Often it is difficult for drivers to say who was left behind. This poses a safety issue for the user EUR-MG.

**Revenue Protection:** The user requires knowing who is on the coach. Since the user operates on a revenue sharing scheme with partners (coach companies) based on the actual travel undertaken by passengers - rather than ticket sales, it is crucial to know who is on the coach. A passenger list is typically issued to the drivers at the start of each journey listing all the passengers who have booked the specific journey.

Additional passengers can get onboard the coaches at specific pick-up points with open tickets – on condition that they have already reserved a seat on the coach beforehand through the call centre or the internet. The driver collects the ticket stubs from all passengers and submits them at the end of the journey upon arrival. These stubs are used in the ‘pool accounting’ which is used to compute the revenue share of the user.

The problem faced by the Eurolines is that
1. Passengers may be allowed on the coach without a valid ticket.
2. Though it is required by the driver to update the passenger list and to submit all ticket stubs at the end of a journey for accounting, errors may occur due to missing stubs or missed entries.

**Last Minute Sales:** Currently, the user has to close the sales of tickets once the coach has departed. By knowing ‘who is on the coach?’ at all times, the user can identify if tickets can still be sold for remaining legs of the journey. In addition, at some departure points the passenger list is handed over to the driver on the eve of the journey. This means that the sale of tickets has to be closed once the passenger list is issued.
CN103 – Navigation Aid for Coaches
The users EUR-MG and EUR-CD require a navigation aid which will primarily display the planned and approved route with indications of pick-up and drop-off points and in the event of rerouting to account for coach dimensions, legislation and restrictions in order to present a safe alternative route to the coach driver with minimal divergence from the planned route.

Coaches are often operated by drivers who do not speak the language of the country they are travelling through and this can make it difficult for them to navigate as they may not correctly interpret the road signs and or can ask for local help. In cases when they are required to find alternative routes, this problem can become acute. They usually rely on fellow drivers that they contact by phone or in some cases the passengers who know the way.

Pick-up and Drop-off points in rural areas pose the most common navigation problem for drivers and in those cases they use assistance from the passengers in order to reach the point. The roads that they take may not be suitable for coaches and taking these roads may introduce delays to the service.

CN104 – Emergency Call Button
Eurolines would like an emergency call service functionality to be available on the coaches, with the possibility to route the call as required – whether directly to emergency services or through the Eurolines operation centres. An emergency call facility is required for accidents and circumstances including the following:
- Aggressive behaviour by passengers who are under the influence of alcohol or drugs or are expressing dissatisfaction with luggage restrictions and handling
- The driver suspects smuggling activity is being undertaken by some passengers
- A passenger tries to seize control over the steering wheel (e.g. mentally unstable passengers)
### Should-Have Needs

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need</th>
<th>Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
</table>
| SHN101 | SAF  | Contact with coach driver           | User EUR-OP and EUR-CS require a reliable always-available communication link with the coach drivers. | DOP002  
|        |      |                                     |                                                                                         | DOP012  |
| SHN102 | SAF  | Send Information to Coaches         | User EUR-OP and EUR-CS would like to send warnings about accidents and possible change of route from the operation centre to the coaches | DOP002  
|        |      |                                     |                                                                                         | DOP012  |
| SHN103 | SAF  | Message board for passengers on the coach | Drivers are sometimes unable to communicate effectively with passengers due to language barriers – during breaks. This would benefit EUR-CD and EUR-PS | DOP002  |
| SHN104 | SAF  | Information announced to the driver in audio | User requires information sent to coaches (SHN-102) to be played using audio | DOP030  |
| SHN105 | COM  | Multi-lingual playback of messages  | User requires multi-lingual support for messages                                          | DOP030  |
| SHN106 | SAF  | Integration of mobile phones with onboard microphone and speakers | User EUR-MG requires the interfacing of the driver mobile phone | DOP030  |

Table 4: Eurolines – Should-Have Needs

**SHN101 – Contact with coach driver**
Eurolines would like to have a more reliable communication link with the coach drivers. Currently the communication between the infrastructure and the vehicle is supported by terrestrial networks. Given that coaches typically cross large distances across Europe and beyond to Morocco, there are areas where the mobile network coverage is poor.

**SHN102 – Send Information to Coaches with Multi-Lingual support**
The operation centre and control centre at the Eurolines station are up-to-date with traffic conditions, accidents and other situations along the routes undertaken by the coaches. The user would like to be able to relay filtered relevant traffic information to the driver – preferably using a communication mode that will be effective and not distract the driver. This will help the driver plan changes to the designated route effectively. Eurolines requires the driver to acknowledge that the message has been read.

**SHN103 – Message Boards for passengers on the Coach**
Eurolines has expressed the need to have an effective communication mechanism between the driver and the passengers – mainly due to language barriers. **Safety Belts:** The most important function of the message board is to display messages linked to safety. Passengers are required by law to wear the safety belts and failure to do so, will have them fined if there is a police check. Often announcements are not made in languages understood by each and every passenger. **Stops (planned and unplanned):** Communication also typically takes place during stops (rest-stops) along the journey and breakdowns. Ineffective communication due to language difficulty can lead...
to passengers being left behind, even though drivers announce the break duration and departure timings. Also, at some stops, the driver needs to communicate that passengers are required to stay on the coach.

A message board with support for both custom and preset messages would help in avoiding miscommunication.

**SHN104 – Information presented as Audio to driver**
EUR-CD and EUR-MG would require that the information that is sent to the driver (SHN-102) is presented as audio. This is to avoid distracting the driver’s attention from the road in order to read text on the navigation device (CN103).

**SHN105 – Multi-Lingual playback of messages**
EUR-MG would like the information sent to the driver to be presented in multiple languages. Given that the drivers EUR-CD have diverse language skills, it is critical that the information being sent to them is in a language that they can understand.

**SHN106 – Integration of Mobile Phones with onboard mic and speakers**
EUR-MG would like an integration of the drivers’ mobile phone with the microphone and speakers in the driver’s cabin. The driver occasionally receives calls on his mobile or has to make calls. It is highly desirable in the interest of safety that a hands-free option is available for the driver to interface the personal phone with the devices on board. This is not to use the SafeTRIP platform to make the call – but simply to interface with the input and output devices on the coach.
Desirable Needs

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN101</td>
<td>CMF</td>
<td>Entertainment for passengers in the form of TV and Radio</td>
<td>DOP030</td>
</tr>
<tr>
<td>DN102</td>
<td>CMF</td>
<td>Internet access for passengers</td>
<td>DOP030</td>
</tr>
</tbody>
</table>

Table 5: Eurolines – Desirable Needs

DN101 – Entertainment for passengers
The user would like to be able to receive TV-Channels in the coaches. Since the trips last for many hours – and occasionally days - this will make the trip more enjoyable for the passengers. In most cases currently, the entertainment system is not switched on because it is inconvenient and not safe while driving for the driver to operate the system from his seat. Also, some drivers may not know how to operate the DVD players. User EUR-MG therefore would like an automated way to stream TV channels, movies and music to passengers.

DN102 – Internet Access for passengers
The user EUR-PG has expressed the need for internet access in the coach – given the long duration of most trips on the coach and the lack of entertainment options on board. In response, EUR-MG would like to provide internet access to the passengers. This service could be free or chargeable.

Insights into processes at Eurolines

The responsibility to provide accurate personal and identity information lies with the passenger. The passport number capture is optional when buying the ticket. During the check-in phase at the station, the staff are not required to check the identity and passport of the passenger – except for coaches travelling to UK or Italy that have to cross the national borders (this occurs upon request by the authorities in these countries). In addition, the check-in personnel are not trained in passport and visa verification. A generic boarding pass is used by the passenger to get on the coach at the station.

Drivers are not legally entitled to request a passport or proof of identity. However, drivers of coaches to destinations outside the EU choose to check passenger passport and visas to speed up border-crossing i.e. they want to avoid having to wait for a long time in cases of visa problems, or having to leave a passenger behind. The normal wait time at border crossing ranges between 10 minutes to 2 hours depending on the checks that are carried out by the authorities.

Ticket Types
Three types of tickets are sold by Eurolines – ATB tickets, eTickets and PDF tickets (printed tickets on formatted sheets). The ones that are sold over the counter are ATB tickets and, due to cost, bar codes cannot be printed on such tickets at the moment. On the other tickets, such as the ones sold online, bar codes may be printed. Around 20% of the current sales of tickets are ATB tickets. The printers for ATB tickets may be replaced in the future, and so ATB tickets would have barcodes on them. Ordinary tickets are also available in case the IT system fails.
1.1.2. ACESA AND ABERTIS

**Profile**
ACESA/ABERTIS is the biggest motorway’s operator in Spain, and manages about 600 km of high capacity roads. ACESA network is part of the Trans European Road Network (TERN), and has a very high level of traffic connecting Spain and France.

A radio centre operated by ACESA/ABERTIS provides traffic information, in audio format, to local radio stations whenever a slot is allocated for traffic information broadcast upon request from the stations. Traffic information is also sent to newspapers and TV stations.

![Patrol vehicle](image1)
![Operations Centre](image2)
![Traffic Info Centre](image3)

**Roles within ACESA**

<table>
<thead>
<tr>
<th>User Role</th>
<th>Code</th>
<th>Description and Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management</td>
<td>ACE-MG</td>
<td>ACESA Management and member of SafeTRIP consortium</td>
</tr>
<tr>
<td>Operation Centre Operator</td>
<td>ACE-OP</td>
<td>User who works in the operation centre and coordinates response to incidents. They work 24/7 at the centre.</td>
</tr>
<tr>
<td>Operation Centre Management</td>
<td>ACE-OM</td>
<td>User who works in the operation centre and coordinates the ACE-OP</td>
</tr>
<tr>
<td>Patrol Vehicle Driver</td>
<td>ACE-PD</td>
<td>Driver of patrol vehicle</td>
</tr>
</tbody>
</table>

Table 6: ACESA/ABERTIS – User Roles

**Core Needs**

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need</th>
<th>Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN201</td>
<td>NAV</td>
<td>Send Traffic Information</td>
<td>User ACE-MG would like to send traffic alerts directly to individual vehicles</td>
<td>DOP001</td>
</tr>
<tr>
<td>CN202</td>
<td>NAV</td>
<td>Filter Traffic Information</td>
<td>User ACE-MG would like to have traffic information filtered by</td>
<td>DOP001</td>
</tr>
<tr>
<td>CN203</td>
<td>SAF</td>
<td>Capture data from patrol vehicle</td>
<td>User ACE-OP and ACE-PD would like its patrol vehicles to be equipped with the capability to capture sensor data (video, images) of incidents</td>
<td>DOP015</td>
</tr>
<tr>
<td>CN204</td>
<td>SAF</td>
<td>Track Hazardous and Large Vehicle</td>
<td>User ACE-MG and ACE-OP would like to be able to track Hazardous and Large vehicle on the segment of motorway under</td>
<td>DOP001</td>
</tr>
</tbody>
</table>
CN201 – Traffic Information
ACE-MG would like to be able to broadcast the traffic information directly to individual vehicle. The user monitors the state of the road network that is under his control. It also collates traffic information for the region of Catalunya – therefore its traffic monitoring operations is not confined to the motorway network. Currently, in the event of problems on the network, a bulletin is produced on a regular basis and the information is relayed to local radio channels – that typically reserve a few minutes for traffic updates every now and then. User is also involved in a government project which aims at improving information exchange amongst road operators in Spain.

CN202 – Traffic Information Filtering
ACE-MG would like to send traffic information to the vehicle filtered according to various criteria. Currently, only the most important traffic information makes it into the announcements by radio stations – typically, this is because of time constraints there. However, localised incidents are more salient to individual drivers. The traffic information filtering will be on the following basis:
1. Geographical region in which the target vehicle is located
2. Information to be prioritised based on urgency and nature of the event. For e.g. an accident involving hazardous goods vehicle will take priority.
3. Type of vehicle - some information may only be relevant to certain types of vehicle. For example, if there is a lane closure, which leads to a width restriction concerning the size of vehicle able to go through, only large vehicles will need to be notified.
4. Subscription to Info Service - the user wants to provide additional and customised traffic information to vehicles that have paid a subscription to an Info Service that will be run by the user.

CN203 – Capture data from patrol vehicle
ACESA/ABERTIS would like to be able to capture information in real time from the patrol vehicle. ACESA has a fleet of vehicles that constantly patrol the motorway network, report its conditions and take remedial action in the event of incidents such as the presence of wild animals or debris on the road. They are very often the first to arrive at the scene of an incident and relay the information to the operations centre using a mobile phone. They also gather additional information - e.g. by taking photographs using a digital camera, make notes of the damage inflicted by other vehicles to the infrastructure, and submit their report when they return to the centre. While some information can be processed at the end of a working day (e.g. insurance claims), other types of information require immediate capture and processing (e.g. the closing of a lane due to debris on the road).

CN204 – Track Hazardous and Large Vehicle
ACE-MG is concerned about the safety risk that is posed by hazardous and large vehicles using the motorways under its management. Normally, such vehicles notify the user in advance when it needs to use the motorway so that appropriate provisions can be made – for response services, arrangements at toll gates and escorts can be dispatched. However, they are not always informed as the request is not mandatory. These vehicles pose a risk in terms of infrastructure damage (e.g. when they pass through a toll gate) or involvement in an incident (causing major disruption and high risk to other road users). The user would like to monitor the position of such vehicle in real-time as they use the motorway.
CN205 – Priority based playback of Traffic Information to driver
The user requires high priority traffic information messages are played as audio to the driver while non-urgent messages can be displayed as text, or as audio based on the driver’s preference.

Should-Have Needs

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need</th>
<th>Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHN201</td>
<td>CMF</td>
<td>Send Additional Information</td>
<td>In addition to traffic information, the user ACE-MG would like to send other types of information to the vehicle</td>
<td>DOP031</td>
</tr>
<tr>
<td>SHN202</td>
<td>CMF</td>
<td>Filter Additional Information</td>
<td>Similar to CN202 as applied to SHN201</td>
<td>DOP031</td>
</tr>
<tr>
<td>SHN203</td>
<td>SAF</td>
<td>Retrieve Vehicle information</td>
<td>User ACE-OP would like to access information about the vehicle (payload) and the driver.</td>
<td>DOP001</td>
</tr>
<tr>
<td>SHN204</td>
<td>SAF</td>
<td>Voice communication with drivers of Hazardous and Large Vehicle</td>
<td>User ACE-OP would like to establish communication with driver to acquire and share information or in case of emergency</td>
<td>DOP001</td>
</tr>
<tr>
<td>SHN205</td>
<td>SAF</td>
<td>Emergency Call Service</td>
<td>User ACE-MG would like the implementation of an emergency call function for Hazardous and Large Vehicle</td>
<td>DOP030</td>
</tr>
</tbody>
</table>

Table 8: ACESA/ABERTIS – Should-Have Needs

SHN201 – Send Additional Information to Vehicle
The user ACE-MG would like to send additional Information to the vehicle including, but not limited to, information about service areas, rest areas (operated by Abertis), parking spaces, advertisements and tourist information. This information is expected to be provided free of charge initially.

SHN202 – Filter Additional Information to Vehicle
The user ACE-MG would like to filter information described in SHN201 according to the filters described in CN202 e.g. based on geographical area and vehicle type.

SHN203 – Retrieve Vehicle Information
In the event of a road incident, the user would like to have access to information about the type of cargo transported by the vehicle. For instance, petroleum products, chemicals and other hazardous substances may require specific approaches and adoption of protocols prescribed by the commission for the routing of the vehicle and handling of incidents involving specific cargoes. Currently, information about the vehicle cargo is available in printed format on an approval letter. The cargo information is not available in a database at the moment. Therefore, the letter could be scanned when the driver boarded the vehicle. In future, it is expected that such information will be available on a tamper-proof swipe card issued to the driver along with the approval letter. Such a card would then be used to read cargo information in the vehicle by the ACE-OP.
SHN204 – Communication with driver of hazardous and large vehicle
The user ACE-OP requires an effective way to communicate with the driver. In case of incidents on
the motorway, user would like to redirect vehicles to roads that are appropriate for them. User can
also offer assistance should the need arise for it.

SHN205 – Emergency Call Service
The user ACE-MG would like implementation of emergency call functionality for the drivers of
hazardous and large vehicles. This would allow the driver to trigger an emergency call. User ACE-
MG has highlighted the need for the emergency call to be routed to the relevant operation centre
for the road operator in the first place and not directly call to the emergency services. The ACE-OP
can then provide assistance to the driver effectively and efficiently.

Desirable Needs

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need</th>
<th>Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN201</td>
<td>SAF</td>
<td>Driver Behaviour Tracking – Duration of Drive</td>
<td>User ACE-MG would like to know how long the driver has been driving without any breaks.</td>
<td>DOP001</td>
</tr>
<tr>
<td>DN202</td>
<td>SAF</td>
<td>Driver Behaviour Tracking – Attention</td>
<td>User ACE-MG would like to detect when the driver is distracted or lacks attention</td>
<td>DOP001</td>
</tr>
<tr>
<td>DN203</td>
<td>COM</td>
<td>Communication with the Patrol vehicle with nomadic handset</td>
<td>User ACE-PD currently uses mobile phones to communicate with the drivers</td>
<td>DOP015</td>
</tr>
<tr>
<td>DN204</td>
<td>SAF</td>
<td>Tracking of Patrol vehicle</td>
<td>User ACE-OP requires reliable way to track patrol vehicles</td>
<td>DOP016</td>
</tr>
</tbody>
</table>

Table 9 : ACESA/ABERTIS – Desirable Needs

DN201 – Driver Behaviour Tracking – Duration of Drive
The user ACE-MG would like to detect the fatigue level of drivers, especially those of hazardous
and large vehicles. Driver fatigue accounts for 20% of heavy commercial vehicle accidents in the
EU. EU laws regulate the driving time of professional drivers in cross-border transport where part
or the entire journey is in EU territory. Fatigue level can be predicted in terms of duration and
frequency of breaks and the cumulative driving time per week. If the fatigue level of a particular
driver is found to be outside the limits, the user ACE-OP can advise or take remedial action in case
there is a breach of law.

DN202 – Driver Behaviour Tracking – Attention
The user ACE-MG would like to detect early signs of driver inattention to the road. This is
especially dangerous if the driver is at the wheel of a hazardous or large vehicle. Signs of
inattention could trigger a local warning to the driver and subsequently send an alert to the
operation centre.
This could also be used for detecting instances of speeding and to alert the driver to the risks.

DN203 - Communication with the Patrol vehicle with nomadic handset
The users ACE-PD and ACE-OP communicate using mobile phones. So in case of an incident a
voice call is initiated to exchange information. Other methods, such as using radio transponders,
have also been investigated by the user, but since the receiver was bound to the vehicle, it was not
possible to reach the drivers if they are outside the vehicle – which they tend to be when dealing
with an incident. Use of mobile phones can solve this problem, mobile phone communications
suffer from availability problems, for instance when a mobile cell is saturated or in severe weather
conditions. An alternative method of communication method that improves reliability would be
desirable, as long as a mobile communication kit that can be carried by the ACE-PD when outside the patrol vehicle.

*DN204-Tracking of Patrol Vehicle*

The user has OBUs installed in patrol vehicles which use GPRS/GSM to send the GPS position information to the operation centre. However during certain periods and in certain areas - when there is heavy traffic and a high volume of calls is made during a traffic jam or incident - there is a loss of communication as the mobile cell becomes saturated. Therefore, the communication link to update the GPS position of vehicle is not available at times when it is most required.
1.1.3. IMA/MAIF/MACIF

**Profile**
IMA has 50 million customers globally. The 38 million mutual insurance company shareholders make up the largest part (more than 1 French person in 2). The group’s other clients, 200 mutual health insurance companies, represent another 12 million beneficiaries. Inter Mutuelles Assistance Shareholding companies are MACIF, MAIF, MATMUT, SMACL, MAPA, Mutuelles des Motards, AGPM, AMF, MAE.

IMA has developed the *VCall* emergency and assistance system marketed commercially as *Virgile* by MAIF and *Sygeo* by MACIF. Assistance and Emergency Call centres are operated by IMA to manage the emergency and assistance calls by coordinating efforts of the police, on-call medical staff and emergency services. This assistance is not only provided in France, but covers individuals when they are travelling abroad.

This *VCall* package combines onboard telematics hardware and a mobile communication system with a range of assistance services. It gives customers instant access to a range of useful geolocalised telematics services such as:

1. Roadside assistance: in case of breakdown
2. Emergency assistance: press button and automatic alert facilities
3. Vehicle surveillance and tracking
4. Danger and traffic alerts for increased driver safety
5. Hands-free outbound and inbound calls via Bluetooth connection
6. Interactive navigation: upgradable GPS mapping & info functionality

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The VCall 3-button interface

Emergency Operators

The VCall system

Medical and Rescue assistance
Roles within IMA/MAIF/MACIF

<table>
<thead>
<tr>
<th>User Role</th>
<th>Code</th>
<th>Description and Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management</td>
<td>IMA-MG</td>
<td>IMA/MAIF/MACIF management and member of SafeTRIP consortium.</td>
</tr>
<tr>
<td>Emergency Technician</td>
<td>IMA-ET</td>
<td>User who works in the operation centre and coordinates response to incidents</td>
</tr>
<tr>
<td>VCall Developer</td>
<td>IMA-VD</td>
<td>User who has been involved in the design and development of the VCall system</td>
</tr>
<tr>
<td>VCall End User</td>
<td>IMA-EU</td>
<td>End user of the VCall system including beta testers</td>
</tr>
</tbody>
</table>

Table 10 : IMA/MAIF/MACIF – User Roles

Core Needs

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need</th>
<th>Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN301</td>
<td>COM</td>
<td>Better voice and data communication</td>
<td>User IMA-MG and IMA-VD would like better communication link between vehicle and infrastructure</td>
<td>DOP003 IPD012</td>
</tr>
<tr>
<td>CN302</td>
<td>SAF</td>
<td>Capture and relay Vehicle information</td>
<td>User IMA-MG and IMA-VD would like to use the data channel to relay environmental information to the operation centre in case of incidents</td>
<td>DOP003</td>
</tr>
<tr>
<td>CN303</td>
<td>SAF</td>
<td>Communication with impaired passenger</td>
<td>User IMA-MG, IMA-VD and IMA-ET would like to use video communication to give assistance to hard-of-hearing and disabled occupants for medical assistance, breakdowns and emergency</td>
<td>DOP003</td>
</tr>
<tr>
<td>CN304</td>
<td>NAV</td>
<td>Navigation Map Integrity</td>
<td>User IMA-MG, IMA-VD and IMA-EU would like regular map updates through communication link</td>
<td>DOP003</td>
</tr>
<tr>
<td>CN305</td>
<td>NAV</td>
<td>Rich Point of Interest</td>
<td>User IMA-MG, IMA-VD and IMA-EU would like richer information from point of interests available in navigation system</td>
<td>DOP003</td>
</tr>
<tr>
<td>CN306</td>
<td>NAV</td>
<td>Access to Vehicle Information</td>
<td>User IMA-MG and IMA-VD would like access to vehicle information in order to make adjustments for navigation</td>
<td>DOP003</td>
</tr>
<tr>
<td>CN307</td>
<td>NAV</td>
<td>Road Alerts Service</td>
<td>User IMA-MG, IMA-VD and IMA-EU would like drivers to relay information about the road to infrastructure and other drivers</td>
<td>DOP003</td>
</tr>
</tbody>
</table>

Table 11 : IMA/MAIF/MACIF – Core Needs

CN301 and CN302 are in compliance with normative document – CEN/TC278 TPS supported eCall – Operating requirements.
CN301 – Better Communication Coverage
The user requires an improved communication link between the vehicle and the operation centre. Currently, a GPRS/GSM communication link is used for both data and voice transfer for VCall. This communication link is subject to the availability of the terrestrial network. The user would like the voice and data communication link between the vehicle and the operation centre to be more reliable. This would have a significant impact on the credibility of the assistance service especially with the authorities. If a call for assistance is triggered by mistake and the communication link is disrupted due to coverage, emergency technicians are required to call the individual on his phone. If there is insufficient coverage, this second call may fail, which then requires the emergency technician to inform the police about the request for assistance. Recurrent false alarms have been detrimental to the relationship between the emergency call centres and the police.

CN302 - Capture and Relay Vehicle information
The user requires sensor data to be sent back to the operation centre during an incident. The most important data after an impact would be the geographic position of the vehicle. There are two further categories of information that would be useful: vehicle-specific and external (environmental) information. Vehicle-specific information includes impact points, airbag activation, overturns, fuel level, and photos of the impact inside of the vehicle. External factors such as temperature and climatic conditions (e.g. snow and rain) can be captured through sensors (e.g. camera) and relayed. This would assist in providing the right rescue services through the first emergency vehicles to arrive at the scene. A connection to the CAN bus of the vehicle will allow for identification of faults and feedback to the assistance platform will facilitate breakdown diagnostics.

CN303 – Communication with Impaired Passenger using Video Call
The user would like to communicate effectively using video link with hard-of-hearing and disabled occupants of the vehicle in case of medical assistance, breakdowns and emergencies. The current solution involves interaction with various icons which trigger a set of commonly used messages. In some cases, the occupants may be in shock and/or unable to interact effectively with the touch screen. A video link will allow visual communication to take place and would thus support communication through sign language. It may also be useful for medical staff to give an immediate diagnostics as to how badly the passengers are injured.

CN304 – Navigational Map Integrity
The user requires that the integrity of the navigation map is maintained. Two options have been suggested.

1. Enable the navigation application to have regular updates of map data through a data link.
2. Navigation application to use a ‘live’ map which is not stored locally but retrieved from the mapping service provider whenever it is required.

CN305 – Rich Point of Interest
The user requires additional point-of-interest information that would be useful to drivers, such as the number of free spaces in a parking lot, the fuel prices petrol stations. This information can be centrally provided by tourism authorities, local governments or by individuals, the latter using an approach similar to Coyote for V2V information sharing.

CN306 – Access to Vehicle Information
The user requires access to the vehicle profile – typically information about the height, width, load, type (motor-homes, trailer), etc - in order to identify a route that can accommodate the height and width of those vehicles.
**CN307 – Road Alerts Service**

The user would like to have a *citizen call* ("appel citoyen") functionality, which allows victims or witnesses to declare a *hot spot* in case of an accident, flooding or any road-related incident. This information would be relayed to the operation centre (infrastructure). In addition, information can be exchanged between vehicles without going through the infrastructure if they happen to be in the vicinity of the declared hot spot.

**Should-Have Needs**

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need</th>
<th>Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHN301</td>
<td>SAF</td>
<td>Driver behaviour monitoring</td>
<td>User IMA-MG and IMA-VD would like to be able to monitor the driver behaviour</td>
<td>DOP003</td>
</tr>
<tr>
<td>SHN302</td>
<td>SAF</td>
<td>Alcohol and Tiredness Detector</td>
<td>IMA-MG and IMA-VD would like to be able to plug alcohol and drowsiness detectors in the OBU</td>
<td>DOP003</td>
</tr>
<tr>
<td>SHN303</td>
<td>NAV</td>
<td>Traffic Information</td>
<td>User IMA-MG, IMA-VD and IMA-EU would like to have richer and real time traffic information made available to the vehicle</td>
<td>DOP003</td>
</tr>
<tr>
<td>SHN304</td>
<td>OTH</td>
<td>Integration with Mobile Devices</td>
<td>User IMA-MG, IMA-VD and IMA-EU would like integration of handheld devices – such as phones, PS2 with the vehicle</td>
<td>DOP003</td>
</tr>
<tr>
<td>SHN305</td>
<td>ENV</td>
<td>Car Pooling</td>
<td>User IMA-MG would like to have the support for the car pooling service</td>
<td></td>
</tr>
</tbody>
</table>

*Table 12: IMA/MAIF/MACIF – Should-Have Needs*

**SHN301 – Driver Behaviour Monitoring**

The user would like to monitor the driving skills and ability of individual drivers. This would firstly allow the user to provide additional incentives (typically lower insurance premiums) to ‘safe’ drivers. In addition, regulation in France requires recently qualified drivers to be monitored over a set mileage to establish whether they are indeed capable of driving safely before awarding a more permanent driving license. The monitoring does not need to be in real time, but can be logged over a period of time and transmitted upon request. IMA-MG would also like use the information about driving behaviour to reward eco-conscious drivers. The services proposed and developed around eco-driving and pay-as-you-drive will be discussed in work package WP 2.4.

**SHN302 – Alcohol and Tiredness Detector**

The user would like provision in the on-board unit to connect additional detectors such as alcohol detectors (e.g. camera to scan eye pupil dilation) and tiredness detectors, with a view to notifying drivers of the dangers of taking control of the vehicle if they have exceeded certain limits. Drink-and-Drive is one of the major causes for road incidents and is highly important from road safety viewpoint.

**SHN303 – Traffic Information**

The user would like to have up-to-date real time traffic information made available to the vehicle. This would allow route planning to take into account prevailing traffic conditions and to adapt the route on-the-fly based on updates.
**SHN304 – Integration with Mobile Devices**

The user would like mobile devices to be able to communicate with the onboard unit in the vehicle, for instance, to give internet access and access to streaming media to laptops, phones and game devices.

**SHN305 – Car Pooling**

The user requires the support of the car-pooling service (a dynamic communal service that allows potential carriers to receive automatic notification if there is a registered car sharer who wants to undertake the same trip). When the driver accepts to pick up a passenger, the navigation system guides the driver to the pickup point. There are community car-pooling system in place and the system should be able to connect to those.

**Desirable Needs**

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need</th>
<th>Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN301</td>
<td>CMF</td>
<td>In-Car Entertainment</td>
<td>User IMA-MG, IMA-VD and IMA-EU would like passengers to have access to TV shows</td>
<td>DOP003</td>
</tr>
<tr>
<td>DN302</td>
<td>SAF</td>
<td>Vehicle Passenger Information</td>
<td>User IMA-MG and IMA-VD would be able to relay passenger information to emergency services in case of accidents</td>
<td>DOP003</td>
</tr>
</tbody>
</table>

**Table 13 : IMA/MAIF/MACIF – Desirable Needs**

**DN301 – In Car Entertainment**

The user would like to offer streaming TV programs, video on demand and internet access services to the passenger. These will all be paid services. The user believes that packaging more services with the OBU increases the added-value of the product.

**DN302 – Vehicle Passenger Information**

The user would like to have provision for relay of information about regular users of the vehicle and extraction protocols to emergency services in case of accidents. Such information could be stored at all times on the vehicle itself, and only relayed to the relevant services in case of accidents or emergencies. This is in compliance to the operating requirements of the TPS supported eCall.
1.1.4. SANEF

Profile
SANEF’s core business is to operate motorways and to provide safety and comfort to all drivers on the motorway, at any time and in any condition. For that purpose, SANEF has developed and implemented many tools to collect traffic, weather and incident data, to process and verify all sources of information and to distribute information and alerts via different media, such as VMS (Variable Message Signs), FM 107.7 radio traffic, web sites and mobile internet, navigation systems, etc. Incident management, in particular handling of emergency calls either from mobile telephones and emergency call boxes, is part of the daily activity of SANEF.

Motorway in Northern France

Operation Centre in Senlis, France

Roles within SANEF

<table>
<thead>
<tr>
<th>User Role</th>
<th>Code</th>
<th>Description and Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management</td>
<td>SAN-MG</td>
<td>SANEF Management and member of SafeTRIP consortium</td>
</tr>
<tr>
<td>Operation Centre</td>
<td>SAN-OP</td>
<td>User who works in the operation centre and coordinates response to incidents</td>
</tr>
</tbody>
</table>

Table 14: Sanef – User Roles

Core Needs

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need</th>
<th>Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN401</td>
<td>SAF</td>
<td>Detection of events and incidents along the road network</td>
<td>User SAN-MG and SAN-OP would like to more data from the road network</td>
<td>DOP026</td>
</tr>
<tr>
<td>CN402</td>
<td>SAF</td>
<td>Hazardous Goods, Large Goods and Heavy Goods Vehicle Parking Service</td>
<td>User SAN-MG would like to assist these types of vehicles to find parking spots off the road network</td>
<td>DOP024</td>
</tr>
</tbody>
</table>

Table 15: Sanef – Core Needs

CN401 – Detection of Events and Incidents

The user monitors the state of the road network under its control. There are cameras and other sensor devices along the road network. However, due to the cost involved in installing and maintaining cameras and sensors, along the network, these are mostly concentrated around tunnels which are regulated by EU directives that SANEF has to implement. On other sections of the road network, the cameras are far apart. This means that there is currently insufficient coverage to detect incidents.
Given that SANEF has numerous patrol vehicles, these could be used as mobile sensors along the network to detect events and to provide additional live feeds to the operation centres. SANEF would also be interested in using data from individual vehicles to improve detection of events (status of wipers, fog lights, occurrence of abrupt braking) – this could be particularly beneficial since precise detection of weather conditions is very difficult.

**CN402 – Hazardous Goods, Large Goods and Heavy Goods Vehicle Parking Service**

The user is faced with problem that Heavy Goods Vehicles (HGVs) park on hard shoulders (above figure), creating a serious safety hazard to the traffic. There is a growing trend for trucks to park on hard shoulders, especially at night, and at lunch time, near major cities. A study conducted by the user has shown that drivers choose to park on the hard shoulder because of:

1. The need to stop due to regulations after a certain time
2. The lack of parking spaces
3. The concern regarding security of their vehicles and goods.
4. The lack of information with regards to available parking spaces.

To guide these vehicles to adequate parking spaces, the user would implement a system to monitor the availability of parking spaces and to relay this information to the HGVs. However, in order to reliably find a parking space, several factors need to be considered. These include the following:

a. Size of vehicle – unlike cars, HGVs can vary largely in dimensions (5-35m) and weight. Therefore, parking slots are not standard.
b. Cargo of vehicle – if the vehicle is carrying hazardous cargo, it needs to be parked in a safe zone in the parking area – away from coaches and other large vehicle with equally hazardous cargoes

Therefore, obtaining vehicle information on-the-fly in order to find an appropriate parking spot is essential. In addition, the availability of parking spaces varies, and the request for parking space needs to account for changes in real time.

Once a parking space has been identified and reserved for a particular vehicle, SANEF requires the driver to be guided to the parking space through the navigation aid.
**Should-Have Needs**

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHN401</td>
<td>SAF</td>
<td>Automatic detection of patrol vehicle activity</td>
<td>DOP026</td>
</tr>
<tr>
<td>SHN402</td>
<td>NAV</td>
<td>Provide traffic info about travel times to road users by using their position</td>
<td>DOP027</td>
</tr>
</tbody>
</table>

**SHN401 – Automatic detection of patrol vehicle activity**
When there is a road incident, the most appropriate patrol vehicle is sent to investigate and remedy the situation. In determining which vehicle to send, the user has to account for the location of the patrol vehicle (how close it is to the event) and what the current activity of the vehicle (if involved in an ongoing incident management on the road). This requires the driver of the vehicle to set the status showing the current activity. Experience from previous projects undertaken by the user shows that drivers do not report their activity through the new in-vehicle interface – mainly because existing paperwork to report the activity remains unchanged and, therefore, reporting their activity through the interface represents additional work and no benefit to the drivers. The user wants to use a combination of automatic detection of activity and reporting by the driver to determine status of vehicle activity.

**SHN402 – Provide traffic info about travel times to road users using their position**
The user wants to provide value-added information services to road users. Currently, traffic information is rather general and typically includes information about incidents on the road and traffic jams. The travel time can be calculated using loops and counters along the road network; however, it is not cost effective to use these where there is low traffic flow along long stretches of lightly-used motorway segments. Therefore, if vehicles could provide information about their location or speed along various segments, it will allow SAN-OP to model and predict traffic flows, and therefore compute travel times.

**Desirable Needs**

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>DN401</td>
<td>NAV</td>
<td>Send adaptive speed limits to individual drivers</td>
<td>DOP025</td>
</tr>
</tbody>
</table>

**DN401 – Send adaptive speed limits to individual users**
User SAN-MG would like to send adaptive speed limits to individual users. Statistics from the User show that reducing speed helps to reduce congestion and the number of incidents by as much as 33%. Currently adaptive speeds are displayed on Variable Message Signs (VMS). However, during incidents on the road network, more important message take priority and it is therefore not possible to display the speed anymore.
1.2. Stakeholders Needs

In this subsection, the stakeholder needs are described. Stakeholders represent all parties that would benefit from SafeTRIP. Subsection 1.2.1 represents the needs of individual EU citizens, whereas the needs of organisations and businesses not part of the SafeTRIP consortium are presented in subsection 1.2.2. The needs are classified as Core (CN), Should-Have (SHN) and Desirable (DN) Needs in decreasing order of importance.

1.2.1. Needs of Individuals

The needs of individual drivers have been captured through 21 semi-structured interviews, discussions and observations undertaken at partner-user sites. These are users of the European road network and include end-users of navigation solutions (e.g. Tomtom, In-Car), emergency solutions Virgile(MAIF) and Sygeo(MACIF).

**Core Needs**

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need</th>
<th>Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCN101</td>
<td>SAF</td>
<td>To know that communication link is available</td>
<td>To be reassured that there is a working communication link at all times – which can be used in emergency or for assistance</td>
<td>IPD014</td>
</tr>
<tr>
<td>SCN102</td>
<td>SAF</td>
<td>Need rescue service to know location in areas of no or bad sky visibility</td>
<td>Assistance when trapped at a location with no positioning coverage but communication options</td>
<td>IPD012</td>
</tr>
<tr>
<td>SCN103</td>
<td>SAF</td>
<td>Be able to call emergency services when outside the motorway on unfamiliar roads</td>
<td>Effective roadside assistance when travelling on unfamiliar roads in case of incidents</td>
<td>IPD015</td>
</tr>
<tr>
<td>SCN104</td>
<td>SEC</td>
<td>Need to have control over information transmitted by the car</td>
<td>To know what information is made available to others at any time. For instance, there are concerns that microphones and cameras installed for emergency response could be used for spying or by the ‘Big Brother’</td>
<td>IPD001</td>
</tr>
<tr>
<td>SCN105</td>
<td>SEC</td>
<td>Need to know what data &amp; what use</td>
<td>To know what information is being collected and retained and for what purpose. User needs assurance that these uses will be maintained and not extended e.g. by selling data to third parties</td>
<td>IPD001</td>
</tr>
<tr>
<td>SCN106</td>
<td>NAV</td>
<td>Fastest route under current traffic conditions</td>
<td>Route planning to compute fastest routes as a function of traffic conditions prevailing when the travel is taking place. The traffic condition could be collated from different sources</td>
<td>IPD002</td>
</tr>
<tr>
<td>SCN107</td>
<td>NAV</td>
<td>Route planning using traffic information from other NAV motorist</td>
<td>Route planning to take into account reported incidents – since some incidents can take time before being announced on the</td>
<td>IPD013</td>
</tr>
</tbody>
</table>
radio by the traffic news.

**SCN108** NAV Renting maps for short period of use

Current map updates and solutions are prohibitively expensive. A service that would allow rental and download of maps – on demand – would be highly desirable. Given the availability of free maps on the internet – the rental price needs to be minimal.

**SCN109** NAV Sharing information about road incidents with other drivers

To have a system similar to Coyotte where information about incidents can be shared with other drivers and the infrastructure

**SCN110** NAV Legislative Information

Route planning to account for the type of vehicle – LPG, trailer – because some tunnels, roads and parking lots do not allow LPG vehicles or trailers

Table 18: Individuals – Core Needs

**Should-Have Needs**

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need</th>
<th>Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSHN101</td>
<td>SAF</td>
<td>Need others to know the geographical location specially when travelling in remote and dangerous territories</td>
<td>In case of an attack or hijack/carjack, the police should be able to locate the vehicle</td>
<td>IPD002</td>
</tr>
<tr>
<td>SSHN102</td>
<td>NAV</td>
<td>Interesting Route</td>
<td>Route planning to include scenic regions – especially when going on a holiday trip</td>
<td>IPD001</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>IPD013</td>
</tr>
<tr>
<td>SSHN103</td>
<td>SAF</td>
<td>Route planning to account for weather conditions</td>
<td>Route planning to compute the least disruptive route based on prevailing weather conditions – to avoid for instance areas of snow, icing, heavy rain, etc</td>
<td>IPD013</td>
</tr>
<tr>
<td>SSHN104</td>
<td>NAV</td>
<td>Route planning to account for infrastructure</td>
<td>During adverse weather conditions, some areas do not have the necessary ability infrastructure with the problems. Route planning to avoid such areas when travelling at those times.</td>
<td>IPD013</td>
</tr>
<tr>
<td>SSHN105</td>
<td>NAV</td>
<td>Provide diversion information</td>
<td>Information about reason behind diversions to support an informed choice about whether to take the diversion e.g. time saving and the type of roads to be encountered</td>
<td>IPD020</td>
</tr>
<tr>
<td>SSHN106</td>
<td>NAV</td>
<td>Route planning to account for road type</td>
<td>Route planning to compute routes based on road type e.g. mainly motorways</td>
<td>IPD012</td>
</tr>
<tr>
<td>SSHN107</td>
<td>NAV</td>
<td>Localised Recommendations</td>
<td>To know about current interesting</td>
<td>IPD001</td>
</tr>
<tr>
<td>Ref No</td>
<td>Type</td>
<td>Need</td>
<td>Description and Comments</td>
<td>Src Ref</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
<td>------</td>
<td>---------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>SSHN108</td>
<td>NAV</td>
<td>Affordable hotels and restaurant</td>
<td>Affordable hotels and restaurant to be included into the POI function – not only expensive hotels and chains. This should be accompanied by price indications as well.</td>
<td>IPD002</td>
</tr>
<tr>
<td>SSHN109</td>
<td>NAV</td>
<td>Cost implication of rerouting</td>
<td>To know if additional costs will be incurred when going off the motorway in order to access an alternative route or a POI</td>
<td>IPD002, IPD014</td>
</tr>
<tr>
<td>SSHN110</td>
<td>CMF</td>
<td>Access to TV Channels</td>
<td>To access specific TV programs such as cartoons for the kids on an on-demand mode</td>
<td>IPD014</td>
</tr>
<tr>
<td>SSHN111</td>
<td>CMF</td>
<td>Access to local radios</td>
<td>To access radio stations from a particular country of origin for news and entertainment rather than local radio in foreign language</td>
<td>IPD001</td>
</tr>
<tr>
<td>SSHN112</td>
<td>SEC</td>
<td>Anonymization and short retention</td>
<td>Prefer data to be anonymous and destroyed quickly after it was used</td>
<td>IPD020</td>
</tr>
<tr>
<td>SSHN113</td>
<td>SEC</td>
<td>Security</td>
<td>To know the data is being kept securely i.e. protected from breaches by hackers etc</td>
<td>IPD012</td>
</tr>
<tr>
<td>SSHN114</td>
<td>SEC</td>
<td>Consent</td>
<td>Opportunity to consent to the general collection/retention of data</td>
<td>IPD012</td>
</tr>
</tbody>
</table>

**Table 19: Individuals – Should-Have Needs**

### Desirable Needs

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need</th>
<th>Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDN101</td>
<td>SAF</td>
<td>Share information about illegal activities or threats on the road</td>
<td>Ability to inform police about suspicious or illegal activities taking place on the road or at stops (e.g. petrol stations)</td>
<td>IPD002</td>
</tr>
<tr>
<td>SDN102</td>
<td>SAF</td>
<td>Motorcyclists are at greater risk to have accidents or fall off the bike</td>
<td>Locate motorcyclists after accident (they often end up off the road and can be quite difficult to locate and may take a long time before they are found). Also as they are more vulnerable with serious injuries, user would like to have this system on the motorbike.</td>
<td>IPD015</td>
</tr>
<tr>
<td>SDN103</td>
<td>SEC</td>
<td>Need to remain untracked</td>
<td>Geographical position not to be known at all times</td>
<td>IPD001</td>
</tr>
<tr>
<td>SDN104</td>
<td>ENV</td>
<td>Current information regarding petrol &amp; CO2 &amp; actions that could currently reduce petrol/CO2</td>
<td>To know how much petrol &amp; CO2 are currently being consumed/emitted. They would also like advice concerning what actions to take to reduce petrol/CO2 e.g. gear</td>
<td>IP012</td>
</tr>
<tr>
<td>SDN105</td>
<td>ENV</td>
<td>Summary information on petrol/CO2 at the end of journeys</td>
<td>To have a summary at the end of each journey showing how much petrol has been consumed &amp; CO2 emitted plus advice about how the petrol/CO2 could be further reduced in future</td>
<td>IP012</td>
</tr>
<tr>
<td>--------</td>
<td>-----</td>
<td>----------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>SDN106</td>
<td>ENV</td>
<td>Route planning information that includes petrol/CO2 information</td>
<td>To have information about the estimated petrol consumption associated with alternative routes.</td>
<td>IP020</td>
</tr>
<tr>
<td>SDN107</td>
<td>NAV</td>
<td>Comfortable route</td>
<td>Route planning to suggest routes with a minimal number of roundabouts and bends due to the medical condition of passengers.</td>
<td>IPD017</td>
</tr>
<tr>
<td>SDN108</td>
<td>NAV</td>
<td>On demand only</td>
<td>An easy way to initiate request for information</td>
<td>IPD001</td>
</tr>
<tr>
<td>SDN109</td>
<td>NAV</td>
<td>Provide overviews</td>
<td>To see overviews of his current position and the route at the start of journeys and during journeys</td>
<td>IPD012</td>
</tr>
<tr>
<td>SDN110</td>
<td>CMF</td>
<td>Internet Access</td>
<td>Have cheap internet access when on the move.</td>
<td>IPD001</td>
</tr>
<tr>
<td>SDN111</td>
<td>NAV</td>
<td>Route planning to include ferry transportation</td>
<td>Route planning to take into account ferry timings when suggesting routes to minimise wait time at ferry ports</td>
<td>IPD002, IPD014</td>
</tr>
</tbody>
</table>

**Table 20 : Individuals – Desirable Needs**
1.2.2. NEEDS OF ORGANISATIONS AND BUSINESSES

1.2.2.1. USERS OF EAST-WEST TRANSPORT CORRIDORS WITH EU BORDER CROSSING

The European Border Crossing

Every year over 10 million vehicles cross part of the East European land border (EU border with Russia, Belarus and Ukraine) as shown in Figure 2: East European land border. These include passenger vehicle, coaches and heavy goods vehicles.

The busiest corridors are Corridors No. 1, No. 2 and No. 3 which serves a total volume of over 7 million vehicles yearly. The goods vehicles go through Germany and Poland which are European transit countries and therefore have to cross the European border.
These corridors are the main supply link by land for Europe for raw material coming from Russia and Asia. They are also important for individuals who travel to Europe from the East by land.
## Border Crossings

### Poland-Ukraine

<table>
<thead>
<tr>
<th>Polish name</th>
<th>Ukrainian name</th>
<th>People</th>
<th>Goods</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dorohusk</td>
<td>Jahodyn</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Hrebenne</td>
<td>Rawa Ruska</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Korczowa</td>
<td>Krakowiec</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Krościenko</td>
<td>Stariawa</td>
<td>✔️</td>
<td>✔️</td>
<td>Vehicles up to 7.5t</td>
</tr>
<tr>
<td>Medyka</td>
<td>Szeginie</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Zosin</td>
<td>Uścigł</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Planned**

- Budomierz Hruszew Under construction
- Dolhopyczów Uhrynów Started in 2008
- Malhowice Niżankowice Started in 2009
- Smolnik Boberka Started in 2010
- Kryłów Krecziw Will be finished in 2020

### Poland-Belarus

<table>
<thead>
<tr>
<th>Polish name</th>
<th>Ukrainian name</th>
<th>People</th>
<th>Goods</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Białowieża</td>
<td>Piererow</td>
<td>✔️</td>
<td></td>
<td>On foot and cycle, open during daytime</td>
</tr>
<tr>
<td>Bobrowniki</td>
<td>Brzestowica</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Kukuryki</td>
<td>Kozłowicze</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kuźnica</td>
<td>Brużgi</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Połowce</td>
<td>Pieszczatka</td>
<td>✔️</td>
<td>✔️</td>
<td>Only for Polish and Belarusian citizens</td>
</tr>
<tr>
<td>Sławatycze</td>
<td>Domaczewo</td>
<td>✔️</td>
<td></td>
<td>Excluding coaches</td>
</tr>
<tr>
<td>Terespol</td>
<td>Brześć</td>
<td>✔️</td>
<td>✔️</td>
<td>Vehicles up to 3.5t</td>
</tr>
</tbody>
</table>

**Planned**

- Lipszczany Sofijewo
- Chworościany Dubnica
- Włodawa Tomaszówka Under construction

### Poland-Russia

<table>
<thead>
<tr>
<th>Polish name</th>
<th>Ukrainian name</th>
<th>People</th>
<th>Goods</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bezledy</td>
<td>Bagrationowsk</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>Gołdap</td>
<td>Gusiew</td>
<td>✔️</td>
<td>✔️</td>
<td>Vehicles up to 7.5t</td>
</tr>
<tr>
<td>Gronowo</td>
<td>Mamonowo</td>
<td>✔️</td>
<td>✔️</td>
<td>People – all citizens Goods – Polish and Russian citizen Vehicles up to 6t</td>
</tr>
</tbody>
</table>

**Planned**

- Grzechotki Mamonowo
- Perły Kryłowo
- Piaski Bałtsijk
- Rapa Oziersk
The Characteristics and Issues of the East-West Corridors

The East-West corridors (No. 1, 2 and 3) differ from other European transport corridors in the following ways.

1. Users of East-West corridors must cross the EU border and fulfil all conditions laid out by the Schengen Agreement
2. There is thorough verification of individuals' identity
3. These corridors are closely monitored by the police and custom services – due to the likelihood of smuggling activities, illegal border crossing, human trafficking etc.
4. Though the Schengen Agreement was introduced in 2008, it has not been fully implemented at all the border-crossings. As a result, the number of border-crossings is limited and far apart with an average distance of 100 km in between crossings.

The Problem

As a result of the

a. high volume of traffic (10 million yearly)
b. limited number of operational border crossings
c. lengthy procedures for Schengen agreement at the border crossings
d. lack of information about the queues and traffic jams at the border crossings

Long queues build up at the border crossings and can extend up to 10km in length with a waiting time of up to 48 hours.

In order to address this issue, we have initiated discussions with the following companies:

Business Company
Freight Forwarder Eurogate, Van der Wal Poland
Transportation ExpressLogic
Passenger Transport Operator ORBIS Travel Warsaw

Profiles

Eurogate, a member of Eurogate Freight Group, is a freight forwarder focusing its operations along the European transport corridors (No. 1, 2 and 3). It deals with a wide range of vehicles including refrigerated trucks, isotherms, and tankers.

ORBIS Travel Warsaw is the largest travel company in Poland. It has its own fleet of coaches.

ExpressLogic is a transport company with 100 Cargo vehicles, 14 of which are equipped with Dynafleet system. Due to the high cost of this system, ExpressLogic has not equipped the other vehicles with this system.

Van der Wal Poland, is a transport company operating along the Asian corridors from Russia, Azerbaijan and Kazakhstan. It is currently using the TRANSICS system, which has GPS tracking and uses GPRS for communication.

\footnote{Volvo Dynafleet is a transport information system for tracking, information management}
### Core Needs

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need</th>
<th>Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCN201</td>
<td>SAF</td>
<td>Track the vehicle</td>
<td>To know the exact geographical position of the vehicle</td>
<td>DOP034, DOP035, DOP036, DOP037</td>
</tr>
<tr>
<td>SCN202</td>
<td>NAV</td>
<td>Fastest route through border crossings</td>
<td>The route planning to account for current traffic condition at each border crossing point</td>
<td>DOP034, DOP036, DOP037</td>
</tr>
</tbody>
</table>

**SCN201 – Track the Vehicle**

By tracking the movement of the vehicle, it would be possible to

1. Anticipate need for assistance, when vehicle crosses through known dangerous areas or accident hot-spots
2. Provide assistance in case of accidents or breakdown
3. Improve reliability of freight delivery by rescheduling deliveries if vehicle is held up at border crossing

**SCN202 – Fastest Route through Border Crossing**

The drivers would like to be able to plan the fastest route through the border crossings. This will require information about the traffic conditions at the border crossings and on each of the corridors (1, 2 and 3). This would help towards

1. Minimizing the time to deliver goods as in some cases, it would be better to go to an alternative border crossing instead of wasting several hours waiting in a queue
2. Increasing the drivers comfort – vehicles are sometimes held up to 48 hours at a border crossing.

### Should-Have Needs

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need</th>
<th>Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSHN201</td>
<td>SAF</td>
<td>Contact with driver</td>
<td>To have a reliable audio communication link with the driver</td>
<td>DOP034, DOP035, DOP036, DOP037</td>
</tr>
<tr>
<td>SSHN202</td>
<td>SAF</td>
<td>Request for assistance</td>
<td>To reroute vehicle in order to assist another vehicle</td>
<td>DOP034, DOP036, DOP037</td>
</tr>
<tr>
<td>SSHN203</td>
<td>NAV</td>
<td>Send traffic information to vehicle</td>
<td>Operation centre to send traffic information and route changes to vehicle</td>
<td>DOP034, DOP036, DOP037</td>
</tr>
<tr>
<td>SSHN204</td>
<td>CMF</td>
<td>Information about the current position of the vehicle</td>
<td>To present information about the location of the vehicle to passengers</td>
<td>DOP035</td>
</tr>
</tbody>
</table>

**SSHN201 – Contact with Driver**

It is important to have a reliable audio communication link with the driver to handle emergency situations (e.g. accidents). The mobile phones used by the drivers are affected by the lack of mobile phone coverage – especially in regions outside the EU and are subject to high roaming charges.
SSHN202 - Request for Assistance
In case of accident or breakdown of a vehicle, operation centre may request another vehicle travelling in that region to offer assistance. Information about the geographical position of the stranded vehicle along with details of the incident can then be relayed to the 'rescue' vehicle.

SSHN203 - Send Traffic Information to Vehicle
The operation centre would like to be able to inform a driver about potential problems along the route due to road works and accidents.

SSHN204 – Information about the Current Position of the Vehicle
Coach companies would like to provide information about the current location of the coach to passengers at all stages of the journey. The trips typically last several hours and passengers are keen to know about the cities and regions that they are crossing. In addition, tourist information about the stops and destination can be shown to the passengers.

Desirable Needs

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Need</th>
<th>Description and Comments</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDN204</td>
<td>SAF</td>
<td>Access to vehicle information</td>
<td>The operation centre requires access to vehicle information</td>
<td>DOP034</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DOP036</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>DOP037</td>
</tr>
</tbody>
</table>

SDN204 – Access to vehicle information
The operation centre would like access to information about the state of the vehicle, such as speed, fuel usage, etc. The information can be monitored for unexpected changes and help in informing the driver in advance of a pending dysfunction.
1.3. Functional Requirements

In this section, the Partner-User Needs (1.1) and Stakeholders Needs (1.2) are aggregated and mapped onto functional requirements. The importance of the requirement can be determined by the Partner-User Needs and the Stakeholder Needs references.

Importance of the Partner-User Needs are in the following order - CN (Core Need), SHN (Should Have Needs), DN (Desirable Needs) – from highest to lowest importance. For the definition of these terms, please refer to subsection 1.1. The functional requirements have been classified using the MoSCoW prioritisation technique to reflect the importance of each requirement from the SafeTRIP project perspective - with focus on Safety (SAF) related needs.

<table>
<thead>
<tr>
<th>Letter</th>
<th>Meaning</th>
<th>Classification Rationale - Minimum Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>MUST have this</td>
<td>If it results from any of the following&lt;br&gt;1. At least 1 Core (CN) partner-user need or stakeholder which is a SAF&lt;br&gt;2. Several Core partner-user and stakeholder needs of any type</td>
</tr>
<tr>
<td>S</td>
<td>SHOULD have this if at all possible</td>
<td>If it results from any of the following&lt;br&gt;1. At least 1 Should-Have (SHN) partner-user need which is a SAF or 1 Core stakeholder need&lt;br&gt;2. Several partner-user and stakeholder needs</td>
</tr>
<tr>
<td>C</td>
<td>COULD have this if it does not affect anything else</td>
<td>If it results from&lt;br&gt;1. At least 1 Desirable (DN) partner-user need which is a SAF&lt;br&gt;2. At least 1 Should-Have stakeholder need</td>
</tr>
<tr>
<td>W</td>
<td>WOULD have this in future, but not required at the moment</td>
<td>If it results only from Desirable needs of partner-user and stakeholders</td>
</tr>
</tbody>
</table>

Table 21 : Functional Requirements - Criteria for Prioritisation
### Must have

<table>
<thead>
<tr>
<th>Ref</th>
<th>Partner User Needs Ref</th>
<th>Stakeholder Needs Ref</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>FNM01</td>
<td>CN301 SHN101</td>
<td>SCN101 SSHN201</td>
<td>Provision for resilient communication link with high territorial coverage – supported by fallback and alternative data and voice communication channels – coupled with clear indication of availability of channel</td>
</tr>
<tr>
<td>FNM02</td>
<td>CN101 CN204 SHN402 DN204</td>
<td>SSHN101 SCN201</td>
<td>Detect and send geographical location of vehicle in real-time to infrastructure</td>
</tr>
<tr>
<td>FNM03</td>
<td>CN201 SHN102 SHN303 DN401</td>
<td>SSHN105 SSHN203</td>
<td>Ability to receive traffic information from road operators and other services in the vehicle from infrastructure</td>
</tr>
<tr>
<td>FNM04</td>
<td>CN104 SHN205</td>
<td>SCN103</td>
<td>Emergency call button accessible to driver to request for assistance (not limited to road incidents) – with fully configurable routing of emergency call</td>
</tr>
<tr>
<td>FNM05</td>
<td>CN203 CN302 CN401</td>
<td>SDN204</td>
<td>Support for peripheral sensors (e.g. camera, camcorder) in vehicle and ability to stream information from those in real-time to infrastructure – both in push and pull mode</td>
</tr>
<tr>
<td>FNM06</td>
<td>CN302 CN401</td>
<td></td>
<td>Interoperability with CAN bus of the vehicle to capture in-car sensor data (e.g. braking, fuel level, damages) in vehicle and send when required</td>
</tr>
<tr>
<td>FNM07</td>
<td>CN306 CN402 SHN203 SHN401</td>
<td></td>
<td>Capture vehicle information (such as dimensions, type, goods transported, etc) and send to infrastructure</td>
</tr>
<tr>
<td>FNM08</td>
<td>CN103 CN306</td>
<td>SCN110</td>
<td>Support for handing legislative information (to be used by navigation application) concerning vehicle for route planning based on the type of vehicle (e.g. LPG, trailer, etc) as well as dimensions allowed over certain roads, bridges, tunnels, etc</td>
</tr>
<tr>
<td>FNM09</td>
<td>CN205 SHN105 SHN204</td>
<td></td>
<td>Support playback of multi-lingual messages to driver in audio</td>
</tr>
<tr>
<td>FNM10</td>
<td>CN102 DN302</td>
<td></td>
<td>Detect or record the current occupants in the vehicle. The detection mechanism will need to be adapted to current work processes and practices of the organisation to minimise disruption.</td>
</tr>
<tr>
<td>Ref</td>
<td>Partner Needs Ref</td>
<td>Stakeholder Needs Ref</td>
<td>Functionality</td>
</tr>
<tr>
<td>-------</td>
<td>-------------------</td>
<td>-----------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>FNM11</td>
<td>CN402</td>
<td></td>
<td>Support for guidance to a reserved parking place (to be used in navigation application) – especially for hazardous goods vehicles</td>
</tr>
<tr>
<td>FNM12</td>
<td>CN103</td>
<td></td>
<td>Provide vehicle dimensions to be used by navigation application in order to compute route suitable for vehicle of particular dimensions</td>
</tr>
<tr>
<td>FNM13</td>
<td>SCN102</td>
<td></td>
<td>Store GPS trail to allow computation of last known location when communication or tracking has failed</td>
</tr>
</tbody>
</table>

**Table 22: Functional Requirements – Must Have**

**Should have**

<table>
<thead>
<tr>
<th>Ref</th>
<th>Partner Needs Ref</th>
<th>Stakeholder Needs Ref</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>FNS01</td>
<td>CN202</td>
<td>SHN202</td>
<td>Receive information (including traffic information) based on geographical location, priority of message, type of vehicle and status of subscription to traffic info service</td>
</tr>
<tr>
<td>FNS02</td>
<td>CN307</td>
<td>SCN107, SDN101</td>
<td>Provide mechanism to allow drivers to report and share information about unexpected incidents on the road such as accidents with other drivers, illegal activities, threats</td>
</tr>
<tr>
<td>FNS03</td>
<td></td>
<td>SCN106, SCN202</td>
<td>Retrieve current real-time traffic information to be used in computation of fastest route based. This information can be sourced from individuals or from the infrastructure.</td>
</tr>
<tr>
<td>FNS04</td>
<td>SHN302, DN202, DN303</td>
<td></td>
<td>Monitor driver behaviour to detect lack of attention or distraction, tiredness (e.g. if vehicle is moving in and out of lane), influence of alcohol or other substances</td>
</tr>
<tr>
<td>FNS05</td>
<td>SHN301, DN202</td>
<td></td>
<td>Monitor driving style of driver to detect aggressive or risky behaviour over entire journeys</td>
</tr>
<tr>
<td>FNS06</td>
<td>SHN102</td>
<td></td>
<td>Support acknowledgement of messages by driver to ensure they are read</td>
</tr>
<tr>
<td>FNS07</td>
<td>SHN204</td>
<td>SSHN202</td>
<td>Support data and voice communication with driver</td>
</tr>
<tr>
<td>FNS08</td>
<td>DN101, DN301</td>
<td>SSHN110, SSHN111</td>
<td>Receive TV and Radio channels in the vehicle</td>
</tr>
<tr>
<td>FNS09</td>
<td>SCN107, SCN109</td>
<td></td>
<td>Support sharing of data from vehicle to vehicle directly or through infrastructure</td>
</tr>
<tr>
<td>FNS10</td>
<td>SHN106, SHN304</td>
<td></td>
<td>Green-Box to support communication with mobile devices in the vehicle through Bluetooth or WiFi for interoperability</td>
</tr>
</tbody>
</table>
### Table 23: Functional Requirements – Should Have

<table>
<thead>
<tr>
<th>Ref</th>
<th>Partner Needs Ref</th>
<th>Stakeholder Needs Ref</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>FNS11</td>
<td>CN304</td>
<td>SCN108</td>
<td>Support download and update of navigation map data</td>
</tr>
<tr>
<td>FNS12</td>
<td>SSHN103</td>
<td></td>
<td>Retrieve weather conditions prevailing in certain areas to allow computation of route that avoids snow, torrential rain or flooding for instance in the navigation application</td>
</tr>
<tr>
<td>FNS13</td>
<td>SHN104</td>
<td></td>
<td>Support playback of messages to driver in audio</td>
</tr>
<tr>
<td>FNS14</td>
<td>SHN103</td>
<td></td>
<td>Display messages to occupants of the vehicle – this could be remotely initiated by infrastructure or by the driver</td>
</tr>
<tr>
<td>FNS15</td>
<td>CN305</td>
<td>SSHN108</td>
<td>Support for Point of Interest augmented with hyperlink and additional contextual data</td>
</tr>
<tr>
<td>FNS16</td>
<td>SHN203</td>
<td>SCN104</td>
<td>Support capture of driver information and transmission of such information to infrastructure on demand</td>
</tr>
<tr>
<td></td>
<td>DN302</td>
<td>SSHN112 SSHN113 SSHN114</td>
<td></td>
</tr>
</tbody>
</table>

### Could have

<table>
<thead>
<tr>
<th>Ref</th>
<th>Partner Needs Ref</th>
<th>Stakeholder Needs Ref</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>FNC01</td>
<td></td>
<td>SSHN102</td>
<td>Retrieve tourist information to allow navigation application to compute scenic route</td>
</tr>
<tr>
<td>FNC02</td>
<td></td>
<td>SSHN104</td>
<td>Retrieve information about infrastructure and facilities available in certain areas (e.g. recreational facilities, service stations, ability to deal with adverse weather – (road operators with snow ploughs), rural vs. urban crossings) to allow computation of adequate route by navigation application</td>
</tr>
<tr>
<td>FNC03</td>
<td></td>
<td>SSHN109</td>
<td>Access prices for toll gates and transition from motorway to regular roads to allow computation of financial cost of rerouting</td>
</tr>
<tr>
<td>FNC04</td>
<td></td>
<td>SSHN201</td>
<td>Functionality to receive other types of non-traffic related information</td>
</tr>
<tr>
<td>FNC05</td>
<td></td>
<td>SSHN204</td>
<td>Display vehicle geographical position to the occupants of the vehicle on a map</td>
</tr>
<tr>
<td>FNC06</td>
<td></td>
<td>SSHN107</td>
<td>Support for dynamic Point of Interests based on database of current events in a geographical region</td>
</tr>
<tr>
<td>FNC07</td>
<td></td>
<td>DN201</td>
<td>Monitor distance driven in vehicle without stopping –</td>
</tr>
</tbody>
</table>
sustainable interoperability with current digital tachometers

<table>
<thead>
<tr>
<th>Ref</th>
<th>Partner Needs Ref</th>
<th>Stakeholder Needs Ref</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>FNC08</td>
<td>SDN102 support</td>
<td></td>
<td>Support for interoperability and installation on Motorbikes who are at high risk to have accidents</td>
</tr>
</tbody>
</table>

Table 24: Functional Requirements – Could Have

Would have

<table>
<thead>
<tr>
<th>Ref</th>
<th>Partner Needs Ref</th>
<th>Stakeholder Needs Ref</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>FNW01</td>
<td>DN203 support</td>
<td></td>
<td>Support for a nomadic handset for voice communication when driver is outside vehicle</td>
</tr>
<tr>
<td>FNW02</td>
<td>DN102 availability</td>
<td>SDN110 availability</td>
<td>Availability of internet access in the vehicle – accessible from mobile devices such as laptops and game consoles</td>
</tr>
<tr>
<td>FNW03</td>
<td>SDN107 navigation</td>
<td></td>
<td>Navigation application to compute comfortable route with fewer roundabouts, or traffic lights, or intersections/crossing of cities</td>
</tr>
<tr>
<td>FNW04</td>
<td>SDN111 access</td>
<td></td>
<td>Access to information about multimodal transportation (e.g. the use of ferry not related to road network) to support computation of route which involves such transport modes</td>
</tr>
<tr>
<td>FNW05</td>
<td>SDN103 function</td>
<td></td>
<td>Functionality to allow user to turn on or off tracking of vehicle</td>
</tr>
<tr>
<td>FNW06</td>
<td>SDN108 support</td>
<td></td>
<td>Support retrieval of dynamic Point of Interests on demand and not automated</td>
</tr>
<tr>
<td>FNW07</td>
<td>SDN104 summary</td>
<td>SDN105 summary</td>
<td>Provide live information regarding CO2 (emissions, summary) with information of how it can be reduced through a change in driving style</td>
</tr>
<tr>
<td>FNW08</td>
<td>SDN106 navigation</td>
<td></td>
<td>Navigation application to present CO2 emission values for each alternative routes to a destination</td>
</tr>
</tbody>
</table>

Table 25: Functional Requirements – Would Have
Guidelines and Insights

1. FNM02 vs. FNW05 - Control over Vehicle Tracking
For fleet management and tracking of hazardous goods vehicles, the tracking functionality should be protected from tampering by the driver. It is required that tracking is always enabled in such vehicles. However, for individuals, the option to switch off tracking should be made available due to security concerns expressed.

2. FNS05 - Driving Behaviour
FNS05 (“Monitor driving style of driver to detect aggressive or risky behaviour over entire journeys”) promotes road safety and is a core need expressed by partner-users. However, interviews with drivers show opposition and reluctance towards driving behaviour to be monitored. The main concerns are as follows:
   a. The use of the information e.g. negative impact on insurance premium
   b. Misinterpretation of information due to lack of context – for e.g. a sudden direction change to avoid collision with another vehicle or a careless pedestrian could be interpreted as bad driving behaviour
It is recommended therefore that this functionality is made optional for individual drivers. It has been proposed that financial incentives will be used (by insurance providers for e.g.) to incentivise them to opt in. Whereas, this function should not be optional for vehicles that are part of a fleet or are carrying hazardous cargo.

3. FNM13 – Retention of GPS Trail
While the GPS trail functionality is essential for the stolen-vehicle recovery service and the tracking of fleet as well as hazardous goods vehicle, it raises security concerns amongst individuals about access and the usage of the GPS trail.
It is recommended that for individuals’ vehicle, the GPS trail function is only enabled upon activation of the stolen-vehicle service.

4. FNS07 - Communication with the driver
In fleet management scenarios (e.g. involving road operators and patrol vehicles, control centres and trucks/coaches), effective and efficient information exchange can be achieved in most cases by the use of data communication. However, professional drivers favour voice communication to feel connected to other people given the long hours spent in isolation.

5. FNW07 and FNW08 – CO2 values
CO2 values on their own have little significance for drivers from their perspective (based on our interviews). CO2 values need to be linked with financial savings to become a motivating factor for individuals to change their driving behaviour in order to promote eco-driving.

6. Navigation Functionalities
It is recommended that the SafeTRIP platform should provide the necessary support for innovative functionalities identified (e.g. FNM08, FNW03) to navigation applications – implemented within SafeTRIP or provided by third parties.
With the emergence and increased availability of free navigation applications on smart phones (e.g. Nokia OVI Maps) with free maps and updates, it is desirable for the SafeTRIP platform to consider interoperability with such devices and applications, rather than competing with them.
1.4. Experience in Deploying Green Box like Systems

SafeTRIP consortium has members with expertise in developing and fitting on-board units (OBUs). Some OBUs were for the purposes of emergency services. The following is a list of system recommendations based on expertise acquired, including the VCall project (Section 2.2.15).

1.4.1. ON-BOARD UNITS (OBUS)

The following sections list the important aspects to be considered for the design, implementation, installation and support for the Green Box.

1.4.1.1. POWER SUPPLY

Depending on the design of the Green Box, there is need for a permanent 12V feed and/or 12V after ignition.

- **12V permanent feed**  If the Green Box has anti-theft, car surveillance and tracking functionalities
- **12V after ignition**  Based on the use of the Green Box

It is important to have an understanding of the electrical system in the car for installation purposes. Some car manufacturers (e.g. BMW and Audi) do not provide power supply on certain parts of the electrical circuit of the car. Detailed knowledge about the electrical system for each car is required in order to connect the Green Box at the correct point in the circuit. The anti-theft product Cobra (partner with BMW France) has been designed according to specific requirements and is installed in BMW garages. BMW has laid out specific installation procedures for each model of its cars.

1.4.1.2. POWER CONSUMPTION

Equally important is the power consumption of the Green Box, especially when the car’s engine is switched off. This is for the following reasons

- The risk of completely discharging the battery
- In BMW cars and on some models of Audi, the on-board car computer switches off the electrical supply in the car, if it detects power consumption by electrical systems in the car greater than 10mA when the engine is turned off. Therefore, the Green Box design should consider this restriction on the power consumption to work on those models.

As from 2013, with the uptake of electrical vehicles, these issues will become more salient and have to be addressed. In addition, it is currently unclear what will be the state (live or off) of the electrical system of such cars during the charging phase of the car batteries.

1.4.1.3. OBU SIZE

The OBU size needs to be small enough to facilitate its installation. Currently, the VCall box from IMA could be too large to fit into some cars (e.g. Mini). One approach would be to design the box in a modular fashion so that it can be fitted easily. This issue is particularly important for installation in cars – and may not be an issue for larger vehicles such as coaches, trucks and vans.

1.4.1.4. SATELLITE ANTENNA INSTALLATION

It is likely that the satellite antenna will have to be installed on the roof of the car to maximise signal reception. However, this requires a wire to run through the roof of the vehicle to connect the antenna to the OBU. In many cars, it is not possible to run a wire in the car roof due to space constraints and to the way in which the interior of the car is designed around the roof area – in addition the drilling of the car roof is not a trivial matter.
1.4.1.5. ACCELEROMETER
The accelerometer is the most important sensor for the implementation of the emergency call functionality. In order to ensure the proper functioning of the Green Box, the following will be required based on experience from VCall
- A reliable and robust installation of the accelerometer to the chassis of the vehicle
- Support for remote configuration of the accelerometer and of the criteria for triggering the emergency call

1.4.1.6. REMOTE MAINTENANCE AND UPDATE
The Green Box should support the facility to remotely run diagnostics and control the operation of certain sensors and peripherals, effectively allowing for repairs to be done remotely. This would also allow for updates to be sent into the OBU, using a push-model, when there is a new release of the software components for a particular model or category of vehicle.

1.4.1.7. AESTHETICS
Preservation of the car’s aesthetics is one of the key elements to the acceptance of the Green Box. This is applicable to the wiring, the positioning of the user interface and the interaction screen itself (if there is one). For instance, the wiring in Figure 6: Aesthetics of installation may not be acceptable to all users.

![Figure 6: Aesthetics of installation](image)

1.4.1.8. NETWORK OF INSTALLERS
A network of approved installers of the Green Box would be desirable in order to ensure the correct installation procedure is followed. This requires the selection and training of installers. In particular, the installation of the accelerometer (which is central to the emergency functionality as described earlier) should be flawless so as to guarantee the expected functionality of the Green Box, and it is essential to demonstrate to the customer that the installation was successful by carrying out a series of functionality tests with the customer.

1.4.1.9. COST OF THE GREEN BOX
The cost of installation should be maintained low in order to appeal to individuals. In France, the cost of installation (without VAT) in 2010 is estimated to be around

- € 50-60 Simple OBU (only the electrical wiring)
- € 100-120 Complex OBU (e.g. VCall)
- € 150-250 Complex OBU (Green Box) and satellite antenna

The installation cost has shown to be one of the hurdles for the adoption of VCall according to market research carried out by IMA and MAIF.
1.4.1.10. **ACCOUNTING FOR VEHICLE STATE**
If the Green Box is programmed to respond to failure of the main power source in a particular way (for instance, assuming that the car is being stolen), it needs to account for situations where the power source is disconnected for a genuine reason – for e.g. when the car is being repaired. Thus the green box should not trigger an alarm or emergency call in such situations.

1.4.1.11. **TAILORING THE GREEN BOX**
The Green Box needs to be designed to be customisable so that it does not offer services that are already in the car. For example, if the car is equipped with in-car navigation from the car manufacturer, it would make sense to offer a Green Box without the navigation module to the user.

1.4.2. **INSIGHTS**

<table>
<thead>
<tr>
<th>Ref</th>
<th>Description</th>
<th>Detail</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEIS001</td>
<td>Request for assistance by mistake</td>
<td>A large number of calls are initiated by mistake or children in the vehicle. Operators initiate conversation and propose to send the rescue services if there is no response</td>
<td>IPD008</td>
</tr>
<tr>
<td>PEIS002</td>
<td>Emergency operators may not be able to handle gruesome scenes in case of incidents</td>
<td>Proposal to use video link in case of emergency should account for the fact that operators of the platform may be disturbed by scene in vehicle. Suggested approach to have a video feed URL that can be sent to emergency services on request.</td>
<td>IPD010</td>
</tr>
<tr>
<td>PEIS003</td>
<td>Assistance and emergency calls are routed to country of origin rather than current country</td>
<td>By sending calls to operation centre in country of origin, language problems are eliminated. Subsequently, calls are initiated by the operation centre to current countries’ operation centre to liaise with emergency and rescue services This is one of VCall’s major advantage over eCall</td>
<td>DOP019</td>
</tr>
</tbody>
</table>

**Table 26 : Previous Experience - Insights**

1.4.3. **USER INTERFACE**

<table>
<thead>
<tr>
<th>Ref</th>
<th>Description</th>
<th>Detail</th>
<th>Src Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEUI001</td>
<td>The system should have a core 'button-based' interface</td>
<td>Users need a simple 'button-based' interface to call for SOS and emergency without visualisation</td>
<td>DOP020</td>
</tr>
<tr>
<td>PEUI002</td>
<td>The system should support an optional visualisation and interaction screen</td>
<td>Users may opt to use navigation and other feature of the system and have an additional screen connected to the system</td>
<td>DOP020</td>
</tr>
<tr>
<td>PEUI003</td>
<td>The interface should be designed and placed to be accessible by both drivers and passengers</td>
<td>In case of accident or emergency, the driver may not be in a position to use the interface. Passengers should have clear access to the interface as well</td>
<td>DOP019  DOP020</td>
</tr>
</tbody>
</table>

**Table 27 : Previous Experience – User Interface**
1.5. Summary

This section presented the User Needs for the SafeTRIP platform. Each need has been classified as Core, Should-Have and Desirable Needs reflecting its importance. In Subsection 1.1, the partner-user needs for Eurolines, Abertis/Acesa, IMA/MAIF/MACIF and Sanef have been described. Their Core Needs reflect the motivation behind their involvement in SafeTRIP and have been given great consideration when formulating the functional requirements.

The following is a list of most common and important needs expressed by partner-users:
1. To reliably retrieve the geographical location of the vehicle (for providing assistance or tracking vehicles (e.g. hazardous goods vehicle, coaches))
2. To have access to information about the vehicle including passenger information, cargo carried (if any), vehicle specifics (dimensions, type) and car sensors
3. To have a reliable communication link with the vehicle for voice and data transfer

In Subsection 1.2, the stakeholder needs are discussed. The needs of individuals are presented in 1.2.1, and have been captured through interviews and discussions. This is followed by the needs of organisations and businesses likely to benefit from the SafeTRIP platform in 1.2.2.

The following is a list of most common and important needs expressed by individuals:
1. To have an always-available communication link for requesting assistance for any kind of emergency (including medical, road assistance, accident) and subsequent communication
2. To receive relevant, useful and timely traffic information in the vehicle
3. To have a navigation application that plans routes to account for
   a. Current traffic conditions
   b. Adverse weather and road conditions
   c. Costs (toll charges)
   d. Services available along the route

The most important needs of businesses and organisations outside the SafeTRIP consortium, according to our initial findings, largely overlaps with the needs of partner-users listed above.

Subsection 1.3 maps the partner-user needs and stakeholder needs to functional requirements – that are prioritised based on goals of the SafeTRIP project and the importance of the needs from the partner-users’ and stakeholders’ perspective. Four tables of Must Have, Should Have, Could Have and Would Have present these requirements. The implementation of Must Have and Should Have functions in the SafeTRIP platform will support the development of SafeTRIP services (as defined in WP 2.4), addressing the salient needs of partner-users and stakeholders. The Could-Have and Would Have functional requirements will shape the SafeTRIP platform so that it can be extended to support services in the future, which are not necessarily within the goals of SafeTRIP. What is clear from these requirements is the need for the SafeTRIP platform to at least
1. Offer a communication channel that uses the most effective communication link available when needed (a combination of satellite, terrestrial and V2V communication technologies)
2. Provide reliable information from the vehicle (including and not limited to its geographical position, content – passenger and cargo, state (detection of accident), sensor information)
3. Provide media and information in the vehicle (including and not limited to traffic information, general information, entertainment media such as TV and radio)

Subsection 1.4 presents valuable insights that will inform the various stages of the Green Box development based on experience of some of the partners on the SafeTRIP consortium in developing and deploying OBUs.
2 Competing Technology and Services

In the early 1990’s, the first ITS systems were installed. Since then, these systems have benefited from great technological improvements but have always been designed to achieve very specific goals such as toll payment or provide driver information. The first devices were DSRC (Dedicated Short Range Communications) devices which operated at 915MHz or 2.45GHz. Each system achieved its goal in isolation and interoperability was not seen as a primary requirement.

With the evolution of the mobile telecommunications over the last decade and the availability of a large number of ITS systems, the ITS world needs to change its philosophy. In effect, application developers or system integrator cannot afford to develop their own communication media anymore such as DSRC. A lot of services being developed nowadays require mobile connectivity and it is desirable that the platform providing the connectivity is independent of the nature of these services.

In order to design a good solution for connectivity, we need first to understand what the existing systems are and how they meet their goal of providing the desired services.

The goal of this section is to present information about existing ITS systems in order to have a clear view of the systems competing with SafeTRIP.

It is worth noting that there are two different communication principles that are in use by ITS systems. These are broadcast technologies, like RDS-TMS or DAB, and bi-directional communication technologies like CEN DSRC, Infrared or GSM/GPRS. S-Band is designed to support both principles.

2.1 Competing Technologies

2.1.1 DSRC – DEDICATED SHORT RANGE COMMUNICATIONS

2.1.1.1 DESCRIPTION

DSRC are originally one-way or two-way short- to medium-range wireless communication channels specifically designed for automotive use and a corresponding set of protocols and standards.

In the USA, in October 1999, the Federal Communications Commission (FCC) allocated in the USA 75MHz of spectrum in the 5.9 GHz band for DSRC to be used by Intelligent Transportation Systems ITS. Historically, the first frequency band dedicated to DSRC in the USA was the LMS band (LMS-Location and Monitoring Services band) located around 915MHz.

In Europe, the European Telecommunications Standards Institute (ETSI) has allocated 30 MHz of spectrum in the 5GHz band for ITS in August 2008. The decision to use the spectrum in the 5GHz range is due to its spectral environment and propagation characteristics, which are suited for vehicular environments and also to the fact that the 900 MHz frequency band is used for GSM communications in Europe.

Note that the 915 MHz DSRC band used in the United States is classified in the radio frequency category (from 0 to 1GHz) while the 5.9GHz band is in the microwave category, implying some differences in the signal propagation.

DSRC is the communications media of choice for car-to-x communications because:

- It operates in a licensed frequency band; then is free of use
- It supports high speed, low latency, short range wireless communications (≤30m)
- It works in high vehicle speed mobility conditions
- Its performance is immune to extreme weather conditions (e.g. rain, fog, snow, etc.)
- It is designed to be tolerant to multi-path transmissions typical with roadway environments
Currently its main use in Europe and Japan is in **electronic toll collection** (20 millions of tags in operation in Europe), but there are numerous research projects that intend to use DSRC for general car-to-infrastructure or car-to-car communications. DSRC systems in Europe, Japan and U.S. are not, at present, compatible.

Technically speaking, DSRC tags can transmit through walls and solid objects and non-line of sight communication is possible although transmission losses are higher in this case. DSRC signals, due to its frequency band range, cannot penetrate car bodies, generally in metal, implying that the receiver must receive through the glass, or by means of an external antenna. The first option is commonly accepted and so the tags are mounted behind the windscreen. Note that there can be a problem with metal-coated glass, because the signal suffers big attenuation up to 40dB when crossing the windscreen.

**Figure 7: Examples of DSRC devices**

DSRC tags are nowadays all active (passive tags\(^2\) have been used until 2000). They are battery powered and can be read/write tags and are more expensive than former passive versions. They can operate in half-duplex or full-duplex mode and can work in a communication zone up to 30m.

At last, DSRC allows communications at bitrates up to 500kbps (1024kbps in Japan).

**2.1.1.2. Position regarding Safetrip project**

Today, DSRC technology is very use in the ITS world. It is recognized as an efficient standard for car-to-infrastructure and car-to-car communications and it has, for sure, a role to play on future ITS systems. But, from the SafeTRIP prospective, it has to be seen more as a complementary technology than a competitive one.

In effect, one of the advantages of the DSRC is that it is nowadays widely use on motorways for road tolling. But, if we look into new European directives, we can foresee that, in a near future, vehicles will have to pay a toll on EVERY road. Thus, it would imply to install a lot of gantry all Europe, because of the short communication zone around each gantry, and this cost would not be negligible for toll collection operators.

Indeed, we can look at DSRC as a complementary mean of communication for the Greenbox. Because of the low prices of the devices, we can easily integrate a DSRC interface in the Greenbox in order to enable efficient car-to-car communications or to provide car-to-infrastructure capabilities in any zone covered by a DSRC network (motorways, cities,…).

Note that task 4.3 is dedicated to study the integration of the Greenbox with car-to-x communications technology and will address the DSRC topic.

\(^2\) Passive tags modulated and reflected the received power from the transmitting equipment (called backscatter transmission)
2.1.1.3.  **Price**

There are mainly two costs to consider in DSRC: the cost for road operators represented by the furniture, installation and maintenance of the infrastructure and the cost to be supported by the user represented by the on board unit.

For road operators, DSRC does not represent a cheap solution in terms of CAPEX. In effect, at the opposite of the GSM/3G network for example, the operator needs to set up its own communication infrastructure. In addition to that, the short effective range of DSRC implies to ever use it on “close” road in order to optimize the number of gantry, ever to install a consequent number of gantries.

Concerning existing system, cost per transaction of an ETC (electronic toll collection) system range from $0.05 to $0.10. In comparison, the cost per transaction in a manual collection system is approximately $0.086. While a conventional interchange requires 25 full-time employees (assuming four toll booths), at a cost of up to one-third of the toll collection revenue, the ETC option would require only one maintenance person and account support.

For end users, the OBU price depends mainly on the embedded technology, active or passive. The cost of a transponder varies between €10 and €50.

2.1.1.4.  **Known Evolutions or Roadmap**

Actually DSRC techniques are widely use in electronic toll collection. But the future of this technique seems to be general car-to-infrastructure and car-to-car communications.

Note that there are several research project covering the future of DSCR topic.

2.1.1.5.  **Main Actors**

Qfree, CS, GEA, Kapsch, Thales, Efkon, Telvent.

2.1.1.6.  **References**


Article: A comparison of different technologies for EFC and other ITS applications (Juan Guillermo Jordán, Francisco Soriano, David Graullera, Gregorio Martín)


2.1.2.  INFRA RED TECHNOLOGY (IR)

2.1.2.1.  **Description**

Infrared is a line-of-sight technology meaning that the OBU must ‘see’ the terrestrial relay to communicate. Communication is possible via reflections of the IR signal (think of the IR commander of your TV) and IR signals cannot go through opaque surfaces or objects. Communication must be through the glass of the windscreen even metal coated ones since attenuation is lower for the IR spectrum (up to 7dB) than for the DSRC one.

IR allows very high data rate communications because the IR spectrum is placed at very high frequencies, so a lot of bandwidth is available. IR does not receive interference from other devices but little spectrum pollution is present, mainly coming from the sun light.

2.1.2.2.  **Position Regarding SafeTRIP Project**

The position of SafeTRIP regarding IR technology is the same than for DSRC technology (see DSRC description). IR technology presents interesting capabilities regarding ITS systems but cannot be seen as a competitor for S-band communications because of is short range of action. IR
is not designed to be a global communication media and SafeTRIP approach is to consider IR as a complementary communication media. For example, IR technology could be used in SafeTRIP project for enforcement purposes or car-to-car communication media.

The major weakness of IR technology is that, in general, DSRC has been preferred in tolling systems and in ITS in general for short range communications. Thus, in SafeTRIP, we will focus on DSRC more than on IR technology.

2.1.2.3. **Price**

Price of OBU using IR technology is in the same order of magnitude as for DSRC.

2.1.2.4. **Known Evolutions or Roadmap**

Several successful implementations of IR technology have been carried out over the past few years, in particular for ETC in Taiwan and Malaysia, and toll enforcement in Germany. However, future use of IR in ITS may be limited by the fact that only one manufacturer (EFKON) is pushing for this technology and that the technology itself contains so many weaknesses for V2V and V2I communications (line of sight, range, etc.).

2.1.2.5. **Main Actors**

EFKON is a worldwide leading company in Intelligent Transportation Systems Electronic Payment Applications. It actually supplies one of the most advanced Truck Tolling System in the world, i.e. the German multilane free flow Satellite Truck Tolling System. In the frame of that project, Active DSRC Infrared Communications are placed in strategic 300 locations like borders, in-roads to cities etc. and are designed for vehicle speed up to 250 km/h.

http://www.efkon.com

2.1.2.6. **References**


2.1.3. **WiFi, Wave**

2.1.3.1. **Description**

A Wi-Fi network can be used to connect computers to each other, to the Internet, and to wired networks (which use IEEE 802.3 or Ethernet). Wi-Fi networks operate in the unlicensed 2.4 and 5 GHz radio bands, with an 11 Mbps (Megabit per second) or 54 Mbps (802.11a) data rate or with products that contain both bands (dual band). They can provide real-world performance similar to the basic 10BaseT wired Ethernet networks.

Wi-Fi can operate in one of two modes - a managed-access mode (a Basic Service Set or BSS, where one access point is connected to a wireless network), called an infrastructure mode, or an unmanaged mode (a peer-to-peer mode or an Independent Basic Service Set or IBSS), called ad-hoc mode.

The Ad-Hoc mode is a cost effective and easy-to-install network structure, but the number of users and the distance between the users is limited. At a data rate of 11 Mb/s the maximum distance is approx. 30 m.

IEEE 802.11p is a draft amendment to the IEEE 802.11 standard to add wireless access in vehicular environments (WAVE). It defines enhancements to IEEE 802.11 required to support Intelligent Transportation Systems (ITS) applications. This includes data exchange between high-
speed vehicles and between the vehicles and the roadside infrastructure in the licensed ITS band of 5.9 GHz (5.85-5.925 GHz). IEEE 802.11p is based on higher layer standard IEEE 1609.

IEEE 802.11p will be used as the groundwork for Dedicated Short Range Communications (DSRC) in a U.S. Department of Transportation project based on the ISO Communications, Air-interface, Long and Medium range (CALM) architecture standard looking at vehicle-based communication networks, particularly for applications such as toll collection, vehicle safety services, and commerce transactions via cars. The ultimate vision is a nationwide network that enables communications between vehicles and roadside access points or other vehicles. The official IEEE 802.11 Work Plan predictions the approved 802.11p amendment is scheduled to be published in November 2010.

Most recently the European Commission has allocated 5.9GHz band for priority road safety applications and inter-vehicle, infrastructure communications. The intention - compatibility with the USA - will be ensured even if the allocation is not exactly the same; frequencies will be sufficiently close to enable the use of the same antenna and radio transmitter/receiver.

2.1.3.2. **POSITION REGARDING SAFETRIP PROJECT**

Wireless networks, especially if no broadband transmission is needed, can cover areas more than 100 m radius. Therefore Wi-Fi (or Wave) systems are capable of supporting vehicle-to-vehicle (V2V) or vehicle to infrastructure (V2I) communication on areas where the satellite coverage is low, or not available.

As a short range application, Wi-Fi networks can be used at any dedicated points in the transportation network, e.g. at toll gates, highlighted junctions etc.

As a short range application, Wi-Fi networks can be used at any dedicated points in the transportation network, e.g. at toll gates, highlighted junctions etc. High bandwidth data transmission as the main advantage, and the limited range, as shortcoming has to be considered in SafeTRIP applications.

State-of-the-art InVANET communication (see MANET, VANET section) involves Wi-Fi technology.

2.1.3.3. **PRICE**

Since Wi-Fi is widely used, prices are relatively low, but hardware and installation costs for new versions, such as Wave, are hard to estimate.

2.1.3.4. **KNOWN EVOLUTIONS OR ROADMAP**

There are many Wi-Fi standards are existing and more and more are expected to come with higher range and bandwidth.

2.1.3.5. **MAIN ACTORS**

Main actors are the car manufacturers together with automotive equipment suppliers. Car 2 Car Communication Consortium ([www.car-to-car.org](http://www.car-to-car.org)) is the leading forum of automotive industry for WiFi / WAVE development and standardisation.

2.1.3.6. **REFERENCES**

- [http://en.wikipedia.org/wiki/Wi-Fi](http://en.wikipedia.org/wiki/Wi-Fi)
- i-way Intelligent co-operative system in cars for road safety, [http://www.iway-project.eu/](http://www.iway-project.eu/)
- SAFESPOT: [http://www.safespot-eu.org](http://www.safespot-eu.org)
- Car 2 Car CC: [http://www.car-to-car.org](http://www.car-to-car.org)
2.1.4. MANET, VANET

2.1.4.1. DESCRIPTION

A mobile ad hoc network (MANET), sometimes called a mobile mesh network, is a self-configuring network of mobile devices connected by wireless links.

Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward data unrelated to its own use, and therefore be a router. The primary challenge in building a MANET is enabling each device to continuously maintain the information required to properly route a message.

Types of MANET:

- Vehicular Ad Hoc Networks (VANETs) are used for communication among vehicles and between vehicles and roadside equipment.
- Intelligent vehicular ad hoc networks (InVANETs) are a kind of artificial intelligence that helps vehicles to behave in intelligent manners during vehicle-to-vehicle collisions, accidents, drunken driving etc.
- Internet Based Mobile Ad-hoc Networks (iMANET) are ad-hoc networks that link mobile nodes and fixed Internet-gateway nodes. In such type of networks normal ad-hoc routing algorithms don't apply directly.

A Vehicular Ad-Hoc Network, or VANET, is a form of Mobile ad-hoc network, to provide communications among nearby vehicles and between vehicles and nearby fixed equipment, usually described as roadside equipment.

The main goal of VANET is to provide safety and comfort for passengers. To this end a special electronic device is placed inside each vehicle which provides Ad-Hoc Network connectivity for the passengers. This network tends to operate without any infrastructure or legacy client and server communication architecture. Each vehicle equipped with VANET device becomes a node in the Ad-Hoc network and can receive and relay others messages through the wireless network.

Most of the high level concerns related to MANets are presenting VANets, but they differ at a finer level of detail differ. Rather than moving at random, vehicles tend to move in an organized fashion. The interactions with roadside equipment can likewise be characterized fairly accurately. And finally, most vehicles are restricted in their range of motion, for example by being constrained to follow a paved highway.

Intelligent vehicular ad hoc networks (InVANETs) use WiFi IEEE 802.11 and WiMAX IEEE 802.16 for easy and effective communication between vehicles with dynamic mobility. Effective measures such as media communication between vehicles can be enabled as well methods to track automotive vehicles. InVANET is not foreseen to replace current mobile (cellular phone) communication standards.

"Older" designs within the IEEE 802.11 scope may refer just to IEEE 802.11b/g. More recent designs refer to the latest issues of IEEE 802.11p (see WAVE description in Section 2.15). Due to inherent lag times, only the latter one in the IEEE 802.11 scope is capable of coping with the typical dynamics of vehicle operation.

Automotive vehicular information can be viewed on electronic maps using the Internet or specialized software. The advantage of WiFi based navigation system function is that it can effectively locate a vehicle which is inside big campuses like universities, airports, and tunnels. InVANET can be used as part of automotive electronics, which has to identify an optimally minimal path for navigation with minimal traffic intensity. The system can also be used as a city guide to locate and identify landmarks in a new city.
Communication capabilities in vehicles are the basis of an envisioned InVANET or intelligent transportation systems (ITS). Vehicles are enabled to communicate among themselves (vehicle-to-vehicle, V2V) and via roadside access points (vehicle-to-roadside, V2R). Vehicular communication is expected to contribute to safer and more efficient roads by providing timely information to drivers, and also to make travel more convenient. The integration of V2V and V2R communication is beneficial because V2R provides better service sparse networks and long distance communication, whereas V2V enables direct communication for small to medium distances/areas and at locations where roadside access points are not available.

Providing vehicle-to-vehicle and vehicle-to-roadside communication can considerably improve traffic safety and comfort of driving and travelling. For communication in vehicular ad hoc networks, position-based routing has emerged as a promising candidate. For Internet access, Mobile IPv6 is a widely accepted solution to provide session continuity and reachability to the Internet for mobile nodes. While integrated solutions for usage of Mobile IPv6 in (non-vehicular) mobile ad hoc networks exist, a solution has been proposed that, built upon a Mobile IPv6 proxy-based architecture, selects the optimal communication mode (direct in-vehicle, vehicle-to-vehicle, and vehicle-to-roadside communication) and provides dynamic switching between vehicle-to-vehicle and vehicle-to-roadside communication mode during a communication session in case that more than one communication mode is simultaneously available.

Currently there is ongoing research in the field of InVANETs for several scenarios. The main interest is in applications for traffic scenarios, mobile phone systems, sensor networks and future combat systems. Recent research has focused on topology related problems such as range optimization, routing mechanisms, or address systems, as well as security issues like traceability or encryption. In addition, there are very specific research interests such as the effects of directional antennas for InVANETs and minimal power consumption for sensor networks. Most of this research aims either at a general approach to wireless networks in a broad setting or focus on an extremely specific issue.

2.1.4.2. POSITION REGARDING SAFETRIP PROJECT
VANET technology is capable of both vehicle-to-vehicle and vehicle-to-infrastructure communication, therefore is to be considered as competing technology to SafeTRIP. For example, collision warning, road sign alarms and in-place traffic view will give the driver essential tools to choose the best route along the way.

2.1.4.3. PRICE
N/A

2.1.4.4. KNOWN EVOLUTIONS OR ROADMAP
N/A

2.1.4.5. MAIN ACTORS
N/A

2.1.4.6. REFERENCES
http://en.wikipedia.org/wiki/Mobile_ad-hoc_network
SAFESPOT, http://www.safespot-eu.org
Martin Mauve, Jörg Widmer, and Hannes Hartenstein: A Survey on Position-Based Routing in Mobile Ad-Hoc Networks
2.1.5. **UMTS, HSDPA**

2.1.5.1. **SERVICE DESCRIPTION**
UMTS (Universal Mobile Telecommunication System) a "new" mobile standard available in Europe, which belongs to standards of the third Mobile radio generation (3G): 144 kbits/s satellite and rural outdoor, 384 kbits/s urban outdoor, 2048 kbits/s indoor and low range outdoor.
High-Speed Downlink Packet Access (HSDPA) is an enhanced 3G (third generation) mobile telephony communications protocol in the High-Speed Packet Access (HSPA) family, also coined 3.5G, 3G+ or turbo 3G, which allows networks based on Universal Mobile Telecommunications System (UMTS) to have higher data transfer speeds and capacity. Current HSDPA deployments support down-link speeds of 1.8, 3.6, 7.2 and 14.0 Mbit/s. Further speed increases are available with HSPA+, which provides speeds of up to 42 Mbit/s downlink and 84 Mbit/s with Release 9 of the 3GPP standards.

2.1.5.2. **POSITION REGARDING SAFETRIP PROJECT**
Cellular communication networks have high coverage around the transportation network all over Europe. 3G mobile communication technology enables high speed data rate transmission. Since this type of communication technology is widely used, equipment is affordable. On the contrary broadband transmission is available mostly in urban areas only.

2.1.5.3. **PRICE**
Technical background is available on the transmission side, regular cell-phones and PDAs are capable of connecting to existing mobile communication networks.

2.1.5.4. **KNOWN EVOLUTIONS OR ROADMAP**
Mobile communication technology develops day by day, even higher transmission rates become available and affordable for the wide public.

2.1.5.5. **MAIN ACTORS**
Mobile communication companies, e.g. AT&T, Nokia, Qualcomm

2.1.5.6. **REFERENCES**
http://en.wikipedia.org/wiki/UMTS
i-way Intelligent co-operative system in cars for road safety, http://www.iway-project.eu/

2.2. **Competing Services**

2.2.1. **E*MESSAGE**

2.2.1.1. **SERVICE DESCRIPTION**
E*message is a company specializing in the provision of messaging services for professionals. This messaging system is better known under the name “Pager”. Its system is based on a terrestrial radio broadcast network that covers 95% of the French and German territories.
E*message provides two kinds of services:
- BtoC services
  E*message provides messaging services directly to customers. For example, there is a service called e*broker that allows the customer to receive stock exchange information on a mobile device for a yearly fixed price.
- BtoB services
E*message proposes its infrastructure to companies that want to act as a service provider or to broadcast content. The name of the platform is E*wip (wireless information protocol) and allows any third party company to act as a broadcaster for existing terminals or even to distribute their own terminals.

![Example of E*Message device](image)

**Figure 8: Example of E*Message device**

### 2.2.1.2. Position Regarding SafeTRIP Project

E*message does not compete directly with SafeTRIP for two main reasons. Firstly, it actually seems that their technology is not able to support a high number of terminals for bi-directional communications (mainly due to the low frequency band). Secondly, they are currently not offering end-user applications for the transportation domain which is the main field of application for the SafeTRIP’s Greenbox.

Nevertheless, their business model seems to be quite similar to the SafeTRIP one. They propose a complete communication infrastructure including terminals that allows anybody to launch new services and, in addition to that infrastructure, they have developed several basic services to ensure the platform profitability and ease of deployment. Thus SafeTRIP consortium will need to monitor the evolution of E*message in the future.

### 2.2.1.3. Price

Given the fact that the platform is dedicated to professional use, it is very difficult to obtain a rough service price.

### 2.2.1.4. Known Evolutions or Roadmap

N/A

### 2.2.1.5. Main Actors

E*Message is the leader in the continental European paging market. Its subsidiaries in Germany and France operate nationwide networks with excellent coverage that deliver the highest reliability.

The company was founded in 2000 and took over Deutsche Telekom’s and France Telecom’s paging activities in the course of the same year. The e*Message Group offers a full range of Alerting, Business Paging and Data Broadcast services, as well as a professional trunked radio network for voice and data transfer made available to industry companies, public agencies and service providers in the Berlin-Brandenburg region. The Group has introduced major innovations every year since its creation.

### 2.2.1.6. References

http://www.emessage.eu/index.html

### 2.2.2. ORBCOMM

#### 2.2.2.1. Service Description

The ORBCOMM System uses 29 low-Earth orbit (LEO) satellites to provide cost-effective tracking, monitoring and messaging capabilities to and from anywhere in the world. Similar to two-way paging or e-mail, the system is capable of sending and receiving two-way alphanumeric packets of data. These short, economical messages increase the efficiency of your remote operations by
making critical information readily available, often from areas beyond the geographic and economic reach of traditional systems.

Each satellite is equipped with a VHF and Ultra High Frequency, or UHF, communication payload capable of operation in the 137.0-150.05 MHz and the 400.075-400.125 MHz bands. The use of the system uplink (Earth-to-space) spectrum is managed by an on-board computer that employs the ORBCOMM-pioneered Dynamic Channel Activity Assignment System, or DCAAS.

![Figure 9: ORBCOMM satellite coverage](image)

The ORBCOMM system proposes a range of on-board units, designed for professional usage and not targeted for simple cars. This range of devices is quite large and tuned for several usages. We can however make a list of the main devices:

- a simple modem that has only power and serial data inputs, which is used for fixed site applications where global positioning system, or GPS, is not needed, or in applications where we are replacing an existing communications device such as cellular communications device
- vehicle-powered OBU that accept wide input voltage ranges
- OBU's that have built-in application processors which allow customers to write specific applications
- Full-featured devices that include application processor, multiple inputs, battery charger, GPS and weather-tight enclosure.

![Figure 10: Stellar DS100 Modem for ORBCOMM](image)

ORBCOMM devices, targeted for M2M industrial applications, are designed to interface with sensors or control devices through a variety of industry-standard interfaces. For many mobile applications, the addition of GPS functionality allows not only the tracking of assets, but also the capability to add geo-fencing features into the service. Finally, note that it is possible to integrate
some ORBCOMM OBU with other communication devices to provide dual-mode solutions that are compatible with multiple cellular networks.

ORBCOMM services can be integrated with business applications. Customer data can be retrieved or auto-forwarded via SMTP or HTTP/XML feed directly over the Internet or through a dedicated link.

Figure 11: Example of ORBCOMM automotive antenna

2.2.2.2. POSITION REGARDING SAFE TRIP PROJECT
ORBCOMM has been clearly identified as a strong competitor for SafeTRIP. It addresses the topic of mobile messaging systems using satellite connectivity and is already on the market. However, SafeTRIP, as an advanced research project, can take advantages of several capabilities of W2A.

First of all, the frequency band used by ORBCOMM limits the overall system data rates. It is difficult to assess the effective ORBCOMM system’s bitrates but we can objectively think that the system is not able to cover all vehicles in Europe.

Concerning the price of the service, SafeTRIP shall be able to propose better pricing options for several reasons:

- ORBCOMM is not able to use broadcast capabilities of the satellite technology and SafeTRIP has put a lot of emphasis on the broadcast ability. Indeed, SafeTRIP plans to use DVB-SH based solution in order to optimize transmission costs
- Due to the choice of low earth orbit, if ORBCOMM wants to increase its spacial capacity, the operator will have to send several satellite to ensure a 24/7 coverage. On the contrary, SafeTRIP system needs only one additional GEO satellite to double is spatial capacity
- ORBCOMM satellites are fully dedicated to the ORBCOMM system. It means that the whole satellite OPEX has to be funded by the system. In contrast, SafeTRIP will take advantage of a shared satellite capacity coming from an external satellite operator. This will allow SafeTRIP to ramp up its OPEX according to its need in capacity.

The previous remarks show the pertinence of SafeTRIP project compared to ORBCOMM.

Finally, note that Orbcomm has been growing rapidly but is still trading in the red. It has cut losses from $12.4m to $9.1m in 2005 when revenue grew by 43% to $15.5m. However, the net loss rose from $6.3m to $10.2m in the six months to June 30 on revenue that rose 97% to $12.6m. One reason it needs to raise money is the need to launch a new generation of satellites.

2.2.2.3. PRICE
Since ORBCOMM is not a mass market product, it is difficult to establish a cost for the service. However, regarding the services proposed by several resellers, we can figure out that ORBCOMM charge about €6 for 1Mbytes of data based on a monthly fee. Note that due to the nature of the
data (message) this amount of data has to be translated in characters to appreciate the actual capacity. It corresponds approximately to 5000 characters.

2.2.2.4. KNOWN EVOLUTIONS OR ROADMAP
On 3 September 2009 a deal was announced between ORBCOMM and Space Exploration Technologies (SpaceX) to launch 18 second generation satellites on SpaceX's Falcon 1e rocket. These spacecraft are due to launch between 2010 and 2014.

2.2.2.5. MAIN ACTORS
ORBCOMM provides satellite data services. As of August 18, 2009, ORBCOMM reported 500,000 billable subscriber communicators on the company's U.S.-based gateway control centre. ORBCOMM has control centres in the United States, Brazil, Japan, and Korea, as well as U.S. ground stations in New York, Georgia, Arizona, and Washington State, and international ground stations in Curacao, Italy, Australia, Kazakhstan, Brazil, Argentina, Morocco, Japan, Korea, and Malaysia. Plans for additional ground station locations are under way.

2.2.2.6. REFERENCES
http://www.orbcomm.com/

2.2.3. LOJACK

2.2.3.1. SERVICE DESCRIPTION
LoJack is a stolen vehicle recovery system based on VHF communications. It works thanks to a small Radio Frequency transceiver hidden the vehicle. Each LoJack Stolen Vehicle Recovery System has a unique code that is tied to the Vehicle Identification Number (VIN). When a vehicle theft is reported to the police, a routine entry, into the state police crime computer, results in a match of the LoJack System's unique code against the state VIN database. This automatically activates the LoJack Unit in the vehicle, which emits an inaudible signal. Law enforcement authorities who are equipped with LoJack Police Tracking Computers—in their police cars and aviation units—are always listening for a LoJack signal. Police use the LoJack Police Tracking Computers to track and recover your stolen LoJack-equipped vehicle.

Lojack is providing solutions for private individuals as for professionals. It can protect cars, motorcycles, cargos and even persons at risk!

2.2.3.2. POSITION REGARDING SAFETRIP PROJECT
Stolen vehicle recovery is a service that can be addressed by the SafeTRIP system. But the main idea of SafeTRIP is to avoid the installation of multiple boxes onboard of cars. Unfortunately, this idea of centralization between different boxes is not applicable to the stolen vehicle recovery problem since the box needs to be hidden in the car to protect it against the thieves.

In practice, SafeTRIP will try to discuss with LoJack manufacturers to explore the possibility for "collaboration" between the Greenbox and their devices. If we are able to define an interface between the LoJack device and the Greenbox, SafeTRIP platform could offer several services to LoJack.

For example, they could take advantage of the possibility to send updates to their OBUs via broadcast or extend their system coverage using satellite. For these reasons, SafeTRIP approach with regards to LoJack shall be that of seeking cooperation more than competition.
2.2.3.3. **PRICE**
The service is provided in Europe for approximately 200€/years.

2.2.3.4. **KNOWN EVOLUTIONS OR ROADMAP**
N/A

2.2.3.5. **MAIN ACTORS**
Currently LoJack Corporation, the premier worldwide provider of wireless tracking and recovery systems for mobile assets, is the leader in global stolen vehicle recovery, with its unrivalled, proven solutions and direct integration with law enforcement. LoJack created the stolen vehicle recovery category over 20 years ago and has earned a 90 percent recovery success rate. Globally, more than 250,000 stolen vehicles worth over $5 billion have been recovered using LoJack technology.

LoJack operates in areas of the country with the greatest population density, highest number of new vehicle sales and greatest incidents of vehicle theft. LoJack is currently operable in 27 states and the District of Columbia, as well as more than 30 countries throughout North America, South America, Europe, Africa and Asia.

2.2.3.6. **REFERENCES**
http://www.lojack.com/
http://www.traqueur.fr/

2.2.4. **COYOTE (CONNECTED GPS)**

2.2.4.1. **SERVICE DESCRIPTION**
Coyote Systems provides integrated systems and services targeted to driver information and safety. Its main product is a connected GPS device that is able to provide information coming from the Coyote community to the end-user.
Coyote system is mainly used for speed camera detection, traffic information and weather information.

![Figure 12: Mini Coyote and Coyote v2](image-url)
Coyote is based on a collaborative system which relies on the contribution of individual users for the benefit of all. Mini Coyote is always up to date as it maintains a GSM/GPRS communication link with the Coyote servers to exchange information relative to fixed and mobiles speed cameras as well as frequent danger zones.

![Coyote System Diagram](image)

Figure 13: Coyote system

Coyote receives the signals from GPS satellite and determines the position and speed of the vehicle. It is equipped with a GSM/GPRS modem and communicates, at regular intervals, with the Coyote servers to be updated with speed camera locations, speed limits and other real-time information.

2.2.4.2. POSITION REGARDING SAFETRIP PROJECT

Coyote Systems is a service provider. Its focus is on providing a paid service to the end user rather than on the technology and device supporting the service. Thus, even if they provide services that we could provide using the SafeTRIP platform, Coyote cannot be perceived only as a competitor. In fact, one of the objectives of SafeTRIP is to provide a platform opened to third party developers such as Coyote.

In the past, Coyote Systems has shown their interest to implement their services on other platform (apple iphone for example) and if SafeTRIP is able to impose the Greenbox onboard of private vehicles, we can easily imagine synergies between both actors.

Another point that strengthens SafeTRIP’s position compared to current coyote PND is the satellite coverage. Currently, Coyote system proposes a pan European service at a fixed price. In practice, they are subsidising the extra charges (roaming) of mobile operators when an end user use the service abroad. This allows them to maintain the fixed price and not to pass on additional costs to the end user. Since the usage of coyote abroad is currently limited, their business model is working but SafeTRIP has a great role to play if we were able to propose a pan European satellite coverage at low cost!
In conclusion, SafeTRIP role will be to collaborate with Coyote more than to compete with them. In case of collaboration, each party would benefit in terms of revenue: SafeTRIP can take advantage of Coyote assets (existing services, client database), while Coyote can offer a fixed price pan European connectivity at no extra internal cost.

2.2.4.3. **PRICE**

There are currently two Coyote devices in the market:
- a low end product called mini coyote costing 199€
- a high end product called Coyote V2 costing 299€.

The coyote V2 device is a fully working PND embedding communications capability. It is quite similar to Tomtom’s or Navtech’s devices. The service charge is approximately 12€/month, including the SIM card.

Note that Coyote devices are working everywhere in Europe without extra charges. Coyote decided to take in charge extra costs due to roaming fees invoices by mobile operators.

Lastly, an iphone version of Coyote is available called iCoyote. This application is free of charge but the service charge is the same as that for using a coyote PND (12€/month).

2.2.4.4. **KNOWN EVOLUTIONS OR ROADMAP**

Coyote is currently launching its product all around Europe. It just launched the iphone version and it is a safe assumption to make that they will target android phones as well.

2.2.4.5. **MAIN ACTORS**

Coyote system is a European company providing innovative road safety products and services to motorists across Europe.

Coyote System launched its first product the **Coyote Classic** in February 2006 in France. It was the world's first real-time speed camera alert system. It still is the only speed camera alert system to provide speed limits at all times on all roads in France.

The **Mini Coyote** was launched in France in February 2008. There are now more than 100 000 users of Coyote products in Europe in 2009.

2.2.4.6. **REFERENCES**

http://www.coyotesystems.com/

2.2.5. **TRAFFICMASTER**

2.2.5.1. **SERVICE DESCRIPTION**

Trafficmaster and Teletrac are both focused on the same goal - integrated, intelligent driving services that reduce costs, improve efficiency and reduce carbon footprint.

Their services use a common telematics technology platform, developed in-house to offer tailored solutions to our customers.

Teletrac offers fleet tracking, management and navigation under the Fleet Director brand across the US, serving 6,000 fleets and a total of 90,000 commercial vehicles. Fleet Director generates significant savings in fuel use, vehicle emissions and fleet costs, by allowing precise control and real time understanding of vehicles on the road.
Trafficmaster has developed a suite of services in the UK, which includes Fleet Director and the award-winning Smartnav, an intelligent route finding service that uses satellite navigation and live traffic information to find best routes and guide drivers around congestion.

Their real road speeds data and live incident information allows Smartnav to calculate the optimum routes and avoid traffic congestion on every journey, improving on-road efficiency and reducing congestion overall. In addition, their comprehensive traffic data means Smartnav is continually updated with traffic information, road closures and speed camera locations.

The connectivity for all their services in the UK, including Smartnav and Fleet Director, use the O2 network to transmit data securely and reliably via GPRS. Trafficmaster also provides traffic news to O2’s 1200 Traffic Line, to give up to the minute traffic information for roads.
Their live traffic information is also available via mobile phone and Radio Data System -Traffic Message Channel (RDS TMC), used by six of the UK’s top ten car brands and a wide range of portable navigation systems.

Data comes from our unique network of 7,500 traffic sensors, covering 8,000 miles - all the UK’s motorways and 95% of its trunk roads.

2.2.5.2. POSITION REGARDING SAFETRIP PROJECT

The SafeTRIP position regarding Trafficmaster will be the same than the position regarding Coyote system (SubSection 2.6).

Trafficmaster will be seen as a service provider and, by consequence, as a potential customer., Trafficmaster’s added value is based on the content provisioning (traffic information) and on the data processing (tracking system, messaging) more than the connectivity provision. Trafficmaster uses O2's GPRS infrastructure to connect their devices and can switch to S-Band satellite connectivity if SafeTRIP is able to demonstrate its competitiveness. In addition, it is interesting to see that Trafficmaster proposes solutions for mobile phone because it illustrates their willingness to address the largest market independently of the hardware used.

In conclusion, SafeTRIP will try to address Trafficmaster’s needs in a bid to seek collaboration rather than see them as competition.

2.2.5.3. PRICE

With regards to the fleet management system “Fleet Director”, the subscription range comprises of two offers. The low end offer allows only tracking the vehicle. The premium offer has same functionalities than the low end but it also permits to exchange messages between the vehicle and the headquarter, and also to receive traffic information.

<table>
<thead>
<tr>
<th>Subscription</th>
<th>Price</th>
<th>Functionalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleet director basic</td>
<td>~270£ per year</td>
<td>Vehicle tracking</td>
</tr>
<tr>
<td>Fleet director colour screen and messaging</td>
<td>~331£ per year</td>
<td>Vehicle tracking + messaging + traffic information</td>
</tr>
</tbody>
</table>

As for the Smartnav service, the end user device is sold ~315£. This price includes the touch screen device and the installation by a professional. The subscription to the Smartnav service...
costs \textbf{\£121 per year} including the connectivity and the service itself. The traffic information service only, to be used on a mobile phone, is sold \textbf{\£40 per year}.

Smartnav is your personal journey management system. It guides you intelligently, avoiding traffic jams, hold-ups and all kinds of other frustrations.

- Simply press the Smartnav button to connect directly to your personal assistant
- Less than a minute later your Smartnav system will be loaded with your journey, ready to provide clear directions at every turn
- Personal assistance is always just a touch away

2.2.5.4. \textit{Known Evolutions or Roadmap}

N/A

2.2.5.5. \textit{Main Actors}

Trafficmaster was founded in 1988 and floated on the London Stock Exchange in 1994. Teletrac Inc is Trafficmaster entirely owned US subsidiary company. Trafficmaster is also the force behind Trackstar stolen vehicle tracking system.

2.2.5.6. \textit{References}

http://www.trafficmaster.co.uk
http://www.teletrac.net

2.2.6. \textit{TMC – Traffic Message Channel}

2.2.6.1. \textit{Service Description}

The Traffic Message Channel (TMC) is a technology used for broadcasting real-time traffic and weather information. Data messages are received in the background and decoded by a TMC-equipped terminal, before being delivered to the driver in a variety of ways. The most common of these is a TMC-enabled navigation system that can offer dynamic route guidance - alerting the driver of a problem on the planned route and calculating an alternative route to avoid the incident.

TMC traffic information systems conform to a global standard that has been adopted by traffic data gatherers, information service providers, broadcasters and vehicle/receiver manufacturers. TMC information is currently received via the normal FM radio antenna (RDS system) but new delivery channels are emerging, including digital radio (DAB), mobile Internet, paging and GSM/GPRS mobile phone networks.

All TMC receivers use the same list of event codes, while the location database (typically on the navigation system map CD-ROM or DVD) contains a country-specific set of location codes for the strategic European road network. Standard TMC user messages provide five basic items of broadcast information:

- event description, details of the weather situation or traffic problem and its severity
- location, the area, highway segment or point location affected
- direction and extent, identifying the adjacent segments or point locations affected, and the direction of traffic affected
- duration, how long the problem is expected to last
- diversion advice, whether or not drivers are advised to find an alternative route.

As a consequence, users can receive traffic information in their own language, since The TMC unit decodes the received event and presents it to the user. Whichever country the user is driving in, he or she can understand the local traffic situation immediately.
TMC traffic data are already being broadcast in Austria, Belgium, Denmark, Finland, France, Germany, Italy, The Netherlands, Norway, Spain, Sweden, Switzerland and the United Kingdom. Also planning services soon are the Czech Republic, Hungary, and Portugal.

2.2.6.2. **POSITION REGARDING SAFETRIP PROJECT**
Currently, the service provider sends the coded messages to the appropriate FM radio broadcaster for transmission as an RDS (Radio Data System) signal within normal FM radio transmissions. The TMC data are received by the vehicle radio and antenna, and decoded by a TMC decoder. This reconstructs the original message, using a database of event and location codes, which is presented to the driver as a visual or spoken message.
In that context, we shall ensure that SafeTRIP platform supports traffic message channel to allow service providers to switch easily from terrestrial FM radio to S-band satellite.

2.2.6.3. **PRICE**
N/A

2.2.6.4. **KNOWN EVOLUTIONS OR ROADMAP**
Though TMC was originally designed for the narrowband data channel of RDS, it can also be broadcast by means of DAB (DAB-TMC). Thanks to higher data rates, DAB users can receive more TMC reports in less time. And data transfer is considerably more robust in DAB compared with VHF in the event of multipath reception interference. In the same spirit, we can imagine that traffic data gatherers will explore the S-band channel.

2.2.6.5. **MAIN ACTORS**
N/A

2.2.6.6. **REFERENCES**

2.2.7. **T-DMB (TERRESTRIAL DIGITAL MULTIMEDIA BROADCASTING)**

2.2.7.1. **SERVICE DESCRIPTION**
Digital Multimedia Broadcasting (DMB) is a digital radio transmission technology developed in South Korea for sending multimedia content such as TV, radio and datacast services to mobile devices such as mobile phones. It can operate via satellite (S-DMB) or terrestrial (T-DMB) transmission. DMB has some similarities with the main competing mobile TV standard, DVB-H. T-DMB is made for transmissions on radio frequency bands band III (VHF) and L (UHF). It is an ETSI standard (TS 102 427 and TS 102 428). On December 2007, France chose T-DMB Audio as the national standard for terrestrial digital radio.

2.2.7.2. **POSITION REGARDING SAFETRIP PROJECT**
T-DMB is a strong competitor of SafeTRIP platform. It is a broadcasting standard that will benefit from the support of countries such as France for its deployment.
Nevertheless, we shall keep in mind that the terrestrial coverage of a country is very expensive and that it will be impossible to cover 100% of the populations.
Another point to bear in mind is the presence of several digital audio broadcasting standards in Europe. Countries in Europe, other than France, have chosen other broadcasting standards. For instance, Germany has chosen DAB+ standard that is not compatible with T-DMB.
Based on these two points, SafeTRIP consortium will support a multi-standard approach for digital audio broadcasting in Europe to ensure its compatibility with terminals supported by different European states. At the same time, SafeTRIP platform will have to be flexible enough to integrate third party technologies and will guarantee full pan-European coverage.

2.2.7.3. **PRICE**
N/A

2.2.7.4. **KNOWN EVOLUTIONS OR ROADMAP**
A T-DMB directive is currently under discussion in France. This directive would require the installation of a T-DMB receiver in every car sold in France.
In the event that this directive becomes official, the T-DMB standard will benefit from a very strong support for its deployment. Ranuter is a French research project supported by the Ministry of Economy and Industry whose goal is to experiment and assess mobility services through T-DMB.

2.2.7.5. **MAIN ACTORS**

**ETSI**
The European Telecommunications Standards Institute (ETSI) produces globally-applicable standards for Information and Communications Technologies (ICT), including fixed, mobile, radio, converged, broadcast and internet technologies.

**TDF**
The TDF Group operates radio-relay networks and shared infrastructures. It supports its customers, television channels, radio stations, telecommunications operators and local authorities, over the entire value chain of audiovisual and telecommunications networks: complete solutions for the filming, management and distribution of content up to transport, the deployment of networks, the hosting of operators' equipment on its sites and maintenance.

2.2.7.6. **REFERENCES**
http://www.etsi.org/website/technologies/dab.aspx
http://fr.wikipedia.org/wiki/Digital_Audio_Broadcasting
http://www.worlddab.org
http://www.ranuter-dmb.eu/en

2.2.8. **TEMA.MOBILITY**

2.2.8.1. **SERVICE DESCRIPTION**
Magneti Marelli and Telecom Italia founded, at the end of 2007, the Tema.mobility consortium with the specific mandate of exploiting all the possible benefits from the integration of advanced COM and NAV technologies.

Activities related to satellite navigation carried out with the support of a well-known R&D centre "Istituto Superiore Mario Boella"

**Areas of Competence**

**Vehicle Tracking Suite**
Solution for vehicle tracking and the main parameters. It mainly addresses:
- Insurances society: enabling improved insurance services (e.g. PAYD)
• Rental cars: fleet management solutions
• Special Fleet: solutions for fleet management for public services (e.g. Taxi) and public safety (e.g. ambulances)
• Society for public activities (e.g. plumbers): solution for workforce management

Cargo suite

Solutions for management, optimization and monitoring of fleets dedicated to goods transportation
• Mission Planning and management
• Route optimization and service improvement
• Checking of the operational vehicle parameter
• Driver support

Urban mobility suite

Solution dedicated to the improvement of mobility in urban areas
• Traffic monitoring and optimization
• Monitoring and control to limited areas
• Optimization of the parking management

Automotive suite

B2B solutions dedicated to car makers for the management of services to the customers (e.g. SOS Emergency, Intelligent maintenance Info Portal), using an info-brokering platform able to integrate contents and services coming from different providers. Provides the management of the front-end process (e.g. CRM, Billing, Reporting)

Overview on system architecture

Figure 16: Tracking and Infomobility Services using M2M boxes (Telematic Box or T-Box)
Based on GSM boxes, T-boxes are designed to allow for insurance services, pay-per-use, anti-theft, tracking and localization services, e-call, traffic information. Pictures of the Marelli T-box are as shown in Figure 17: The Marelli T-Box.

The platform has been designed to connect also to a Public Safety Answering Point (PSAP), with the following main features:

- Usage of the Telco Service Exposure (TSE) platform for SMS reception.
- Management of the Minimum Set of Data (MSD) compliant to the eCall standard.
- Vehicle information display.
- Vehicle position and data visualized on several mapping tools and systems.

![Figure 17: The Marelli T-Box](image)

Main features declared:

- No central eCall PSAP necessary (but possible)
- Fast solution introduction, no specific infrastructures are needed
- Open and neutral technology (SMS, USSD, WLAN etc.)
- Car manufactures can select which protocol and encryption of data they prefer
- High reliability (currently proved on the field and massive tests)
- Redundancy through multi-access possibilities for the PSAPs
- Possibility to connect the system to other backend applications
- Low cost

2.2.8.2. POSITION REGARDING SAFETRIP PROJECT
The technology developed under tema.mobility is clearly competing with SafeTRIP platform. However, the approach seems quite obsolete and there have been no public recent updates since Oct 2009.

It provides a solution for eCall based on GSM. It is interesting the study of the features of the service centre PSAP.

It could be reasonable to start a liaison to verify how the SafeTRIP new technology can be applicable to the tema.mobility scope: Marelli is a very important OEM manufacturer for many car manufacturers across Europe.

2.2.8.3. **PRICE**
UNKNOWN

2.2.8.4. **KNOWN EVOLUTIONS OR ROADMAP**
UNKNOWN

2.2.8.5. **MAIN ACTORS**
Marelli, Telecom Italia, TELIT, Istituto Superiore Mario Boella di Milano

2.2.8.6. **REFERENCES**

http://www.telecomitalia.it/TIPortale/docs/innovazione/032007/pp_55_58.pdf
2.2.9. MERCEDES INCar HOTSPOT AND THE ‘CAR-TO-CAR COMMUNICATION’ TECHNOLOGY

2.2.9.1. SERVICE DESCRIPTION

With the Mercedes-Benz InCar Hotspot, the data signals are received via the vehicle antenna. A special WLAN router and a data-enabled SIM card process the signals and provide wireless Internet access also during the drive.

Up to three WLAN-enabled end devices (e.g. laptop, mobile) can be connected to the Internet simultaneously. The users thus have access to the “World Wide Web” with no site restrictions. The Mercedes-Benz InCar Hotspot system supports the particularly fast HSDPA transmission standard, as well as UMTS and GSM/EDGE.

The technology, called ‘Car-to-Car Communication’, links cars to each other by means of a WLAN (Wireless Local Area Network). Think of it as Wi-Fi for cars.

Whenever sudden braking occurs, the Electronic Stability Programme is triggered, or the hazard warning lights are switched on, the car sends a message to its neighbours to warn of the potential accident black spot. An audible warning and a message on the dashboard inform the drivers of other vehicles within range about the possible danger.

In rural areas, the range of these messages is 1-2km, although this can drop to just a few hundred metres in built-up city streets.

2.2.9.2. POSITION REGARDING SAFETRIP PROJECT

The Mercedes technologies are clearly competing with the SafeTRIP project.

The architecture is based on something very similar to what we consider a “Greenbox”.

It is going to provide services in the area of safety and cooperative driving.

However, since connectivity is based on 3G mobile network it is feasible to verify if Mercedes is interested into S-band to have full coverage.
2.2.9.3. **PRICE**
UNKNOWN

2.2.9.4. **KNOWN EVOLUTIONS OR ROADMAP**

From October 2009, the Mercedes-Benz InCar Hotspot will be available in the new E-Class and S-Class.

About **car-to-car**, a four-year-long test programme, shared among all the big German manufacturers (Audi, BMW, Mercedes and VW), begins this autumn and will test the system using a fleet of 1000 cars. Even once this test has been completed, it's likely that it will be a while before 'Car-to-Car' appears on production models.

Mercedes-Benz expects to put the system into production between 2015 and 2020. The intention is that many manufacturers will launch the system at the same time, with a single standard for the system across Europe.

2.2.9.5. **MAIN ACTORS**
Mercedes Benz, Audi, BMW and Volkswagen

2.2.9.6. **REFERENCES**
http://www.mercedes-benz.it/content/italy/mpc/mpc_italy_website/it/home_mpc/passengercars/home/passengercars_world/news_and_events/product_news/incar_hotspot.html

2.2.10. **MiFi™ 2352 – INTELLIGENT MOBILE HOTSPOT FOR HSPA NETWORKS (FOR EUROPE)**

2.2.10.1. **SERVICE DESCRIPTION**

MiFi is a personal connectivity solution providing wirelessly access the Internet from virtually anywhere with any WiFi-enabled device. MiFi supports multiple users. It is therefore possible to share high-speed connection with friends, family members and co-workers. The MiFi Intelligent Mobile Hotspot is compact to fit in the palm of hand. It also provides swap and transfer files with built-in microSDHC slot providing expandable storage capacity of up to 16GB.

**Features**

- Connects up to five Wi-Fi enabled devices simultaneously
- Computers, PDA’s, cameras, music players, personal and game players and more
- Rechargeable Lithium Ion Battery
- GPS- enabled
- Advanced internal antenna system
- NovaSpeed® capable
- Auto-install and auto-connectivity
- 10M (30 ft) range of network coverage

**Benefits**

- Wireless and secure internet connectivity from virtually anywhere
- Portable and convenient – smaller than a deck of cards
- Great for travel – family, friends and colleagues can connect
• Perfect for the mobile professional – creates a virtual office wherever you go for your and your co-workers
• Easy installation with MobiLink™ Connection Manager- no CD required
• Enhanced performance and less connectivity interruptions with NovaSpeed®
• Lasts up to 4 hours on a single charge so you can be anywhere and have connectivity (when connected to one Wi-Fi device)

2.2.10.2. POSITION REGARDING SAFETRIP PROJECT
MiFi is a cloud of connectivity: for personal and business use providing instant access to email, download of large files, and web browsing from your laptop while simultaneously allowing up to five computers or personal devices to be connected.

For the moment, MiFi is NOT a technology for cars. However it is a good example of a portable entertainment box that could become suitable for car aftermarket

2.2.10.3. PRICE
Less than 200 Euro

2.2.10.4. KNOWN EVOLUTIONS OR ROADMAP
N/A.

2.2.10.5. MAIN ACTORS
NOVATEL WIRELESS
Partner of Novatel Wireless for MiFi are Archos, Alcatel Lucent, Creative Labs and Eye-Fi

2.2.10.6. REFERENCES
http://www.speeka.com/u_merlin_mifi_home.asp

2.2.11. AUDI & NVIDIA
2.2.11.1. SERVICE DESCRIPTION
Audi selected nVIDIA to power its car’s dashboards. nVIDIA and Audi are collaborating to the development of a new multimedia engine called VIVA working as the common platform of the 3G MMI system. VIVA allows the passengers into an AUDI car to see DVD, listen to music from iPod, SD-cards, USB-sticks and online videos.

This means that from 2010, all Audi models will be “equipped with the third-generation multimedia interface system along with technology advances to provide even more sophisticated graphics in the years to come,” according to Audi.

The car maker has signed a deal to use the new Tegra 2 processor to make its in-car graphics, for both its GPS offering and basic menu systems look more “tasty”. The current version can be found on the recently announced Microsoft Zune HD.

A high-performance NVIDIA graphics processor ensures that navigation map images transition smoothly, even when the vehicle quickly changes direction. Driver orientation is enhanced by a three-dimensional landscape view that reproduces true-to-scale terrain. Photorealistic depiction of
points of interest allows visual matching of key landmarks to the in-car display, and identification of commercial points of interest is enhanced with well-known brand logos. The display offers a bird's-eye view of more-distant destinations and features automatic close-up zoom at intersections.

The currently available map data cover 43 European countries, the United States and Canada. Precise audio route instructions and voice commands for audio, telephone, address book and navigation functions are supported in eight languages. The system supports connection of external devices such as USB storage media or an Apple iPod; a jukebox function allows for creation of personal music playlists. The digital radio accepts both European Digital Audio Broadcast signals and U.S. satellite services. An integral four-band GSM cell phone supports Bluetooth connection and accepts a SIM card from a driver's personal phone.

2.2.11.2. POSITION REGARDING SAFETRIP PROJECT
The joint Audi/nVidia project is paving the way for a new generation of car navigators for high-level cars, based on 3D maps on Google Earth engine.

Furthermore, the choice to adopt a GPU-based approach into a car equipment indicates that Audi is convinced to have a computer box managing entertainment and navigation. This is not exactly the « Greenbox » in the SafeTRIP meaning but it could be easily extended to cover support of the SafeTRIP services.

2.2.11.3. PRICE
Currently Unknown

2.2.11.4. KNOWN EVOLUTIONS OR ROADMAP
Beyond the graphics upgrade, Audi is going to a hard drive-based navigation system, which allows more detailed maps and faster rendering than a DVD-based system. The car's 40 gigabyte hard drive will keep 10 gigabytes reserved for music, so CDs can be ripped to the car; this feature is becoming increasingly common with a new generation of automotive infotainment packages.
The 2011 Audi A8 will have the capability to display Google Earth mapping for navigation and point of interest search - a significant advance above traditional navigation systems.

Audi is also boasting new speech-to-text technology, which will not only let individuals enter addresses into the navigation system by saying full city and street names, but will also process the phone book of a paired Bluetooth phone. With this system, individuals will be able to say the name of anyone in their phone book, and have the car make the call.

This feature is similar to that in Ford's Sync system and the 2010 Lexus RX 450h. Further, Audi has also upgraded the MMI hardware, adding a joystick onto the top of the console command & control dial. This special joystick allows manoeuvring around the navigation system's map moving the cursor along an X and Y axis, as in a drawing toy board like Etch A Sketch.

From 2012 the new generation of HD mobile processors NVIDIA Tegra™ will be mounted also on the other cars manufactured in the Volkswagen Group, including Volkswagen, Bentley, Lamborghini, SEAT e SKODA.

2.2.11.5. MAIN ACTORS
Audi, NVIDIA

2.2.11.6. REFERENCES
www.audi.com
www.nvidia.com
2.2.12. **FORD WORK SOLUTIONS™ – IN-DASH COMPUTER**

2.2.12.1. **SERVICE DESCRIPTION**

Ford Work Solutions™ is a mobile productivity office solution dedicated to independent owner/operator of one truck or fleet manager in charge of many vehicles.

Ford Work Solutions™ is based on **In-Dash Computer**, developed by Magneti Marelli and powered by Microsoft® Auto, with high-resolution 6.5” in-dash screen and wireless keyboard. Built-in USB port and SD memory card slot. Supports office automation software and printing on a Bluetooth wireless inkjet printer. In-Dash computer provides the following main features:

**High-speed Internet access**
Full Internet connectivity with all favourite sites is available right from the vehicle with the high-speed Sprint Mobile Broadband Network.

**Remote computer access**
It allows individuals to access a remote office or home computer from your truck through the online LogMeIn® service. The remote computer is completely controlled directly from the In-Dash Computer, including all its programs and files.

**Hands-free calling and navigation**
The computer system works with wireless Bluetooth-enabled mobile phones, providing hands-free calling with push-to-talk voice recognition, access to user phonebooks, plus the ability to receive text messages. Navigation by Garmin includes turn-by-turn directions and voice prompts. With the
Sprint Mobile Broadband Network, there are additional services such as weather forecasts, reroute information to avoid construction delays or traffic congestion, and points of interest (gas station locations and fuel prices, restaurants, Ford dealers, etc..

2.2.12.2. **POSITION REGARDING SAFETRIP PROJECT**

The In-dash computer is an aftermarket solution for professional users, mainly workers that needs office capability while they on the move.

Connectivity is based on 3G/4G networks (Sprint Mobile Broadband Network)

The In-dash can be considered a sort of « Greenbox ». It does not provide yet safety or security functions, but it could be easily extended to do so. It is interesting to analyze its GUI.

![In-Dash GUI](image)

2.2.12.3. **PRICE**

1.200 USD

2.2.12.4. **KNOWN EVOLUTIONS OR ROADMAP**

Currently Unknown

2.2.12.5. **MAIN ACTORS**

Ford Work Solutions

2.2.12.6. **REFERENCES**

[http://www.fordworksolutions.com/Products/In-Dash](http://www.fordworksolutions.com/Products/In-Dash)
2.2.13. EUTELTRACS

2.2.13.1. SERVICE DESCRIPTION
QUALCOMM introduced the OmniTRACS mobile communications system in the United States in 1988. The OmniTRACS system incorporates one of two available satellite-positioning technologies — the standard QUALCOMM Automatic Satellite Position Reporting (QASPR) system and the optional Global Positioning System (GPS) — to provide the most comprehensive satellite tracking system available. Together they support tamper alerts as well as vehicle tracking functions that enhance the security and safety of mobile resources and their operators. Panic buttons allow drivers to send out urgent calls for help during an emergency — a factor that may contribute to retaining qualified drivers.

EutelTRACS is the European version of OmniTRACS and offers the same comprehensive benefits. EutelTRACS offers the following: Real-time data communication, Automatic vehicle tracking, GPS or QUALCOMM-proprietary satellite positioning, Seamless, Pan European coverage, roaming free communication across Europe.

EutelTRACS offers the following:
- Real-time data communication
- Automatic vehicle tracking
- GPS or QUALCOMM-proprietary satellite positioning
- Seamless, Pan European coverage
- Roaming free communication across Europe
- Over 14 years of operational reliability
- Data integration capabilities
- Value-added optional features
- High value cargo security and protection

EutelTRACS currently uses Eutelsat W1 satellite.

2.2.13.2. POSITION REGARDING SAFETRIP PROJECT
Euteltracs system has been designed for truck installations. The size and cost of the Ku-band (Ku band is primarily used for satellite communications, it ranges from 12 to 18 GHz) transmit antenna
is a major obstacle for the introduction of Euteltracs in the vehicular mass market. This point, added to the fact that Euteltracs is operated by Eutelsat, suggests that SafeTRIP platform can be seen as the future of Euteltracs instead of a competitor.

2.2.13.3. **PRICE**
Euteltracs terminal is sold for about 2500€ per units. In addition to the terminal, there is a subscription of around 50€ per month and per units. This subscription comprises:
- 1 report per hour concerning the truck status and position
- 200 pre-formatted messages per month
- 3 custom messages per day.

2.2.13.4. **KNOWN EVOLUTIONS OR ROADMAP**
NA

2.2.13.5. **MAIN ACTORS**
The System and the Services are commercialized in each European Country by Qualcomm Europe and or Partner Service Provider appointed by Qualcomm. The service is based on Eutelsat’s satellite fleet and the messages are operated by Eutelsat Network Operating Centre (NOC).

2.2.13.6. **REFERENCES**
i-way Intelligent co-operative system in cars for road safety, http://www.iway-project.eu/
http://www.qualcomm.com
2.2.14. eCall

2.2.14.1. Service Description

eCall is a project of the European Commission intended to bring rapid assistance to motorists involved in a collision anywhere in the European Union. The project aims to employ a hardware black box installed in vehicles that will wirelessly send airbag deployment and impact sensor information, as well as GPS coordinates to local emergency agencies. eCall builds on E112.

eCall is an emergency call either generated manually by vehicle occupants or automatically via activation of in-vehicle sensors when an accident occurs. When activated, the in-vehicle eCall system establishes a 112-voice connection directly with the relevant PSAP (Public Safety Answering Point), which is a public authority or a private eCall centre that operates under the regulation and/or authorisation of a public body. At the same time, a minimum set of data (MSD) – including key information about the accident such as time, location and vehicle description – is sent to the PSAP operator receiving the voice call. The minimum set of data may also contain the link to a potential Service Provider by including its IP address and phone number. If the user is subscribed to a Service Provider, additional information can be sent from the service provider to the PSAP as illustrated below.

![Figure 18: eCall Implementation](image)

2.2.14.2. Position Regarding SafeTRIP Project

Emergency call is a service that could be integrated in the SafeTRIP system. The system components can be integrated into the SafeTRIP’s onboard unit to allow for emergency calls to be made and for the transmission of the minimum set of required data. The cooperation with eCall and the integration of eCall technology in SafeTRIP is to be considered.

2.2.14.3. Price

NA
2.2.14.4. **KNOWN EVOLUTIONS OR ROADMAP**
As of 2009, the European Commission expects implementation by 2014 that can be seen on the following road plan.

![eCall Deployment plan (Road map)](image)

**Figure 19:** eCall Road Map

2.2.14.5. **MAIN ACTORS**
The project is supported by the European Automobile Manufacturers Association (ACEA), an interest group of European automobile, bus and truck manufacturers, and ERTICO, a non-profit organization promoting the implementation of intelligent transportation systems and service providers in Europe. Many of the stakeholder companies involved with telematics technology have membership in ERTICO or ACEA. An advantage of this membership is the increased ability to influence the development of eCall standards.

2.2.14.6. **REFERENCES**
http://www.esafetysupport.org/
http://en.wikipedia.org/wiki/ECall
2.2.15. VCALL

VCall is the result of recent research & development initiative by IMA, MAIF and MACIF, who are in the SafeTRIP consortium. It aims at providing a range of subscription-services to the motorists. These services include:

- Roadside assistance for breakdown
- Emergency assistance
- Vehicle surveillance and tracking
- Accident hot-spots alert and traffic information
- Interactive navigation

VCall is marketed as a black box loaded with a fully upgradeable applications, more advanced than most personal navigation systems on the market. It is equipped with a GSM/GPRS modem and GPS and most services need the audio and data channels. The black box is an aftermarket product and is therefore installed on the vehicle in certified garages.

VCall is certified by the French ministry of internal affairs and as a result, has permissions to seek assistance from emergency services when required. The VCall processes have also been approved by the French CNIL. It is marketed by MAIF as Virgile and by MACIF as Sygeo.

2.2.15.1. SERVICE DESCRIPTION

Figure 20 : VCall navigation and basic 3-button assistance interface

Automatic emergency alerts
The onboard telematic equipment detects when a vehicle is involved in an accident. In the event of sudden shock, an emergency call is made to an emergency handling platform and information about the vehicle’s main user and precise location is sent. The emergency handling technicians then attempt to establish a voice call with the driver or passengers through the integrated communication system in the VCall box. Through this call, there is an assessment of the situation and the appropriate action is taken. If there is no response from the driver or their passengers, the emergency services are informed and provided with the information at hand to investigate the incident.

Manual emergency alerts
If the vehicle is involved in an accident or the lives of the vehicle’s occupants are at risk (e.g. due to aggression or sudden illness), the occupants (driver or any passenger) can seek assistance by
pressing the SOS button on the 3-button interface (Figure 20: VCall navigation and basic 3-button assistance interface). This establishes a call with IMA’s emergency assistance specialists who will evaluate the situation and provide immediate help. This function can also be used by customers of VCall when they are called upon to assist drivers of other vehicles, for example if they witness an accident or encounter a person requiring medical assistance.

**Breakdown assistance**
If the VCall customer’s vehicle breaks down or has a minor accident, he can call for roadside assistance by pressing the "help" button on the 3-button interface. Using the information about the GPS position of the vehicle, the assistance technician contacts the nearest vehicle repair/assistance team for a timely intervention.

**Vehicle surveillance & tracking services**
This security feature allows the customer to have his parked vehicle under surveillance by activating the onboard "surveillance" application. If the car moves whilst in this mode, an alert is sent to the remote-surveillance team. A series of security checks are then undertaken to establish whether the car has indeed been stolen or the driver has simply forgotten to deactivate the function. If it is not possible to contact the owner or if it is established that an unidentified individual is driving the vehicle, the GPS tracking is activated and the appropriate law enforcement services are notified and are given access to a secured website that allows them to track the stolen vehicle in real-time.

**2.2.15.2. POSITION REGARDING SAFETRIP PROJECT**
Given that the companies behind VCall are in the SafeTRIP consortium, there will be collaboration and reuse of VCall assets to support the SafeTRIP platform. For instance, VCall has got the necessary infrastructure to handle large emergency call volumes and processes in place that have proven to operate well within the context of the emergency, surveillance and roadside assistance services.

In conclusion, there will be collaboration between VCall and SafeTRIP.

**2.2.15.3. PRICE**
The VCall service is offered as part of the insurance product offered by MAIF and MACIF. The price of VCall is therefore dependent on the set of services selected by the customer and the type of insurance package selected. It amounts to approximately € 20 per month and € 150 for the installation of the VCall black box.

**2.2.15.4. KNOWN EVOLUTIONS OR ROADMAP**
N/A

**2.2.15.5. MAIN ACTORS**
IMA, MAIF, MACIF

**2.2.15.6. REFERENCES**
http://www.maif.fr
http://www.macif.fr
### 2.3. Summary

<table>
<thead>
<tr>
<th>Technology/Service Name</th>
<th>Leading company</th>
<th>Position regarding SafeTRIP</th>
<th>Potential collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSRC</td>
<td>-</td>
<td>DSRC can be used as a complement of SafeTRIP for car2car communications.</td>
<td>✓</td>
</tr>
<tr>
<td>IR technology</td>
<td>-</td>
<td>IR technologies can be used as a complement of SafeTRIP for payment enforcement purposes.</td>
<td>✓</td>
</tr>
<tr>
<td>WiFi, Wave</td>
<td>-</td>
<td>WiFi can be used as a complement of SafeTRIP for car2car communications.</td>
<td>✓</td>
</tr>
<tr>
<td>VANET</td>
<td>-</td>
<td>VANET technology is to be considered as a competing technology to SafeTRIP.</td>
<td>✗</td>
</tr>
<tr>
<td>UMTS-HSDPA</td>
<td>-</td>
<td>3G-4G networks are considered as alternative terrestrial networks in SafeTRIP.</td>
<td>✓</td>
</tr>
<tr>
<td>Lojack</td>
<td>Lojack/Traqueur</td>
<td>Lojack is competing with SafeTRIP on stolen vehicle recovery application. However, a collaboration between the two services shall be explored.</td>
<td>✓</td>
</tr>
<tr>
<td>Coyote</td>
<td>Coyote systems</td>
<td>Coyote is a potential customer for SafeTRIP</td>
<td>✓</td>
</tr>
<tr>
<td>TrafficMaster</td>
<td>TrafficMaster/Teletrac</td>
<td>TrafficMaster is a potential customer for SafeTRIP</td>
<td>✓</td>
</tr>
<tr>
<td>TMC</td>
<td>-</td>
<td>SafeTRIP shall support traffic message channel</td>
<td>✓</td>
</tr>
<tr>
<td>T-DMB</td>
<td>ETSI – TDF</td>
<td>T-DMB is a strong competitor of SafeTRIP. However, SafeTRIP shall try to take advantage of directives related to this standard.</td>
<td>✗</td>
</tr>
<tr>
<td>Tema.mobility</td>
<td>Magneti Marelli</td>
<td>The technology developed under tema.mobility is clearly competing with SafeTRIP solution.</td>
<td>✗</td>
</tr>
<tr>
<td>Technology/Service Name</td>
<td>Leading company</td>
<td>Position regarding SafeTRIP</td>
<td>Potential collaboration</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------------</td>
<td>-------------------------------------------------------------------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>Mercedes InCar Hotspot</td>
<td>Mercedes Benz</td>
<td>The Mercedes system is competing with the SafeTRIP solution. However, since Mercedes is not a telecom operator, they could be interested in switching to satellite technology.</td>
<td>✓</td>
</tr>
<tr>
<td>MIFI 2352</td>
<td>NOVATEL wireless</td>
<td>MiFi is not a competitor of SafeTRIP since it is not a technology for cars. However, a collaboration could be initiated in order to take advantage of their hardware.</td>
<td>✓</td>
</tr>
<tr>
<td>Audi &amp; NVidia</td>
<td>Audi</td>
<td>The Audi system is identified as a strong competitor in the future.</td>
<td>✗</td>
</tr>
<tr>
<td>Ford Work solutions</td>
<td>Ford</td>
<td>The FordWork solution is identified as a strong competitor in the future.</td>
<td>✗</td>
</tr>
<tr>
<td>EutelTRACS</td>
<td>Qualcomm – Eutelsat</td>
<td>SafeTRIP can be considered as the future of EutelTRACS</td>
<td>✓</td>
</tr>
<tr>
<td>eCall</td>
<td>ACEA</td>
<td>eCall can be seen either as a competitor or as a potential opportunity for SafeTRIP depending on the technology adopted by the EC.</td>
<td>✓</td>
</tr>
<tr>
<td>VCall</td>
<td>IMA</td>
<td>VCall can be seen as a collaborator as the companies are in the SafeTRIP consortium</td>
<td>✓</td>
</tr>
</tbody>
</table>

Table 28 : Summary of the Competing Technologies and Services Analysis
The review of competing technologies and services, as summarized in Table 28: Summary of the Competing Technologies and Services Analysis, confirms the need for vehicle connectivity over Europe. In addition, it provides relevant information on prices offered by current service providers which will feed into the business models in work package WP2.4. Finally, through this review, we have a better appreciation of the difficulties encountered by existing systems and define the following set of requirements.

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Requirement</th>
<th>Description and Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTS001</td>
<td>OTH</td>
<td>Provision of a pan European coverage without roaming charges</td>
<td>Several systems studied in Section 2 suffer from costly roaming charges applied by telecom operators.</td>
</tr>
<tr>
<td>CTS002</td>
<td>COM</td>
<td>Support of TMC protocol</td>
<td>TMC is a widely adopted protocol that have to be supported in SafeTRIP</td>
</tr>
<tr>
<td>CTS003</td>
<td>COM</td>
<td>Car to car communication technical compatibility</td>
<td>Section 2 demonstrates that V2V technologies will be mature very soon and that they can be seen as a good complement of satellite communications.</td>
</tr>
</tbody>
</table>

Table 29: Competing Technologies and Services - Requirements
3 Influences

3.1. Political & Macro Economics

3.1.1. TRANSPORT IS THE BACKBONE OF THE EUROPEAN ECONOMY

Transport is the backbone of the European economy, accounting for about 7% of GDP and more than 5% of total employment in the EU. As a network industry, transport requires elements such as infrastructures, vehicles, equipment, ICT applications and operational procedures to interact smoothly in order to move people and goods efficiently.

The European Commission launched in 1992 and 2001 two 10-year policy programmes for the competitiveness and sustainability of the European transport system. Today, European skies, seas, railways, waterways and roads are safer, transport services are cheaper and more efficient, passenger rights have been strengthened and transport workers enjoy a higher level of social protection.

Now Europe, and the rest of the world, are facing new and formidable challenges:

- an urgent need to drastically reduce greenhouse gas emissions;
- oil prices are pushed to unprecedented heights through growing demand and declining production;
- traffic congestion is approaching intolerable levels in many cities, airports and ports.

The scope of these challenges is such that a profound transformation in the transport system will be required in the coming decades. Yet resources available to meet these challenges are limited by the economic crisis in the short run and in the longer term by the ageing of the European population.

3.1.2. THE GROWTH OF TRANSPORT ACTIVITY RAISES CONCERNS

According to a 2009 Communication from the EC, the growth of transport activity raises concerns for its environmental sustainability.

Globalisation has a major impact on transport. It has been a powerful trend of the past decades, enabled by trade liberalisation agreements and by revolutionary developments in transport and communication technologies (from containers to satellite radio-navigation) that have reduced distance and time barriers. Together with further deepening of the single market, integration of the EU with neighbouring regions (eastern Europe, North Africa) and into the world economy, this trend is likely to continue.

Congestion that is prevalent in agglomerations and in their access routes is the source of large costs in terms of delays and higher fuel consumption. As most freight and passenger transport starts or ends in urban areas, urban congestion also negatively impacts on inter-urban travel. Urban transport accounts for 40% of CO2 emissions and 70% of emissions of other pollutants arising from road transport. (See Green Paper “Towards a new culture for urban mobility”, 2007)

Nevertheless, progress has been achieved in reducing air pollution and road accidents. Air quality in many European cities has significantly improved through the application of ever-stricter Euro emission standards, but more needs to be done, above all to reduce emissions in urban areas of NOx and fine particles as well as ensuring that real world emissions are adequately controlled.
Europe’s roads have become safer in recent years: the number of road accidents involving a personal injury fell by some 12% between 1991 and 2007. More importantly, the number of road fatalities dropped by more than 44% over the same period. Yet much progress remains to be made to achieve the target of halving the number of road fatalities by 2010 compared with 2001 levels. With still over 39,000 deaths in the EU in 2008, transport by road remains far too costly in terms of human lives.

In transport, like in any other sector, there cannot be economic efficiency unless the prices reflect all costs – internal and external – actually caused by the users. By providing information on the relative scarcity of goods or services, prices convey essential information to economic actors. The transport system would particularly benefit from better price signals. It is rare to have price differentiation for the use of the road in peak versus off-peak hours. Similarly, there is no economic incentive to use more silent vehicles, safer modes of transport or more environmentally friendly means.

3.1.3. EC TRANSPORT POLICY OBJECTIVES HAVE EVOLVED

In response to these challenges, EC objectives have evolved. Today, the goal of the European Transport Policy is to establish a sustainable transport system that meets society’s economic, social and environmental needs and is conducive to an inclusive society and a fully integrated and competitive Europe.

The ongoing trends and future challenges highlighted in the previous paragraphs, point to the need for satisfying a rising demand for ‘accessibility’ in a context of growing sustainability concerns. Increasing ‘virtual’ accessibility through information technology (teleworking, e-Government, e-Health, etc.) could also reduce transportation needs. Evidence on the effect of these practices is still limited, but it seems they have a significant and yet unexploited potential for replacing travel.

The most immediate priorities appear to be the better integration of the different modes of transport as a way to improve the overall efficiency of the system and the acceleration of the development and deployment of innovative technologies. This evolution occurs using holistic approach that always keeps the transport users and workers, their needs and rights, at the centre of policy making.

Technological innovation will be a major contributor to the solution of the transport challenges. New technologies will provide new and more comfortable services to passengers, increase safety and security and reduce the environmental impacts.

Information systems are essential in overseeing complex transport chains involving several actors, as well as in informing transport users of available and alternative options and of possible disruptions. Transport documents and tickets should be made electronic and multi-modal, while preserving privacy of personal data. Questions of liability, dispute settlement and complaints handling across the whole transport chain should be clarified and streamlined. ICT solutions should be developed as a support for better management and integration of transport flows.

“Soft infrastructures”, like intelligent transport systems for road (ITS), traffic management systems for rail (ERTMS) and aviation (Single European Sky’s SESAR), backed by Galileo/EGNOS, can optimise the use of the network and improve safety. Innovative vehicle technology can lower emissions, reduce oil dependency and increase comfort.

The development of technological solutions for sustainable transport is also important to promote growth and safeguard jobs. Europe is a world leader in many fields of transport including infrastructure, manufacturing of transport equipment, transport services and logistics. In view of the expected increase in global competition, keeping and enhancing this leadership is a key factor in preserving the overall competitiveness of the EU economy, and will also provide an opportunity for our transport industry to serve new and expanding markets.
3.1.4. Frameworks and Policy Instruments to Address Transport Challenges

The transport system involves complex interactions among political, economic, social and technical factors. Many new technologies and regulatory practices will develop in the next few years to address transport challenges. Coordination will be needed to ensure equipments’ interoperability and to avoid the proliferation of different systems at national level, for example rules and standards for tolling, for ITS or for access to congested areas.

For promising technologies, the necessary framework conditions to introduce them commercially on the market have to be put in place by policy makers without giving undue advantage to any specific technology. This requires, in particular, setting open standards, ensuring interoperability, increasing R&D expenditures for technologies that are not yet mature for market application, defining a clear legal and regulatory framework – e.g. for liability and privacy issues – and promoting best practice examples.

The most important policy instrument will probably be standard setting. The transition to a new and integrated transport system will only be quick and successful if open standards and norms for new infrastructure and vehicles and other necessary devices and equipment are introduced. The standard setting should aim at interoperable, safe and user-friendly equipment.

This is not only important for the internal market, but also to foster European standards on an international scale. The development of Intelligent Transport Systems (ITS) could provide a success comparable to that of GSM technology. Policy makers must, however, ensure that the standard setting process avoids the introduction of barriers to market entry and to the development of alternative technologies.

Another policy instrument is to foster R&D expenditures towards sustainable mobility. New transport systems and vehicle technologies will have to be first implemented as demonstration projects, to assess their feasibility and economic viability. Public intervention would also be needed at various stages of the development of the infrastructure that supports new vehicles. Much work remains to be done to speed up the integration of already available applications in the transport system.

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCE01</td>
<td>Politics</td>
<td>Demonstrate “sustainable mobility”</td>
</tr>
</tbody>
</table>

3.1.5. Introducing Intelligent Transport Systems (ITS)

New infrastructure is costly and making the optimal use of existing facilities can already achieve a lot with more limited resources. This requires proper management, maintenance, upgrading and repair of the large infrastructure network that has so far given Europe a competitive advantage. Upgrading the existing infrastructure – also through intelligent transport systems – is in many cases the cheapest way to enhance the overall performance of the transport system.

The 2006 review (“Keep Europe moving”) of the EC’s 2001 White Paper on Transport Policy already remarked that transport was becoming a high-technology industry and highlighted the role that ITS could play to meet the new challenges.

ITS is the generic name given to a wide range of systems leveraging information and communication technologies (ICT), and satellite-based communication services in particular, to transform the transport sector. Examples of ITS include traffic information and control, automatic vehicle identification, fee and toll collection, vehicle fleet management, pollution warning and control, hazard warning and control, navigation and cooperative systems.
In Europe, there have been a number of activities in this domain since the 1980s, but ITS use is still uneven. A patchwork of national and local solutions (on specific areas such as clean and energy-efficient transport, road congestion, traffic management, road safety, security of commercial transport operations or urban mobility) is slowing down overall deployment and fails to provide seamless service.

To overcome these problems and make full use of the great potential which ITS offers, the European Commission has issued an Action Plan in 2008 and is preparing a Directive. The goal is to address well-known issues and challenges from a European perspective: greening of transport, improving transport efficiency, road safety and security, geographical continuity, interoperability of services, and systems and standardisation.

Member States, understandably, have a more limited viewpoint, focusing first on national matters and becoming involved in developments at the European level only to resolve cross-border issues such as long distance traffic flows through countries, sharing information to support traffic management and international information services.

The issues they face vary widely: adverse weather in winter can cause severe traffic management problems in northern countries, while in the south, seasonal traffic during holiday periods can cause severe congestion. In some countries, central government is the highway authority for all designated roads, while in others private companies can operate certain roads under a concession. New members have generally less well-developed infrastructures and are struggling to upgrade their transportation systems.

3.1.6. THE ROLE OF ON-DEMAND UBQUITOUS CONNECTIVITY SERVICES

With more than 1.5 billion Internet users and nearly 5 billion mobile subscriptions globally, communication networks are strained and “ubiquitous connectivity” has become a major feature of our times, generally associated with terrestrial mobile and wireless networks. Nevertheless, satellite communication technology too offers the potential of “ubiquitous connectivity”, especially in remote areas, but it can do more to realize the European Commission’s objectives for Intelligent Transport Systems (ITS).

Today, service providers are expanding their business range and satellite-based technology can be applied for hybrid, low cost, in-vehicle, one- and two-way connectivity services with wide area coverage, such as:

- digital radio and television broadcasting;
- telephony, broadband data and multimedia services.

And through technological and business model innovations, these services can now be supplied “on-demand”, almost anywhere instantly within the footprint of the satellite, making the dream of reliable “on-demand ubiquitous connectivity” services come true and helping to relieve overburdened mobile networks.

Accordingly, expectations are growing for satellite-based connectivity to be a key enabler of “on-demand ubiquitous connectivity”, to achieve a safe, secure, clean, efficient and comfortable mobility of people and goods.

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCE02</td>
<td>Business</td>
<td>Enable and demonstrate “on-demand ubiquitous connectivity” services</td>
</tr>
</tbody>
</table>
3.1.7. **AN ACTION PLAN FOR THE DEPLOYMENT OF ITS IN EUROPE**

To address the sustainable transport challenge, the European Commission 2008 ITS Action Plan outlines six priority areas for action:

- **Action Area 1** Optimal use of road, traffic and travel data
- **Action Area 2** Continuity of traffic and freight management ITS services on European transport corridors and in conurbations
- **Action Area 3** Road safety and security
- **Action Area 4** Integration of the vehicle into the transport infrastructure
- **Action Area 5** Data security and protection, and liability issues
- **Action Area 6** European ITS cooperation and coordination

These activities complement ongoing EC initiatives such as the Action Plan on Freight Transport Logistics, the Action Plan on Urban Mobility, the Greening Transport Package, the i2010 initiative on Intelligent Cars, eSafety, eCall, CARS 21, Galileo deployment, the 7th Framework Programme for Research and Technological Development, European Technology Platforms and their strategic research agendas.

Thereafter, we are going to review these activities and initiatives to highlight points where SafeTRIP partners need to be careful.

There is an abundant literature produced both by former and on-going EU and national research projects on the requirements stemming from the European Transport Policy, the ITS Action Plan and related initiatives.

Here is a selection of EU-funded research projects for SafeTRIP partners to consider: EcoMove, EasyWay, COMeSafety, SIM-TD, SPITS, GSC, GiNA, COVEL, GNSSmeter, RTMS, CESARE IV, RCI, iTETRIS, GeoNet, EUCAR, AIDE, EASIS, GST, TRACE, APROSYS, APSN, WATCH-OVER, ATESST(2), FIDEUS, CARTALK 2000, FREILOT, TRKC, EXTR@Web, TRASCOM, CONNECT, VIVALDI, TELLUS, AGORA, EMMA, Mobile.info.
3.1.7.1. **ACTION AREA 1: OPTIMAL USE OF ROAD, TRAFFIC AND TRAVEL DATA**

Many state-of-the-art ITS applications rely on an accurate knowledge of both the characteristics of the road network and the traffic regulations applicable (e.g. oneway streets and speed limits). Whilst in the past the bulk of this knowledge was provided by authorities, there is a trend towards the utilisation of commercial sources.

Where road safety is at stake it is essential that this information is validated and made available to all players on a fair and equitable basis, in view of ensuring a safe and orderly management of traffic. This applies, in particular, to digital mapping, including its inherent processes for data collection, validation and timely updating.

Similar considerations apply to the provision of (real-time) traffic and travel information services. Specific issues include the notion of “universal traffic messages”, i.e. the type of messages to be provided free of charge to all road users as a public information service, the consistency of the information between the various sources, and the need to comply with prescriptions imposed by network management operations.

**The EC proposes the following actions:**

<table>
<thead>
<tr>
<th>Action</th>
<th>Target Date</th>
<th>Description</th>
</tr>
</thead>
</table>
| A 1.1  | 2010        | 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 |
| A 1.2  | 2012        | Optimisation of the collection and provision of road data and traffic circulation plans, traffic regulations and recommended routes (in particular for heavy goods vehicles) |
| A 1.3  | 2011        | 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. |
| A 1.4  | 2011        | 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) |
| A 1.5  | 2009-2012   | Promotion of the development of national multimodal door-to-door journey planners, taking due account of public transport alternatives, and their interconnection across Europe |

**Remarks for SafeTRIP partners:**

- Several national working groups are working on these topics.
- An important element is the licensing conditions for the data exchange.
- The use of TPEG and DATEX/DATEX II to exchange real time traffic information is being discussed.
- Mobile satellite and on-demand ubiquitous connectivity services are not mentioned.

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCE03</td>
<td>Road Data (ITS AP)</td>
<td>Where road safety is at stake it is essential that information is validated and made available to all players on a fair and equitable basis, in view of ensuring a safe and orderly management of traffic</td>
</tr>
</tbody>
</table>
3.1.7.2. **ACTION AREA 2: CONTINUITY OF TRAFFIC AND FREIGHT MANAGEMENT ITS SERVICES ON EUROPEAN TRANSPORT CORRIDORS AND IN CONURBATIONS**

The need to accommodate rising traffic volumes, notably on the major European transport corridors and in conurbations, while promoting environmental sustainability and energy efficiency, calls for innovative transport and traffic management solutions. In this respect, seamless and dynamic traffic and transport management are beneficial for long-distance and urban freight transport and at the same time improve co-modality.

ITS technologies are essential for the introduction of e-Freight (see Communication “Freight Transport Logistics Action Plan”, 2007), whereby “en route” information on the location and condition of transported goods (especially dangerous goods and live animals) is made available on-line in a secure way. This concept can be extended to encompass other supply-chain activities such as the exchange of content-related data for regulatory or commercial purposes, using innovative technologies such as radio frequency identification (RFID) (see COM(2007) 96) and building on applications of the EGNOS/Galileo satellite positioning system. In the future this may lead to a concept of “Intelligent Cargo”, meaning that goods become self-context- and location-aware as well as connected to a wide range of information services.

Charging vehicles to use certain routes or areas is increasingly based on a variety of parameters such as vehicle dimensions, emission levels, distance travelled or time of day. ITS solutions making use of satellite positioning and mobile communications offer new opportunities for implementing such types of infrastructure access and charging.

**The EC proposes the following actions:**

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<thead>
<tr>
<th>Action</th>
<th>Target Date</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>A 2.1</td>
<td>2011</td>
<td>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</td>
</tr>
<tr>
<td>A 2.2</td>
<td>2010</td>
<td>Identification of ITS services to be deployed in support of freight transport (e-Freight) 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</td>
</tr>
<tr>
<td>A 2.3</td>
<td>2010</td>
<td>Support for the wider deployment of an updated multimodal European ITS Framework architecture for intelligent transport systems and definition of an ITS 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</td>
</tr>
<tr>
<td>A 2.4</td>
<td>2012-2014</td>
<td>Implementation of the interoperability of electronic road toll systems (see Directive 2004/52/EC)</td>
</tr>
</tbody>
</table>

**Remarks for SafeTRIP partners:**

- Nanotechnology evolution and standardisation issues are to be considered;
- The State is losing the control over the traffic information sector, against nomadic devices providers or regional operators;
- All stakeholders shall ideally be involved in the definition of the new national ITS services;
- EasyWay, for which 21 countries are joining forces at the moment to deploy ITS in a smooth way, also takes forward the idea of the continuity of services and how to get these services extended;
- ITS have to be rolled out in a continuous way, regardless of the roads or modes of transport used;
- Satellite positioning and mobile communications are there, but mobile satellite and on-demand ubiquitous connectivity services are not mentioned.

3.1.7.3. **ACTION AREA 3: ROAD SAFETY AND SECURITY**

ITS-based road safety and security applications have proved their effectiveness, but the overall benefit for society depends on the scale of their deployment. Issues that require additional attention include designing a safe Human Machine Interface (HMI) (re-using the work done on the “European Statement of Principles” (1998 & 2006), integrating nomadic devices and ensuring the safety of vulnerable road users (such as the elderly).

Note that Nomadic devices are pieces of communication and information equipment that can be brought inside the vehicle by the driver to be used while driving: mobile phone, navigation system, pocket PC, etc. Efforts to promote best practices in these areas are therefore crucial to address these issues.

Transport systems may also be under security threats. Transport security, especially the need to protect travellers and transport workers and to secure transport facilities and assets, must be taken into account without jeopardizing efficient and effective transport operations.

**The EC proposes the following actions:**

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<tr>
<th>Action</th>
<th>Target Date</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>A 3.1</td>
<td>2009-2014</td>
<td>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 used ones</td>
</tr>
<tr>
<td>A 3.3</td>
<td>2010</td>
<td>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 (see C(2006) 7125) on safe and efficient in-vehicle information and communication systems</td>
</tr>
<tr>
<td>A 3.4</td>
<td>2014</td>
<td>Development of appropriate measures including best practice guidelines concerning the impact of ITS applications and services on the safety and comfort of vulnerable road users</td>
</tr>
<tr>
<td>A 3.5</td>
<td>2010</td>
<td>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</td>
</tr>
</tbody>
</table>

**Remarks for SafeTRIP partners:**
- Member states are preparing the eCall implementation (e.g. Germany, Spain, Czech Republic, Romania) and participating in the European eCall Implementation Platform (EeIP);
- Improving road safety and security is a major challenge for public authorities, infrastructure operators and car manufacturers. Advances in automotive electronics and software are called for, as well as support for applications such as dangerous goods tracking and emergency calling.
- Mobile satellite and on-demand ubiquitous connectivity services are not mentioned.
3.1.7.4. **ACTION AREA 4: INTEGRATION OF THE VEHICLE INTO THE TRANSPORT INFRASTRUCTURE**

The use of ITS components or systems is stipulated in several existing or planned legal acts and voluntary agreements applicable to commercial or private vehicles. Examples include the provisions on the transport of dangerous goods and live animals, digital tachograph (see Regulation (EC) 2135/98), electronic toll collection and eCall. So far most of these acts and agreements have evolved independently of each other, so there has been little synergy even when needs are the same.

A streamlining and integration of these applications within a coherent, open-system architecture could yield better efficiency and usability, reduced costs and enhanced extensibility, enabling a “plug and play” integration of future new or upgraded applications such as those in nomadic devices and those utilising GNSS services for advanced positioning and timing.

This open system architecture would be embodied in an open in-vehicle platform, guaranteeing interoperability/interconnection with infrastructure systems and facilities. With this modular approach, additional functionalities could be integrated later for in-vehicle safety and safe HMI, personal mobility, logistics support and access to multimodal information and possibly electronic vehicle identification.

This platform should be introduced in commercial vehicles first. Positive feedback from these applications would help speed up the uptake of integrated ITS applications in private vehicles, therefore stimulating a Europe-wide market for original and after-market in-vehicle products and services.

The development of cooperative systems, based on an exchange of information and communication between vehicles and with the road infrastructure, is also progressing rapidly, and needs to be further promoted.

**The EC proposes the following actions:**

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<tr>
<th>Action</th>
<th>Target Date</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>A 4.1</td>
<td>2011</td>
<td>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.</td>
</tr>
<tr>
<td>A 4.2</td>
<td>2010-2013</td>
<td>Development and evaluation of cooperative systems in view of the definition of a harmonised approach; assessment of deployment strategies, including investments in intelligent infrastructure</td>
</tr>
<tr>
<td>A 4.3</td>
<td>2010 (I2I) 2011 (V2I) 2013 (V2V)</td>
<td>Definition of specifications for infrastructure-to-infrastructure (I2I), vehicle-to-infrastructure (V2I) and vehicle-to-vehicle (V2V) communication in co-operative systems</td>
</tr>
<tr>
<td>A 4.4</td>
<td>2009-2014</td>
<td>Definition of a mandate for the European Standardisation Organisations to develop harmonised standards for ITS implementation, in particular regarding cooperative systems.</td>
</tr>
</tbody>
</table>

**Remarks for SafeTRIP partners:**

- Several projects are on-going at the moment in Germany, with a focus on wireless connection, permitting to receive information from the infrastructure into the cars (safety information but also special parking rates or shops info when entering a city etc).
• In Germany, the test sites for the devices imitate real life environments and situations.
• The open in-vehicle platform concept raises questions from certain stakeholders. There is a need to specify what “open” means from a general point of view. This information is particularly required when approaching the issue with car manufacturers.
• The platform should be “open” without raising questions on its security level and has to be widely accepted by the industry. Thus, standardisation issues are also to be discussed and approached further in this action area.
• Need to establish a realistic time frame for creating and implementing standards is important.
• The ITS Action Plan is an agenda setting, 24 areas where a way to move forward is to be worked out on implementing ITS in Europe. This is why the standards have to be satisfying for all the involved parties and a step by step approach is needed.
• In the infrastructure-to-car area, the public authorities shall be involved and give access to the car manufacturers when the standards are decided.
• In the car-to-car communication area, it is key that the cars are able to communicate from the beginning, not after a revision period (a discussion about the standards is necessary at this stage).
• On the car-to-infrastructure communication, it is important to decide what type of information has to be received from the car, so that the system is not loaded with redundant data.
• There is a need for a mandate for European standards, as otherwise the standards do not have a real value from all stakeholders point of view.
• The importance of private-public cooperation is important in this context: national platforms are needed and strong cooperation ties have to be developed. An example of such cooperation is the European eCall Implementation Platform, where the public and private sector work together both at the national and European level.
• The cooperation should envisage the entire roadmap, so that there is clarity on the involvement’ implications for each party. An example is cooperative systems, where there is a need to make clear what party - private or public - has to take over the work on finalising the standards.
• EasyWay brings into attention issues which regard both private and public sector, but in reality the only one involved in the work is the public sector. A suggested approach to avoid such problems is to only fund in the future the activities of national platforms which already represent not just the public, but also the private sector.
• In some countries the role of the state in operating the roads is decreasing (for example, many French roads are operated by private operators). The state still represents the country’s interests at the European level, but many projects are carried out by private actors (which are not interested to work together in long term projects).
• Mobile satellite and on-demand ubiquitous connectivity services are neither mentioned in the actions nor in the standards.
• Like any embedded in-vehicle system, the SafeTRIP “Greenbox” must comply with the relevant directives under the European motor vehicle type approval system and systems should be designed in a way that the driver is always held responsible for his/her driving.
• The market for automotive head units, the platforms where infotainment, telematics and multimedia meet, is fast becoming crowded with major players like Microsoft, QNX, Google (Android) and GENIVI, all trying to build Apple-like in-car App stores and ecosystems. GENIVI is a Linux-based AUTOSAR-compliant initiative led by automakers like BMW and PSA that aims at both reducing time-to-market and total cost of ownership. Re-inventing the wheel in this area would therefore be counter-productive.
• Hughes Telematics, the service provider behind the brand-new Mercedes-Benz’s system that links cars to smart phones and their apps, plans to create a satellite network that will allow its telematics system to operate anywhere and at all times. SAFETRIP partners should investigate the strategic and techno-economic implications of such an approach.
Hughes Telematics is also introducing innovative business models with a mix of subscription and “à la carte” that allows users to make Amazon or Apple-like impulse purchases and micro-payments. SAFETRIP partners should ascertain the potential of such a business model to sell mobile satellite and on-demand ubiquitous connectivity services.

To seize the ITS opportunity, it is essential for satellite-based connectivity to be recognized as a key enabler in as many ITS-related standards and projects as possible.

At the very least, SAFETRIP partners should establish a liaison with standards organizations like ISO/TC 204 “Intelligent transport systems” and TC 22 “Road vehicles”, CEN/TC 278 “Road Transport and Traffic Telematics”, ETSI/TC ITS “Intelligent transport systems” and TC SMG “Special Mobile Group”, and TISA/TPEG to monitor and influence ITS-related standardization activities. Mobile Satellite Services (MSS) issues are dealt with by ITU-R.

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<tr>
<th>Ref No</th>
<th>Type</th>
<th>Requirement</th>
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<tbody>
<tr>
<td>MCE04</td>
<td>Business</td>
<td>Do not start a SAFETRIP/“Greenbox” ecosystem from scratch and build on existing ecosystems</td>
</tr>
</tbody>
</table>
3.1.7.5. **ACTION AREA 5: DATA SECURITY AND PROTECTION, AND LIABILITY ISSUES**

The handling of data (notably personal and financial data) in ITS applications raises a number of issues, as citizens’ data protection rights are at stake. At the same time, data integrity, confidentiality and availability must be ensured for all parties involved, especially citizens. Finally, the use of ITS applications creates additional requirements in terms of liability. These issues can be a major barrier to wide market penetration of some ITS services if citizens’ rights are not shown to be fully protected.

**Within the Action Area 5, the EC proposes the following actions:**

<table>
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<tr>
<th>Action</th>
<th>Target Date</th>
<th>Description</th>
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<tbody>
<tr>
<td>A 5.1</td>
<td>2011</td>
<td>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</td>
</tr>
<tr>
<td>A 5.2</td>
<td>2011</td>
<td>Address the liability issues pertaining to the use of ITS applications and notably in-vehicle safety systems</td>
</tr>
</tbody>
</table>

**Remarks for SafeTRIP partners:**

- Liability issues and data security are to be seen as keys to open the doors to the public acceptance of the ITS in the implementation process.
- Mobile satellite and on-demand ubiquitous connectivity services are not mentioned.

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<tr>
<th>Ref No</th>
<th>Type</th>
<th>Requirements</th>
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</thead>
<tbody>
<tr>
<td>MCE05</td>
<td>Data Security</td>
<td>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</td>
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<tr>
<td></td>
<td>(ITS AP)</td>
<td></td>
</tr>
<tr>
<td>MCE06</td>
<td>Liability</td>
<td>Address the liability issues pertaining to the use of ITS applications and notably in-vehicle safety systems</td>
</tr>
<tr>
<td></td>
<td>(ITS AP)</td>
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</table>
3.1.7.6. **ACTION AREA 6: EUROPEAN ITS COOPERATION AND COORDINATION**

Coordinated deployment of ITS in the EU calls for intensive and effective cooperation between all parties involved at European level, ideally leading to rapprochement on deployment requirements, better synchronisation of deployment activities and avoidance of national and proprietary silo solutions that constitute barriers to European integration.

Dissemination of the best available knowledge as to the costs and benefits of ITS projects from a full life-cycle perspective and feedback on relevant experience are needed to support informed investment decisions by public authorities across Europe. To make EU-wide deployment a reality, agreements on common assessment methods and uniform tools for decision support are therefore crucial.

Such coordinated deployment of ITS throughout Europe also requires greater involvement of cities and regional authorities, notably at urban and at inter-urban level. Guidance and technical support should be provided to facilitate and underpin consensus building and decision-making processes.

Finally, the implementation of the measures in this Action Plan will call for an adequate governance structure. Member States should aim at reaching agreement on a common ITS agenda and on methods to proceed from plans to coordinated implementation, for example by way of concerted investments or harmonisation initiatives.

**The EC proposes the following actions:**

<table>
<thead>
<tr>
<th>Action</th>
<th>Target Date</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>A 6.1</td>
<td>2008</td>
<td>Proposal for a legal framework for European coordination on the Europe-wide deployment of ITS</td>
</tr>
<tr>
<td>A 6.2</td>
<td>2011</td>
<td>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</td>
</tr>
<tr>
<td>A 6.3</td>
<td>2010</td>
<td>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</td>
</tr>
<tr>
<td>A 6.4</td>
<td>2010</td>
<td>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</td>
</tr>
</tbody>
</table>

**Remarks for SafeTRIP partners:**

- The transformation of the transport sector impacts many other businesses, mainly in the automotive, electronics, Internet, IT, telecom, energy, building, logistics, tourism, infotainment, advertising, insurance and financial sectors, as well as public authorities, broadcasters and infrastructure operators. Their needs for mobile satellite and on-demand ubiquitous connectivity services should be investigated.
- Applications like traffic safety and efficiency that include exchange of traffic related data, services like in-vehicle infotainment, GNSS-based navigation, fleet and freight management, pay-as-you-drive, eco-driving, remote diagnostic and incident detection may include communication, and are therefore prime candidates for investigation.
• How can satellite-based connectivity support “green transport corridors”, journey planning, dynamic in-vehicle navigation and eco-driving to help reduce road congestion and generate clean and energy-efficient transport?

• Public authorities’, users’ and carmakers’ concerns with costs, driver distraction, safety, security and privacy issues need to be addressed.

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<th>Ref No</th>
<th>Type</th>
<th>Requirements</th>
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<tbody>
<tr>
<td>MCE07</td>
<td>Business</td>
<td>Assess the viability, safety and lawfulness of demoed services from an end-to-end perspective</td>
</tr>
<tr>
<td>MCE08</td>
<td>Business</td>
<td>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</td>
</tr>
</tbody>
</table>
3.1.8. **DIRECTIVE FRAMEWORK FOR THE DEPLOYMENT OF ITS [2008/0263 (COD)]**

The Mid-term review of the European Commission's White Paper on Transport Policy suggests that innovation will play a significant part in making road transport more sustainable (i.e. safe, efficient, clean and seamless), in particular by applying information and communication technologies: Intelligent Transport Systems. However, adoption of ITS solutions in road transport has been slower than expected and, in general, services are being deployed on a fragmented basis.

The general objective of this proposal is to establish a framework to accelerate and coordinate the deployment and use of Intelligent Transport Systems applied to road transport, including the interfaces with other transport modes (ITS) in order to support a more efficient and environmentally friendly, safer and more secure freight and passenger mobility in the European Union. Specific objectives include increasing system interoperability, ensuring seamless access, fostering continuity of services and setting up an efficient co-operation mechanism between all ITS stakeholders.

**Within the Directive framework for the deployment of ITS, the EC proposes the following actions:**

**Deployment of ITS**

1. Member States shall take the necessary measures to ensure the coordinated deployment and use of interoperable ITS applications and services within the Community.

2. Member States shall in particular:
   (a) ensure that reliable and regularly updated relevant road transport data is made available to ITS users and ITS service providers;
   (b) ensure that road traffic and travel data and other relevant information can be exchanged between the competent traffic information and control centres in different regions or in different Member States;
   (c) take the necessary measures to integrate safety and security-related ITS systems into vehicles and road infrastructure and to develop safe human-machine interfaces, in particular for nomadic devices;
   (d) take the necessary measures to integrate different ITS applications, involving the exchange of information and communication between vehicles and the road infrastructure within a single platform.

3. For the purposes of ITS applications and services that require global, continuous, accurate and guaranteed timing and positioning services, satellite-based infrastructures, or any technology providing equivalent levels of precision shall be used

**Directive framework for the deployment of ITS - Remarks for SafeTRIP partners:**

- Mobile satellite and on-demand ubiquitous connectivity services are not mentioned.

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<th>Ref No</th>
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<tbody>
<tr>
<td>MCE09</td>
<td>Politics</td>
<td>Monitor and evaluate the progress made towards the approval and full implementation of the ITS Directive</td>
</tr>
</tbody>
</table>
3.1.9. **ACTION PLAN ON FREIGHT TRANSPORT LOGISTICS** [COM(2007) 607]

Freight Transport Logistics focuses on the planning, organization, management, control and execution of freight transport operations in the supply chain. Production and distribution networks depend on high-quality, efficient logistics chains to organize the transport of raw materials and finished goods across the EU and beyond.

Advanced information and communication technologies (ICT) can greatly contribute towards co-modalities by improving infrastructure, traffic and fleet management, facilitating a better tracking and tracing of goods across the transport networks and better connecting businesses and administrations.

The concept of e-Freight denotes the vision of a paper-free, electronic flow of information associating the physical flow of goods with a paperless trail built by ICT. It includes the ability to track and trace freight along its journey across transport modes and to automate the exchange of content-related data for regulatory or commercial purposes.

A cohesive deployment strategy for ITS, incorporating the specific requirements of road haulage, such as for navigation systems, digital tachographs and tolling systems, could contribute significantly to material change in the logistics chain.

**Within the AP on Freight Transport Logistics, the EC proposes the following actions:**

**e-Freight** (Deadline: Identification of action areas by 2009) Together with stakeholders, develop a roadmap for the implementation of e-Freight, expanding on the concept of the "Internet for cargo" and identifying the problem areas where EU action such as standardization is required.

**ITS** (Deadline: 2010) Establish a regulatory framework for the standardization of functional specifications for a single interface (on-board unit) for the provision and exchange of business-to-administration and business-to-business information.

**Freight Transport Logistics - Remarks for SafeTRIP partners:**

- Mobile satellite and on-demand ubiquitous connectivity services are not mentioned.

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<th>Requirement</th>
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<tbody>
<tr>
<td>MCE10</td>
<td>Politics</td>
<td>Monitor and evaluate progress against the Freight Transport Logistics Action Plan</td>
</tr>
</tbody>
</table>

Cities all over Europe face similar problems (congestion, road safety, security, pollution, climate change due to CO2 emissions etc.) and these problems are increasing constantly. Inaction would result in Europe having to pay an even higher price both in economic and environmental terms, as well as for the health and quality of life of European citizens.

The mid-term review of the Transport White Paper emphasized the need for basic passenger rights in all modes of transport, with a particular focus on passengers with reduced mobility.

Stakeholders have recommended that the Commission should promote the idea of a European Charter on rights and obligations for passengers using collective transport.

Urban mobility - Remarks for SafeTRIP partners:

- Mobile satellite and on-demand ubiquitous connectivity services are not mentioned.

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<th>Ref No</th>
<th>Type</th>
<th>Requirement</th>
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<tbody>
<tr>
<td>MCE11</td>
<td>Politics</td>
<td>Watch for developments in the area of urban mobility</td>
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</table>


Mobility is key to our quality of life and is vital for the EU’s competitiveness. But mobility also imposes costs on society due to the impacts it causes. Transport emissions threaten our health, negatively affect our local environmental quality and make a significant and growing contribution to climate change.

“Sustainable mobility”, that is disconnecting mobility from its harmful effects, has been at the heart of the EU’s Transport Policy for several years. In its 2006 review of the 2001 White Paper, the Commission pointed to the need to use a broad range of policy tools, ranging from economic instruments and regulatory measures to infrastructure investment and new technologies in order to achieve sustainable mobility.

“Getting the prices right” is essential. Transport users already pay a significant amount, but the price they pay often bears little connection to the real costs on society of their choices. They have thus no incentive to adopt less costly behaviour.

By making payments smarter (e.g. for congestion charging, allowing this to reflect the location and time of day), economic instruments (taxes, charges or emission trading schemes) can encourage transport users to switch to cleaner vehicles or modes (including walking and cycling), to use less congested infrastructure or to travel at different times.

Greening Transport – New Directive 2006/38/EC on the charging of heavy goods vehicles

Revising the heavy goods vehicles charging directive to encourage Member States to implement differentiated charging systems will improve the efficiency and environmental performance of road freight transport, something that is particularly important given its significant contribution to traffic and emissions.

Greening Transport - Remarks for SafeTRIP partners:

- Mobile satellite and on-demand ubiquitous connectivity services are not mentioned.

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<th>Requirement</th>
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<tbody>
<tr>
<td>MCE12</td>
<td>Politics</td>
<td>Monitor the revision of the Eurovignette Directive</td>
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</table>
3.1.12. COMMUNICATION ON eCALL [COM(2009) 434]

The pan-European in-vehicle emergency call, ‘eCall’, is estimated to have the potential to save up to 2 500 fatalities annually in EU-27 when fully deployed, to reduce the severity of injuries, bring significant savings to society in healthcare and other costs and reduce human suffering.

To help deploy the pan-European eCall, initially aimed for full-scale roll out in 2009, the Commission has already taken several steps. It supported a working group comprising all stakeholders, which agreed on the definition of an interoperable eCall service, which will work across borders in Europe, and invited all stakeholders, including the Member States and industry, to sign a Memorandum of Understanding (MoU) which commits them to work together towards implementing eCall.

eCall is a pan-European service that will operate in all European Member States and states associated to the initiative. It will be available in all vehicles, irrespective of brand, country and actual location of the vehicle. eCall is the only service providing European-wide coverage: no special agreements or additional devices will be needed, eCall will work at your holiday destination and during your business trip as well as at home.

Proprietary in-vehicle emergency call services are offered in Europe and worldwide by different automobile branches and service providers (e.g., Volvo OnCall, GM OnStar, PSA, Fiat, BMW). They are typically bundled with other services, such as breakdown assistance, onboard mobile telephony, dynamic navigation, etc. Emergency calls are received by private call centres that transmit the calls and the accident data to PSAPs in an emergency. Each manufacturer needs to reach an agreement with PSAP authorities in every country in which they want to deploy the service, on a case-by-case basis.

In Member States where there is an agreement to support proprietary eCall services with a similar quality of service as the pan-European eCall, the vehicle manufacturer would be free to choose the type of system supported (pan-European eCall or proprietary eCall service). See CEN TC 278 prEN 2782442 - Operational requirements for third party services providing eCall (TPS-eCall).

In other Member States, vehicle manufacturers must implement the pan-European eCall system. If the buyer of a vehicle does not opt for the proprietary eCall solution, the automobile manufacturer must equip the vehicle with the pan-European eCall system.

Regardless of the solution chosen by the vehicle manufacturer, an in-vehicle emergency call service, including voice link and provision of at least the eCall MSD, must be provided in a seamless way in all EU Member States.

The EC proposes the following actions:

The final aim is to fully roll out the pan-European eCall service and make it standard equipment in all new type-approved vehicles in Europe. If significant progress is not made by the end of 2009, both in the availability of the eCall device in vehicles, and the necessary investment in PSAP infrastructure, the Commission will plan to take the following regulatory measures in 2010:

1. A Recommendation to the Member States targeting Mobile Network Operators on the transmission of eCall, including the MSD from the in-vehicle systems to the PSAPs. The guidelines would be based on the single European emergency number enhanced with location capabilities (E112) and the set of standards related to transmission of the eCall.

2. A proposal for a regulation under the vehicle type-approval legislation [Directive 2007/46/EC] for the mandatory introduction of the in-vehicle part of the eCall service in new type-approved vehicles in Europe starting with certain categories, based on the operating requirements approved by the European Standardization Organizations.

3. The assessment of a potential regulatory measure for the necessary upgrading of the PSAP infrastructure required for proper receipt and handling of eCalls, in the framework of
the proposed Directive on the deployment of ITS in Europe. The resulting Regulation, that would require Member States to take the necessary action for eCall implementation, would be based on the recommendations of the European eCall Implementation Platform (EeIP).

Remarks for SAFETRIP partners:

- Mobile satellite and on-demand ubiquitous connectivity services are not mentioned.

<table>
<thead>
<tr>
<th>Ref No</th>
<th>Type</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCE13</td>
<td>Business</td>
<td>For the purpose of demonstration, allow unorthodox field operation testing (e.g. in emergency calling)</td>
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</table>
### 3.1.13. SUMMARY

<table>
<thead>
<tr>
<th>Ref N°</th>
<th>Type</th>
<th>Requirements</th>
<th>SubSection</th>
</tr>
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<tbody>
<tr>
<td>MCE01</td>
<td>Politics</td>
<td>Demonstrate “sustainable mobility”</td>
<td>3.1.4</td>
</tr>
<tr>
<td>MCE02</td>
<td>Business</td>
<td>Enable and demonstrate “on-demand ubiquitous connectivity” services</td>
<td>3.1.6</td>
</tr>
<tr>
<td>MCE03</td>
<td>Road Data (ITS AP)</td>
<td>Where road safety is at stake, it is essential that information is validated and made available to all players on a fair and equitable basis, in view of ensuring a safe and orderly management of traffic</td>
<td>3.1.7.1</td>
</tr>
<tr>
<td>MCE04</td>
<td>Business</td>
<td>Do not start a SAFETRIP/“Greenbox” ecosystem from scratch and build on existing ecosystems</td>
<td>3.1.7.4</td>
</tr>
<tr>
<td>MCE05</td>
<td>Data Security (ITS AP)</td>
<td>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</td>
<td>3.1.7.5</td>
</tr>
<tr>
<td>MCE06</td>
<td>Liability (ITS AP)</td>
<td>Address the liability issues pertaining to the use of ITS applications and notably in-vehicle safety systems</td>
<td>3.1.7.5</td>
</tr>
<tr>
<td>MCE07</td>
<td>Business</td>
<td>Assess the viability, safety and lawfulness of demoed services from an end-to-end perspective</td>
<td>3.1.7.6</td>
</tr>
<tr>
<td>MCE08</td>
<td>Business</td>
<td>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</td>
<td>3.1.7.6</td>
</tr>
<tr>
<td>MCE09</td>
<td>Politics</td>
<td>Monitor and evaluate the progress made towards the approval and full implementation of the ITS Directive</td>
<td>3.1.8</td>
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<tr>
<td>MCE10</td>
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<td>Monitor and evaluate progress against the Freight Transport Logistics Action Plan</td>
<td>3.1.9</td>
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<tr>
<td>MCE11</td>
<td>Politics</td>
<td>Watch for developments in the area of urban mobility</td>
<td>3.1.10</td>
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<tr>
<td>MCE12</td>
<td>Politics</td>
<td>Monitor the revision of the Eurovignette Directive</td>
<td>3.1.11</td>
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<td>MCE13</td>
<td>Business</td>
<td>For the purpose of demonstration, allow unorthodox field operation testing (e.g. in emergency calling)</td>
<td>3.1.12</td>
</tr>
</tbody>
</table>

Table 30: Summary of Political and Macro Economics Recommendations
3.2. State of the Art – Transport Management & Traffic

3.2.1. INTRODUCTION

The purpose of this document is to review the current state of traffic and transport management. The emphasis will be on traffic management as it is the most pertinent to the SafeTRIP project.

The defining feature of recent development in transport management is the increasing use and reliance on information and communication technologies. This influence is been felt in all areas from monitoring, through management of transport systems to the distribution of information to travellers and other stakeholders.

Important in this is the development of Intelligent Transport Systems (ITS) and in particular cooperative traffic management systems. The European Union has launched a major initiative for the deployment of ITS. (European Commission 2008), (European Union 2009)

Management of transport systems has to find a balance between competing demands and varying objectives, each with its own priorities. Management systems must be responsive to changing policy objectives of the relevant management agencies and political authorities. Travellers want to reach their destination as quickly as possible, at the same time they expect a good level of safety. Today there is also increasing awareness and concern regarding the environmental consequences of the operation of the transport system. This has grown from concern for purely local impacts to an awareness of the global consequences of the operation of transport systems from the consumption of resources to the effects of pollution by carbon dioxide and other emissions.

A wide range interested parties are affected by the management of the transport system. (Heydecker 2010)

- Travellers
- Operating staff of transport service providers
- System managers
- Transport operators
- Emergency service providers
- Infrastructure providers
- Traffic information providers
- Businesses
- Residents
- Administrative bodies

There are three areas through which these demands can be addressed:

1. Better design and utilization of vehicles;
2. Better design of the infrastructure;

This review will concentrate on the third area. Understanding and quantifying the best possible usage of infrastructure can be used ultimately to support better design and management. Four topics will be considered:

- Traffic Monitoring
- Traffic Management and Control
- User Information and Communication
- Safety
3.2.2. TRAFFIC MONITORING

Central to any effective management of a transport network is the need for good information about the current and anticipated future state of the system. The information supplied needs to be both timely and accurate. The current state of the system must be determined by reliable monitoring technologies. The increasing pressure for better traffic management demands better and more timely information. This has driven the demand for sensors able reliably to provide increasingly sophisticated and detailed information about traffic conditions and where possible travellers’ intentions. Current deployed monitoring technologies divide into two categories, in-road detectors and over-road detectors. (Mimbela and Klein 2007)

In-road detectors have been the mostly widely used of the various detector technologies, particularly inductive loops. A major disadvantage of all these technologies is that they and their associated infrastructure can be expensive to deploy and maintain, and are vulnerable to activities in the motorway. They require access to the carriageway for installation and repair. This can result in closure of the road and disruption to traffic.

An over-road sensor will be mounted above the surface of the roadway either directly above the carriage itself or next to it and hence offset from traffic lanes to detect vehicle presence, location, movement, type and speed and also to monitor flow etc. Over-road sensors may make use of a range of technologies such as

- Microwave Radar
- Active Infrared (Laser radar)
- Passive Infrared
- Ultrasonic
- Acoustic
- Video Image Processor

All these technologies have tradeoffs between functionality, cost and reliability under varying conditions and traffic information captured. The increasing demands for information to support traffic management have driven the need for more sophisticated and robust sensors.

The essential and central role that monitoring information has in informing and determining traffic management decisions means that any improvements in the accuracy, reliability and detail of monitoring data will offer scope for improving management techniques and decisions and offer the possibility of new approaches to traffic management. The need for such developments to enable the assist with traffic management under increasingly complex demands is illustrated by the establishment of the NEARCTIS (Network of Excellence for Advanced Cooperative Traffic Management in the Information Society) project by the European Commission.

3.2.3. TRAFFIC CONTROL

The purpose of traffic control is to ensure as far as possible the optimum performance of the traffic system.

3.2.3.1. URBAN TRAFFIC CONTROL

Both active and passive measures are used for urban traffic control. Passive measures include one-way systems, speed limits and other traffic calming measures. All such measures are long-term and not easily altered. Such measures are responses to long-term traffic trends and long-term policy objectives. Such measures have important role to play in achieving medium and long term
policy goals both local and national. These goals may be concerned with safety, improved traffic flow, or traffic reduction and pollution reduction.

Active traffic control is achieved chiefly by means of traffic signal control. The amount of red and green time for each signal is adjusted according to the current traffic state. Adjustments may be made independently on a junction by junction basis or be coordinated for junctions in a designated area. (Silcock and Sang 1990), (Schemama 1995), (Diakaki, Papageorgiou and Aboudolas 2002), (Hunt, Robertson and Bretherton 1982), (Gartner, Pooran and Andrews 2001) The original design aim of traffic signal control was to minimise the total delay to traffic in the road network. More recently there has been an increased requirement to provide for all travellers and to provide priority for various kinds of users, including pedestrians. (Bhouri and Lotito 2005), (UK Department of the Environment Transport and the Regions 2000)

The high demand for travel especially at peak times on many urban routes requires an effective and adaptable response to signal setting. Traffic responsive signal setting strategies offer an effective approach. This approach while potentially effective is costly requiring the maintenance of a real-time control system. Crucial to the efficient use of such systems is an accurate knowledge of current traffic conditions. Just systems are costly to install require sensors communications infrastructure and a control room. Efficient signal settings for coordinated signal control of a network require not only knowledge of the current traffic conditions but needs to make at least short-term estimates, of future states. These estimates could be made for quickly and more accurately with good knowledge of vehicles route choices. Current sensor technologies are unable to supply such information. The development and installation of equipment that allows such information to be gathered would have great potential in improving signal setting strategies.

3.2.3.2. MOTORWAY CONTROL

The introduction of motorways aimed at providing uninterrupted travel avoiding the interruptions of intersection and local urban congestion. The success of motorway contributed to a greatly increased demand for travel leading to congestion on the motorways, one of the problems they were supposed to solve. The high flows on many motorways means that incidents on the motorway quickly lead to long tailbacks and long delays. This demand and the problems associated with it means that motorway traffic must now be managed to at least minimise the effects of congestion.

The control measures that are typically employed in motorway networks are the following:

- Ramp metering, activated via installation of traffic lights at on-ramps or motorway interchanges. (UK Highways Agency 2007), (Kotsialos and Papageorgiou 2001), (Chen, Jia and Varaiya 2001)
- Link control that comprises a number of possibilities including lane control, variable speed limits, congestion warning, tidal (reversible) flow, keep-lane instructions, etc.
- Driver information and guidance systems, either by use of roadside variable message signs or via two-way communication with equipped vehicles.

Ramp Metering

Ramp metering allows control of the rate at which traffic enters the motorway. The UK Highways Agency (UK Highways Agency 2007) describes ramp metering and its benefits:

*Ramp metering is a traffic management technique which regulates the manner in which vehicles join a motorway at peak periods. The purpose of the system is to prevent or delay the onset of flow breakdown on the main carriageway by a combination of:*

SafeTRIP_D2.1.1_User Requirements_Initial_v1.0.doc 117/142
- Regulating the flow of additional traffic onto the motorway that, if unregulated would trigger flow breakdown; and,
- Managing the flow on the entry slip road to avoid large platoons of vehicles entering the main carriageway and causing flow breakdown.

By preventing or delaying flow breakdown the system provides the following benefits:

- Greater throughput during peak periods;
- Less congestion and improved traffic flows;
- Smoother and more reliable journey times;
- Reduced risk of accidents; and,
- Environmental improvements as a result of noise reduction and improved fuel consumption.

As with urban traffic control there are two basic approaches to ramp metering:

- Local Ramp Metering. Local ramp metering makes use of information in the immediate vicinity of the metered ramp. (Masher, Ross, Wong, Tuan, Zeidler and Peracek 1975), (Papageorgiou, Haj-Salem and Blosseville 1991)
- Coordinated Ramp Metering. As with coordinated signal control coordinated ramp metering attempts to achieve a smooth flow along a section of motorway using these ramps. (Kotsialos, Papageorgiou, Mangeas and Haj-Salem 2002)

The utilisation of ramp metering continues to grow as evidence of its effectiveness and usefulness becomes clearer in today’s demand conditions. (European Ramp Metering Project 2007), (UK Highways Agency 2007)

**Link Control**

Link controls comprise local management measures aimed at smoothing flow of traffic along motorway sections between junctions. Such measures include lane control measures restricting the use of lanes to particular classes of vehicles, warnings of lane closures and indications of destination lanes as junctions are approached, and adverse weather conditions such as fog. Lane control can also be used at toll plazas. Lanes can be configured to according to the method of payment and the vehicle type. Large vehicles in particular may have to use special lanes. Other lane controls measures include congestion warnings and recommended speed limits. In busy urban areas with high daily commutes tidal flows are used, allowing traffic to flow in different directions along the same lane at different times of day. Tidal flows may also be used on a more occasional basis in response to larger than normal, predictable flows in one direction.

Variable speed limits (VSL) play an increasing role in link control. According to the UK Department of Transport (UK Department of Transport 2009) (UK Highways Agency 2004) VSL can be used to achieve the following objectives:

- **Improving safety**, where VSL can enhance road safety by reducing speed on the approach to queuing traffic and reducing secondary incidents, thus reducing accident frequency and accident severity; /item improving economy/efficiency, where VSL can improve and enable more reliable journey times by reducing congestion. VSL can additionally contribute towards stimulating regeneration, also leading to economic benefits; /item improving environment where VSL can improve local air quality, reduce greenhouse gas emissions and reduce noise pollution.

VSL is designed to reduce occurrences of flow breakdown by harmonising the speeds of traffic within and between lanes.
While not yet widely used, the use of variable speed limits is growing especially as motorways in busy extended metropolitan areas become subject to increasing congestion.

3.2.3.3. **USER INFORMATION AND COMMUNICATION**

Driver information and guidance systems play an increasingly important role in modern traffic management. Information about traffic conditions is supplied to users by a number of routes.

**Variable Message Signs**

These are used extensively to provide information to drivers about current traffic state. The information displayed can be very varied including warnings of congestion ahead, information about incidents, estimates of travel time or advice about alternative routes when severe disruption occurs. Variable message signs are still the primary means by which motorway operators communicate with drivers on the motorway.

**Radio Traffic Alerts**

The use of traffic information spots on local radio is also an important means of communication with current and potential travellers. Motorway operators are increasingly maintaining dedicated traffic information radio stations. This in many cases face competition from local radio stations. The wide use of mobile phones means that information flow is now two-way with drivers able and encouraged to inform local stations about traffic conditions. (See also section 3.2.6. for a discussion of the Traffic Message Channel).

**Internet. Web sites**

Internet. Web sites are extensively used by motorway operators as an alternative means of providing information about traffic conditions to current and potential users.

**Navigation Systems**

The growing use of navigation and route guidance systems play an important role in influencing driver behaviour. As these become more dynamic reacting in real time to changes in traffic conditions, this influence can be expected to increase.

**Text Messages**

Motorway operators and other transport information providers offer services that supply relevant travel information. Such systems have the advantage that the information supplied is pertinent to the recipient.

**Email notification service**

Motorway operators may also offer an email notification service. As with text messages, this will be relevant to the recipient. ([http://www.highways.gov.uk/traffic/11278.aspx](http://www.highways.gov.uk/traffic/11278.aspx))

3.2.4. **IMPORTANT ELEMENTS OF TRANSPORT MANAGEMENT SYSTEMS**

A concept of transport management system usually refers to a piece of software that is designed to manage transportation operations. However, it might also denote a complex set of hardware, software and communications systems that could be together used to monitor the status of transportation network.

Because of huge variety of transportation means and networks, we can distinguish some types of transport management systems:

- Freeway Management Systems
- Corridor and Arterial Traffic Management
- Electronic Toll Collection and Traffic Management
- Decision Support Systems
- Traveller Information
- Incident Management
• Special Events Management
• Communications Systems.

**Freeway Management Systems and Corridor and Arterial Traffic Management** are designed to control traffic, monitor and manage transportation infrastructure and possibly adjust signal timing to optimize traffic flow. Additionally Freeway Management Systems should be in touch with TMC operators.

**Electronic Toll Collection and Traffic Management** allows for electronic payment. They can also monitor travel time between any two points of toll collection and use it to assist in planning of the route and better serve traffic flow.

**Decisions Support Systems** analyze gathered data and provide solutions for different problems, such as planning the fastest route, optimizing traffic flow, predict potential traffic or other problems. They use different kinds of artificial intelligence in their calculations.

Three main types of those systems can be distinguished:

- Roadway Weather Information Systems
- Event Reporting Systems
- Maintenance Management Systems.

**Traveller Information System** is an important tool that can provide travellers with different kinds of required data, starting from planning routes up to warning in case of nearby accidents. All information could be transmitted by different information means, i.e. traveller information telephone system, radio, dynamic message signs.

**Incident Management** is a key concern of traffic managers, especially motorway managers.
On motorways in particular incidents impede or block the flow of traffic causing delays and congestion. The primary challenges are the early detection of incidents and the assessment of the severity of the incident. In severe cases such as accidents, emergency services will need to be notified. Primary responsibility for the on site management of the incident usually passes to other authorities such as the police. Motorway operators still have responsibility for maintaining the motorway and returning it to operational condition. Motorway patrol vehicles play an essential part in this. Often they are the first vehicle on the scene of an incident. Good communication between patrol vehicles and mangers in the control room are important.
Communication with travels and potential travellers is an important part of incident management. The timely notification of potential problems and delays will allow travellers to make other choices. For those unavoidably caught in the congestion information about the cause and likely delay can help to alleviate the frustration.

**Special Event Management** might not be necessary in everyday use, but might be very useful in managing people and traffic when special event like concerts or festivals are happening.

**Communication Systems** are crucial element of Transport Management Systems as they provide communication between different parts of the system.

Transport Management Systems are very complex and thus some gaps in their functionality might occur. First of all it is difficult to integrate all distinguished parts of the system. Additionally not all of them always exist. There might be different management technologies caused by different status and state of roads. There is lack of staff which would be qualified enough to operate and maintain well intelligent transportation systems.
All gaps are often met but it is also very important to finally fix them.
3.2.5. SAFETY

Of all modes of transport, transport by road is the most dangerous and the most costly in terms of human lives. For this reason, the Road Safety Action Programme (2003-2010) proposes a series of measures such as stepping up checks on road traffic, deploying new road safety technologies, improving road infrastructure and measures to improve users' behaviour. The ultimate objective is to halve the number of people killed on the roads by 2010.

European Commission

Making roads safer is an enormous challenge to all involved in managing, regulating, supplying and using road transport. Those at risk from road accidents include:

- Pedestrians
- Cyclists
- Motorcyclists
- Vehicle drivers
- Vehicle passengers
- Road maintenance crews
- Local residents.

The challenge of making roads safer is addressed in multiple ways. All road travel management measures have potential safety implications.

**Improved infrastructure.** Infrastructure improvements include building new motorways, increasing the amount of dual carriageway, improved layout at identified black spots and the provision of adequate safety barriers. In urban areas in particular various traffic calming measures are used to help reduce speeds. Effective speed limits and other controls. Speed is recognized as a major factor in many accidents. The introduction of effective speed limits plays an important role in improving road safety. Other important controls include measures to ensure driver competence such as alcohol and other drug use limits, and the wearing of seat belts. For these control measures to work there needs to be effective enforcement.

**Improved user information and warnings.** Drivers need to be made aware and reminded of speed limits that are enforce. Information can also be supplied about approaching changes in the road conditions. This includes junctions on motorways, sharp bends in roads and pedestrian crossings on urban roads. These warnings can be conveyed using static road markings and fixed roadside or overhead signs. Warnings of intermittent conditions must be provided by alternative means such as variable message signs and signals. These play an important role in motorway management.

**Safer Vehicles.** Safer vehicles have played and will continue to play an important role in improving road safety. Increasing attention is turning from the design and construction of vehicles to the
use of ITC to achieve continued improvements in road safety. The use of ITC offers a number of opportunities including active driver assistance (ABS, active cruise control, etc.), driver information regarding speed limits and possible black spots and in the monitoring of road conditions and possible hazards and obstacles.

Public Education
Public education plays an important role in improving road safety. This covers a wide range including raising awareness of the dangers of driving under the influence of alcohol or drugs, the role and importance of speed limits and general good driving practice.

The European Union has identified ICT as having an important role to play in the improvement of road safety, both through the development of intelligent cars and to the development of cooperative traffic management.

3.2.5.1. TOOLS FOR IMPROVING TRANSPORTATION SAFETY

Advanced driver assistance systems (ADAS)
There is plenty of systems build-in a vehicle that improves safety of travellers. They either warn a driver that some vehicle parameters are unsafe or act to help driver to drive safely. Some of the systems are dedicated to highways, other to rural roads or to parking areas. Examples of advanced driver assistance systems are listed below:

- Intelligent speed adaptation system,
- Adaptive cruise control
- Lane change assistance
- Lane departure warning system,
- Traffic sign recognition system,
- Collision avoidance system,
- Driver drowsiness system,
- Night vision system,
- Automatic parking system.

Intelligent Speed Adaptation systems are one of those systems that reduce accident risk to a large degree. This system deals with speed limit. It is monitoring the speed of a vehicle and detects if a vehicle is about to exceed a speed limit. In such a case the system perform an action to unable the driver to drive faster.

There are two kinds of Intelligent Speed Adaptation system – passive and active. Passive system only informs a driver about exceeding the speed limit and left the choice about future driving speed to the driver. Active system also informs a driver about exceeding speed limit but additionally it makes the vehicle enable to drive faster by manipulation of braking system or engine.

3.2.6. TECHNOLOGIES
In this section some of the most important technologies used to implement the management techniques and strategies are reviewed.

3.2.6.1. TRAFFIC MESSAGE CHANNEL
The Traffic Message Channel (TMC) both with the FM Radio Data System (RDS) are used for broadcasting real-time traffic and weather information. Data messages are received silently and decoded by a TMC-equipped car radio or navigation system, and delivered to the driver in a variety of ways. The most common of these is a TMC-enabled navigation system that can offer dynamic route guidance - alerting the driver of a problem on the planned route and calculating an alternative route to avoid the incident.

**Main features of TMC system**

- Updated traffic information, delivered in real time
- Instant knowledge of accidents, road works and traffic jams
- Filtered information only for the immediate route
- Information in user's own language

Messages transmitted via TMC system are displayed and information about traffic is processed almost immediately. Users can receive traffic information in their own language. The TMC unit, typically an in-car navigation system, decodes the received traffic information and presents it to the user.

TMC traffic data are already being broadcast in several countries of EU. There are also planned services soon are the Czech Republic, Hungary, and Portugal. Unfortunately, in most countries from Eastern Europe, broadcasting of TMC messages is not supported. Data related to traffic flows, incidents, weather etc. are gathered from traffic monitoring systems, emergency services, motorists' calls etc., and are collated at a central traffic information centre. They are then passed to the TMC traffic information service provider, who generates TMC messages according to the ALERT-C coding protocol.

**General idea of TMC system**

The service provider sends the coded messages to the appropriate FM radio broadcaster for transmission as an RDS (Radio Data System) signal within normal FM radio transmissions. The TMC data are received by the vehicle radio and antenna, and decoded by a TMC decoder. This reconstructs the original message, using a database of event and location codes, which is presented to the driver as a visual or spoken message.

It takes typically about 30 seconds from the first report of a traffic incident to the traffic information centre until the same information is available in the vehicle.

New delivery channels are emerging that could carry TMC services, including digital radio (DAB), mobile Internet, paging and GSM/GPRS mobile phone networks.

### 3.2.6.2. INTELLIGENT SPEED ADAPTATION TECHNOLOGIES

We can distinguish several types of Intelligent Speed Adaptation systems with respect to technology used for local speed limits estimation. The most important of them are:

- GPS,
- Optical recognition,
- Radio beacons.

The system can also base on measurement of rotation of road wheels over time. This method is called dead reckoning.
GPS receiver based systems are extremely popular and thus seems to be very useful but GPS based systems measurements might be inaccurate due to problems like receiver noises, propagation errors or multiple signal propagation paths.

Optical recognition systems base on image recognition technology. A camera is mounted on a vehicle. The image is analyzed and the speed limit is taken from road signs. The limit is valid until the next speed sign is noticed.

Radio beacons based systems are probably the most reliable and give the widest range of potential use. This system requires beacons mounted along roads, which transmit messages with local speed limits. These messages are received by the received placed in a vehicle. This system can be also used for transmission of variable speed limits and potential alarms or traffic warnings.

The system is very efficient in accident risk reduction because it was proven that driving with a speed even 5km/h above speed limit doubles the accident risk. However, for some roads, especially the ones with many bends, the appropriate speed might be lower than the local speed limit. In these cases it might be reasonable to transmit both measures. However it will be only possible in systems based on radio beacons.

3.2.6.3. **Dynamic Message Signs**

Dynamic Message Sign (DMS) is an electronic road sign that gives information to road users about some special, usually unexpected events, i.e.

- Accidents and vehicle fires,
- roadwork zones,
- traffic congestion,
- pavement failure,
- road closure,
- change of speed limit,
- Short-term maintenance of a highway lasting less than three days.

They are very often used on highways; however they can be also used in urban areas for providing information about free parking spaces and parking guidance. The majority of them serve to improve safety on roads, however other uses such as alerts about missing adults (usually seniors with Alzheimer’s Disease) or abducted children can be a distraction to drivers and may be a safety hazard.

This kind of message sign is also called

- Variable Message Sign (VMS),
- Changeable Message Sign (CMS),
- Electronic Message Sign.

One of the most popular types of Dynamic Message Sign is radar speed sign. It is a combination of speed measurement tool with a series of LEDs that displays speed of approaching vehicles. It improves safety on roads by warning drivers if they are driving with unsafe speed and forcing them to slow down. The effectiveness of those signs was proven, especially for drivers which drive more than 15 km/h above the limit.

3.2.6.4. **Dedicated Short Range Communications (DSRC)**
Dedicated Short Range Communications (DSRC) is a kind of high speed communication link either between vehicles or between a vehicle and roadside. It range used in ITS exceeds 1km. It can be used to transmit different kinds of safety massages and support drivers in many cases, mainly:

- Intersection collision avoidance,
- Vehicle safety inspection,
- Electronic parking payments,
- Transit or emergency vehicle signal priority,
- Probe data collection,
- In-vehicle signing,
- Commercial vehicle clearance and safety inspections,
- Approaching emergency vehicle warning,
- Rollover warning.

Current applications usually use 915 MHz frequency, however new 5,9 GHz frequency allows for much higher data-transmission rates. Additionally 915MHz frequency has only 12 megahertz of spectrum available, which is unfortunately shared with different kinds of electronic devices such as garage door openers or cordless phones.

3.2.7. SUMMARY

The discussion in this section has highlighted in important role that information and communication play in the effective management of road traffic. Information about the current and expect state of traffic is needed by traffic managers to make decisions about traffic management measures; by individual travellers to make decisions as to routes to use, time to leave or whether to travel at all; and by transport operators to help keep customers informed and activate contingency plans in the event of severe delays. Communications play a central role in ensuring that the information reaches the people who need it. The importance of supplying appropriate information to travellers is shown by the increasing number of channels used for such communication.

The SafeTRIP project object offers the opportunity to provide a sophisticated adaptable tool to the armoury for information gathering and communication. It should be able to provide

1. Up to date information about vehicle state such as vehicle position, speed, fuel consumption and engine condition. Used in vehicles with vehicle identification speed and location information can be used to track vehicle of interest such as patrol vehicles, vehicles with hazardous loads and coaches. Knowledge of location and speed will help the interested managers to make appropriate decisions such as the deployment of patrol vehicles. Deployed in sufficiently many vehicles it can potentially supply useful information about the state of traffic and allow early detection of the onset of congestion. Such information could be provided anonymously to meet privacy concerns.

2. Information to the driver about traffic conditions, expected journey times and road conditions such as speed limits and hazardous road sections.

3. Two way channels of communication between the driver and other parties. This could be used in patrol vehicles for communication between operators at the scene and managers in the control room or to supply information to emergency services. In ordinary vehicles it could be used to request and obtain information about the location of services or alternative routes, to communicate with breakdown services.
3.3. EU Projects Relevant to SafeTRIP

INTRODUCTION

In order to avoid redundancy and overlapping, both the ongoing and finished EU projects in the field of road safety, vehicular communication and intelligent transportation systems have to be carefully analyzed. Besides the project objectives, both the differences and synergies are to be investigated.

Based on the analysis, it has to be stated how SafeTRIP will avoid overlapping and redundancy with the discussed projects. The detailed investigation helps revealing the achievements of the projects, thus the particular results can be used and incorporated during the research work of SafeTRIP.

3.3.1. J-ORTIGIA

3.3.1.1. PROJECT OBJECTIVES

The J-ORTIGIA project aims at providing DVB-SH technology trials in Italy, Spain and Japan from May 2008 to April 2009.

3.3.1.2. DIFFERENCES

The J-Ortigia project is focusing only on the forward link in order to evaluate broadcast functionalities of the DVB-SH standard. It focuses on the satellite media with the help of the NICT and is considered as a pre-launch phase for the W2A satellite. In the SafeTRIP project, both forward AND return link using W2A satellite will be demonstrated.

3.3.1.3. SYNERGIES

SafeTRIP will reuse the broadcast technology of the J-Ortigia project. This technology will be adapted to W2A satellite and to the car environment in order to achieve SafeTRIP objectives.

3.3.1.4. AVOIDANCE OF REDUNDANCY AND OVERLAPPING

The DVB-SH system developed during the J-Ortigia project will be reused within the SafeTRIP project. The scope of SafeTRIP is different from the J-Ortigia objectives, thus no overlapping is expected between the two projects.

3.3.2. MIRESYS

3.3.2.1. PROJECT OBJECTIVES

The MIRESYS project aims to define a protocol for a mobile bidirectional satellite system based on the S-Band technology. The scope of Miresys is not to implement this protocol neither to demonstrate it.

3.3.2.2. DIFFERENCES

Miresys is a study project. No developments are done within this project.

3.3.2.3. SYNERGIES

SafeTRIP will verify if Miresys achievements are applicable for a car bidirectional communication system and if it is relevant, partners will reuse the “Miresys” protocol.
3.3.2.4. AVOIDANCE OF REDUNDANCY AND OVERLAPPING

Since Miresys is only a study project, there cannot be any overlapping with the demonstration phase of SafeTRIP. Concerning the pre-study phase of SafeTRIP, it is foreseen to reuse Miresys achievements as much as possible in order to avoid redundancies.

3.3.3. SISTER

3.3.3.1. PROJECT OBJECTIVES

The SISTER Project will promote the integration of satellite and terrestrial communications with GALILEO to enable mass-market take-up by road transport applications.

3.3.3.2. DIFFERENCES

SISTER is mainly focusing on the complementarities of satellite and terrestrial communications. Base on this point, it is almost certain that SISTER will use the satellite media only for broadcasting data (forward link only). At the other hand, SafeTRIP will use the satellite media for both forward and return link using a new innovative satellite (W2A).

3.3.3.3. SYNERGIES

It is obvious that synergies need to be created between the projects. SafeTRIP partners should indeed consider how Sister’s partners will integrate satellite communications with terrestrial communication in order to integrate complementary ground component in the SafeTRIP OBU.

On the other hand, Sister’s partners could eventually take advantage of SafeTRIP by using the S-band satellite W2A in their OBU. Following the overall failure of Worldspace, the mobile space segment in Europe is becoming scarcer and it can be a good opportunity for them to adopt the SafeTRIP results.

3.3.3.4. AVOIDANCE OF REDUNDANCY AND OVERLAPPING

The Sister project is not developing any S-Band bidirectional solution as is the case in SafeTRIP. Redundancies could take place during the specifications phase when the integration of satellite and terrestrial segments will be studied. However, SafeTRIP does not dedicate a WP to this task and plans to reuse as much as possible of the Sister project.

3.3.4. SAFESPOT

3.3.4.1. PROJECT OBJECTIVES

The objective is to understand how intelligent vehicles and intelligent roads can cooperate. The aim is to prevent road accidents by developing a Safety Margin Assistant that detects in advance potentially dangerous situations and that extends in space and time drivers awareness of the surrounding environment. The Safety Margin Assistant will be an Intelligent Cooperative System based on Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I) communication.

3.3.4.2. DIFFERENCES

SAFESPOT is focusing on in-vehicle sensors, roadside sensors and V2V and V2I communication. There is no satellite based communication involved in SAFESPOT.

3.3.4.3. SYNERGIES
In the level of services to users (e.g. drivers, road operators) SafeTRIP is also dealing with traffic alerts, incident/accident warnings, driver behaviour warnings, etc. Furthermore, SAFESPOT aims to obtain accurate real-time positioning. SafeTRIP has to analyse and evaluate the results and achievements of SAFESPOT.

3.3.4.4. **AVOIDANCE OF REDUNDANCY AND OVERLAPPING**

Since SAFESPOT is not dealing with satellite-based communication and with services that are involved in SafeTRIP’s objectives, no overlapping is expected between the projects.

3.3.4.5. **WEB**

www.safespot-eu.org

3.3.5. **CVIS**

CVIS (Cooperative Vehicle-Infrastructure Systems) is a major new European research and development project aiming to design, develop and test the technologies needed to allow cars to communicate with each other and with the nearby roadside infrastructure.

3.3.5.1. **PROJECT OBJECTIVES**

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 localization;
- 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 to 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.

3.3.5.2. **DIFFERENCES**

The technology-related developments of CVIS are focusing on communication, networking, positioning, and mapping aspects. There is no satellite based communication involved in CVIS.

3.3.5.3. **SYNERGIES**

SafeTRIP could reasonably benefit from the outcomes of CVIS in the following domains (of CVIS results):

- enhanced vehicle positioning using GNSS and radio triangulation,
- full interoperability in the communication between different makes of vehicle and of traffic management systems,
- enhanced driver awareness and cooperative traveller assistance on inter-urban highways.

3.3.5.4. **AVOIDANCE OF REDUNDANCY AND OVERLAPPING**

Since CVIS is not dealing with satellite communication and services that are involved in SafeTRIP’s objectives, no overlapping is expected between the projects. Liaison is needed in order to map the CVIS outcomes regarding positioning techniques.
3.3.5.5.  **WEB**

http://www.cvisproject.org/

3.3.6.  **PReVENT**

The Integrated Project PReVENT is a European automotive industry activity co-funded by the European Commission to contribute to road safety by developing and demonstrating preventive safety applications and technologies.

3.3.6.1.  **PROJECT OBJECTIVES**

- Develops, demonstrates, tests and evaluates preventive safety applications, using advanced sensor, communication and positioning technologies integrated into on-board systems for driver assistance;
- Creates a greater awareness of the active safety approach (roadmaps, systems, common architecture including infrastructure, cost efficiency and benefits to the potential users) leading to increased user demands for preventive/active safety.
- The three-year WILLWARN subproject is about developing, integrating and validating a safety application that warns the driver whenever a safety-related critical situation occurring beyond the driver's field of view. This includes the development of on-board hazard detection, in-car warning management, and decentralized warning distribution by vehicle-to-vehicle communication on a road network. Positioning, relevance checks, message transport, and on-board message evaluation will enable a low-cost and reliable solution for wireless local danger warnings.

3.3.6.2.  **DIFERENCES**

PReVENT is more focused on particular applications (such as safe speed, lateral support, etc.). There is no satellite based communication involved in PReVENT.

3.3.6.3.  **SYNERGIES**

PReVENT finished in 2008. The project dealt with in-vehicle digital maps and positioning technologies (GPS, GNSS and GALILEO) and wireless communication technologies (V2V, V2I), thus SafeTRIP could benefit from the results and research they have done.

Besides, warning the drivers in dangerous situations is among SafeTRIP’s objectives as well.

3.3.6.4.  **AVOIDANCE OF REDUNDANCY AND OVERLAPPING**

PReVENT did not deal with satellite communication, however, it used high accurate positioning technologies and digital maps enabling lane-level positioning.

3.3.6.5.  **WEB**

http://www.prevent-ip.org/

3.3.7.  **TRACKSS**

TRACKSS project’s goal is to develop new systems for cooperative sensing and prediction of flow, infrastructure and environmental conditions surrounding traffic, with a view to improve road transport operations, safety and efficiency.

3.3.7.1.  **PROJECT OBJECTIVES**
- The development and/or improvement of a number of breakthrough sensing technologies;
- The design and integration of knowledge sharing capabilities into a sensor network, giving optimal integration into the Cooperative Transport Systems;
- Enabling the modular integration of the sensors developed by the project into the Cooperative Transport Systems architecture;
- Making use of the most advanced data fusion and integration techniques in order to get as much information as possible from the data collected;
- Developing knowledge based DSS (Decision Support System) to assess and predict the ambient conditions affecting the safety and efficiency of transport.

3.3.7.2. **Differences**

TRACKSS is mainly sensor-driven (applies similar architecture to SAFESPOT and CVIS). There is no satellite based communication involved in PReVENT.

3.3.7.3. **Synergies**

TRACKSS focused on integrating vehicle sensors instead of applications similar to that of SafeTRIP applications, thus no synergies are foreseen. However, projects aiming to develop intelligent cooperative transportation systems are to be monitored by SafeTRIP partners, synergies on the application level might be expected.

3.3.7.4. **Avoidance of Redundancy and Overlapping**

Since TRACKSS is not dealing with satellite communication and such services that are involved in SafeTRIP’s objectives, no overlapping is expected between the projects.

3.3.7.5. **Web**

http://www.trackss.net/

3.3.8. **COOPERS**

3.3.8.1. **Project Objectives**

COOPERS focuses on the development of innovative telematics applications on the road infrastructure with the long term goal of a “Co-operative Traffic Management” between vehicle and infrastructure, to reduce the self opening gap of the development of telematics applications between car industry and infrastructure operators. The goal of the project is the enhancement of road safety by direct and up to date traffic information communication between infrastructure and motorized vehicles on a motorway section. COOPERS provides vehicles and drivers with real time local situation based, safety related status and infrastructure status information distributed via dedicated Infrastructure to Vehicle Communication link (I2V). The real time communication link between infrastructure and vehicle can also be used vice versa for V2I communication utilising vehicles as floating sensors to verify infrastructure sensor data as primary source for traffic control measures.

3.3.8.2. **Differences**

COOPERS is highly focused on Infrastructure-to-Vehicle (I2V) communication. There is no satellite based communication involved in COOPERS.

3.3.8.3. **Synergies**
COOPERS also aims to define, develop and test new safety related services, equipment and applications using two way communication between road infrastructure and vehicles. On the application level, SafeTRIP could benefit from the results of COOPERS.

SafeTRIP can also incorporate the experiments of driver warning system development.

3.3.8.4. **AVOIDANCE OF REDUNDANCY AND OVERLAPPING**

Although from the technological aspect, COOPERS does not involve bi-directional satellite communication, the core objectives of COOPERS are very similar with regards to bi-directional communication between vehicles and infrastructure. SafeTRIP needs to analyse COOPERS’ results.

3.3.8.5. **WEB**

http://www.coopers-ip.eu/

3.3.9. **SEVECOM**

3.3.9.1. **PROJECT OBJECTIVES**

Sevecom addresses the security of the future vehicle communication networks, including both the security and privacy of inter-vehicular communication and of the vehicle-infrastructure communication. Its objective is to define the security architecture of such networks, as well as to propose a roadmap for integration of security functions in these networks.

3.3.9.2. **DIFFERENCES**

Sevecom’s main goal is to identify the possible threats and to specify an architecture and security mechanisms. Sevecom is not dealing with services that are involved in SafeTRIP.

3.3.9.3. **SYNERGIES**

Secure communication is a highlighted issue that should also seriously considered by SafeTRIP. Therefore analysis and evaluation of the results of Sevecom is required.

3.3.9.4. **AVOIDANCE OF REDUNDANCY AND OVERLAPPING**

Since Sevecom is not dealing with satellite communication (as technology) and such services that are involved in SafeTRIP’s objectives, no overlapping is expected between the projects.

3.3.9.5. **WEB**

http://www.sevecom.org/

3.3.10. **INTRO**

3.3.10.1. **PROJECT OBJECTIVES**

INTRO is an FP6 project with the aim of developing innovative methods for increased capacity and safety of the road network. This combines sensing technologies and local databases with real-time networking technologies. The project has been coordinated by FEHRL institute together with partners from the ITS and research sector.

*Surface safety monitoring*
Real-time warning systems at network level to achieve a significant decrease in the number of accidents due to "surprise effects" from sudden local changes in weather resulting in low friction and hence skidding.

Traffic and safety monitoring

Combination of different sensor data will enable the estimations of entirely new real-time safety parameters and performance indicators to be used in traffic monitoring and early warning systems.

Intelligent pavement and intelligent vehicles

Innovative use and combination of new and existing sensor technologies in pavements and bridges in order to prevent accidents, enhance traffic flows and significantly extend the lifetimes of existing infrastructure. A prolonged lifetime of high capacity roads could thus be obtained using novel methods for early warning detection of deterioration and damage of road surfaces.

3.3.10.2. DIFFERENCES

The INTRO project has mainly focused on 3 layers: “Intelligent Centre”, “Intelligent Pavement” and “Intelligent Road” with particular attention on the technologies for traffic and road condition measurement and sensor technologies analysis and evaluation.

The INTRO project does not contain specific activities related to communication infrastructure and service middleware like the SafeTRIP project.

3.3.10.3. SYNERGIES

SafeTRIP could benefit from the outcomes of the INTRO project. In particular, within the INTRO project (WP4) there have been developed methodologies for predicting traffic conditions and for monitoring traffic safety using data measured from traffic sensors and floating car data. With the SafeTRIP approach the Dynamic Traffic Assignment (DTA) model could use not only data from “probe vehicles”, but from ALL the vehicles with enormous improvement of accuracy and reliability of the model.

Furthermore, with the SafeTRIP architecture, the mobile vehicles can act as relay gateways, retransmitting data from passive sensors on the infrastructure. This will allow to spread high number of passive sensors for pavement health monitoring or bridge health monitoring, achieving for intelligent road monitoring at affordable prices.

3.3.10.4. AVOIDANCE OF REDUNDANCY AND OVERLAPPING

Actually, INTRO and SafeTRIP are strongly complementary, in particular in the frame of intelligent road monitoring. The INTRO project finished in the first half of 2008. The public results of the project should be carefully analyzed to verify the feasibility make the SafeTRIP architecture able to support the Intelligent Transport System architecture of INTRO. If applicable, in T2.4 it will be verified how to integrate INTRO demonstrative applications in SafeTRIP. Possibly a dedicated liaison with the representatives of INTRO, if still available, will be established.

3.3.10.5. WEB

http://intro.fehrl.org/

3.3.11. PRECIOSA

3.3.11.1. PROJECT OBJECTIVES
The goal of PRECIOSA is to demonstrate that co-operative systems can comply with future privacy regulations by demonstrating that an example application can be endowed with technologies for suitable privacy protection of the location related data of individuals.

The major objectives of the PRECIOSA project are to:

- Define an approach for the privacy evaluation of co-operative systems in terms of communication privacy and data storage privacy;
- Define a privacy aware architecture for co-operative systems which involves suitable trust models and ontologies, a V2V privacy verifiable architecture, and a V2I privacy verifiable architecture, and which includes the architecture components for protection, infringement detection, and auditing;
- Define and validate guidelines for privacy aware co-operative systems;
- Investigate specific challenges for privacy.

3.3.11.2. DIFFERENCES

The main focus of PRECIOSA is investigating co-operative systems from the privacy point of view. SafeTRIP’s goal is to create a fully functional satellite based service, which should include privacy as well, thus evaluation of the results of the project is recommended.

3.3.11.3. SYNERGIES

SafeTRIP could benefit from PRECIOSA’s results from the perspective of privacy regulations.

3.3.11.4. AVOIDANCE OF REDUNDANCY AND OVERLAPPING

The PRECOSIA project’s main goal is developing cooperative systems with high security. Although SafeTRIP have to deal with privacy issues as well, the main field of focus is transportation safety. The results delivered by PRECOSIA can be taken into consideration in SafeTRIP, however overlapping can be avoided by applying different technologies.

3.3.11.5. WEB

http://www.preciosa-project.org/

3.3.12. PRE-DRIVE C2X

3.3.12.1. PROJECT OBJECTIVES

The European project PRE-DRIVE C2X prepares a large scale field trial for vehicular communication technology. Based on the European COMeSafety architecture for a vehicle to x communication system (V2X), the project develops a detailed specification for such a system and a functionally verified prototype. The prototype will be robust enough to be used in future field operational tests.

PRE-DRIVE C2X develops an integrated simulation model for cooperative systems that enables a holistic approach for estimating the expected benefits in terms of safety, efficiency and environment. This includes all tools and methods necessary for functional verification and testing of cooperative systems in laboratory environment and on real roads in the framework of a field operational test.

3.3.12.2. DIFFERENCES
The project focuses on developing and researching the vehicle to X (V2X) communication system, previously initialized by COMeSafety.

3.3.12.3. **Synergies**

PRE-DRIVE C2X also aims to apply state-of-the-art info-communication technologies in order to improve road safety. Applications and main project outcomes are to be analysed.

3.3.12.4. **Avoidance of Redundancy and Overlapping**

The PRE-DRIVE C2X project will end on 30.06.2010. SafeTRIP could use all the results and experiences from PRE-DRIVE C2X to choose the auxiliary communication system for tunnels and areas where satellite coverage is not available. Other advantage of the PRE-DRIVE C2X could be that this project involves on-field tests as well, which could play a very important role in SafeTRIP, as well.

3.3.12.5. **Web**

http://www.pre-drive-c2x.eu

3.3.13. **DRIVE-IN**

3.3.13.1. **Project Objectives**

The goal of DRIVE-IN project is to investigate how vehicle-to-vehicle communication can improve the user experience and the overall efficiency of vehicle and road utilization.

DRIVE-IN addresses both foundations and applications of inter-vehicle communication. Concepts, methodologies and technologies will be developed in the three main research thrusts: Geo-optimized VANET protocols, intelligent and collaborative car routing, and VANET applications and services. These research thrusts shall fertilize horizontal activities covering realistic large-scale simulation and massive real-life experiments in urban environments.

3.3.13.2. **Differences**

The project's goal is to extend existing vehicular communication networks (VANETs) with geo-optimization, and to develop intelligent applications and services based on this technology. It doesn't involve satellite communication.

3.3.13.3. **Synergies**

DRIVE-IN involves researching vehicle-to-vehicle communication, therefore its experiments (e.g. applications) can be used in SafeTRIP.

3.3.13.4. **Avoidance of Redundancy and Overlapping**

This project uses only VANET to realize car to car communication, thus no overlapping is expected until SafeTRIP uses alternative communication types for V2V tasks.

3.3.13.5. **Web**

http://drive-in.cmuportugal.org/

3.3.14. **CityMOBIL**
3.3.14.1. **PROJECT OBJECTIVES**

Citymobil addresses the integration of automated transport systems in the urban environment.

The main aim of CityMobil is enhancing the deployment of advanced transport systems to achieve a more effective organization of urban transport. It is inevitable that automation, in all possible forms between providing information at one end of the spectrum and fully autonomous driving at the other, will play a major role in the integrated traffic solutions of the city of tomorrow. CityMobil will contribute to a more rational use of motorized traffic with less congestion and pollution, safer driving, a higher quality of living and an enhanced integration with spatial development.

3.3.14.2. **DIFFERENCES**

There is no satellite based communication involved in CityMobil.

3.3.14.3. **SYNERGIES**

SafeTRIP has to be open to the latest development of urban transportation involving V2V and V2I communication and semi- or fully automated solutions.

3.3.14.4. **AVOIDANCE OF REDUNDANCY AND OVERLAPPING**

CityMobil and SafeTRIP focus on different services and involve different communication technologies, therefore no overlapping is expected.

3.3.14.5. **WEB**

http://www.citymobil-project.eu/
3.3.15. **Summary**

<table>
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Table 31: Summary of Other EU Projects Analysis

### 3.4. Summary

Section 3 – Influences focuses on three major topics: Political and macro-economical issues, Transportation management and Relevant EU projects.

Subsection 3.1 “Political and macro-economical issues” summarizes the relevant directives and initiatives of the European Commission will need to be considered in order to ensure the success of the SafeTRIP platform. To that end, this section presents a list of recommendations for the SafeTRIP consortium.

Subsection 3.2 “Transportation management” has an overview of the state-of-the-art transportation management technologies and methods. It describes the recently used traffic monitoring and controlling technologies, distinguishing urban and motorway traffic control methods. Transportation management systems involving freeway management systems, toll collection systems, decision support systems, traveller information systems, and special event management systems are also presented. Road safety issues are discussed in particular for the role cutting edge technologies can and do play in improving safety.

Subsection 3.3 “Relevant EU projects” gives an overview of the main ongoing or finished EU projects that might have relate to SafeTRIP’s objectives. Beside the general introductions, the projects are studied considering the differences and possible synergies with SafeTRIP. According to EC policies, evaluation includes the discussion of avoidance of overlapping and redundancies. Therefore the material enables the rapid overview of the relevant projects and points out the cooperation possibilities.
Annex 1 – Interview, Presentation and Discussion Reference

Interviews

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## Discussions, Observations and Presentations

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Annex 2 – References for Section 3.2 – State of the Art – Transport Management and Traffic


UK Highways Agency. (n.d.). Traffic feeds and alerts, web site.-


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http://www.wikipedia.org