AlpenCorS

Alpen Corridor South

WP3 Final Report

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Table of contents

Table of contents ___ *3*

1. Corridor 5 and ITS application ___ *4*

2. State of the art of ITS solution ___ *5*

2.1 Overview on general ITS architecture ___ **5**

2.1.1 The Vehicle ___ 5

2.1.2 Infrastructure on field ___ 6

2.1.3 Communication link ___ 6

3. Environment analysis and identification of main criticalities ___ *8*

3.1.1 Scenario 1: The tunnel area ___ 8

3.2 Scenario 2: Increasing traffic demand and congestion ___ **13**

3.2.1 Scenario 4: Emergency call ___ 16

4. GIS and Cartographic Data Repository ___ *19*

4.1 Generation of final cartographic image data bases ___ **19**

4.2 Distribution of data bases to project partners ___ Errore. Il segnalibro non è definito.

5. Conclusion ___ *22*

1. Corridor 5 and ITS application

The availability of new technologies related to electronics, informatics, and telematics, are providing new opportunities for the development of application fields where science and technology play an important role. The field of Intelligent Transport Systems (ITS) is maybe one of the most challenging one, since it offers many interesting scenarios, it requires the highest level of technology and its development can have a strong social impact.

Under the acronym “ITS” a wide range of application technologies, addressed to the transportation sector, are currently designed and developed aiming to:

- Improve road and traffic management;
- Collect and transmit information on traffic conditions;
- Assist drivers in reaching a desired destination with navigation systems;
- Decrease congestion and reduce the number of traffic incidents;
- Improve safety on the road and increase efficiency in rescue operations;
- Improve the productivity of commercial, transit, and public safety fleets;
- Improve the efficiency of the different transport modality, by using an intelligent management system able to choose the more efficient transport modality, to give a constant update information about the position, condition and situation of the object passing in the corridor;
- To give a constant valid support to the drivers that go along the corridor, by providing them a series of services.

ITS is the marriage of the information and communication technology with the vehicles and networks that move people and goods. A central theme in the ITS philosophy is the cooperation among vehicle and infrastructure. This concept is clear in applications for example related to: traffic management, e-payment, access control, emergency call service, etc.

In Europe Intelligent Transport System and Services are helping to improve virtually every section of the transport chain and as well as reduce their environmental impact.

Corridor 5 with traffic flow and specific road condition represents ALPENCORS environment. Concerning the corridor scenario, part of ALPENCORS activity has been addressed to identify the main problems related to traffic and road condition inside this area, and to identify some technological solution to improve the current situation.

2. State of the art of ITS solution

2.1 Overview on general ITS architecture

Generally a telematic architecture is composed by the following main actors:

- The vehicle equipped by a special telematic device
- Infrastructure on field
- Communication link

The combination of these modules let the realization of technological solution which in the document are grouped under the umbrella ITS (Intelligent Transport System).

2.1.1 The Vehicle

The vehicle is the road user. A vehicle equipped with special device is able to exchange information with infrastructure on field and so consequently to receive support during travel.

At least a telematic device is composed by:

- GSM module for communication
- GPS module for localization
- Central Processing Unit (CPU)
- OEM network interface

The systems we are speaking about can provide several services to the driver; some examples are:

- On board or Off board navigation;
- Emergency call and breakdown assistance;
- Phone functionalities (call, SMS, e-mail);
- Point of interest;
- Multimedia & entertainment;
- Traffic information;
- Preventive diagnosis;

In order to implement navigation and location based services a GPS receiver is embedded in the telematic box enabling location algorithms which use the GPS signal together with odometer and Gyro sensors.

Other features of the on board system are:

- To acquire information from CAN network and perform preventive diagnosis;
- Off board navigation

- To receive from the control centre information regarding: point of interest, accident, traffic, road condition, etc.

At the same time the vehicle can start a request addressed to the control centre, for example in case of accident or emergency.

Generally the mentioned application are classified as driver support. A central concept on this kind of application is the service design and the HMI, due to the fact that the system is generally created to be used in driving context. Human factors and HMI are a crucial link between ITS implementation and traffic safety. Generally the driver has a limited capacity to interact with multiple systems and information sources at the same time.

Considering the vehicle not only as user vehicle but like a probe equipped by some sensors and able to acquire information regarding the road and traffic condition we have a complementary set of application which are at first layer addressed to the infrastructure and secondly to the driver.

2.1.2 Infrastructure on field

Vehicle directly interacts with the infrastructure on filed. The infrastructure can be:

- **Control Centre** / Service Provider who is the collector of information and accordingly to user profile distributes the most interested and updated data. The aim of these control centre is to deliver the efficient movement of goods and people on road network in different conditions and consequently the broadcasting of all the information regarding road condition and navigation indication in the most efficient way.
- **Infrastructure on field** like **VMS** displaying updated information regarding incident management information (accident detection, route diversion, congestion detection, lane closures, road work), information on events (sporting event, festivals), services (location and estimation time to reach point of interest), approximate time needed to reach a location. The information are provided by dedicated probe sensors (vehicles or sensors on the road) to the control centre who is responsible to update the VMS. The information delivery through the VMS is low cost and cover a large amount of users.
- **Infrastructure on field** like **special sensors**. This is the most advanced environment in which the user vehicle is supposed to be able to communicate wirelessly with the sensors present on the road. Moreover the vehicle itself is also supposed to communicate wirelessly with other vehicle and so the information about road condition should be received in this way. This configuration has a double meaning:
- the user vehicle can receive information by infrastructure (low cost instead of GMS connection);
- the user vehicle is a probe vehicle and travelling collects information about the area and sends those data to the control centre.

2.1.3 Communication link

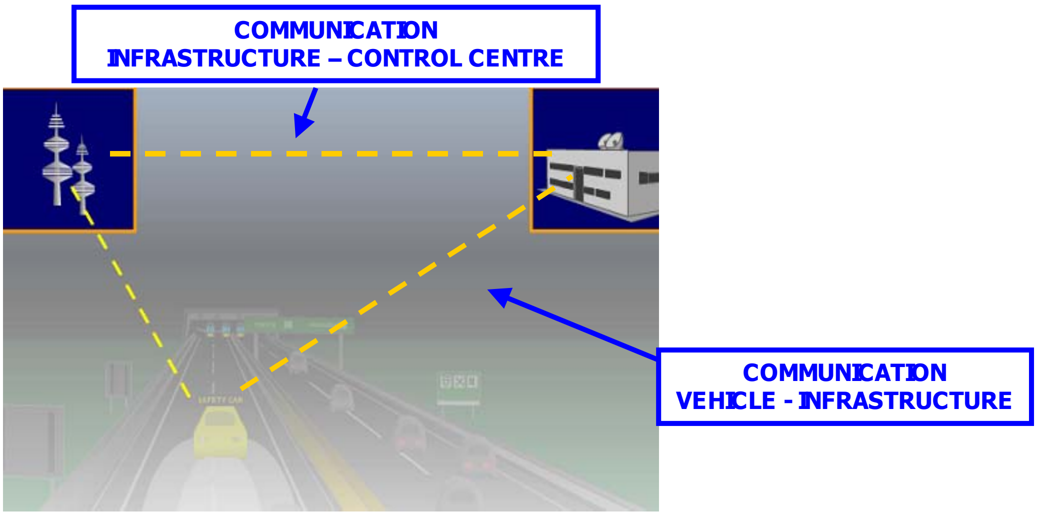
In order to close the loop, there is the need to establish the communication among the mentioned actors. The greatest part of telematic applications are based on a direct cooperation among the vehicle and a control centre on field.

Looking at the greatest part of telematic application the communication link found are:

- Vehicle – Control Centre
- Vehicle – Vehicle

- Vehicle – Infrastructure
- Infrastructure – Control Centre

Automotive telematic is based on an on-board platform able to acquire information from different sensors present on the vehicle and to manage the communication (voice & data) with a service provider control centre.

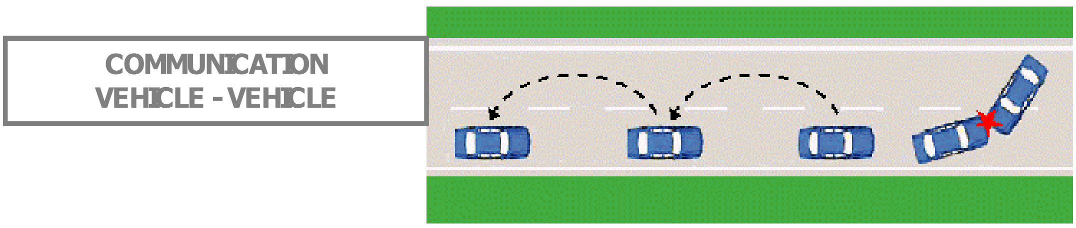


Communication is achieved using a cellular phone (GSM evolving towards GPRS) .

Upon the direct communication among **vehicle and control centre** it is often introduced an intermediate layer which manage the bi-directional communication among:

a) **Vehicle – Infrastructure**: realized by short range technology reducing the amount of data transmitted via GSM and consequently the costs. A probe vehicle provides environmental data. Those not processed data could be available in loco. In a second step the infrastructure will update the control centre. Facing the issue on the other side, the vehicle receives information while passing in front of a special totem.

b) **Vehicle – Vehicle**: possibility to create community of vehicle or to receive in real time information regarding road condition (ice presence, traffic, accident,….) without additional costs;



c) **Control Centre – Infrastructure**: the control centre uses the infrastructure to distribute information to the user on the territory. An example could be the VMS (virtual Message Signs).

Accordingly to the application the bearer is different. Generally the long range communication is based on GSM/GPRS. Short range communication is based on Bluetooth of Wi-Fi. Due to the fact that the communication link among vehicle and control centre is private some special protocol are defined in order to manage the data link.

3. Environment analysis and identification of main criticalities

Every year 40000 people die on Europe's road. During last decade numerous measures were taken to reduce the number of fatalities on European roads. Nevertheless from society point of view the accident costs of road transport are too high with 1.300.000 accidents per year in Europe causing 40000 fatalities and 1.700.000 injuries at an estimated cost of 160 billion €.

The European Road Safety Action Programme published by the Commission provides a general strategy and framework for road safety to reach the ambitious target of halving road fatalities by 2010.

In November 2002 an eSafety working group, established by the Commission, automotive industry and other stakeholders, proposed 28 recommendations to accelerate the research, development and use of these safety systems. These recommendations address the improvement of road safety by integrated safety systems that use advanced ICT for providing new, intelligent solutions. These solutions are addressed to involve and create the interaction between the driver, the vehicle and the road environment. Based on the output generated by the mentioned dedicated working group, has been decided that in order to accelerate the process for safety increasing within territory, a large use of active safety systems, called Intelligent Vehicle Safety System (IVSS) should be done.

Looking to corridor 5 environment some specific areas have been identified as representative scenarios of the corridor problems and criticalities. Here below are described in details.

Figure 1 – Some specific scenarios have been identified within Corridor 5 which have been analysed and considered as representative scenarios of corridor problems and criticalities.

3.1.1 Scenario 1: The tunnel area

The transport system and notably the Trans-European Transport Network is of paramount importance in supporting European integration and ensuring a high level of well being among Europe's citizens. The European Union has the responsibility to guarantee a high, uniform and constant level of security, service and comfort on the Trans-European Road Network. Tunnels facilitate communications between large areas of the Union and are thus essential to long distance transport. They also play a decisive role in the functioning and development of regional economies.

The UN-ECE has set up an inventory of road tunnels longer than 1000 m. This inventory includes 370 tunnels with a total length of 900 km, 182 of which are located in the Trans-European Road Network, with a total length of 446 km (in Figure 2 is reported the list of main tunnel).

Member State	Existing TEN Tunnels > 1000m	New TEN Tunnels > 1000m 2002-2010	Existing TEN Tunnels 500-1000m	New TEN Tunnels 500-1000m 2002-2010	Total TEN Tunnels > 500m in 2010
Austria	33	8	19	4	64
Belgium	1	0	1	0	2
Germany	19	12	18	6	55
Denmark	1	0	2	0	3
Spain	16	3	4	2	25
Finland	0	1	0	4	5
France	18	2	13	2	35
United Kingdom	6	2	4	0	12
Greece	3	16	4	22	45
Ireland	0	1	0	0	1
Italy	83	13	144	6	246
Luxembourg	0	0	0	3	3
The Netherlands	1	3	7	0	11
Portugal	1	0	0	1	2
Sweden	0	3	0	0	3
EU total	182	64	216	50	512

Table: TEN road tunnel inventory

Figure 2 – TEN road tunnel inventory

Due to the increasing of traffic volume risks have increased in recent years also with the ageing of tunnels. Most tunnels have indeed been built to specifications that with time have become outdated. Either their equipment no longer corresponds to the state of the art or traffic conditions have significantly changed since their initial opening. There is moreover no general mechanism at national level to oblige tunnel managers to improve safety once the tunnels are put into service.

Tunnel users have changed. The risk of serious fires has significantly increased in recent years, due to the more intensive HGV (heavy goods vehicle) use of tunnels, and in bi-national tunnels in particular, lack of co-ordination between both sides. Moreover, serious accidents have shown that non-native users are at greater risk of becoming a victim in an accident, due to the lack of harmonisation of safety information, communication and equipment.

From a recent study of PIARC (Permanent International Association of Road Congresses), the average frequency of fires in tunnels is higher than 25 per 100 million vehicle kilometres (number of vehicles per km), while for a group of tunnel (e.g. Frejus, Mont Blanc and Gotthard) the frequency of fires involving HGV is much higher than that of passenger cars.

Concerning Frejus Tunnel, for example, in the year 2000 happened 482 incidents of which 281 were due to mechanic failures, 82 were caused by fuel tanks empty, 23 involved property damage only accidents, 1 was a collision involving 1 injured person, 34 were fire incidents and 47 were incidents which had other or unknown causes.

The **direct costs** of recent tunnel fires, including reparation, amount to **210 million € per year**. The **indirect costs** on the economy resulting from the closure of a tunnel are huge: in the case of the Mont-Blanc tunnel and for Italy alone, these amount to **300-450 million € per year**.

Tunnel closure is also prejudicial to the European economy: it increases transport costs, reduced competitiveness and negatively impacts road safety due to longer journeys which in turn increase pollution.

The most important road tunnel in Corridor V is, at the present day, the Fréjus one, between France and Italy. As it is 13 km long, connecting Modane to Bardonecchia, the single-pipe tunnel has a low speed limit, a curtailment of the vehicles and some security restrictions that impose a low capacity.

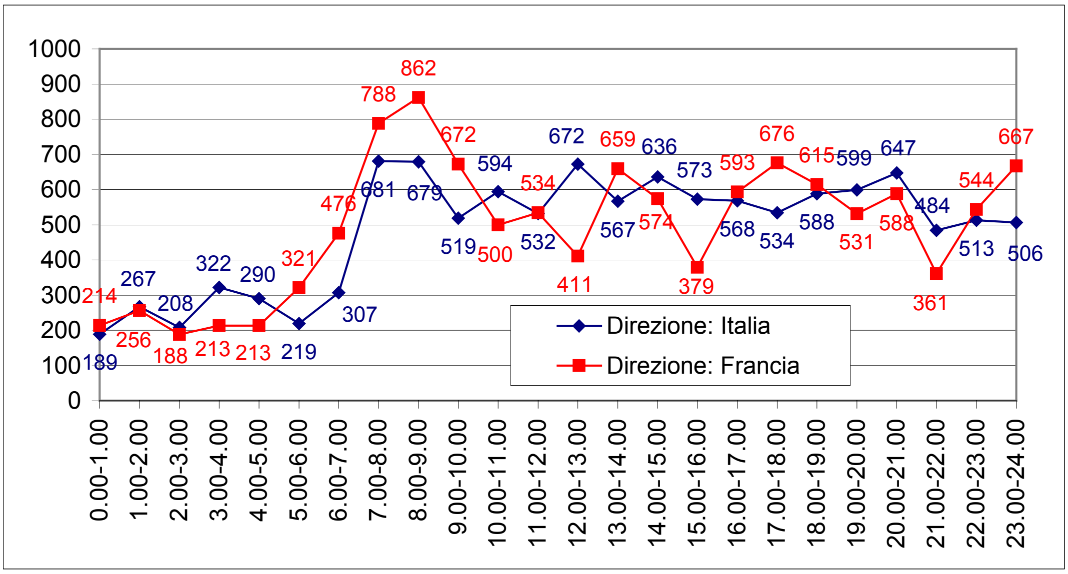


Figure 3 – This graphic shows the traffic volume in 24h crossing the Frejus tunnel in both the direction for Italy and from France.

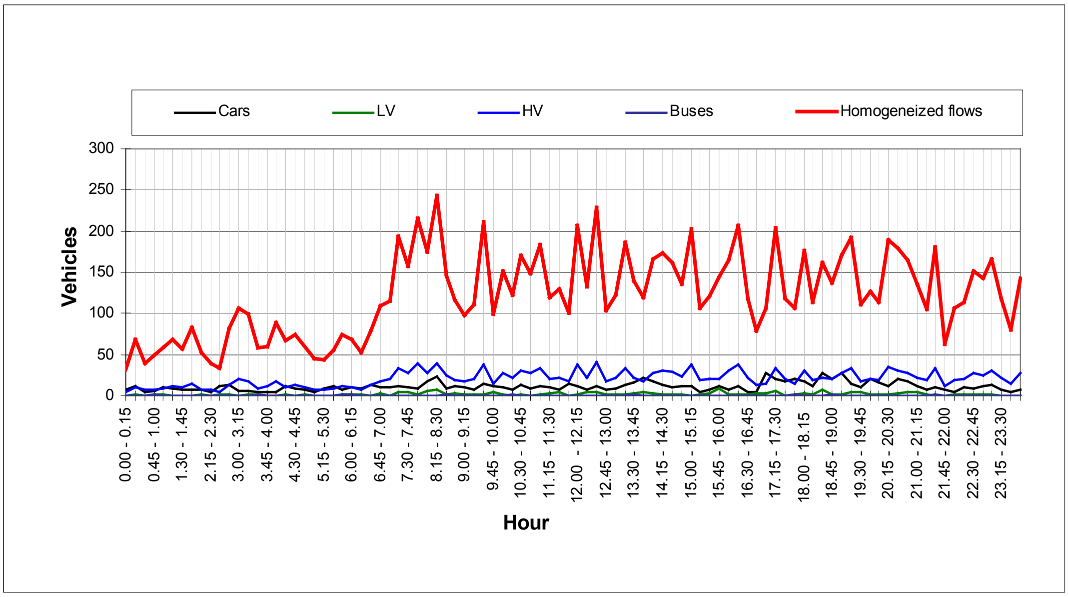


Figure 4 – This graphic shows traffic composition in 24h Italy direction, heavy vehicles flows

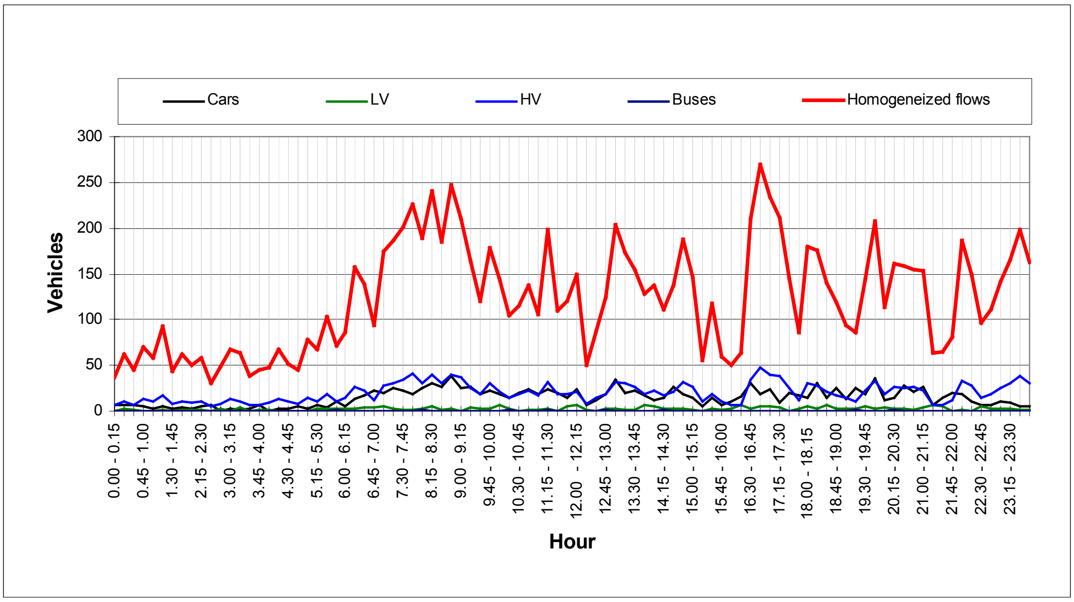


Figure 5 This graphic shows traffic composition in 24h France direction, heavy vehicles flows

3.1.1.1 Technological approach towards tunnel safety improvement

The technological approach is based on the cooperation among vehicle in transit along tunnel and infrastructure. Of course this approach highlights the role of three main actors which are: the vehicle, the dedicated control centre and the infrastructure identified which special sensors distributed on the road and tunnel itself.

This integration vehicle-infrastructure shall be achieved at different levels:

- Concentrate the **intelligence on infrastructure** in order to reduce the requirements for the vehicle (video cameras, pollution sensors, temperature and fire sensors, traffic volume detector, etc…);
- Create a dedicated **control centre** addressed to monitor and manage the infrastructure sensors and to manage the rescue operation when needed; the control centre is equipped with a workstation linked with the telematic tunnel architecture and connected to the rescue units (ambulance, …) and the public authorities (fire department, police, …) by a priority link for the emergency situations.
- Introduce the presence of a high level **telematic equipped vehicle**. Telematic equipment helps the driver to obtain the needed data from the Control Centre (status of the tunnel, emergencies, etc.), from the vehicle (diagnosis and prognosis) and from the tunnel in order to be always aware about the best action to do in case of emergency. This equipment is also the responsible for the voice link towards the Control Centre.

Establish the **link among the vehicle equipment and the road infrastructure** and on the other side the link among the **vehicle equipment and the control centre**. In this way the vehicle is able to be informed on time about accident or danger, or to received input to set cruise speed, or to launch the alarm in case of emergency. The information collected by:

- vehicles and infrastructures will be provided as input to the task concerning emergency operations;

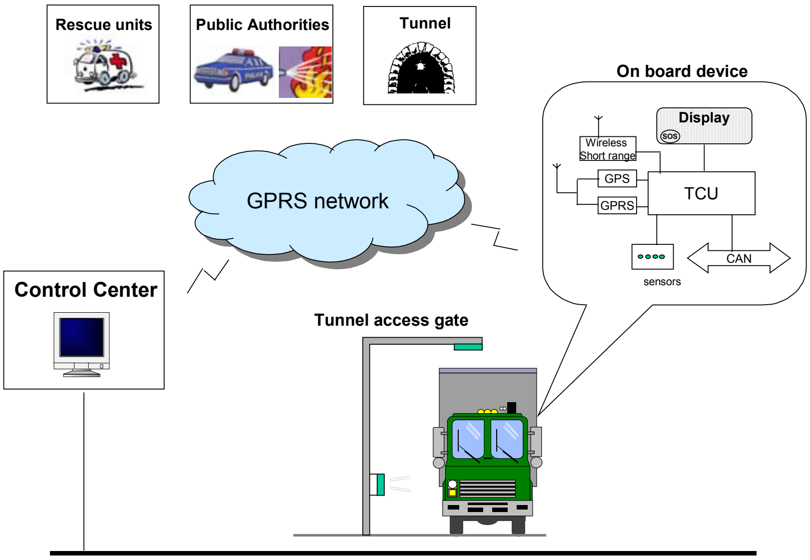


Figure 6 - The picture represents the actors involved in tunnel architecture: the user vehicle, the control centre, the infrastructure and the link with specific entities: rescue units, police, public authorities.

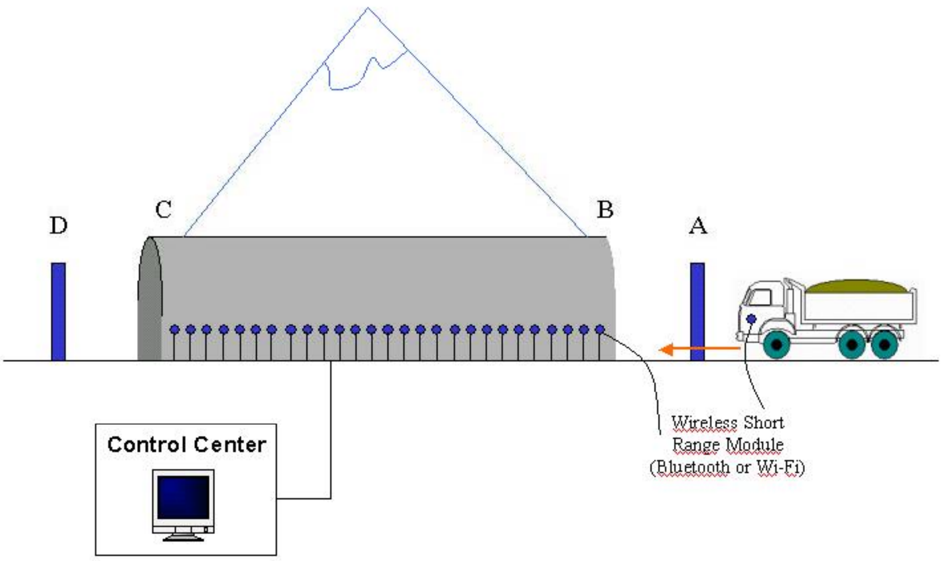


Figure 7 - Represents the situation in which the vehicle equipped by special system is screened at tunnel gate and when inside is supported by the communication link with the control centre.

3.2 Scenario 2: Increasing traffic demand and congestion

Traffic demand has been growing steadily for decades, and this growth is expected to continue in the future. Especially in urban and suburban areas the result is traffic congestion, as the traffic demand cannot be managed by the existing infrastructure. Traffic congestion threatens the economic well being of many towns and cities as well as affecting the quality of life.

For many years, the main way of reacting to this increasing demand has been to increase the capacity of the roadway network by building new roads or adding new lanes to existing ones. However, financial and ecological considerations are posing increasingly severe constraints on this process.

Hence, there is a need for additional intelligent approaches designed to meet the demand while more efficiently utilising the existing infrastructure and resources. The solutions are traffic management systems in combination with traffic and travel information systems which are not only restricted to road transport but also integrate all modes of transport in a multi-modal approach. The optimisation of utilising existing infrastructure and increase of efficiency in the transport system shall be achieved by:

- homogenising traffic flow by adapting velocity,
- equalising traffic demand temporarily which means shifting departure time of a trip,
- equalising traffic demand spatially which means redistributing traffic in the transport network in case of congestion and
- shifting traffic demand to other modes of transport either for the whole trip or at least for parts of a trip (intermodality).

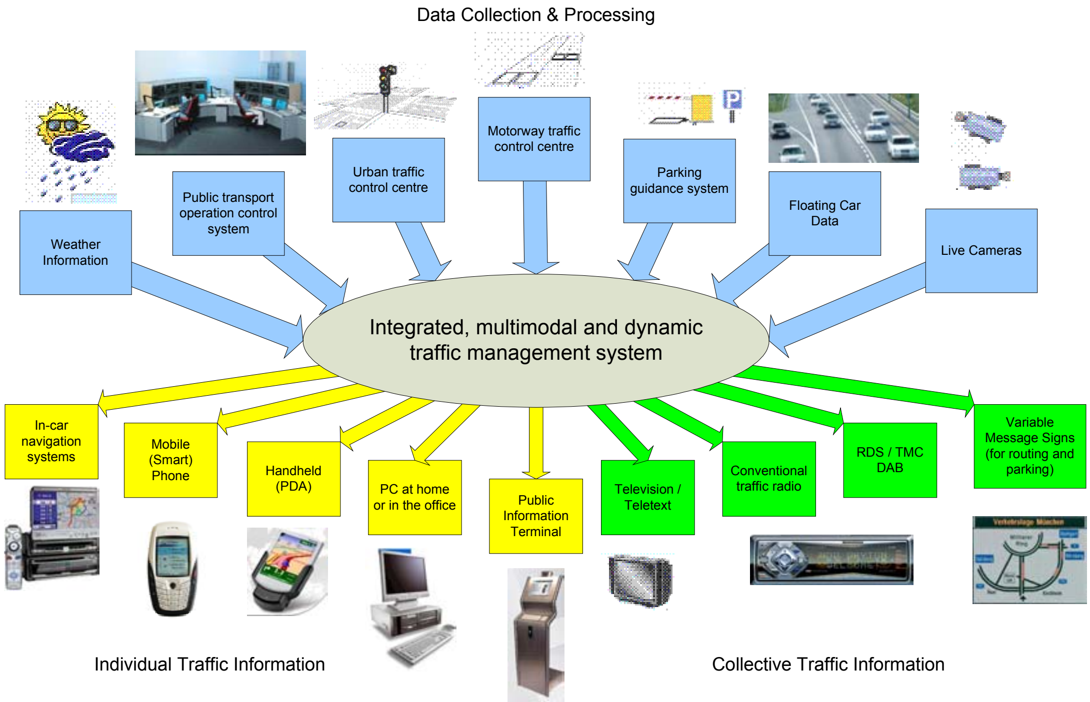


Figure 8 Traffic management architecture with input and output channels

In order to perform an efficient traffic management function, in urban areas or on motorway, first of all it is needed the acquisition of information concerning the real time situation.

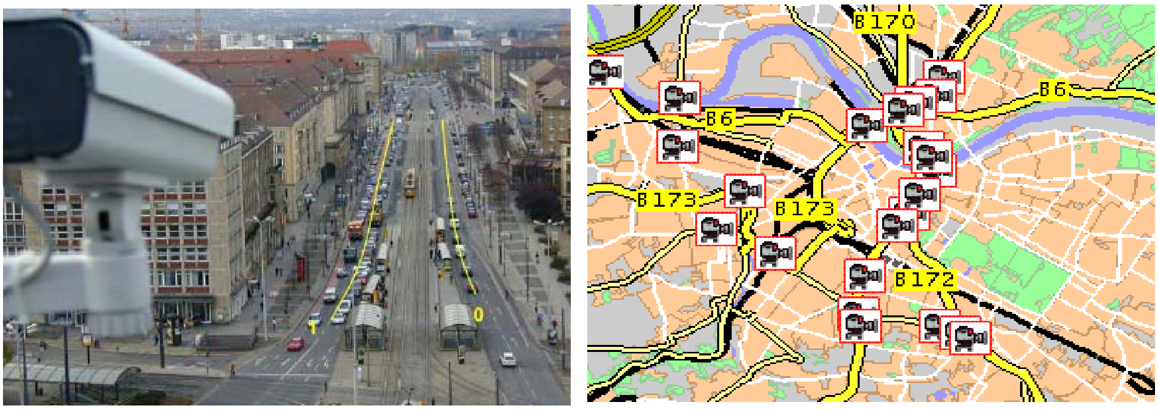


Figure 9 Video cameras installed on the most critical road's nodes are used to monitor the traffic condition.

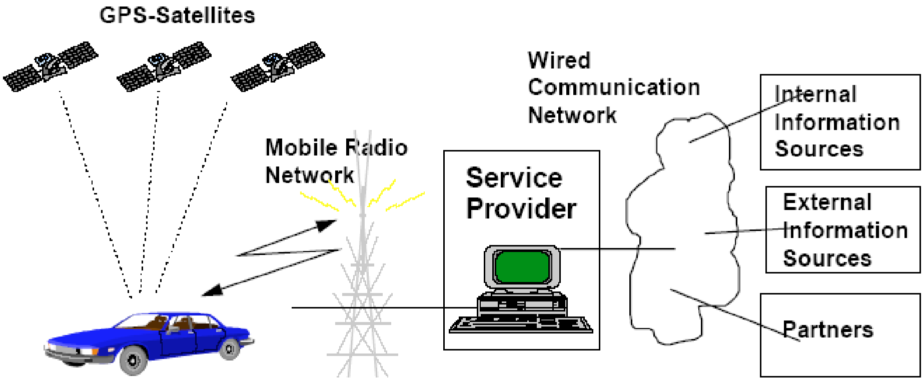


Figure 10 Floating cars, also known as "probe vehicles", act as mobile sensors and can collect a range of information including speed and position data. Service provider is responsible for the collection and processing data and provisioning of routing indication to the users.

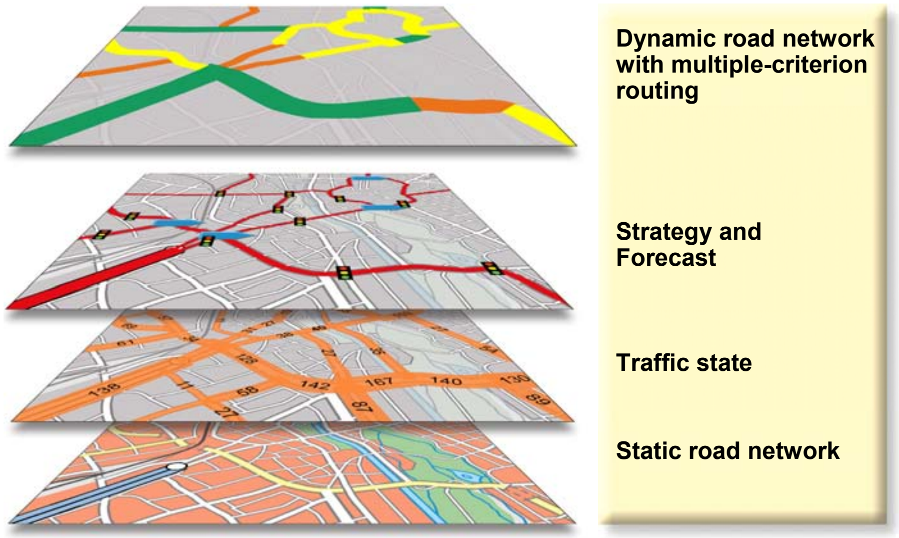


Figure 11 To reduce traffic jam the control centre is expected to be able to provide routing information to the road vehicles equipped with telematic system. Upon a static map of road network is matched a layer with specific traffic condition and route calculation

Moreover within the environment of road safety improvement the statistical analysis shows that critical weather conditions are one of incident causes.

Table 1 – Accident rate per different weather condition – Italy [Istat data]

WEATHER CONDITIONS	MOTORWAY	MAIN ROADS	SECONDARY ROADS	EXTRAURBAN CITY ROADS	URBAN ROADS
	Accidents	Accidents	Accidents	Accidents	Accidents
Good weather	6.0	8.3	5.5	3.3	77.0
Fog	9.9	15.7	13.2	6.3	54.9
Rain	9.8	12.7	6.8	4.0	66.7
Hail	21.7	9.8	2.8	3.5	62.2
Snow	20.4	16.9	9.7	4.5	48.5
Strong wind	9.3	14.7	9.9	3.5	62.5
Other	9.3	11.4	7.2	4.3	67.8
Total	6.8	9.1	5.9	3.5	74.7

Table 2 – Killed person rate per different weather condition – Italy [Istat data]

WEATHER CONDITIONS	MOTORWAY	MAIN ROADS	SECONDARY ROADS	EXTRAURBAN CITY ROADS	URBAN ROADS
	Killed persons	Killed persons	Killed persons	Killed persons	Killed persons

Good weather	11.0	22.0	15.4	5.9	45.7
Fog	23.1	16.7	17.9	7.7	34.6
Rain	10.9	30.8	11.9	3.5	42.8
Hail	66.7	0.0	0.0	0.0	33.3
Snow	25.0	12.5	25.0	6.3	31.3
Strong wind	16.7	33.3	25.0	8.3	16.7
Other	11.7	26.2	17.7	8.0	36.5
Total	11.3	23.3	15.3	5.9	44.2

Fog causes more severe accidents followed by snow and strong wind. Accidents during rain are less severe than during good weather both considering killed and injured persons. That means persons take more care in case of rain, but not in case of fog and snow, probably because the human sense is not able to discriminate dangers in such situations.

Included in the provisioning of appropriate routing information to the user, within the aim to reduce traffic congestion, there is the possibility to provide warning concerning critical weather condition.

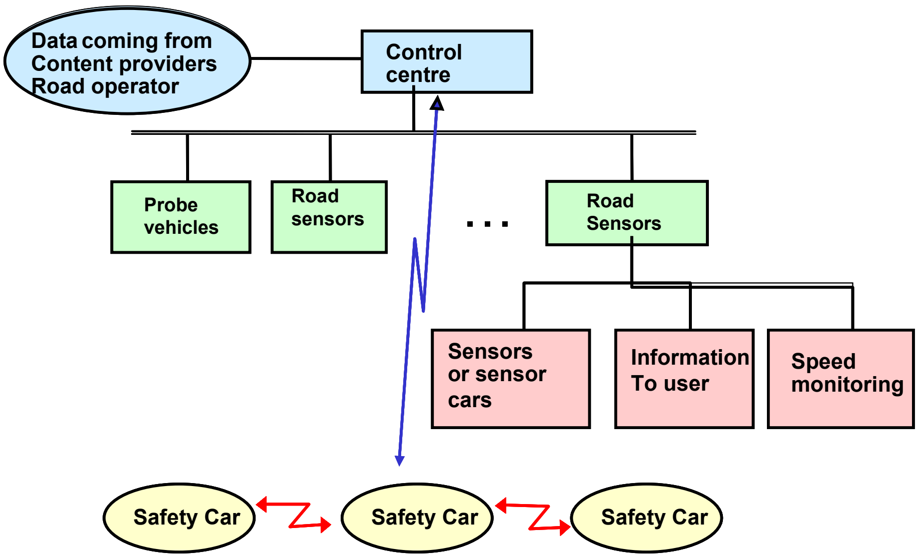


Figure 12 Architecture implemented in Italian Motorway Pilot site aimed to create a guiding system in case of fog.

3.2.1 Scenario 3: Emergency call

Emergency call has been considered of great importance in the corridor 5 landscape. Looking to statistical data, the number of road incident is still high and in particular it is evident that in a large number of cases, mainly due to lack of information, the efficiency of rescue operation is not satisfying. In 40% cases the operator is not able to understand accident location and has not enough information to identify which is the most appropriate rescue means to involve. Looking to the caller point of view in some case is not easy to know which is the right number to call for SOS (especially when abroad).

The introduction of telematic in the management of rescue chain can provide benefits in terms of efficiency and time saving, but also saving social costs reducing the number of deaths and reducing injured severity.
The introduction of solutions based on ICT is composed by the introduction in the vehicle of a specific system able to detect the accident and automatically start the SOS call sending to the control centre precise information on accident location and typology and supporting the operator in the dispatching of the right rescue means.
Looking to a pan European scenario the availability of a unified solution for the telematic eCall management assumes a good relevance. ECall represents a social service and due to the mobility level of modern society, it is a need for the traveller the possibility to make SOS call while moving from country to country.
Benefits are bi-directional, for road user is guaranteed the possibility to perform eCall using the in vehicle device without considering the language problems and number to call (112 is unified), but also for the rescue centre operator it is an advantaged the availability of detailed information form accident scene.
At this purpose European Commission is working to the definition of a pan European solution covering all the mentioned items, from the in vehicle system, to the PSAP structure considering also the communication strategy and data set.

Figure 13 represents the reference architecture for the eCall telematic management.

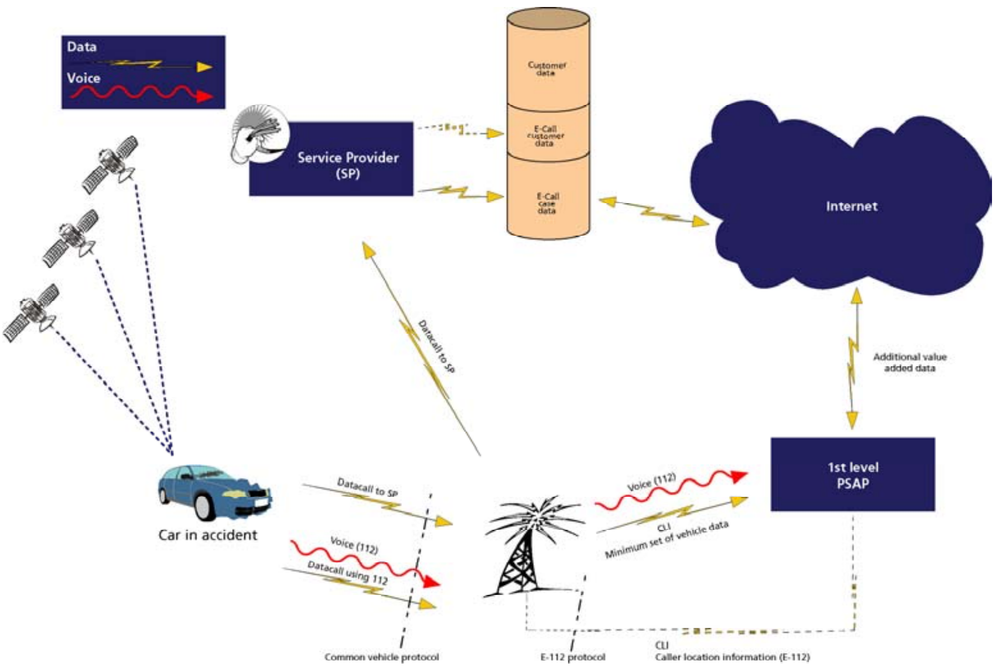


Figure 13 – pan European emergency architecture block scheme

Where:

- There is a car equipped by the in vehicle system in charge to automatically launch the SOS;
- PSAP represents the European 112 centre which is in charge to receive and process data from the vehicle and which is in charge to involve rescue units;

- In case the user would be a subscriber of a private service provider, the last is included in the architecture as SP and a specific interface between SP and PSAP is defined;

4. GIS and Cartographic Data Repository

Within WP 3.7 "GIS and Cartographic Data Repository" the main purpose was to provide GI services to AlpenCorS Partners and to supply digital cartographic base material for maps, reports and Internet appearances.

The following products have been generated in the frame of the project:

- Digital database containing synoptic cartographic representation (Base Data) of whole AlpenCorS area of interest
- Specific cartographic representations (Local Data) over selected areas; accessible/delivered to AlpenCors partner

Tasks of the Sub-WP included:

- 3.7.1 the definition of requirements based on a questionnaire (part of Interim report)
- 3.7.2 the generation of Base Cartographic Data based on the database specifications derived from consolidated user requirements
- 3.7.3. Generation of Local Cartographic Data based on the database specifications derived from consolidated user requirements
- 3.7.4 Management & Communication by contribution to reports and communication with project partners

4.1 Generation of final cartographic image data bases

The following activities were performed for the generation of final local and base cartographic data material:

- Area of Interest selection

  Base Cartographic Data: The database corners were geographically defined by the Rhone valley in the west, parts of the Rhine and Danube river in the North, lake Balaton in the East and the northern parts of the Adriatic and Ligurian Sea in the South. The whole region of Emiglia-Romana (Italy) is also covered as requested in the requirements. The database covers the following countries: France (partially), Germany (partially), Switzerland, Liechtenstein, Austria, Italy (partially), San Marino, Monaco, Slovenia, Croatia (partially), Bosnia and Herzegovina (partially), Hungary (partially), Czechoslovakia (partially)

  Base Cartographic Data: The database corners have been defined by the project partners.

- Projection definition, scale and accessibility

  The *Base Cartographic Data* were delivered in GIS compatible format (GeoTiff). The projection has been defined to Lambert Azimuthal Equal Area – Datum GRS80. The data with a scale of 1:1Mio were accessible to all AlpenCorS partners. Usage was free to all AlpenCorS project partners within the frame of the AlpenCorS project.

  The *Local Cartographic Data* were also delivered in GIS compatible format (GeoTiff) The projection has been adapted to the standard projection system UTM. The datasets were produced on request and were free to the specific AlpenCorS project partners within the frame of the AlpenCorS project.

- Geometric and radiometric correction of image data
  The image databases (Landsat) have been geo-coded based on topographic maps and vector data (layers: streets, lakes, rivers). Further radiometric corrections of atmospheric effects were performed and radiometric adjustment of different scenes has been applied.
- Mosaicing of satellite scenes
  After geocoding of the individual scenes the image databases have been mosaiced manually along environmental borderlines (forests, rivers etc.).
- Colour balancing
  The mosaicing process included the application of colour balancing between the individual scenes to compensate colour differences due to acquisition date and phenology.
- Vector information

  The products have been delivered on request in combination with vector features of transport networks and administrative boundaries (NUTS 0, 1, 2, 3).

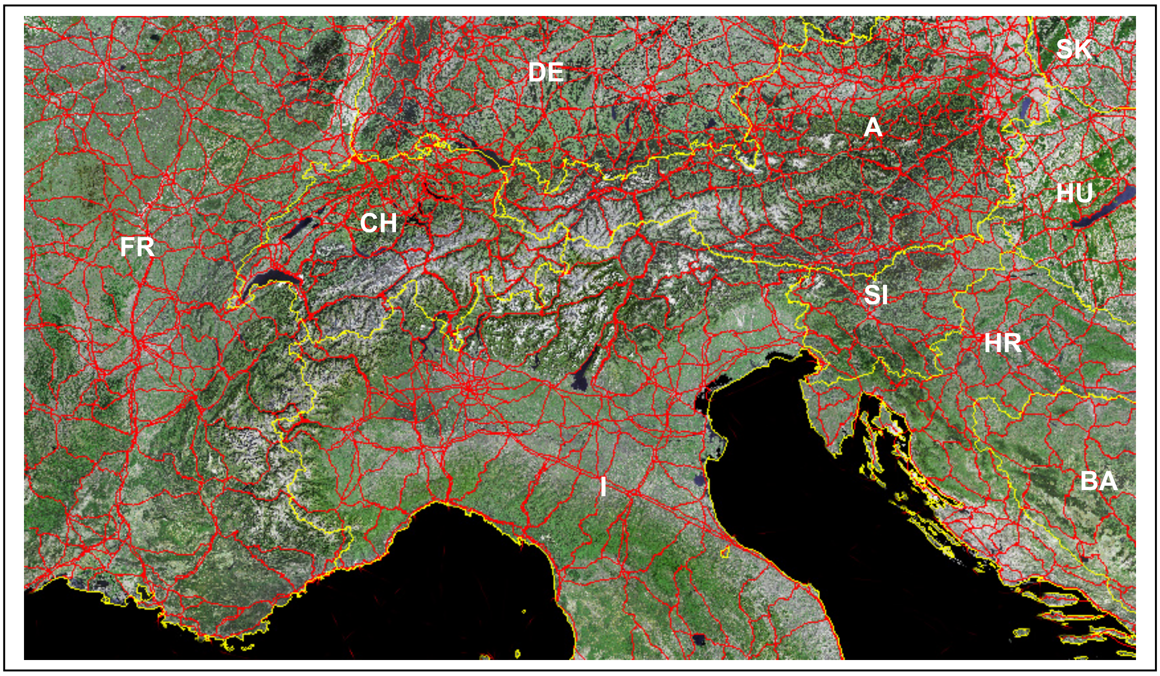


Figure 14 Cartographic database with state borders (yellow) and high level road network (red)

4.2 Dangerous Goods

In order to improve the traffic conditions on the European motorway and road network, in which the incidence of goods freighting is gaining an increasingly higher share on the total of traffic, an intervention at the level of freighting the dangerous goods appears to be necessary.

To reach a decided increase of the safety levels in freighting these types of goods, it seems essential attempting to standardise national regulations to the recommendations of the European Union and to the indications deriving from the ADR standards. This appears all the more important within a corridor policy, for which international freighting plays an important part, while however having to meet very variable regulations between one country and another.

On parallel, it appears in any case possible to start to define a set of safety standards, related to the roads and to the vehicles, with the purpose of outlining precise limits, both at the level of infrastructure characteristics and of user behaviour, below which the traffic conditions cannot be without a potential risk factor.

The standard make possible to identify the most appropriate design solutions for the motorways of the corridor and for the roads, which though not being motorways, form part in all respects of the paneuropean goods freighting network.

5. Conclusion

In this document have been summarized the main concepts faced within WP3. The main focus of the activity has been the evaluation of benefits introduced by the use of ITS application in order to improve road traffic efficiency and safety. Focused on Corridor 5 area special attention has been dedicated to road traffic giving low priority to the rail and naval transport requirements.

In agreement with the adopted approach, first of all have been analyzed the currently applied ITS solution and has been evaluated the diffusion level.

ITS covers a large number of thematic related to transport management, from fleet management and public transport to traffic information management and road efficiency improvement.

The performed analysis highlights the following aspects:

- Some application are part of the state of the art and largely diffused (e.g. traffic information, TMC, etc…);
- Some application are pilot sites implementation and so at prototypal level dedicated to testing and evaluation of benefits related to application itself;
- Some other application covers municipalities and restricted area, dealing with specific vehicles fleet. These represent the starting point for a large scale diffusion;

It is evident that even if specific standards related to application exists and also reference architecture, the implementation on field looks quite proprietary. This fact means that is difficult to extend solution to other sites and above all to manage the integration with other entities.

Considering the ITS analysis, WP3 activity has been focused on two main features: Corridor 5 area and ITS systems. The philosophy, which leaded the activity, has been to consider different scenarios which, for their own features, represents weakness to Corridor 5 safety, and to identify possible improvement with the use of ITS systems.

In the requirements collection have been considered many points of view: transport point of view, end users, heavy traffic, motorway operator, political maker and public authorities. Moreover the normative aspect has been taken into account in order to understand where EC already identified criticalities and provided regulation. Corridor 5 shall be integrated within European normative environment guaranteeing continuity in the solution implemented independently from the belonging country.

In each of the technological solutions proposed there are some key elements in common, which represents modules building the pan-European Corridor 5 architecture.

Upon the solution described for each scenario, which apparently seems to be single solutions specifically cut, it is easy to identify which are the key points in common to the presented solutions.

The road map shows the presence of vehicles (private or belonging to fleets) equipped by special telematic device aimed to provide support to the driver or transforming the user vehicle in probe vehicle and so able to acquire information from road environment.

Secondly appears the presence of a dedicated control centre in charge to maintain the link with the vehicle and to process data so to obtain the maximum benefits.

Looking to different point of view, there is the existence of information which should be processed in the right way. The probe vehicle collects input and forwards those data to a control centre allowing the identification of road condition. On the other side the user is supported by an external actor in charge to provide warning in special scenario or to provide navigation information or to coordinate rescue intervention.

Considering vehicles belonging to fleets, for example transporting special goods, in the aim to improve road safety and adopt preventive action, road operator thanks to the technological support has the possibility to monitor in each situation the goods condition on the road.

The implementation of presented concept sees the following ties/issues:

- Availability of vehicles equipped by telematic systems;
- Control centre network covering the described competences and able to interact with existent infrastructure;
- Road sensors aimed to acquired information about road condition (temperature, ice, fog, traffic, incidents, etc….);

Looking to ITS solutions aimed to improve traffic condition or road safety there are different faces of the problem. This implies firstly the identification of some similes between architectures proposed, even if looking with more attention to implementation aspects some big differences appears.

Around this hypothesis it is clear that the benefits given by technology introduction are different and addressed to different actors, going from the life quality improvement to the social cost reduction.

For this reason it is not possible to identify a generic solution addressed to all aspects related to transport needs, but rather it is necessary to identify specific thematic area (i.e. dangerous goods transport, traffic management , etc…) and to define specific solution.

On the other side, even if considering specific solutions, it is difficult to guarantee a common solution for different countries, characterized by different social, economical and environmental aspects, as Corridor 5 appears.