Cooperative Traffic ICT
Strategic Research Agenda
ICT SHOK

v. 1.1

Executive Summary

There are some 300 million drivers in the EU Member States, who wish that driving would be more comfortable, efficient and less risky. Of all daily activities, driving is crucial as our entire life could change in an instant because of a serious road accident. This is one easy example of drivers behind the current activities to move towards a new situation, where cars themselves prevent accidents and traffic congestions are reduced. The environment pollutions, traffic safety and congestion are truly European problems affecting in all 25 Member States (EU25) and therefore, European level solutions need to be found. As a summary the basic requirements for the future traffic are changing.

At the same time, people spend more time in cars, busses and trains. With the experience of always connected at homes and offices people are expecting also more possibilities to work and use various contents while traveling. And when people want to increase the personal productivity of travel time they require new services and new kind of travel automation not to exclude better logistics of goods. These developments do create an other set of drivers towards more advanced traffic and transportation.

The challenge for the industry and the society is to deliver the next generation ubiquitous and converged systems, networks and service infrastructures for exchanging information. Such new infrastructures will permit the emergence multi-discipline variety of business models capable of dynamic and seamless end-to-end composition of resources across different devices, networks, providers and service domains. This ubiquitous traffic, transport and travel infrastructure combines in a unique form the various kinds of vehicles, their drivers and passengers as well as their cargo.

The combination of intelligent vehicles and infrastructures (for transport and communications) is something that is a continuous and evermore increasing requirement for an ecological, environmental sustainable and intelligent transport system. So far, automotive and telecommunication industries have been developing almost in isolation. Now the advanced wireless and internet technologies enable completely new possibilities to integrate these industries in a new much more advanced traffic paradigm – cooperative traffic.

The future Intelligent Transportation Systems (ITS) operate seamlessly upon hybrid of separate access networks, with millions of simultaneous subscribers. ITS handles, not only unlimited number of users, but even more enormous amount of incoming information from highly complex sensor networks, monitoring systems and public services. Ecologically, the obtained know-how, about the benefits of future ITS, together with widespread utilization, will solve the great challenges with the constantly growing traffic and pollution already in the near future.

Drivers for proposed work are *demands for sustainable traffic* (less accidents, less congested traffic and cleaner environment), *digital convergence and vehicles that are becoming capable to communicate* with services, infrastructure and each others. Finland has excellent starting points to give contribution and take meaningful portion of the future business via the strong *Finnish expertise in both wireless and wired communication technologies, in sensors and sensor systems and in automation.*

Cooperative Traffic ICT activity is aiming to develop highly efficient, seamless and flexible ITS solution in environmentally and ecologically friendly manner, qualifying the latest and forthcoming ICT demands of continuously growing traffic, by commercial, public and private objectives. It also aims to enable Finnish companies to reach the world elite in the ITS development and gain a leading position in the world-wide ITS business, including the quality and maturity of R&D, testing and piloting sites and infrastructures, but most importantly, the international success of participating companies. Cooperative traffic focus area acts as a wide

application area for other focus areas and makes research on efficient data fusion methods by combining information from various sources with the sensor data measured locally.

Cooperative traffic focus area generates demanding requirements for testing, verification and validation activities. These activities have to be able to test and evaluate not only users in a multiform and complex environment inside the car, but must be able to monitor and analyse human actions in alive traffic situation as well as track and analyse the functionalities of number of technical systems both in the vehicles and in the environment. These activities to be made on cooperative traffic presume that various, repeatable tests can be made in both in closed, carefully implemented laboratory like environments and in open, alive situations among live traffic. This focus area has special requirements to the information management and presentation due to the fact that driver's primary task, driving the car should not be disturbed by additional sensory stress. The methods and solutions used to solve these problems can be used by other areas using ICT.

Intelligent Transport Systems (new infrastructure and services) contain great business potentials waiting for investors. The estimate for aggregate growth rate for the Intelligent Transport related businesses has been estimated to be 10…25 %. The current value of the global market is well beyond the €100 billion (10^9) level. The Finnish ITS R&D, the state-of-the-art consists of the world-class research competence, profound know-how and strong experience on various traffic systems and applications. In addition, the Finnish R&D community and participating companies cover the all needed capabilities to develop various types of ITS.

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1. Introduction

The past quarter of a century in the deployment of Intelligent Transport Systems (ITS) and Intelligent Vehicle Safety Systems (IVSS) in Europe has been the era of developing *sensing* capabilities both of vehicles and traffic monitoring systems to perceive anomalies and hazards in the environment and to improve the fluency of traffic for less costs and cleaner environment. Mainly this has been R&D on camera (video, FIR- and NIR) and radio radar technologies (77 & 24 GHz) – recently also laser scanning to sense the environment and objects in the vehicle path, monitoring and prediction of the vehicle trajectory and driver behaviour, monitoring road segments and traffic flow from fixed installations. The pursuit has been to develop applications for driver assistance and systems for the road authorities for maintenance and traffic management operations. The trend is still in terms of methodology to use sensor data fusion to provide as full understanding as possible of the environment.

There are some 300 million drivers in the EU Member States, who wish their driving to be easier with less trouble, less delay, and less chance of getting injured. Of all daily activities, driving is crucial as our entire life could change in an instant or even end because of a serious road accident. The present activity responds to the need to move towards a new situation, where cars don’t crash anymore, and traffic congestion is reduced. The pollution of the environment, traffic safety and congestion are truly European problems affecting all 25 Member States (EU25) and therefore, European solutions need to be found.

In the EU, traffic congestion has a price tag of €50 billion per year or 0.5% of Community GDP, and by 2010 this figure could go up to 1% of EU GDP. The number of cars per thousand persons has increased from 232 in 1975 to closer to 500 today. The overall distance traveled by road vehicles has tripled in the last 30 years and, in the last decade, the volume of road freight grew by 35% contributing to 7 500 km or 10% of the network being affected daily by traffic jams.

With an annual investment of around €20 billion in R&D, the automotive sector is the largest R&D investor in Europe (20% of total European manufacturing R&D) and constitutes a major driver for the development and diffusion of new technologies and innovations throughout the economy. The industry's R&D intensity is a sign of the fact that the European automotive industry remains a future-oriented industry and sees innovation as being at the heart of its future competitive position.

From the market perspective, despite relatively flat demand in Western Europe over the last couple of years, the overall demand for motor vehicles is showing signs of recovery although it might take some time to reach the levels of 1999 again. The issue of fleet renewal should also be given consideration by policymakers as it can have important environmental and safety implications. A vehicle fleet with a high average age of vehicles tends to have a negative effect on road safety and the environment and if vehicle owners retain their old vehicles for longer periods the market penetration of new better performing vehicles is slowed down.

The Finnish industry – with its strengths in communication equipment, devices, networks and services – is well placed in the European and even in the world-wide race to define and develop the system and service infrastructures of the near future. These will generate new economic opportunities with new classes of networked applications, whilst reducing operational expenditures. The current internet, mobile, fixed and broadcasting devices and networks and the related software service infrastructure need to progress accordingly in order to enable another wave of growth in the on-line economy and society.

The challenge for the industry and the society at large is to deliver the next generation of ubiquitous and converged systems, networks and service infrastructures for communication, computing and media. Such new infrastructures will permit the emergence of a large variety of business models capable of dynamic and seamless end-to-end composition of resources across a multiplicity of devices, networks, providers and service domains. This ubiquitous traffic, transport and travel infrastructure combines in a unique form the various kinds of vehicles, their drivers and passengers as well as their cargo.

The combination of intelligent vehicles and infrastructures (for transport and communications) is something that is a continuous and ever increasing requirement for an ecological, environmental and intelligent transport system.

The global population growth combined with strong economic expansion have created a mega trend, in which the problems caused by increasing traffic and number of automobiles are approaching the limits of our societal tolerance. The traffic related safety, environment and flow problems are familiar to all corners of the world and the continuous growth further increases the level of severity and negative impacts of the problems.

The proposed research work within the Cooperative Traffic ICT addresses the major socio-economic challenges caused by Europe's increasing demand for mobility: ever-increasing congestion, continuously raising consumption of energy, pollutant emissions, and fatalities and injuries caused by traffic accidents. The EC forecasted increase of 26% in vehicle-kilometers and 38% in goods transport up to 2010 could in the worst case lead to a loss of 4% of the GDP in Europe, when no sufficient efforts are taken. Cooperative Traffic ICT puts research emphasis on cooperative travel and transport issues, as identified notably also in the Strategic Research Agendas of the ERTRAC European Technology Platform and the eSafety Forum in the European level. The national research impact will be achieved through the Cooperative Traffic ICT SRA.

The emissions caused by traffic threaten the accomplishment of the objectives agreed in The Kyoto Protocol. It is estimated that the traffic emissions cause lethal illness to 40.000 to 100.000 in Europe alone. Globally the traffic emissions cause the death of approximately 800.000 persons a year. The traffic branch is responsible for approximately 20% of the emissions contributing to the global warming.

The conventional approach to solve the traffic congestion problem by investing in the route capacity doesn’t work anymore due to the complex and extensive nature of the problems. The driver-road-traffic system is a complex one involving drivers, vehicles, road, weather phenomena, etc. The key opportunity identified is the application of Intelligent Transport Systems enabled by technological innovations. On the other the ITS systems generates the frame for development of intelligent vehicles and traffic infrastructure and their co-operation which furthermore, enables interaction between vehicles and with the surrounding infrastructure. This opens new non-explored opportunities to invent new technological innovations for increasing traffic safety. For example, when infrastructure “detects” potential danger it may warn or make in-visible corrective actions to prevent potential hazard. Moreover, the technology offers potentiality to increase fuel efficient driving for example in intersections and thus, saving environment and lives by reducing harmful emission gases.

The prime incentives to use the tools offered by intelligent transport system are the positive impacts expected in the area environment, traffic safety, congestion and the well being of citizens at large. In particular, high expectations are attached to the technologies which help to stabilize the greenhouse gas concentrations. Additionally the Intelligent Transport Systems (i.e. new infrastructure and services) contain great business potentials waiting for investors. The estimate for aggregate growth rate for the Intelligent Transport related businesses has been estimated to be 10…25 %. The current value of the global market is well beyond the €100 billion level.

An average European drives his/her own car which is most often medium sized or a small car. Europeans buy second hand and new cars fairly equally but the car fleet appears to be rather old (4 years+) than new (up to 3 years old). About a half of EU citizens have a car older than six years since the first registration. Those who drive a lot are more likely to drive a bigger and newer car, a company/fleet car and to use motorways and other fast highways. As the new generation active safety features are at present mainly installed in the high-end range of vehicles, they are not yet available to a large share of EU citizens.

Eventually the most important beneficiaries of the onboard ITS and IVSS are the drivers. They are active stakeholders in private cars, taxis, buses, heavy goods vehicles (HGV) as well as in the emergency vehicles. The driver is the common nominator in the whole wide array of Cooperative Traffic ICT. The task of driving covers the main part of the Collective Traffic Agenda; the other important end of the story is the traveling task in various vehicles as a passenger. In both of these roles access to information is the value factor we are driving after.

In brief, safety is the most important factor that EU citizens would take into account if they were to buy a car but most would consider fuel consumption in parallel. Europeans do not appear to give much importance to other factors when choosing a car. In conclusion, there appears to be demand, and thus, a market for intelligent vehicle systems since their aim is first to enhance safety and secondly decrease fuel consumption by making driving more economic and efficient.

Concerning after-market telematics devices and nomadic devices such as smart phones and navigators used for driver assistance, the issue has been to some extent about finding or agreeing on open interface solutions when connecting mobile terminals to vehicle systems. On the other hand, the problem has also been to some extent creating service concepts for operators and service providers to make money out the functions assisting drivers. Currently, however, increasing numbers of independently functioning aftermarket telematic devices are entering the market. These devices either provide road users with traffic information and functions or would be capable of doing so in a moving vehicle. As a good example of these mobile devices serve portable navigators and smart phones that are affordable today and have a capacity to serve travelers in a number of ways in addition to assisting in navigation or serving as mobile phones only.

The aim of cooperative traffic solutions is to support foresighted driving and early detection of hazards. This is realized by means of a communication based system that extends the drivers' horizon and warns of potentially dangerous situations ahead. Consequently, the aim of these approaches is to provide drivers with the opportunity early to adapt the vehicle speed and also increase headways between vehicles leading to a higher situational awareness of an unforeseen danger.

2. Vision

Novel Finnish cooperative traffic concept provides functions and services for driver assistance and sustainable traffic. The first commercially available results of the R&D activity will be available in 2009.

The success of Intelligent Transport Systems is based on consequences of significant growth of traffic and global climate change as well as disruptive new technologies enabling the world of ubiquitous communications as well as driving that is increasingly supported by advanced technology. Current market offering contains primarily solutions addressing single problems while the expanding large scale problems call for solutions at traffic system level. We should refocus our attention from sub-optimization to total optimization of the driving experience, as well as the traffic control and management system. As to timing, we should do it now!

In the transport domain the vehicle (i.e. cars, buses, vans, trucks, emergency vehicles) has been considered to be a closed area accessible only for the manufacturer, their service and maintenance facilities and nominated licensed partners. That is still quite close to a reality today; namely with applications related to the vehicle body control, power train and safety critical systems. However, the “vehicle” is beginning to communicate more and more with the “outside world” as a result of handheld devices penetrating into the vehicle sphere with specifically designed physical and application interfaces. Car radios, mobile phones, navigation devices and other electronic on-board units (OBU, e.g. for toll collection) have established the early steps of today’s in-vehicle system roadmaps.

The main ITS system and applications, with real-time context aware reasoning, cover the various needs of professional and leisure drivers or even some communities with general interests, taking into consideration their demands, needs and current willingness for information and entertainment, by highly sophisticated content and context sensing methods. Moreover, the future ITS, is not limited to single user communication or personal devices, but additionally extends to high-tech in-car platforms, intelligent infrastructure, car-to-car and car-to-infrastructure communication, by all the means of future ubiquitous ICT.

However, the new development will bring along areas of tension and dilemmas, namely on reliability, safety/security, liability, legal constraints, usability, commercial aspects in the form of OEM expenses and product retail pricing, communication infrastructures and customer values.

Portable and handheld components of the telematics structures and modules have been brought inside the vehicles to establish add-on functions of the built-in vehicle infrastructure. Together these fixed and nomadic building blocks support the consumption of a wide variety of applications and services for safety, security, information and entertainment. The HMI may well be implemented using text, audio, video, voice, voice recognition, tactile and cognitive communication and response. This collection of functionalities and hardware relies on the wireless connectivity with the outside world. This connectivity network forms the new boundary in the coming era.

Short-range, cellular, broadband and/or high speed communications are stepping inside the vehicles. DSRC, cellular, WiFi and WiMAX devices and communication links will enhance the world experienced inside the private and public as well as the commercial vehicles.

Research is additionally targeted to increase efficiency of logistics operations both nationally and globally through development of new optimization models and methodologies. Efficient planning reduces also environmental impact of transportation and enables e.g. better and more flexible customer service levels.

For affordable and reliable in-vehicle module and component development there are prerequisites from OEMs, Tier1s and silicon suppliers. The overall win-win situation can be achieved through accelerated integration process, cost reductions and investing in quality improvements. For OEM and Tier1 cooperation the drive is towards a full system solution including support from the Tier1 for vehicle integration activities. For OEMs and silicon suppliers the drive is to achieve scalable architecture and migration paths for ECUs. For Tier1 and silicon suppliers the emphasis is on the development of chipsets, pre-products, software and SDK Tools as well as integration support from the suppliers.

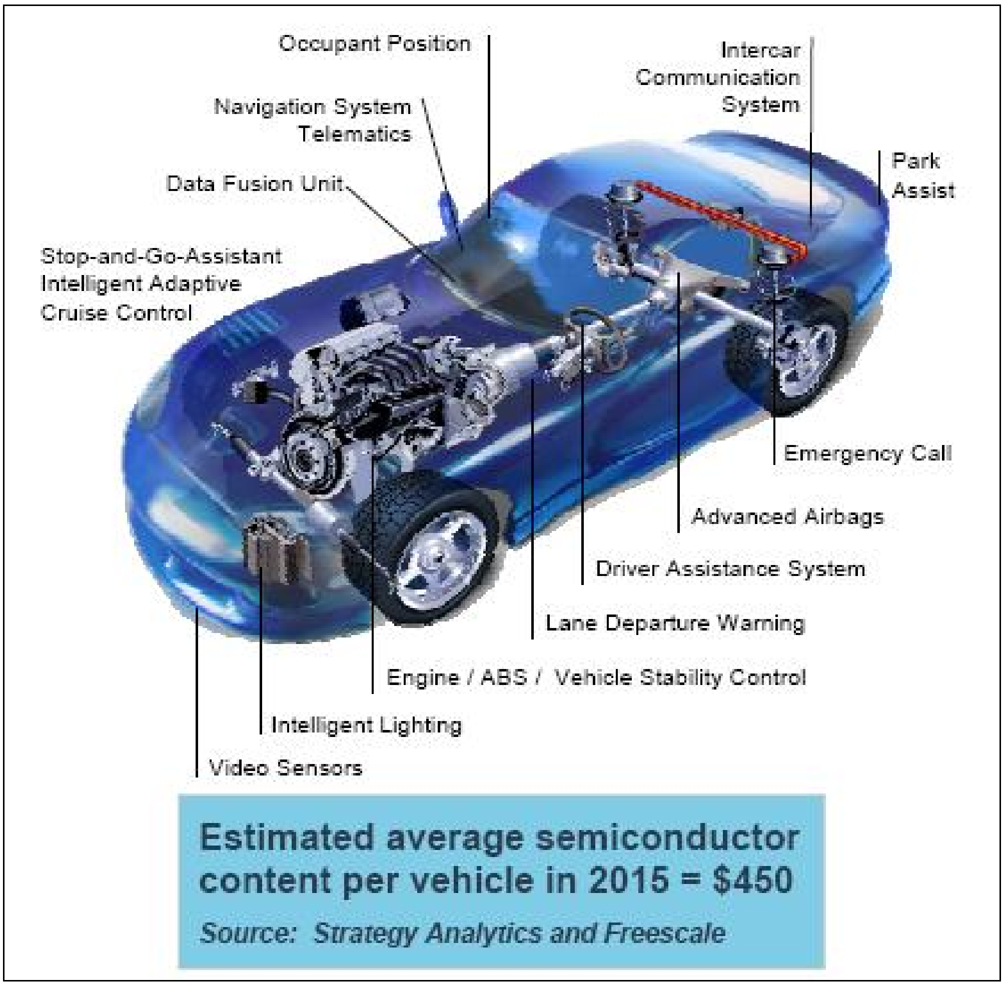

Figure 1. Intelligent car systems

To achieve a connected vehicle platform the active safety systems together with advanced driver assistance systems (ADAS) will drive the automotive electronics growth over the next decade. Sensor technologies are making the vehicles to become aware of their environment more and more. Highly-integrated analog technologies will allow efficient integration of analog components, sensors and ECUs in a single package. The number of controllers and demands for performance will increase as the systems integrate and add intelligence in the vehicle. The open systems and industrial standards accompanied by industry collaboration will be crucial to manage the increasing vehicle electronics complexity. The collaboration and design environments will define the data networks and paths as well as the system interdependencies when assigning the performance criteria for all signals in the automotive components and modules.

The ultimate mission for Finnish ITS:

To develop highly efficient, seamless and flexible ITS solution in environmentally and ecologically friendly manner, qualifying the latest and forthcoming ICT demands of enormously growing traffic, by commercial, public and private objectives.

To reach the world elite in the ITS development and gain a leading position in the world-wide ITS business, including the quality and maturity of R&D, testing and piloting sites and infrastructures, but most importantly the international success of participating companies.

State-of-the-art

Currently, the commercial ITS product range consist of several specific or even tailored solutions, while expanding large-scale problems call for complete and highly scalable ITS platforms. Thus, the focus of Finnish ITS R&D should be targeted from sub-optimization to comprehensive traffic control and management system. In addition, private consumption of traffic related data and other ITS related content is highly increasing in car environment. The rising interest towards more sophisticated applications and simultaneous requirements to make traffic smoother, allows several novel business opportunities, including the ITS systems, but even more potentially new personalized services for the players in the market.

About the Finnish ITS R&D, the state-of-the-art consists of the world-class research competence, profound know-how and strong experience about various traffic systems and applications. In addition, the Finnish R&D community and participating companies cover the all needed capabilities to develop various types of ITS. Thus, the ultimate challenge will be to obtain the lead position in the world.

3. Objectives and Themes

3.1 Objectives

To create an active collaboration network between companies and research organizations

- **Participation only through ongoing project, co-operation or testing**
- **Participants can vary from technology vendors to content providers**

To make Finnish ITS companies and research globally recognized and competitive

- **Including joint ventures, marketing efforts and strong partnership between participants**

To make Finland well-known and recognized ITS testing and validation site world-wide

- **New R&D, Interoperability, and Living Lab sites should be formed collaboratively**
- **Piloting and development of cooperative traffic ecosystem**

To clarify the principal objectives the ITS field must be divided to more focused themes and subjects. This can be done by separating potential user groups, professional or non-professional ITS, the type of transportation, the level of necessity or the level of public or private involvement. Although, the focus of the SRA will be set to the road transportation and related traffic interfaces, other transportation forms and their characteristics need to be considered on some level. These are railroad, sea and air transport, customs and safety regulations, pollution and congestion management, fluency of transportation and fleet management, and several ICT related topics such as telematics or access networks (Figure 2.).

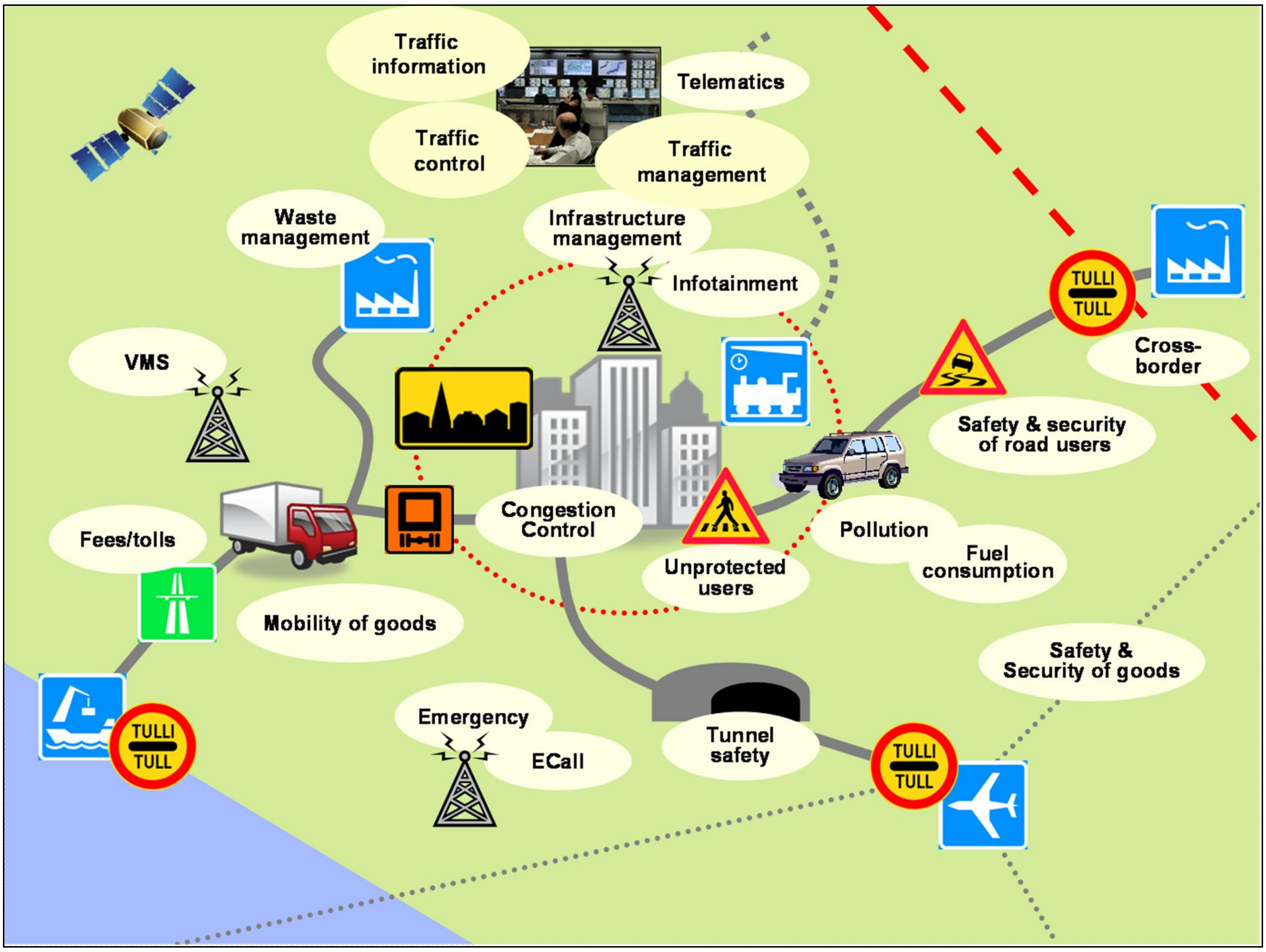

Figure 2. Cooperative Traffic ICT – Example topics

One option for the division is to utilise the term *Cooperative Traffic ICT* which could be separated forward into two complimentary application domains:

1 *Cooperative Travel ICT, considering the travel of people*, and
2 *Cooperative Transport ICT for the transport of goods*.

However, it is still worthwhile to pay attention that people, vehicles and infrastructures are present in both domains. We should also add that by having people in the loop we are targeting both drivers and passengers. The overall scheme for the ICT for Cooperative Traffic is drafted below, Fig 3.

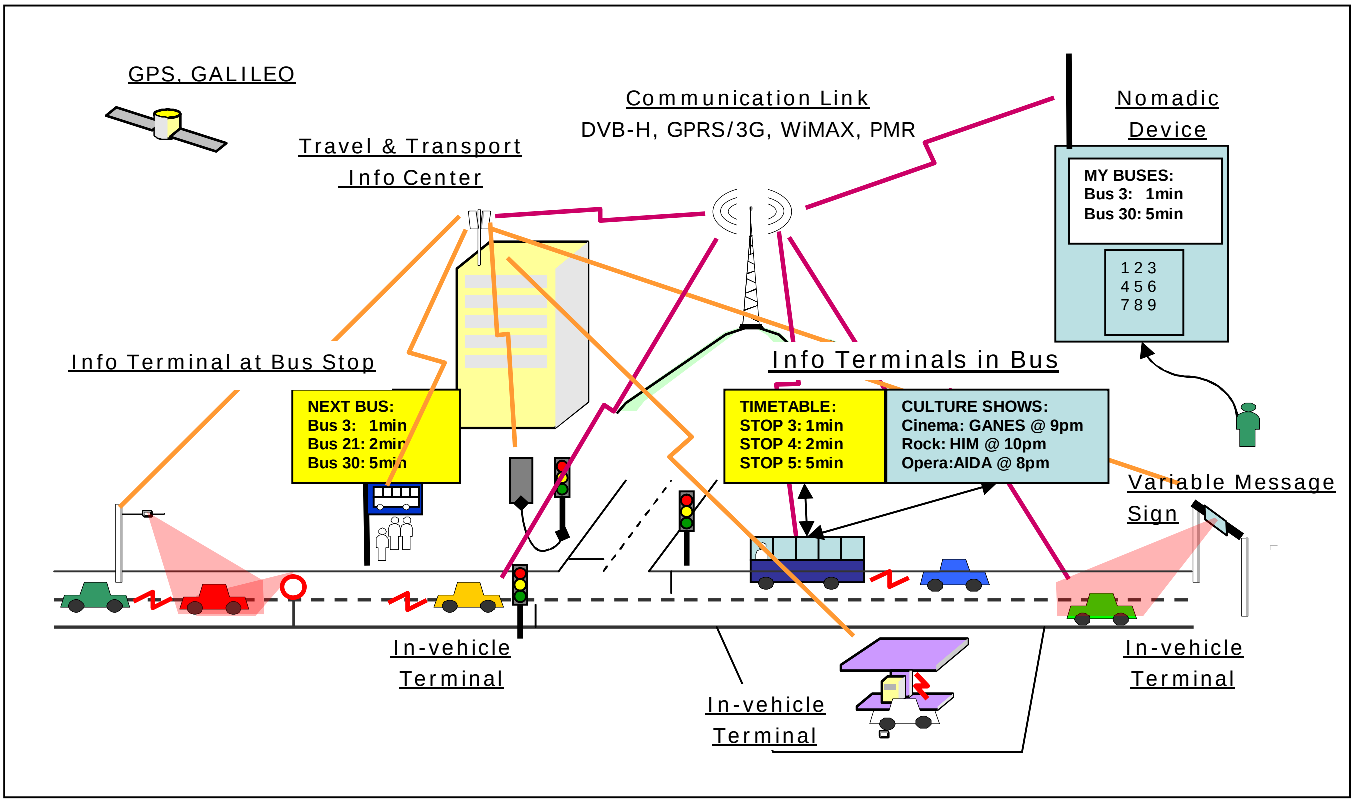

Figure 3. The overall ICT Scheme for Cooperative Traffic ICT

Other efficient way to divide the ITS field is based on users and separate user groups. Moreover, it will be important to notice that the requirements set by private road users and professional drivers are in many cases very different. In the future, ITS should meet these requirements, alleviate the problems of today's road traffic and offer new solutions, such as:

- Efficient mobility of goods in all environments, including urban environments as well as border traffic between different countries. This requires developed navigation systems, real-time routing, Electronic Fee Collection etc.
- Safety and security of freight and transport, including surveillance and tracking of goods, transportation of dangerous goods, sensors in the infrastructure and in the car, ADAS (Adaptive Driver Assistance System), ACC (Automatic Cruise Control), in-car networking and systems for making night time driving safer.
- Context-aware information to all road users, including information about weather and road conditions, traffic disorders, commercials and travel information.
- Safety and security systems for private road users, such as ACC, ADAS, systems to observe the driver's behaviour and alertness, context-aware and driver's profile observing warnings and information, parking aid, sensors in the car and infrastructure, vehicle-to-vehicle, vehicle-to-infrastructure and in-car communication.
- Infotainment and office applications.
- Multimodal travelling services that aim to increase using public transport.

In the domain of Cooperative Traffic ICT there are various stakeholders with direct and indirect impacts on the global systems, figure below. From the services viewpoint the value chain starts from the service creation and provision which are integrated by the service aggregation actors. The infrastructure plays an important aspect in the value chain since the road, traffic and communication infrastructures are the backbone of the Cooperative Traffic. The public authorities are responsible for the road infrastructure and the (telecom) network operators for communication networks. Terminal and Vehicle manufacturers (a.k.a. OEM) with their league of suppliers (a.k.a. Tier1) provide the common factor for the driver, i.e. consumer for services, the consumer device (access terminal) and the car (vehicle).

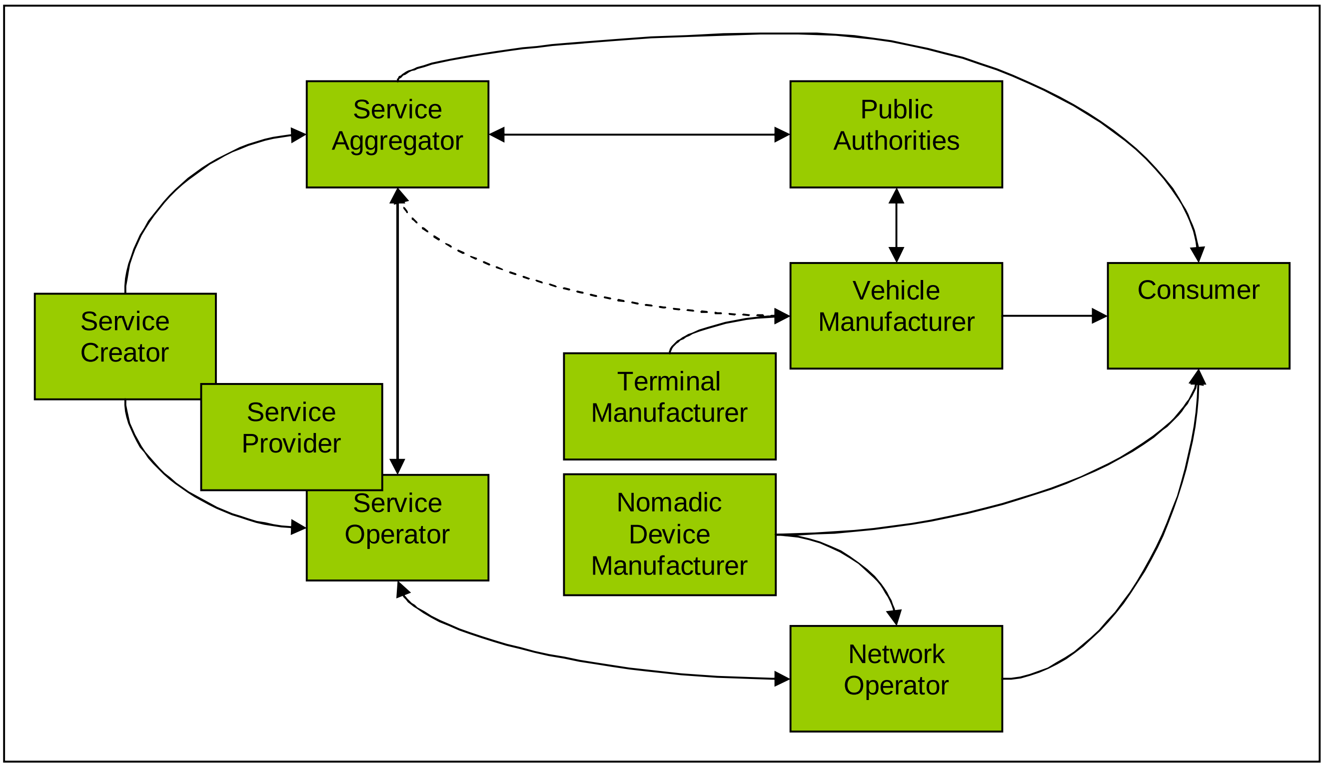

Figure 4. Stakeholders in the Cooperative Traffic ICT value chain.

3.2 Themes

To reach the mission R&D efforts need to be focused on several different themes. Themes are divided to three categories: One category is to collect the data (research and develop new sensors, new sensor combinations/systems and new sensor applications), second category is to process the data and make (right) decisions, and the third category is to share this information between different users. Furthermore, the activities within these themes can be phased to research oriented technology development, applied R&D work towards applications, verification and validation in pilots, and business related activities during market entries. These activities in different areas may occur in a different timescale. At the same time some theme area activities might be in application phase and some activities might be in technology phase.

We have divided our activities as follows:

I. New intelligent sensors, data fusion and sensor based applications,
II. Information management and decision support,
III. Applied communication,
IV. Piloting and technology/interoperability testing

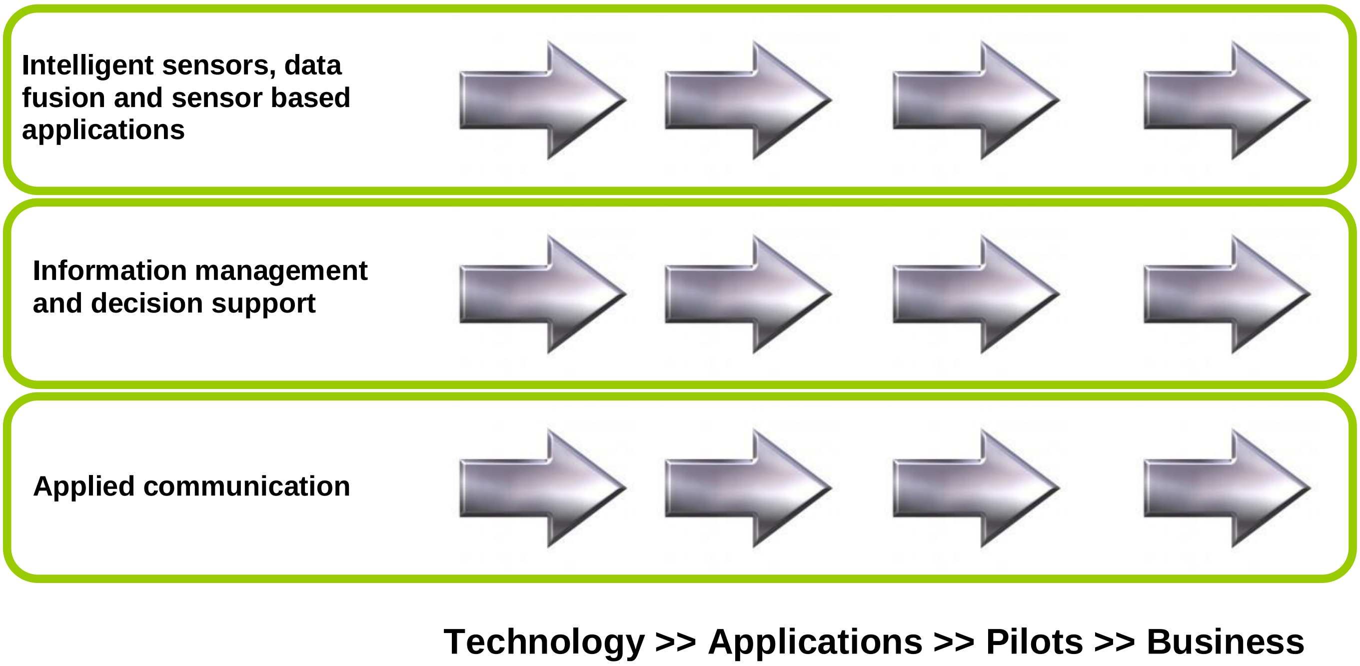

Figure 5. R&D activities for the Cooperative Traffic ICT

I. New intelligent sensors, data fusion and sensor based applications

- New sensors and algorithms for driver behaviour analysis, driver monitoring (e.g. drunk or drowsiness driving)
- In-vehicle, mobile and infrastructure sensing equipment (E.g. sensor systems for monitoring road condition and weather conditions, vehicle relative position, traffic flow, vulnerable road users)
- Perception of special conditions like night time, rain or ice on the road
- Modelling, simulation and testing of complex (vehicle) systems (including analyses of behavioural adaptation effects of in-vehicle information and safety systems)
- Advanced telematics platform (HW&SW, traffic data, APIs)
  - Platform specifications
  - Interoperability with telematics systems
  - Interfaces defined for smart automotive environment
- Automotive-SW
  - Automotive SW technology transfer from and to other areas (i.e. work machines)
  - Tools and methods training & transfer
  - Techniques, tools, methods, methodologies and processes for Automotive-SW development (e.g Agile methods, Auto-SPICE, Open Innovation, Testing)

II. Information management and decision support

- Applications helping driver in driving task
- Applications for enhancing use of public transport
- Fleet management applications
- Real-time optimization and management methods
- In-vehicle information and map/GIS information fusion for ADAS
- Methods for handling and correcting geographical data, optimization algorithms

- Adaptive HMI: Safe presentation of information to the driver, context-awareness for information scheduling, seamless nomadic device integration (mobile phones, mp3-players, …)
- Intelligent, plug and play -interaction of third party devices to the vehicles
- Context-based information management
- Designing ontologies for the “Vehicle Systems”, “Driver Behaviour”, and “Complex Vehicle Systems” domains
- Tools and systems for diagnostics fault tolerance (dependability)
- Technology at the service of the autonomy and independence of older, disabled, or otherwise less able drivers
- Intelligent vehicle environment
- Entertainment (infotainment) for passengers and travellers

III. Applied communication

- Transfer, gathering and integration of information of various sources (internet, mutual vehicles, roadside sensors, traffic stations, etc.)
- Information distribution and synchronisation
- Driver and vehicle identification and authorization applications
- Protection of the vehicle, goods and travellers
- Secure V2V, V2I communication solutions
- Broadband and hybrid communication solutions for traffic
- Media independent handover, IPSec, VPN, DRM
- Service interfaces (terminal & infra, access, payment)
- Content formats, protocols and message structures for applications
- Solutions for drivers/passengers for managing their content efficiently
- Shared applications for home and on the move use

IV. Piloting and technology / interoperability testing

- Instrumented vehicles for evaluating and assessing prototype implementations
- Pilot and test sites (in Finland) to verify and validate systems
- ITS LAB Finland – Cross-section of Finnish Lab Activities
  - ITS system tests, multi-network streaming content delivery and hybrid networking, Interoperability and Field Testing, Pilot Case and Cross-section of FinLab
- System pilots in global environments (i.e. Russia, China or Germany)
- Experiments and case studies

4. Relevance

In Finland, we have a globally competitive traffic system know-how and excellent competence applicable to all sectors of ITS. To date, no one has created a comprehensive Intelligent Transport System as a commercial service product. Japan appears to be most advanced in the business, but even they are at early stage of deployment in the field of ITS.

Automotive industry with €800 billion turnover is globally the largest segment in manufacturing. Current vehicle base runs at 800 million level and the annual new vehicle market is about 70 million units. The current EU25 vehicle fleet is around 200 million vehicles with an annual renewal rate of 8%; approximately 16 million vehicles annually. The ITS service market makes use of the fact that electronics and software are expected to represent 80–90% of vehicle innovations through 2010. The motor vehicle has become a connected entity interacting with other vehicles and the entire traffic system over communication networks.

The automotive industry companies enhance their competitive position by investing in the development of vehicle specific embedded systems. This will offer new possibilities to Finnish companies involved in the business. The industry has vehicle-to-vehicle and vehicle-to-infrastructure communication systems on its R&D agenda, but the scale of this activity is relatively small compared with the vehicle specific systems. The most omitted area is the collection and use of the data available from various sources to manage the traffic flow and impact on the demand of traffic service. The omitted area is however the most essential in terms of constructing the key functionality for traffic control and management. The use of ICT technology is revolutionizing the automotive industry (i.e. in-vehicle, external & home connectivity). Mobile device integration and public telematics are seen the most potential technologies to transform in-vehicle communications in coming years (5-10). Public telematics are driven by governments for improving traffic flows, congestion, toll collection etc. As the life cycle of a vehicle is very long compared to consumer electronics, the automotive industry has started to develop in-vehicle platforms that can be updated or individualised as new features and connections are launched. This will open opportunities for additional consumer focused telematics services. [1]

Car manufacturers roughly double the amount of outsourced development by 2015 (from €28 billion to €54 billion), high growth especially for module fabrication by suppliers (from €303 billion to €505 billion) and area of growth for subcontracted manufacturers and assembly specialists. Europe will still be the core market for automotive suppliers. [2]

There are a number of topics within the Intelligent Transport Systems in the need of R&D activities. All these systems and applications relate to:

1. Environment sensing
2. Communication (V2V, V2I)
3. HMI
4. Traffic management (sub-)systems
5. Traffic modeling
6. Traffic information systems
7. Rescue systems
8. Actuation systems
9. Training.

Road traffic levels are on the rise which creates undesired effects such as congestion, air pollution and negative health effects (fluency of travelling, safety & security, environment). This is due both to individual traveling, and commercial transportation. Optimization (and, hence, total decrease) of commercial transportation in real-life cases is possible although one of the most difficult challenges to solve. Development of better heuristic solution strategies together with more realistic models and real-time optimization with uncertain information are the main challenges for research. Other important challenges are accurate geographical data and integrated problems that combine strategic, tactical and operational planning.

Road safety is a social problem of international dimensions. More than 1.2 million people are killed on the world's roads annually. The European Union (EU) has set the goal of halving the number of people killed between 2000 and 2010. In the year 2000, road accidents killed over 40 000 people in the European Union and injured more than 1.7 million. [5] Similar efforts are being made by the Finnish Ministry of Transport and Communications. Nationally the target of road fatalities by the year 2010 has been set to 250. After six years, however, the road safety figures remain pessimistic.

During the last 12 months 379 people have died in traffic accidents. [9] Economically, the impact of road accidents represented the sum of 220 M€ claims paid by Finnish Insurance companies for bodily injuries in 2005. The annual lost in the European economic growth is €80 billion due to automobile accidents and in the EU productivity lost is €2-4 billion due to traffic congestion. Cost of the accidents in the US exceeds $230 billion in 2005.

Today’s accidents are mostly attributable to human driving errors of different characteristics. For instance, the Ministry of Transport and Communications Finland in the Road Safety 2006-2010 report indicates that, “Figures from accident investigation boards have shown that the principal cause of head-on collisions on public roads is vehicle handling error in 36% of cases, error of observation or anticipation in 19% of cases, and poor positioning in 15% of cases. Falling asleep accounted for 12% of head-on collisions, and suicide for 10%”. [5] This is, in 92 out of 100 head-on collisions the human driver has been responsible for the accident. Thus, both efficient solutions related to the driver’s skills, behaviour, and alertness, as well as technological assistance for risky situations is needed. This is specifically true as the number of cars is increasing, and the number of old drivers will be rapidly increasing in most countries.

Market drivers for cooperative traffic (i.e. cooperative travel and transport) technology and service implementations from private vehicle and driver viewpoint are emergency and breakdown services, location-based and location-aware services, navigation with real-time traffic information and route planning services and numerous value-added services.

Drive for an ecological and sustainable transport system is growing worldwide. Today the industry has presented a wide set of powerful and affordable technology for ITS, but also the development trend is to achieve more environmental friendly transport solutions. We are harnessing the capability of technology to contribute to well being of society and individuals. To succeed in this we are creating a collaboration environment encouraging innovation and take-up of new ecological and intelligent technologies ensuring that **Finnish industry continues to play an important role in the global scene**.

All Regions will develop same demands

2007:	Americas	Eur	APAC / IJK
Car Services	High	Low	Low
Mobile Navigation	Starting	High	Starting
Head unit	Starting	Mid	High
Handsfree	Low	High	Starting
Rear Seat Entertainment	High	Starting	Low
In Car Internet	Starting	Low	Low
prime content/ DRM	Starting	Starting	Starting

2012:	Americas	Eur	APAC / IJK
Car Services	High	High	High
Mobile Navigation	High	High	High
Head unit	High	High	High
Handsfree	High	High	High
Rear Seat Entertainment	High	High	High
In Car Internet	High	High	High
Prime content	High	High	High

Figure 6. Development of different automotive systems [3]

Intelligent vehicle is based on four extensions: increased use of embedded systems, data mining from a variety of vehicle sensors, communication with external systems and Human Machine Interface (HMI). HMI is gaining importance to manage all the information flow to the driver. Intelligent infrastructure should match the vehicle modules with a wider array of infrastructure sensors, communication links and back-office systems in ensuring the availability of traffic, travel and transport information.

Regarding the climate change we need to fight to achieve lower emission vehicles and transport system. Individuals are facing – and in this we have a great role to play – informed choices regarding huge or tiny decisions related to travel and transport. The energy efficiency and alternative fuels is the other path together with telematics solutions ensuring environmental friendly and ecological transport solutions. In transport economy the challenges are with the ever-growing congestion of road and street infrastructure. Within ITS, safety and security are the key drivers. Safety of road infrastructure and safety of vehicles together form the building blocks to have significant impact in travel and transport. Security of data and monetary value transfers with secure communication networks in relation with commercial services are the corner stones of ITS. [10]

European Commission is pushing for larger impetus to achieve a sustainable intelligent transport system. In this scope, EC is providing a framework for ecological and intelligent transport system through emphasis on economic growth, innovation, solutions with minimum negative environmental impact, sustainable movement of goods and people, and safety. EC has several instruments to achieve their target, namely resources for research (including demonstrations), funding and legislation (including Commission Communications, recommendation, directive and regulation).

5. Future traffic as a co-operative system

The Cooperative Traffic ICT can be split toward two application domains as presented earlier, namely *Cooperative Travel ICT* and *Cooperative Transport ICT*. The third dimension is naturally the Driver with the task of *Driving*. The fourth dimension is the *road and street infrastructure*, i.e. the national road administrations and local cities and towns.

The third dimension *Driving*, however, should not be separated from the scope of the two application domains; the driver and the task are integral parts of the two application domains and the characteristics of the task are directly tide to the vehicle, thus either on Travel or Transport. The driver utilises the common in-vehicle infrastructure components independently whether the environment is private or commercial. The drivers' task whether in a private vehicle or in a commercial (i.e. public transport and/or heavy goods vehicle) is to operate the vehicle safely, and, at the same instance, the driver should be capable to receive and access relevant and personalised information according to his/her interests and tasks in a safe manner.

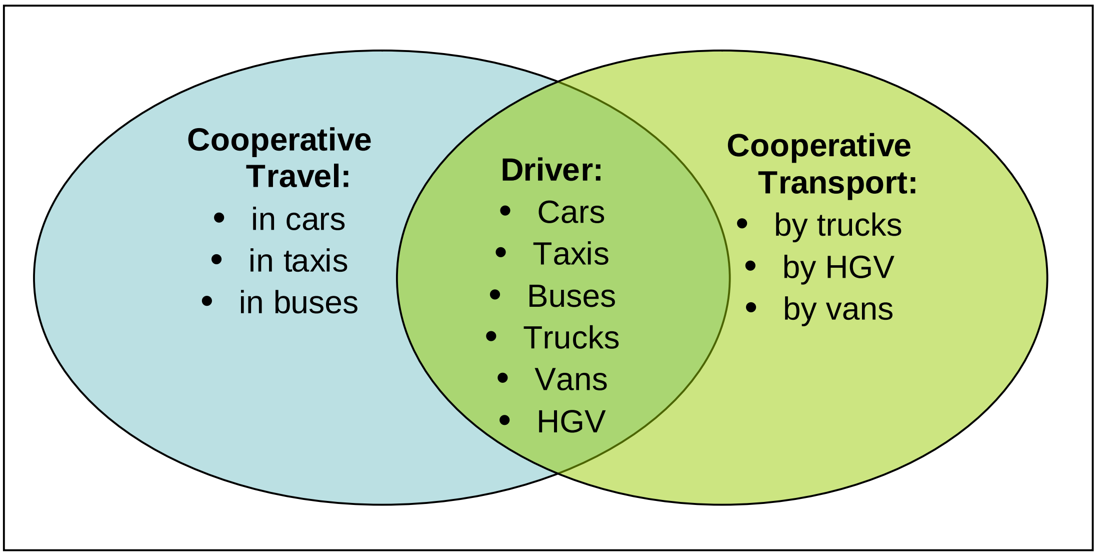

Figure 7. Cooperative Travel and Transport has the Driver as their common nominator

The fourth dimension, the *road and street infrastructure*, play the utmost important role in the Cooperative Traffic ICT. The major stakeholders in the ICT SHOK are the commercial companies. However, in the Cooperative Traffic ICT, the national and local administrations own the traffic infrastructure. There are already several administrations (e.g. national, regional and local) that have openly expressed their interest in participation in and collaboration with the Cooperative Traffic ICT companies; they are also willing to provide the test and pilot traffic environment for deployment of Cooperative Traffic ICT solutions.

For **the Cooperative Travel ICT** the leading principle is "*when I'm travelling around, I need services, information and entertainment related to my interests and actual location*". Devices, vehicles and infrastructures are intended to be context aware and capable of providing the needed information for the driver seamlessly and on time.

The vehicles in this application domain are cars, taxis and buses whether on the move on roads & streets or parked in the parking areas or in home garage. People are referred in this domain as drivers of the vehicles and travelling in the vehicles. The required communication infrastructures are as follows:

- In-vehicle connectivity between driver personal equipment (mobile phones, mp3 or video players, etc.), third party devices (e.g. navigators), and in-vehicle information systems,
- Mutual vehicle to vehicle information exchange connectivity, Car2Car communication,
- Road & street infrastructure connection between the vehicles and the intelligent road-side equipment, Car2Infrastructure communication
- Services & Infotainment connectivity between drivers and information servers,
- Connectivity between the vehicles and the driver's home or office systems.

In-vehicle connectivity enables the driver with his nomadic devices to connect seamlessly over short-range (Bluetooth) or local broadband (WiFi/WiMAX) network with the vehicle equipped with embedded connectivity solution containing the in-vehicle access gateway and server. In this application domain a set of new intelligent sensors, sensor fusion and applications like EmFit, printed electronics, acceleration, road friction, intelligent tyre are implemented. The domain contains also e.g. vehicle environment perception and monitoring systems and applications, image processing, camera systems, optics as well as modelling, simulation and testing of complex (vehicle) systems. As an integral part of this domain are modules like in-vehicle information and map/GIS information fusion for ADAS and adaptive HMI for safe presentation of information to the driver, context-awareness, nomadic device integration and other intelligent interaction of various devices. In order to proceed with the module and component implementation the technology partnerships and open standards (e.g. FlexRay protocol, Automotive Open System Architecture AUTOSAR) encourage the introduction of plug-and-play modules.

Vehicle to vehicle (V2V) connectivity enables the in-vehicle systems to communicate securely and connect over dedicated short-range (DSRC, C2C) or local broadband (WiFi/WiMAX) network with the vehicle equipped with interworking embedded connectivity solution containing the in-vehicle access gateway and server.

Road and street infrastructure connectivity enables the vehicle with embedded capability to connect seamlessly over short-range (DSRC), broadband (WiFi/WiMAX) or high speed access network with the external services networks containing the road-side communication equipment, data servers and service provider networks. For safety, security & diagnostics services the vehicle (and the driver) requires identification and authorization applications in order to protect the vehicle, travellers and also goods (in the Cooperative Transport ICT).

Services and infotainment connectivity enables the driver with his nomadic device to connect seamlessly over cellular (GPRS/WCDMA), broadband (WiFi/WiMAX) or high speed access network with the external services networks containing the mobile and wireless communication network equipment, data servers and service provider networks.

Home connectivity enables the driver with his nomadic device and the vehicle's embedded connectivity to connect seamlessly over a high speed access network with the home system and multimedia network structure containing the home server, digital TV, music equipment, air conditioning/heating system, stove and oven, etc.

For **the Cooperative Transport ICT** the leading principle is "*when I'm transporting my cargo around, I need services and information related to my transport task and cargo*".

The vehicles in this application domain are trucks and other heavy goods vehicles (HGV) and emergency vehicles whether on the move on roads and streets or managing their tasks at the location and their cargo in the terminal facilities, at the airports, harbours and ports or in the company garage or depot. People are referred in this domain as professionals driving the vehicles and handling the cargo. The required communication infrastructure is largely corresponding with the Cooperative Travel ICT:

- In-vehicle connectivity between the driver, nomadic device and in-vehicle systems,
- Vehicle to vehicle connectivity between the vehicles,
- Road & street infrastructure connectivity between the vehicles and road-side equipment,
- Services & Information connectivity between the driver and the access points and service providers,
- Office, Cargo Terminal and Public Safety Answering Point (PSAP) connectivity between the driver/vehicle and company DSS systems as well as cargo documents and authorities.

In-vehicle connectivity, *Vehicle to vehicle (V2V) connectivity*, *Road and street infrastructure connectivity* and *Service and information connectivity* are very similar and comparable with the corresponding domains described in the Cooperative Travel ICT.

Office, Cargo Terminal and PSAP connectivity enables the driver with his nomadic device and the vehicle with embedded connectivity capability to connect seamlessly over short-range (DSRC/Bluetooth), cellular (GPRS/WCDMA), broadband (WiFi/WiMAX) or high speed access network with the office and terminal facility systems and PSAP access network containing but not limited the connectivity servers, gateways as well as information management and DSS including the cargo documents and connections with the required authorities, such as customs services. It remains unclear whether Terrestrial Trunked Radio (TETRA) system would play any significant role in any other application domains than in the PSAP-to-Vehicle (and vice versa) communications of emergency vehicles due to its limited bandwidth.

Connectivity is combined with optimization of commercial transportation operations, which contains the largest known potential for improving the efficiency and productivity in companies both nationally and globally. The currently available optimization tools have several deficiencies and the number of companies applying sophisticated optimization tools is still very limited. Therefore, the existing business opportunities are very remarkable both from the viewpoint of software and end-user companies and public sector.

6. Envisaged outputs

For the **mobility of people** domain the always-on services – when travelling in a private vehicle or in public transport – offering reliable information personalised to the users should provide a seamless user experience, irrespective of the end-user device or the access and/or communication network.

The information existence problem can be shared to the two categories which are looking the information needs and requirements from different aspects:

"People": *Cooperative Travel ICT*
"*When I'm travelling around, I need services, information and entertainment related to my interests*"

"Goods": *Cooperative Transport ICT*
"When I'm transporting my cargo around, I need services and information related to my transport task and cargo"

Adequate personalised info-mobility services, including pre-trip, on-trip and post-trip information can help individuals to cope with these mobility problems contributing to a more efficient, ecological and enjoyable mobility experiences. True real intermodality information will be offered through the whole chain for private, public or combined transport modes.

The development of mobility services for people has as a by-product enabled various other services. Development of communication solutions for private, commercial and public transport vehicles have already started with higher available data transfer rates, availability of download capabilities and dedicated designed HMIs powered by embedded systems and hardware modules. More and more information about our mobility environment is available with autonomous real-time and/or requested updates. Entertainment possibilities are increasing remarkably with multimedia messaging, music downloading and content sharing. There is a strong need to develop harmonised and interoperable context aware mobility services, with reliable traffic, transport and travel contents.

Seamless integration of handheld and nomadic devices into vehicle's HMI is coming more and more evident requirement from users and legislation; it is one of the key feature for advanced safety on board. Driver distraction needs to be minimised, and at the same time high customer value is expected if data can be exchanged between home, car and portable use. It will be unavoidable that users carry their handhelds into the vehicle; therefore integration according to HMI European Code of Practice will avoid uncontrollable use while driving.

Professional drivers need most of all accurate, reliable and real-time information about things influencing their work whereas private road users need more infotainment, and thus all the information transmitted by them does not have to be as accurate and real-time as for professional drivers. Private road users are also not as experienced drivers as professional drivers, so the importance of different safety applications and systems should be emphasized. Also driving in urban environment should be organized efficiently for both user groups, taking unprotected road users into consideration. Thus, in order to answer the requirements of all the road users, it is important to address the needs of private road users and professional drivers separately.

For the **mobility of goods** the stress is on the development of seamless, efficient logistics and data chains across boundaries, modes and services, in order to meet customers' expectations at lowest cost and to address Europe's major societal challenges arising from the increasing demand for transport services. The goods transport sector's actions have a high impact on the overall structure and performance of our transport networks. Logistics counts for a high share of the load on our networks, and successful implementation of improvements will deliver immediate benefits.

There are major common challenges related to the goods transport, logistics and information systems requiring to be addressed. The more traditional issues are related to planning and optimising, monitoring and managing, the transport chains within and across modes and transfer points all the way up to the border control points. Some more technical issues are related to exploiting the potential of radio frequency identification (RFID) for goods transport and logistics with intelligent and value-added applications and services. In the modern society the craving for enhanced transport security is becoming a new competitive factor when ICT could be used in local and cross border goods flows. The added value of ICT can be measured also with ICT solutions for network operators to cooperate with 'intelligent trucks' to guide trucks and lorries smoothly and safely within urban areas.

6.1. Short, medium and long term targets

The focus area will produce outputs based on short, medium and long term targets. The short term targets will be defined to deliver business applicable results after the first year of focus area operation, while the medium and long term targets will be tuned to produce results later. Thus the research process will yield directly applicable results such as demonstrators and pre-commercial pilots each year, but allows simultaneous more theoretical research and generation of radical disruptive innovations.

The steering board of the focus area will process the targets annually and refocus them if necessary.

Short term targets

When: 2009-
What: Perception system for special conditions
Sensing equipment (both in-vehicle, mobile and infrastructure)
Exchanging and integration of information of various sources
Interaction of third party devices to the vehicle
Driver and vehicle identification and authorization applications
Instrumented vehicles with prototype implementations
"Next generation" navigators
Context-based information delivery for transport and travelers
Designing ontology for the "Vehicle Systems" domain
Data collection with reusable, annotated semantic history storages
Resources:
Existing technologies and platforms for information integration
New skills & competences:
New industry collaboration models (based on Cooperative Traffic ICT work)
Usability experiences and competences

Medium term targets

When: 2012-
What: Sensors and algorithms for driver behaviour analysis
In-vehicle information and map/GIS information fusion
Methods for handling and correcting geographical data
Protection of the vehicle, goods and travelers
Secure V2V, V2I communications solutions
Customer and community-based information production and exchange
Enhanced traveling experience solutions for customers
Pilot and test sites in Finland
Designing ontology for the "Driver Behavior" domain
Annotating and collecting driver behavior patterns
Modeling various behaviors and their interactions with agent-driven platforms
Resources:
New sensor and information integration technologies

New skills & competences:
New industry networks and business models
Consumer and community based piloting and innovation models
New software engineering approaches and methods for distributed computing solutions
Understanding new information integration possibilities brought by sensor data fusion

Long term targets
When: 2015-
What: Modeling, simulation and testing of complex (vehicle) systems
Real-time optimization and management methods
Adaptive HMI
Tools and systems for diagnostics fault tolerance
System pilots in global environments
New technology enablers for radiometric surroundings monitoring
Concepts of new applications and exploring data integration possibilities enabled by radiometric data gathering

Resources:
Integrated transport/traveler, vehicle and environmental context systems
Enhanced and seamlessly integrated, personal, vehicle, environmental and commercial context information collection and integration solutions

New skills & competences:
New software engineering solutions for customer based personalization and seamless mobility
New process optimization and innovation approaches and methods for the industry
New simulation, testing and diagnostics methods and tools for highly complex systems
Capability of applying emerging miniaturized hardware technologies to radiometric monitoring

6.2. High level work plan

In higher level, the progress map is divided to three parts which are partially running parallel (see. Figure 8). Each step takes approx. 3 years and enables smooth handover between the work streams taking also into account dependency between results of the previous work flow. Some main points concerning work plan:

- The context awareness requires sensor systems for gathering the necessary information of a driver and vehicle state and driving environment. In this step, the sensor providers and service providers are needed to work together for enabling exhaustive information availability
- Create the mid-term pilot and demonstration sites in Finland and develop the sophisticated information processing methods. The stakeholders interested in test site development should be contributed as well as road service providers.
- Generate the adaptive-HMI products which are evaluated in the Finnish test platforms. The OEMs interested in vehicle industry sub-contracting is the main audience for the last activity.

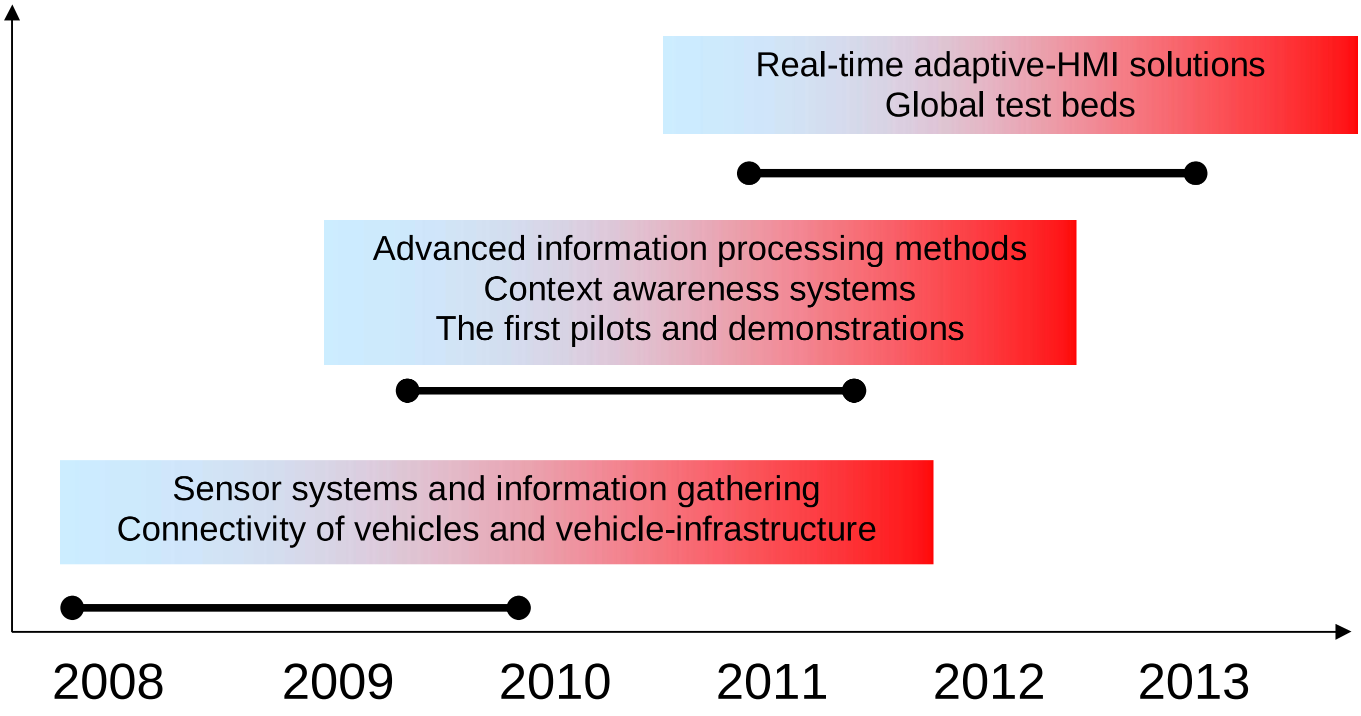

Figure 8. Time schedule of activities

7. Potential Impact

In overall, this SHOK focus area will have three major impacts.

- In traffic safety manner, this program will provide telematic products which will improve driving experience and allowing a driver to focus primarily attention for surrounding traffic. The intention is to reduce traffic accidents 40 %, getting Finland closer to the EU-25's "zero-accident" policy.

- The co-operative systems enables environment friendly driving which also helps Finland to meet the CO2 emission reduction with 5,2% before 2012 according to the KIOTO agreement. Traffic causes 12 % of the annual carbon dioxide emissions in Europe. The telematic product can improve traffic flow e.g. in urban intersections and advising drivers to avoid congestion thus, enabling even 15 % reduction for harmful emission gases.

- Economically aspect, is that SHOK open opportunities for the Finnish enterprises to penetrate to the global €800 billion automotive and transportation sector markets

For achieving the scope of the work programme, is to create a global cooperative transport and mobility concept to be tested, evaluated and demonstrated in Finland. Successful demonstrations help Finnish stakeholders to take the first step and fix their positions in the international markets. This requires getting together all the relevant stakeholders in transport and mobility industry in order to strengthen the exportation incomes in the transport sector. The strong national reference case is the best way of marketing Finnish expertise in this area for selling sensor, modular sub-systems, applications and individual components abroad.

National cooperative travel and mobility system would add to the growth of related industries and increase international market shares of Finnish industries. Furthermore, a successful reference case would make Finnish enterprises desired partners in transport ICT and breed spin-offs in the area. Other expected benefits would be to make national enterprises and R&D sector the leader in cutting-edge technologies associated with transport ICT – not only in mobile communication.

Further crucial impact of the programme, is the forum for Finnish enterprises to network in national level and globally with automotive sector. Today the automotive industry buys bigger and modular parts not just a single sensor from their suppliers. For achieving position as a automotive industry supplier, contacts to the other suppliers is more and more important since a single company can rarely produce a whole system (e.g. dashboard unit). The national R&D programmes hosted by the Ministry of Transport and Communications like Tetra, Fits, Navi and Aino have activated both private and public sector to work together in the field. About 100 companies and enterprises have taken part in the projects during the past 15 years in Finland. (The biggest actual forum is ITS Finland, which has today some 50 members representing both private and public sector which provides good basis for national level networking.

Finnish universities and research organisations (like VTT) has participated many EU projects concerning automotive sensors and applications, road infrastructure systems and traffic systems, telematics, in-vehicle HMI, etc.. Transfer of this know-how to Finnish companies and to benefit Finnish economy would be beneficial.

The Cooperative Traffic ICT SRA has a good basis to grow and continue the ITS R&D activities in Finland. It is important to activate the potential partners to take their share of the enormous global market.

8. Dissemination, Continuation and Exploitation

The focus area will use the following means to cover the action required by the topic:

- director level communications among business community will be used to spread the results
- expert workshops on key findings of the focus area will be organized
- research organizations and universities will use the focus area to build up internationally acknowledged research teams, increase the volume of knowledge transfer in terms of top researcher exchange and enhance the contents of academic education offered
- scientific and business articles will be published, the focus area participants are encouraged to present the results in pre-selected conferences
- demonstration and test sites will be constructed to present the results for ecosystem stakeholders and press

9. Cross project cooperation

The Cooperative Traffic ICT program has interface to other programs in ICT SHOK: Device and Interoperability Ecosystem, Flexible Services, and Future Internet.

The closest relation is to Device and Interoperability Ecosystem program, which considers local, networked and heterogeneous smart environments where different kind of contextual and user information can be accumulated and used for new purposes, and for eventually services and businesses.

The technology developed in Device and Interoperability Ecosystem program can be exploited to develop new end user services for ITS.

The Flexible Services program considers the transition to a service oriented economy and networked business. The end user services for ITS will exploit information maintained and generated by several different actors in the field and in particular the end-user services need to be based on municipal services. This calls for models and methodologies for networked business and collaborative services.

The Future Internet program considers the ubiquity, scalability, availability, reliability and dependability issues related to future information networks. Many of these aspects are driven by mobility which is an essential characteristics of ITS, thus the innovations from this program can also be exploited when developing the ITS services.

Tekes has now included ITS as a theme in ongoing technology programmes like Vamos, Ubicom and Safety and security for implementing products and services to traffic sector markets. The service enablers like smart phones, open telematics platforms and wireless broadband IP-network as well as RFID technology have been identified to offer a great business potential in ITS field.

The Cooperative Traffic ICT activity has also interfaces to national R&D programs. Especially, the Ubicom is closely related. This program emphasizes the embedded system aspect in ICT and many of the ITS end-user services are based on embedded systems or information generated by different kind of embedded systems. The technology and innovations developed in Ubicom program can be exploited in Cooperative Traffic ICT to create new networked business in the field.

The Cooperative Traffic ICT activity has a close relation to ÄLLI R&D programme by Ministry of Transport and Communications. The target of the ÄLLI program is to catalyse and accelerate the networking between the municipal sector and Ministry of Transport and Communications Administrative Sector in order to pave ground to the services that are at the program focus. The ÄLLI programme has the similar goal as Cooperative Traffic ICT, generating and facilitating services for the end users, but ÄLLI programme concentrates on developing the municipal services to support the development of commercial services for end users. The Cooperative Traffic ICT, on the other had, focuses on developing end-user services based on the municipal services.

Also there are currently several ITS projects going on in the EU and many Finnish companies and research organisations are actively involved with the development work. In order to reach the world elite in developing ITS services and products, cross project cooperation is crucial as well as up-to-date knowledge of projects and ITS development going in Europe and rest of the world. Thus, while making the Cooperative Traffic ICT SRA especially European Commission’s Framework Programme 5, 6 and 7 projects and project guidelines have been studied and taken into account. Also ERTRAC (European Road Transport Research Advisory Council) SRA, EUCAR (European Council for Automotive R&D) SRA and CLEPA (European Association of Automotive Suppliers) SRA have been considered and compared to the Cooperative Traffic ICT SRA.

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