

TELEMATICS AT THE RESCUE OF ROAD SAFETY

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ABSTRACT : *Several European initiatives and projects have been started by the European automobile industry to support the objective of the European Commission to divide by two the number of fatalities on the European roads by 2010. In this scope, Renault, in strong co-operation with some European partners, is prototyping some e-Safety services which shall be tested in France and in other European countries within the scope of the GST (Global System for Telematics) European Commission Integrated Project work plan. This paper is reporting about the current vision and progress of the GST project, focusing on the RESCUE services and on the CERTECS (Certification of Telematics Components and Services) approach.*

Keywords : Telematics, Safety, E.Call, Emergency, GST.

1. THE ACCIDENT EMERGENCY ASSISTANCE SCENARIO

With the objective to reduce the intervention time of a public emergency assistance team by at least 30 %, the GST project [1] is working on the complete accident emergency assistance service chain which is represented on the figure 1 below.

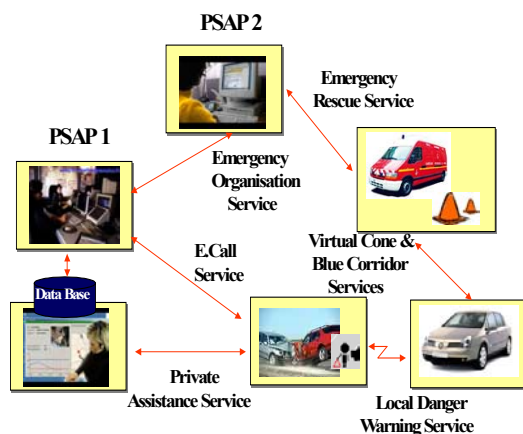


Figure 1 : The accident emergency assistance services chain

The accident emergency assistance services chain is then the integration of the following services which are co-operating efficiently to reach the targeted safety objectives:

- The E.Call (Emergency call) service is allowing to directly alert the public emergency services. This E.Call will be, in most of the cases, automatically triggered upon detection of a car crash (e.g. on airbag deployment and / or specific crash detection captors). However, the E.Call may also be triggered manually by pressing a red button which shall be particularly protected to avoid an erroneous action. As soon as the E.Call is triggered, the car TCU (Telematic Control Unit) is issuing an MSD (Minimum Set of Data) which will be received in a few seconds by the relevant level 1 Public Service Access Point (PSAP 1). This single E.Call service will have some major impacts in the achievement of the E.C objectives (Reduction of average response time to an accident by 50% in Rural Areas, and by 40% in Urban Areas, Reduction of accident severity by 15% to less severe medical category, Annual lives saving over than 4000 in EU 25, Cost saving more than 20 Billion €, that is to say 600 € on a per equipped vehicle basis).
- The Wireless Local Danger Warning service is a “Vehicle to Vehicle” service allowing to immediately alert (broadcasting a Wireless Local Danger Warning message) all vehicles being in the flow of a vehicle in accident in order to avoid crashes in succession.
- The private assistance service which will complementing the public services by providing supplementary information (FSD : Full Set of Data) to the public services and assisting its customers for all other problems and difficulties resulting from an accident (e.g. removal of vehicles in accident, insurance questions, proposing some replacement vehicles,...etc.).
- The emergency organization service which will consist for a level 2 Public Service Access Point to efficiently organize the rescue (activating the right human and material

resources) taking into account all information received from the PSAP 1.

- The emergency rescue service will consist to transport as quickly as possible the rescue team on the spot of the accident. At this level the emergency car navigation system will play a major role by guiding the rescue team through the best possible corridor (taking into account real time traffic information). Then this emergency rescue service will transport the injured people to the best available emergency place.
- The blue corridor (or blue wave) service is a “vehicle to vehicle” service giving the capability for emergency cars to broadcast alert messages requesting all the cars ahead to free a corridor to give way to the emergency vehicle.
- The virtual cone service is also a “vehicle to vehicle” service giving the capability for emergency cars to broadcast some navigation information guiding vehicles in the vicinity of vehicles in accident in such a way to not disturb the evacuation of injured people and the removal of vehicles in accident.

Indeed, in this services chain, we can distinguish passive safety services which are reducing the impacts of an accident (e.g. the rescue services) from active safety services which are avoiding new accidents (the wireless local danger warning service).

2. THE REQUESTED TELEMATICS INFRASTRUCTURE

With the objective to enable the full deployment of the accident emergency assistance services chain which has been presented here before, the GST project has been specifying three different standard protocol stacks which are represented on the figure 2 below. These protocol stacks are relying on standards which have been selected at each layer level according to the services requirements collected the first year of the GST project.

- The E.Call protocol stack (V to PSAP on the figure) is relying on the GSM network which is insuring a wide European coverage. For this purpose, the USSD signaling channel will be used to carry the MSD message before establishing a voice channel between PSAPs and the people being in the vehicles in accident. This protocol has been selected by the telecom operators which are partners of the GST experiments (BT, FT, Orange, Vodaphone, Deutsch Telecom, Telefonica) as offering the required flexibility without

requiring important evolution of the existing GSM infrastructure.

- The C2C (Car to Car) protocol stack (V to V on the figure) [2] will be used for all “Vehicle(s) to Vehicle(s)” communication. This protocol stack will be relying on the IEEE 802.11p standard WLAN which has been retained by the European C2C-C (C2C-Communication) Consortium in co-operation with the US VSC (Vehicle Safety Communication) project. This C2C-C wireless network is targeting the use of licence free 2x10 Mbits channels in the 5.8 Ghz band.
- The Light Webservice protocol stack (V to SC (Vehicle to Service Centre) or V to CC (vehicle to Control Centre)) based on standard internet protocols (and particularly using Mobile IPv6) enabling standard communications between vehicles and servers and between servers (B to B communications). In this case, various local (WiFi, WiMax,..) and global (GSM-GPRS, UMTS) will be used.

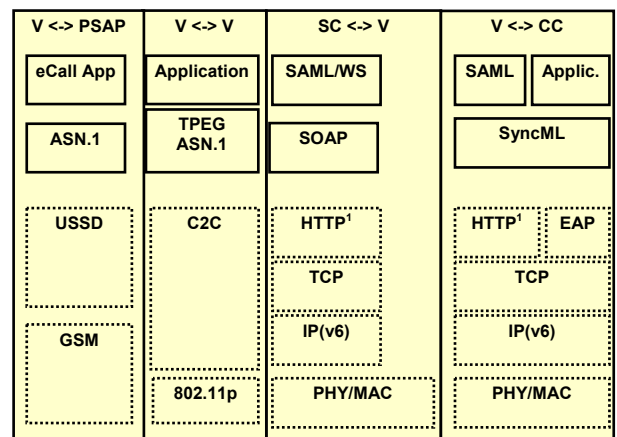


Figure 2 : The main GST protocol stacks

3. THE PROPOSED CERTIFICATION APPROACH

The proposed certification approach has been developed from the following main requirements:

- The approach must be cost-effective for all automobile telematics stakeholders being involved in the certification process.
- The approach must take into account the various automobile telematics markets including the incremental evolution market emerging due to the asymmetry of life cycle between a car and its telematics components.
- The approach must be compliant with the European Commission New and Global approach. This approach shall allow simultaneously voluntary and regulatory certification.

- The approach shall allow the certification of a diversity of items starting with a single telematic product (hardware and software) and finishing with a complete chain of services. In this context, the approach shall be able to propose certification programs tailored according to the complexity of the product / service Implementation under certification, but also to the safety criticality of supported services.
- The certification process is part of the product / service validation process. However for safety affecting services, the certification process will cover the whole life cycle of the concerned products and services (e.g. In-Service inspection)

Being given these requirements, the GST-CERTECS (Certification of Telematics Components & Services) subproject [3] has been specifying :

- A complete certification organization
- A complete certification process
- An information system supporting the Certification Process
- Somme test and inspection services to be added to some already existing services (e.g. EMC : Electromagnetic Compatibility). The main test and inspection services on which CERTECS will be focusing are : - Protocols Conformance and Interoperability Testing, - Security, - Risk Management , - Design review and or inspection covering Data Quality and quality management.

The certification process is scalable according to the complexity of considered product / service and its safety criticality (see the figure 3 below).

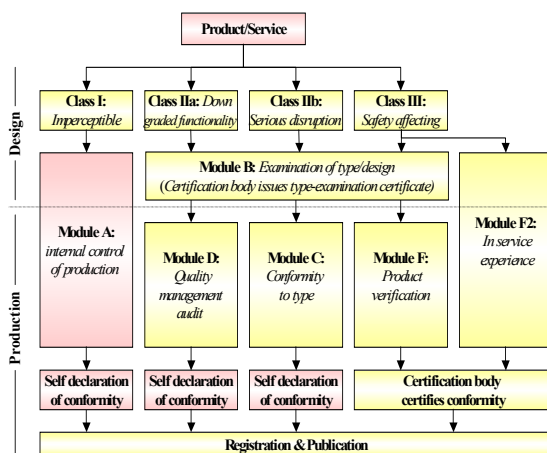


Figure 3 : Scalability according to criticality

Protocol standardization and certification are achieved in strong co-operation with competent organizations such as ETSI and EOTC (European Organization for Test and Certification), test

laboratories and certification bodies. The formal description of the selected standard protocols will be achieved using SDL and MSC languages to be able to quickly develop test cases using TTC-N3 compliant testing tools.

The Risk Management process to be followed during the design of “safety affecting” products and services is an important quality element as it will allow to cost-effectively mitigate risks associated to the vulnerabilities and associated threats of the considered implementations. This is particularly true at the level of car embedded telematic system which will have to support a diversity of heterogeneous services which will be constantly evolving to keep pace with technological progresses and new services offers.

The security aspect is fully considered by the GST SEC (Security) subproject which is strongly co-operating with the CERTECS subproject to include some security test and inspection modules into the certification process. The GST security approach is also considering some requirement coming from the GST S-PAY (Service Payment led by Renault) subproject, so proposing a trusted environment.

4. THE FRENCH EXPERIMENT

The GST French partners have been proposing to experiment the GST results in some French Region (in a triangle formed by Paris – Rennes – Caen). Unfortunately, due to the lack of interest of the French public emergency services, the E.Call will not be tested in France within the scope of GST. However the private assistance service will be tested between Renault – Renault Assistance and AXA Assistance. The Wireless Local Danger Warning as the other C2C services proposed by RESCUE will be also experimented likely between Renault and some other car manufacturers supplying the Sussex police which is part of the Accident Emergency Assistance service chain to be experimented in UK. Other business oriented services are part of the French story board. The main partners being involved in the French experiment are:

- France Telecom R&D (Caen) & Orange which are providing the telecom infrastructure and some telematic services. FT R&D is coordinating the French test site.
- Renault which will be providing equipped vehicles and some services with AXA Assistance.
- Siemens VDO which is providing GST compliant car telematic control unit.
- TDF which is providing some real time info traffic.
- Trialog (leader of the GST SEC subproject) which is supplying security components and consultancy,

- Trusted Logic which is also providing some security environment (for service payment) and consultancy.
- NAVTEQ which is providing the MAP and navigation data with the expected quality of service.
- PTV which is providing the navigation service and the EFCD (Enhanced Floating Car Data) service.
- The CERTECS partners and other certification stakeholders which are contributing to and observing the certification aspects.

This experiment will be conducted second half of 2006 after a certification phase.

5. CONCLUSION

The E.Call is now strongly recommended by the European Commission while the other described services are still in the research area. A clear E.Call deployment roadmap has been proposed by the European Commission and agreed during a recent e.Safety forum meeting. This roadmap plans the deployment of the E.Call service on all new vehicles in 2009, with some pilots starting in 2007. The ACEA (Association des Constructeurs Européens d'Automobiles : Automobile European Car Manufacturers association) has signed the MoU (Memorandum of Understanding) proposed by the European Commission related to the E.Call deployment. Some countries have already clear deployment plans (North european countries). In GST several test sites are already planning the evaluation of the GST RESCUE subproject accident emergency assistance chain, they are

- The London test site (VOLVO) which is dedicated to this subproject,
- The Munich test site (BMW),
- Possibly the Aaren and Ruselsheim test site (FORD, OPEL)
- Possibly one new test site in Spain in which Renault would be involved with Telefonica (see FT / Orange)
- The Turino test site (Fiat CRF) will also evaluates some part of the RESCUE Accident assistance services chain.

It is planed that the GST CERTECS subproject supports these experiments in terms of protocol conformance testing and interoperability. Before this E.Call service adoption at the European level, some studies have been demonstrating its interest in the achievement of the E.C objectives. The other safety oriented services have to be assessed in term of efficiency and relevance relatively to safety benefits versus their respective costs. This is an expected result of the GST project. Renault is strongly engaged in the promotion and test of C2C network and protocols with is C2C-C

Consortium partners. But it is clear that the deployment of C2C and C2I (Car to road side Infrastructure) services will require a strong co-operation between all involved partners and of course a strong motivation of public authorities to facilitate their deployment.

REFERENCES

- [1] <http://www.gstproject.org>
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