ECALL PRE-DEPLOYMENT STATUS IN EUROPE

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Abstract:
The article presents the actual stage of eCall service pre-deployment into European Union as part of eSafety initiative launched in 2004. Intelligent Transports Systems become more present in day to day life, hoping that more life will be saved and the injuries resulted from road accidents will be limited. The eCall functioning suppose that a Minimum Set of Data (MSD), when an accident occur, by triggering of least two sensors disposed on vehicle, or manual, is sent. The MSD is sent using an in-vehicle device, using mobile network, to 112 emergency services. After that, the MSD is decoded, using EUCARIS database, to identify the vehicle and the owner. The GPS coordinates are included into MSD together with a time stamp, indicating the time of accident. When the MSD is decoded, the emergency services initiate a similar procedure like voice calls for initiating the rescue. The eCall service relies on 112 present systems. More details about FP7 HeERO project, having as goals interoperability and harmonization of eCall system will be depicted.

1. INTRODUCTION

From 2004, through Intelligent Car Solution i2010 initiative of European Commission, road fatalities reduction is targeted, by implementing as mandatory, more technologies, and part of Intelligent Transports Systems. The phases, as time scale, tracks road safety procedures: exposure, crash avoidance, injury reduction and post crash situations. Accordingly with statistics published by Romanian Minister of Administration and the Interior, in 2011, were recorded 9290 severe road traffic accidents with 2018 deceases, 8768 persons with severe injuries and other 3362 persons injured. Also, the same report emphasizes another 17358 crush accident with 21361 persons injured. In the same time, the number of road accidents without injured persons is 73771 for 2011.

Also, World Health Organization place as death cause for 15-29 years population, road accident on the first place. In the same time, a correlation might be established between GDP per capita and road safety and health costs related with injured persons medical treatment and also the labor inactivity time.

For Romania, National Institute of Statistics reports for 2011, 578551,9 million RON as GDP [10], the results of Public Census realized in 2011 being 19 042 936 persons registered as stable population. On 31th December 2010, total length of public roads was 82386 km, with 16552 km (20,1%) national roads, 35221 km (42,8%) county roads and 30613 km (37,1%) local roads [11]. In 2011, total number of vehicles registered in Romania was 5 482 654 with age distribution emphasized in figure 1.

Having in mind the statistics emphasized above, road safety must be treated from humanitarian point of view, where any life saved is priceless, but also as economic issue, each accident with or without injuries having costs composed by health treatment of injured persons, lost labor output, vehicle damage and administration [4].
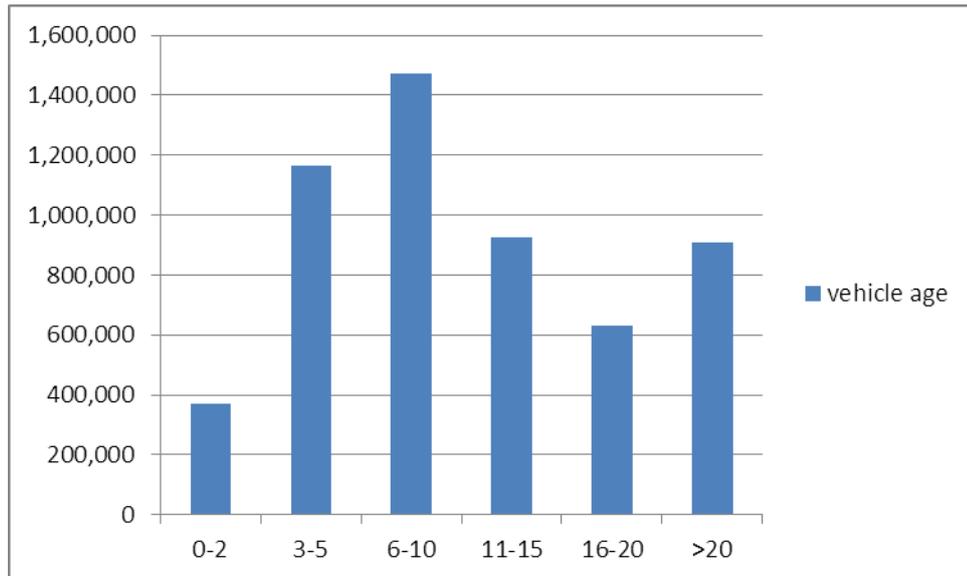
Figure 1. Registered vehicle distrubution in Romania, for 2011, by age

The above presented data concerns road safety. Meanwhile, by using ITS technology as mandatory, it hopes that costs related with road accidents shall decrease because of total number of accidents and injures severity reduction. So, those systems might be imposed only for new cars, when a new model is launched or, for all cars as additional feature.

The post-crush assistance, in Europe is using 112 emergency systems. Each country had developed its own emergency systems. Romanian 112 Emergency System is managed by the Special Telecommunication Service, gathering under all rescue services from firefighters, police, Emergency Situation Inspectorate, ambulance and other similar services, organization that also is responsible for implementing eCall service [2]. The next parts of article will explain the eCall principle, how could be integrated into existing 112 platform, the expected benefits of using eCall and partially results of FP7 project, where Romania is represented by a consortium, including Romanian-American University. As notice, Romania is signatory of Memorandum of Understanding initiated by European Commission regarding ITS and European Parliament approve on August 28, 2010 a new ITS Directive (Directive 2010/40/EUi) on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport.

2. ECALL PRINCIPLE AND EU RECOMMENDATION

The eCall is the only one post crush ITS system (figure 2), enclosed in eSafety measures assisting injured persons in case of road accidents. Its aim is to reduce the intervention time of rescue by a better location of crush and also, more important, by signaling automatically crush situations when none is able to do that because of injuring or lack of telecommunication terminals [5].
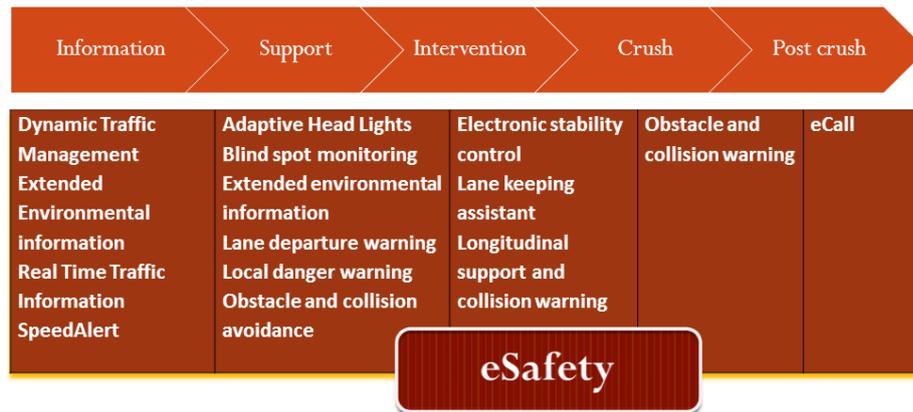
Figure 2. Positioning eCall among road safety measures eSafety

The eCall principle relies on 112 existing European emergency systems (figure 3), supposing that vehicles are equipped with an in-vehicle system. After a sever crush, two or more sensors are initiating data call between in-vehicle system and 112. Data sent contains information regarding some very useful questions about the crush [1]:

- Where? The in-vehicle (IVS) device incorporate a GSM locator, and the coordinates are sent to Public Safety Answering Point (PSAP).
- When? The Minimum Set of Data (MSD) contains a time stamp from the in-vehicle device.
- Who? The vehicle identification number (VIN) is part of MSD and resolved on PSAP on EUCARIS database, having as result type, color, owner etc.
- How severe? The data sent over GPRS/GSM network inform the rescue agency about number of sensors activated and if dangerous loads are registered in that time on car issued.

After sensors triggering, an automated data message as MSD, containing all information written above, is sent over the GSM/GPRS network, being treated by mobile operator with maximum priority and carried to 112, no matter what mobile system is local available and who the operator is, like all other 112 calls, using In band Modem function of In-vehicle systems [6, 7]. PSAP receive MSD and resolving VIN instantly. Furthermore, after all information from MSD is deciphered and friendly displayed to PSAP operator, a voice call is initiated backwards from PSAP to IVS, hoping that someone from crashed car could possibly answer to offer more information to operator. If nobody is answering to the call, the situation is treated as accidents with possible causalities or severe injured persons. Also, the system could be activated manually, if the driver suffers a heart attack or similar and its life is putted in a danger situation [3].

In Commission Staff Working Paper Impact Assessment, published by European Commission in 2011 the aCall service is well appreciated indicating as benefit for using eCall service the following [8]:

- Reduction of fatalities (with all vehicles eCall-equipped, between 1% and 10% depending on country population density, road and emergency response infrastructure).
- Reduction of severity of injuries (between 2 and 15%).
- Reduction of congestion costs caused by traffic accidents (between 3 and 17%, depending on country population density, road and incident management infrastructure).

- Facilitation of rescue services and increased security of rescue teams (ex.: firemen) when extracting trapped occupants, as the MSD will provide information on the fuel type.
- Added value services may share technical resources with eCall. The eCall in-vehicle system would include the basic functionality of a telematic system, which would allow automotive industry to include more connected-car functionality.
- Reduction of SOS roadside infrastructure, as road users would have the possibility to trigger an emergency call from each vehicle.
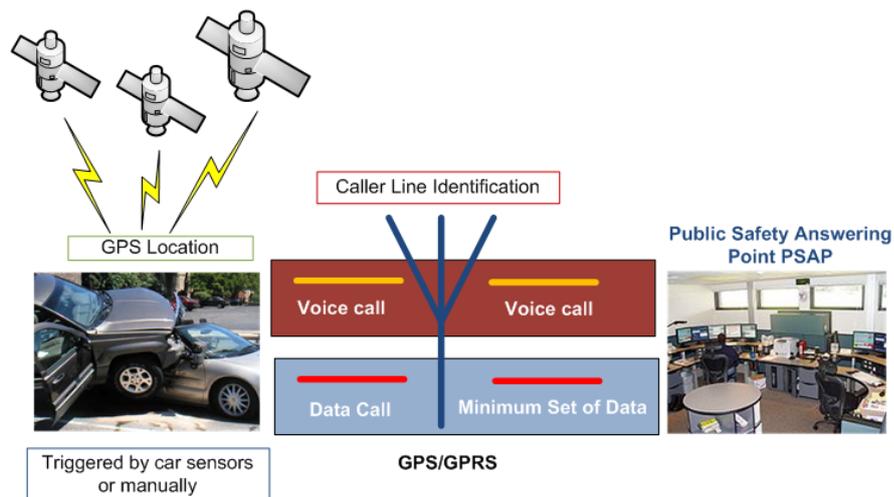
Figure 3. eCall functioning principles

3. HEERO PROJECT AND ROMANIAN PILOT SITE

As result of European initiative in ITS, European Commission had financed eCall pre-deployment project HeERO Harmonised eCall European Pilot Grant Agreement No 270906 [9]. HeERO addresses the pan-European in-vehicle emergency call service "eCall" based on 112, the common European Emergency number. During three years (January 2011 to December 2013), the nine European countries forming the HeERO consortium develop together a joint program in order to assure an interoperable and harmonized 112 based in-vehicle emergency call system.

In HeERO project consortium is formed by over 40 partners, from: Croatia, Czech Republic, Finland, Germany, Greece, Italy, The Netherlands, Romania and Sweden The eCall system will help achieving the EU's objective to decrease the number of severe road injuries and fatalities to 50%. The project is partially funded by the European Commission under the ICT PSP programme.

The Romanian consortium is formed by ITS Romania, Romanian National Road Administration, Special Telecommunication Service, UTI Systems, ElSol and Romanian-American University. As reminder, ITS Romania, ElSol and Romanian-American University have developed in 2008-2010 the project named *Study regarding eCall technology*, financed by Romanian Ministry of Communication and Information Society, as primary initiative in eCall pre-deployment approach.

112 system in Romania is organized in 41 counties, each one of them has a dedicated 112 PSAP and several dedicated emergency agencies (police, ambulance, fire brigade).
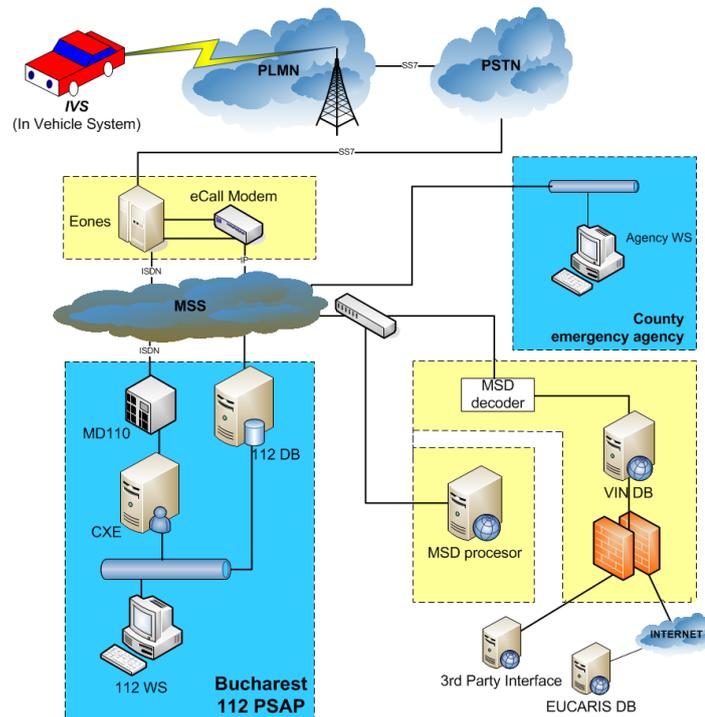
Figure 4. PSAP architecture

For handling data calls, containing MSD, STS choose one regional PSAP on Bucharest, to be the primary centralized answering point, with a backup on Brasov county. Also, some changes were made into original PSAP architecture (figure 4) in order to assure MSD extraction and VIN decoding. The procedure of treating an eCall is the following:

- The MSD is extracted and automatically is initiated the voice call backward between PSAP and IVS.
- The operator is diverted that is an eCall.
- If somebody is answering then follow the 112 rescue procedure.
- If nobody is answering, the operator categories the crush depending on number of sensors activated or number of vehicles involved in accidents, with close GPS coordinates and time.

During January 2012, successfully tests were made by STS and HeERO project, with data test. In the future, more work must be done to assure the resolving of VIN on EUCARIS database and also, for this fall are programmed more test regarding the interoperability of service with more than one IVS and, possible, with Russian ERA-GLONASS similar project.

4. CONCLUSIONS AND FUTURE WORK

eCall clearly aims to save lives across European continent, fact which cannot be measured, in terms of financial meaning, being expected to have more than 5000 people/year saved with this service. Also, by rescue time reduction we expect to have a decrease of health treatment costs and time of inactivity of person injured after the crush. But also, the cost of deployment, supported by national 112 systems and GSM operators could be recovered by offering to third-party companies' valuable information. In that case, eCall could be used as proof in case of an accident, by insurance companies.

Furthermore, the data could be used by Management Traffic Centres to divert routes when accidents occur.

After HeERO will be finalized, nine European countries will have a harmonized in interpretational tested eCall service. Already, European Commission sustains that a new generation of national pre-deployment pilot to be started in the new future. In HeERO case, now the activity is focused to assure the interoperability of tests sites, after seven country pilot sites were successfully in achieve eCall functioning service.

Another issue on debate is about the future business model for eCall and PSAP, where both could be totally or partially in the state or private management. In Romania, 112 emergency services is managed by state through STS, but also data recorded about accidents might be very useful for third-party companies, like insurance companies, to verify the damage claims of customers.

The authors are part of Romanian pre-deployment team in HeERO project and also were involved in previous Romania project regarding eCall technology.

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