EXPANDING ECALL FROM CARS TO OTHER MEANS OF TRANSPORT

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ABSTRACT

The article begins with a short presentation of ECall, an extension of the emergency service 112 to a part of the recently developed cars, which is unique in Europe at this moment. Moreover, the article outlines the rules and regulations from EU in this field, the development stage of the ECall component for the recently developed cars and several concerns regarding the expansion of the system to other means of transport. Romania is among the first countries in EU which participate in the development and implementation of 112 emergency services and its ECall component for cars, as well as its expansion to other means of transport. Romanian-American University has been involved in the 112 emergency system and Ecall projects for several cars, and it is currently a partner in the European funded project UEF Transport/INEF/No.INEA/UEF/ TRAN/A2014/1031743/ Infrastructure Harmonised eCall European Pilot (I HeERO).

KEYWORDS: *112, eCall, HeERO, eSafety, PSAP, SNUAU, MSD*

1. INSIGHT INTO THE SINGLE EMERGENCY CALL 112

Adverse events are considered occurrences which endanger life or health primarily of people but also damage their goods or the goods belonging to the respective community. Among them we can mention: fires, epidemics with serious medical emergencies, attacks on physical integrity of persons, serious traffic accidents, serious pollution, high-intensityearthquakes, extended floods, etc. Each country has built strategies, regulations, methodologies, institutions and allocated resources for appropriate interventions in case of such events (firefighters for fires and explosions, ambulances for health, police for robbery and armed attacks, etc.).

To increase the efficiency of intervention in order to eliminate or mitigate the effects of adverse events or reduce these impacts after their occurrence, the European Union decided to set up a "Unique emergency call 112."

112 is the unique telephone number agreed upon in the European Union to call an emergency service (fire, health, police, etc.). The system by which 112 is a unique

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emergency call is complex as its design and implementation raised difficult issues, mainly due to complex structures within a country or from one country to another one. There are difficult problems establishing the institutions involved and their skills, communication problems and allocation of resources.

It was designed and implemented, and is currently operating in all EU Member States "The single emergency call 112."Moreover, the system was adopted by countries outside the European Union, enjoying support today even in countries that have not adopted it, yet. Thus, a citizen of UE can dial the emergency call number 112 in most countries around the globe.

"The unique emergency call 112" is supported by a specific technical support, containing two-tiered "Public SafetyAnsweringPoints (PSAPs)" which are connected in the specific own networks and integrated with the other communicationn networks.

PSAP level 1 takes over the emergency call 112 from the communication networks (this call is a priority in all communication networks) and, after a brief analysis, it distributes it through its network which is more reliable than other communication networks, to a PSAP level2 for intervention. One can choose the PSAP with the best chances for a more efficient intervention. After a brief analysis of the PSAP level 2, there are transmittedintervention to the nearest resource centers (firefigheters, ambulance, police etc). They operate according to well-defined procedures.

By implementing the "Directive 2002/22/EU of 7 March 2002, the Universal Service Directive and the Commission Recommendation 2003/558 / EU of 25 July 2003 concerning the processing of information for identifying the location in the electronic communications networks for emergency call services the location identification is possible"; currently the system takes the geolocation data of the caller.

2. 112 IN ROMANIA

In Romania, the introduction of the single European emergency number – 112is regulated uniformly representing the technical and organizational system that is accountable for the reception and transmission of emergency calls related to fires, accidents, medical emergencies, disasters and other events that require rapid intervention by agencies specialized in intervention.

[Thus the Government Ordinance no. 18/2002 on the functioning of the single national emergency number (SNUAU) with additions and amendments have worked to create the conditions in Romania for calling the emergency number 112.

Through the "Order of MCTI the carrying into function of the Single National System for Emergency Calls number 112 of 07.04.2005 (Official Gazette of Romania, Part I, no. 312/ 13.04.2005), the telephone number 112 becomes operational throughout the country.][1]

The organization and functioning of the single national emergency number (SNUAU) was and is being improved permanently.

[1] www.112.ro

Currently, the system in Romania uses the geographical location of emergency calls. The communications structure for the emergency calls from Romania has PSAPs Level 1 at national level and PSAPs Level 2 in each county.

3. ECALL

A great number of calls to the emergency number 112 refers to road accidents.

Europe-wide analyses have shown that a reduction of minutes for responding to traffic accidents could save lives and would significantly reduce the negative effects of such events.

One solution to this problem was found and accepted at European level. It consists of the installation on vehicles of a device (IVS- in-vehicle system) which triggers either automatically or manually, a call using "The Single National System for Emergency Calls 112."

["ECall" means an emergency call to 112 from the vehicle, which can be made either automatically via activation of sensors from the vehicle or manually which transmits via mobile communication networks a minimum set of standard data (MSD) and establishes an audio channel (voice) between the persons that are in the vehicle and the most appropriate response center in case of an emergency (in accordance with European Commission Recommendation no. 2011/750 / EU of 8 September 2011).

MSD –"the minimum set of data" means the information to be sent to the response center PSAP level 1, in case of an emergency, in accordance with the standard EN 15722 (according to the European Commission Recommendation no. 2011/750/EU of 8 September 2011). It includes information such as accident location, direction of travel, date and time of the accident, the vehicle identification number.][1]

Among the many regulations on these issues we mention the "Regulation (EU) 2015/758 of the European Parliament and of the Council of 29 April 2015 concerning type-approval requirements for the deployment of the eCall in-vehicle system based on the 112 service and amending Directive 2007/46 /EC."

This regulation comprises an overview of the results achieved by eCall in 2015 and detailed aspects of the activities to be carried out by 2020.

We outline some of the most important aspects[2]:

• A comprehensive system for type-approval of motor vehicles was set at EU level through the Directive 2007/46 / EC of the European Parliament and the Council.

• In order to further improve road safety it was launched a series of inițiatives. The release of the Commission on the 21st of August 2009 entitled 'eCall: Time for Deployment'

[1] www.112.ro

[2] Regulation (EU) 2015/758 of the European Parliamentand of the Council of 29 April 2015 concerning type-approval requirements for the deployment of the eCall in-vehicle system based on the 112 service and amending Directive 2007/46/EC.

proposed new measures to install an emergency service aboard vehicles in the EU. One of the measures proposed was to make compulsory the installation of the eCall systems based on the service 112 aboard all new vehicles, starting with vehicle categories M1 and N1, as defined in Annex II of the Directive 2007/46 /CE.

• On the 3rd of July 2012, the European Parliament adopted a resolution on eCall: a new 112 service for citizens, inviting the Commission to present a proposal under Directive 2007/46 / EC to ensure mandatory implementation of a public eCall system, based on the service 112 until 2015.

• Ecall aims to reduce the number of fatalities in EU and the severity of injuries caused by road accidents in EU through the rapid emergency services. The mandatory in-vehicle installation of the eCall system based on the 112 service and the required modernization and coordinated public network infrastructure of mobile wireless calls and the emergency centers (PSAP) for receiving and handling the Ecalls will benefit all citizens and thus contribute to reducing deaths and serious injuries related to health care costs, congestion caused by accidents and other costs.

• Member States will implement on their territory no later than 1 October 2017 the PSAPs infrastructure for the handling and proper management of all the calls and will ensure that operators of mobile phone networks have implemented the mechanism for managing the „eCall discriminator".

• Provide information for positioning, accurate and reliable is an essential element for effective functioning of the eCall system based on the service 112 installed in the vehicle. It is therefore appropriate to require compatibility with services provided by Galileo and the European Geostationary Navigation Overlay Service (EGNOS) as provided in regulations. The system established under the Galileo program is a global navigation system through an independent satellite whreas the one established under the EGNOS program is a regional navigation system through satellite, which improves the signal quality of the global positioning system.

• The mandatory in-vehicle installation of the eCall system based on the 112 service should initially apply only to new types of passenger cars and light commercial vehicles (categories M1 and N1) for which there are already adequate trigger mechanisms. The possibility to extend in the near future the requirement to install the Ecall system based on the 112 service in other categories of vehicles such as heavy vehicles for transportation of goods, buses, coaches, motorized two-wheelers and tractors. should be further assessed by the Commission to present, if appropriate, a legislative proposal in this regard**.**

• The installation of the ECall based on the service 112 in types of vehicles which are to be manufactured after March 31, 2018 should be promoted to increase the degree of system implementation. Regarding the types of vehicles type-approved before 31 March 2018, the subsequent installation of an ECall system is possible.

• The European Standardization Organisations, the European Institute for Telecommunications Standardization (ETSI) and the European Committee for Standardization (CEN), have developed common standards for implementing a Pan-European ECall which should apply for the purposes of this Regulation, as this will facilitate technological developments of the ECall service installed in-vehicle, ensure

interoperability and continuity of service throughout the EU and will reduce implementation costs in the European Union as a whole.

This Regulation lists the general requirements for the CE type-approval of vehicles regarding the ECall systems based on the service 112 which are installed in the vehicle, and of systems, components and separate technical units. Furthermore, the ECall Regulation contains details on the scope, definitions, general and specific obligations of the manufactures, specific rules on data protection and privacy, requirements that must be met by the Member States, by implementing acts and amendments to Directive 2007/46 /CE, etc.

4. PROBLEMS AND SOLUTIONS IN THE IMPLEMENTATION OF ECALL IN THE EU

The ECall solution raised and still raises many complicated issues to be solved and implemented. These complicated issues relate to:

• **The communication aspects.** The emergency call from the device installed on the vehicle (in-vehicle system IVS) must be preempted by any mobile operator that has coverage in the area where the call to 112 is made. This call should be directed to that PSAP (Public Safety Answering point) level 1 with the best chance of intervention. Recognition of priority was agreed to carry out the "eCall discriminator" – a mechanism which is currently being implemented and accepted by all mobile operators. Routing the call to a PSAP is based on an algorithm agreed between all mobile operators and national components of the „Single European emergency number 112." It should also be agreed, accepted and implemented by mobile operators a mechanism to ensure the connection între IVS and PSAP for a period allowing at least to receive a minimum set of data (MSD) for the required intervention.

In some situations the mobile operator has to make a call and a connection from PSAP to IVS (which is installed in the vehicle). To establish the minimum set of data (MSD) which are to be included in an eCall, it must be considered the proposals of all those involved to reach an agreement for an accommodating solution. It is also important the communication between the IVS device manufacturers and the vehicle manufacturers on which the devices are installed, to harmonize both the requirements for triggering the emergency call 112 and how to establish a minimum set of data that has to be included in the communication to PSAP, given that some of the data from the set refers to the requiremts when the call is already triggered (geographical location, direction of travel, etc.). Last but not least, there are language problems when the emergency call sent by IVS is assigned to a PSAP in a country where another language is spoken.

• **The technical aspects.** In order to meet the deadlines for implementing the European system eCall (i.e in all new vehicles of a particular type must be installed a functional device IVS no later than the end of 2017), technical solutions must be found and implemented at all car manufacturers who supply goods of that kind in the EU.

Mobile operators must make technical changes for implementing the specific mechanisms of eCall. The single national systems for emergency calls 112 must find technical solutions and deploy them to answer calls from eCall so as to initiate and conduct

effectively the required emergency services. The major changes taking place in the field of technical equipment and IT&C can cause structural changes in the technical configuration of the eCall system.

• **Regulatory issues and bodies.** The results of extensive communication and collaboration between those involved in the eCall system should be supported by the EU authority through regulations of the institutions and bodies both at European level and national level in each Member State. International treaties, EU Directives or provisions in the directives, standards, procedures, protocols and other types of regulations present the agreed solutions for setting up an effective eCall system.

5. HEERO –EFFORTS FOR AN HARMONIZED ACHIEVEMENT OF THE EU-WIDE ECALL SYSTEM

To ensure a lucrative communication and collaboration to achieve the European eCall system, the EU has organized and partly funded partnership projects.

”HeERO - HarmonizedeCall European Pilot” was a project partly funded by the European Commission through the PSP ICT, where over a period of three years (January 2011 - December 2013), nine European countries ensured the implementation, interoperability and harmonization of the eCall based on the single European emergency number 112. Romania, along with Croatia, Czech Republic, Finland, Germany, Greece, Italy, Sweden, the Netherlands shared the same major goal: preparing the infrastructure of the 112 emergency System, testing of the eCall service and disseminating this experience with other member countries or associated with the European Union.

This project was followed by the **HeERO2** project in which the partners are EU member states that have not participated in the first project. The overall project objective of HeERO[1] is to prepare for the deployment of the necessary infrastructure in Europe with the aim of making the harmonised Pan-European interoperable in-vehicle emergency call service "eCall" a reality.

The implementation of the eCall service at European level should take into account two major conditions on which its successful operations will depend[2]:

- **Interoperability and cross border continuity**: the possibility for any vehicle from any European country travelling across Europe to use the Call service in case of a serious accident should be a service key driver. The interoperability issue covers not only the technical solution but also operations aspect.
- **Harmonisation**: the eCall service can work properly across Europe only if developed in a harmonised way in the different countries, still respecting the different national implementations. The use of 112/E112 represents the first steps of this harmonised approach.

[1] www.iheero.eu
[2] www.iheero.eu

To address the interoperability and harmonisation dimensions of the eCall implementation, the following high level objectives have been identified for the European pre-deployment pilots:

- Define operational and functional requirements needed to upgrade all eCall related service-chain parts (PSAPs-integrated rescue systems, telecommunication-112/E112, etc.) to handle eCall
- Implement available Pan-European eCall related European standards
- Implement needed technical and operational infrastructure upgrades
- Identify possible use of eCall system for public and/or private value-added services
- Produce the training materials for the eCall operators
- Assess certification procedures related to the eCall services equipment in liaison with CEN Project Team
- Produce recommendations for future eCall pre-deployment and deployment activities in Europe
- Promote pilots results and best practices with other EU Member and Associated States not involved in HeERO pilot
- Demonstrate interoperability and continuity of harmonised EU wide eCall service

The project is currently ongoing, and it is supported and funded in part by the European Union, called I_HeERO - Infrastructure Harmonised eCall European Pilot during 1 January 2015-31 December 2017. The project is coordinated by the German State of Lower Saxony, under the Authority of the German Ministry of transport BMVI and is coordinated technically by ERTICO - ITS Europe.

The project operates in 11 Member States (Bulgaria, Cyprus, Czech Republic, Finland, Germany, Greece, Ireland, Italy, Portugal, Romania and Slovenia), includes 58 commercial partners and counts 26 Associated Partners (from Belgium, Croatia, Germany, Italy, the Netherlands, Norway, Poland, Slovakia, Sweden, Switzerland and UK).

I_HeERO: Deployment pilot project of EU-wide eCall_HeERO, ("I" for Infrastructure") is aimed at the preparation of the PSAP in Member States for the deployment of eCall based on 112 as reference implementations. It addresses explicitly the PSAP element of the eCall roll-out and will enable the PSAP to install hardware and software solutions that fit the necessary requirements within each Member State.

I_HeERO will[1]:

- Prepare the necessary PSAP infrastructure to realise Pan-European eCall
- Boost Member States investment in the PSAP infrastructure and interoperability of the service within the roadmap (by the end of 2017)
- Prepare for deployment for eCall for HGV and Dangerous Goods and Long Distance Coaches
- Prepare for deployment for eCall for Powered two wheeled vehicles (P2W)

[1] www.iheero.eu

- Define and then perform PSAP Conformity Assessments, which is a legal obligation for all PSAP handling eCall based on 112
- Look at advancements in the management of data and next generation 112 for eCall
- Provide Associate Partnership for I_HeERO open to both Member States and Commercial Organisations who are involved in eCall deployment

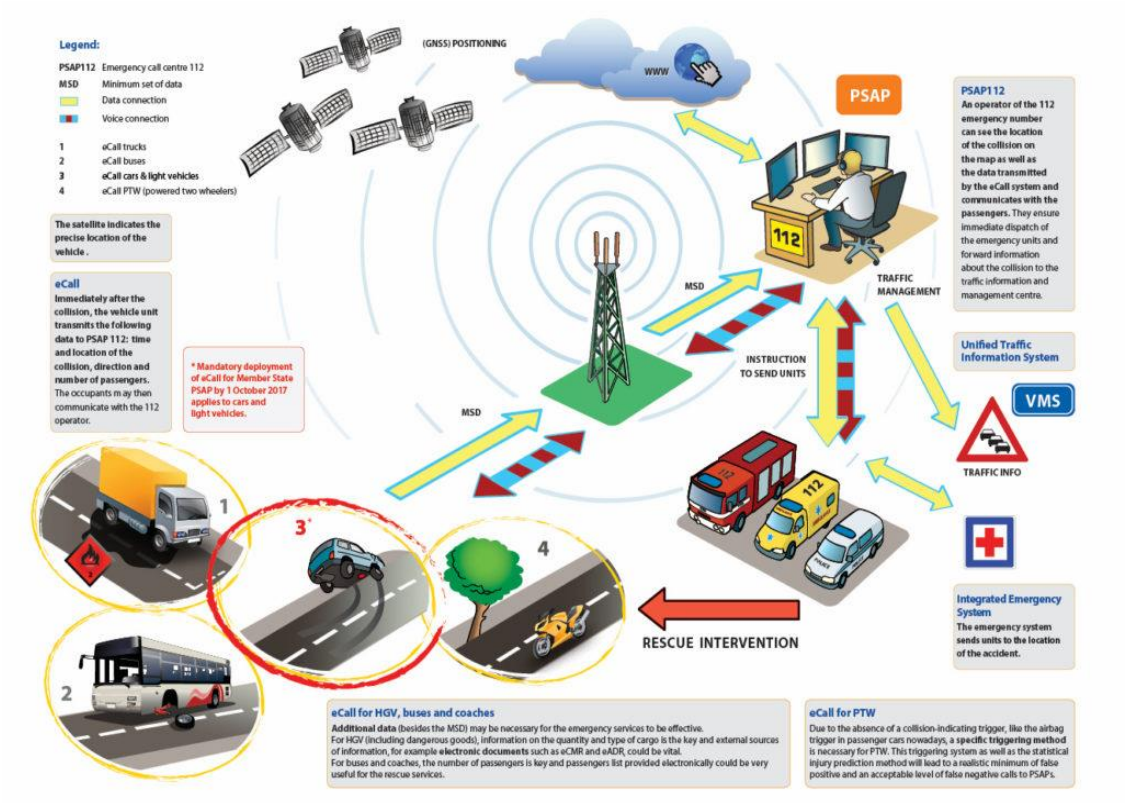

Figure 1. Representation of eCall extended to all vehicles [1]

The activities carried out in these projects have revealed new challenges, especially in efforts to expand in ECall the integration of other vehicles such as trucks, trams, buses, passenger trains and two-wheeled vehicles.

The encountered problems mainly regard communication problems which involve the extension of MSD with a data set, leading to the need to supplement the type of communication from voice to voice plus data or only data. Changes are foreseen in the technical structure of communications between PSAPs between PSAPs and intervention centers with the necessary emergency services.

To better understand the need to complete the MSD with a set of data, we consider several cases:

[1] www.iheero.eu

• For a coach or wagon to travel over large distances involved in an accident the emergency response service must know the number of persons carried, which can require a number of ambulances.

• For a truck carrying hazardous substances the emergency response service must know what substances and what hazards exist related to these substances. We remind that the transport of dangerous substances is peculiar and is subject to strict regulations.

The completed analyses show that it is increasingly required to ensure the access of PSAPs to a much larger volume of data and the Internet being one of the most attractive solutions as it is supported by the development of the IT&C.

To better understand the beneficial effects of efforts at EU level to ensure a safe traffic, the website www.iheero.eu proposes an exercise of imagination: [Imagine a world without road congestion where cars do not crash, a world where your car is energy efficient and pollutes less. Today Information and Communications Technologies (ICT) have already started to make this dream true. Your car is becoming smarter, helping to reduce Europe's road transport problems.][1]

6. CONCLUSIONS

The implementation of eCall in EU is ongoing; being a complex process, it involves both the EU authorities and Member States, manufacturers of vehicles and IT&C components, communication networks, institutions involved in emergency response, vehicle owners and traffic participants, etc. The deadlines set for the deployment of eCall in Europe have been respected although there is an increasing concern for its extension to other categories of vehicles.

Romanian-American University was one of the partners who participated in the eCall project in Romania and then in both the HeERO project and the I_HeERO project which is now ongoing.

The HeERO projects engaged a large number of partners who contributed through great efforts to identify problems, design solutions, testing and implementation in pilot centers and are currently involved in the extension of implementation throughout EU.

Romanian-American University has had the opportunity to present to the students of the School of Computer Science for Business Management specific problems of IT&C which raised a real and complex problem but also the implications that such a project has for both the authorities and for our lives.

Additionally, we would like to mention the equal opportunities of any institution in a EU Member State to participate in achieving major objectives in carrying out large projects such as this in order to increase the efficiency of the protection of life, health and property of citizens, through systems such as “the single emergency call 112 'with the eCall subsystem, which is also an important component of the “Intelligent Traffic system” (component of the eSafety).

[1] https://ec.europe.eu/digital-single-market/node/556

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[8] www.112.ro

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[10] www.iheero.eu

[11] https://ec.europe.eu/digital-single-market/node/556