

eCall – MINIMUM SET OF DATA (MSD)

Claudiu-Dan BÂRCĂ¹, Rareş ROPOT², Sorin DUMITRESCU³

1-Faculty of Computer Science for Business Management, Romanian – American University, Bucharest, Romania

2-ITS Romania

3-Electronic Solutions, Bucharest

Abstract

The introduction and use of in-vehicle eCall for deployment of emergency assistance will save lives and reduce social burden by improving the notification of road accidents and speeding up emergency service response.

This article describes the specifics of an emergency message (minimum set of data - MSD) that is sent to the most appropriate emergency response center – Public Safety Answering Point (PSAP), as defined by the relevant public authorities. The mobile network operator forwards the call to the PSAP where the operator can analyze the data on a display so that he will be able to determine which emergency services are needed at the scene.

Key words: eCall, minimum set of data, intelligent transport systems

Introduction

eCall is a pan-European in-vehicle emergency call system which uses the European emergency number 112 over a cellular network in the event of an accident. An eCall can be placed manually, e.g., on the push of a button, or automatically upon detection of an emergency situation by the car's safety systems, e.g., due to airbag deployment.

The basic system overview can be observed in Figure 1.

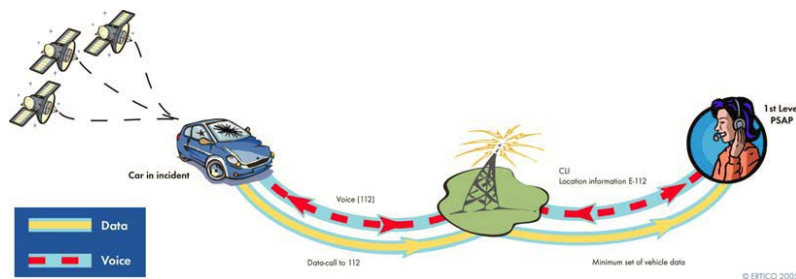


Figure 1 – eCall System Overview

The Minimum Set of Data (MSD) contains vehicle information such as location, vehicle identification number, etc. The expected benefit is that emergency services will be made aware of accidents rapidly, will get precise location information and therefore will be able to reach accident victims faster, with the potential to save many hundreds of lives annually.

Requirements relating to the delivery of the MSD

Whilst there is no existing legislation mandating MNOs to support eCall, all 2G and 3G mobile networks within the European Union, that support 112 or E112 emergency calls, are also anticipated to

support this service. The eCall Driving Group, in consultation with the PSAPs has defined the Minimum Set of Data (MSD) to have a size of maximum 140 bytes.

Whilst the call set-up time and the time to transfer the MSD from the in-vehicle system (IVS) to the PSAP are important following a vehicle accident, it is also important to ensure that the MSD is correctly populated and that the call is established in an efficient manner. To avoid unacceptably high levels of network registration and location update signaling, the IVS should not register with a network until it needs to make an emergency call. It is expected that the IVS will be powered-up, aware of its location and direction of travel so that the IVS can then quickly access a mobile network and make the eCall (E112+MSD).

Figure 2 shows the time specifications for the delivery of the MSD:

- T1 - Pre-call preparation period

This represents the elapsed time from when the in-vehicles system is activated (IVS) to the start of the call set-up. During this period the IVS will prepare the MSD and access a mobile network. T1 should be less than 10 seconds.

- T21 - Call set-up period

This represents the elapsed time from the start of call set-up to the time when the caller gets a ring-back tone from the PSAP. T21 should be less than 4 seconds.

- T22 - Voice call PSAP reaction time

This represents the time it takes the PSAP to relay the voice call to an operator and answering the call. 90% of the calls have to be answered in a time less than 10 seconds.

- T31 - MSD transfer period

This represents the elapsed time from when the data is transmitted by the IVS to when it has been delivered to the PSAP. T31 should be less than 4 seconds.

- T32 - Data forwarding and mapping period

This represents the time it takes the PSAP to relay the data to an operator that also received the voice call and to visualize it. T32 should be less than 10 seconds.

Accident	Call Initiation Time	Voice call establishment time	
	T1	T2	
	< 10 s	T21	T22
eCall sensors triggered		Data transmission and visualisation time	
		T3	
		T31	T32
		< 4 s	< 10 s

Figure 2 – Time requirements for eCall

Contents of the MSD

The information from the MSD can be divided in two categories: mandatory and optional. The mandatory information includes: message ID, vehicle identification, vehicle propulsion storage type, time stamp, vehicle location and direction and format field.

The ID field, which contains the MSD format version as well as a message identifier. The message identifier will initially have a value of 1, which will be incremented with every MSD retransmission after the incident event.

The MSD will also have a Control field which will indicate the activation type (0 for automatic and 1 for manual), the call type (1 for test call and 0 for an emergency call), the position confidence (1 for low confidence in position or 0 if the position can be trusted) and the vehicle type consisting of 4 bits which indicate the vehicle class. The position confidence bit will be set to 1 (low confidence in position) if the position is not within the limits of +/- 150m with a confidence of 95%.

The Vehicle Identification field will indicate the VIN number of the vehicle, according to ISO 3779.

The Vehicle Propulsion Storage Type field indicates the type of energy storage(s) available on the vehicle (0 indicates a type of storage is not present and 1 indicates a type of storage is present). All bits set to 0 indicate an unknown type of energy storage is present. The following types of energy storage have an assigned field: hydrogen, electric (with more than 42v and 100Ah), liquid propane gas (LPG), compressed natural gas (CNG), diesel tank and gasoline tank.

The Time Stamp field stores the time of the accident, expressed in seconds elapsed since midnight January 1st 1970 UTC.

The MSD contains a field regarding the vehicle location and direction. The position latitude and longitude are expressed according to ISO 6709. If the longitude or latitude is invalid or unknown, the value 0xFFFFFFFF shall be used. The vehicle direction is expressed in 2 degrees steps from magnetic north (0-358 clockwise).

The Format field contains information regarding the optional additional data: 0 - No optional additional data, 1 - Binary data, 2 - BCD, 3 - XML encoded data, 4 - ASN.1 BER defined data, 5 - ASN.1 PER defined data, 6 - ASCII encoded data.

Standardization of the MSD

There are two key organizations that are responsible for developing standards for eCall:

- Working Group 15, eSafety, of CEN TC278 - responsible for the development of eCall standards at the application level;
- The ETSI-3GPP-MSG Working Group – responsible for progressing issues on technical performance and certification.

Within Working Group 15, the Minimum Set of Data (MSD) Standard, “CEN TS 15722:2008”, was published in 2008. The Minimum Set of Data specifies the minimum information that must be contained in the data message that is sent to the PSAP. At the moment the standard is being balloted as full EN standard (Draft EN 081018).

In addition to the adopted MSD standard, Working Group 15 has recently approved “278220 – Operational Requirements for the Operation of eCall” as a preliminary work item. The standard is being commented by member countries prior to ballot as an EN (Draft EN 090316), with the ballot launch being expected in late 2009.

„CEN WI 278243 Intelligent Transport Systems - eCall – High Level Application Protocols” is currently adopted as draft and being commented by member countries prior to ballot as an EN, and finalized within WG (ballot launch expected in Q4 of 2009).

Further standardization work may also be needed to speed-up network access, eCall set-up and subscription handing.

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