Draft

European e-Call functional specifications

In Vehicle System

Version 1.1

Working Document

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DOCUMENT CONTROL SHEET

Version History			
Date	**Version**	**Main author**	**Summary of changes**
01/11/05	0.05	Dr. Form	Creation
03/11/05	0.051	Dr. Form	Add contributions paragraph 2.2 and 3.4.1
08/11/05	0.6	ECIV	Processed document in ECIV-Meeting 8/11/05
13/12/05	0.7	ECIV	Processed document in ECIV-Meeting 13/12/05
04/01/06	0.8	Dr. Form	Editorial comments from ECIV members included
07/02/06	0.9	ECIV	Processed document in ECIV Meeting 7/2/06
03/03/06	1.0	Dr. Form	Editorial comments
05/04/06	1.1	ECIV	Processed documents in ECIV Meeting 5/4/06

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1 Glossary *(to be reviewed later)*

API:	Application Programming Interface
+BAT:	Permanent voltage from vehicle's battery (e.g. 12 or 24V)
GPS:	Global Positioning System
GPRS:	General Packet Radio Services
GSM:	Global System for Mobile communications
HMI:	Human Machine Interface
IVS:	In Vehicle System. This is expected to be a module working either: - as a stand-alone solution for e-call (to be completed with connection, interfaces and antennas), - or as a system to provide necessary information to a customer's mobile phone, - or as an add-on on existing on-board electronic device.
MSD:	Minimum Set of Data,
MS:	Member State (European)
PSAP:	Public Safety Answering Point
SP Identifier:	Private Service Provider Coordinate, if any.
UMTS:	Universal Mobile Telecommunication Service
NAD:	Network Access Device (e.g. a GSM or UMTS module)
MNO:	Mobile Network Operator
GNSS:	Global Navigation Satellite System

2 System overview

The objective of implementing the in-vehicle emergency call system (eCall) is to automate the notification of a traffic accident, wherever in the European Union, with the same technical standards and the same Quality of Services objectives by using the Mobile Telecommunication network (e.g. GSM) and the European preassigned emergency destination address (e.g. 112).

2.1 High level Functional Requirements

The high level functional requirements of the in-vehicle system are as follows:

- In the event of an accident the eCall system must automatically determine whether or not to trigger an eCall.
- An eCall must be able to be triggered manually.
- Upon triggering an eCall the eCall system must try to send a Minimum Set of Data (MSD) to any given mobile network operator (MNO) with the European preassigned destination address 112.
- The eCall system must also try to establish a voice connection between the vehicle and that preassigned destination address (e.g. a public safety answering point (PSAP) with 112)

'Actors': eCall 'system'
eCall user
Mobile and Telecommunication network operator
PSAP

2.2 In-Vehicle Functional Requirements:

The in-vehicle system unit is either an embedded unit with an integrated network access device (NAD, e.g. a GSM module) or a phone based solution, consisting of a standardized interface and a cellular phone. The interface could be Bluetooth or a standardized cable connection.

2.2.1 Phone based solution:

- IVS must be able to establish a data connection with customer's mobile phone.
- IVS must relay information regarding the connection (mobile phone – vehicle) to the user (e.g. driver).
- IVS must detect when an 'eCall trigger' has been initiated after a severe accident.
- IVS must transmit via the connection the vehicle ID and other vehicle specific MSD content to customer's mobile phone. The voice connection must be established by the mobile phone to the PSAP.

´Actors: Vehicle
Mobile Phone (must provide position with the required accuracy
and must put together the MSD, in addition location information
can be provided by the vehicle)

2.2.2 Embedded solution:

- IVS must detect when an 'eCall trigger' has been initiated.
- IVS must initiate eCall voice connection with mobile network operator (MNO).
- IVS must send the MSD to MNO.

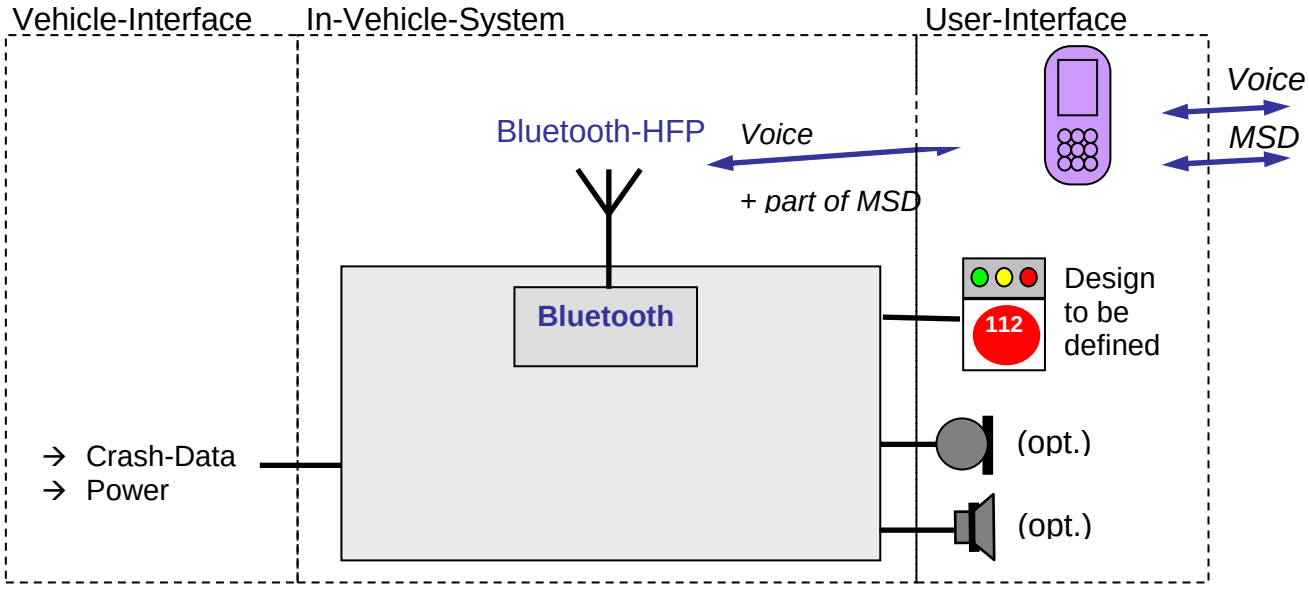
- a call back voice connection has to be initiated between IVS and PSAP in case of a disconnected eCall.

Actors: Vehicle
eCall User
Telecom Network

2.3 Interfaces

Below the two vehicle interface configurations are described.

Example for phone based configuration:



Embedded configuration:

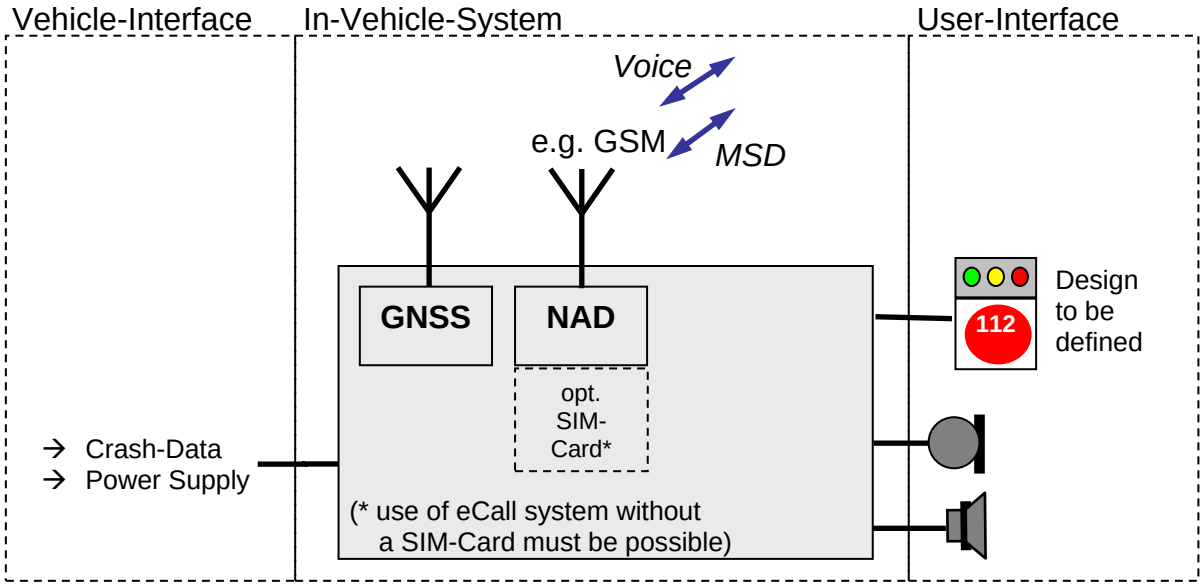


Figure 1: Example for phone based and embedded configuration.

3 Functional Specification

The In Vehicle system must fulfil the specific OEM automotive requirements.

3.1 User-Interface Elements

The eCall system consists at least of the following elements:

1. 112-button (SOS)
   This button starts and ends the manual emergency call. The manual call will only be started when the button is pushed for at least 2 seconds.

   A call will be aborted or ended immediately when pushing the button for at least 1 second during a call or the initiating of a manual or automatic call.

   By starting a call, an acoustic feedback (beep for 0.5 sec) will be played.
   By ending/aborting a call an acoustic feedback (2 beeps in 0.5 sec) will be played
   The call must be given the highest priority.

2. System status indication with colour status light or alphanumerical display. The following status should be indicated (Implementation according to individual vehicle manufacturer HMI philosophy):

   – that no mobile phone is connected to the eCall system,
   – if the Bluetooth connection is being in progress,
   – the eCall system is powered ON and ready to make calls,
   – a call is being connected or in progress,
   – that the eCall system may not be functioning properly,

   all colours to be discussed of dimming and blending character.

Any installation should comply with the European Statement of Principles on HMI (ESOP/HMI, *when agreed among the stakeholders*).

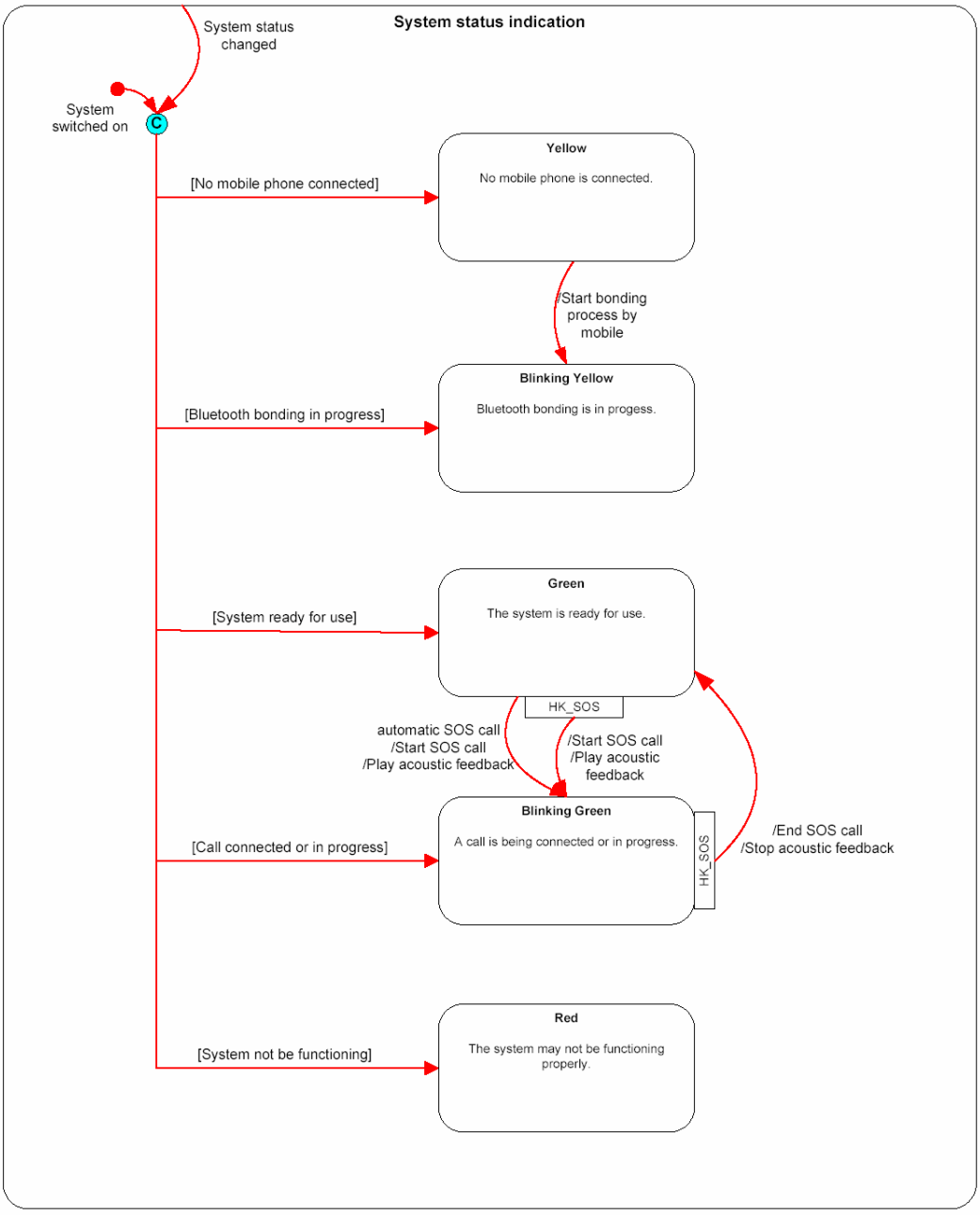


Figure 2: Example Human Machine Interface for phone based Bluetooth solution

3.2 Arming and disarming

The system is armed when ignition is ON, and disarmed when ignition is OFF.

If an e-Call is ongoing while ignition is being switched to OFF that call must not be terminated automatically. The system will then disarm after the e-Call was terminated by the user or the PSAP.

3.3 Manual activation state charts

Manual triggering via a SOS button inside the vehicle pushed by the driver or passenger

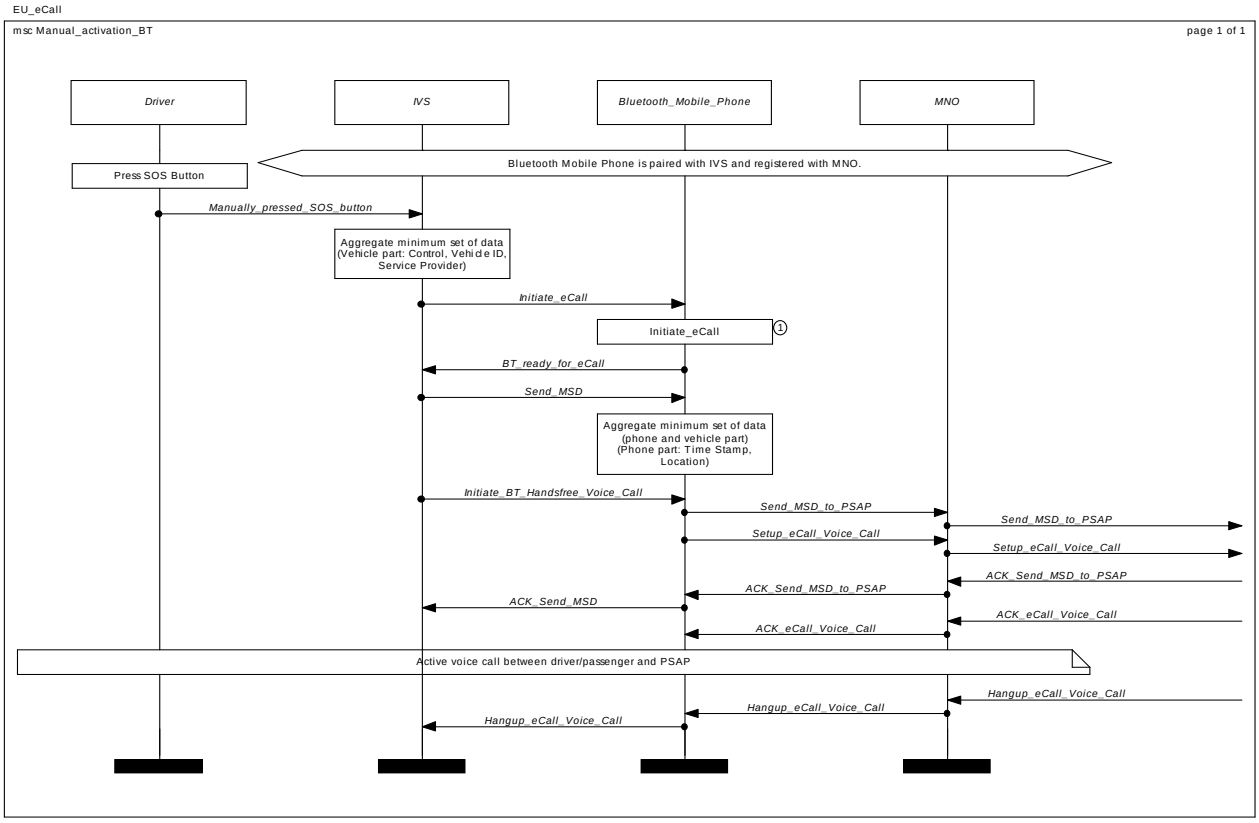


Figure 3: State chart for phone based solution and manual activation.

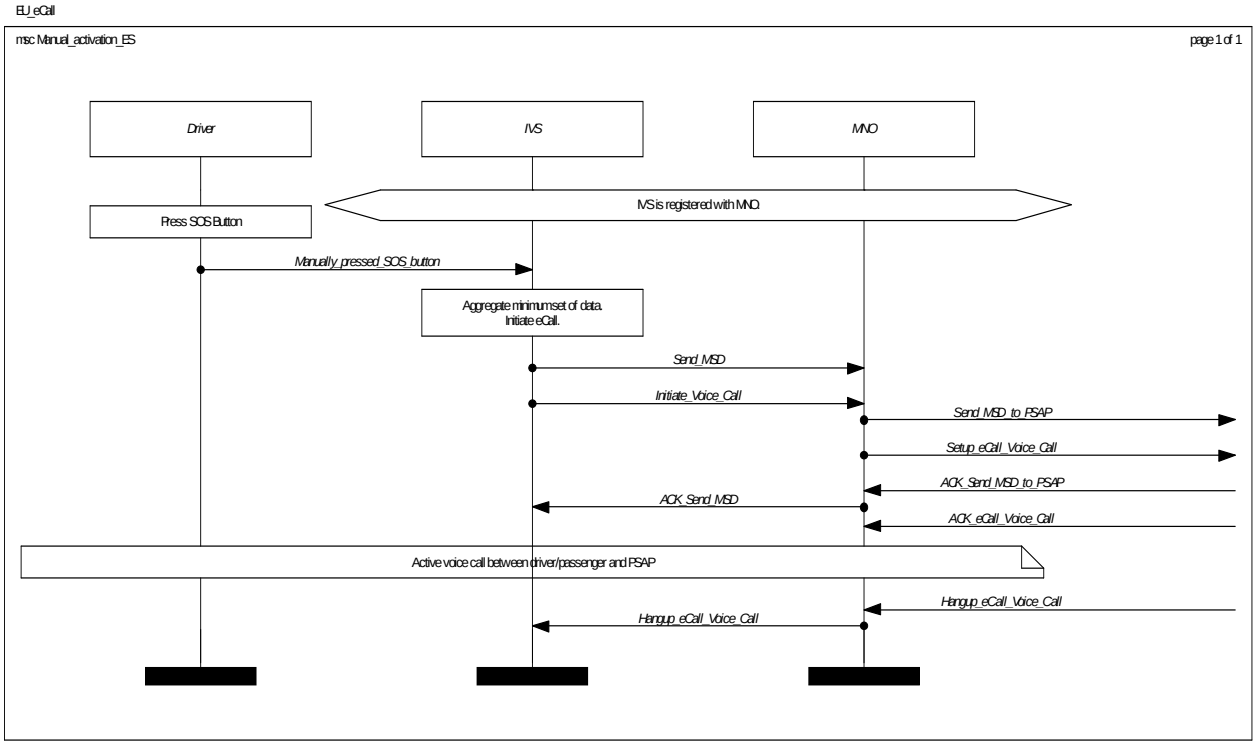


Figure 4: State chart for embedded solution and manual activation.

3.4 Automatic activation state charts

3.4.1 State charts

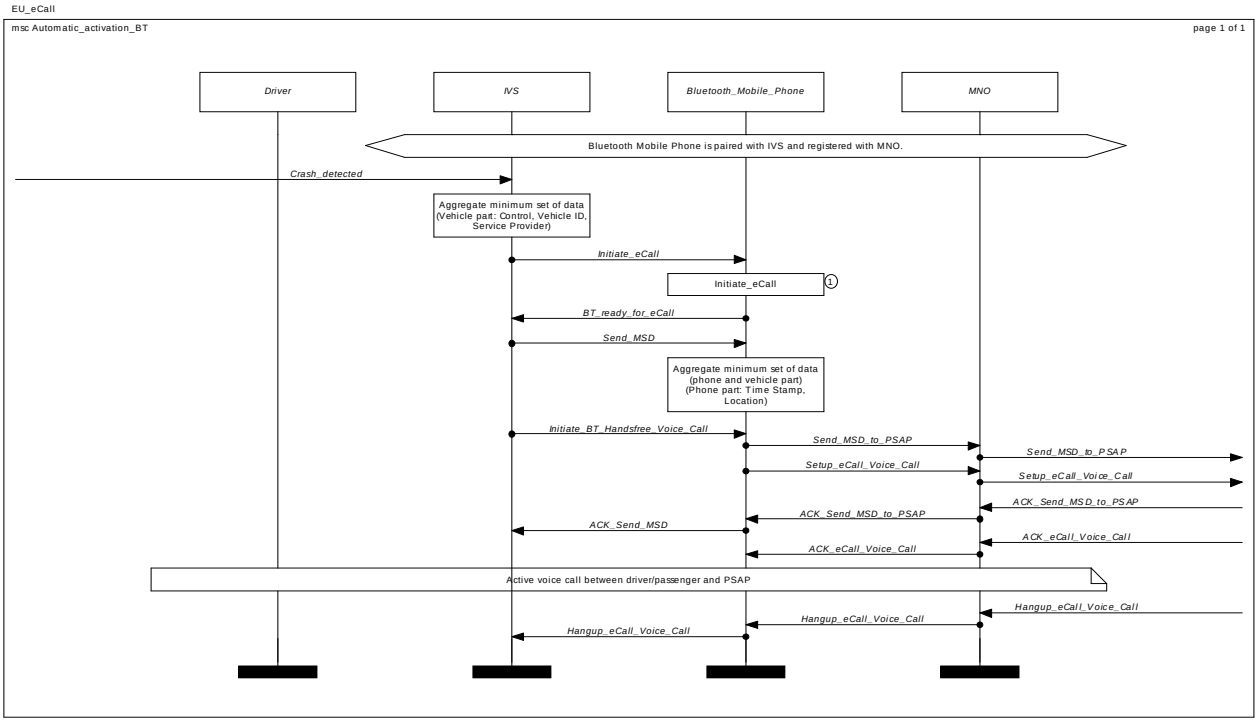


Figure 5: State chart for phone based solution and automatic activation.

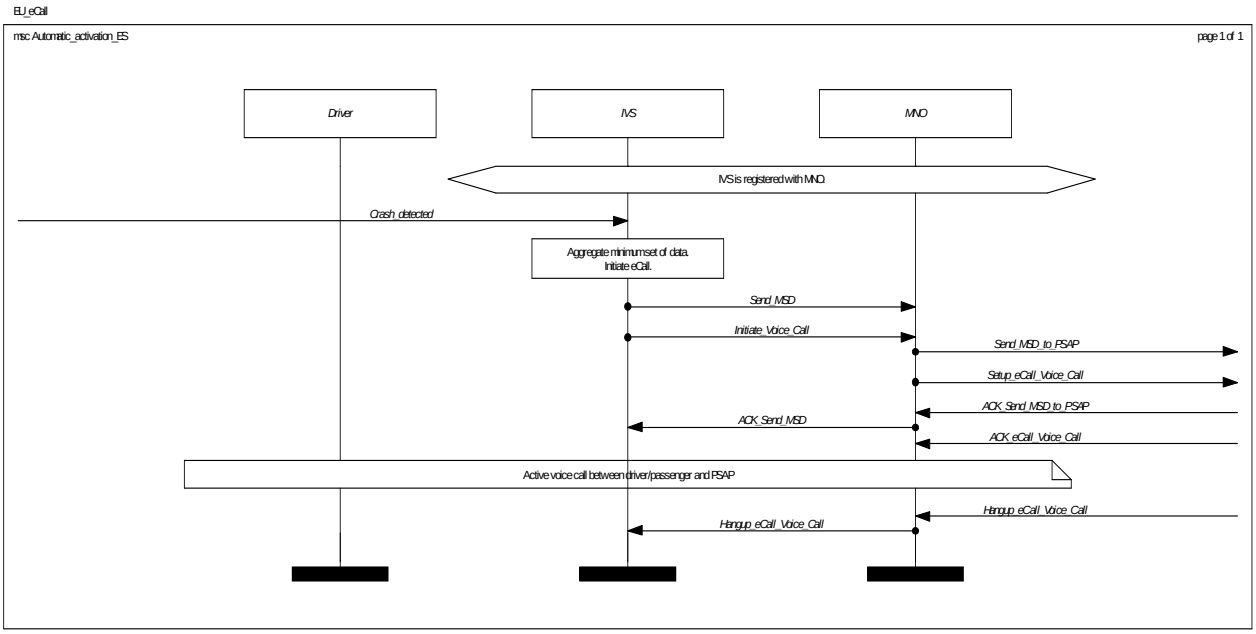


Figure 6: State chart for embedded solution and automatic activation.

3.4.2 *Triggers*

Automatic triggering generated by a "crash signal", created in the airbag control module and/or a combination of other sensor data (e.g. gyro, radar, axle load, speed). The car and truck manufacturers are responsible for the determination of the "crash signal".

The „crash signal“ can be:
- airbag deployment
- other crash information status (→ a severe accident has happened), e.g. created in the airbag control module without deployment of an airbag (e.g. rear crash), in responsibility of the manufacturer of the specific vehicle.

3.4.3 Call Back functionality

In Case of a SIM-less eCall the IVS must try to re-establish an interrupted call unless the preassigned destination address (e.g. PSAP) has terminated the call intentionally or the user has pressed the 112-button for more than 1s (see 3.1).

3.5 Localization

Reference point is vehicle geometric vehicle centre.

3.5.1 Location accuracy (according to US E911)

+-150m 95% of the time
+-50m 67% of the time
90% confidence for both

3.5.2 Direction of travel

Direction of travel to be calculated from the last 3 valid positions.

3.5.3 Confidence on Location accuracy

If the position can not be calculated with the required accuracy (e.g. in a tunnel) the system should indicate this with the confidence bit in the MSD.

3.6 Timing

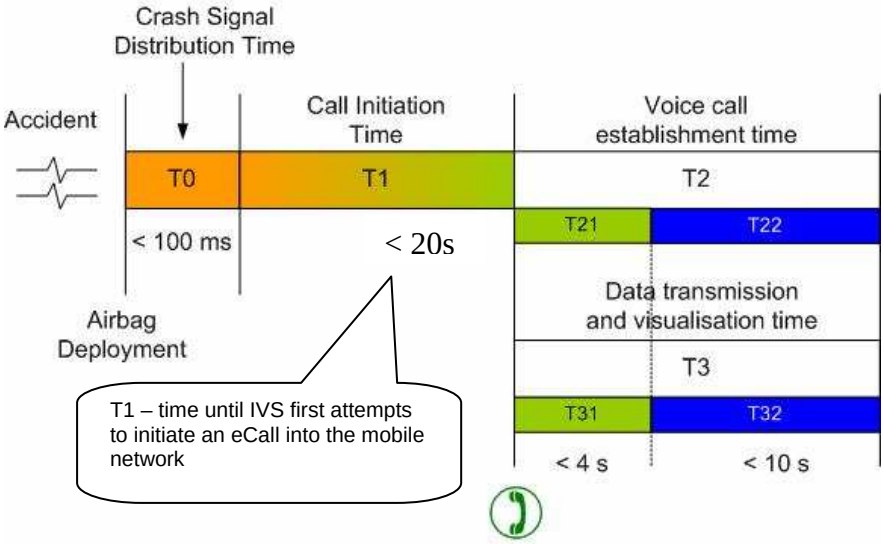


Figure 7 : Timing for automatic activation.

3.7 Performance Criteria of the In-Vehicle System (IVS)

The objectives of this statement are to provide the performance criteria of the in-vehicle system of the overall eCall System.

An accident is either detected automatically by crash sensors or other sensors or manually activated by the driver or passengers. This eCall trigger is transmitted over the car-specific bus (CAN, MOST or others) to the in-vehicle system. The in-vehicle system aggregates the MSD as specified by ACEA. The IVS is responsible to deliver parts of the MSD to an embedded mobile phone or via Bluetooth to a paired mobile phone and to handle all aspects of an eCall such as call initiation, audio management, HMI, MSD aggregation and preparation.

The HMI of the IVS has to inform the driver, if the e-Call system on board is not properly functioning.

GNSS minimum accuracy as defined by CGALIES, i.e. < 50m for urban and < 150 m for rural or motorway scenarios.

Timing constraints: The time between crash detection by a sensor or by pressing the eCall button and the first call attempt (T_1) should not exceed 20 seconds. For the call initiation the NAD (Network Access Device) is responsible. The NAD could be a part of a mobile phone or embedded in the IVS itself. An acknowledge message from the NAD for the successful transmission of the MSD has to be monitored and stored by the IVS.

A SIM-less solution is required. False calls should not be a problem, because through the vehicle identification number (VIN) as part of the MSD a call initiator can be identified. Additionally, the network operator can deliver the IMEI-Number, which is a unique identifier for the NAD hardware.

Because of the high implementation and maintenance costs no backup batteries will be required.
No certification of the IVS is necessary. The current certification requirements for all the electric/electronic devices in the vehicles are sufficient.

3.8 Minimum Set of Data (MSD)

The minimum Set of Data (MSD) shall be transmitted by the Network Access Device according to ETSI ??? (provided by ETSI 3GPP MSG).

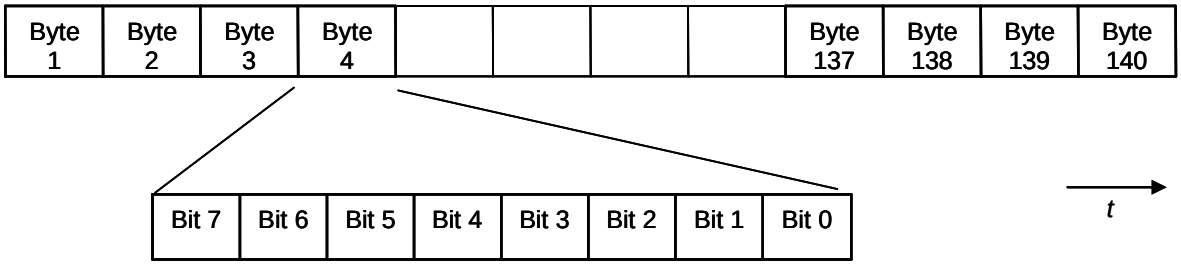


Figure 8 : MSD Frame format.

Byte No.	Name	Size	Type	Unit		Description
1	Control	1 Byte	Integer		M	Bit 7: 1 = Automatic activation Bit 6: 1 = Manual activation Bit 5: 1 = Test Call Bit 4: 1 = No Confidence in position Bit 3: Bit 2: Bit 1: Bit 0:
2	Vehicle identification	20 Bytes	String		M	VIN number according ISO 3779
3	Time stamp	4 Bytes	Integer	UTC sec	M	Timestamp of incident event
4	Location	4 Bytes	Integer	milliarcsec	M	GNSS Position Latitude (WGS84)
		4 Bytes	Integer	milliarcsec	M	GNSS Position Longitude (WGS84)
		1 Byte	Integer	Degree	M	Direction of Travel
5	Service Provider	4 Bytes	Integer	IPV4	O	Service Provider IP Address
6	Optional Data	106 Bytes	String	tbd	O	Further data encoded in XML Format
	Sum:	**140 Bytes**				

M – Mandatory data field
O – Optional data field (default blank characters)

Figure 9: MSD-Format field.

4 Annex

4.1 Corresponding documents

Reference to Extended Bluetooth Hands-free-Profile
Reference to ETSI eCall standard to be provided by ETSI 3GPP MSG
Reference to ISO 3779 / SAE J272

4.2 Vehicle Identifikation Number Passenger Car (VIN)

(according to ISO 3779 and SAE J272)

Example DaimlerChrysler:
Verwendung/Applications: USA/Kanada mit/with Code 494/460
Andere Länder mit/other countries with Code 986

W D D	1. – 3. digit	WMI – World Manufactuerer Identifier of the manufacturer DaimlerChrysler AG, Stuttgart
A	4. digit	Line: siehe Blatt 3 / see sheet 3
J	5. digit	he 4. character of type designation encoded: see sheet 3
7 8	6. – 7. digit	(e.g. 199.378) The last two characters of Mercedes-Benz type designation
X	8. digit	3) Restraint system code (see sheet 3)
2	9. digit	check digit
3	10. digit	model year code see sheet 4)
M	11. digit	production plant (siehe Seite 5 / see sheet 5)
1 2 3 4 5 6	12.-17. digit	Fortlaufende, aufsteigende 6-stellige Zählnummer (identisch mit der 12. – 17. Stelle der “EG-Fahrgestellnummer) sequential number, rising from 000001 to 999999