Lab 1
Translating ITS requirements into positioning performance levels
eCall exercise

COST Action: TU1302
Satellite Positioning Performance Assessment
for Road Transport – SaPPART
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Fundamentals of GNSS
for ITS applications
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Lab 1

eCall

Description of the service:
Under normal circumstances, the stages of the pan-European eCall transaction that provide the service can be described as comprising 9 steps:

- Step 1: Procedures following power-up and initialisation of the in-vehicle system
- Step 2: Activation (of system)
- Step 3: Call set-up (including identifying call type, make call, network selection and registration, authentication (home location registry), cell localisation (by network), establish audio connection to PSAP modem server)
- Step 4: MSD transfer (including disconnect microphone and loudspeaker in vehicle from the line, send network echo canceller disabling tone (optional), send IVS INITIATION signal, synchronise, request MSD, send MSD, error check), and link layer ACK (including stop MSD transmissions)
- Step 5: Application layer ACK
- Step 6: Establish audio link (including check audio link to vehicle occupants, MSD visualisation, rerouting to another PSAP)
- Step 7: Clarification of the overall emergency situation and location
- Step 8: Initiate incident resolution and inform vehicle occupants verbally that help is coming
- Step 9: Call clear down.

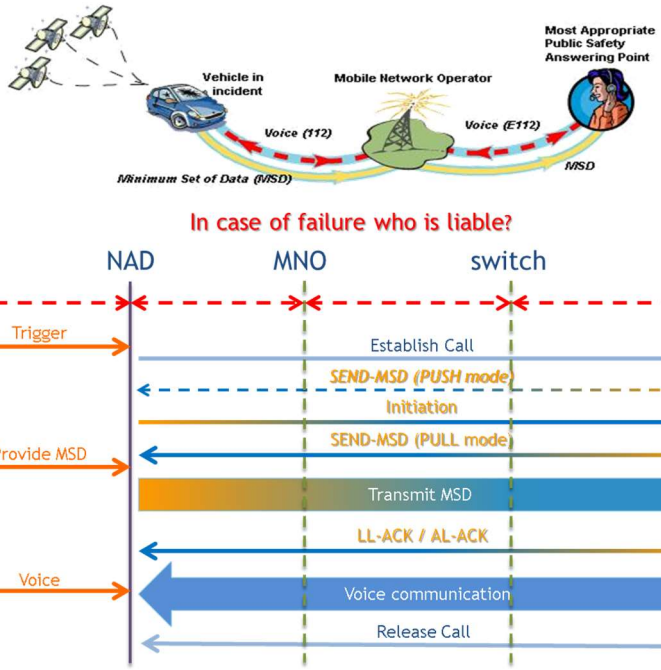


Figure 1: eCall –message flow

Abbreviations:

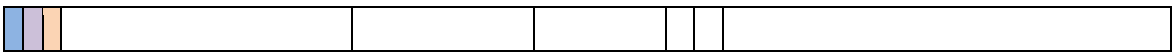
- IVS: In-Vehicle systems
- NAD: Network Access Device
- MNO: Mobile Network Operator
- PSAP: Public Safety Answering Point

Table 1: eCall – MSD message format

MSD					
	msdVersion	INTEGER (1..255)	-	M	**Not relevant for the Lab**
	Msd				
		msdStructure			
		messageIdentifier	INTEGER	M	**Not relevant for the Lab**

	(1..255)			
Control			M	
automaticActivation	BOOLEAN			**Not relevant for the Lab**
testCall	BOOLEAN			**Not relevant for the Lab**
positionCanBeTrustd	BOOLEAN			true = Position can be trusted false = Low confidence in position “Low confidence in position” shall mean that there is less than 95% confidence that exact position is within a radius of ± 150 m of reported position
vehicleType	ENUM			**Not relevant for the Lab**
VIN	VIN[1]		M	**Not relevant for the Lab**
vehiclePropulsionStorageType			M	**Not relevant for the Lab**.
				Not relevant for the Lab
timeStamp	INTEGER (0..2^{32}-1)	sec	M	**Not relevant for the Lab**
vehicleLocation			M	The last known vehicle position determined at the latest moment possible before message generation.
positionLatitude	INTEGER (-2^{31}..2^{31}-1)	milliarcsec		Position latitude (WGS84) calculation example: 48.3003333 = 48°18'1.20" N = 48*60*60.000” + 18*60.000” + 1.20” = 173881.200” = 173881200 milliarcsec maximum value: 90°00'00.000” = 324000000 minimum value: -90°00'00.000” = -324000000 If latitude is invalid or unknown, the representation of value 2147483647 shall be transmitted. If both latitude and longitude have value 0 then the location shall also be interpreted as invalid/unknown. If the transmitter determines either latitude or longitude to be invalid/unknown, then it is recommended to transmit both longitude and latitude as unknown. If the receiver determines either latitude or longitude to be invalid/unknown, then it is recommended to interpret both longitude and latitude as invalid/unknown
positionLongitude	INTEGER (-2^{31}..2^{31}-1)	milliarcsec		Position longitude (WGS84) maximum value: 180°00'00.000" = 648 000 000 minimum value: -180°00'00.000" = -648 000 000 See latitude for calculation example and notes.
vehicleDirection	INTEGER (0..255)	2° (2 degree)	M	The vehicle’s last known real direction of travel (expressed in 2°-degrees steps

					from magnetic north (0– 358, clockwise) determined at the latest moment possible before message generation. calculation example: due North = 0° = 0 * 2° => 0, due East = 90° = 45 * 2°=> 45 due South = 180° = 90 * 2°=> 95 due West = 270° = 135 * 2° => 135 The direction shall be unaffected by random fluctuations of GNSS signals. If direction of travel is invalid or unknown, the representation of value 255 shall be transmitted
	recentVehicleLocationN1			O	Known location of the vehicle some time before the generation of the data for the MSD message. The recent location shall be chosen such that they could normally assist the receiving party to confirm the current location of the vehicle in different driving environments such as city or motorway.
		latitudeDelta	INTEGER (-512..511)	100 milliarcsec	Latitude Delta (+ for North and – for South; WGS84) with respect to vehicleLocation. 1 Unit = 100 miliarcseconds, which is approximately 3m (on Earth) maximum value: 511 = 0°0'51.100'' (±1580m) minimum value: -512 = -0°0'51.200'' (± -1583m)
		longitudeDelta	INTEGER (-512..511)	100 milliarcsec	Longitude Delta (+ for East and – for West; WGS84) with respect to vehicleLocation. See latitudeDelta for details
	recentVehicleLocationN2			O	Known location of the vehicle some time before recentVehicleLocationN1. • The recent location shall be chosen such that they could normally assist the receiving party to confirm the current location of the vehicle in different driving environments such as city or motorway.
		latitudeDelta	INTEGER (-512..511)	100 milliarcsec	Latitude Delta (+ for North and – for South) with respect to recentVehicleLocationN1. See recentVehicleLocationN1. latitudeDelta for details
		longitudeDelta	INTEGER (-512..511)	100 milliarcsec	Longitude Delta (+ for East and – for West) with respect to recentVehicleLocationN2. See recentVehicleLocationN1. latitudeDelta for details
	numberOfPassengers		INTEGER (0..255)	O	**Not relevant for the Lab**
optionalAdditionalData				O	



EN16072 - 6.6.1.2 Vehicle based location data

The reference point shall be the last known vehicle's position at the triggering time as determined by the on–board system at the time of message generation. It shall be at the responsibility of the in-vehicle equipment provider to determine how the location data is established.

In the event that at the time of the MSD generation there are inadequate sources of information to provide a reliable determination of location, the confidence bit shall be set to 'no confidence in position' as determined in EN 15722. In this event, the location data element shall contain the manufacturer/equipment supplier best estimate based on available information.

NOTE 1 This may be, forFor example, the last location obtained where there was adequate data source available, or a calculation based on that data and other information made available to the MSD calculation, for example a dead-reckoning.

The confidence bit shall be set as determined in EN 15722. This flag should only be cleared to 'position can be trusted' if a 2D or 3D position fix from current GNSS reception is available or the manufacturer/equipment supplier has another means of being confident that the information provided is within the limit set by EN 15722.

NOTE 2 In the event that the flag is set to 'no confidence in position' this does not mean that the information is necessarily wrong, only that it can be unreliable or lack precision.

NOTE 3: Satellite technology such as EGNOS may be of assistance to provide and validate a “true’ response (position can be trusted).

WGS84 World Geodetic System 84 (last revised 2004)

The World Geodetic System is a standard for use in cartography, geodesy, and navigation. It comprises a standard coordinate frame for the Earth, a standard spheroid reference surface (the datum or reference ellipsoid) for raw altitude data, and a gravitational equipotential surface (the geoid) that defines the nominal sea level.

The latest revision is WGS 84 (dating from 1984 and last revised in 2004. Earlier schemes included WGS 72, WGS 66, and WGS 60. WGS 84 is the reference coordinate system used by the Global Positioning System.