D2.5 Manuals for operators’ training

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<td>112</td>
<td>single European emergency call number supporting Teleservice 12 (ETSI TS 122 003)</td>
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<tr>
<td>call clear-down</td>
<td>termination of call and freeing up of line (usually achieved by hanging up the receiver or pressing ‘end call’ or similar on screen)</td>
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<tr>
<td>cellular network</td>
<td><em>wireless communications network</em> consisting of multiple adjacent access points (cells) with the capability of homogeneous transfer of a communications session instance to an adjacent cell without significant interruption to the session</td>
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<tr>
<td>E112</td>
<td>emergency communications service using the single European emergency call number, 112, which is enhanced with location information of the calling user TS12</td>
</tr>
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<td>eCall</td>
<td>emergency call generated either automatically via activation of in-vehicle sensors or manually by the <em>vehicle occupants</em>; when activated it provides notification and relevant location information to the most appropriate <em>Public Safety Answering Point</em>, by means of <em>mobile wireless communications networks</em>, carries a defined standardized <em>minimum set of data</em> (MSD) notifying that there has been an incident that requires response from the emergency services, and establishes an audio channel between the occupants of the vehicle and the most appropriate <em>Public Safety Answering Point</em></td>
</tr>
<tr>
<td>eCall generator</td>
<td>occupant of a vehicle or equipment within a vehicle that has cause to trigger an <em>eCall</em> transaction by automatic or manual means</td>
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<tr>
<td>eCall In-band Modem (eIM)</td>
<td>Modem pair (consisting of transmitters and receivers at IVS and PSAP) that operates full-duplex and allows reliable transmission of eCall Minimum Set of Data from IVS to PSAP via the voice channel of the emergency voice call through cellular and PSTN networks.</td>
</tr>
<tr>
<td>eCall service</td>
<td>end-to-end emergency service to connect occupants of an affected vehicle to the <em>most appropriate</em> PSAP via an audio link across a PLMN together with the transfer of a <em>minimum set of data</em> to the PSAP</td>
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<tr>
<td>eCall transaction</td>
<td>establishment of a <em>mobile wireless communications session</em> across a <em>public wireless communications network</em> and the transmission of a</td>
</tr>
<tr>
<td><strong>minimum set of data</strong> from a vehicle to a <strong>public safety answering point</strong> and the establishment of an audio channel between the vehicle and the PSAP</td>
<td></td>
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<tr>
<td><strong>eCall trigger</strong></td>
<td>signal emanating from within the vehicle to the eCall in-vehicle equipment which requests to start an eCall transaction</td>
</tr>
<tr>
<td><strong>emergency control centre</strong></td>
<td>unit which deals with emergency calls and which has the capacity to consider professionally the need for response, and which has the provision to mobilize the needed resources to deal with the emergency in question</td>
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<td><strong>eSafety</strong></td>
<td>European Commission-sponsored forum to improve safety for European citizens</td>
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<tr>
<td><strong>in-vehicle equipment</strong></td>
<td>equipment within the vehicle that provides or has access to in-vehicle data required for the <strong>minimum set of data</strong> and any other data that is to be sent as part of or complementary to the <strong>minimum set of data</strong> to effect the eCall transaction via a public mobile wireless communications network providing a link between the vehicle and a means of enacting the eCall service via a public mobile wireless communications network</td>
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<td><strong>in-vehicle system (IVS)</strong></td>
<td><em>in-vehicle equipment</em> together with the means to trigger, manage and effect the eCall transaction</td>
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<tr>
<td><strong>Minimum Set of Data (MSD)</strong></td>
<td>standardized data concept comprising data elements of relevant vehicle generated data essential for the performance of the eCall service [EN 15722:2011]</td>
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<tr>
<td><strong>most appropriate PSAP</strong></td>
<td>PSAP defined beforehand by responsible authorities to cover emergency calls from a certain area or for emergency calls of a certain type</td>
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<td><strong>network access device (NAD)</strong></td>
<td>device providing communications to a mobile wireless communications network with homogeneous handover between network access points</td>
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<tr>
<td><strong>public safety answering point (PSAP)</strong></td>
<td>physical location working on behalf of the national authorities where emergency calls are first received under the responsibility of a public authority or a private organisation recognised by the national government</td>
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<tr>
<td><strong>Teleservice 12</strong></td>
<td>emergency service supported by PLMNs</td>
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<tr>
<td><strong>VIN</strong></td>
<td>vehicle Identification Number</td>
</tr>
<tr>
<td><strong>vehicle occupant(s)</strong></td>
<td>person(s) inside the vehicle</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>DEFINITION</td>
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<tr>
<td>3G</td>
<td>Third generation mobile telecommunication system</td>
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<td>3GPP</td>
<td>Third generation partnership protocol</td>
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<tr>
<td>ACK</td>
<td>Acknowledgement</td>
</tr>
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<td>AleC</td>
<td>Automatic Initiated eCall</td>
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<tr>
<td>CCD</td>
<td>Charge coupled device</td>
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<td>CCIVR</td>
<td>Contact Centre Interactive Voice Response</td>
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<td>CRC</td>
<td>Cyclic Redundancy Check</td>
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<td>ETSI</td>
<td>European Telecommunications Standards Institute</td>
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<td>GIS</td>
<td>Geographic Information System</td>
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<td>GSM</td>
<td>Global System for Mobile communications</td>
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<tr>
<td>HMI</td>
<td>Human Machine Interface</td>
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<tr>
<td>HPLMN</td>
<td>Home Public Land Mobile Network</td>
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<tr>
<td>IVR</td>
<td>Interactive Voice Response</td>
</tr>
<tr>
<td>IVS</td>
<td>In-Vehicle System</td>
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<tr>
<td>MIeC</td>
<td>Manually Initiated eCall</td>
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<td>MSC</td>
<td>Mobile Switching Centre</td>
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<tr>
<td>MNO</td>
<td>Mobile Network Operator</td>
</tr>
<tr>
<td>MSD</td>
<td>Minimum Set of Data (EN 15722)</td>
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<tr>
<td>NACK</td>
<td>Negative Acknowledgement</td>
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<tr>
<td>NAD</td>
<td>Network access device</td>
</tr>
<tr>
<td>OXE</td>
<td>OmniPCX Enterprise</td>
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<tr>
<td>PSAP</td>
<td>Public Safety Answering Point</td>
</tr>
<tr>
<td>REQ</td>
<td>Request</td>
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<tr>
<td>SIM</td>
<td>Subscriber Identity Module (GSM/3GPP)</td>
</tr>
<tr>
<td>TS12</td>
<td>Teleservice 12 ETSI TS 122 003</td>
</tr>
<tr>
<td><strong>UML</strong></td>
<td>Unified Modelling Language (ISO 15901)</td>
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<tr>
<td>--------------</td>
<td>----------------------------------------</td>
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<tr>
<td><strong>UMTS</strong></td>
<td>Universal Mobile Telecommunication System</td>
</tr>
<tr>
<td><strong>USIM</strong></td>
<td>User Service Identity Module</td>
</tr>
<tr>
<td><strong>VLR</strong></td>
<td>Visited Location Register</td>
</tr>
<tr>
<td><strong>WGS</strong></td>
<td>World Geodetic System</td>
</tr>
<tr>
<td><strong>WGS 84</strong></td>
<td>World Geodetic System; issue 1984 (last revised 2004)</td>
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1 Introduction

1.1 Purpose of Document

Main goal of this document is to provide guidance in the preparation of a manual for the receipt of eCalls by PSAP operator’s training during the HeERO project.

There was widespread discussion during preparation of this document as to what exactly should be contained in this document.

Having undertaken a consensus view amongst the Pilot Sites, the overall feeling expressed was that it was unrealistic to prepare an operator’s training manual in a situation, where the full system development was not completed. Therefore the first version of this deliverable is to provide an overview of what eCall is, and how it operates.

This will be provided at a project level, and will be non-specific. A second version of the document will be prepared in month 18 of the project in preparation for the second phase of testing when the PSAP’s will be actively involved, this will be pilot site specific and targeted at the PSAP operators actively involved in the second phase of testing across all pilot sites. This change will be reflected in a contract change which will be submitted at the conclusion of the year 1 annual review.

1.2 Structure of Document

As this document should provide guidance for PSAP and system operators, the structure of document is uncomplicated. As described above; there are not parts dedicated to each Member State Pilot Site as in previous documents from WP2, all parts should be valid for each Member State.

1.3 HeERO Contractual References

HeERO is a Pilot type A of the ICT Policy Support Programme (ICT PSP), Competitiveness and Innovation Framework Programme (CIP). It stands for Harmonised eCall European Pilot.

The Grant Agreement number is 270906 and project duration is 36 months, effective from 01 January 2011 until 31 December 2013. It is a contract with the European Commission, DG INFSO.

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Any communication or request concerning the grant agreement shall identify the grant agreement number, the nature and details of the request or communication and be submitted to the following addresses:

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Information Society and Media Directorate-General
B-1049 Brussels
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by electronic mail:

INFSO-ICT-PSP-270906@ec.europa.eu
2 Manuals for operator’s training

2.1 Introduction

A short description of the whole eCall handling chain can be found in paragraphs 2.3 and 2.4, there then follow scenarios with descriptions of PSAP operator requirements in paragraphs 2.5 and 2.6, which should be taken into account when preparing the necessary procedures in real a live PSAP environment.

2.2 Requirements from DoW

Operator trainings will be performed on the basis of the requirements identified as a part of the analysis of functional and operational requirements (WP 2.1). The different situation related to the eCall system operation will be identified and worked up in the form of training manuals for PSAP operators. This manual and consequent training will cover all eCall system functionalities connected with operators as defined in functional specifications within the European standards.

2.3 eCall – general introduction

eCall can be described as an emergency call generated either automatically via activation of in-vehicle sensors or manually by the vehicle occupants. When eCall is activated, it provides notification and relevant location information to the most appropriate Public Safety Answering Point (PSAP), by means of mobile wireless communications networks and carries a defined standardised minimum set of data (MSD), notifying that there has been an incident that requires response from the emergency services.

After the MSD is transmitted, an audio channel between the occupants of the vehicle and the most appropriate PSAP is established. Should the MSD not be sent or received for any reason then the eCall continues as a normal 112/E112 emergency call and is afforded the same protection and priority as a Teleservice 12 (T12) emergency voice call.

Under normal circumstances, the pan-European eCall transaction consists of the following 9 steps:

Step 1 – Procedures following power-up and initialisation of the in-vehicle system (IVS)

Step 2 – Activation of system
**Step 3** – Call set-up (including identifying call type, make call, network selection and registration, authentication, cell localization and establishing audio connection to PSAP modem server)

**Step 4** – MSD transfer (including disconnect microphone and loudspeaker in vehicle from the line, send call tone, synchronise, request MSD, send MSD, error check and link layer ACK)

**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

### 2.4 eCall service establishment

To initiate an eCall the IVS eCall activation function will request the NAD to initiate a call set-up to the network with a request for a T12. In the call set-up message the IVS NAD shall set the “Service Category Request” message information element (IE) which is known as the "eCall flag". ETSI TS 122 101 provides a description of the "eCall flag" and specifies the mandatory inclusion of the manually initiated eCall (MeC) or automatically initiated eCall ( AeC) identifiers in the call set-up message.

![Figure 1: eCall chain](image-url)
Mobile switching centre (MSC) in the network then routes the call to the most appropriate PSAP. The MSC will make use of the "eCall flag" in the call setup message to route the eCall to a designated eCall compatible PSAP. To be “eCall enabled”, a PSAP needs to be equipped with the necessary hardware and a software application that can receive, process and display the MSD contents to its operators. This could either be a dedicated eCall application or integration in the existing PSAP application. An eCall enabled PSAP shall conform in all respects to the high-level application protocols as specified herein. The eCall flag makes it possible that the eCalls are routed to a designated number which will be created. This way, the PSAP can distinguish the eCalls from the e112 call.

It is necessary to handle three basic procedures for operators, which are described in 2.4.1 (MSD reception), 2.4.2 (request SEND MSD) and 2.4.3 (PSAP call back). Below you can find time diagrams for a better understanding of the dependencies between each process.

2.4.1 Basic eCall - MSD reception

When an in-vehicle system (IVS) calls the PSAP via 112, the OXE routes the call directly to an IVR group. The call is routed to an IVR. The IVR application will collect the MSD from the IVS call, attach all information contained in the data to the call and then route it to an agent group – pilot CCD.

Once the uplink synchronization has been detected, the PSAP modem transmits the NACK message until reception of a successful CRC check of the MSD message is obtained.

Where an MSD reception failure is detected by the failure of the CRC check, a new synchronization is required and the PSAP eCall modem retransmits the START message and add data to the redundant version of the MSD. The MSD reception should not exceed T8 (Requirement specified in EN16062). In this case a MSD_TIMEOUT error message will be return to the CCIVR application and the call will be routed to an operator.

Once information has been collected by the PSAP eCall modem, the CCIVR will attach data to the call and then transfer the call to a PSAP operator. When an operator takes a call, the call taker application retrieves the data from the MSD. The PSAP operator is in voice communication with the occupants of the vehicle.

The above sequence is depicted in the next diagram.
2.4.2 Request SEND MSD

After the MSD has been sent and the IVS occupants are in communication with an operator, the system will continue to respond to the MSD resend request from the PSAP for the duration of the call.

The above sequence is depicted in the next diagram.
2.4.3 PSAP Call back

If an eCall has been successfully terminated by the PSAP, then the IVS will allow a call-back to the vehicle. The call taker application has an integrated a “call-back” button in the user interface. This feature will allow a call-back to the IVS and the transfer of the call to the CCIVR application, as in the previous scenario.

The above sequence is depicted in the next diagram.
2.5 Process of eCall reception and handling

The following text describes the operating sequence of the PSAP operator during the eCall reception and dispatch and also the main differences between an ordinary 112 and eCall dispatch:

**E112 call**

An operator receiving an E112 call will only have available voice contact with the caller and the presumed location provided by the mobile network operator.

**eCall**

In addition to the voice contact as described above, the operator receives more information in the form of a minimum set of data (MSD) which means:

- Precise caller identification
- Event location
- Vehicle direction
• More accurate event classification

This data enables the implementation of automatic processes for quick evaluation and dispatch:

• Automatic classification (automatic/manual/test call)
• Automatic matching caller position with event position
• Automatic regionalization (based on event location and classification – correct rescue forces unit)

This information means that the operator does not need to have voice contact with caller; therefore he/she has to be trained for the situation when only the MSD is presented on operator’s screen.

2.5.1 eCall reception and visualization

eCall can be automatically received due to the auto answer function. On the operator screen the calling number and eCall icon is displayed. Special acoustic notification can also be configured.

2.5.2 Event form opening

The operator opens the screen the form for new event data entry the “telephone detail” call information and the MSD are displayed. The location and vehicle direction are handed over to the GIS client. GIS displays these data and recent vehicle location.

2.5.3 Proposal of data interpretation

The operator is notified of eCall data quality and credibility by means of key MSD value (automatic activation, test call, trusted position).

The event that this information cannot be confirmed by voice communication with passengers, the interpretation is as follows:

• eCall was activated automatically – it is a probably traffic collision
• eCall was activated manually – it could either be a traffic collision or another type of incident
• eCall is test call – event classification is predefined as technological test
• in the event that both automatic and manual activation occurs, it can signal an error in the MSD communication
• if the positional data’s credibility is compromised, then the automated receipt of eCall is halted.
2.5.4 Process automation
The operator can take control of all automated processes

2.5.4.1 Automatic matching caller position with event position
This functionality allows the caller’s position to be graphically displayed via a map. The location is based on either GPS or mobile network position identification.

2.5.4.2 Automatic classification
System automatically set up predefined classification “traffic collision” for all rescue forces (Fire Rescue, Ambulance, Police). System is also able to set-up predefined classification as a “technological test”.

2.5.4.3 Automatic regionalization
If the caller position is matched with event positioning, the system determines the regionalisation rule for the road (road + km + direction) that has been found as probable road where vehicle was moving. In case that the rule doesn’t exist or such a road is not found, the system takes a nearest urban area accordingly to GPS position and offers a regionalisation rule position based on the GPS coordinates and the urban locality.

2.5.5 GIS visualization
Call taker application sends position and direction information to GIS.

2.5.6 Manual classification and regionalisation
In the case that the process of automatic classification is deactivated, the operator selects the classification manually from the menu.

2.5.7 Event position determination
• By means of line topography if a probable road is known
• If a probable road is not found, then the event position is determined as the call position point + urban area, to which the call position point belongs – it means determination of the location with the help of address topography

2.5.8 Additional information
If vehicle occupants can communicate, the operator completes the following information.
• communication level (communicates / doesn’t communicate)
• call back number
• other remarks
2.5.9 Event saving and dispatch
The operator saves an event and the system automatically sends the data record to the Emergency Control Centre system of rescue forces to enable dispatch.

2.5.10 Request SEND MSD
Description:

1. Operator evaluates the data in the MSD are finds that it is inadequate, or requires updating (corrupted data, the position is marked as unreliable).

2. Operator notifies the caller that voice communication will be interrupted.

3. Operator presses "Request MSD" button.
   - In call sub-form a running MSD query is signalled
   - The call is automatically routed to the IVR (disappears from the phone software)
   - after the MSD is received, the call is routed back to the operators workplace, where the call was originally handled - in SW phone call is ringing
   - this call is indicated by the Call Agent as a call from the previously adopted and broken eCall
   - data from the IVR is processed by eCall Centre module meanwhile, this module informs dispatching applications which reads the updated data
   - operator will answer call automatically – thus voice communication with the caller will be restored

4. Operator notifies the caller in need of assistance that voice communication has been restored.

2.5.11 PSAP Call-back
This is a situation where the call is interrupted or there is need to call the vehicle back. If the operator uses the PSAP call back function (i.e. for call back is used a number which comes from the initial call) he/she will be able to request the delivery of the MSD.

Description:

1. Operator uses the option from the context menu item and chooses the "Call back" option.

2. After creating a connection the, application automatically connects an outgoing call to the event.

3. The operator has the possibility to request the re-sending of the MSD by the IVS.
4. MSD received will be added to the original call.

2.6 eCall visualization - screen examples

2.6.1 Acoustic signalisation of eCall

System indicates eCall acoustically based on configuration:

- different from E112
- identical with E112
- does not indicate

![Figure 5: Example of visualization acoustic signalling of eCall](image)

2.6.2 eCall visualization in the SW phone

System indicates an eCall visually by the eCall icon. SW phone displays attributes from the MSD control. A repeated call from the number is indicated by colour.

![First call and Repeated call](image)
2.6.3 eCall visualization in the Event details

Event details indicate an eCall visually by means of eCall icon. List Control is extended by eCall items that are placed first.

System displays whether voice communication with car occupants was established or not. Moreover it shows call-back number and information if the event is bound with the caller or not (checkbox witness).
Operator can see MSD content in the event details. Position and direction data are automatically handed over to view in GIS.

**Figure 8: MSD content visualization**

2.6.4 eCall visualization in the Call list

The system visualizes the call in the call list in a standard way but for eCall it displays the respective icon.

**Figure 9: eCall visualization in the Call list**
2.6.5 eCall visualization in the application protocol

The system displays eCall in the application protocol in the format as follows:

- first row "eCall (real one, automatic activation, trusted position) from the number 603123789, time 14:59:32, X= -461333, Y= -1102339"
- if the eCall data errors, then they are displayed as child rows (tree control) - on each line is always an error (error code and error description)
- font colour pink, the first line bold

![Figure 10: eCall application protocol](image)

2.6.6 Automatic Visualisation

It is used five states, which have been designed for the corresponding icons

1. ✗ Automatic run, the system waits for data
2. ✔ Automatic action was successful
3. ✗ Automatic action failed (the data are incomplete or inaccurate)
4. ❌ This call does not perform automatic actions
5. ✗ Manual intervention, the result of any automatic action is not reflected.

These icons are displayed next to the appropriate controls, i.e. bookmarks with classifications and showing the interaction of rescue units. They inform the operator about the appropriate data quality.
2.6.7 eCall visualization in GIS

GIS Map application shows eCall position twofold - firstly, the eCall adopted by the dispatcher at the station and also historical eCall calls throughout the country.

The call is displayed in the map by icon which is specific for eCall, with label with ID phone with a red arrow showing the direction of vehicle movement (azimuth) and the circle indicating the call area. The radius of the circle is dependent on whether the call position is guaranteed. If the call position is guaranteed, the following radii are valid:

First level - radius = 100 m  
Second level - radius = 500 m  
Third level - radius = 1000 m

If the call position is not guaranteed, the following radii are valid:

First level - radius = 500 m  
Second level - radius = 1000 m  
Third level - radius = 10000 m

These are also areas for searching by means of topography helper.
At the same time the likely road on which the vehicle is moving is highlighted by a transparent orange colour in the map.

The GIS Map client displays two types of eCall information: current calls received on the station and positions of all other eCalls.

The GIS Map client also displays call areas for ordinary E112 call.

Figure 12: eCall visualization in GIS

Map displays the likely call with eCall road, mile and direction of vehicle. In the right panel, telephone points in the GIS application, call the eCall is divided into two parts - essential part of the call contains telephone ID + suffix “(eCall)”. GSM part of the call contains only telephone ID. If the operator wants to view the map of GSM calls, simply selects the entry in the "Telephone identification" field and click on the "Show phone" button.
Addressing the priorities of the available positions for the user to display and switch between the two positions:

- The eCall location obtained from MSD is considered as priority if such position is available.
- If MSD positioning data is not available (delivered or damaged MSD) the location obtained with the call is used.
- The operator can choose from both positions or choose another entry in the "Telephone identification" field and press "View Phone" button.

Recent position view:
A view of previous positions is beneficial for operators because it will allow problem solving by identifying the roads, on which the damaged vehicle has been moving in the situation of a complex intersection. The attached figure presents a way to view: two points (N-1, N-2)
connected by red broken line. Such a view corresponds to reality: the first two previous points, then place intended as a location (middle icon) and then the arrow indicating the direction in which the vehicle would continue. Since previous positions are optional, these points will only be displayed sometimes.

![Figure 14: Detail of eCall position](image)

**View of other eCall positions**

In addition to the position of the currently adopted eCall there are locations displayed of all the other eCalls in the map. This is enables the operator to detect any related calls. It appears as an icon for all other eCalls in respective places. Additional information is available in the bubble help.

![Figure 15: View of other eCall positions](image)