MIGRATION OF eCALL TRANSPORT

This information is based upon STF456 working assumptions.
The views expressed do not necessarily represent the position of ETSI in this context.
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eCall is based on Circuit Switched emergency call (Teleservice 12) and in-band modem which was optimised for 2G (GSM) and 3G (UMTS) networks.

There is no Circuit Switched emergency call in 4G-only (LTE) networks. IMS Emergency Call and IMS Multimedia Emergency Service are used instead.

Circuit Switched emergency call is assumed to be supported in mobile networks for a long time, due to legacy handsets and regulatory reasons. However, vehicles have a long lifespan.

A long term plan to deliver eCall over IP Multimedia Subsystem (IMS) is desirable to benefit from resource efficient packet based systems and ensure continuity of eCall.
TR 103 140 is about 80% complete.

- Owned by ETSI TC MSG (Mobile Standards Group)
- The current draft version is 0.5.0
- The next MSG meetings are 6 February and 5-7 March, 2014
- Approval of TR 103 140 is expected on 7 March, 2014
- Publication of TR 103 140 expected before 31 March, 2014
Technology possibilities
IMS eCall solution
Migration options
Possible future eCall enhancements
Recommendations & conclusions
3GPP IP Multimedia System (IMS)
- Main subject of this presentation.
- Use IMS Emergency Call or IMS Multimedia Emergency Service with a few additions.

In-band modem over VoIP
- Would work but de-jitter buffering and time-warping might impair in-band modem performance.

Fall-back to CS domain (CSFB)
- Assumes IMS capable IVS is also CS capable.

Over the Top (OTT) eCall app
- No standardised solution for routing the eCall to the appropriate PSAP.
- Very little operator control.

ITS-stations
- Requires detailed consideration in TC ITS as a future eCall method.
- A mechanism for routing eCalls to PSAP needs to be specified.
Main eCall features required in IMS are:

- eCall Flag
- Voice
- Transfer of MSD
- Location of the vehicle
- Caller identity
- Identifying network support for eCall over IMS (new)
- Mobility management
- Session management
- Call-back for eCall
- End to end acknowledgement that the PSAP application has received the MSD

Many of the above features already exist in IMS Emergency Call and IMS Multimedia Emergency Service.
**IMS eCall solution**

**eCall Flag**

- Recommended solution is to use new URN - SOS sub-categories to be defined in IETF. These would be used for routing in a similar way to emergency service specific routing. Two new sub categories are required, e.g.:
  - urn:service:sos.ecall.manual
  - urn:service:sos.ecall.automatic

**Transfer of MSD**

- The recommended solution is the send the MSD in the initial SIP INVITE message. The MSD is received by the PSAP before the voice call starts and it is in the same session as the voice. Up to 1024 bytes is possible but only 140 are needed. IETF also agrees with this method.
- An alternative method would be to send the MSD in the SIP user plane.
Location information of the vehicle

- Two sources of location information are available in CS eCall (i.e. GNSS derived is in the MSD and cell-id from the operator)
- Dual source adds confidence and should be preserved in IMS eCall

Caller identity

- Calling line identity (CLI) is necessary for the PSAP or emergency workers to call back the IVS. CLI is supported in IMS specifications.

Identifying network support for eCall over IMS

- A new indicator from the network to indicate its support of IMS eCall to the IVS is needed. A request to 3GPP will be made in Release-13 or Release-14
  - Without the indicator the IVS may attempt to use IMS but eCall would not work properly

Mobility management

- The eCall inactive substate is needed in IMS so that an eCall-only IVS does not register to the selected PLMN until the eCall is triggered.
  - Needs to be introduced into IMS specifications in Release-13 or Release-14.
Session management
- Providing emergency bearers to the IMS and eCall bearers.

Call-back for eCall
- Required for PSAP and first responders to call back with IVS during at least the first hour.
  - The IVS does not know that the callback is from a PSAP but 3GPP is working on a solution for this in Release-13
  - An alternative solution is to leave the session open for 1 hour.
End to end acknowledgement

- Application layer ACK from the PSAP to IVS confirming the reception of the MSD.
  - Used to store a record in the IVS.
  - The recommendation is to send the ACK in the INFO message.
Co-existence of CS and IMS eCall

Make all accesses usable, with adequate effort

Extremely rare scenario

Voice (bi-directional) + Modem (one-directional)

IMS eCall

3G / 4G

PLMN

IVS

CS eCall

2G / 3G

CS

IP based eCall

PSAP

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Migration scenarios

Initial scenario

• In-band modem and CS emergency (scenario 1)

IP Multi Media based PSAP but no IMS eCall coverage

• There would be a media gateway function (MGF) to convert from CS to PS at the PSAP (scenario 2)

IMS eCall coverage but CS based PSAP

• There could be fallback to CS after initial IMS try (scenario 3a), or a media gateway function in the PSAP (scenario 3b), or use in-band modem end-to-end (scenario 3c).

All packet scenario

• IMS eCall (scenario 4).
### Summary of scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>IVS</th>
<th>MNO</th>
<th>PSAP</th>
<th>MGF</th>
<th>Comments</th>
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<td>MSD over CS</td>
<td>2G/3G CS</td>
<td>in-band CS</td>
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<td>Initial solution using CEN High Level Application Protocol (HLAP) EN16062.</td>
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<td>IP MM</td>
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<td>2G/3G CS</td>
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<td>MSD in IMS</td>
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<td>3G/4G IMS</td>
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<td>4</td>
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<td>3G/4G IMS</td>
<td>IP MM</td>
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<td>Long term solution</td>
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</tbody>
</table>

**IP MM** – IP Multi Media  
**MGF** – Media Gateway Function  
**MNO** – Mobile Network Operator
Possible future enhancements of eCall

- More comprehensive data set(s)
  - Regional specific data (e.g. ERA-GLONASS), medical data of the occupants, other vehicle data.

- Wider range of support services
  - Integration of eCall with ITS-stations would allow obstacle alerts, ramp control, platooning collision avoidance as well as eCall.

- Wider range of users (additional user categories)
  - Commercial vehicles
  - Powered two wheel vehicles
  - Unpowered vehicles (bicycles etc.)
  - Vulnerable road users (visually, physically, mentally challenged)
  - Personal eCall

- eCall enhancement
  - Extended MSD, no muting of the voice channel, other media (e.g. video from on-board cameras), return path data (e.g. metadata)
Recommendations and conclusions

- Existing “IMS Emergency Service” and “IMS Multimedia Emergency Service” standards are suitable, with relatively minor modifications, to support eCall.
- eCall in-band modem performance may be impaired in packet networks (de-jitter buffering) and therefore in-band modem over VoIP is considered as last resort for some migration cases only.
- The initial SIP-INVITE message should be used for MSD transport. An alternative solution using a separate media bearer is not ruled out.
- Some existing eCall functionality (eCall flag for routing, inactive sub-state) is currently only specified for CS and needs to be added to IMS eCall solution.
- New URN sub-classes need to be defined for IMS eCall for routing purposes (equivalent to the Service Category in CS).
- An indication in the system broadcast information over the air interface (UMTS-PS and LTE), that the network supports IMS eCall, is required.
- For eCall-only UEs a short term solution is to use CS eCall on 2G/3G instead of LTE, even if the UE is IMS capable (i.e. auto default to 2G/3G).
- From a certain date, all IVSs should support both CS and IMS eCall. If PSAPs are upgraded to support IMS eCall then they should continue to support CS eCall.
- IMS eCall opens the possibility of additional eCall functionality.
- An application layer protocol needs to be specified in CEN for IMS eCall to meet current higher layer requirements and potential future requirements.
- XML encoding needs to be retained as an option in EN15722.
Potential advantages of IMS eCall vs CS eCall

- Faster MSD transfer, substantially smaller effort, no loss of speech path, > 140 bytes, 2 way data.
- Additional media (e.g. text and video).
- Enhanced functionality such as PSAP ability to view video streams from on-board cameras, send instructions to vehicle, e.g., sound horn, flash lights, lock/unlock doors, disable ignition.
Recommendations for next steps

An EC funded project under either ETSI or CEN lead, should be created to:

- Study and develop any additional specifications for integration of eCall into ITS- Stations, and provide high level protocols for routing to the 'most appropriate PSAP'.
- Consider the potential future requirements and the viability of including other media, particularly video in IMS eCall.
- Produce a new version of the CEN High Level Application Protocol for IMS eCall (the current EN 16062 is for in band modem).

It is recommended that this study is used by stakeholders as the basis for change requests in 3GPP for IMS eCall.