In-Vehicle Emergency Call Service
Save lives in road accidents

Workshop on Vehicle Communications and Automated Driving
28-29 July 2015, Beijing, China
Motivation and history of In-Vehicle Emergency Call

eCall and NG-eCall

Emergency Rescue System Architecture

Conclusion
Motivation for In-Vehicle Emergency Call


<table>
<thead>
<tr>
<th>Year</th>
<th>Accidents</th>
<th>Injuries</th>
<th>Death</th>
<th>Economic losses</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>298,076</td>
<td>258,827</td>
<td>6,225</td>
<td>86,276</td>
</tr>
<tr>
<td>2011</td>
<td>272,042</td>
<td>247,900</td>
<td>11,104</td>
<td>84,021</td>
</tr>
<tr>
<td>2012</td>
<td>254,075</td>
<td>237,421</td>
<td>11,576</td>
<td>84,327</td>
</tr>
<tr>
<td>2013</td>
<td>237,384</td>
<td>224,327</td>
<td>11,589</td>
<td>84,896</td>
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</table>


Death rate (%) for traffic accident

- 10% Death in the Accident
- 46% Death before Arriving Hospital
- 44% Death in Hospital

Source: Epidemiology trends and characteristics of Chinese traffic accidents Chongqing Medical Science 2004 July.

Rescue in the first hour is vital
What happened so far in EU

2005
EC tasked ETSI MSG to develop eCall modem

2008
ETSI/3GPP eCall modem competition

2011
HeERO1 Start & MNO Recommendation for MS

2012
Qualcomm Europe Field Trial

2013
HeERO2 Start & ETSI NG eCall STF & EU regulation for PSAPs

2015
EU IVS Type-Approval Adoption & I_HeERO Start
China Emergency Rescue System (E-Call)

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>Emergency rescue WG is kicked-off</td>
</tr>
<tr>
<td>2014</td>
<td>E-Call kick off</td>
</tr>
</tbody>
</table>
| 2015 H1 | § System solution design  
          § Baseline setting  
          § Testing     |
| 2015 H2 | § Solution standardization  
          § Procedure standardization  
          § Policy recommendation |
| 2016  | § Start operation  
          § Mass commercial deployment                                 |

- Promote national standardization and procedure setting  
- Equipment deployment  
- Filed test
What is eCall?

- eCall is the upcoming pan-European and Russian in-vehicle emergency call system utilizing connectivity over mobile networks
- eCall IVS to be installed in all new vehicles
  - In Russia – 2015 onwards...
  - In EU - 2018 onwards...
- Existing PSAPs need to be upgraded to support eCall

Requirements
- Allow automatic and manual data transmission
- `Minimum Set of Data` (MSD) e.g.
  - Position, orientation, direction, time
  - Car and fuel type
  - Severity of incident, # passengers
- Employing existing emergency mechanisms (call prioritization)
- Simultaneous speech connection to PSAP
- Data transmission over in-band modem (3GPP/ETSI standardized)
Why In-Band Solution?

GSMA Operators wanted to leverage routing of normal e112 voice calls

- Reuse existing emergency call prioritization mechanisms
  - Currently only available for CS domain

- Minimal impact to mobile networks
  - Main modifications to the system are in the terminal and the PSAP
    - Some “hidden” voice quality enhancements or voice compression in the network may cause trouble
    - Voice and accident information are inherently linked together using the same transport bearer

- Packet data systems were not as widely deployed at that time
  - CS voice is still the common minimum service available everywhere in the EU
  - PS networks in the EU are so far legally not obliged to provide emergency services

- European operators use AMR/AMR-WB speech codecs
  - Waveform codecs that preserve time-scale of signals which enable higher-rate pulse-position modulation vs. frequency-shift-keying
eCall In-band Modem Transmission Chain

From IVS to PSAP

- IVS or PSAP initiates MSD transmission within the E112 call
- Voice path is muted until MSD is correctly received
eCall to be mandated for all new vehicles in Russia and the EU

**Russia since 2015, EU in 2018**

- **HeERO** = European Commissioned-sponsored pre-deployment trials for eCall
  - 82 HeERO Partners, 19 pilot sites, 15 countries
  - QCOM conducted an own trial prior to the official national HeERO pilots
    - Results serve as reference for all national HeERO pilots
    - eCall modem performance is now considered to be reliable enough for public safety services

- Qualcomm Europe field test campaign has greatly promoted eCall
  - Qualcomm established as independent trusted technical advisor in the community
  - Qualcomm received HeERO award in November 2013 for our contribution toward the deployment of Pan European eCall
Why Next Generation eCall?

- To address the limitations of In-band Modem eCall
  - e.g. low data rate, 140 bytes data size constraint
  - no consideration of complementary data transmission

- To embrace LTE and VoLTE deployment trend
  - Evolve the call from CS to VoIP
  - High quality voice, faster call setup, simultaneous voice & data

- To improve flexibility and Extensibility
  - Easy to introduce complementary data or new media
Next-Gen eCall Architecture

Based on IMS emergency voice calls in 3GPP Rel-9 plus enhancements expected in the Rel-14 timeframe for NG eCall

- Richer media by utilizing IMS service
- NG-eCall requires only minor enhancements to the IMS emergency call systems dedicated for PS networks
- Multi-mode IVS device supports falling back to in-band eCall mode if network doesn’t support IMS NG-eCall
Emergency Rescue System Architecture

Accommodate regional deployments and operations

<table>
<thead>
<tr>
<th>EU</th>
<th>Russia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandating 112 public services employing in-band where PSAP is decoding the MSD directly</td>
<td>Mandating same 112 public service approach as EU but with SMS and PS data extensions</td>
</tr>
<tr>
<td>Allowing also 3rd party services with fallback to 112 which requires handover of MSD data to PSAPs</td>
<td>Established dedicated emergency call network operator (Glonass-Union) requiring dual profile SIMs to differentiate</td>
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</tbody>
</table>

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<tr>
<th>TIAA/China</th>
<th>Commercial 3rd party service (no mandate)</th>
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<tr>
<td></td>
<td>PS data + CS call with fallback to legacy or NG eCall</td>
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<td></td>
<td>Allowing constant tracking through stay alive messages of registered vehicles</td>
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Conclusions

eCall can save lives by reducing response times of emergency services for road accidents

- In-band modem PSAP capability should be retained as long as not all CS networks are shut down
  - Increases network coverage and thus the chance to setup an eCall

- A short/mid term solution is to use CS eCall on 2G/3G instead of packet-switched networks like LTE, even if the IVS is IMS capable
  - i.e. employing 2G/3G CS fallback (CSFB) mechanism

- From a certain date, all IVSs should support both CS and IMS eCall
  - Even if PSAPs are upgraded to support IMS eCall then they should still continue to support CS eCall for legacy devices
  - A NG-eCall broadcast flag is proposed to instruct dual-mode IVS to place an eCall over IMS when this is supported end-to-end by the network and the PSAP

- IMS eCall paves the way for “Next Generation” eCall
  - Allows the integration of new features and applications
  - Can further improve time and cost efficiency of rescue services for saving lives
Thank you

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