Next Generation eCall
Background

• eCall standardisation began in 2004
  – A GSM & UMTS world
  – The chosen solution was in-band modem and circuit switched 112 call
  – The in-band modem was optimised for circuit switched GSM and UMTS.

• eCall for LTE standardisation was started in 2013
  – There is no circuit switched in LTE
  – IMS emergency call will replace circuit switched emergency call.

• Need for long term thinking
  – Motor vehicles last longer than phones
  – PSAPs investments must be protected
  – GSM and UMTS spectrum is being re-farmed for LTE
  – 5G is coming
eCall options for packet switched networks

- In-band modem on VoIP
  - De-jitter techniques in packet switched networks affect performance
  - Loss of audio path (muting)
  - Not a good base case but useful as back up in some scenarios
- Over the top data
  - No priority or QoS. Data not associated with voice.
  - Data service has to be enabled on the phone
  - MNO can’t route to most appropriate PSAP
- Short Message Service (SMS)
  - Data not associated with voice
  - Roaming scenarios are complicated
  - SMS to 112 not supported in some countries
- IP Multimedia Service (IMS)
  - Supported in 3G (PS), 4G and 5G
  - IMS emergency call can carry data with the signalling
  - Integrated voice and data, emergency prioritization, & high reliability
• First Generation eCall is based on Circuit Switched emergency call and in-band modem
  - “CS eCall”

• Next Generation eCall is based on IMS emergency call
  - “NG eCall”
Why not go straight for NG eCall?

- The eCall deployment deadline is March 2018.
- IMS emergency call is unlikely to be deployed everywhere in Europe by 2018.
- NG eCall needs a network support indicator which is in 3GPP Release-14.
- Some countries are now ready for CS eCall.
- CS eCall can co-exist with, and migrate to, NG eCall.
- Majority of PSAPs will not be NG eCall ready by 2018.
  - NG eCall to a CS only PSAP will provide the worst possible MSD reliability due to transcoding from VoIP to inband (at a media gateway)
NG eCall key features

- Based on IMS emergency call, and SIP server in the PSAP
- Routing to PSAP based on Uniform Resource Names (URN)
  - urn:service:sos.ecall.manual for manual eCall
  - urn:service:sos.ecall.automatic for automatic eCall
  - urn:service:test.sos.ecall for test eCall
- Initial Minimum Set of Data (MSD) is sent in SIP INVITE
- MSD is acknowledged in the INVITE response
- A new MSD can be requested by the PSAP using SIP INFO
Co-existence of NG eCall with CS eCall

- Vehicles supporting NG eCall shall also support CS eCall
- PSAPs supporting NG eCall shall also support CS eCall
- The network shall have an NG eCall support indicator
  - Shows if the network supports NG eCall and there is an NG eCall capable PSAP
  - If the indicator is present, the vehicle does first attempt NG eCall
  - If the indicator is not present, the vehicle does first attempt CS eCall
Co-existence of NG eCall and CS eCall

- **Vehicle**
  - NG eCall
  - CS eCall

- **Network**
  - Circuit switched 2G / 3G
  - IMS 3G / 4G / 5G

- **PSAP**
  - NG eCall
  - CS eCall

**Diagram Notes**
- In band modem
- SIP
- NG eCall supported in network and PSAP
- NG eCall not supported in network or PSAP
- Circuit switched network not available
NG eCall Standardization Status

- **ETSI / 3GPP**
  - TR 103 140 recommends to use 3GPP and IETF for eCall – published in 2014
  - Emergency call requirements for IMS – **stable**
  - IMS eCall requirements and migration from CS eCall – **stable**

- **IETF**
  - “eCall” RFC – publication soon
    - Focuses on next generation eCall specific needs for the EU
    - Carries data and metadata/control objects per ‘additional-data’ mechanism
    - Metadata/control (ack, retransmission, requests to vehicle, etc.)
  - ‘additional-data’ specification (RFC 7852) - published
    - Transmit any registered data block with emergency call

- **CEN**
  - eCall over IMS (TC278 WG15, PT1506) – draft available, approval expected Q1 2017
  - eCall to other classes of user (PT1507) – **started**
  - eCall over a common telematics platform (PT1508) – **started**
Additional possibilities in NG eCall

- Pictures and video sent to the PSAP
- More data, e.g. information from nearby cars
- Telemetry, e.g. PSAP to flash lights and sound horn

- None of the above are required by current regulation
Considerations for numbering

- NG eCall will use the mechanisms IMS emergency call (e.g. resolving domain names to IP addresses or SIP addresses).
- NG eCall PSAP needs a number or IP address to call back to.
- CS eCall PSAP needs a number to call back to.
4G Architecture for NG eCall with an IMS capable PSAP (IMS eCall broadcast indicator = 1)

- The signaling path rather than voice path is used to transfer the MSD from the IVS to the PSAP
- Initial MSD can be transferred during call setup procedure and an updated MSD can be transferred during an eCall
4G Architecture for NG eCall with a legacy CS capable PSAP (IMS eCall broadcast = 0)

- The MSD cannot be transferred using the signaling path
- The MSD is transferred over the voice path using the same data modem as for CS eCall in Rel-13
- The transcoding from VoIP to CS voice at the MGW can degrade in-band MSD transfer reliability and increase delay and is a solution of last resort
Handover of an NG eCall from LTE to CS with an IMS PSAP

- After handover any updated MSD must be transferred in-band from the IVS to the PSAP
- The PSAP will be aware of the handover and has to switch to in-band mode after the handover
What do stakeholders have to do for NG eCall?

- **Vehicle manufacturers**
  - Install both NG eCall and CS eCall on new vehicles. As soon as possible (cars last 20 years).

- **Mobile network operators**
  - Set up networks to act upon URNs and route eCalls to NG PSAPs according to location.
  - Set up NG eCall support indicator so that the vehicle behaves correctly.

- **PSAPs**
  - Upgrade to NG eCall, including a SIP server.
  - Continue supporting CS eCall (for older vehicles)
EU eCall Regulations

- Does NG eCall comply?
• **What are the eCall regulations in the EU?**
  - Require countries to upgrade their PSAPs and accept eCalls by 1 Oct 2017
  - Require eCall for new vehicle type approvals from 31 March 2018
  - Recommend that mobile network operators implement the eCall flag

• **Does NG eCall fit the EU regulations?**
  - NG eCall will be a European standard (CEN and ETSI)
  - NG eCall does everything that regulation requires (voice, MSD, callback)
  - NG eCall meets the requirements better; low MSD transfer delay, more reliable MSD transfer, no voice muting
  - NG eCall will still work when 2G and 3G networks close down
    But
  - The recommendation to mobile network operators does not currently extend to URNs
  - Additional features may be prohibited
Conclusion

- Deploy CS eCall now
- Start preparing for NG eCall (eCall on IMS)

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Thank you

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Key Abbreviations

- LTE = long term evolution
- IVS = In vehicle System
- CS = Circuit Switched
- PS = Packet Switched
- VoIP = Voice over Internet Protocol
- SIP = Session Initiation Protocol
- MGW = Media GateWay
- MSD = Minimum Set of Data
- PSAP = Public Service Answering Point
- URN = Uniform Resource Name
- USIM = Universal Subscriber Identity Module
- IETF = Internet Engineering Task Force
- 3GPP = Third Generation Partnership Project
- CEN = Comité European de Normalisation
- ETSI = European Telecom Standards Institute