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In-Vehicle Emergency Call Service

Save lives in road accidents

QUALCOMM®
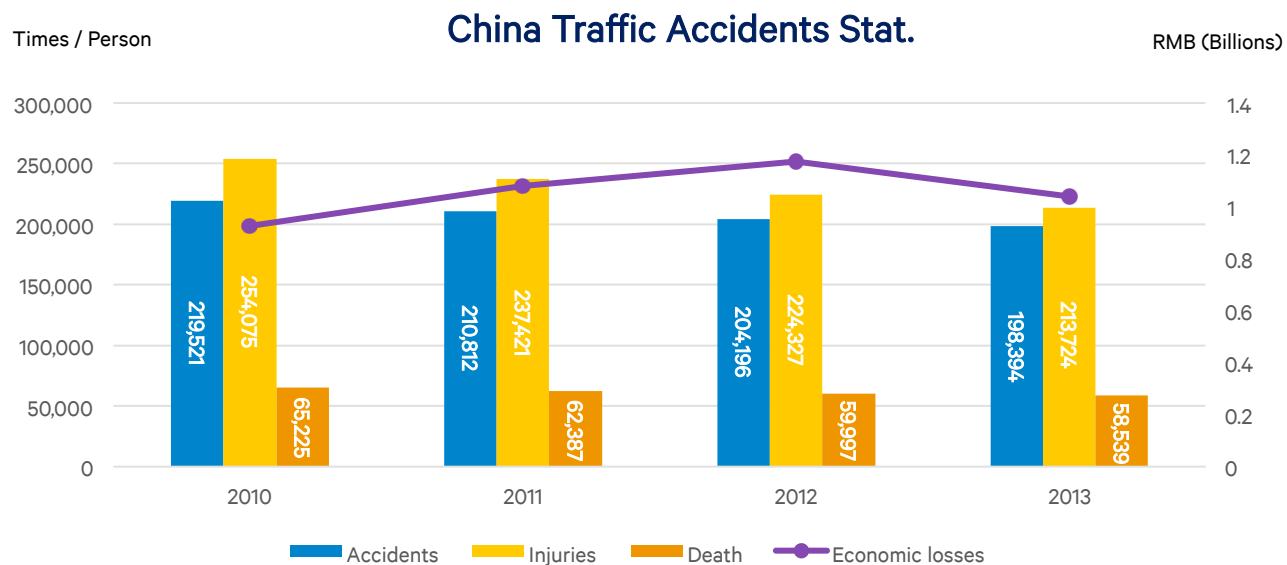
Workshop on Vehicle Communications and Automated Driving
28-29 July 2015, Beijing, China

1 Motivation and history of In-Vehicle Emergency Call

2 eCall and NG-eCall
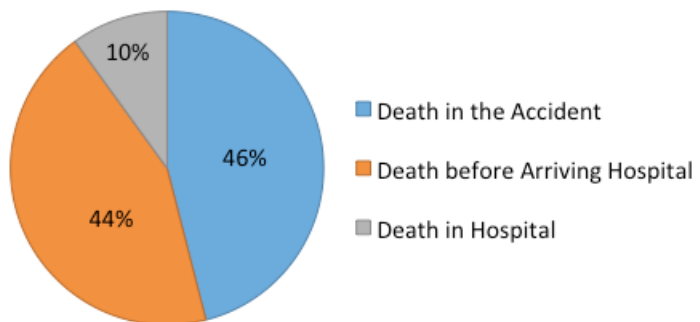
3 Emergency Rescue System Architecture

4 Conclusion

Agenda

Motivation for In-Vehicle Emergency Call
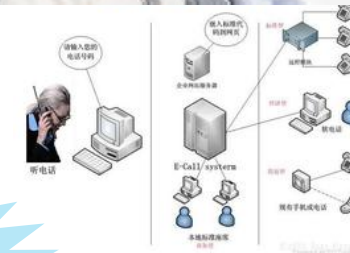
China Traffic Accidents Stat.

Times / Person

RMB (Billions)

- Accidents
- Injuries
- Death
- Economic losses

Source: National Bureau of Statistics of PRC http://www.stats.gov.cn/tjsj/ndsj/

Death rate (%) for traffic accident

- Death in the Accident — 46%
- Death before Arriving Hospital — 44%
- Death in Hospital — 10%
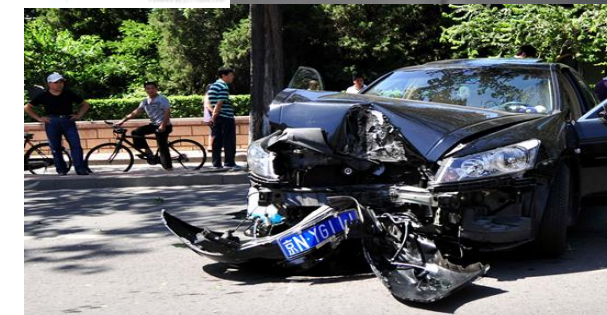
Source: Epidemiology trends and characteristics of Chinese traffic accidents
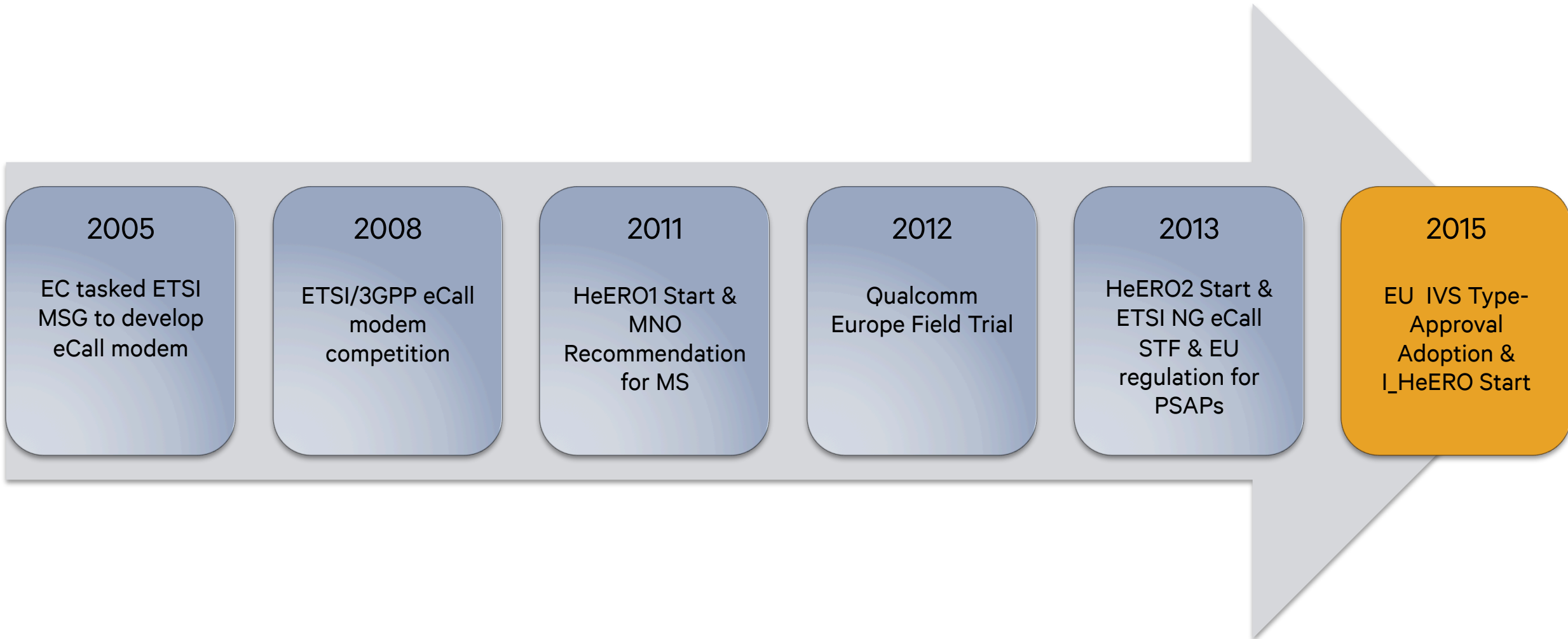*Chongqing Medical Science 2004 July.*

Rescue in the first hour is vital

3

What happened so far in EU

2005	2008	2011	2012	2013	2015
EC tasked ETSI MSG to develop eCall modem	ETSI/3GPP eCall modem competition	HeERO1 Start & MNO Recommendation for MS	Qualcomm Europe Field Trial	HeERO2 Start & ETSI NG eCall STF & EU regulation for PSAPs	EU IVS Type-Approval Adoption & I_HeERO Start

China Emergency Rescue System (E-Call)

2012
Emergency recuse WG is kicked-off

2014

E-Call kick off

- System solution design
- Baseline setting
- Testing

2015 H1

- Solution standardization
- Procedure standardization
- Policy recommendation

2015 H2

- Promote national standardization and procedure setting
- Equipment deployment
- Filed test

2016

China Emergency rescue system

- Start operation
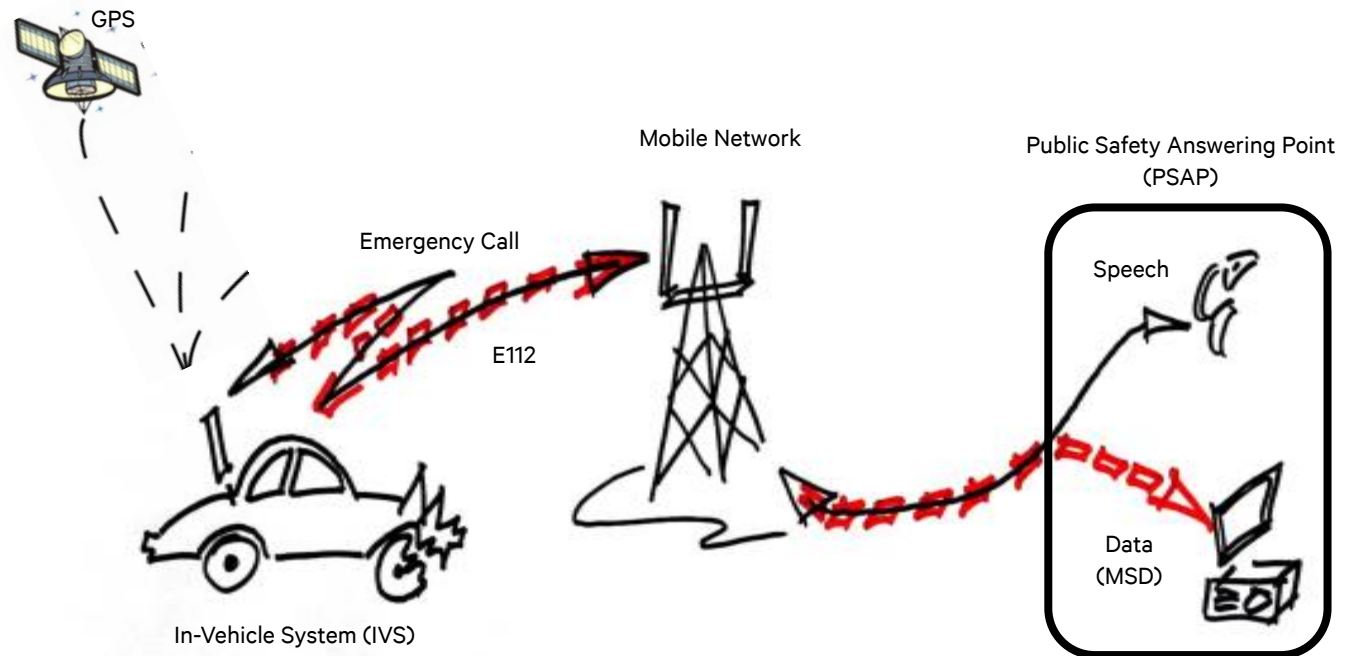- Mass commercial deployment

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)

GPS

Mobile Network

Public Safety Answering Point (PSAP)

Emergency Call

Speech

E112

Data (MSD)

In-Vehicle System (IVS)

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
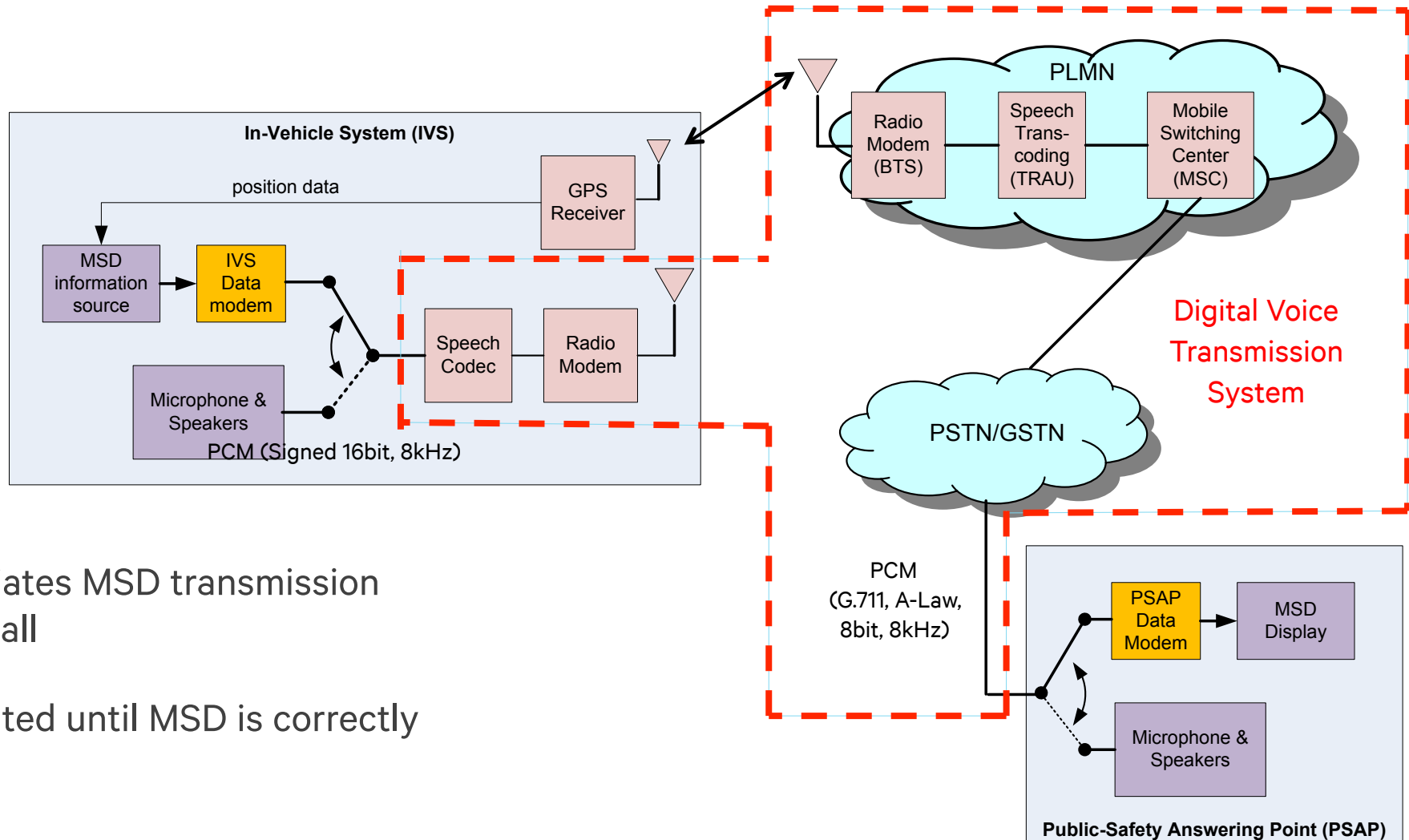
- IVS or PSAP initiates MSD transmission within the E112 call

- 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

Legend:
- HeERO1 Pilot countries
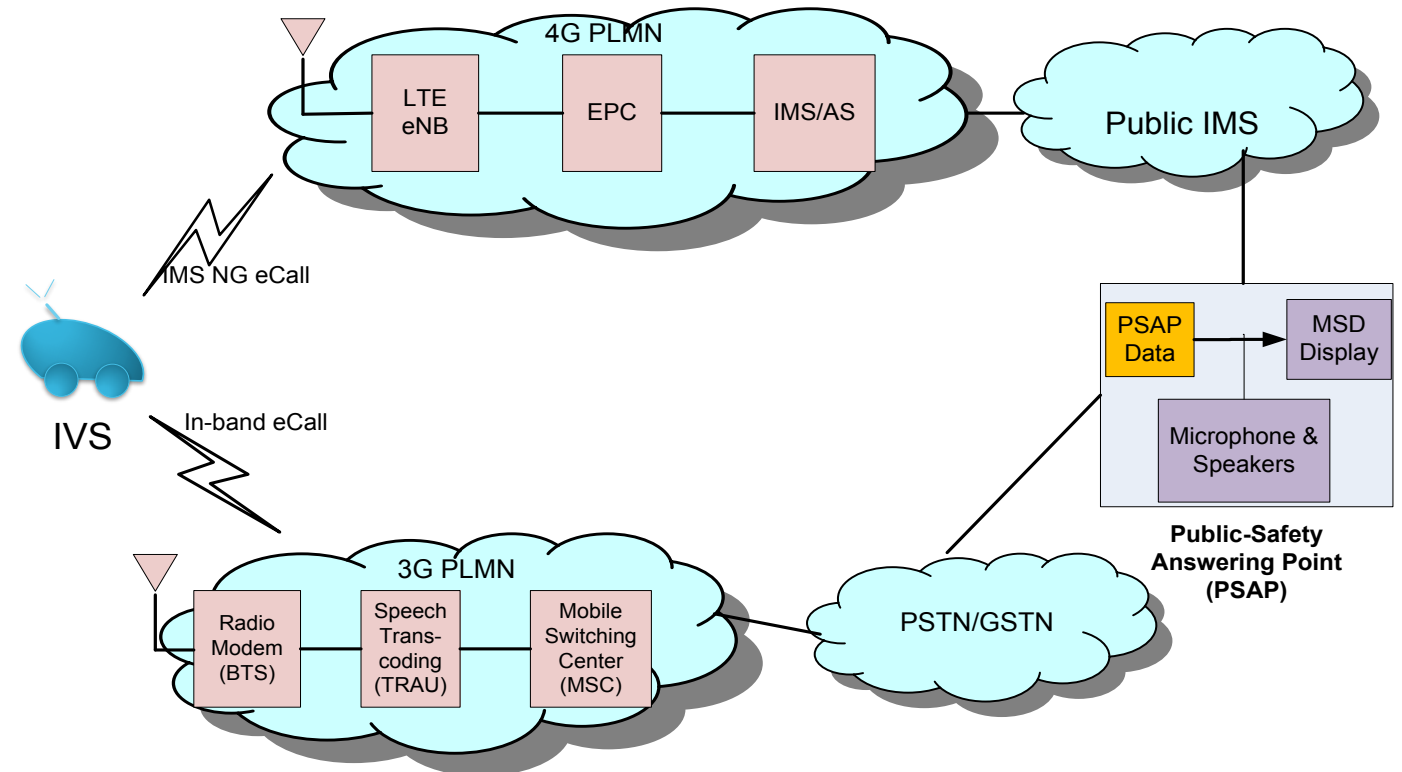- HeERO2 Pilot countries
- HeERO2 associated partners
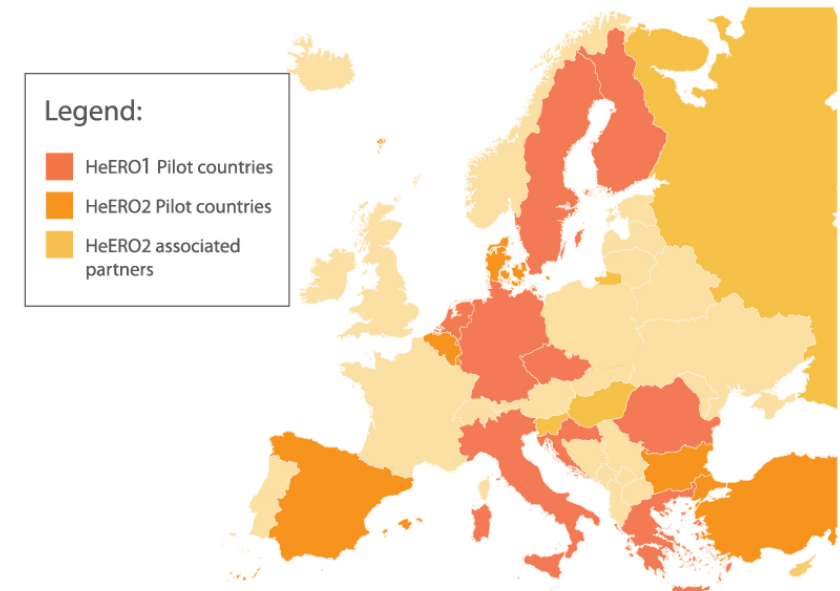
Why Next Generation eCall?

- 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
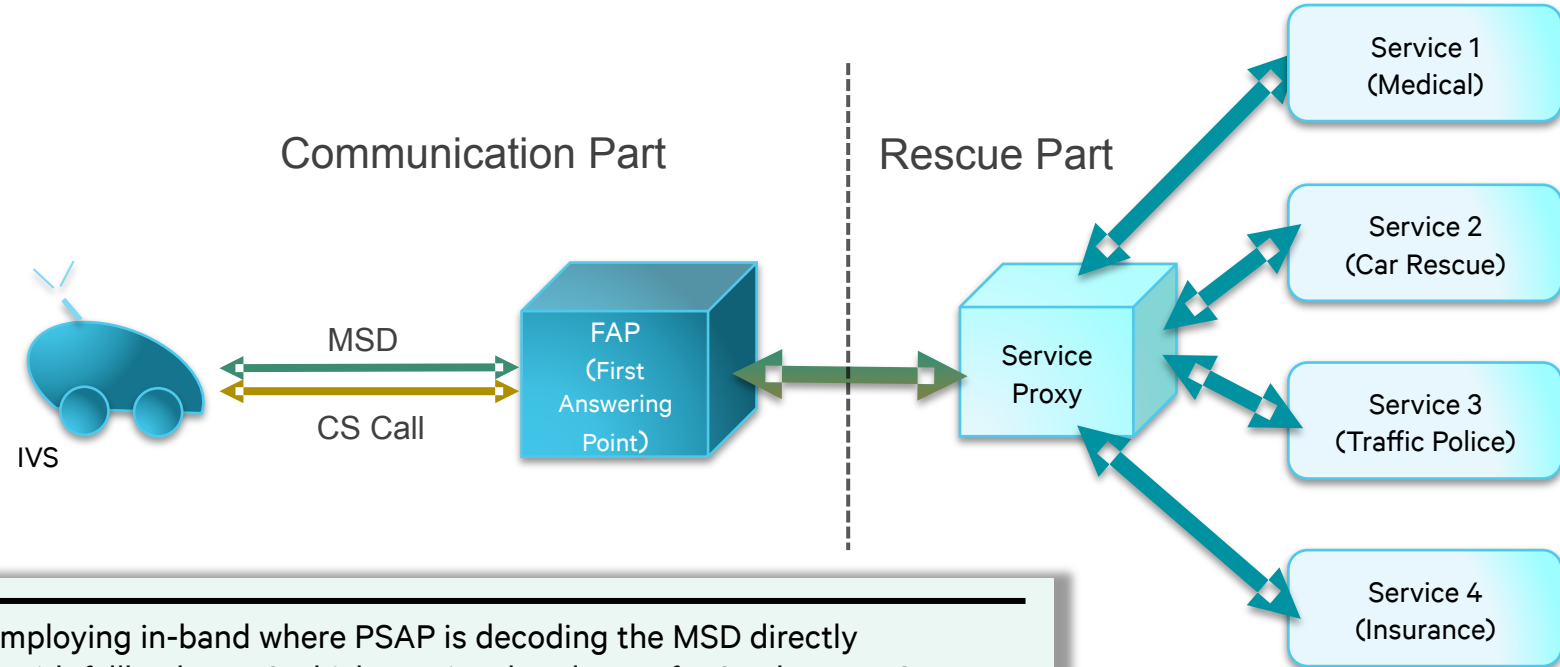
Next-Gen eCall Architecture

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

4G PLMN

| LTE eNB | EPC | IMS/AS |

Public IMS

IMS NG eCall

IVS

In-band eCall

PSAP Data → MSD Display

Microphone & Speakers

Public-Safety Answering Point (PSAP)

3G PLMN

| Radio Modem (BTS) | Speech Trans-coding (TRAU) | Mobile Switching Center (MSC) |

PSTN/GSTN

Emergency Rescue System Architecture

Accommodate regional deployments and operations

Communication Part | Rescue Part

MSD

CS Call

IVS

FAP (First Answering Point)

Service Proxy

Service 1 (Medical)

Service 2 (Car Rescue)

Service 3 (Traffic Police)

Service 4 (Insurance)

EU	• Mandating 112 public services employing in-band where PSAP is decoding the MSD directly • Allowing also 3rd party services with fallback to 112 which requires handover of MSD data to PSAPs
Russia	• Mandating same 112 public service approach as EU but with SMS and PS data extensions • Established dedicated emergency call network operator (Glonass-Union) requiring dual profile SIMs to differentiate
TIAA/ China	• Commercial 3rd party service (no mandate) • PS data + CS call with fallback to legacy or NG eCall • Allowing constant tracking through stay alive messages of registered vehicles

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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