Pan-European eCall: Standardization, Implementation, and Performance

EENA Emergency Services Workshop

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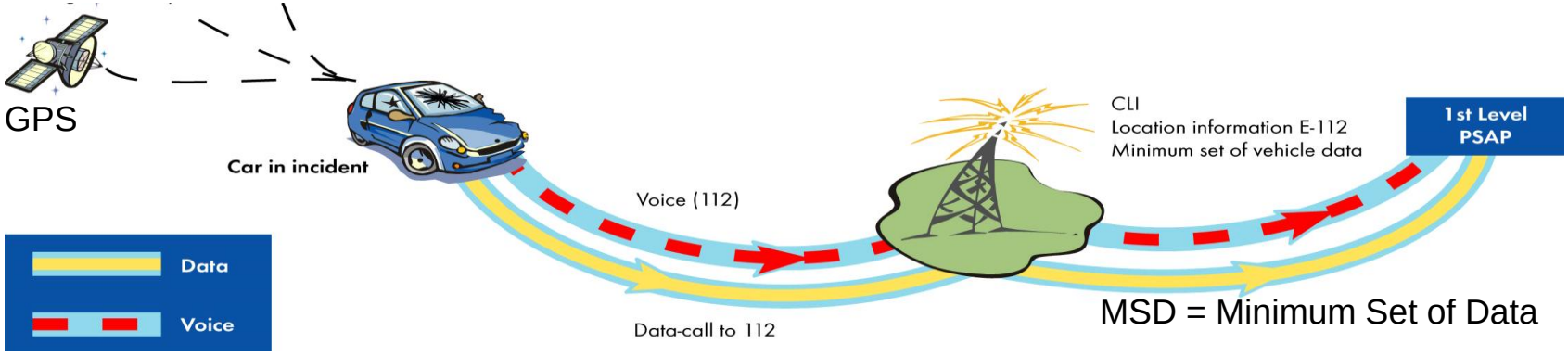
Outline

- **eCall System Overview**
- **Qualcomm's Role in eCall**
- **Standardization Status**
- **Implementation Guidelines**

Introduction: eCall Procedures and Requirements

- **In an accident, an E112 cellular voice call is *automatically* established (can also be triggered manually)**
- **Transmission of vehicle MSD (140 bytes) *at the beginning of voice call***
- **Transmission must be *fast* and *reliable* (acknowledged)**
- **Pan-European operation *without modifications* to existing networks**

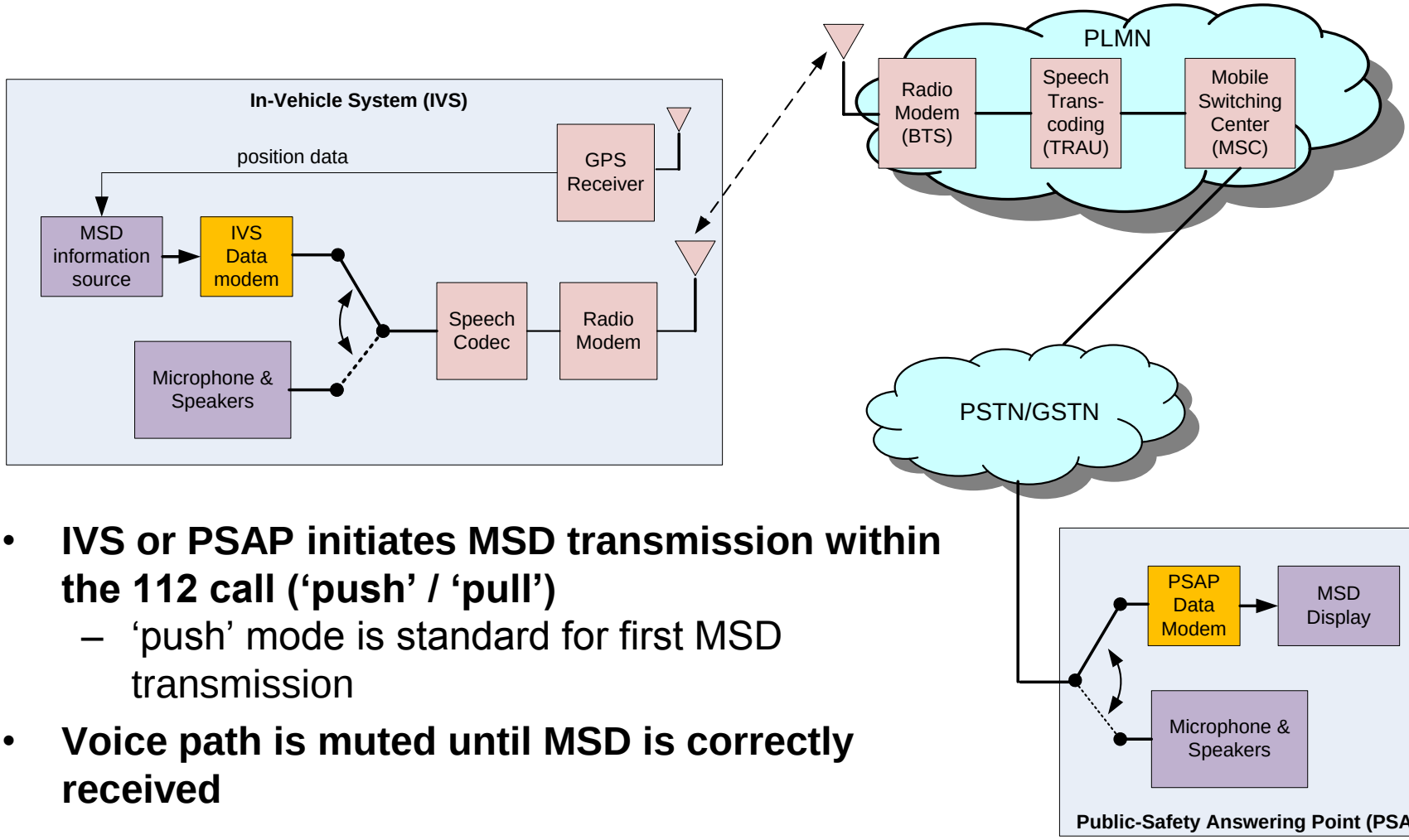
- ***Data channels* may not be available everywhere, usually not prioritized**
- ***'Emergency SMS' transmission* may be delayed and not prioritized, or otherwise requires significant network changes**
- **eSafety initiative and GSM Europe decided that only a *standardized in-band modem solution* can meet the eCall requirements**



MSD = Minimum Set of Data

eCall System Overview

eCall In-band Modem within the Cellular Architecture



- **IVS or PSAP initiates MSD transmission within the 112 call (‘push’ / ‘pull’)**
  - ‘push’ mode is standard for first MSD transmission
- **Voice path is muted until MSD is correctly received**

eCall Signaling Procedure (simplified)

- **PSAP**
  - PSAP operator
    - receives emergency call
    - indentifies eCall (via flags or ‘push’ signal)
    - triggers MSD transmission
  - PSAP modem continuously triggers MSD until it detects the incoming MSD signal
  - PSAP modem detects MSD signal and continuously tries to decode MSD
  - Upon correct reception, PSAP modem sends acknowledgement and then stops transmission
    - PSAP operator or application can confirm validity of MSD using *higher-layer acknowledgement*
  - Downlink voice channel is un-muted

- **IVS**
  - In event of an accident, IVS automatically sets up a 112 voice call using eCall flags
  - (IVS transmits eCall initiation ‘push’ signal)
  - IVS modem listens for sync frames
  - IVS starts transmitting MSD after detecting trigger from PSAP
  - IVS continues to transmit MSD with *incremental redundancy*
  - After reception of acknowledgement, IVS stops MSD transmissions
  - Uplink voice channel is un-muted

Two Options of Indicating eCall to PSAP

- **Option 1: eCall flags for manual / automatic eCalls**
  - Telecom operator routing eCalls to an eCall-designated MSISDN
- **Option 2: IVS-initiated signalling ('PUSH mode')**
  - IVS initiation signalling should only start once PSAP has answered the call (i.e., indication via ISUP signalling)
  - Upon detecting the IVS-initiated signalling, the PSAP modem will request the MSD from the IVS
  - No delays for normal emergency calls
  - If PSAP is not eCall equipped, operator can still identify an eCall by the unique initiation signal

- **Options 1 and 2 will be used in parallel in first deployments**
  - IVS initiation signalling increases the overall transmission time by 0.8 – 2.0 s (1.2 s on average)

Qualcomm's Role in eCall

Qualcomm's Role in eCall

- **Standardization**
  - Qualcomm designed an eCall in-band modem solution for 3GPP
  - The Qualcomm modem was selected by 3GPP in a competition with two other candidates
  - Qualcomm is continues to be active in eCall-related standardization activities (3GPP, CEN, ETSI, …)
- **Products**
  - Qualcomm offers communication chipsets including eCall for IVS telematics modules
  - We do not offer eCall modules/products for PSAPs
  - PSAP demo implementation was done
    - on a laptop with ISDN card
    - on a wireless chip (QSC), with cellular modem on ARM-9 at 384 MHz

Qualcomm MDM6x00 – for Telematics applications

- **MDM6200/6600: Qualcomm's next generation data-centric devices**
  - Selected for Telematics Program
- **Integrated baseband and RF in single package, with companion PMIC**
  - Multiband CDMA 1X, 1xEV-DO, including 1X-Advance & 1xEV-DO Rev B
  - Multiband WCDMA, including HSPA+ (Cat 9/10, Rel 7 protocol)
  - Quad-band GSM/GPRS/EDGE
- **Gen 8 GPSOne with GPS and GLONASS support**
- **Pin compatible between UMTS (MDM6200) and Multimode (MDM6600)**
- **45nm technology**
- **BMP M2M profile**
- **3GPP and 3GPP2 voice support using 3rd party audio codec**
- **Pan-European eCall support**
  - **Best-in-class power consumption**
  - **Best-in-class board area**
  - **Best-in-class RF**

The Junction of Car & Mobile

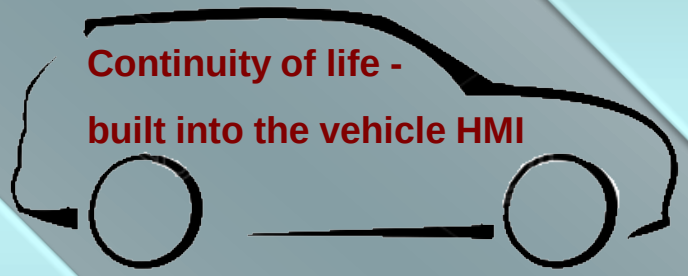
Expanding Vehicle Capabilities …

…Embedded Connectivity

Automotive use cases

- Emergency Assistance
- Advanced Driver Assistance Systems (ADAS)
- Navigation
- Energy management
- Electric vehicle use cases
- Entertainment
- Phone Integration

"Build in"



Continuity of life -

built into the vehicle HMI

Mobile Life Use Cases

Life & Productivity

- Email
- Scheduling / Planning
- Messaging
- Following your Interests
- Social Network Participation

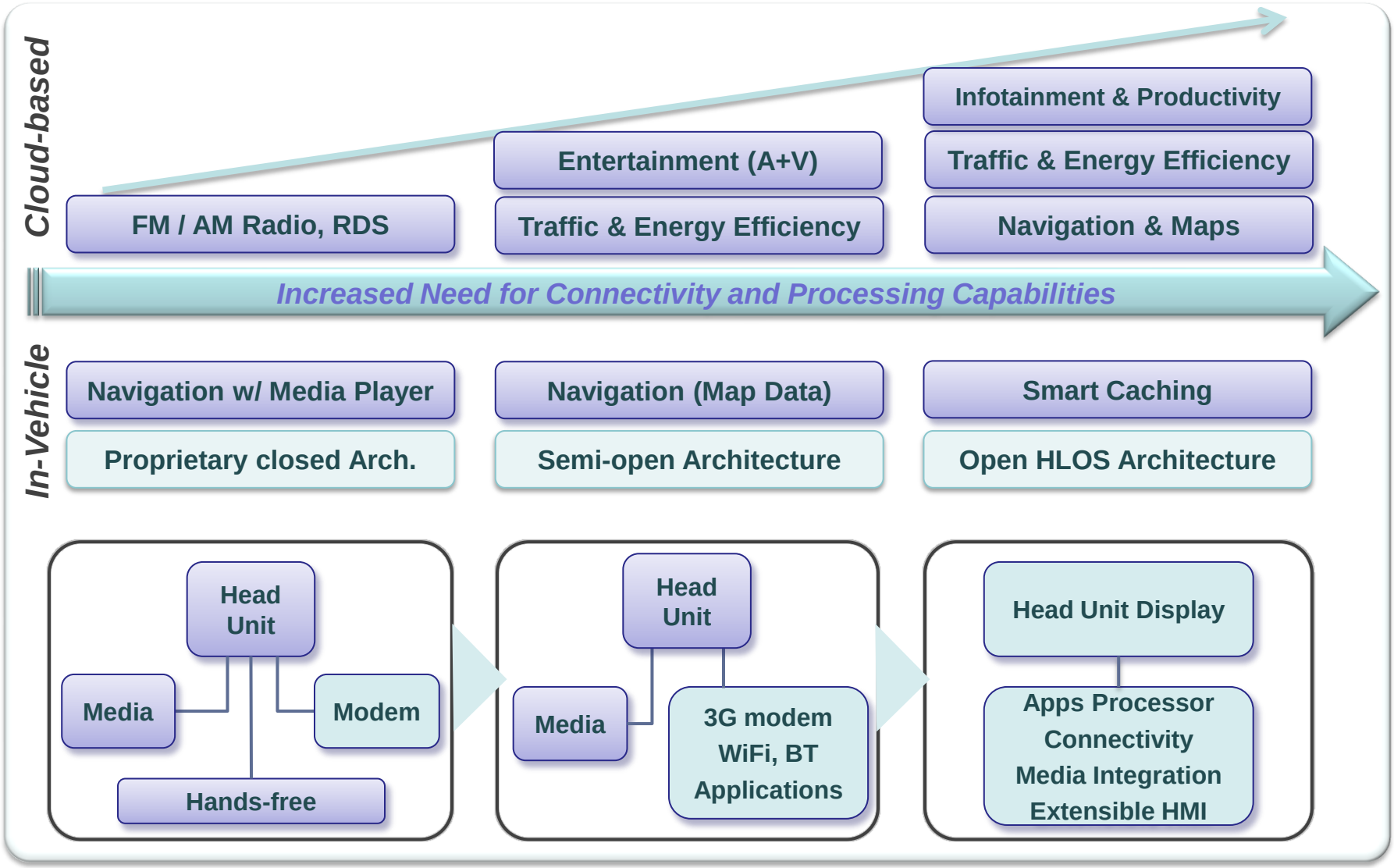
"Bring in"

Automotive Use Cases

Bringing Life into the Vehicle…

…Phone to Car Integration

Trends for In-Vehicle Systems



Our focus: the connected car …

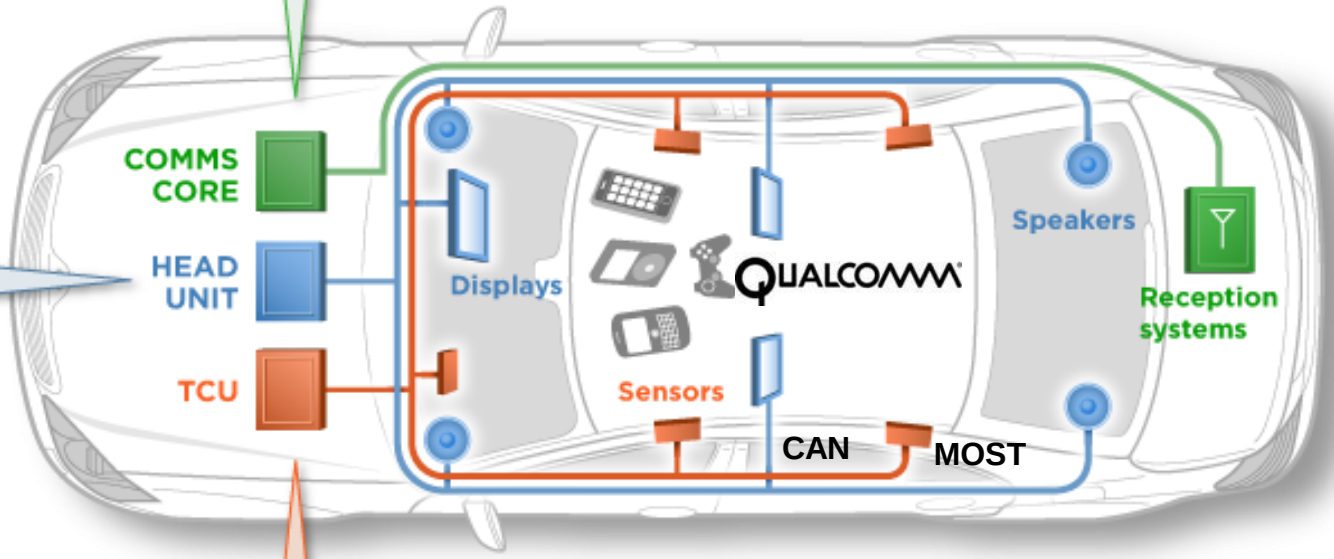
For driver:
- **Navigation, Information**
- **Safety, Communication**

For passenger:
- **Entertainment, Audio / Video**
- **Internet, Sync to mobile devices**

Connectivity
WWAN, WiFi, Bluetooth, USB
Wireless charging

Information & Entertainment

Navigation
Media
Audio
Video

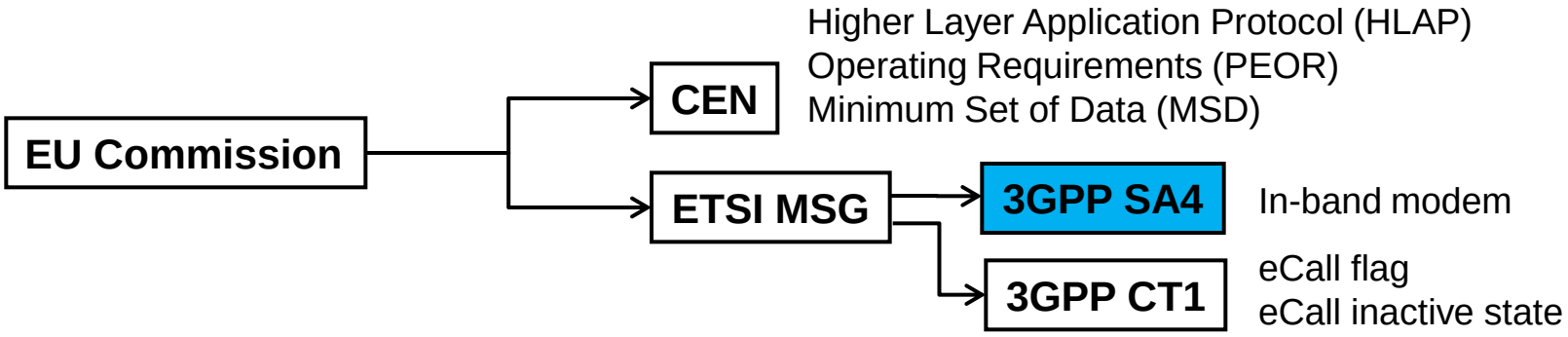


Telematics
Connectivity, Safety, eCall

… enabled by Qualcomm

Standardization Status

eCall Standardization: 3GPP and CEN



- **3GPP eCall general description TS 26.267 and Reference C-code TS 26.268 (v8.0.0) first released March 2009**
- **Conformance testing TS 26.269 first released in April 2009**
- **Characterization test report TR 26.969 first released September 2009**

- **Extensive real-world testing resulted in several modem upgrades in 2010**

- **eCall compliance test specs were developed in 3GPP RAN5 and GERAN3 in cooperation with ETSI MSG December, 2010**

Recent 3GPP Spec Upgrades

- **v8.0.0: Initial release**
- **v8.5.0: Last major spec update, December 2010**
  - Synchronization in the presence of sample slips
- **v8.6.0: Minor adaptations, published March 2011**
  - Contains the last set of updates based on field testing and feedback received from other vendors
  - Fully backward compatible with 8.5.0, not critical for interoperability
  - Stable version to be used in the EU‘s HeERO field trials

(version numbers refer to TS 26.268 Rel-8; Rel-9 specs are derived automatically)

CEN TC 278 Specifications – about to be published

- **EN 16062 Intelligent transport systems — ESafety — ECall high level application requirements (HLAP)**
- **EN 15722 Road transport and traffic telematics — ESafety — eCall minimum set of data**
- **EN 16072 Intelligent transport systems — ESafety — Pan European eCall- Operating requirements**

- **EN 16102 Intelligent transport systems — ECall — Operating requirements for third party support**

- **Status: Drafts revised and submitted for affirmation vote**

Implementation Guidelines

Implementation Recommendations / Lessons Learned

- **Requirements of the eCall PSAP modem:**
  - Telephone interface: Jitter-free lossless PCM interface to ISDN or analog line
  - Application interafce: MSD ouput, control input (e.g., manual *Pull* signal)
  - Minimization of clock drift / sample slips
    - eCall modem can handle sample slips, but slips decrease performance
  - Computing equipment / processor to run PSAP modem (ARM, PC, ...)
    - Low complexity and memory requirements
    - Implementation using offline decoding / multithreading can be used to further reduce peak processor load
    - Real-time transmit signal generation must be maintained
  - Network echo cancellers can degrade performance
    - Use of 2.1 kHz tone recommended in case of such degradation in PSAP network
    - In general, all speech processing functions should be deactivated

- **Similar requirements exist for the eCall IVS modem**

Recommendations are derived from field test results and early vendor implementations

2G/3G Connectivity for eCall IVS devices

- **GSM Directive and EU Commission decision on harmonization of the 900 MHz band**
  - Expect migration of GSM networks to UMTS
- **By 2014, less than 15% of mobile subscriptions in the 12 largest European markets will be non-3G+**
- **Lifespan of private vehicles (12-15 years)**

→ **Careful assessment of 2G/3G support is necessary**

- **GSMA recommends dual-mode (2G&3G) devices for eCall**
- **Additional benefits of a connected in-vehicle platform**
  - Provides high speed mobile connectivity for ITS services
  - Enables telematics business models

Thank you

Licensing

Licensing

PSAP Equipment

In recognition of the important public safety aspects of this work and to accelerate the deployment of the eCall solution, subject to certain standard terms and conditions (e.g., protection for Qualcomm products as to the licensees or its customers patents), Qualcomm will not charge royalties for the implementation of Qualcomm patents essential to the 3GPP eCall in-band modem standard (3GPP TS 26.267 and TS 26.268) on sales of in-band voice-channel modem equipment that implements such standard and is located in the PSAP or core network, but solely when and to the extent such equipment is used for emergency communications. Qualcomm will offer to grant licenses on terms and conditions that are fair, reasonable and free from unfair discrimination for the use of such equipment for non-emergency communications.

In-Vehicle System Devices

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For further information on licensing terms in relation to eCall, please contact Daniel Hermele at dhermele@qualcomm.com.