Attachment to Tdoc S4-100940

# eCall: Inband? eSMS!

3GPP/SA4, Barcelona, 2010-11-11

Source: Telefon AB LM Ericsson, ST-Ericsson SA

# Introduction

- The following set of slides, partly together with a real-time demonstration of eCall Inband and eSMS, has been presented in this or similar form to

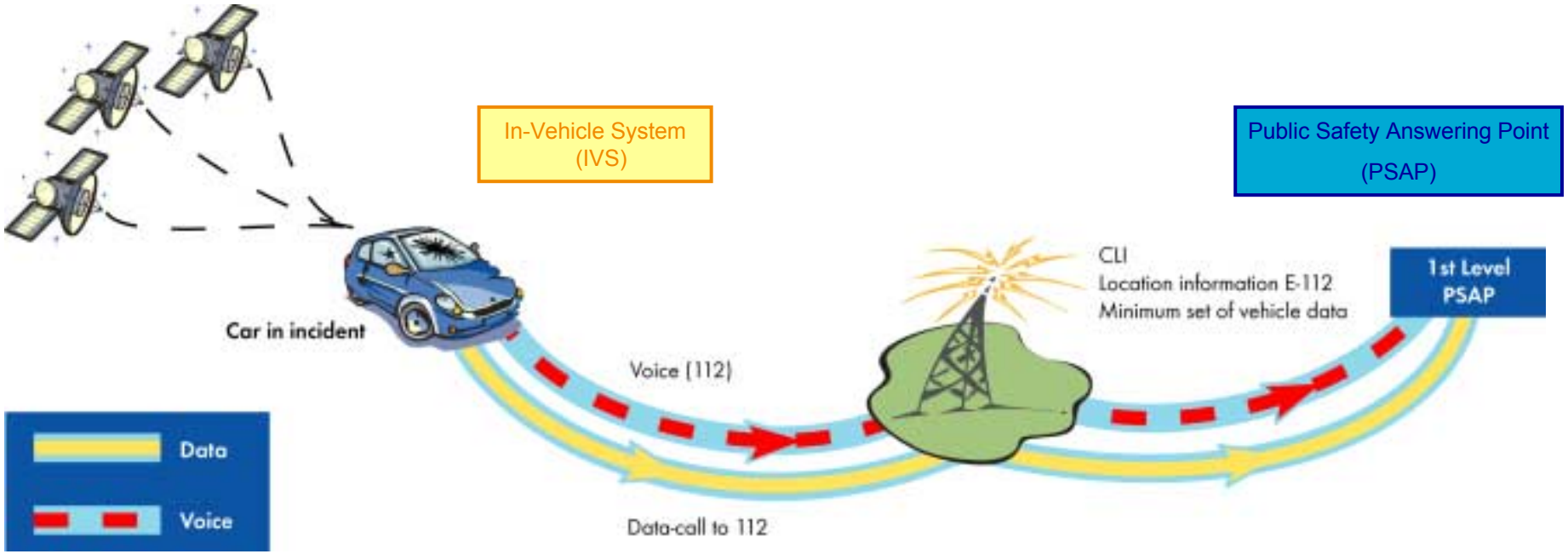
- the European Commission in Brussels, Belgium 2010/10/02
- the Ertico eCall Workshop in Brussels, Belgium 2010/10/06
- the EC eCall Implementation Platform, Belgium 2010/10/19
- the ITS world congress in Busan, Korea 2010/10/-26-29

- The real time demo is available in Barcelona on Friday, 2010-11-11/12.

- Ericsson intends to include eSMS in the coming eCall field tests (HeERO)
- and to report the test results to 3GPP and others.

# What is eCall?

- Triggered automatically by a car crash or by pressing an alarm button,
- an emergency voice call is set up by the IVS to the next local PSAP;
- additionally GPS-position and other eCall data are sent.
- European Commission aims for Pan-European standard



# eCall data, Minimum Set of Data

- **eCall data, MSD content**, (see CEN TC 278 / 15722)
  - MSD version and MSD repetition number
  - Vehicle type (car, bus, motorcycle, etc…)
  - (international) Vehicle Identification Number
  - Propulsion type (gasoline, diesel, gas, electric, etc…)
  - Timestamp
  - Location (GPS coordinates of location latitude and longitude)
  - Direction of travel
  - Number of passengers
  - Other Optional data
  - Missing: location altitude, speed, hint on dangerous goods, handheld-class, … more
- ≤ 140 bytes (in binary form)
- Discussions on a future extension, “Full Set of Data”
- Discussions in other regions on emergency Text-Chat for hard-of-hearing

# Private and public eCall

- **Private eCall systems are operational today**
  - Volvo OnCall, BMW Assist, PSA Apell d´Urgence, Toyota G-book …
  - Private call centers forward the information to the Public Safety Answering Points (PSAP).
  - Other services are offered on top of eCall

- **EU Commission: introduce a public Pan-EU eCall**
  - Fully employed it would save 2000 lives per year and have an positive impact also on injuries.
  - In all new cars from 2015?

# Present status

- Standardization and legal framework are prepared
  - but not finished

- Pan-EU eCall and Third Party Solutions may coexist
  - The TPS-service must cover all EU Member States or have the Pan-EU eCall as back-up.

# Ericsson supports eCall!

- Ericsson strongly supports eCall !
  But Ericsson raises concerns about the current eCall technical solution (inband)!

- Information about an accident to be sent as audible ‘pulses’ through the voice channel.
  This "Inband" way for sending information was thought to be “invisible”
  and useable worldwide, also on analogue lines, but

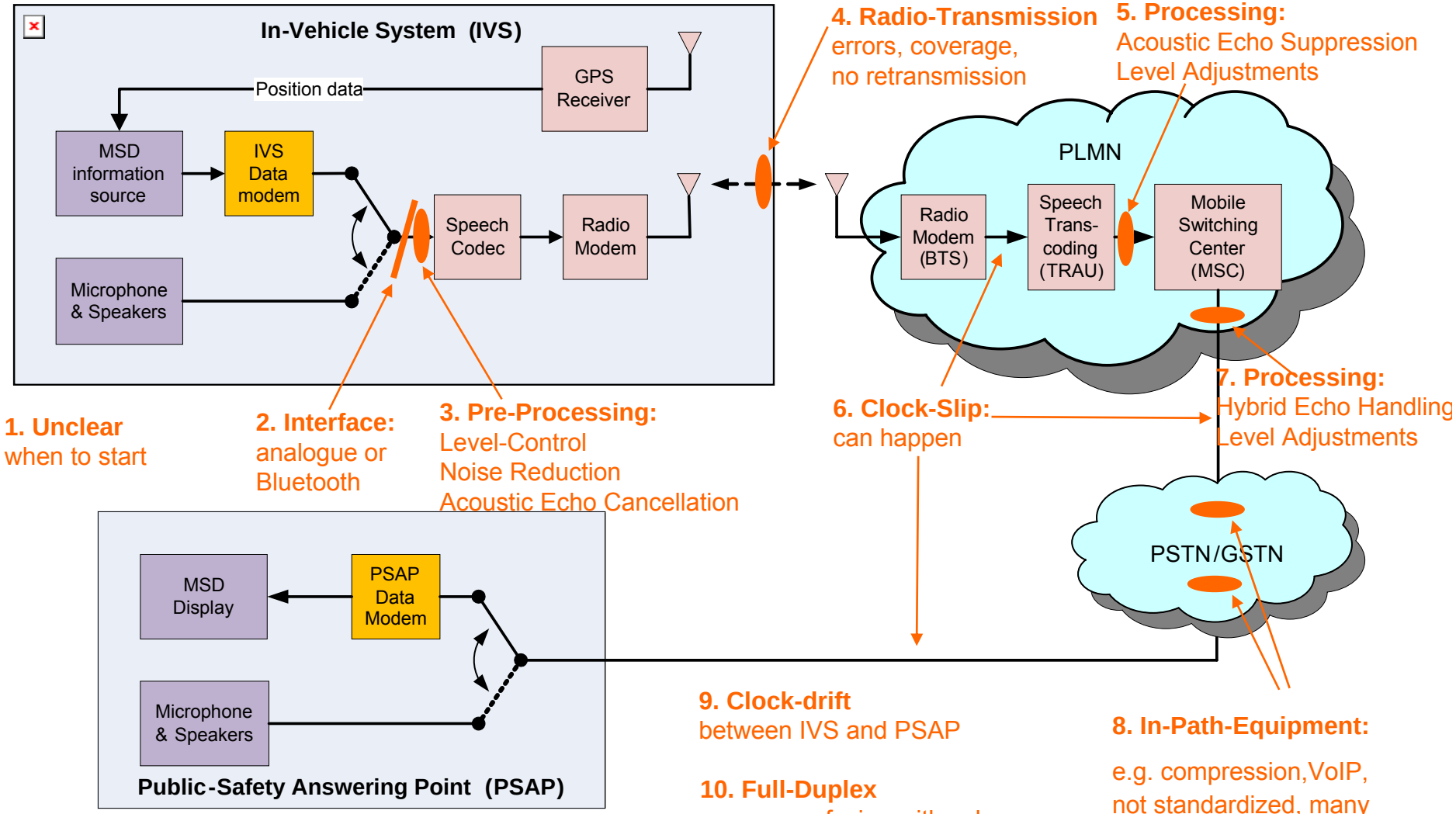
  – The Inband holds some (substantial) shortcomings and hassles in modern networks

  – Mobile Network upgrades, maintenances and verifications will be needed frequently

  – The Inband imposes limitations on the evolution into All-IP networks

  – The Inband imposes limitations to the evolution of eCall itself !

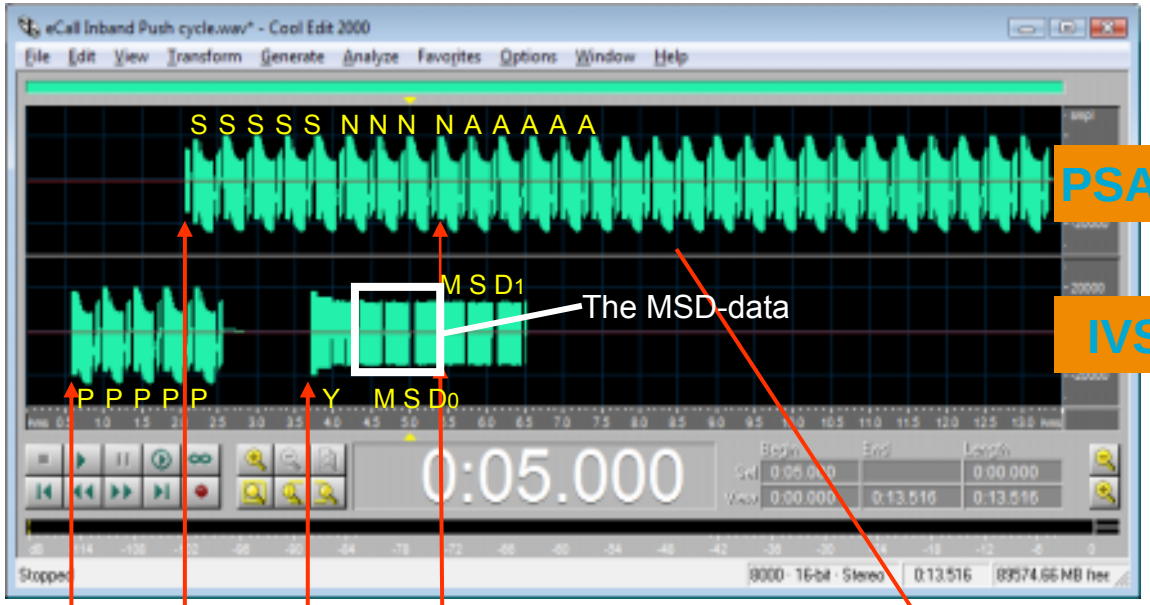
# eCall via Inband Modem - Critical Points



# The In-Band Modem

- 140 octets of data (Minimum Set of Data), pulses sent over the voice channel in GSM
- PSAP = Public Safety Answering Point
- IVS = In Vehicle System

- Example here according to 3GPP Rel 9.2, no radio errors, some speech path delay:




PSAP

Transmission time for $MSD_0$: about 1.3 sec!

IVS

Elapsed time after trigger: about 5 sec!

Voice channel blocked: about 12 sec!

IVS triggers PUSH command

IVS accepts PUSH, starts to send SYNC and MSD

PSAP accepts PUSH, starts to send START

PSAP received $MSD_0$, CRC OK IVS sends a second version $MSD_1$

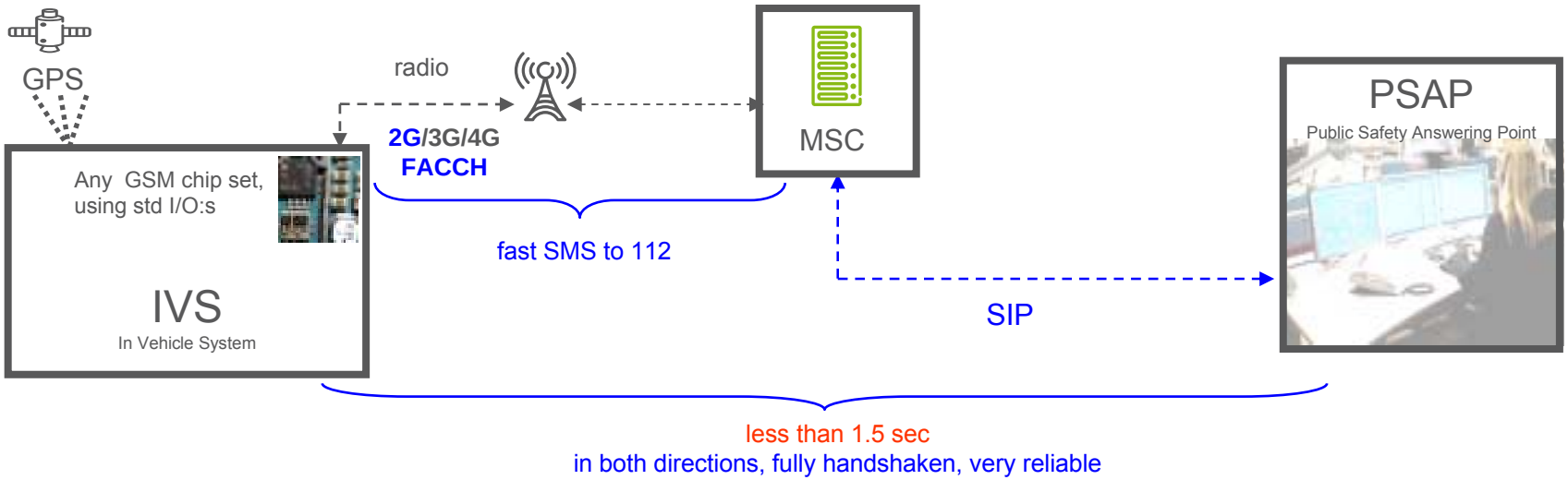
PSAP sends many (unnecessary) copies of ACK signal

# Traditional SMS - not good for eCall!

- SMS was ruled out against Inband as not feasible for eCall ! True!
  The standardized SMS has several severe shortcomings:
  - SMS is not reliable enough:
    the usual SMS-Service-Centers may overflow in rush hours or in catastrophic events and may trash too many SMS
  - SMS is not prioritized on radio and may be blocked in loaded cells
  - SMS is not fast enough:
    a standard SMS of 140 octets takes about 5 seconds on the GSM radio channel and even 10 seconds, if an emergency voice call is ongoing in parallel.
  - SMS is not routed to the correct destination:
    a standard SMS is sent to a fixed destination, but for emergency calls it should go to the next local PSAP, which is not known to the IVS.

- How can Ericsson dare to propose SMS again?
  We don't! We propose an "enhanced SMS for eCall": eSMS

# eCall Block Diagram – eSMS / SIP



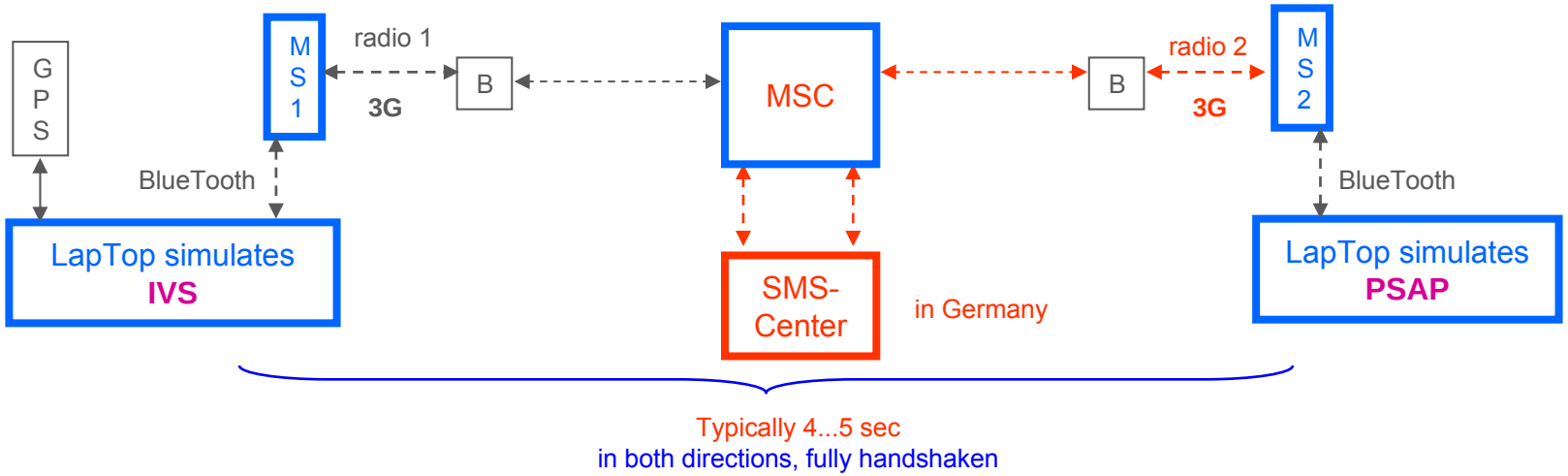

The standard emergency voice path is used (not shown) for Voice (with priority on radio).
The IVS uses standard, available AT-Commands to send the SMS to the MS.

The existing signalling channels (dashed lines) are used for eCall Data transfer:
eSMS is characterized by a normal SMS with SMS-Service-Center = 112;
eSMS is running fast over the existing GSM signalling channel (<1.5 sec) (with priority on radio).
The MSC filters the eSMS and send it directly and fast via secured IP to the PSAP.

The MSC routes the voice path to the next local PSAP.
The MSC routes the eCall-Data to the same local PSAP (or a central eCall-Data-Server).

The correlation between Voice Call and eCall-Data is based in the phone number of the IVS.

# DEMO




Today the Serving MSC here in Brussels/Busan/Barcelona is not modified for eSMS.

We show an eSMS-emulation over UMTS (3G) with the ordinary SMS-Service-Center.
We hope that we don't get severe overload and no SMS-trash. Good enough for a demo.

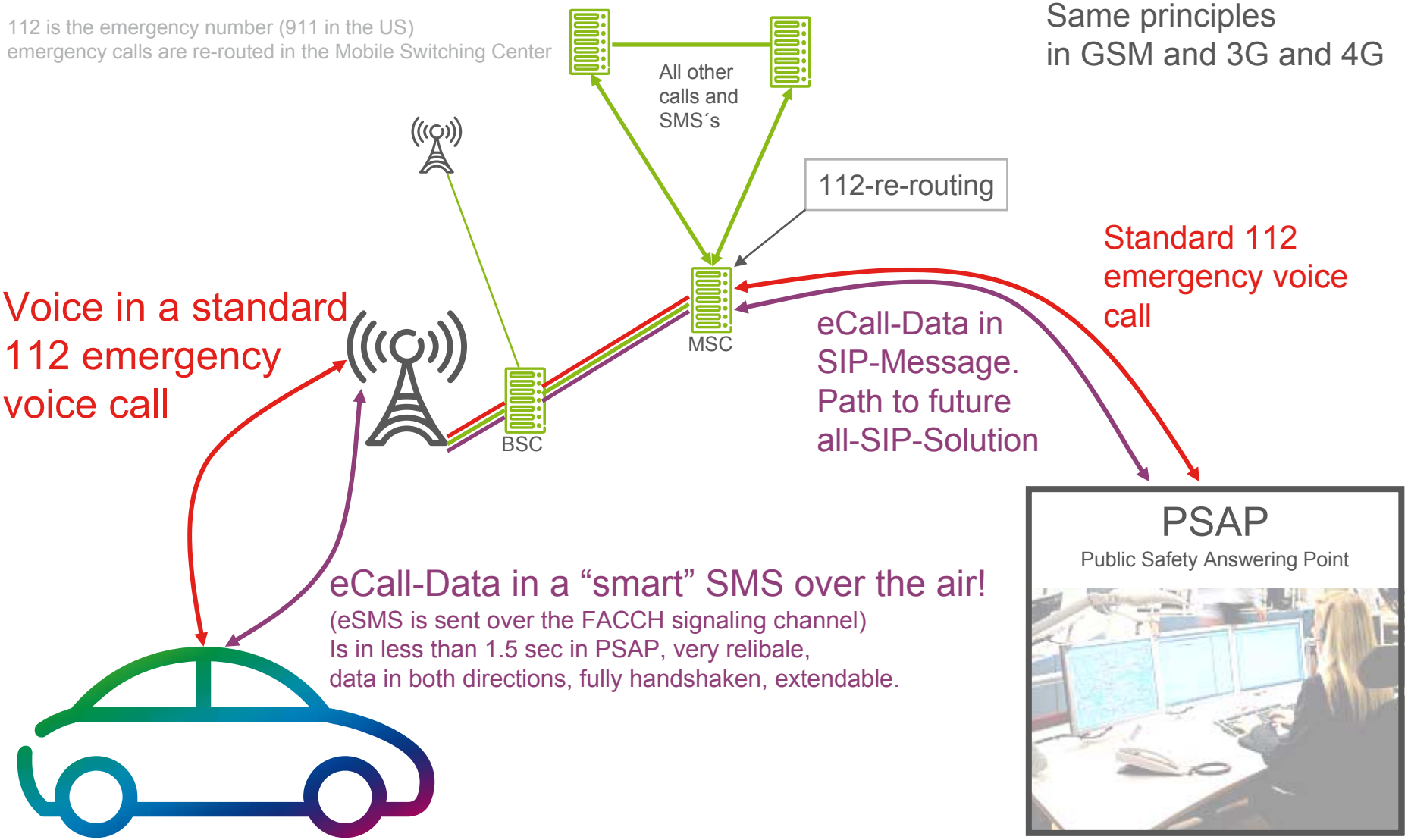
Please obey: the eSMS must here cross the radio channel two times! So double transmission time.

Please be invited to come to Aachen (Germany) to see the real eSMS with (slightly) modified MSC!

# VOICE IN Standard 112 and data in eSMS/SIP for eCall

112 is the emergency number (911 in the US)
emergency calls are re-routed in the Mobile Switching Center

Same principles
in GSM and 3G and 4G




Number-matching in PSAP

# ESMS IS THE Low cost, future proof eCall solution

- eSMS is independent of voice path
  - No interruptions of the call
  - No limitations on voice path evolution
  - No dependency on Codec selection
- eSMS is simple to implement
  - Uses standard building blocks – minimum cost for all
  - Minimal impact on the fixed and mobile Networks
  - Decoupling of Networks and PSAP migration possible, once-and-for-all Network-upgrade
- eSMS is faster under all conditions
- eSMS has widest radio coverage
- eSMS is future proof
  - Bi-directional data exchange between IVS and PSAP
  - Allows encryption
  - Easy to expand service – send more data
  - Can be also be beneficial for Third-Party-eCall

# eSMS contra Inband: performances (1)

- **eSMS:**
- Transmission starts already with alerting tone
- Arrives typially before voice call is connected

- Takes < 1.5 seconds from IVS to PSAP; a re-push takes about 1.5 seconds nearly constant over all radio conditions

- Is not audible
- Does not block the voice path

- Is independent of voice path
- Is future proof

- Is trivial to implement in IVS and PSAP

- Needs modifications in MS and MSC Modification once and forever done

- **Inband:**
- Starts when connected (long after alerting)
- Arrives about 5 seconds after Connect

- Takes about 1.5 seconds from IVS to PSAP; a re-push takes about 5 seconds, dependent on radio conditions; may fail

- Is audible (at least partly)
- Blocks the voice path about 6...10 sec

- Needs a transparent voice path
- Will be a hassle for all time to come

- Complex Inband Modem in IVS and PSAP

- Needs modifications in MS and MSC Modifications and maintenance forever

# eSMS contra Inband: performances (2)

- **eSMS:**
- Is fully bi-directional:
  Flexible data channels in uplink and downlink exist fully
- Supports eCall data privacy:
  Exchange of enycyption keys easy
- Is easily extendable to other services:
  example: fast Text chat between IVS and PSAP
- Simplifies routing in Mobile Network:
  Voice remains unmodified;
  eSMS to PSAP-central-Server;
  PSAP-migration invisible to Mobile Network
- The "fast-SMS" feature of eSMS can be used by any other application, e.g. proprietary eCall Services may send additional data via the fast, reliable, prioritized SMS channel to their proprietary destination, while the emergency voice call is ongoing.

- **Inband:**
- Is not bi-directional:
  Data channel for fixed MSD in uplink, but only few commands in downlink
- No eCall data privacy forseen:
  Exchange of encryption keys not forseen
- Not extendable, dead end;
  example: no text chat possible
- More complex routing in Mobile Network
  Voice-routing must consider PSAP-Status

  PSAP-Migration is visible in Mobile Networks
- No counterpart to this eSMS feature.

ERICSSON