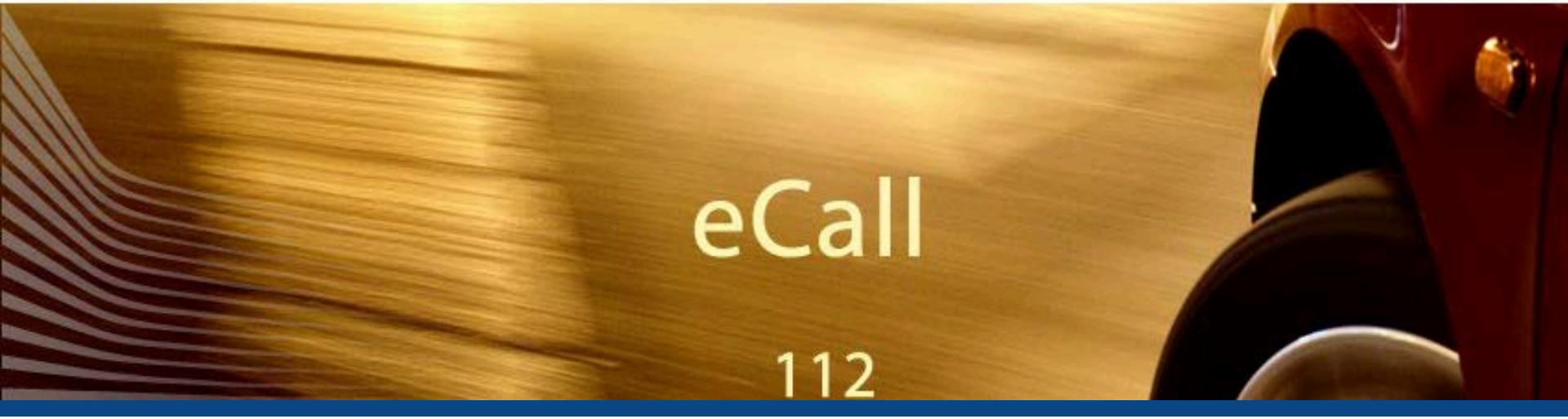
21. ITG/VDE Fachtagung “Mobilkommunikation”,
Osnabrück, Germany, May 11-12, 2016

European Commission



112 eCall – Lessons Learnt and Next Steps

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Outline

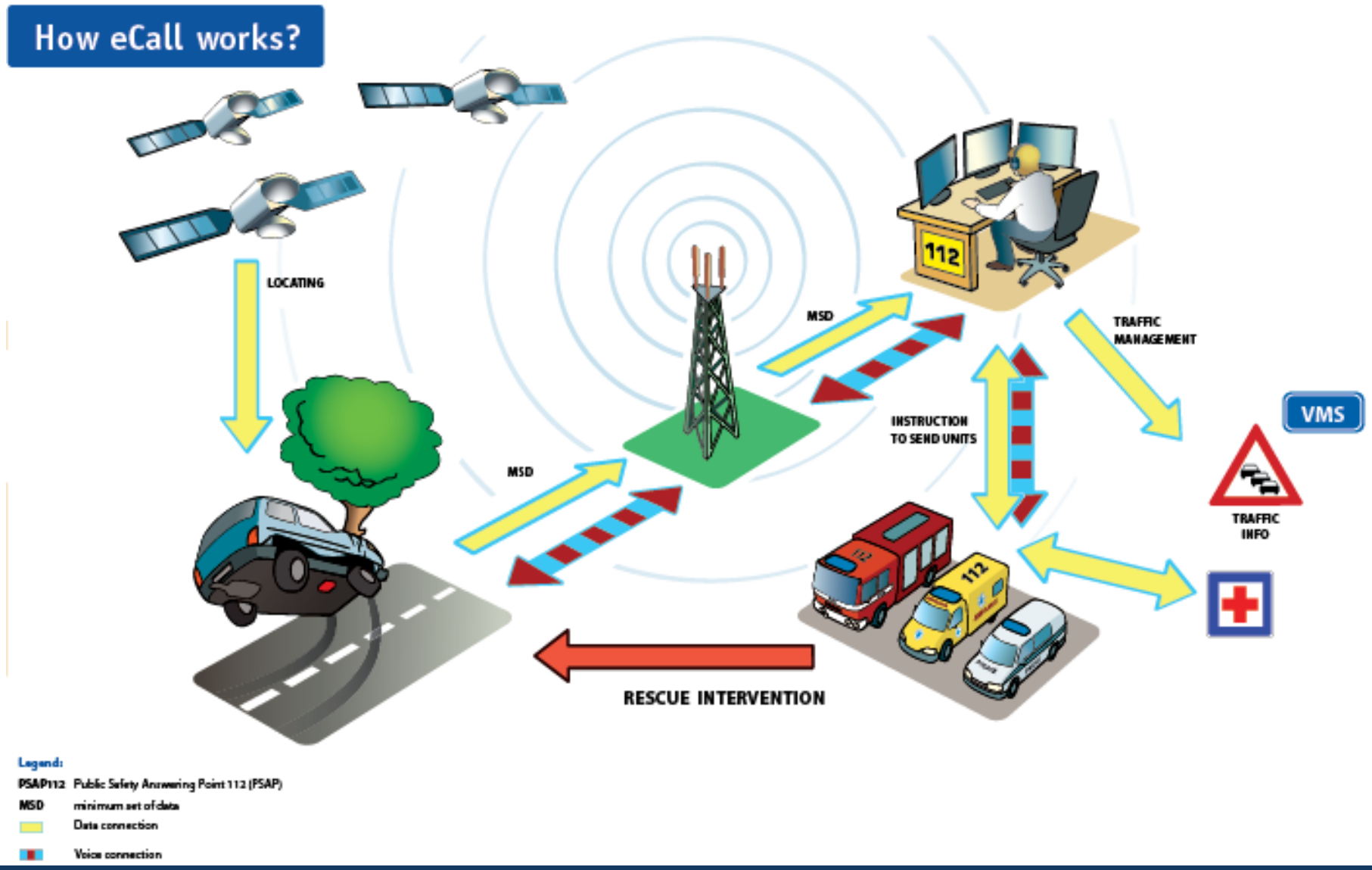
- Introduction
- Lessons Learnt
  - Example: AMR-WB Performance
- Certification Framework
- eCall Evolution
- Conclusion

Introduction

Introduction

Motivation

eCall Transmission Chain



Lessons Learnt

Example: AMR-WB Performance

Lessons Learnt

- Expected performance
  - Average MSD success rate should be >99%
  - Average MSD transmission time should be <4s
- Issue investigation
  - Failed MSD transmissions need careful investigation to isolate the root cause, e.g.
    - Network related issue ?
    - PSAP configuration/implementation issue ?
    - IVS integration/implementation issue ?
    - In-band modem related issue ?
- Failure analysis guideline
  - What is the failure symptom ?
    - How often did it happen and at what call stage ?
  - What was the test environment ?
    - E.g. field test or lab?
  - What is the root cause?
    - Inspect available HLAP and audio logs and identify the potential entity that is responsible
  - Who could help to solve the issue ?
    - E.g. PSAP vendor/operator, IVS vendor, test equipment vendor, car manufacturer, network operator

Most observed issue are due to wrong configuration or implementation/integration

eCall Performance with AMR-WB

Failure Symptom & Analysis

1. NW-A exhibits unexpected performance issues
   - Lower MSD success rate
   - Higher MSD transmission time
2. Root issue cause investigation
   - Resampling artifacts leading to misdetections of signal sign reversals, resulting in synchronization failures
3. Solution
   - Improvement of codec inversion detection (CID) algorithm
   - 3GPP adopted the new solution from Rel. 11.1 onwards

Codec	%Succ	%Succ-gt20s	avg MSD time
AMR-NB (NW-B)	100.0	100.0	3.6
AMR-WB (NW-B)	100.0	100.0	3.6
AMR-NB (NW-A)	100.0	100.0	3.2
AMR-WB (NW-A Region 1)	100.0	100.0	3.5
AMR-WB (NW-A Region 2)	87.1	76.7	7.8

No AMR-WB issues seen

Increased MSD TX Time

Unsatisfactory NT MSD success rate

eCall Performance with AMR-WB (cont'd)

Validation challenges with new CID algorithm

1. Comparing legacy and new CID results with modified 3GPP simulator and post-processing of existing data showed promising results
   – See our presentation from 19th ITG/VDE Fachtagung "Mobilkommunikation"

2. Field test validation (Part 1)
   – Retested in critical regions with new IVS software builds
   – Unfortunately, NW-A had switched off AMR-WB for mobile to fixed-line calls
      • "It should have newer been switched on"

3. Field test validation (Part 2)
   – We had to employ a mobile PSAP to bypass the network configuration
   – Disadvantage: 2nd radio link with potential additional AMR-WB re-encoding
      • May lead to weaker performance compared to mobile to fixed-line connections
   – Conducted more than 6000 test calls
      • Employing all combinations of legacy and new CID on both IVS and PSAP side
      • Tested in critical areas with mobile PSAP in Nuremberg office as well as in same cell as IVS
      • Some tests had to be repeated due to network related issues in order to obtain reasonable confidence of the statistics

eCall Performance with AMR-WB (cont'd)

Validation result overview

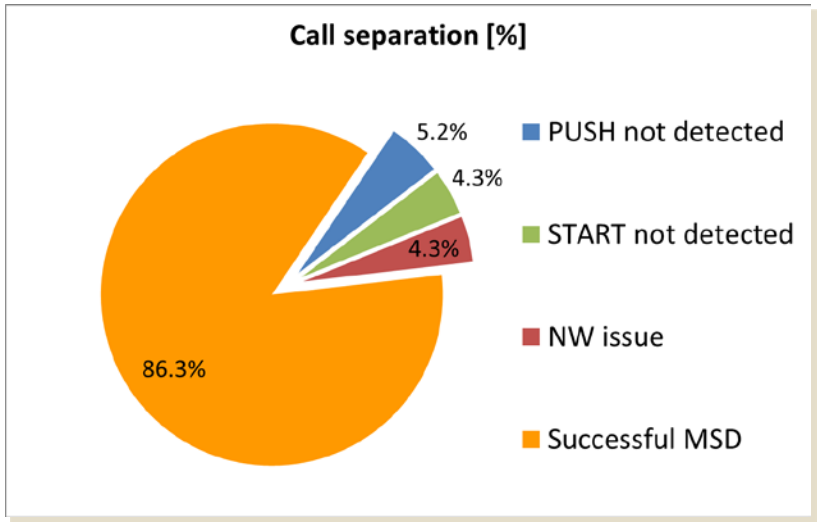
PSAP location	IVS CID	PSAP CID	#Calls	#Succ	%Succ	avg MSD time	stdev MSD time
same cell	legacy	legacy	1118	1017	91.0	4.32	0.87
	legacy	**new**	**610**	**586**	**96.1**	**3.88**	**0.54**
	new	legacy	600	571	95.2	4.23	0.70
	new	**new**	**1240**	**1238**	**99.8**	**3.88**	**0.53**
Nbg office	legacy	legacy	906	808	89.2	4.32	0.59
	legacy	**new**	**200**	**191**	**95.5**	**4.08**	**0.43**
	new	legacy	199	183	92.0	4.23	0.49
	new	**new**	**908**	**906**	**99.8**	**4.06**	**0.35**

No significant difference between results from different PSAP locations

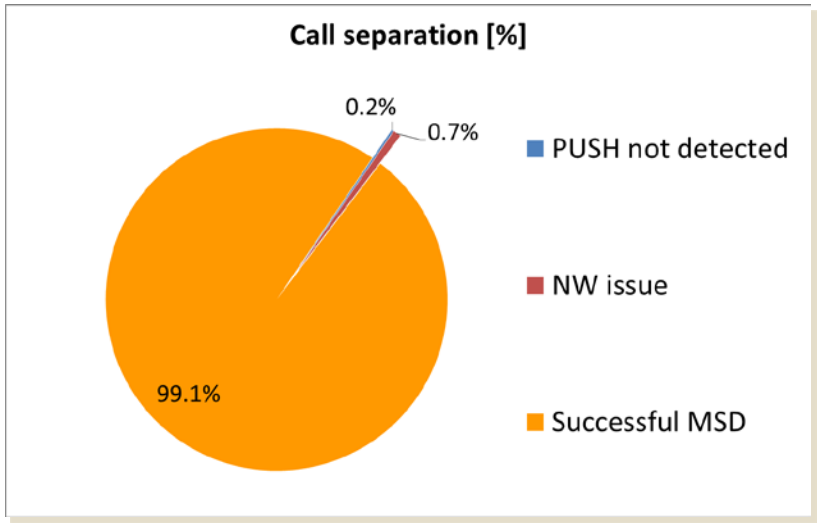
eCall Performance with AMR-WB (cont'd)

Failure Cases

- Legacy CID IVS + legacy CID PSAP



- New CID IVS + new CID PSAP



NW issues were regarded as non-relevant failures

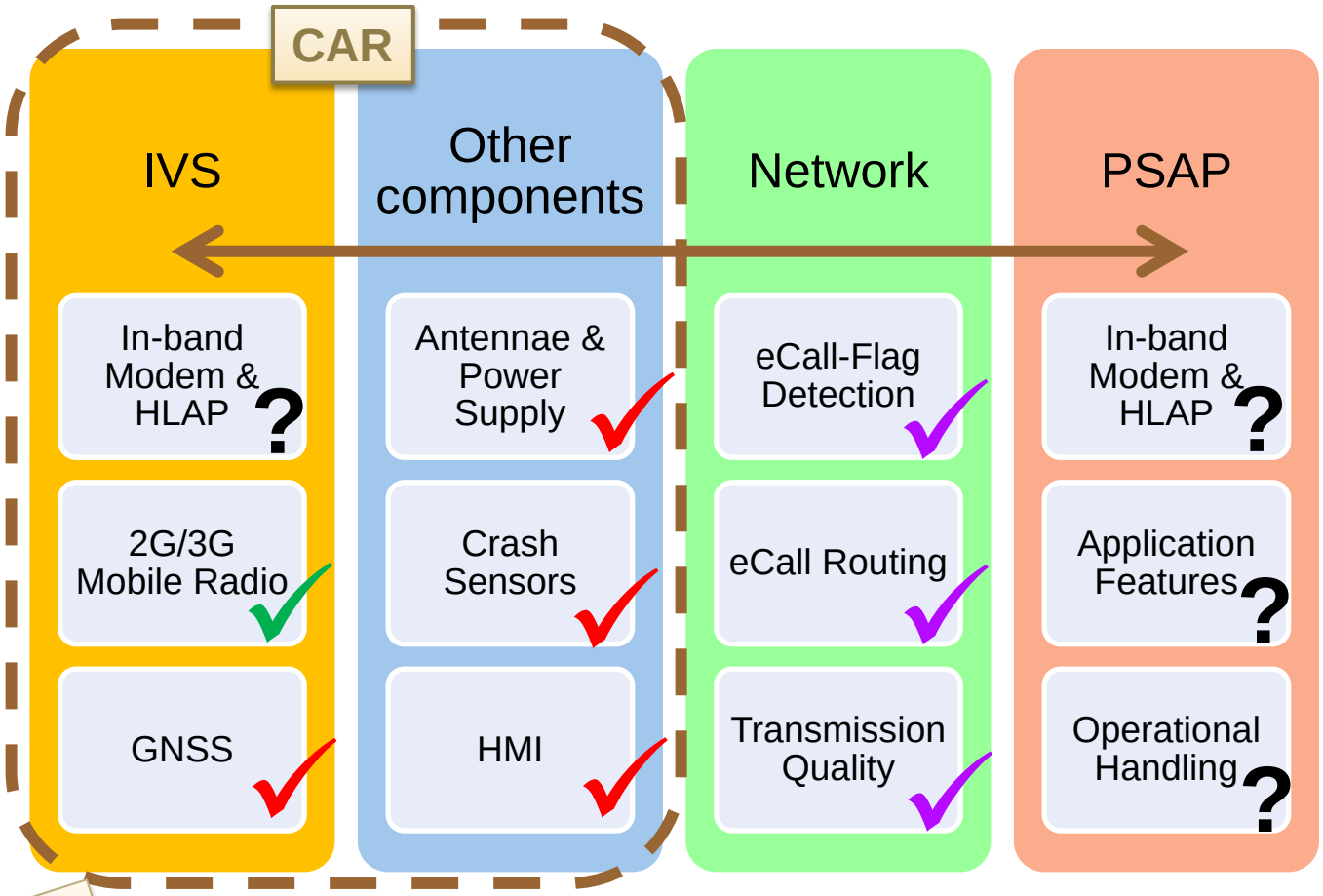
Certification Framework

Certification Challenges

Why it is not so easy?

- Automotive industry is not familiar with the certification approach used in the telecommunication industry
  - Only used to follow car type-approval regulations
- Car-type approval regulations are so far self-contained and do not allow to inherit voluntary certification schemes
  - Mainly covering car safety related aspects (e.g. EMC, crash resistance)
  - So far no need to care about interoperability
- Voluntary certification schemes like GCF are hesitant to become part of a mandated car type-approval regulation
  - Claim to be in contrast with the 'voluntary' principle
  - However, 2G/3G NADs are already part of the eCall mandate
- Current focus of ERTICO's certification framework initiative
  - Define boundary between regulated type-approval and voluntary certification
  - Consolidate tests from different standards and identify gaps

eCall System Elements



Embedded IVS device requires joint certification to ensure E2E functionality

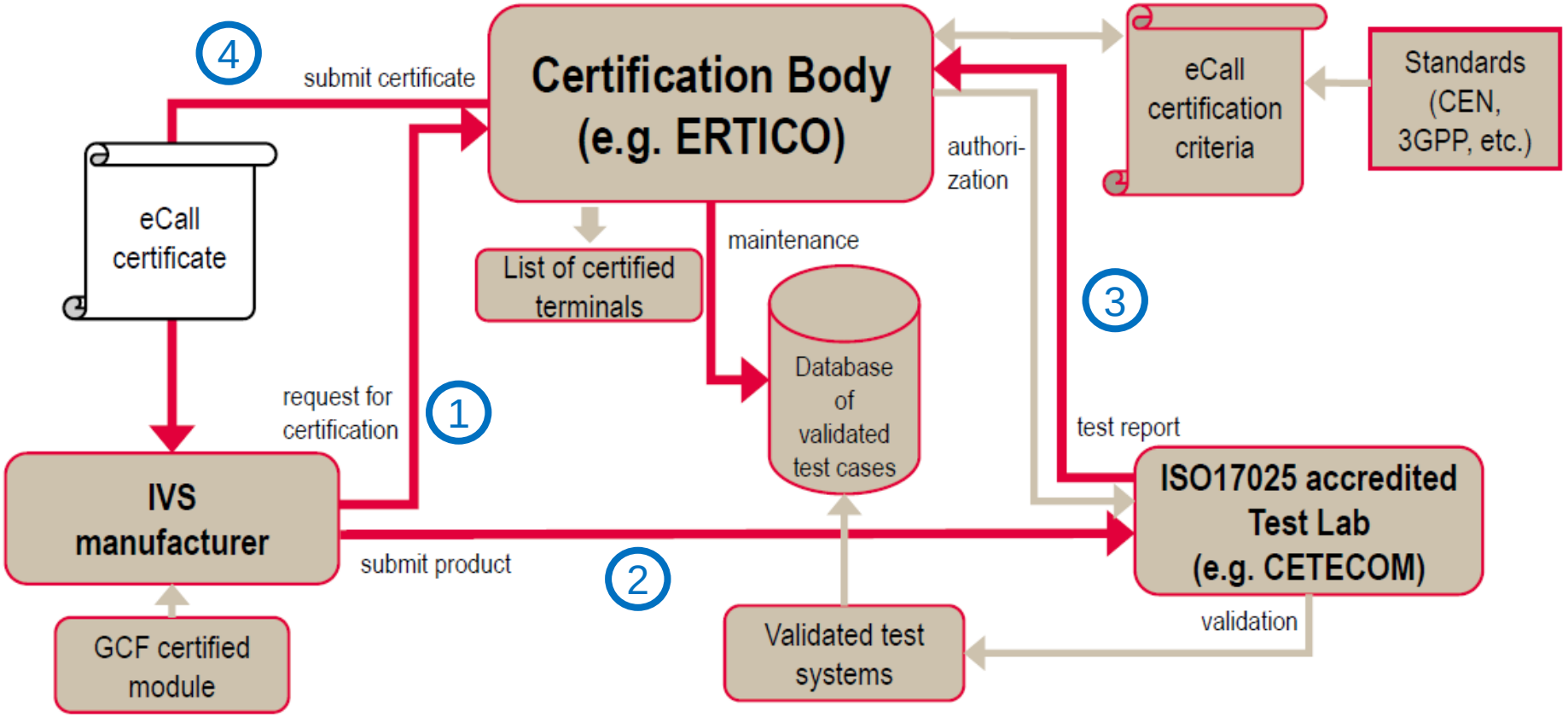
? **Certification TBD**

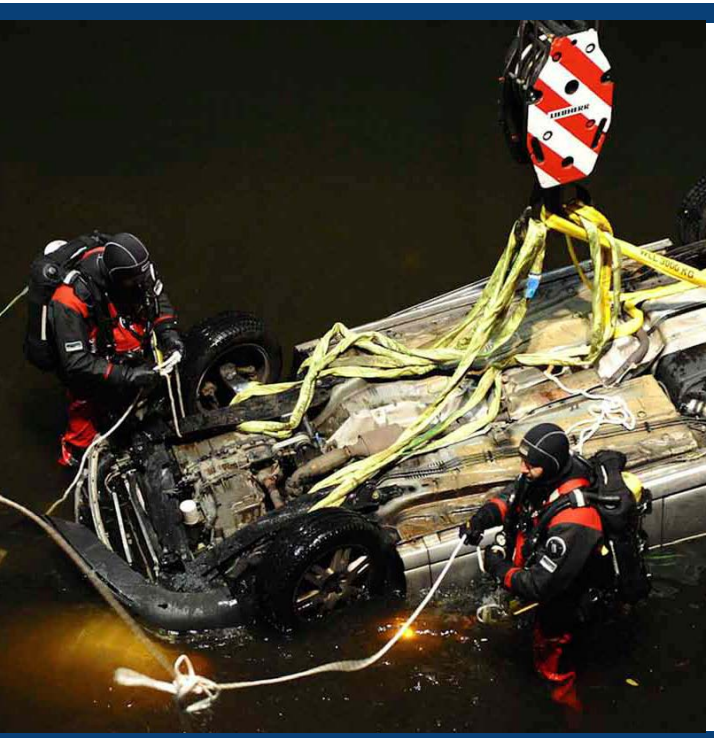
✓ GCF Certification ✓ Car Type Approval

✓ Network Maintenance and Optimization

Certification Process Overview

Proposal for eCall developed within ERTICO

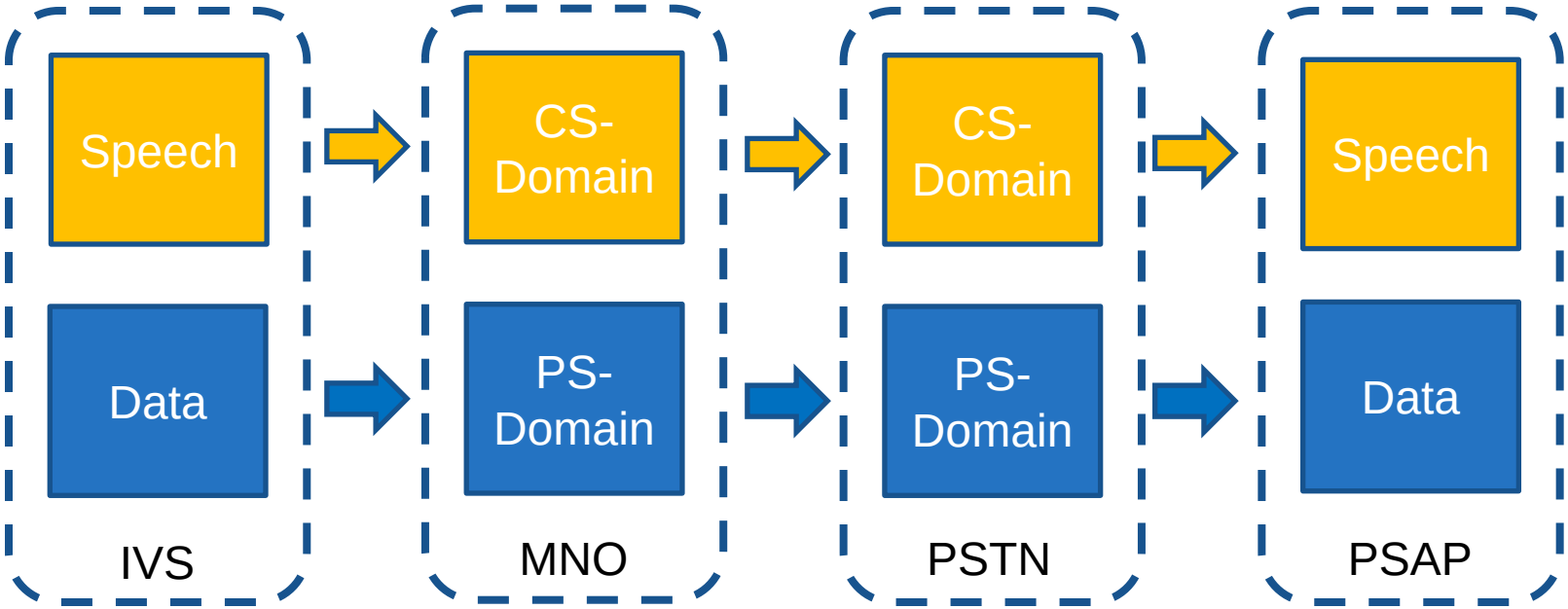




eCall Evolution

Network Environment Evolution

- 2G/3G network separating speech and data transmission over CS and PS domains



All NW components separate speech and data over CS and PS domains

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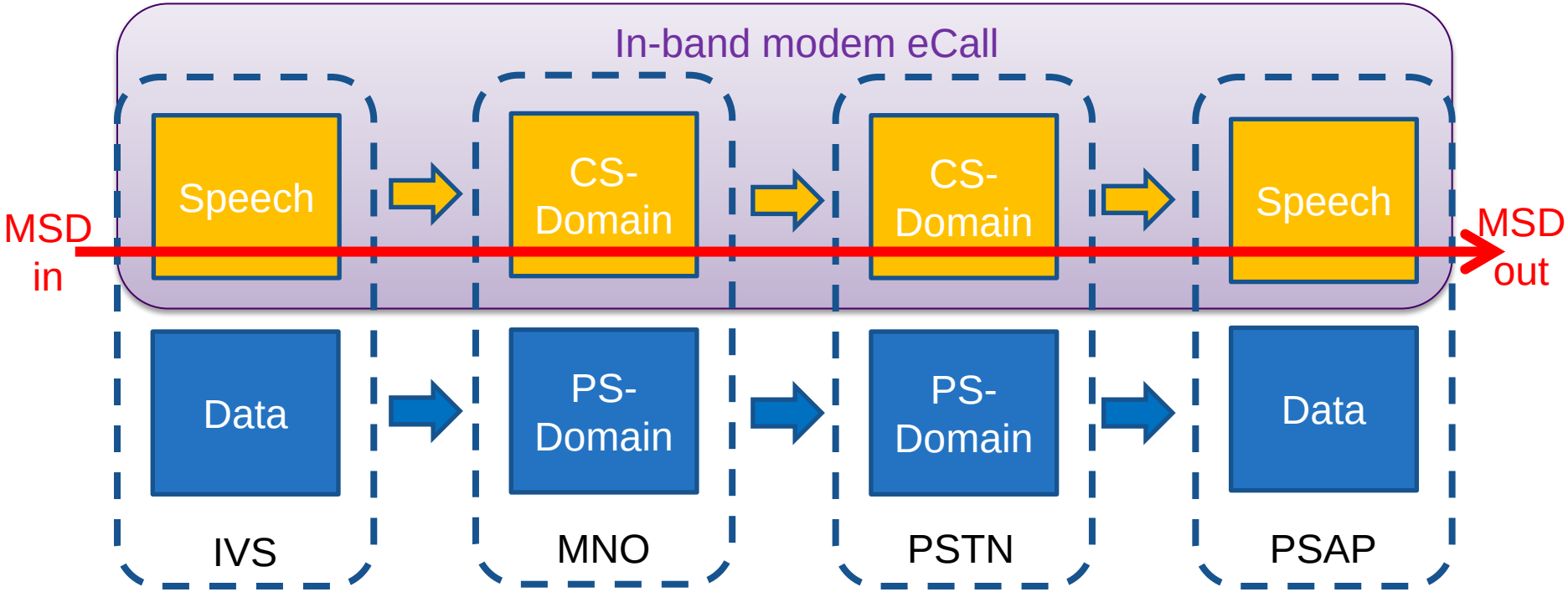

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Network Environment Evolution (cont'd)

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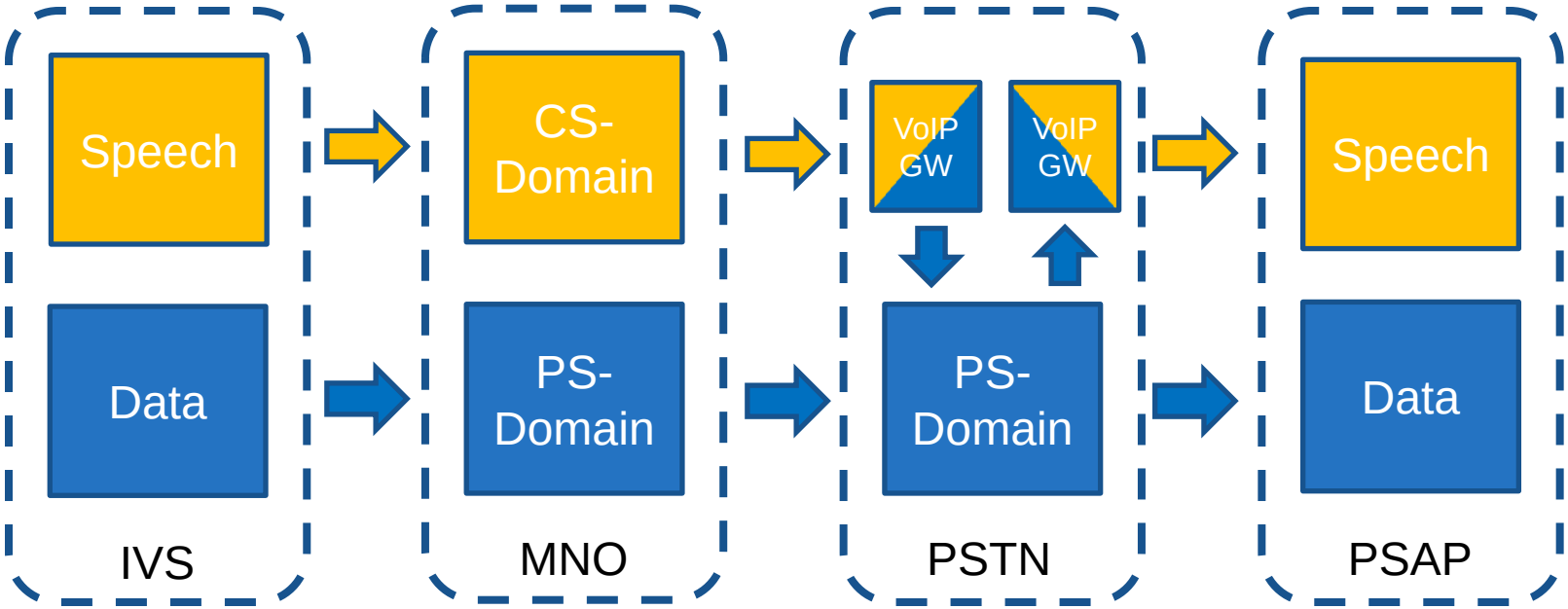
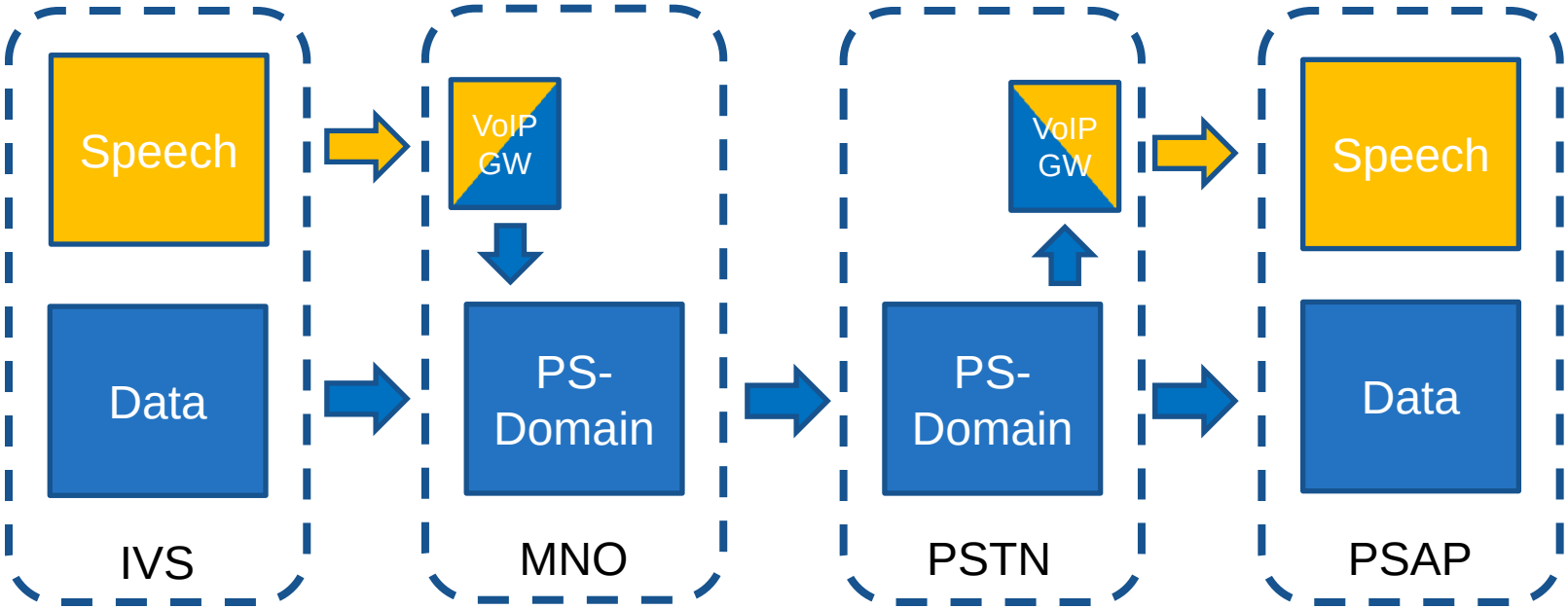


PSTN combines speech with data through Voice-over-IP gateways (VoIP GW)

Network Environment Evolution (cont'd)

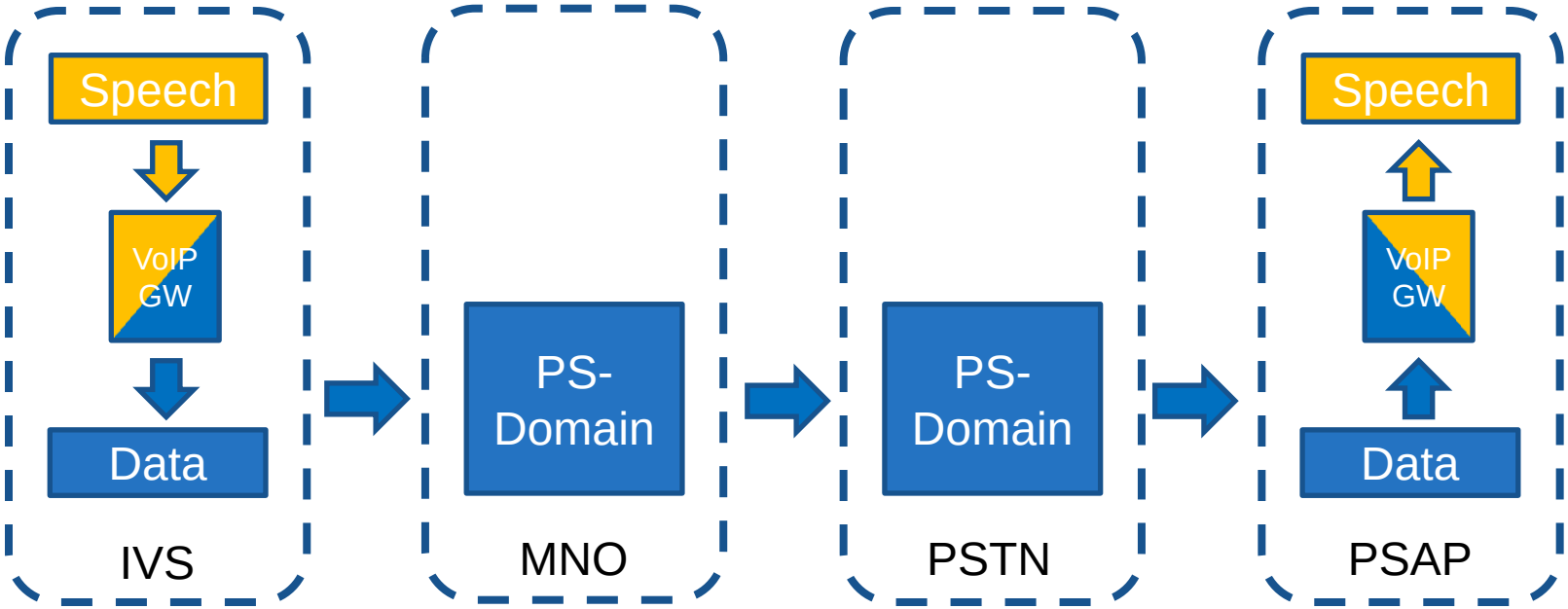
- 2G/3G network combining speech and data transmission over PS domains



MNO and PSTN combine speech with data through Voice-over-IP gateways (VoIP GW)

Network Environment Evolution (cont'd)

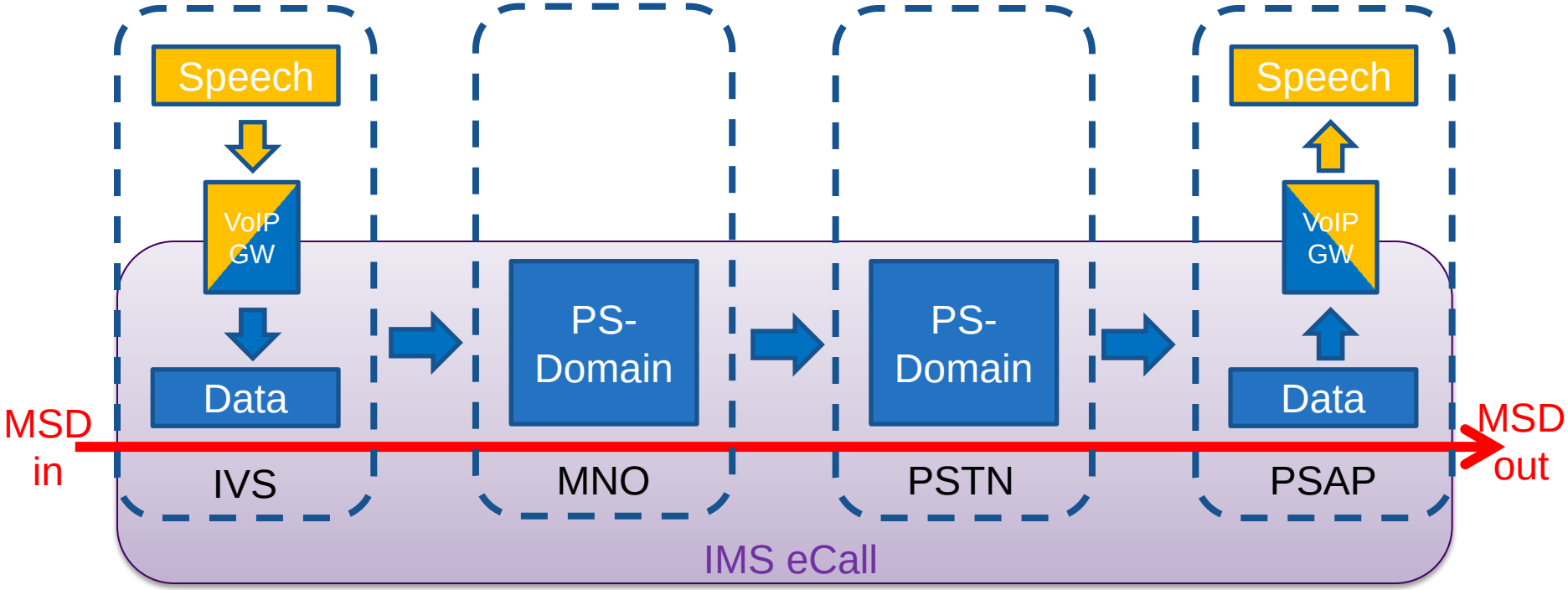
- 3.5G/4G networks can transport speech purely over PS domain through VoIP
- IVS devices require fallback to CS domain if networks do not support VoIP



End-to-end speech and data combination through Voice-over-IP gateways (VoIP GW)

eCall for Future Networks

- Recommended by ETSI STF 456
  - Use existing IMS Emergency Services (including multimedia)



- Requires only small enhancements to support eCall-specific functionality
- Provides end-to-end resource reservation and call prioritization

IMS eCall Prospects

- IMS eCall enables “Next Generation” eCall
  - Faster MSD transfer (during call-setup)
  - No muting of speech path necessary
  - More than 140 bytes could be exchanged
  - Allows 2 way data transmission
  - Extended data, e.g. regional/vehicle specific data, medical data, HD audio
  - Enhanced features for PSAPs, e.g. video, car instructions

- Seamless integration of warning, rescue and traffic management services
- Smartphone implementation (personal eCall)
- Interworking with other wireless networks (e.g. C-ITS, WiFi, NFC etc)
- New range of embedded and aftermarket devices employing
  - Medical equipment (e.g. defibrillators)
  - eHealth devices (e.g. patient monitoring)
  - Security devices (e.g. door/window lock/unlock, surveillance cams)
  - Monitoring devices (e.g. sensors for fires, flooding, earthquakes)

Conclusion

Conclusions

- Several field trials have proven that eCall performance is reliable enough for public safety services
- Nevertheless, the eCall transmission chain is complex and the dynamic network environments may lead to varying performance figures
- Careful investigations are needed to identify IVS, PSAP or network related performance issues
  - Example: AMR-WB performance issues required new CID algorithm
    - Improved MSD success rate
    - Reduced MSD transmission time
- A unified certification framework can ensure
  - Interoperability of devices
  - Reliable performance
  - Well defined test and validation procedures
  - Cost efficient development
- IMS eCall provides an evolution path for next generation networks
  - Additional multi-media applications allow to further improve emergency services

Thank You !

Questions?

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