ETSI CTI Report V1.0.3 (2020-12)

TECHNICAL REPORT

The Next Generation eCall#1 Remote Plugtests;
02 - 06 November 2020

PLUGTESTS™
INTEROP EVENTS

ETSI

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1   Executive Summary

The first Next Generation eCall Plugtests was held remotely from 02 to 06 November 2020.

This event was organized by ETSI with the support of the European Commission, ETSI TC MSG, the sAFE 112 project and EENA and hosted remotely by SINTESIO in cooperation with Iskratel as technical partner.

The Remote NG eCall Plugtests 2020 event had a specific focus on the interoperability of Next Generation eCall (NG eCall) systems or eCall over Long Term Evolution (LTE), based on the interoperability test descriptions defined in ETSI TS 103 683.

The vendors of In-Vehicle System (IVS) and Public Safety Answering Points (PSAP), supported the Next Generation eCall technology, joined the event. While carrying out interoperability tests, participants had the opportunity to test multiple aspects of their NG eCall implementations.

In difference with previous eCall events, the 1st NG eCall Plugtests event was executed remotely because of the COVID-19 pandemic situation. Unfortunately, many IVS and PSAP vendors were not able execute proposed test scenarios in remote environment. Running of compliance test sessions was also impossible in remote conditions and all GNSS and audio performance tests were cancelled.

Test results were reported by vendors using the ETSI test reporting tool, allowing assessing the level of interoperability either by test categories or across all vendors.

The event provided value for standardisation with the final debriefing session where experts could address technical questions and interoperability issues. In particular, it was found out that some 200 OK (MSD ACK) message were not transmitted by the vIMS to the PSAP. Thus, initial investigation showed a possible condition with the ReqLine coding, to be clarified with the relevant IETF working group.

As a result of the event, some clarification notes are proposed to be included in the Interoperability test specifications, ETSI TS 103 683, relating to the 200 OK ReqLine coding issue as well as the SDP block omission in the INVITE message.

The remote test bed was allowing to test Acoustic performances as Head Acoustics adapted their test setup accordingly. Head Acoustics also emphasized about the value of ITU-T P.1140 [10].

Questions were raised about the policy and regulatory aspects of NG eCall, in particular the situation and impact of decommissioning 2G/3G networks. Network regulation is depending on Member states, so that different situation may occur in EU. For instance, it is expected that 2G will not be decommissioned in Germany to keep eCall alive. Also, the support of NG eCall by MNO is questioned. Further information concerning the EC plans to update the current eCall regulation with the eCall over IMS feature is considered as essential for the automotive industry.

The ETSI Mobile Standards Group (TC MSG) is the Technical Committee within ETSI working on the NG eCall standards. As result of the Plugtests series an interoperability test specification was developed. It is actually published in February 2020 as ETSI TS 103 683 V1.1.1 "Mobile Standards Group (MSG); Testing; Next Generation eCall High Level Application Protocol (HLAP) Interoperability Testing" [9]. The 1st NG eCall Plugtests event permits to evaluate and validate this specification.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

[1] IETF RFC 8147: "Next-Generation Pan-European eCall"

[2] ETSI TS 124 008: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Mobile radio interface Layer 3 specification; Core network protocols; Stage 3".

[3] ETSI TS 123 167: "Universal Mobile Telecommunications System (UMTS); LTE; IP Multimedia Subsystem (IMS) emergency sessions (3GPP TS 23.167)".

[4] ETSI TS 124 229: "IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3"

[5] ETSI TS 103 479: "Emergency Communications (EMTEL); Pan-European Mobile Emergency Application"

[6] CEN EN 15722:2020: "Road transport and traffic telematics - eSafety - eCall Minimum Set of Data".

[7] CEN TS 17184:2018: "Intelligent transport systems - eSafety - eCall High level application Protocols (HLAP) using IMS packet switched networks"

[8] CEN TS 17240: "Intelligent transport systems - ESafety - ECall end to end conformance testing

[9] ETSI TS 103 683: "Mobile Standards Group (MSG); Testing; Next Generation eCall High Level Application Protocol (HLAP) Interoperability Testing".

[10] ITU-T P.1140 (03/17): "Speech communication requirements for emergency calls originating from vehicles"

[11] ETSI TS 126 132: "Universal Mobile Telecommunications System (UMTS); LTE; Speech and video telephony terminal acoustic test specification (3GPP TS 26.132 version 14.1.0 Release 14)"

[12] IETF RFC 3261: "SIP: Session Initiation Protocol"

2.2   Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1]   ETSI ETR 266: "Methods for Testing and Specification (MTS); Test Purpose style guide".

[i.2]   ETSI TR 103 140: "Mobile Standards Group (MSG); eCall for VoIP".

[i.3]   CEN EN 16062:2015: "Intelligent Transport Systems - eSafety - eCall - High Level Application Requirements".

[i.4]   ETSI TS 103 412: "Mobile Standards Group (MSG); Pan-European eCall end to end and in-band modem conformance testing; Prose test specification".

3   Abbreviations

BGCF   Border Gateway Control Function
DNS   Directory Name Server
E-CSCF   Emergency CSCF
EUT   Equipment Under Test
GPRS   General Packet Radio System
GPS   Global Positioning System
GSM   Global System of Mobile telecommunications
HLAP   High Level Application Protocol
HSS   Home Subscriber Server
IMS   IP Multimedia Subsystem
IVS   In Vehicle System

NOTE: eCall terminal and associated sub-systems in vehicle.

MGCF   Media Gateway Control Function
MNO   Mobile Network Operator
MSD   Minimum Set of Data
MSISDN   Mobile Subscriber Integrated Services Digital Network Number
NO   Test is recorded as NOT successfully passed.
NA   Test is not applicable.
OK   Test is recorded as successfully passed.
OT   Test is recorded as not being executed due to lack of time.
P-CSCF   Proxy CSCF
PLMN   Public Land Mobile Network
PSAP   Public Service Answering Point
SIM   Subscriber Identity Module
Test Session   A paring of vendors that test together during a given time slot.
TRT   Test Reporting Tool.
URN   Unique Resource Name
USIM   Universal Subscriber Identity Module
VIN   Vehicle Identification Number
vIMS   virtual IMS
VPN   Virtual Private Network

5 Host

This event was hosted remotely by SINTESIO in cooperation with Iskratel as technical partner.

6 Participants

In this section all the participants are listed.

Table 1 : List of participants

	Company Name	Country
1.	AMPER SISTEMAS SA	ES
2.	CESTEL	ES
3.	ISKRATEL	SL
4.	OECON Products & Services GmbH	DE
5.	Satellite Applications Catapult Ltd	UK
6.	THALES	FR

7 Technical and Project Management

7.1 Interoperability Tests

The interoperability tests specification is available as ETSI TS 103 683 [9]. It contains a set of pro-forma table corresponding to test scenarios to be executed by vendors, and it provides guidance to participants for executing and assessing the test sessions.

The interoperability tests specification was published by ETSI in February 2020 and available for all participants. The tests were grouped in basic and advanced tests.

Table 2: Basic Tests

Test case ID	Title	Remote
TD_BAS_01	Initiation of manual eCall	Y
TD_BAS_02	Initiation of automatic eCall	Y
TD_BAS_03	Initiation of test eCall	Y
TD_BAS_04	MSD transfer to PSAP supporting IMS eCall	Y
TD_BAS_05	MSD transfer to PSAP supporting IMS eCall in roaming scenario	-
TD_BAS_06	PSAP initiated callback to IVS and MSD update	Y
TD_BAS_07	PSAP initiated call clear-down	Y
TD_BAS_08	IVS initiated call clear-down not allowed	Y
TD_BAS_09	Verification of audio interfaces of IVS and PSAP	Y
TD_BAS_10	MSD update on request from PSAP	Y
TD_BAS_11	IVS behaviour after unsuccessful MSD update	Y
TD_BAS_12	IVS behaviour after unacknowledged MSD update	Y
TD_BAS_13	Format of encoded and decoded MSD in accordance with CEN EN 15722:2015 [10]	Y
TD_BAS_14	MSD transfer via in-band modem to PSAP supporting IMS eCall	?

Table 3: Advanced Tests

Test case ID	Title	Remote
TD_ADV_01	MSD transfer to PSAP supporting IMS eCall over IPv4	Y
TD_ADV_02	MSD transfer to PSAP supporting IMS eCall over IPv6	-
TD_ADV_03	MSD transfer to PSAP supporting IMS eCall over IPv4(IVS)/IPv6(PSAP)	-
TD_ADV_04	MSD transfer to PSAP not supporting IMS eCall	-
TD_ADV_05	IMS eCall establishment with IMS emergency registration	?
TD_ADV_06	IMS eCall establishment without IMS emergency registration	Y
TD_ADV_07	IMS eCall establishment without IMS emergency registration GIBA supported	?

Table 4: Advanced Tests (IVS only)

Test case ID	Title	Remote
TD_ADV_IVS_01	Fallback to legacy eCall following busy during call setup	?
TD_ADV_IVS_02	Fallback to legacy eCall following unavailable response during call setup	?
TD_ADV_IVS_03	Fallback to legacy eCall following no-answer during call setup	?
TD_ADV_IVS_04	Dropped eCall after MSD has been acknowledged	Y
TD_ADV_IVS_05	Dropped eCall before call has been established	?
TD_ADV_IVS_06	IVS configured for 'eCall only' service (restricted)	Y
TD_ADV_IVS_07	eCall is attempted when no networks are available (limited service condition with forbidden PLMN on SIM/USIM)	-
TD_ADV_IVS_08	MSD transfer to PSAP supporting IMS eCall via PLMN without VoIMS support	-
TD_ADV_IVS_09	Termination of manually triggered eCall by vehicle occupant	Y
TD_ADV_IVS_10	Termination of automatically triggered eCall by vehicle occupant not allowed/not possible	Y
TD_ADV_IVS_11	Ongoing eCall shall not be disconnected if new trigger is received	Y

Table 5: Advanced Tests (PSAP only)

| Test case ID	Title	Remote
TD_ADV_PSAP_01	PSAP handling of more than 1 eCall simultaneously	Y
TD_ADV_PSAP_02	PSAP correct MSD additional data decoding	Y
TD_ADV_PSAP_03	Rerouting to another PSAP/emergency control centre	Y
TD_ADV_PSAP_04	PSAP operator user interface	Y

7.2   Test Scheduling

The ETSI Test Report Tool (TRT) was used to manage the test scheduling. There were 1-2 parallel test sessions of 4 hours, and the test schedule provided pairing sessions for the whole week of tests.

7.3   Test Site Layout

The generic test bed used to carry out interoperability tests, during the event, is summarized in the figure 1. In normal operation conditions, the IVS calls urn:service:sos.ecall.manual or urn:service:sos.ecall.automatic. This call setting is then interpreted by the mobile network as a requirement to connect the IVS with the most appropriate PSAP, able to handle Next Generation (NG) pan EU eCalls, accordingly to the RFC 8147 [1] and CEN TS 17184 [7].

However, during an NG eCall interoperability event, IVS will need to be connected to given PSAP in order to carry out pairing test sessions, following the test scenario provided in the present document. The selection of the PSAP is therefore achieved by the use of proposed plugtests URNs defined in Table 6 of ETSI TS 103 683 [9]. Based on the proposed URNs routing was configured at the virtual IMS (vIMS) network solution to access the correct PSAP and assure parallel sessions at the same time.
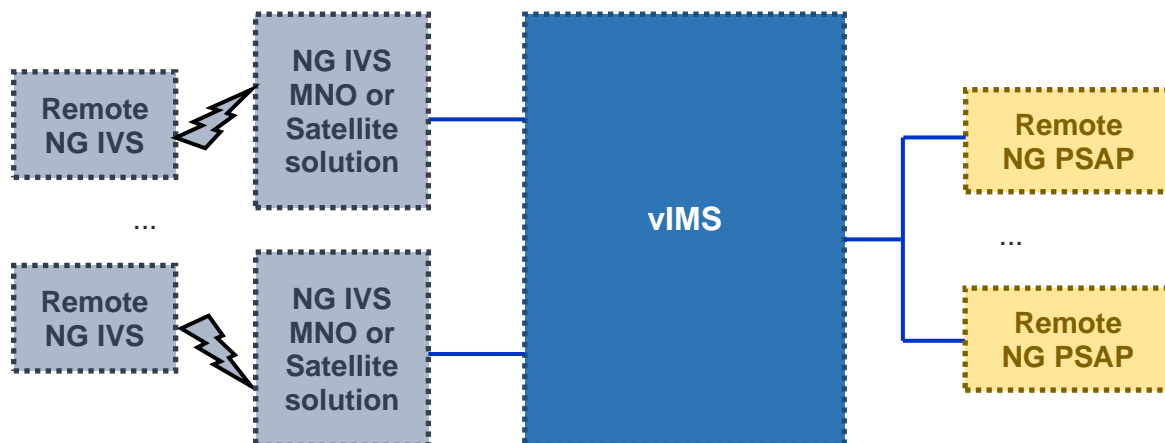
Figure 1: Test Site Layout

The Plugtests network environment was set up on the server as cloud platform. Required servers were installed to support the vIMS solution (see figure 2). One of supported services at vIMS was NG eCall.

Setup of VPN tunnels was precondition to avoid malicious attacks to the established vIMS environment. VPNs were successfuly established between PSAPs and NG eCall Plugtests network. Since the IVS equipments were connected over the sattelite or MNO there was not possible to establish the VPNs. Final solution was to enable public connection of IVS equipments directly to the vIMS. During the registration establishment of the IVSs it was possible to retreive their public IP addresses and prepare the firewall protection on the Plugtests site to limit the mailicios calls form unknown sources.
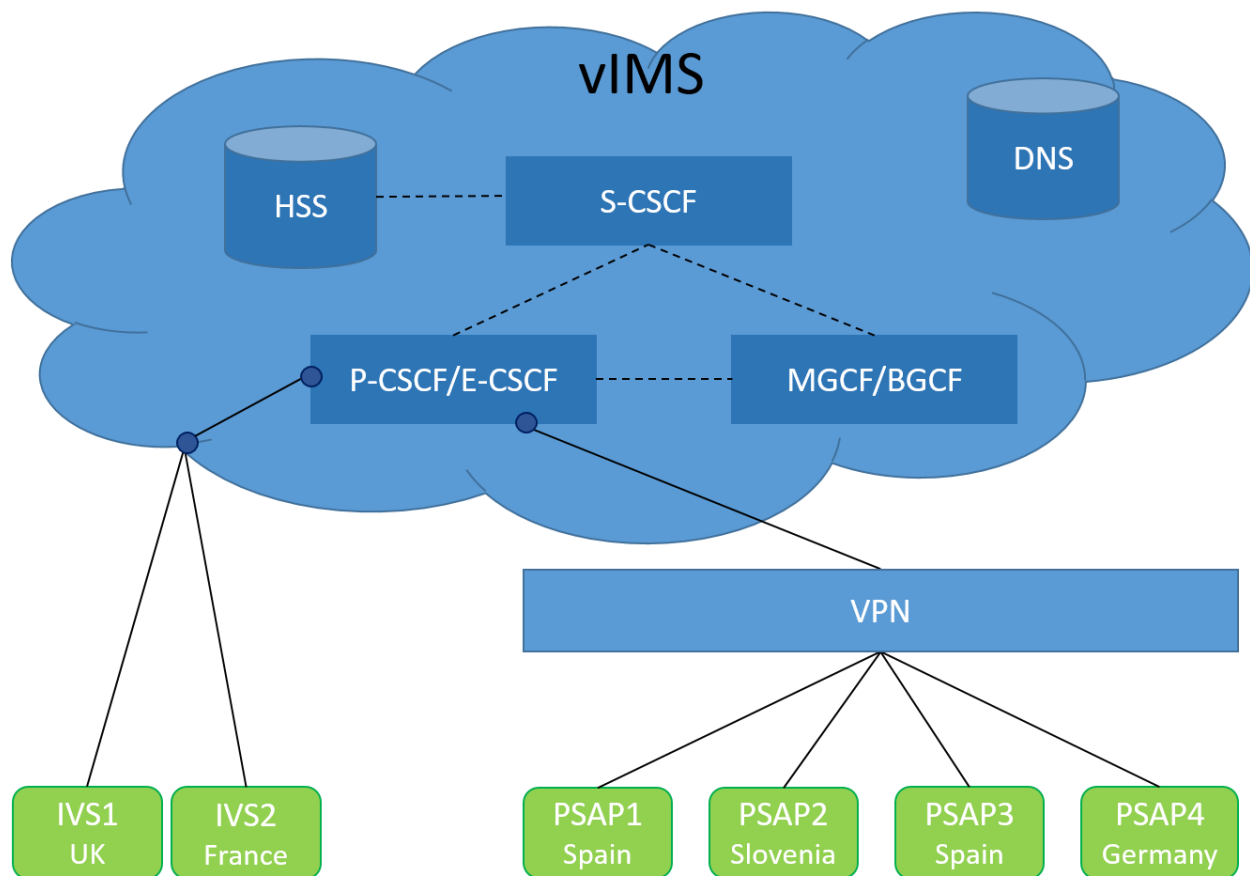
Figure 2: NG eCall Plugtests network

7.4 Interoperability Test Procedure

Each test was executed in the same manner as listed below:

1) Connect devices from different vendors

2) Check connectivity between devices

3) Perform tests according to Test description document

4) Check if devices can send/receive frames from each other

5) Check if data is handled correctly in the network and facility layers

6) Result determination and reporting

7) Result OK: run next test

8) Result NOK: check monitor tools to identify source of error

9) Report results in ETSI Test Reporting Tool

8   Results

8.1   Results reporting

The results of each interoperability test session recorded using the ETSI Test Report Tool (TRT). After each test execution the interoperability result is documented and agreed among all participants.

Vendors can only access results of their own test sessions.

8.2   Overall Results

There were 8 tests sessions between 6 participants: 2 IVS and 4 PSAP vendors.

100 use-cases (56.5% of total amount) were executed during these sessions, 76 of them were executed successfully.

77 use-cases (43.5% of total amount) were skipped according to different reasons.

The Table 6 presents the overall results of tests execution

Table 6: Overall results

Interoperability		Not Executed		Totals	
OK	**NO**	**NA**	**OT**	**Run**	**Results**
76 (76.0%)	24 (24.0%)	77 (43.5%)	(0.0%)	100 (56.5%)	177

The Table 7 presents the count of use-cases executed during test sessions.

Table 7: Results per sessions

	Interoperability		Not Executed		Totals
	OK	**NO**	**NA**	**OT**	**Run**
Minimum	5	1	5	0	11
Maximum	14	8	16	0	22
Mean	9.8	3.8	10.5	0.0	12.3

There were 13 basic and 17 advanced tests to be performed in each test session.

The Table 8 and Table 9 presents the execution statistics of each use-case.

Table 8: Results per test (basic tests)

	Interoperability		Not Executed		Totals	
	OK	**NO**	**NA**	**OT**	**Run**	**Results**
TD_BAS_01	8 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	8 (100.0%)	8
TD_BAS_02	8 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	8 (100.0%)	8
TD_BAS_03	8 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	8 (100.0%)	8
TD_BAS_04	6 (75.0%)	2 (25.0%)	0 (0.0%)	0 (0.0%)	8 (100.0%)	8

TD_BAS_06	3 (60.0%)	2 (40.0%)	2 (28.6%)	0 (0.0%)	5 (71.4%)	7
TD_BAS_07	7 (100.0%)	0 (0.0%)	1 (12.5%)	0 (0.0%)	7 (87.5%)	8
TD_BAS_08	1 (33.3%)	2 (66.7%)	5 (62.5%)	0 (0.0%)	3 (37.5%)	8
TD_BAS_09	4 (57.1%)	3 (42.9%)	1 (12.5%)	0 (0.0%)	7 (87.5%)	8
TD_BAS_10	1 (25.0%)	3 (75.0%)	4 (50.0%)	0 (0.0%)	4 (50.0%)	8
TD_BAS_11	0 (0.0%)	2 (100.0%)	6 (75.0%)	0 (0.0%)	2 (25.0%)	8
TD_BAS_12	0 (0.0%)	3 (100.0%)	5 (62.5%)	0 (0.0%)	3 (37.5%)	8
TD_BAS_13	5 (71.4%)	2 (28.6%)	1 (12.5%)	0 (0.0%)	7 (87.5%)	8
TD_BAS_14	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	0 (0.0%)	1

Table 9: Results per test (advanced tests)

	Interoperability		Not Executed		Totals	
	OK	**NO**	**NA**	**OT**	**Run**	**Results**
TD_ADV_01	5 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	5 (100.0%)	5
TD_ADV_05	0 (0.0%)	0 (0.0%)	5 (100.0%)	0 (0.0%)	0 (0.0%)	5
TD_ADV_06	1 (100.0%)	0 (0.0%)	4 (80.0%)	0 (0.0%)	1 (20.0%)	5
TD_ADV_07	0 (0.0%)	0 (0.0%)	5 (100.0%)	0 (0.0%)	0 (0.0%)	5
TD_ADV_IVS_01	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	0 (0.0%)	1
TD_ADV_IVS_02	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	0 (0.0%)	1
TD_ADV_IVS_03	0 (0.0%)	0 (0.0%)	1 (100.0%)	0 (0.0%)	0 (0.0%)	1
TD_ADV_IVS_04	3 (100.0%)	0 (0.0%)	2 (40.0%)	0 (0.0%)	3 (60.0%)	5
TD_ADV_IVS_05	0 (0.0%)	0 (0.0%)	5 (100.0%)	0 (0.0%)	0 (0.0%)	5
TD_ADV_IVS_06	4 (100.0%)	0 (0.0%)	1 (20.0%)	0 (0.0%)	4 (80.0%)	5
TD_ADV_IVS_09	0 (0.0%)	1 (100.0%)	4 (80.0%)	0 (0.0%)	1 (20.0%)	5
TD_ADV_IVS_10	0 (0.0%)	1 (100.0%)	4 (80.0%)	0 (0.0%)	1 (20.0%)	5
TD_ADV_IVS_11	3 (100.0%)	0 (0.0%)	2 (40.0%)	0 (0.0%)	3 (60.0%)	5
TD_ADV_PSAP_01	1 (50.0%)	1 (50.0%)	3 (60.0%)	0 (0.0%)	2 (40.0%)	5
TD_ADV_PSAP_02	3 (100.0%)	0 (0.0%)	2 (40.0%)	0 (0.0%)	3 (60.0%)	5
TD_ADV_PSAP_03	1 (50.0%)	1 (50.0%)	3 (60.0%)	0 (0.0%)	2 (40.0%)	5
TD_ADV_PSAP_04	3 (100.0%)	0 (0.0%)	2 (40.0%)	0 (0.0%)	3 (60.0%)	5

9   Event feedback and wrap up meeting summary

9.1   Technical issues detected and solved during the event

- Issues to connect to public IP address or URN were reported
- Usage of wrong SIP header values as well as wrong SDP values
- The configuration of the vIMS setup was updated
- Wrong Message Body(MSD+SDP) calculation noticed and reported to participant
- Initial message INVITE was not recognized or correctly received at PSAP side

9.2   Technical issues requiring clarification in the SIP base standards

One technical issue was detected and requiring base standard clarification:

- ACK was not forwarded to PSAP (200 OK Contact/ACK ReqLine content)

After some investigations SINTESIO found one IVS was able to send an ACK message, which was forwarded over the vIMS to all PSAPs. But another IVS was not able to forward the ACK message to any of PSAPs. The difference was found to be only the ReqLine of ACK method:

- when the ACK with ReqLine with urn:… as specified in INVITE method was used then the ACK was routed to the PSAP (see RFC 3261 [12] clauses 17.1.1.3 and 17.2.3)
- when the ACK with ReqLine with sip:... received from 200 OK Contact was used then the ACK was stopped at the vIMS(see RFC 3261 [12] clause 24.2)

The issue could also be located at the vIMS, not supporting mix of urnUri and sipUri in the same call and therefore the ACK was not forwarded.

It is recommended to seek clarification from the relevant IETF working group, as well as to add a temporary note in the test specification ETSI TS 103 683 and in CEN TS 17184:2018.

9.3   ETSI TS 103 683 updates

Beyond the note about the ReqLine coding mentioned above, the following note should be added:

According to RFC 3261 [12] the SDP block may be omitted in the INVITE message, however, it is highly recommended to include the SDP block to ensure a media (audio) path between the IVS and the PSAP. If the SDP block is omitted in the INVITE message, it must be included in the following SIP messages (e.g. 200, ACK). See RFC 3261 [12], clauses 13.2.2.4 and 13.3.1

9.4   Head Acoustics test bench

Acoustic test sessions were not executed during this event, as participants were mostly interested in assessing NG eCall procedures.

Head Acoustics confirmed that the remote setup allowed carrying out useful Acoustic test sessions while using the Car audio setup available at Head Acoustics labs, over the remote test bench.

As for standardization of audio quality test, we would like to suggest that every IVS to apply audio test of ITU-T P.1140 [10], as the first step, which would enable gradual and smooth migration to mandate ITU-T P.1140 [10] after a certain period of time.

Head Acoustics recommends for all IVS manufacturer and also for the standardisation process of NG- eCall to follow the complete ITU-T P.1140 [10] as the output of a lot of international effort.

NOTE: ITU-T P.1140 [10] does not define IMS-based tests (e.g. Jitter buffer management) – those are defined in ETSI TS 126 132 [11].

9.5   Wrap up discussions about eCall EU regulation

Questions were raised from participants about the eCall regulation with regards to the VoIP transition. The following issues were presented as the current understanding, but requiring further clarification from the EC or GSMA for instance:

Several MNOs in Europe announced shutdown of 2G/3G networks already – 2G could be maintained by MNOs in some Member States if relevant critical applications need it.

EU Commission does not mandate the MNOs to keep CS networks alive

Correct NW coverage is coordinated by each Member state as part of the MNO licenses, but the regulation needs PSAP to ensure proper handling of eCalls

- Commission Recommendation 2011/750/EU (4) on support for an EU-wide eCall service in electronic communication networks for the transmission of in- vehicle emergency calls based on 112 ('eCalls') advises Member States to indicate the eCall PSAP to route eCalls and to ensure that mobile network operators handle eCalls properly
  - o Member States should draw up detailed rules for public mobile network operators operating in their countries on handling eCalls.

- o Mobile network operators should handle an eCall like any other call to the single European emergency number 112

About a possible date where CS networks are 100% decommissioned in first countries in Europe so they should support NG eCall based on IMS: acc. to GSMA decommissioning should be a case by case decision from MNO

Will EU Commission mandate the support of NG eCall based on IMS or will they stay on their view that eCall is mandated regardless of technology?

DG MOVE has started discussions last year to evaluate the needs and means to update the eCall regulation.