1st NG112 Emergency Services Plugtest; Sophia Antipolis, FR; 14 - 18 March 2016

Keywords
Testing, Interoperability, ITS

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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Contents

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1 Executive Summary

Emergency services is defined primarily as the communication from individual citizens using individual electronic communication devices to the Public Safety Answering Points with a view of requesting and receiving emergency relief from emergency organisations.

The EU has stated in the rolling plan for ICT standardisation that the lack of commonly agreed standards in support of electronic communications networks for the emergency call service in Europe is a barrier for implementing future proof solutions which fulfil the requirements of the amended Universal Service Directive 2002/22/EC. It is also stated that Standards for Total Conversation access to 112 are required to fulfil special needs for users' rights as per 2009/136/EC.

The EU has defined amongst others, the following standardisation actions:

- Action 2 Identify the standardisation needs for the deployment of 112 Smartphone applications enhanced with caller location and multimedia features accessible for the widest range of users.
- Action 3 Completion of standards in response to mandate M/493 to produce the relevant standards to support the Location Enhanced Emergency Call Service. Global standards bodies are invited to contribute taking into account next generation networks and location accuracy and reliability.
- Action 4 Identify the standardisation needs for the transmission of the GNSS location data from the handset to the Public Safety Answering Points by mobile network operators.

ETSI Emergency Telecommunications (EMTEL) Special Committee performs work in response to these standardisation actions by

- Work on Total Conversation Access to emergency services: an ETSI Technical Specification TS 101 470 was published in 2012 and an implementation guide TR 103 201 was published during the Plugtest week.
- The organization of NG112 Emergency Services Plugtest series

Standard development should ideally undergo a cycle of specification development, followed by validation of the specification, followed by development of standardized test specifications. ETSI implements these best practices through organizing Plugtests™ interoperability events and creating standardized test specifications.

ETSI, in partnership with EENA (the European Emergency Number Association), has organized the first NG (Next Generation) Emergency Services Plugtests™ event. This event was hosted by ETSI, from 14 to 18 March in Sophia Antipolis, France.

The aim of the event was to trial independently and jointly all components of the 112 communication chain based on Next Generation networks. Different topics were addressed, including Location Based Emergency Call Routing, Policy Based Emergency Call Routing, and Next Generation Media Types.

Companies from around the world, including Asia, Europe, and North America, had the opportunity to connect their equipment to the test infrastructure and test their solutions on-site from the ETSI headquarters in Sophia-Antipolis, France, as well as from their own labs.

More than 100 test pairings over 4 days of testing were executed during the course of the event showing a high level of interoperability and maturity of the NG112 technology.

The Plugtest blog is accessible at http://www.etsi.org/news-events/events/977-ng112?tab=3.

2 References

The following base specifications were validated in the Plugtest.

[i.1] EENA. Next Generation 112 Long Term Definition, Version 1.1, March 2013. http://www.eena.org/uploads/gallery/files/pdf/2013-03-15-eena_ng_longtermdefinitionupdated.pdf

[i.2] EMTEL. Emergency Communications (EMTEL); Total Conversation Access to Emergency Services, ETSI TS 101 470, June 2012. http://www.etsi.org/deliver/etsi_ts/101400_101499/101470/01.01.01_60/ts_101470v010101p.pdf

[i.3] EMTEL. Emergency Communications (EMTEL); Total Conversation for Emergency Communications, Implementation Guidelines, ETSI TR 103 201, March 2016. http://www.etsi.org/deliver/etsi_tr/103200_103299/103201/01.01.01_60/tr_103201v010101p.pdf

[i.4] 3GPP. TS 22.173: IP Multimedia Core Network Subsystem (IMS) Multimedia Telephony Service and Supplementary Services; Stage 1, Version 9.4.0, December 2009.

[i.5] 3GPP. TS 23.167: IP Multimedia Subsystem (IMS) Emergency Sessions, Version 9.3.0, December 2009.

[i.6] 3GPP. TS 24.229: IP Multimedia Call Control Protocol Based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP), Stage 3, Release 11, Version 11.4.0, June 2012

[i.7] ETSI NG112 Test Specification. https://portal.etsi.org/Portals/0/TBpages/CTI/Docs/ETSI_NG112_Test_Specification_v1.2.pdf

3 Abbreviations

EUT	Equipment Under Test
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
Test Session	A paring of vendors that test together during a given time slot
TSR	Test Session Report. Report created during a test session

4 Participants

The teams which executed tests during the Plugtest are listed in the table below.

Table 1: List of teams

#	Teams
1	**ACULAB**
2	**AVAYA**
3	**Engelbart Sodtware (AYAYA's integrator)**
4	**BETA80**

5	**COM4INNOV**
6	**EHU**
7	**FREQUENTIS**
8	**GEO-COMM**
9	**HUAWEI**
10	**INDIGITAL**
11	**IURGENCE**
12	**OMNITOR**
13	**UNIFY**
14	**VOLTDELTA**
15	**Project http://www.emynos.eu/**

The observers who attended the Plugtests are listed in the table below.

Table 2: List of Observers

#	Observer
1	**SIVECO http://www.concorde-project.eu/**
2	**SMART 112 MOBILE**
3	**SOS ALARM**
4	**TTA (Telecommunications Technology Association - Korea)**
5	**UNI LUXEMBOURG (http://www.redirnet.eu/)**

5 Technical and Project Management

5.1 Interoperability Tests

A document defining Test Descriptions was developed by one NG112 expert. It contains Test Configurations, Interoperable Function Statements and the test scenarios to be executed by vendors.

The document was distributed to participants some weeks before the event, proposing them to comment on the tests or to add more tests.

Table 3: Interoperability Tests

Test case ID	Summary
CN/NGCS/01	Verify end-to-end connectivity between UE and PSAP for emergency calls including IP access and NG core services
CN/NGCS/02	Verify end-to-end connectivity between UE and PSAP for emergency calls including IMS/VoLTE access and NG core services
CN/NGCS/03	Verify end-to-end connectivity between UE and PSAP for emergency calls including UC access and NG core services
CN/NGCS/04	Verify end-to-end connectivity between UE and PSAP for emergency calls including PSTN access and NG core services
RT/LBV/01	Verify end-to-end connectivity between UE and PSAP for emergency calls including IP access, NG core services and Location By Value
RT/LBV/02	Verify end-to-end connectivity between UE and PSAP for emergency calls including IMS/VoLTE access, NG core services and Location By Value
RT/LBV/03	Verify end-to-end connectivity between UE and PSAP for emergency calls including UC, NG core services and Location By Value
RT/LBV/04	Verify end-to-end connectivity between UE and PSAP for emergency calls including PIF, NIF, NG core services and Location By Value
RT/LBR/01	Verify end-to-end connectivity between UE and PSAP for emergency calls including IP access, NG core services and Location By Reference
RT/LBR/02	Verify end-to-end connectivity between UE and PSAP for emergency calls including IMS/VoLTE access, NG core services and Location By Reference
RT/LBR/03	Verify end-to-end connectivity between UE and PSAP for emergency calls including UC access, NG core services and Location By Reference
RT/LBR/04	Verify end-to-end connectivity between UE and PSAP for emergency calls including PIF, NIF, NG core services and Location By Reference
MM/VID/01	Verify end-to-end connectivity between UE and PSAP for multimedia emergency calls (audio and video) including IP access and NG core services
MM/RTT/01	Verify end-to-end connectivity between UE and PSAP for multimedia emergency calls (audio and text) including IP access and NG core services
MM/TC/01	Verify end-to-end connectivity between UE and PSAP for multimedia emergency calls (audio, video and text) including IP access and NG core services
PO/TIME/01	Verify end-to-end connectivity between UE and PSAP for emergency calls including IP access, NG core services and routing policies (time)
PO/STAT/01	Verify end-to-end connectivity between UE and PSAP for emergency calls including IP access, NG core services and routing policies (queue state)
PO/LNG/01	Verify end-to-end connectivity between UE and PSAP for emergency calls including PIF, NIF, NG core services and PIF RTP monitoring features
PO/LNG/02	Verify end-to-end connectivity between UE and PSAP for emergency calls including PIF, NIF, NG core services and PIF SIP monitoring features
RT/ECRF/01	Verify end-to-end connectivity between UE and PSAP for emergency calls including IP access, NG core services and overlapping geo-areas NOTE: This test was created during the Plugtest and does therefore not figure in the test specification

5.2 Test Scheduling

The preliminary test schedule was developed before the Plugtest and was circulated to all the participants in advance for comments. The initial test schedule allowed for each company to test against a fair number of other companies. A day was organized in a morning test session from 9.00 to 13.00 and in an afternoon test session from 14.00 to 18.00. Within the test sessions, test slots of variable length were allocated according to the relevant test configurations.

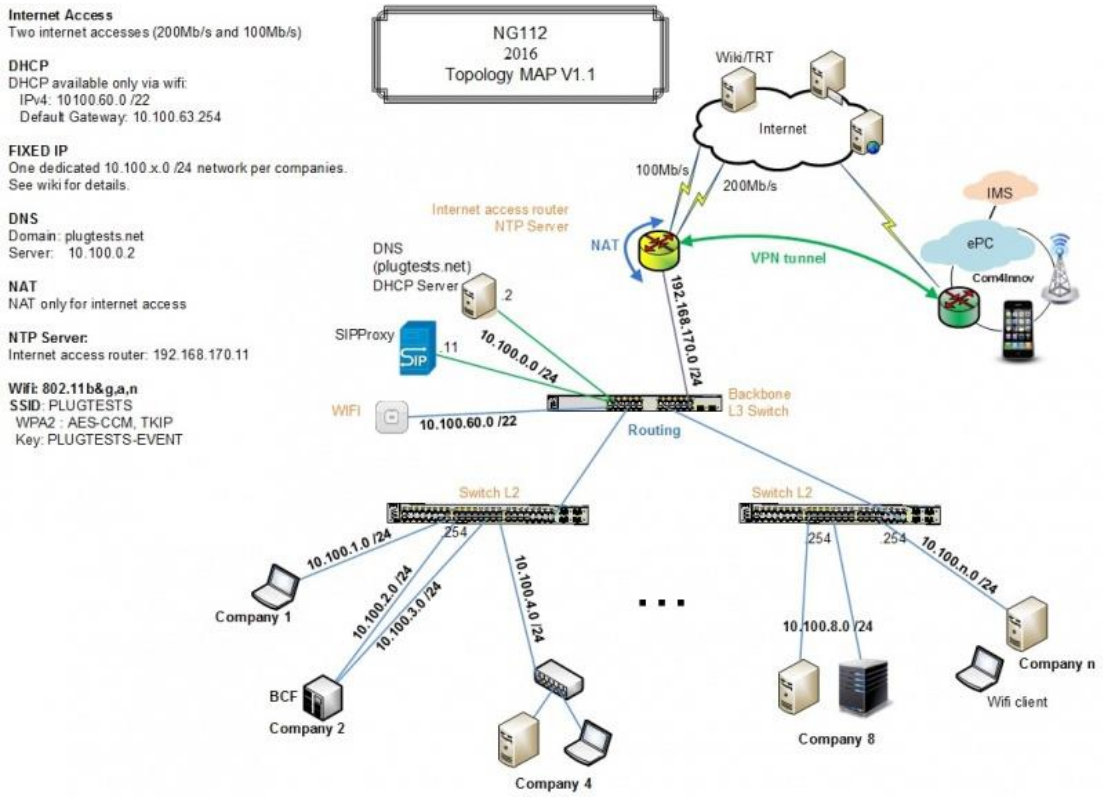
During the test event the test schedule was constantly updated according to the progress of the test sessions. This was done during the daily wrap-up meetings at the end of each day and during face-to-face meetings with the participants.

The final schedule can be viewed at https://trt.plugtests.net/tt.php?key=dcd28a05c1758b7194998105df369259937e7129

5.3 Test Network Infrastructure

The Test Network Infrastructure is shown in the picture below. It allowed to connect remote sites to the local network. The VPN access router and the local network were setup at the ETSI HQ.

Table 4: Test Network Infrastructure



5.4 VoLTE IMS

Com4Innov http://www.com4innov.com/ , who deploy a 4G/IMS network at Sophia Antipolis, provided access to their network in order to enable emergency calls from VoLTE mobile phones.

Here is a brief overview of the IMS emergency call steps from the UE perspective :

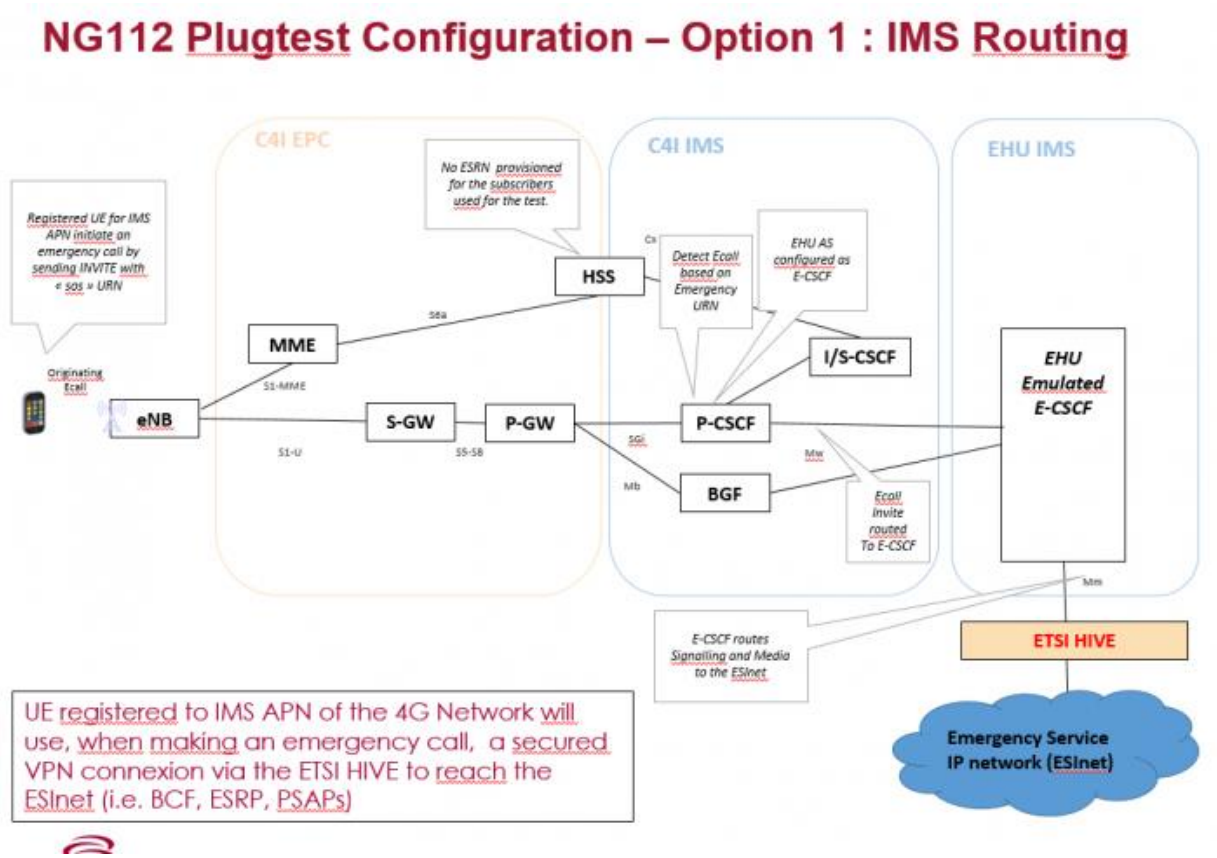
- UE Detectable Emergency Call (The UE can detect when a specific call is an emergency call or not)
- UE initiates an emergency PDN connectivity request.
- Due to the new APN for emergency , the UE need to perform an IMS registration for emergency
- The emergency SIP REGISTER message has the “sos” parameter present in the Contact URI field.
- The request URI of the SIP INVITE for the emergency call is in the form “urn:service:sos”

Prioritty management for IMS Emergency Call :

The eNodeB is mainly responsible to secure the QoS of the call, and to ensure that the ARP used for emergency is enforced in case of congestion. The eNodeB uses the ARP (Allocation and Retention Priority) to allow mobility to restricted areas.

The picture below describes the setup.

Table 4: VoLTE IMS



The test setup did not include the E-CSCF. This component was replaced by an Application developed by EHU. The IMS infrastructure was used in order to provide IP connectivity for mobile app testing (Mobile apps were installed on mobile phones and tested). Furthermore VoLTE IMS emergency calls were tested with native VoLTE applications.

5.5 Wiki, Blog, Mailling List

- For the information management the WIKI https://wiki.plugtests.net/wiki/NG112-2016/index.php was used.
- Updates and invitations to conference calls were distributed via the mailing list NG112_PLUGTESTS@LIST.ETSI.ORG
- Impresions of the Plugtest were captured with the blog http://www.etsi.org/news-events/events/977-ng112?tab=3

6 Achieved Interoperability Results

6.1 Overview

The concept of the ESInet is built upon well known, stable standards from ETSI, 3GPP and IETF. Vendors who have already attended NENA test events and who are active in the NG112 community have demonstrated the maturity and interoperability of their implementations. The Plugtest was open to all kind of vendors, and especially for newcomers with prototype implementations. Naturally these implementations did not support all features and the vendors used the event to validate their understanding of the base standards, and to debug discovered issues. The protoype implementations did only partially file reports, and hence they are only partially represented in the results. It is anticipated that a couple more Plugtests are required before all NG112 vendors are on the same maturity and interoperability level.

The highlights of the Plugtest were:

- a good range of originating devices of VoLTE – IMS mobile phone with emergency apps, IP based soluctions such as webRTC, VoIP Clients and Apps as well as Unified Communication Enterprise Solutions;
- a high level of interoperability of EENA-based and NENA-based implementations;

In summary it can be stated that the basic concepts of the ESInet (Location Based Routing, Policy Based Routing) were successfully verified.

Table 4: Results Overview

Interoperability		Not Executed		Execution Rate
OK	NO	NA	OT	
99 (97.1%)	3 (2.9%)	26 (20.3%)	(0.0%)	102 (79.7%)

Table 5: Results of Basic Configuration

	Interoperability		Not Executed		Execution Rate
	OK	NO	NA	OT	
CN/NGCS/01	2 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (100.0%)
CN/NGCS/02	2 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (100.0%)
CN/NGCS/04	6 (100.0%)	0 (0.0%)	1 (14.3%)	0 (0.0%)	6 (85.7%)
CN/NGCS/03	5 (71.4%)	2 (28.6%)	1 (12.5%)	0 (0.0%)	7 (87.5%)

Table 6: Results of VoLTE IMS Configuration

	Interoperability		Not Executed		Execution Rate
	OK	NO	NA	OT	
IMS-RT/LBV/02	2 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (100.0%)
IMS-RT/LBR/02	2 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (100.0%)
IMS-IP-RT/LBV/02	4 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	4 (100.0%)
IMS-IP-RT/LBR/02	3 (100.0%)	0 (0.0%)	1 (25.0%)	0 (0.0%)	3 (75.0%)

Note 1: IMS-RT was run in VoLTE mode
Note 2: IMS-IP used the IMS infrastructure only to provide IP connectivity

Table 7: Results of IP Configuration

	Interoperability		Not Executed		Execution Rate
	OK	NO	NA	OT	
IP-RT/LBV/01	6 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	6 (100.0%)
IP-RT/LBR/01	2 (100.0%)	0 (0.0%)	4 (66.7%)	0 (0.0%)	2 (33.3%)
IP-MM/VID/01	6 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	6 (100.0%)
IP-MM/RTT/01	3 (100.0%)	0 (0.0%)	3 (50.0%)	0 (0.0%)	3 (50.0%)
IP-MM/TC/01	3 (100.0%)	0 (0.0%)	3 (50.0%)	0 (0.0%)	3 (50.0%)
IP-PO/TIME/01	2 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (100.0%)
IP-PO/STAT/01	1 (100.0%)	0 (0.0%)	1 (50.0%)	0 (0.0%)	1 (50.0%)

Table 8: Results of PSTN Configuration

	Interoperability		Not Executed		Execution Rate
	OK	NO	NA	OT	
PSTN-RT/LBV/04	8 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	8 (100.0%)
PSTN-RT/LBR/04	6 (100.0%)	0 (0.0%)	2 (25.0%)	0 (0.0%)	6 (75.0%)
PSTN-PO/LNG/01	6 (100.0%)	0 (0.0%)	2 (25.0%)	0 (0.0%)	6 (75.0%)
PSTN-PO/LNG/02	8 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	8 (100.0%)

Table 9: Results of UC Configuration

	Interoperability		Not Executed		Execution Rate
	OK	NO	NA	OT	
UC-RT/LBV/03	9 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	9 (100.0%)
UC-RT/LBR/03	8 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	8 (100.0%)
UC-MM/VID/01	0 (0.0%)	0 (0.0%)	8 (100.0%)	0 (0.0%)	0 (0.0%)

Note: UC-MM/VID/01: The UC devices did not support the video codecs required by the PSAPs and listed in the EENA LTD

Table 10: Results of ECRF Configuration

	Interoperability		Not Executed		Execution Rate
	OK	NO	NA	OT	
RT/ECRF/01	5 (83.3%)	1 (16.7%)	0 (0.0%)	0 (0.0%)	6 (100.0%)

7 Lessons Learnd

7.1 General

- Use pre-defined data sets
    - Data set covering all elements is needed
    - Provided it as csv file
    - Update WIKI during event to capture IP address changes etc
    - Use forge.etsi.org for revision control
    - Including civic addresses as well as geo information
    - Provide data set before the pre-testing
- Difficult to have an overview of how calls are being routed
    - Visualize call path through elements
- Use a more automated way to test the various routes
- Define in test plan who provides Location Information and how it should be queried
- Pre-testing should start 2 month in advance of the face-2-face test sessions in order to avoid ramp-up time at the face-2-face sessions
    - Make it a more formalized pre-testing, .e.g. all vendors should run the basic tests before the Plugtest
    - The first two days of a Plugtest are reserved for test sessions with vendors who have successfully done the pre-testing
    - Vendors who have not done the pre-testing can use the first two days of a Plugtest to catch up

7.2 By Type of Equipment

7.2.1 ECRF

- Need to ensure that appropriate PSAP identity is returned when input locations overlap multiple PSAP boundaries

- Need to ensure that PIDF-LO parsing is compliant with the XML schema of RFC5139
- Usage of Forest Guide to select different ECRFs works well

7.2.2 LIS

- Consider extending the test plan for the HELD protocol

7.2.3 UE

- SIP Proxy is required and worked well
- Include relay services and bridges
- WebRTC Testing requires to increase the PSAP buffer to be able to handle SDP (3K buffer not sufficient)

7.2.4 UC

- Consider testing of mobile users inside UC environment
- Enterprise LIS required for roaming enterprise user
- Consider testing of call-back calls RFC7090
- Ensure that UC and PSAP do support the same video codecs as listed in the EENA LTD

7.2.5 IMS

- Include webRTC gateway in EPC infrastructure
- Consider testing of Video, Messaging

7.2.6 ESRP

- Parsing and validating the location object should be made mandatory at ESRP level

7.2.7 BCF

- Sequential execution of test preferred due to fact that there was only 1 BCF
- Every originating element should be pre-tested with BCF for next Plugtest

7.2.8 PSAP

- Include scenarios with stage1 and stage2 PSAPs
- Each element adding location should use a unique location
- Not all features were supported by all PSAPs, e.g. RTT and Location by Reference resolution and service urns

7.2.9 Log/Rec

There were not enough vendors who provided the Log/Rec capabilities. Therefore it was decided to cancel the Log/Rec tests. In a next event Log/Rec features should be tested

7.3 VPN

- Use IPSec GRE rather than IPSec

    - Ease Tunnel maintenance (dynamic routing facility, no access list constraints)

- Use dedicated subnet IP scheme for remote site connectivity

History

Document history		
V0.0.1	23.03.2016	First draft
V0.0.2	30.03.2016	Second draft – comments from Gunnar Hellstrom, Omnitor and Wolfgang Kampichler, Frequentis included
V0.0.3	22.04.2016	Final version comments from Evangelos Markakis, Emynos on webRTC buffer included comments from Joseph Budziak, Unify on typos included comments from Cristina Lumbreras, EENA on missing vendor included comments from Markus Bornheim, AYAYA on missing vendor included comments from Philippe Badia, Com4Innov on IMS setup description included