# Report on 1st NG112 Emergency Communications Plugtest

# Objectives

1. Goal
2. Ng112 Overview
3. Organisation of the event
4. Tests scenarios
5. Results
6. Lesson learnt
7. Next steps

# Goal

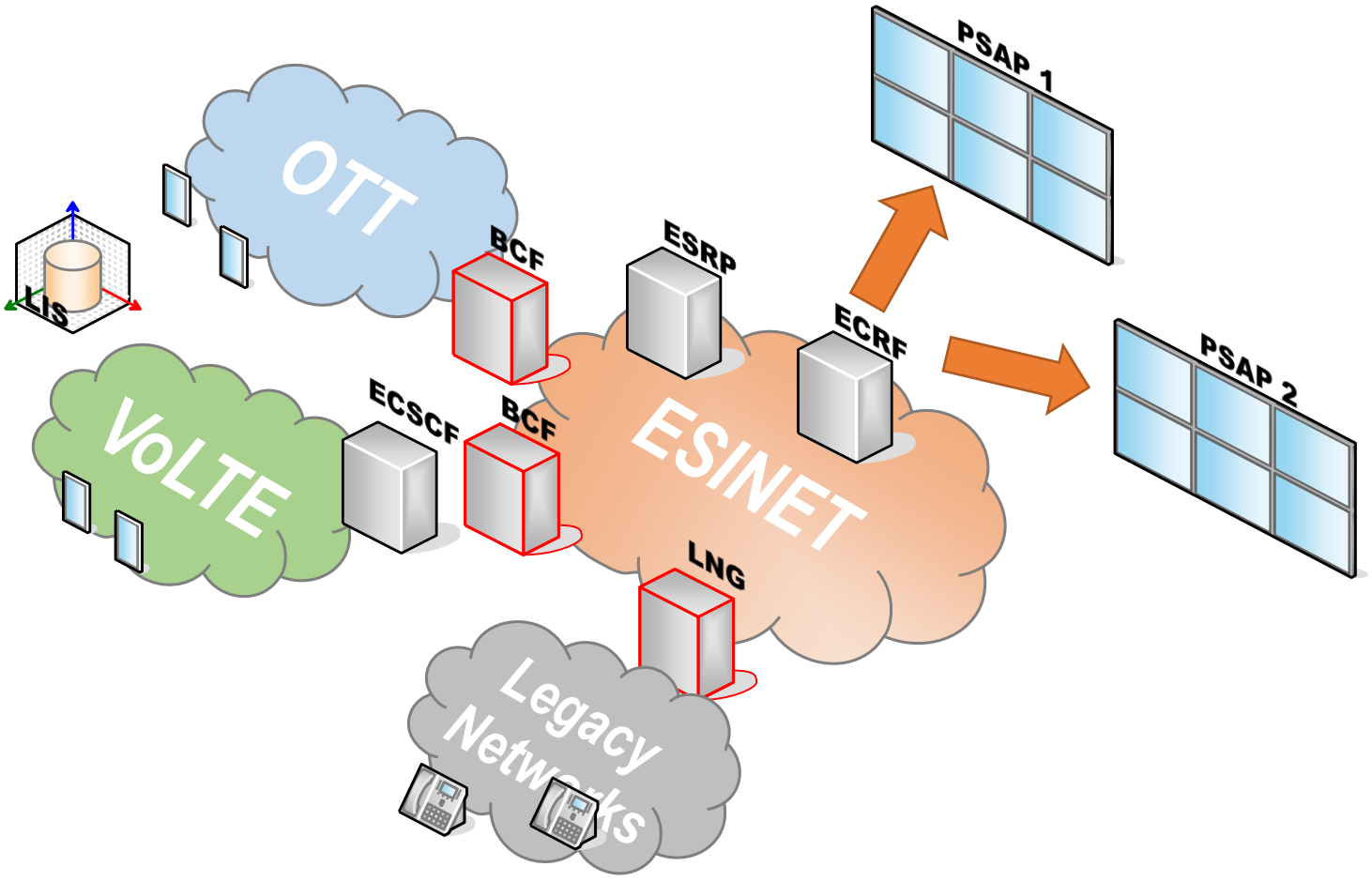
# Goal

- EENA published the Next Generation 112 Long Term Definition Document (here) (March 2013)

- The aim of the event:
  - Independent and joint trial of all components of the 112 communication chain based on Next Generation networks
  - Address Location Based Emergency Call Routing, Policy Based Emergency Call Routing and Next Generation Media Types
  - Have a view on the maturity of the technology

# NG112 overview

# Background


PSAP 1
OTT
BCF
ESRP
ECRF
LIS
PSAP 2
VoLTE
ECSCF
BCF
ESINET
LNG
Legacy Networks

# Border Control Function (BCF)

- External security border for ESInet (Internet)
- Internal isolation border for PSAP
- Has both, firewall and session border controller
- Has functions to block specific call sources (suspicious levels)

# Emergency Service Routing Proxy ESRP

- Call routing engine
- Use location information to route the call
- Policy may take into account the state of a PSAP, time, …

# Emergency Call Routing Function ECRF

- Routing database used for all calls
- Provides PSAP address to route the call

# Public Safety Answering Point PSAPs

- Receives all calls with location via the ESInet
- Multimedia capable: voice, video, real-time text, and messaging
- Allows for virtual PSAPs
- Services may reside in a data centre or at the PSAP

# Legacy Network Gateway LNG

- Element to interconnect with legacy originating networks
- Bridge between existing originating network and ESInet
- Interworks location towards ESInet
- Forwards calls to ESRP

# Location Information Service LIS

- Stores location against some kind of key
- Key can be a network address, phone number, URI …
- An originating device queries the LIS when it boots, periodically when it moves and before an emergency call
- Returns a PIDF/LO (civic address, geodetic) either by reference or by value

# User Equipment - UE

- IP based (Softclient, App)
- VoLTE based (4G mobile)
- UC (Soft Switch, Enterprise Communication)
- PSTN based

# Organisation of the event

# Organisation of the event

- The event took place in ETSI premises in Sophia-Antipolis (France)
- One week of testing (14th – 18th of March)
- 19 organisations participated in the event: 14 vendors and 5 observers

# Participants

aculab

com4innov INNOVATE TOGETHER

HUAWEI

UNIFY

AVAYA

UPV EHU CAMPUS OF INTERNATIONAL EXCELLENCE

INdigital

VoltDelta CONNECTING PEOPLE & INFORMATION

BETA 80 GROUP

FREQUENTIS

iURGENCE

next generation EMYNOS emergency communications

GeoComm

Omnitor

# Observers

COncORDE

Smart 112 Mobile

SOS Alarm

TTA Telecommunications Technology Association

REDIRNET

# Organisation of the event

- 3 Open Conference Calls in 2015 and from Jan to Mar 2016 bi-weekly preparation conference calls
- For the information management a WIKI set up by ETSI was used
- Creation of the Test Descriptions Document
- Distribution of the Test Descriptions Document some weeks before to the event for comments
- Establishment of the preliminary test schedule
- Organisation of the day: morning test session from 9.00 to 13.00 and in an afternoon test session from 14.00 to 18.00

# Organisation of the event

- Updates and invitations to conference calls were distributed via a special mailing list
- Impressions of the Plugtest were captured in a blog set up by ETSI, see http://www.etsi.org/news-events/events/977-ng112?tab=3
- Setup of virtual lab by creating VPN tunnels per company
- Pre-testing of basic scenarios prior to the Plugtest

# Testing Infrastructure

# Test network infrastructure

**Internet Access**
Two internet accesses (200Mb/s and 100Mb/s)

**DHCP**
DHCP available only via wifi:
IPv4: 10100.60.0 /22
Default Gateway: 10.100.63.254

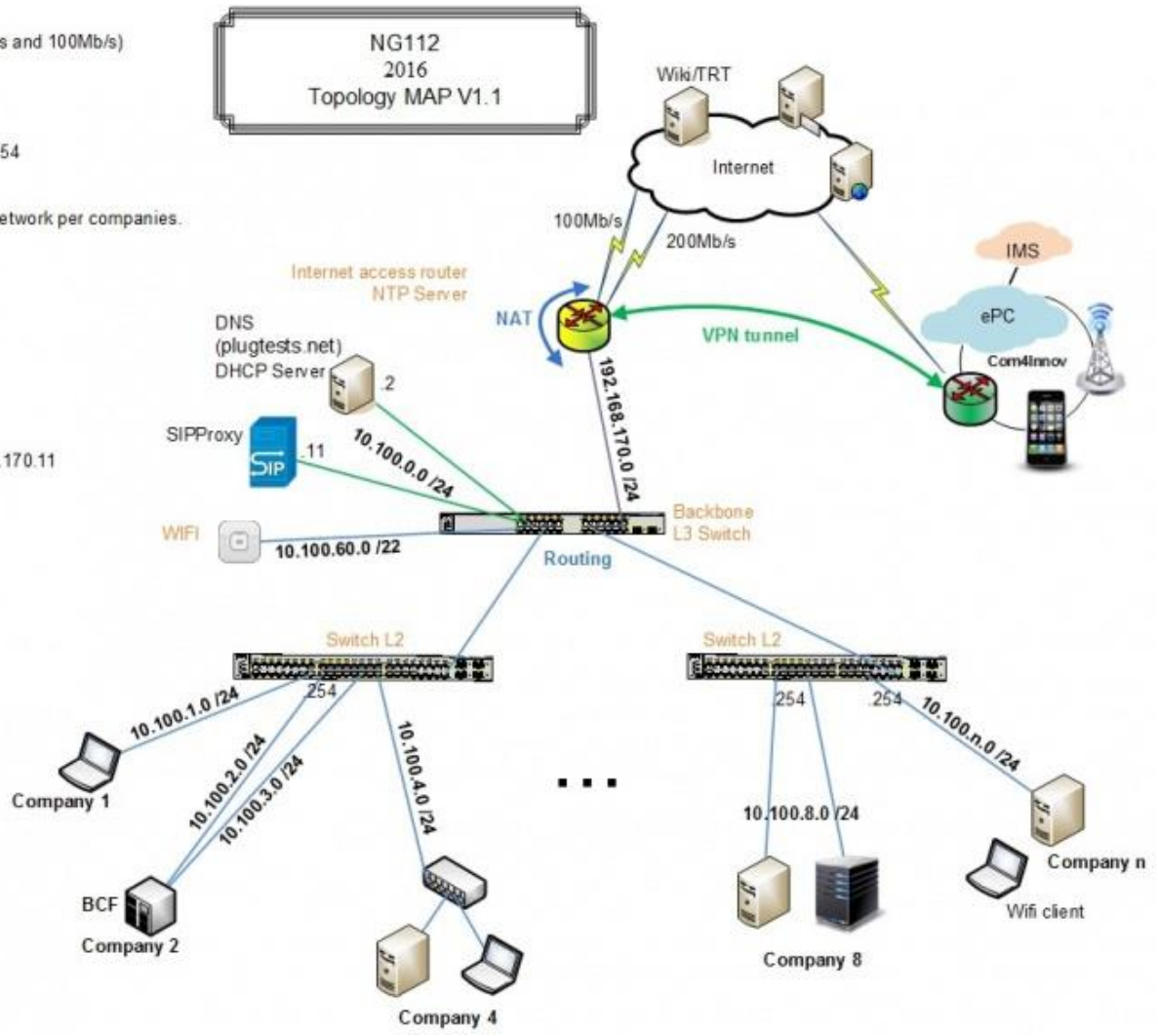
**FIXED IP**
One dedicated 10.100.x.0 /24 network per companies.
See wiki for details.

**DNS**
Domain: plugtests.net
Server: 10.100.0.2

**NAT**
NAT only for internet access

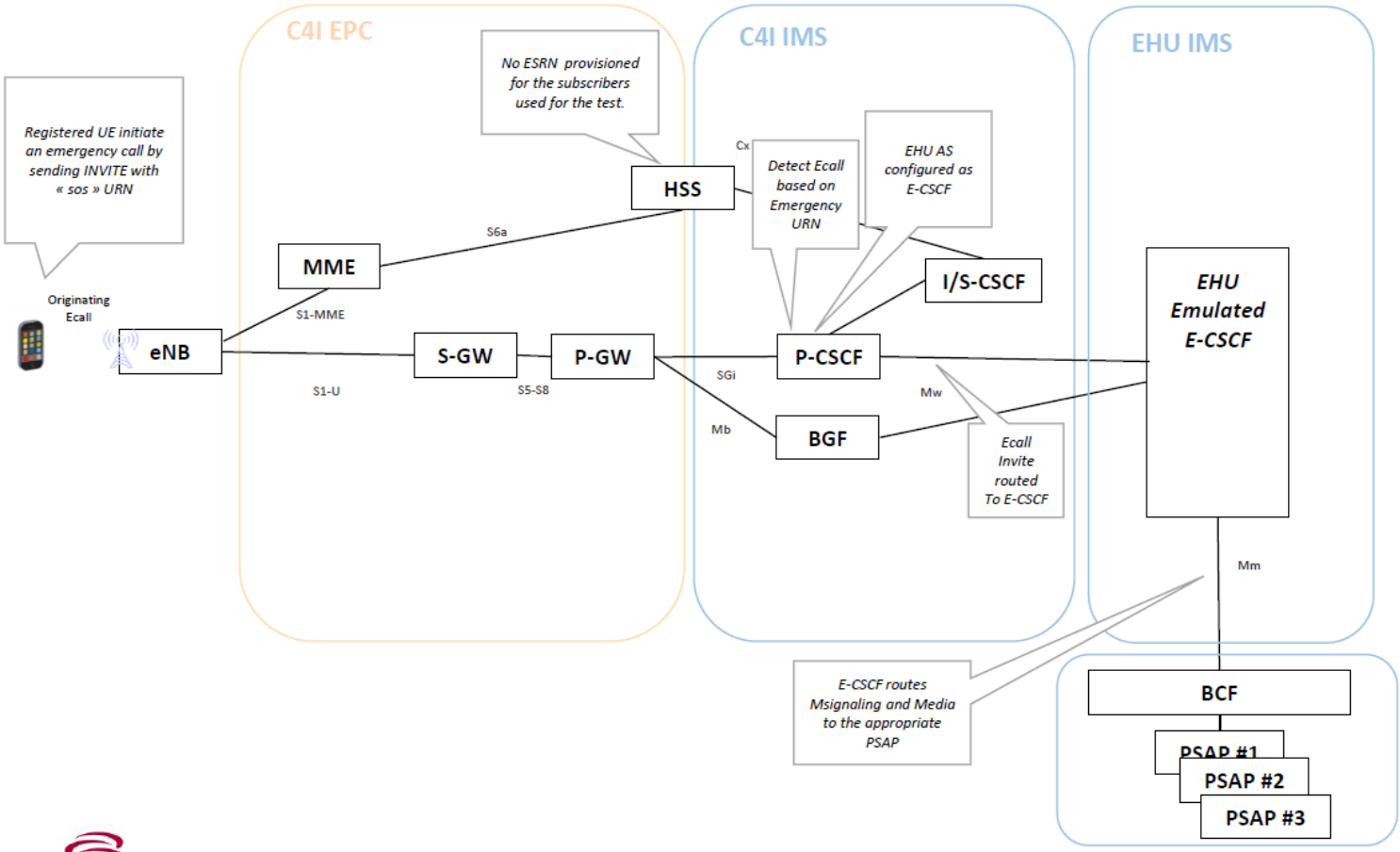
**NTP Server:**
Internet access router: 192.168.170.11

**Wifi: 802.11b&g,a,n**
**SSID**: PLUGTESTS
WPA2 : AES-CCM, TKIP
Key: PLUGTESTS-EVENT



# VoLTE IMS Infrastructure

## NG112 Plugtest Configuration - Overview



# Test Specification

- Test scenarios to be executed by participants

Table 19: RT/LBV/01

| Interoperability Test Description | | | |
|---|---|---|---|
| **Identifier** | RT/LBV/01 | | |
| **Test Objective** | Verify connectivity between UE (IP) and PSAP with emergency call including NG core services and Location By Value | | |
| **Configuration** | - CFG_NGCS_IP-1 (5.6) | | |
| **References** | - SIP (n.13)<br>- RTP (n.17)<br>- URN (n.26)<br>- HELD (n.10,n.33,n.35,n.40,n.42)<br>- LoST (n.29,n.30)<br>- LTD (n.1) | | |
| **Applicability** | - UE_SIP, UE_RTP, UE_G711 (6.2)<br>- BCF_SIP, BCF_RTP, BCF_URN, BCF_NGS, BCF_HELD, BCF_PFL (6.8)<br>- LIS_HELD (6.9)<br>- ESRP_SIP, ESRP_URN, ESRP_LOST, ESRP_PFL, ESRP_NGS (6.10)<br>- ECRF_LOST, ECRF_PFL (6.11)<br>- PSAP_SIP, PSAP_RTP, PSAP_G711, PSAP_URN, PSAP_PFL, PSAP_NGS (6.12) | | |
| **Pre-test conditions** | - IP connectivity among all elements of the specific scenario<br>- UE configured to register with SIP Proxy/Registrar<br>- SIP Proxy trigger points for emergency call routing (to BCF)<br>- BCF, ESRP trigger points for emergency call routing<br>- ESRP configured to query the ECRF<br>- ECRF configured with correct mapping | | |
| **Test Sequence** | **Step** | **Type** | **Description** |
| | 1 | stimulus | User dials emergency number (e.g. 112) |
| | 2 | check | Dialog creating INVITE received at BCF |
| | 3 | check | Location object retrieved from LIS by BCF |
| | 4 | check | Dialog creating INVITE (LbyV) received at ESRP |
| | 5 | check | LoST request received at ECRF |
| | 6 | check | Dialog creating INVITE received at PSAP |
| | 7 | check | SIP dialog established |
| | 8 | verify | PIDF/LO (LbyV) received at PSAP |
| | 9 | verify | Call connected and location displayed |

# Test Descriptions Document

## Test Configurations

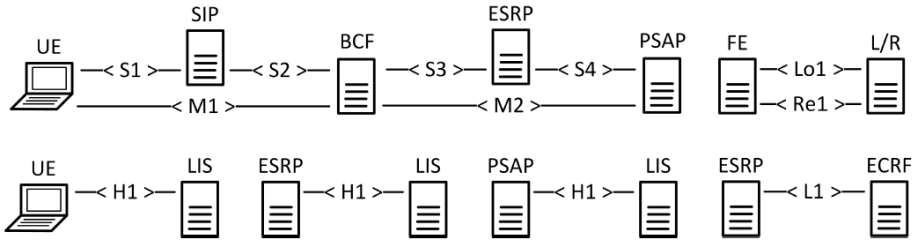



Figure 13: CFG_NGCS_IP-1 Interfaces

## Interoperable Function Statements

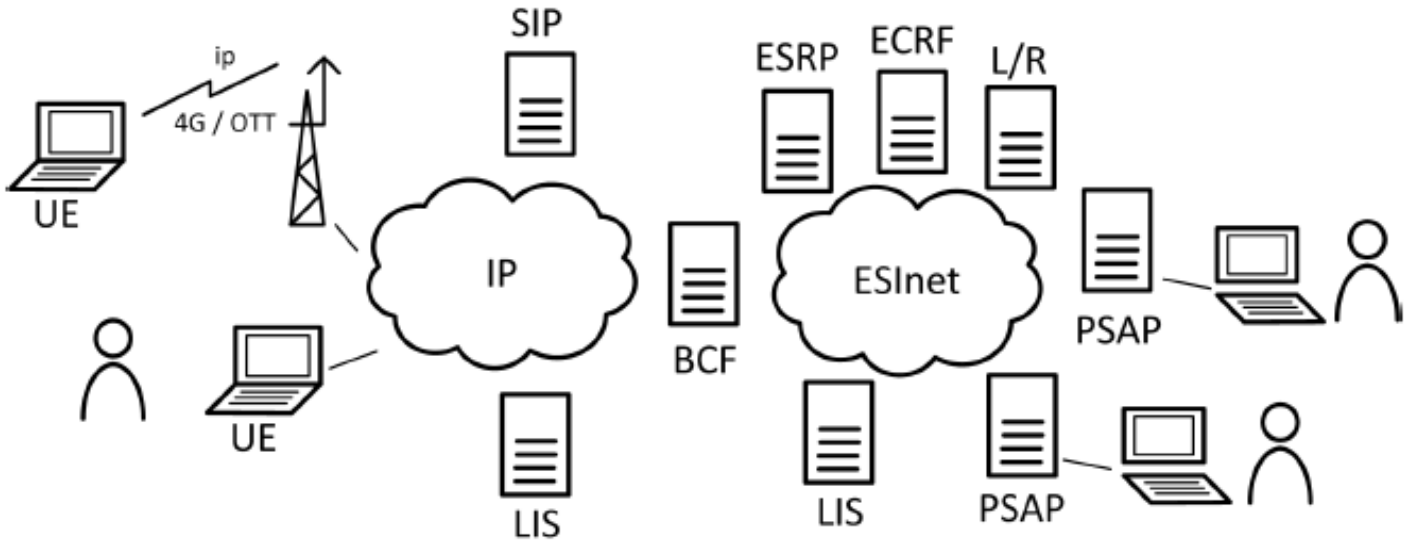
Table 7: LIF features

| Item | Feature | ID | Ref | Status | Support |
|---|---|---|---|---|---|
| 1 | Does the LIF support PIDF/LO? | LIF_PFL | n.22<br>n.27 | | |
| 2 | Does the LIF support HELD? | LIF_HELD | n.10<br>n.33<br>n.35<br>n.40<br>n.42 | | |

# Test Configurations

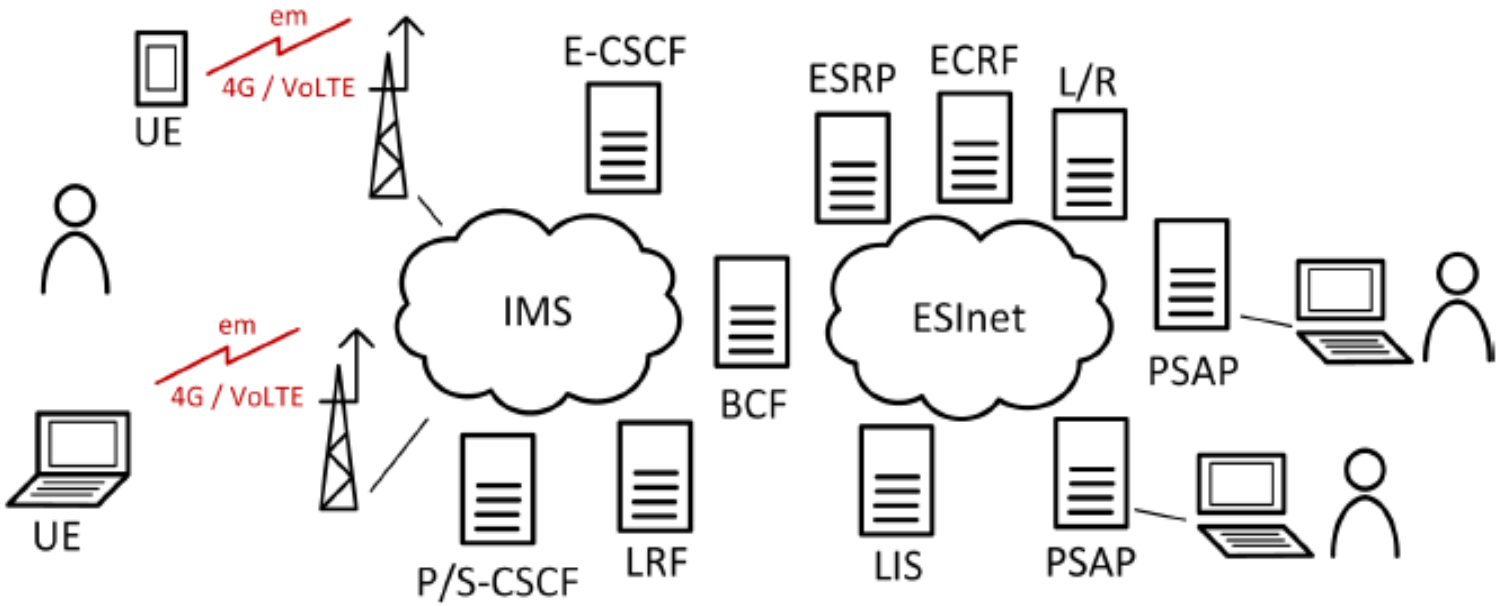
# IP - Test Configuration

- IP-based access to the ESInet



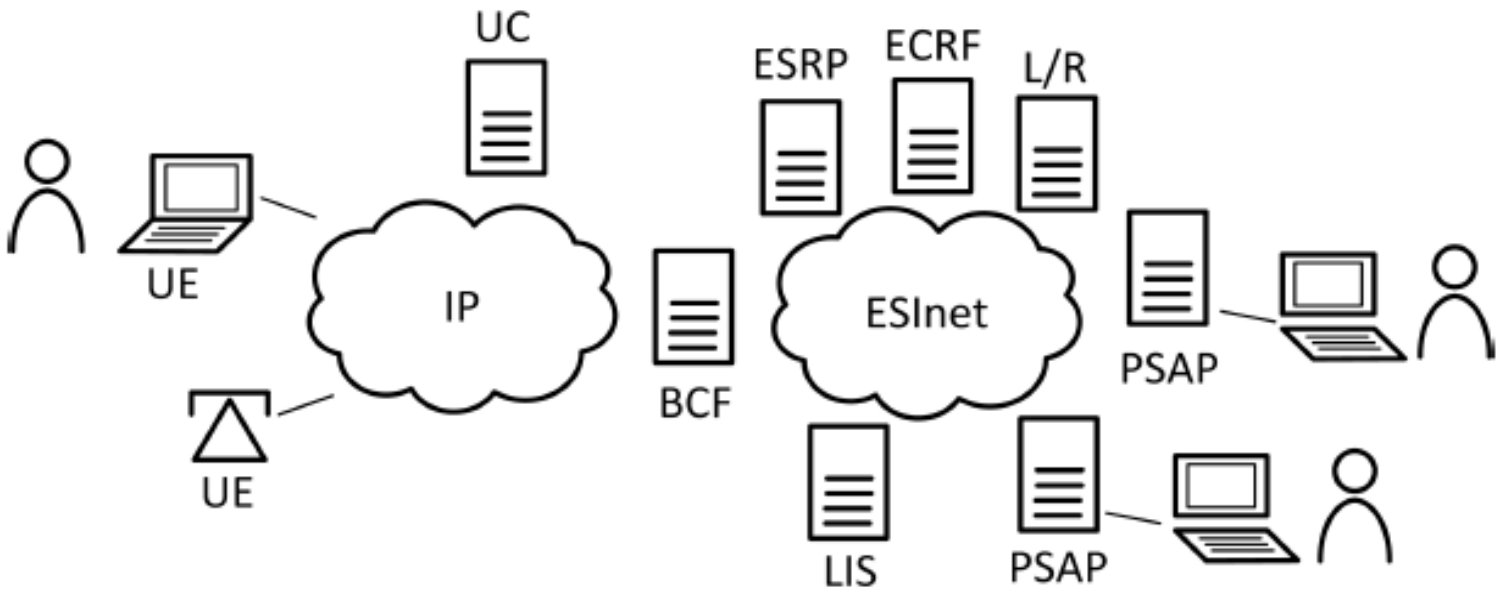
# IMS - Test Configuration

- IMS - based access to the ESInet



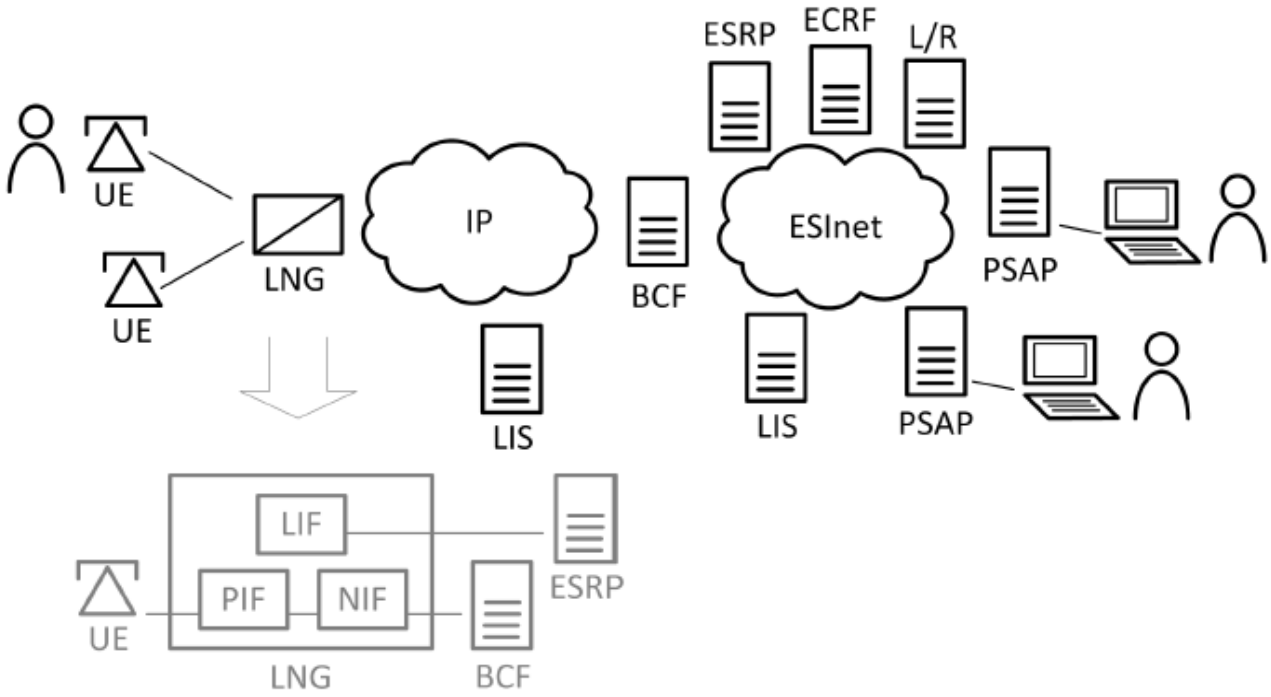
# UC - Test Configuration

- UC - based access to the ESInet



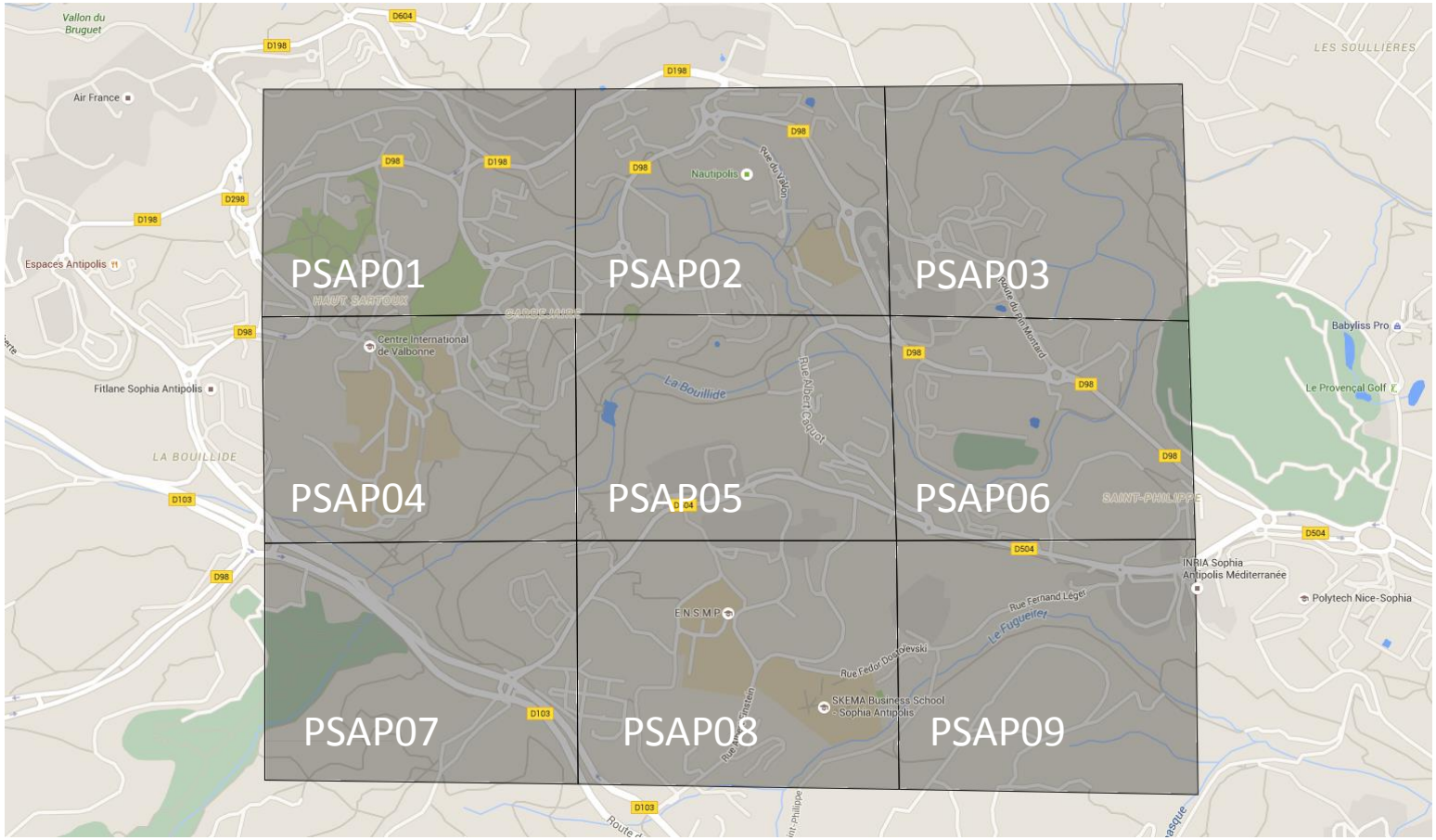
# PSTN - Test Configuration

- PSTN - based access to the ESInet



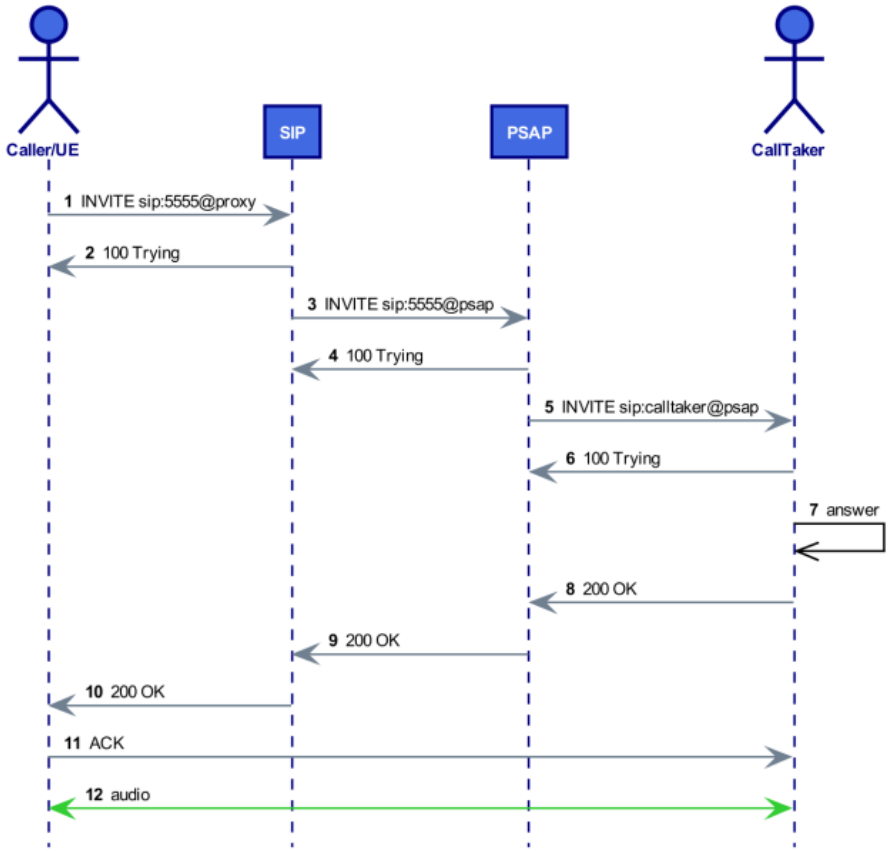
# PSAP Service Boundaries

- Location-by-Reference and Location-by-Value



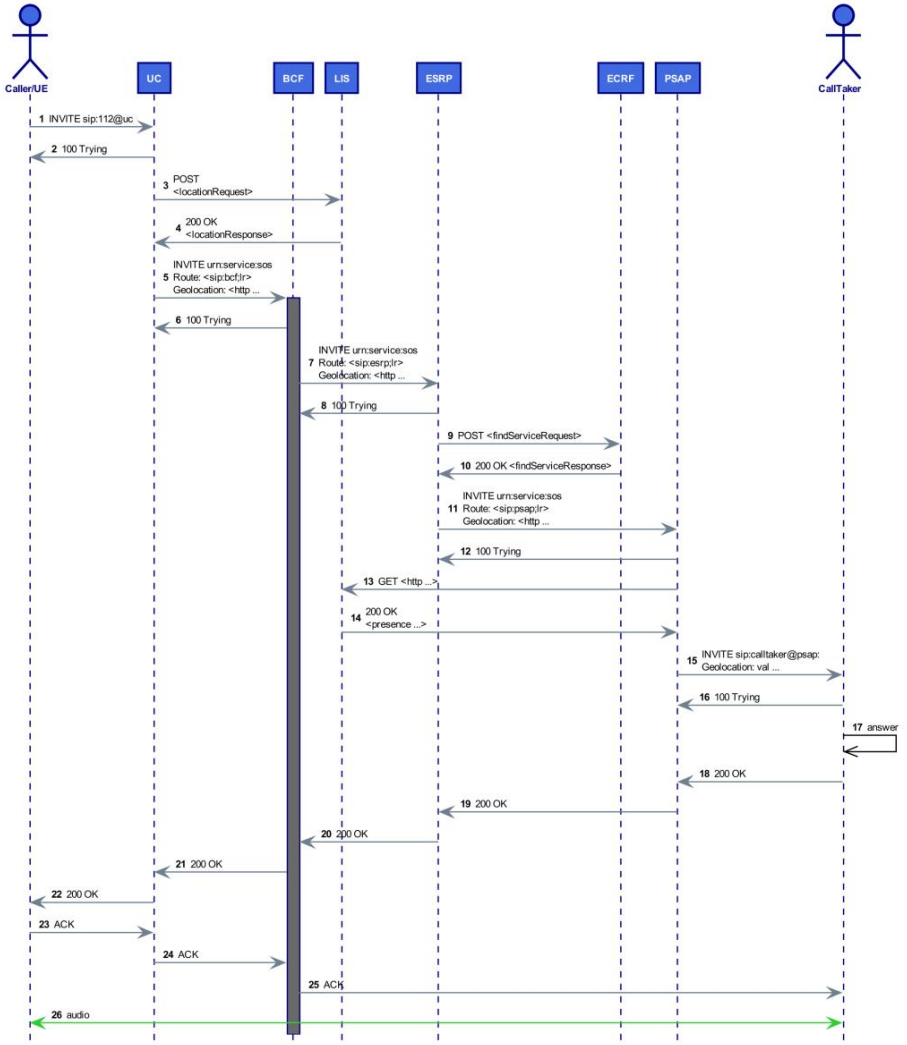
# Connectivity Test Cases

- Tests to verify end-to-end connectivity between UE and PSAP for administrative calls.



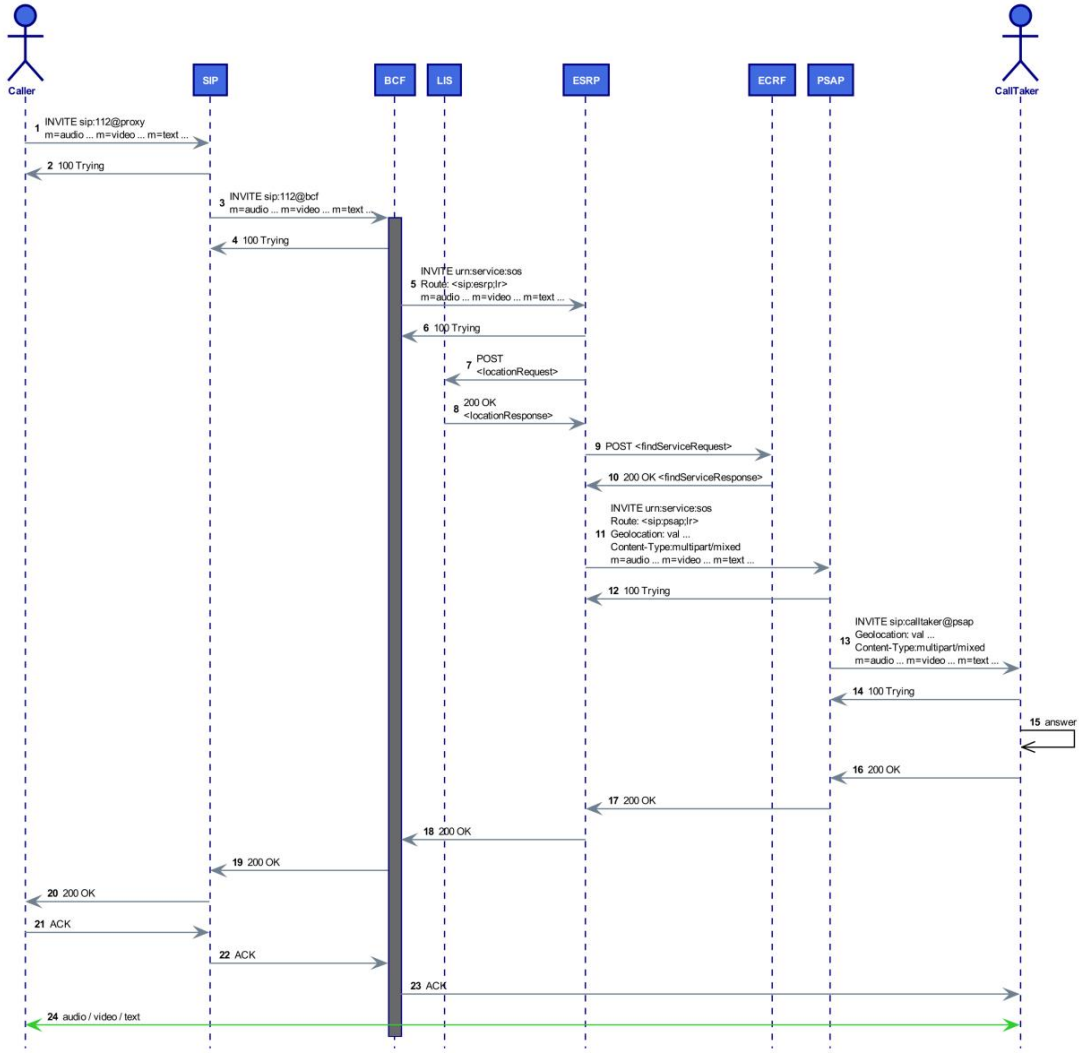
# Routing Test Cases

- Tests to verify end-to-end connectivity between UE and PSAP for emergency calls including access networks, NG core services and Location.



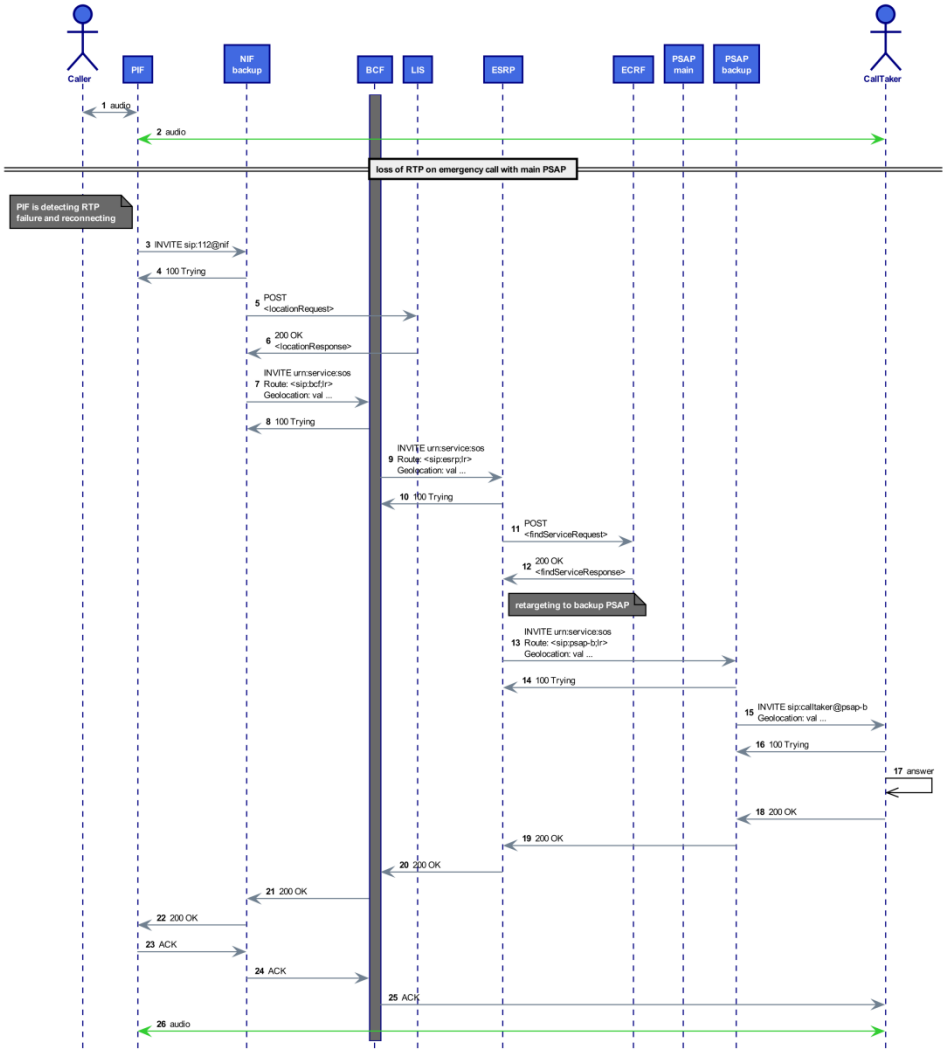
# Media Test Cases

- Tests to verify end-to-end connectivity between UE and PSAP for multimedia emergency calls (audio, video and text) including access networks and NG core services.



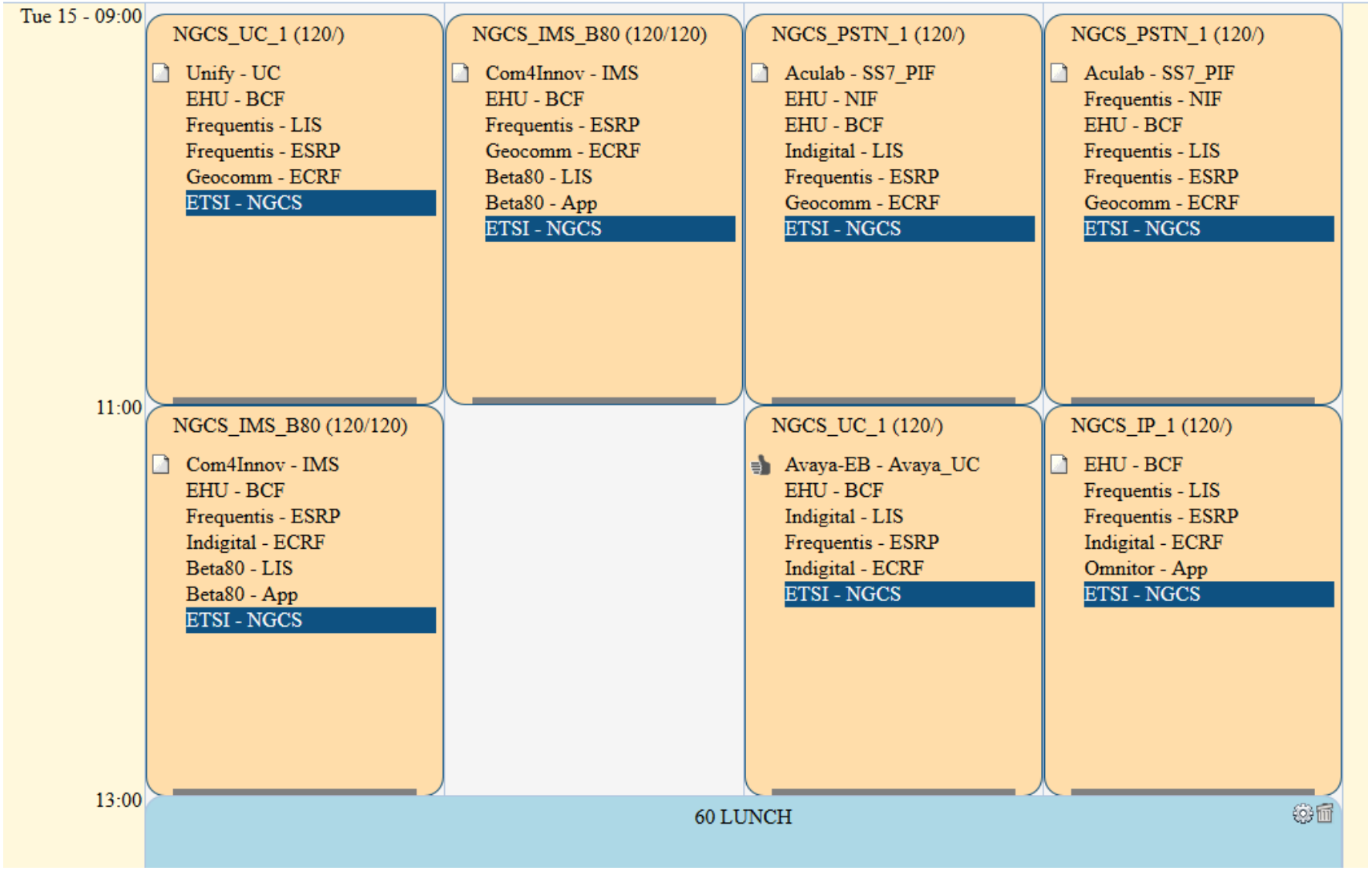
# Policy Routing Test Cases

- Tests to verify end-to-end connectivity between UE (IP) and PSAP for emergency calls including access networks, NG core services and routing policies (time, queue state, …).

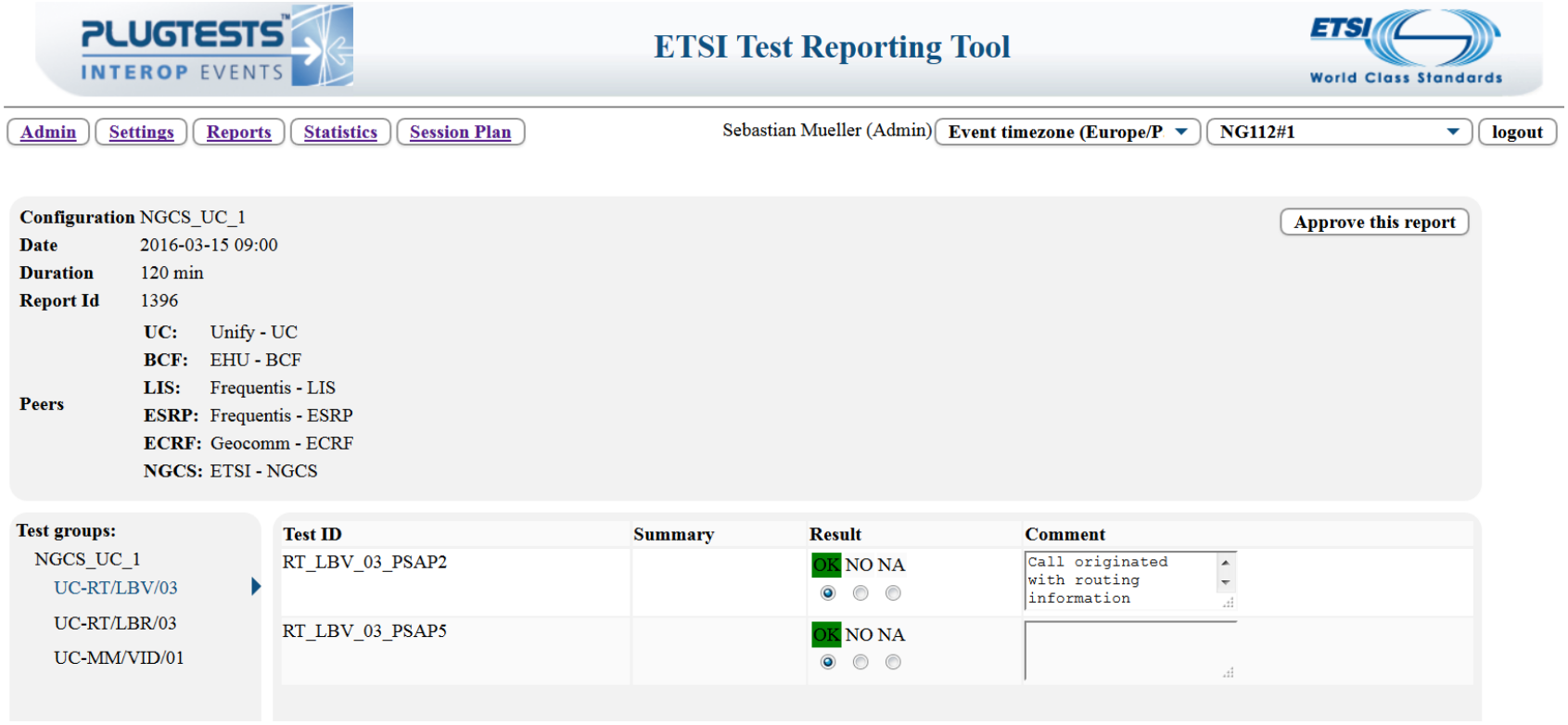


# Results

# Session Plan



# Result Collection



# Result Summaries

PLUGTESTS INTEROP EVENTS — ETSI Test Reporting Tool — ETSI World Class Standards

Admin | Settings | Reports | Statistics | Session Plan — Sebastian Mueller (Admin) — Event timezone (Europe/P — NG112#1 — logout

## Result Summaries

Overall results | Statistics per Session | **Results per group** | Results per test | In-kind contribution

| | Interoperability | | Not Executed | | Totals | |
|---|---|---|---|---|---|---|
| | OK | NO | NA | OT | Run | Results |
| IMS-RT/LBV/02 | 2 (100.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 2 (100.0%) | 2 |
| CN/NGCS/02 | 2 (100.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 2 (100.0%) | 2 |
| CN/NGCS/01 | 2 (100.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 2 (100.0%) | 2 |
| CN/NGCS/04 | 6 (100.0%) | 0 (0.0%) | 1 (14.3%) | 0 (0.0%) | 6 (85.7%) | 7 |
| CN/NGCS/03 | 5 (71.4%) | 2 (28.6%) | 1 (12.5%) | 0 (0.0%) | 7 (87.5%) | 8 |
| IMS-RT/LBR/02 | 2 (100.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 2 (100.0%) | 2 |
| IP-RT/LBV/01 | 6 (100.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 6 (100.0%) | 6 |
| IP-RT/LBR/01 | 2 (100.0%) | 0 (0.0%) | 4 (66.7%) | 0 (0.0%) | 2 (33.3%) | 6 |
| IP-MM/VID/01 | 6 (100.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 6 (100.0%) | 6 |
| IP-MM/RTT/01 | 3 (100.0%) | 0 (0.0%) | 3 (50.0%) | 0 (0.0%) | 3 (50.0%) | 6 |
| IP-MM/TC/01 | 3 (100.0%) | 0 (0.0%) | 3 (50.0%) | 0 (0.0%) | 3 (50.0%) | 6 |
| IP-PO/TIME/01 | 2 (100.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 2 (100.0%) | 2 |
| IP-PO/STAT/01 | 1 (100.0%) | 0 (0.0%) | 1 (50.0%) | 0 (0.0%) | 1 (50.0%) | 2 |
| PSTN-RT/LBV/04 | 8 (100.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 8 (100.0%) | 8 |
| PSTN-RT/LBR/04 | 6 (100.0%) | 0 (0.0%) | 2 (25.0%) | 0 (0.0%) | 6 (75.0%) | 8 |
| PSTN-PO/LNG/01 | 6 (100.0%) | 0 (0.0%) | 2 (25.0%) | 0 (0.0%) | 6 (75.0%) | 8 |
| PSTN-PO/LNG/02 | 8 (100.0%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 8 (100.0%) | 8 |

# Results

- Good range of originating devices
  - VoLTE - IMS, wireline and IP based (UC, webRTC, VoIP Clients / Apps)
- Stable implementations and some prototype implementations attended
- NG112 features that were not yet fully supported
  - service urn, location by reference, media
- More than 100 test pairings, each 1 hour duration, over 4 days of testing
  - The final schedule can be viewed at https://trt.plugtests.net/tt.php?key=dcd28a05c1758b7194998105df369259937e7129

**Table 4: Results Overview**

| OK | NO | NA | Execution Rate |
|---|---|---|---|
| 99 (97.1%) | 3 (2.9%) | 26 (20.3%) | 102 (79.7%) |

Source: 1st NG112 Emergency Services Plugtest Report

# Conclusion

- Stable base specifications
- Location based call routing works well
- Total conversation successfully tested
- Interoperability of EENA-based and NENA-based implementations
- Basic Concept of ESInet successfully verified

# Lessons Learnt

# Lessons Learnt

- Use pre-defined data sets
  - Data set covering all elements is needed
  - Provide data set before the pre-testing
  - Provided it as csv file
  - Update WIKI during event to capture IP address changes etc
  - Including civic addresses as well as geo information
- 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
- Be more strict in pre-testing

# Lessons Learnt – Border Control Function (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

# Lessons Learnt - ESRP

- Define more complex routing policies – real world scenarios

# Lessons Learnt – 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

# Lessons Learnt - PSAPs

- Make a more formalized pre-testing, e.g. run the basic tests
- Include scenarios with stage-1 and stage-2 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

# Lessons Learnt – LIS

- Consider extending the test plan for the HELD protocol

# Lessons Learnt – User Equipment (UE)

- SIP Proxy is required and worked well
- Include relay services and bridges
- Consider testing of webRTC
- SDP is large, 3K buffer not sufficient

# Lessons Learnt – Unified Communications (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 codec

# Lessons Learnt – IP Multimedia Subsystem (IMS)

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

# Next steps

# Next steps

- Next Plugtest event foreseen for Q1 of 2017 (Date to be confirmed)
- Update test scenarios – add more complex scenarios
- Syncronise with NENA
- Meetings ETSI TC EMTEL (Emergency Telecommunications)
  - Test specification as ETSI standard ?
  - EENA LTD as ETSI standard ?

# THANK YOU!

**Contact information**

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