Test Bed for Integrating IMS and PSTN services over 3G

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Executive Summary

Objective

To create an open source test bed for validating the end to end VOIP calls originating or terminating at 3G/4G mobile network for use cases like PSTN-IMS and IMS-PSTN call flows.

- Conformance to the 3GPP IMS standards using open source elements which can provide advantages like
  - Standard conformance
  - Negligible cost
  - Potential for wide usage across different 3G/4G technologies

Approach

- Selection of the open source softwares to emulate IMS and PSTN gateway functionalities.
- Integration of the above components into the test bed which enables the testing of Mobile-Mobile (M-M), Mobile to Land (M-L) and Land to Mobile (L-M) VOIP calls.

Results

Availability of cost effective test solution for validation of end to end VOIP calls for M-L, L-M and M-M scenarios

Potential Reuse

▪The test bed proposed in this paper can be reused effectively in testing mobiles moving in roaming architecture across different domain/technologies.

Approach

- Selection of the open source elements
  - OPENIMSCORE
    - It is the open source project of the Fraunhofer Institute FOKUS which aims to fill the currently existing IMS void in the Open Source software landscape.
    - OpenIMScore is in conformance to 3gpp standard specification.
  - ASTERISK
    - Asterisk is an open source software implementation of a private branch exchange (PBX).
    - Asterisk acts as the PSTN gateway.
    - It supports SS7 ISUP stack towards the PSTN side.

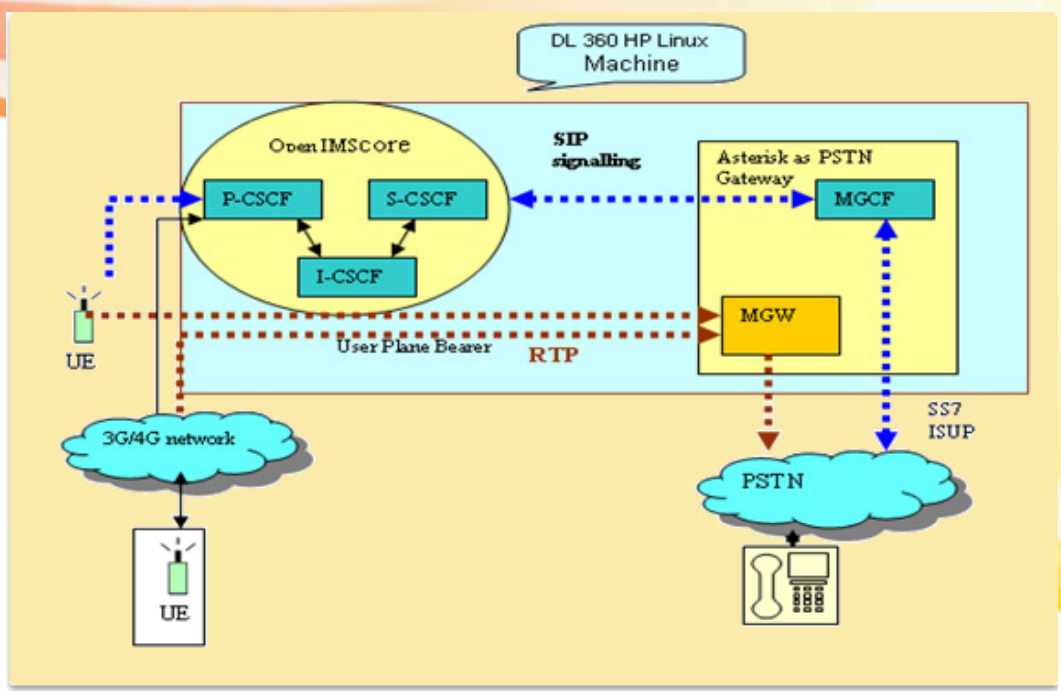
- Installation and configuration of open IMSCore and Asterisk .

- Functional evaluation of open IMS Core.

- Integration of open IMS Core with Asterisk to create a low cost test bed that can be used in
  - Making and end to end Mobile to Mobile VOIP call.
  - Making an end to end Mobile to Land VOIP call via IMS->PSTN.
  - Making an end to end Land to Mobile VOIP call via PSTN->IMS.

Solution

IMS and Asterisk Integration Setup



- Our test bed consists of Open IMS Core and Asterisk running on the same Linux system which is a Quad Core HP DL 360 machine.
- Open IMS core communicates with Asterisk using SIP signaling.
- Asterisk acts as a PSTN gateway (MGCF + MGW) and can perform signaling conversion between SIP and ISUP.
- Asterisk terminates bearer channel from CS network and media streams from backbone network and executes conversion between these terminations and performs transcoding and signal processing for user plane.
- Asterisk interfaces with Digium T1 cards to provide the PSTN interface

Deployment

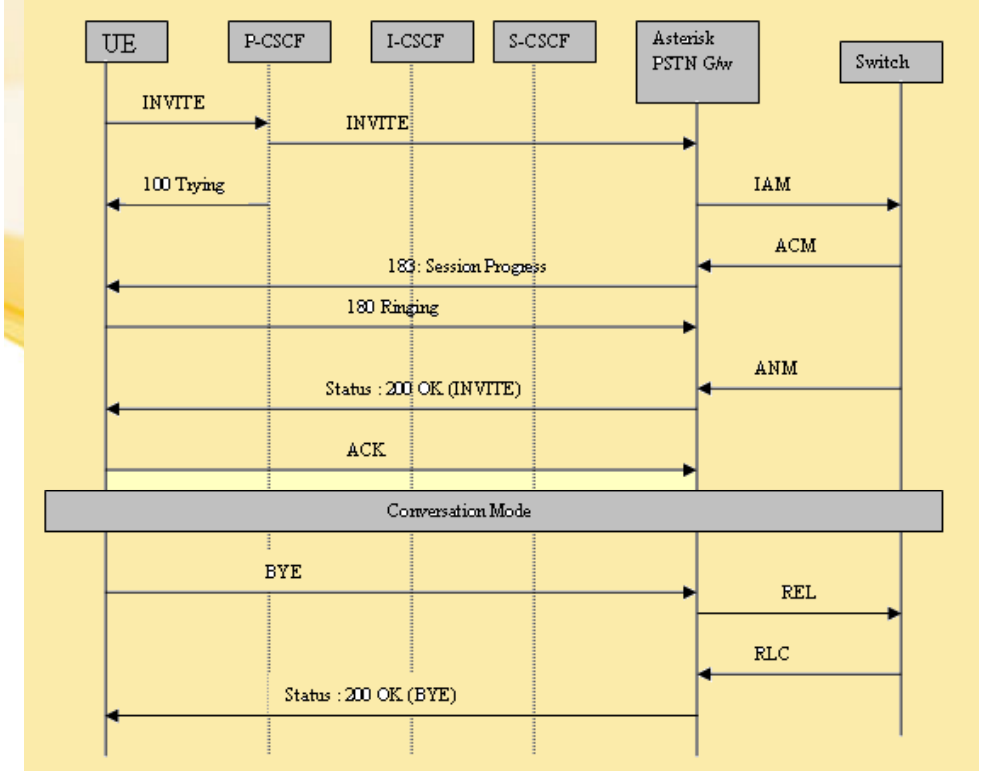
Challenges faced during Integration

- Conversion from TEL URI to SIP URI
  - Identification is one of the most important abilities of a network. Mobile to Land call is identified by a TEL URI at OpenIMSCore.
  - Asterisk does not support the TEL URI. Hence the open IMSCore was modified to handle the conversion from TEL URI to SIP URI.

- Open IMS core supports IMS SIP and Asterisk support IETF SIP.
  - The Asterisk v6 version used was appending the port number in the TO header of the INVITE message if not configured for the standard SIP port number. This resulted in an incompatibility issue when a PSTN-IMS call was attempted. This invite message sent from Asterisk was not acceptable by open IMS Core due to the presence of the port number in the request line. Asterisk code had to be modified to handle this issue.

- Bringing up the link between Asterisk and PSTN switch.
  - Asterisk interfaces with PSTN using Digium T1 card.
  - To setup the ss7 interface for asterisk, zaptel drivers and libpri packages had to be installed and configured along with digium T1 card.
  - There were few compatibility issues during the compilation of Asterisk with these packages which were fixed with minimal code changes to the libpri package.

- This test bed currently supports basic codecs required for voice testing. It can be enhanced with additional cost for advanced codecs.



End to End Mobile to Land VOIP call

Results

• Using a open source solution provides immediate cost savings compared to the option of using any licensed third party software.

•This test bed can be used to measure the quality of voice, video, and data traffic across fixed to mobile, VoIP and IMS networks

•This case study highlights how open source components can be used to drastically bring down the overall test cost and turn around a solution in a very limited time.

•This solution can be easily extended to 4G and is in conformance to the standards.

•The approx cost for the open source IMS - Asterisk test bed that can run on a generic platform is 1K USD.

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Thank You