Evolution of VoLTE - The More Affluent Voice Calling Over LTE

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ABSTRACT

Customer’s zeal for mobile data services has obsessed operator to implement 4G LTE networks for better serving their subscriber with high bandwidth, more capacity, reduced latency and improved pricing thus LTE smartphone’s mass market introduction has begun. Voice over-LTE is designated voice calling solution in LTE mobile network and it is on the way of deployment worldwide. It has reshaped call services to VoIP i.e. packet switching from circuit switched telephony. VoLTE supports OPEX savings, higher spectral efficiency, improved voice call quality and more refined voice-based services. This paper clarifies the how and on which architecture VoLTE works, IMS routing, advantages of implementing VoLTE over CSFB, how VoLTE benefits both communication providers and their user bases, performance improvement with SRVCC indicating future enhancements and application areas, Challenges and opportunities.

Keywords—LTE, VoLTE, IMS, SIP, SRVCC, CSFB, OTT.

I. INTRODUCTION

In this paper various ground plane are taken and studied the input impedance of the antenna. It is found ground plane acts as impedance matching element. Voice is simple yet vibrant utility service for both phone users and mobile operators, But as per demand infrastructure upgraded to LTE, voice services is also moving through its fast evolution and VoLTE is solution for 4G networks. VoLTE is a voice over IP scheme for packet switched (PS) only-all IP based LTE networks [2]. The design of voice over IP is very direct, it converts voice messages to IP packets on data plane instead of 2G/3G dedicated circuit. To simplify the voice communication, separate signaling session is carried out over control plane and to maintain carrier-grade quality cellular specific techniques are adopted.

To address issues from the CSFB approach, Third Generation Partnership Project (3GPP), European Telecommunications Standards Institute (ETSI), and Telecom & Internet Converged Services & Protocols for Advanced Networks (TSPAN) standards bodies, jointly developed the VoLTE Profile (GSMA Volte IR.92 specification) [4]. VoLTE is an IMS-based specification, it integrate the system with the set of applications that will become available on LTE. IMS provide the essential call control function (figure 1) which do not exist in the core LTE and thus such functionality is needed for VoLTE. IMS provides architecture that is flexible enough to be reused for other services, it is an architectural framework which deliver IP multimedia services. Rather than having several disparate applications operating concurrently IMS enables a variety of services to run flawlessly.

Fig.1. Role of IMS and LTE cores in VoLTE

CSFB is also considered as the solution to voice services in LTE. CSFB is circuit – switched fall back in this complete radio fall back to 2G/3G best available network when voice call is initiated. CSFB does not require any IMS network to set up the call. CSFB has low essential investment and is technical requirement as well for operators to support incoming roamers because there is lack of roaming architecture in IMS network. But on these two advantages of CSFB has multiple drawbacks:

Extended call set up timing – Extra time is needed to make or receive calls because of fallback.

Drop in data connection – Parallel running LTE data connection will not have handover to 2G/3G, so user may experience a break in services.

Difficulty in operator deployment: CSFB is complex in operational point of view as it require continuous location update when fallback to circuit switched network.
II. IMS ARCHITECTURE AND ROUTING

To offer VoLTE operator need to have an IMS core deployed network. IMS technology is well proven in fixed line but implementation in much more dynamic mobile environment is not practiced yet. An example of how tighter integration between EPC and IMS can help from study from Cisco, It states that the P-CSCF and S-CSCF must each process 28 SIP transaction for a voice call, which when modeled to represent a real-world VoLTE deployment, configured for voice service only and 1 million subscriber, would need to support 16,000 transaction per second [HR VoLTE]. The IMS provides service mediation and a common subscriber profile management across multiple devices and access networks. It provides one common IP bases kernel core network, providing a common signaling world for all connected access networks on one side and corresponding IP based barrier network. IMS is introduced with a concept of one IP overlay network, common services and charging, access independent mobility from any access network, single ID for different access networks and end to end Quality of services.

Fig.2. IMS Architecture

A. IMS components:
P-CSCF or Proxy call session control function: It the first contact point within IM CN network, it represents the user equipment and forwards the registration and session initiation messages.

SBC or Session Border Controller: It controls the access of signaling messages to the IMS core network and manipulates the contents of these messages, The Border control function will be used for this part.

BGCF or Breakout gateway control function: It is used to establish multimedia session between IMS and CS domain. In case the S-CSCF is unable to route the SIP invite message to a terminating I-CSCF, it forward the session to BGCF, then it selects the media gateway control function.

I-CSCF/S-CSCF or Interrogating/Serving CSCF: I-CSCF is the contact point within an operator’s network for all connections destined to a user of that network operator, or roaming user located to that network area, there may be multiple I-CSCFs within an operator network. The S-CSCF performs the session control service as needed by network operator.

HSS or Home subscriber server: The HSS is subscriber database of the IMS. Subscriber accounts, profile an access rights are stored in this central database that can be accessed from the CSCF to provide temporary copy of the profile.

MGCF or Media gateway control function: The MGCF provides control plane for the interconnection point between the packet and circuit switched network. It is signaling unit of the MGW to control this unit and to convert signaling messages between circuit and packet switched network.

PDF or Policy decision function: It provides policy based network resource control, to authorize and control the resource usage for PDP contexts in the GGSN.

B. IMS Routing :

III. BENEFITS OF VOLTE

There are many advantages of VoLTE over OTT for calls over IP.

Improved Spectral efficiency: Better spectral efficiency helps VoLTE to handles twice calls in same spectrum. It helps to optimise the use of radio resource with reduced cost. Spectral efficiency of LTE is twice that of 3G and six times of GSM technology.

Simplification: With the integration of voice and data domain on same LTE network, operator can reduce the operating cost. Integration of resource in network, optimising and service management of network and service delivery simplification all helps in cost reduction.

High definition voice: The most obvious benefit users will experience in VoLTE is improved voice quality. With low latency VoLTE clearly benefits. Faster call setup and shorter delay leads to high quality voice and data connection improving customer experience Internet based VoIP generates greater load on mobile network and this has advantageous effect on quality. Operator require more capacity to handle OTT voice traffic so OTT apps typically uses more network resources. The OTT voice quality is often variable and operator will enjoy advantage here
because user often consider their mobile voice calls more reliable than OTT calls.

**Richer Voice**: Rich communication services and VoLTE are based on IMS, so VoLTE is much more than an IP based network. VoLTE also will allow wireless operators to carry a new set of standards-based services stated to as RCS. These amenities include things like file transferring, video calling, video voicemail, real time language translation, and instant messaging.

**Integration of VoLTE with voice over Wi-Fi service**: Benefit to consumers is better integration between a Wi-Fi calling service and a Mobile voice service. This is mostly important for operators, which will start to use Wi-Fi for handling data traffic and as well as some voice calls. Improving the alteration between the mobile voice call with licensed wireless spectrum and a Wi-Fi call which uses unlicensed spectrum is important because it will allow operators get improved indoor coverage wherever licensed wireless spectrum is limited.

As the call setup essential for voice over LTE is the same asVoLTE, when VoLTE is deployed fully, then it will be easier to provide coverage wherever limited coverage is there for licensed spectrum.

**New Revenues**: VoLTE establishes the base to enable Mobile network operators for introducing new digital services. Operators have likely to offer congregated fixed and mobile services on wireline and wireless networks using VoLTE/VoIMS.

With multiple advantages there are few downsides of VoLTE such as More call drops in initial phase due to the new technology it wont work perfectly everywhere, Limited to certain devices only, No carrier interoperability.

IV. **CONCLUSION**

VoLTE is a solution based on the ability in providing full IMS over existing CS voice roaming ecosystem, allowing re-usability that reduce investment and operational cost. LTE is raising the game in mobile communication LTE is accomplishing fastest ever interest of any mobile technology and the first radio technology which is completely IP based network, which combined to all-IP network core, transform greater efficiency. VoLTE has much more than just imitate CS voice, enabling a rich multimedia range that includes apps for chat, voice calls, video conferencing, communication for location based services etc. VoLTE create revenue streams with new business opportunities and it will help operator maintaining existing revenue more sufficiently. In most markets, operators are planning to adopt voice over LTE over circuit switching, In fact they need to have their voice over LTE should be in place at the correct time as the LTE smartphones are already in market and for the right section to complete successfully with OTT players, voice services, gain new revenue with rich multimedia and will help in achieving full OPEX benefits.

V. **ABBREVIATIONS**

CS – Circuit Switched  
HSPA – High Speed Packet Access  
IMS – IP Multimedia Subsystem  
LTE – Long Term Evolution  
OPEX – Operating Expenditure  
OTT – Over the Top  
SIP – Session Initiation Protocol  
SRVCC – Single Radio Voice Call Continuity  
VoLTE – Voice over LTE  
VoIP – Voice over IP

REFERENCES