Considerations for VoLTE Implementation

The mobile industry is in a painful transition as service providers make the costly mass migration to a new network environment: LTE. Adding to the situation, many core services are becoming commoditized and traditional revenue streams are under pressure from inter-provider competition and a new breed of Internet service providers.

White Paper

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Introduction

VoLTE is a critical tool for service providers to significantly improve voice performance and capacity while reducing cost. For mature markets, service providers will look at VoLTE primarily as a mechanism for improving capacity on a finite spectrum. Some service providers may also try to leverage VoLTE's features to improve customer retention, including the promised improvements in voice quality and integration of video calling.

The supply of spectrum is unlikely to keep up with the demand for data services over time. Given this, service providers need to employ more cell sites and new technology to improve capacity. While service providers are investing heavily to deploy faster data services using LTE, voice services are still riding on slower 2G and 3G networks. VoLTE is roughly three times more efficient than 3G voice services and six times more efficient than 2G voice services. VoLTE also improves the quality of voice and introduces integrated video calling features.

Before they can introduce VoLTE, service providers need efficient signaling delivery, policy enforcement, load balancing, security, and billing in the new LTE environment —essential, high-level functions offered by F5.

The State of VoLTE Deployment

Americas

In the United States, T-Mobile and AT&T have taken the lead for VoLTE deployments. To this point, all of the national service providers except Sprint have announced formal plans to test and commercialize VoLTE services over the next 12 months. Verizon currently has the highest wireless margin in the sector and the lowest amount of spectrum per customer. iPhone users are unable to use simultaneous voice and mobile data, and a significant portion of Verizon's spectrum is being used for relatively inefficient 2G CDMA voice services.

VoLTE implementation is not easy because IP-based calls are at greater risk of dropping when customers move between cellular towers. That being said, service providers migrating to LTE from a GSM platform will have a smoother transition than those using 2G CDMA. This is because GSM employs Single Radio Voice Call Continuity (SRVCC), a technology that retains call quality and reduces dropped calls —serving as a back-up solution for the provider.

Europe

While there is a general agreement among the European operators regarding the long-term benefits of VoLTE, most see little immediate benefit to it, hindered by limited availability of handsets, poor LTE coverage, technology challenges in SRVCC deployment, and unclear customer demand. For European operators, voice quality is the main strength of their brand. The common view is that until they can provide the same customer experience on VoLTE as on 3G, they will be reluctant to introduce the technology.

Asia Pacific

In 2012, initial VoLTE launches and trials began in South Korea. Currently, South Korea leads APAC and the world in VoLTE adoption. This is largely due to the country's competitive environment and ability to offer 100 percent LTE network coverage. In June of 2013, SK Telecom announced that it had more than 4.5 million VoLTE users, leading the South Korean VoLTE market.

Looking at other APAC regions—Japan and Singapore—only the incumbent operators DoCoMo and SingTel (respectively) have commercially engaged in VoLTE service. For most of the emerging Asia markets (China, India, Indonesia, Thailand, Malaysia, Philippines, Taiwan), VoLTE won't be in play for the foreseeable future due to limited LTE network deployment and pre-paid centric subscriptions that limit subsidies important for LTE handset adoption.

Rural Service Providers

While the majority of rural service providers don't need VoLTE, many are feeling the pressure to follow the lead of their tier-one partners. Rural providers see VoLTE as complex, costly, and they're pushing implementation out until they are forced to launch. Because VoLTE is expensive, these smaller providers benefit from waiting for tier-one service providers to deploy first. Managed service providers can support VoLTE for rural operators, helping them avoid hefty investments in IMS.

Maturity of VoLTE

Infonetics Research interviewed service providers representing three key stages of LTE adoption—those that have deployed LTE, those currently trailing LTE, and those planning to deploy by 2015.[1] When asked when they plan to offer a voice service over their LTE network, 90 percent said they will do it at launch, 5 percent said two years from launch, and another 5 percent will do it three years from launch. Eighty-six percent of respondents selected VoLTE as their voice technology, and 63 percent chose circuit switched fallback (CSFB). This is not a surprise; many have operations in various countries and are facing a variety of alternatives including roaming with other countries. Traditional issues about hand-over complexity between technologies and the size of the investment needed for VoLTE have been solved with the maturity of the technology. And new technologies like software-defined networking (SDN), network functions virtualization (NFV), and cloud can optimize the infrastructure investment.

Another concern is the immaturity of the VoLTE ecosystem, specifically handsets and the ubiquity needed in LTE to offer a better service than 3G networks. The burden of building this ecosystem is squarely on the shoulders of major service providers such as NTT DoCoMo, AT&T, and Verizon, and the ubiquity of VoLTE will be the result of LTE growth.

Considerations for VoLTE Implementation

Service providers require important services to make the VoLTE environment operate efficiently. Below are key services that should be considered when implementing VoLTE.

Aggregation of SIP Messages

Aggregation ensures that SIP messages are exchanged only between the handset and the correct SIP server.

Load Balancing

Message-based load balancing provides a message-by-message look within the SIP communications to determine and maintain the correct client-server connections. This is important to establish the proper quality of service (QoS).

Compression

Using compression, service providers can reduce the amount of data being transmitted, increase the throughput, and generally improve performance by up to 20 percent.

Call Flow Blocking

When call flow blocking occurs, service providers must wait for one piece of information to be retransmitted. This can cause all subsequent information to wait. By using a multi-stream construct, service providers can continue processing communications without waiting for a response from the first session.

Subscriber Location

Service providers can achieve more efficient routing by deploying Diameter Routing and Edge Agents with subscription locator functionality.

Interworking Function

The deployment of a Diameter Routing Agent with the Interworking Function (IWF) solves the problem of subscribers roaming from an LTE/EPC Diameter signaling protocol network to a non-LTE network. The IWF provides the translation and mapping capability required for communication between Diameter-based networks and SS7 based networks.

Network Simplification

The quantity and complexity of inter-network and intra-network routing can be reduced by placing a centralized Diameter Routing Agent (DRA) in the core of the network. Since the routing responsibility is removed from individual network elements, their expensive resources are freed up to perform their primary function, thus reducing network-wide capital expenditures.

PCRF Binding

The Policy Charging Rules Function (PCRF) is becoming increasingly more important in managing network operator resources. The PCRF is used for the authorization of a subscriber's bandwidth allocation. By deploying a DRA with PCRF binding capabilities, multiple PCRFs can be provisioned in the network.

Policy Charging

The DRA can be a policy-charging environment, capable of changing policies and charging rules many times throughout the duration of a call. This accounts for the different services being used and prevents subscribers from being double charged for both data and voice. Session binding capabilities ensure that the DRA routes all billing data to the same charging system.

Topology Hiding

Topology hiding increases the security of network nodes by hiding them from foreign nodes. The deployment of a DRA provides a single point of interface to all interconnected networks. This single point of contact enables topology hiding.

Conclusion

VoLTE represents a large transformation in the mobile industry, serving as the core component for a new set of services being defined for all-IP networks. The objective is to make these services as ubiquitous and accessible as voice and SMS are today, yet also open to interaction with web and Internet applications.

VoLTE is a foundation that is essential to the future of service provider business models. Service providers need to develop a suite of richer, unified communications services. VoLTE is the voice element to make them more competitive with Internet application innovators (over-the-top [OTT] providers).

Devices, the radio network, packet transport, the Evolved Packet Core (EPC), and the IMS service core all have to be aligned. The network must reserve bandwidth of sufficient performance across the call path using LTE QoS mechanisms. The registration to the IMS core relies on SIP and Diameter signaling for mobility, roaming, scalability, and security, placing demands on provisioning voice call setup and control.

F5 plays a critical role in VoLTE—bringing signaling delivery, policy enforcement, load balancing, security, and routing of billing records to an LTE environment—and solving these challenges prior to VoLTE deployments.

[1] http://www.infonetics.com/pr/2013/sdn-and-nfv-survey-highlights.asp

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