VoLTE: from promise to reality
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Despite mobile voice revenues being in decline, voice remains a crucial offering for service providers. With its familiar “Green Button”1 and convenience of use, voice is here to stay. Or is it? As competitive offerings have become increasingly popular, service providers need to be careful or face potential disaster ahead.

Voice over LTE (VoLTE), with its promise of high-definition (HD) voice and fast call setup times, seems to hold the answer. But introducing VoLTE brings its own challenges in designing and optimizing the network to support a high-quality voice service. Issues regarding traffic planning and load balancing, numerous network interfaces, standardization, software release versions and equipment compatibility, all add to the complexity of upgrading a network to VoLTE. A successful VoLTE launch depends on effective network optimization, pre-launch testing and ongoing quality of experience (QoE) management.

This paper takes a look at some of the challenges facing service providers in the process of planning or introducing VoLTE. It sets out approaches to help resolve issues related to network readiness and QoE management, which aim to reduce rollout cost and risk, while ensuring a high-quality voice service.

A successful VoLTE launch depends on effective network optimization, pre-launch testing and QoE management

There was a time when voice was the mainstay of the mobile revolution, fuelling the rapid growth of mobile telephony during the heady days of the nineties. But cheaper ways of communicating, like short message service (SMS), then appeared on the scene, appealing to a predominantly younger generation. With the increasing demand for alternative forms of “chat” – such as Skype, WhatsApp, Facebook and other social media platforms – conventional voice service, the service provider’s cash cow, has been hard hit.

Some service providers are now offering unlimited call minutes as part of their service bundle to help retain customers and entice new ones, but this kind of business model is unlikely to be sustainable in the long term. While voice service revenues are in decline, voice remains an important offering to most mobile users. And despite the success of social media, mobile voice may well be set to make a comeback.

Today, voice calls on LTE networks without VoLTE rely on OTT VoIP apps or are routed to the 2G/3G network via circuit-switched fallback (CSFB), which was intended as an interim solution until IP Multimedia Subsystem (IMS) became available to support voice over an all-IP network. Eventually, circuit-switched networks will be phased out in favor of packet-switched networks, which make better use of the available bandwidth. VoLTE, in contrast, provides high-quality voice calling and works over the same IP network that supports mobile data.
VoLTE: next-generation voice

VoLTE is a packet voice service that is delivered over IP using the LTE network and IMS. According to GSMA, “voice calls over LTE are recognized as the industry-agreed progression of voice services across mobile networks deploying LTE radio access technology”. VoLTE presents a significant opportunity for mobile service providers, with its promise to enable high quality voice calls on LTE networks, while freeing up badly needed spectrum.

Indeed, a key benefit of VoLTE is increased RF spectral efficiency, which facilitates spectrum re-farming (i.e. reallocating 2G and/or 3G spectrum for use by LTE). VoLTE also simplifies network operations by enabling an all-IP network.

VoLTE utilizes a guaranteed bit rate (GBR) bearer, which is differentially routed on the LTE network to ensure high-quality voice. By comparison, OTT VoIP calls (such as WhatsApp and Skype) rely on a non-guaranteed bit rate (non-GBR) bearer, which is routed on a best-effort basis and is susceptible to errors and delays, thereby impacting voice quality.

VoLTE is also well-positioned for the enterprise user market, where high-quality voice (and video) call services have become essential business tools.

The IMS platform for VoLTE supports video calling and rich multimedia services, including presence, instant messaging, in-call file transfers and video sharing. Once IMS has been deployed, voice over Wi-Fi (VoWi-Fi) or Wi-Fi calling can also be supported, something which could be regarded as complementary to VoLTE. With Wi-Fi calling, subscribers can make voice calls in areas where cellular coverage is poor, such as within buildings.

According to GSMA, there will be 164 launches of VoLTE across 88 countries by 20202.

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**KEY BENEFITS**

- Faster call setup time (almost instant)
- High-quality voice (HD voice)
- More efficient use of spectrum
- All-IP network enabler
- Precursor to video calling (ViLTE)
- Increased handset battery time (compared to VoIP)
- Better customer experience
- Reduced churn
- Reduced OpEx
- Increased revenue

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2 GSMA: Delivering an All-IP World
service provider challenges

**Business issues**
Following years of being used to reliable voice calls, customers have high expectations for VoLTE. As a result, service quality must be at least as good as, if not better than conventional voice. QoE will be high on the service provider’s agenda, and failure to meet these expectations will result in unhappy customers and increased churn. This, in turn, will impact the service provider’s revenue and competitive position. Competition is already coming from OTT VoIP players, whose apps are offering reasonable voice quality despite being a “best effort” IP service.

Added investment in network infrastructure, optimization, operations and domain-specific experts will also need to be carefully considered, along with the projected return on investment. Choosing the right VoLTE launch strategy will be key.

VoLTE brings with it a need for cross-domain best practices and the removal of silo-based organizational structures. Multiskilled teams will need to be trained to handle best practices and new technologies, as well as to prepare for 5G networks and beyond.

**Technical issues**
If growing network and service complexity was not already enough of a challenge, VoLTE introduces further complexity. This is because it requires both IMS and evolved packet core (EPC) implementation or enhancements for a fully converged IP service. In addition, radio access needs to be optimized according to strict performance requirements, while the network and user equipment may also have to undergo software and/or hardware upgrades.

All this, in turn, means more equipment and software release versions, which can introduce compatibility and interworking issues. Interoperability and stress testing will therefore be crucial, as well as end-to-end network acceptance testing and ongoing QoE management.

With 80% of voice call drops and 50% of data throughput issues originating in the RAN, radio service assurance is critical both during and after VoLTE launch. Being able to rapidly identify if a problem is RAN-related or core-specific will be essential.

VoLTE call drops can be an issue too in poorly optimized networks. This is because VoLTE demands a more robust network with better network performance. Crucial issues include jitter, latency, throughput and packet loss.

Service providers are already looking to create more agile networks that have the capability to dynamically match available capacity to localized demand in order to improve user experience – especially for VIP customers. Adding to the mix of complexity is network virtualization, as well as transitioning from physical to virtual infrastructure by adopting new technologies such as network function virtualization (NFV). During this transformation period, networks will be physical/virtual hybrids.

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VoLTE network deployment risks

While VoLTE brings opportunities, it also creates headaches. And in the short term, it will generate significant risk around the voice service, as KPIs may fall below those of legacy voice if the network is not optimized properly.

Service providers therefore need to ensure network readiness. However, this is hindered by the lack of a clear set of KPIs. There is little or no end-to-end network visibility, and quality assurance (performance and fault management) falls short of what is needed. For these reasons, service providers will need a clear strategy for VoLTE deployment that includes planning, engineering and operations support. Cost efficiency, skills and capabilities will all need to be assessed, as well as competitive and regulatory issues.

VoLTE implementation will also require careful change management to achieve shorter time to market. As a result, there is a clear need for better tools and processes for network project planning and rollout.

The success of VoLTE will heavily depend on the service surpassing the quality of experience of both conventional circuit-switched calls and OTT VoIP applications. One major concern is the limitation of network-centric processes for planning, management and optimization, when challenged with responding to huge variations in subscriber behavior and demand. In addition, VoLTE suffers from local interoperability and international roaming issues due to lack of standardization or incompatible networks. Although this is currently being addressed, it only adds to complexity.

Making VoLTE a success

Launching and successfully operating a new HD voice service depends on pre-launch network preparation, data analysis and post-launch optimization. It is therefore essential to determine network usage, network performance and user experience before VoLTE is launched. This is best carried out via a network readiness survey, with the results used to optimize the network and maximize user experience in key focus areas.

3 Source: Amdocs State of the RAN report 2016
VoLTE launch

The high-level steps required to validate the readiness of LTE networks for VoLTE are described in the diagram below. These steps incorporate both RF and core (EPC and IMS) metrics in order to capture and resolve issues such as one-way audio, call drops and handover failures.

VoLTE triage and optimization

Triage is the term applied to understanding and prioritizing network problems in order to determine which ones are the most critical to resolve first, according to business impact and urgency. Triage can be applied to VoLTE optimization by continuously monitoring the network to detect problems early. Root cause analysis can then be carried out to identify the cause of the problem, and then categorize and prioritize it for resolution.

While service providers must provide their subscribers with contiguous coverage, they often lack the right information such as real-time synthetic KPIs, end-to-end visibility, fit-for-purpose tools and network quality indicators. They therefore need an integrated view of their radio access, transport and core network domains.

End-to-end VoLTE optimization should leverage data from a variety of sources, including field measurements, call traces, OSS counters and probes. Furthermore, VoLTE optimization needs to span the RAN, EPC and IMS domains, breaking the silo-based approach to network engineering/operations and supporting the service providers’ efforts for optimal customer experience.
Service providers are not limited to network KPIs when optimizing the network for VoLTE. Geo-location data and customer value metrics can also be used as part of a customer-focused approach. By combining location-based usage data from multiple sources with customer-relevant data, service providers can identify key “hot spots” for high volume/value customers. This approach takes into account commercial metrics to ensure that VoLTE-related decisions are based on a combination of technical, customer and business needs. Service providers can then prioritize VoLTE network investment and optimization plans accordingly.

the way forward

Launching VoLTE presents many challenges, and getting it wrong can result in poor quality of experience, increased churn and lost revenue. Service providers must therefore ensure that their networks are ready for VoLTE by utilizing well-defined, real-time, end-to-end KPIs. For most service providers today however, there is little or no end-to-end network visibility, and quality assurance falls short of what is needed for VoLTE.

The key to a successful VoLTE launch lies in the right tools, processes and expertise. In this way, service providers can avoid the pitfalls of VoLTE, and their customers can fully benefit from the ultimate mobile voice service.

amdocs VoLTE offering

Amdocs has been helping service providers launch, optimize and fully benefit from VoLTE since 2013. Amdocs offers an innovative solution to help address network complexity, optimize customer experience and maximize return on network investment. Our solution builds upon a unique mix of key features – network equipment independence, proven expertise and unparalleled flexibility – to provide distinct technical and commercial benefits. The Amdocs VoLTE offering, which is part of the Amdocs Network Solutions portfolio, has delivered tangible results in challenging real-life projects worldwide.

For more information, contact networkmarketing@amdocs.com.
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