Business white paper

Digital Services with VoLTE

Enabling MNOs to compete with OTTs
Stop the decline in income. Be in a better position to compete with OTTs. And don’t be just a “pipe.” The solution involves an integrated digital services approach, including between others, voice over LTE (VoLTE)/RCS, and WebRTC. This is perhaps your last opportunity to overcome the challenge and evolve services to new standards enabling digital life development.

**Gain ground**

For many years mobile network operators (MNOs) have dedicated their efforts to expand their networks and improve the quality of their services. In the last five years, customers’ demand for faster data services have forced them to implement Long-Term Evolution (LTE) technology; evolving their networks toward an all Internet protocol (IP) network.

In parallel, Over-the-Top (OTT) players have innovated in voice and integrated it with a sophisticated suite of services such as video, presence detection, messaging, and integration to social networks. It’s this integration of services that provides the digital experience that makes OTTs “sticky” to customers; making them more than a simple communications utility alternative to the MNO. As a result, OTTs have impacted MNOs’ revenues, as typically 60% come from voice and short message service (SMS), while pressing MNOs to invest in networks for better data speeds and quality to meet customer needs.

MNOs have been reluctant to accept this “dumb pipe” situation and are willing to develop—by themselves—new and differentiated services. The quick adoption of LTE by MNOs, at a much faster rate than 3G in the early 2000s, and the arrival of Voice over LTE (VoLTE) offer operators the chance to regain some ground lost to OTTs. It can be done by developing a richer suite of integrated digital services. VoLTE is also a crucial step toward greater efficiency in the network, in terms of spectrum management and the opportunity to phase and retire obsolete technologies and users and services consolidated in a single network technology, optimizing the network cost. But to do that, it’s essential to have an appropriate voice offering over LTE.

There is strong demand from operators to roll out VoLTE. According to Infonetic’s report: LTE Strategies and Vendor Leadership, Global Service Provider Survey issued on July 15, 2013, Infonetics Research interviewed service providers who have deployed LTE, are currently trialing it, or are planning to deploy it by 2014. When asked when they plan to offer a voice service over their LTE network, 90% said they will do it at launch, 5% said two years from launch, and another 5% will do it three years from launch. Eighty-six percent of respondents selected VoLTE as the technology, and 63% chose Circuit switched fallback (CSFB). This is not a surprise, as respondents could check all that apply, and 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.
A significant challenge is that many MNOs are entering into LTE, and many are expecting to replicate the traditional voice approach with VoLTE, while OTTs are providing an integrated digital experience. Each MNO is different, and each needs to define its own VoLTE strategy. There isn’t a common recipe.

Across the different potential strategies an MNO may adopt, VoLTE integrated with Rich Communications Suite (RCS) and Web Real-Time Communication (WebRTC) has perhaps the greater opportunity to compete in a good position against OTTs. It provides the means for an integrated digital experience over their traditional and most valuable tools—the network, customers, information, and their brand.

**Review VoLTE fundamentals**

Initial LTE deployments were focused on data only using Dongle terminals, but LTE operators had the immediate need to supply voice and messaging services to their customers using smartphones. To solve this immediate need, the Groupe Speciale Mobile Association (GSMA) accepted CSFB as an interim solution while a definitive VoLTE solution was standardized. The accepted CSFB ensures performance, reliability, interoperability, and roaming, but with longer establishment time than the 2G/3G networks.

With CSFB, an incoming or outgoing voice call forces a radio fallback from LTE to legacy 2G or 3G services. Any LTE data is stopped at this point and handed over to the 3G network. This means that during voice calls, the subscriber is limited to legacy circuit-switched (CS) voice and texting, and slower 3G mobile data services. The reason is that 4G LTE smartphones, due to cost and battery consumption, are built to use only one radio at a time. The deactivation and activation of the 4G/3G radio, produces voice and data service fall back simultaneously from 4G LTE to legacy service.

**VoLTE standardization**

To address transitional CSFB approach issues, the Third Generation Partnership Project (3GPP) and 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). It’s based on the multimedia telephony (MMTEL) initiative, which serves as the technical specifications for implementing VoLTE using IP multimedia subsystems (IMS).

The VoLTE Profile (GSMA) is specified based on 3GPP release 8; however, the functions standardized in releases 9, 10, and 11 have also been adopted. There are many new improvements, including handover mechanisms—Single Radio Voice Call Continuity (SRVCC), enhanced e-SRVCC, and video v-SRVCC; interworking between different technologies; emergency calls; and roaming were available. In January 2012, GSMA published another new specification, profiling video calling over LTE (GSMA IR.94). The 3GPP is working on release 12, planned for Q2 2014, and some signaling improvements—specifically in the SRVCC before ringing—are expected.

**SRVCC**

In the CSFB paradigm of voice communications, LTE handset terminals can readily interoperate with more prevalent, existing circuit-switched networks, but with long establishment times. However, in a VoLTE paradigm, there will be areas where LTE has not been rolled out, and LTE handset terminals must interoperate with existing networks in order to guarantee service continuity and, at least, the quality of services offered by the legacy networks.
To overcome that challenge, the GSMA and 3GPP—standards TS 23.216, TS 23.237, and TS 24.237—have defined Single Radio Voice Call Continuity (SRVCC) technology to provide seamless voice continuity (handover) from LTE coverage to 2G/3G CS networks. The first version of SRVCC solution has been specified in 3GPP release 8, but the handover performance time of this version needed improvement. For that reason, the SRVCC enhancement version was created and issued in 3GPP release 10, being called eSRVCC.

It’s the same way that GSMA defined the video Single Radio Voice Call Continuity (VSRVCC) as the technology to guarantee the handover of the “TV phone service” between LTE and 3G networks.

**Implement VoLTE**

The first LTE network was deployed at the end of 2009. Just over three years later, at the end of 2012, there were 145 commercial networks in 66 countries. One year later (December 2013), there were 263 networks (76% annual growth), and on February 19, 2014, there were 274 networks in 101 countries. The number of subscriptions worldwide is surpassing 200 million, and the forecast is to have 350 LTE networks by end of year 2014. This is all according to the Global Mobile Suppliers Association (GSA) in the February 2014 update of the Evolution to LTE Report.

Initial VolTE launches and trials started in 2012 in South Korea, and today, it’s the world leader in penetration, largely due to the competitive environment and ability to offer 100% LTE network coverage. SK Telecom announced that it had more than 4.5 million VolTE users as of June 2013 and leads the South Korean VolTE market.

There was a big expectation that 2013 was the year in which big operators would deploy their VoLTE networks. But at the end of 2013, only seven MNOs have VolTE operations in five countries: KT, LgU+, and SK from Korea; O2 of Germany; CSL from Soft Hong Kong; Azarcell of Azerbaijan; and Evolve Broadband of the U.S. Although 23 MNOs were under VolTE deployment and 7 MNOs were trialing the service, the main reasons for the delay were that many operators decided to increase LTE coverage before introducing VolTE. And, there were some difficulties with stabilizing the hand-over technology and roaming difficulties between operators.
Another concern was 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 carriers such as NTT Docomo, AT&T, and Verizon, and the ubiquity is getting obtained with LTE growth.

However, these situations are being solved, and market estimates are huge; some figures are:

- LTE and VoLTE will become the mainstream technology, and by 2016, VoLTE will account for about 10% of all LTE subscriptions. This is according to ECC (Electronic Communications Committee) in this report: LTE User Equipment Transmission Activity, released on January 8, 2014.
- According to Infonetics Research: Current state of over-the-top mobile VoIP and VoLTE, issued on July 8, 2013, VoLTE subscriber ranks are expected to grow at a 145% compound annual growth rate (CAGR) from 2013 through 2017.

**LTE/EPC/IMS**

The basic infrastructure an MNO should have for providing VoLTE is the LTE/Evolved Packet Core (EPC) and IP multimedia subsystem (IMS). See Figure 2. It consists of five modules for mobility and Quality of Service (QoS) control: The eNodeB, the Mobility Management Entity (MME), Serving Gateway (SGW), Packet Data Network Gateway (PGW), and Policy and Charging Rules Function (PCRF).

**Figure 2.** LTE/EPC/IMS basic architecture for VoLTE

- **eNodeB** is a node accommodating base station and radio link that control functions in the LTE radio access network. It’s the element E-UTRAN of LTE that is the evolution of the element Node B in UTRAN of UMTS.
- **MME** is a logical node accommodating the eNodeB and provides mobility management.
- **SGW** is a packet gateway in the camped-on network accommodating 3GPP access system.
- **PGW** is a gateway serving as interface to the IMS platform, and performs IP address allocation and packet transfer to the SGW, among others.
- **PCRF** is a logical node for controlling user data QoS and charging.
- **Proxy-Call Session Control Function (P-CSCF)** uses a server for relaying SIP messages located at the interface point to the EPC. It not only relays SIP messages, but also has the role of triggering QoS control in coordination with the EPC.
- **Serving-CSCF (S-CSCF)** is the central node of the signaling plane. It’s a SIP server and performs terminal session control and user authentication.
- **Interrogating-CSCF (I-CSCF)** uses a SIP gateway server, to which a remote network first connects when interconnecting networks or roaming. It has the roles of identifying the S-CSCF and relaying messages.
- **Application server** (AS) is a SIP Application Server host and execute services, and interfaces with the S-CSCF using SIP. It may include the telephony application server (T-AS) and Service Centralization and Continuity Application Server (SCC-AS), which performs the call processing in SRVCC.
IMS is an architectural framework for delivering IP multimedia services through the use of SIP, which is a protocol used on the Internet and multimedia devices. It was originally designed by the wireless standards body 3GPP, and embraced by ETSI and TSPAN. It has been designed to work with multiple access types, such as GSM, CDMA, WCDMA, WiMax, LTE, Wire line broadband, fixed lines, packet cable, among others.

**Network Functions Virtualization**

Network Functions Virtualization (NFV), in its simplest form, is the application of virtualization and automation techniques from IT to transform network functions and equipment in a carrier’s networks. Transformed network functions are called virtual network functions (VNF). Specifications for NFV are being driven by broad industry participation in ETSI.

NFV is quickly gaining acceptance as the new approach to delivering communication services. The promises of greater flexibility and dramatically reduced time to introduce new services, coupled with a reduction in capital expenditure and operational costs, are driving MNOs around the world to deploy NFV-based services.

For LTE operators willing to introduce VoLTE services, this is a unique opportunity to virtualize some network elements like IMS, VoLTE, SBC, and Policy Management, and get all the benefits that the new technology architectures provide. For operators close to initiating the implementation of LTE and then the VoLTE service, they could also include EPC and Radio Access Network (RAN).

**VoLTE and RCS/WebRTC**

The Rich Communications Suite (RCS) is another GSMA-led initiative that was started in 2008. As with VoLTE, RCS uses IMS but merges picture and video messaging with phone calls and online contacts in a user’s phone book—a process known as discovery. As IMS supports multiple services, RCS users can have a single Instant Messaging (IM) customer that works across all phone contacts via a single sign-on to all services.

Above all, RCS is dependent on interoperability between operators and native handset enablement. It avoids the need for manual settings or downloading applications prior to using services. Just like VoLTE, RCS promises ubiquity—the ability to communicate any files to any device on any network—and also guarantees carrier-grade QoS.

IMS-based services bring the need of networks interoperability, restricting the capacity to compete against the Internet-based services OTTs are offering. But the appearance of WebRTC—a free, open project that enables web browsers capabilities with Real Time Communications (RTC) via simple JavaScript APIs—opens up the opportunity. MNOs can connect 3G or VoLTE voice with the browsers, and also develop new digital services, leveraging a new, high level of interoperability for browsers, devices, networks, and services.

OTTs will have to overcome a big challenge because WebRTC will bring down the walled gardens they have created. For example, today, people from different communities can’t connect, for example, Skype with Viber or Hangout; in the WebRTC world, there could be connections between any approved browser. In this changing market, nobody will maintain continuous advantages.
In this context, VoLTE may be seen as a beachhead for the deployment of complementary RCS and WebRTC services. Some RCS services, in particular the ones included in RCS-e, or enhanced, were launched recently under the alliance Joyn, initially in Spain, Korea, and Germany. But integration with WebRTC is expected to come as soon as the new technology becomes available.

It’s clear this won’t be easy for the MNO, because the critical factors are agility and time to market. These two characteristics are far away from MNOs skills that are accustomed to the traditional core network management. But, the opportunity is there.

**User Equipment—terminals**

The IP Multimedia Subsystem (IMS) Profile for Voice and SMS—a mandatory set of features specified by the 3GPP that voice and SMS services must meet—is documented in the Permanent Reference Document (PRD). This defines the characteristics that a wireless device—for example, the User Equipment (UE) and network—are required to implement in order to guarantee an interoperable, high-quality IMS-based telephony service over LTE radio access.

Every alternative for providing Voice over LTE needs standardized and commercial terminals, with appropriated cost, features, and design. Generally, it’s difficult to get the complete ecosystem for a determined technology, including its terminals, which delays its introduction and massive acceptance by the public.

While the ubiquity of the LTE network is there, the UE terminal must introduce native VoLTE with enhanced IMS services such as video share, instant messaging, HD voice, and RCS. And, it must include some basic functionality such as SRVCC for HO of calls, CSFB for roamers, and many frequency bands.

The UE and network protocol stacks forming the scope of the IMS Profile for Voice (IR 92) and SMS are depicted in Figure 3.

---

**Figure 3.** Depiction of UE and network protocol stacks in IMS profile for voice
Gain these benefits

The reasons for using VoLTE, instead of separated voice and data solutions or fault-back technology, are numerous, starting with the opportunity to rebuild the MNO architecture around new digital services. However, there are some requirements, of which most are related to the size of the investments. Fortunately, NFV and cloud technologies have come to decrease them significantly.

• Costs
  – VoLTE lets MNOs decrease operational cost using a flat, all-IP network.
  – VoLTE is spectrally efficient. It provides a big improvement in voice quality with more available data capacity in their bands for a given voice load.
  – VoLTE accelerates LTE evolution. With it, an operator can offer voice service in its LTE spectrum, while optimizing its 2G/3G spectrum for re-deploying additional LTE bandwidth.

• Quality of Experience
  – VoLTE exceeds OTT VoIP and even 3G voice quality, and provides “HD Voice.”
  – The VoLTE handover to a GSM/UMTS network implemented with IMS centralized Services (ICSS) and SRVCC, experiences the same voices services quality on the LTE or GSM/UMTS network.
  – VoLTE is reliable. With its guaranteed QoS, VoLTE offers MNO subscribers a much better alternative to OTT VoIP, without changing the way they use their smartphone.
  – Registration call set-up times in VoLTE are excellent compared with 3G networks.

• New revenues
  – VoLTE establishes the foundation to enable MNOs to introduce new digital services.
  – MNOs have the potential to offer converged fixed and mobile services on their wire-line and wireless networks using VoLTE/VoIMS.

Understand the requirements

• Investments—preparing the network
  – VoLTE requires a sizable investment in the LTE network, because the MNO needs to deploy the IMS core, and the IP-SM-GW SMS gateway for Internet working. The HSS may also require an upgrade for IP-SM-GW support.
  – Implementation of VoLTE/VoIMS requires a larger investment and network changes. The high cost associated with VoLTE/IMS is wrapped up in the Session Border Controller (SBC) and voice application server. Close to 41% of IMS hardware costs are tied to the access SBC, and 53% of IMS software costs are tied to the MMTEL (telephony AS), according to Infonetics Research: Operator Optimism Circles VoLTE Despite Challenges, issued on October 10, 2013. It’s a sensitive issue for an MNO to struggle with the cost of a new voice network in light of declining or flat voice revenues.
Investments—managing the handover and Quality of Service

- SRVCC is required for handover (HO) of voice during the migration period when the LTE services areas and 3G service areas co-exist.

- SVRCC implementation requires Service Centralization and Continuity Application Server (SCC-AS), and SRVCC upgrades to the Enhanced Universal Terrestrial Radio Network (E-UTRAN) and Mobility Management Entity (MME). In legacy networks, the implementation SRVCC requires deployment of a Media Gateway Control Function (MGCF) and upgrades to all Mobile Switch Center (MSCs) bordering the LTE/IMS networks. An HLR upgrade may also be necessary to support the IP-SM-GW.

- The HO quality and shortening of switching time have improved with eSRVCC. There are still some efforts to improve the time and impact on the UE.

- In order to deliver HD voice services, an advanced policy management is needed to control the QoS of every VoLTE call. Delivering QoS is not just limited to voice, rich communication services (RCS) such as video messaging also needs to be managed. All these messaging services need to have policy to dynamically manage every call and session.

Decide and move forward

The industry is in a painful transition. Operators are in the costly mass migration to a new network environment—LTE. This is at a time when their core services are becoming commoditized. Traditional revenue streams are under pressure from inter-operator competition and the presence of a new breed of Internet service providers or OTT, characterized for being region independent and more effective than the MNO for introducing innovation.

According to LTE Roaming Information in the article “Why Voice Matters,” issued on April 2, 2014, voice revenues will still account for more than half of all mobile operator revenues out to 2017, but the challenge from OTT is increasing. Trying to compete just in the voice market is not the solution, and in many cases, the correspondent business case is not strong enough to push VoLTE. The industry response: Stop the decline in incomes. Be in a better position to compete with OTTs. And don’t be just a “pipe.” This involves an integrated digital services approach, including, between others, voice over LTE (VoLTE)/RCS, and WebRTC. This is perhaps your last opportunity to overcome the challenge and evolve your services to new standards enabling digital life development.

The digital service approach can be leveraged with new technical architectures like NFV, SDN, and cloud services, which enable a big efficiency in investments and operations cost, through consolidation and virtualization of many technical solutions.

You have the unique opportunity to have a complete new business case and competitive position. You just need to decide which road to take.
Work with an experienced leader

Knowing the big challenge that MSOs have and that VoLTE is the enabler of the digital service portfolio, HP has updated its solutions to support the new technologies, providing quick implementation, while leveraging in their existing investments.

Basic solutions like the integrated Home Subscription Service (iHSS), Policy control, Charging control, and Multimedia Services Environment, among others, have been updated to support the new VoLTE/RCS services. This facilitates integration with traditional services, enhancing the characteristics of new services, and guaranteeing the traditional quality and support of HP products.

As a trusted partner and technology leader, HP is committed to solving clients’ needs, develop new solutions, and update their existing solutions.

Learn more at
hp.com/go/scs
About the author

Sergio Restrepo is a business consultant from HP Communication Media Solutions (CMS) Solution Consulting Services (SCS) in the Americas, and a former CTIO. Restrepo has extensive experience in the telecommunications industry, especially in merging information and telecommunication technologies, introducing new technologies and products, and business transformation. His deep business knowledge helps HP define a more realistic approach to clients and a transformation consultancy based on his operative experience.