by Jose Deras

Service Brokering on the LTE Network

The 4G networks are coming. Many communications service providers have now officially announced their LTE plans, and some have even begun LTE rollouts. But we are still at the infancy, and there's a larger wave of network upgrades and new handsets that will certainly transform mobile broadband as we know it.

As with all transformations, there are some critical decisions to be made. A considerable amount of these efforts to date has been concentrated on spectrum, with options ranging from the 700MHz to 2GHz, depending on region and service provider.

CSPs considering the transition to LTE data are faced with the choice of whether also to offer LTE voice services to better utilize the new network infrastructure, or deploy LTE data-only networks. For the most part, it seems that the desire is there to transition to LTE voice sooner rather than later. This strategy makes sense as LTE requires entirely new radio access technology, from handsets to antennas to base station controller upgrades, and keeping two radio access networks greatly increases opex, which might be best spread across a wider segment of offerings.

It is the how to deliver LTE voice services that has created confusion. When LTE was originally envisioned, the conventional thinking was that the CSPs' networks would have transitioned to IMS architectures by then, and therefore voice on LTE would naturally be based on VoIP. The reality is that as of this writing, there are very few true IMS production networks in place, and therefore CSPs must reconcile how to deploy LTE quickly with the realities of network transformation timelines and budgets.

Of course there are options on how to move forward with voice delivery architectures. The backdrop of which is the general agreement that current 2G and 3G networks will be in place for some time to come, and therefore CSPs must take into account not only how their networks will evolve, but how to support roaming and handovers across multiple CSPs. In addition, the expectation is that current 2G/3G subscribers will be the first to migrate to 4G as CSPs provide upgrade incentives. That creates that additional burden of providing feature and service parity as part the upgrade as subscribers will expect their current call feature sets to behave the same once they upgrade.

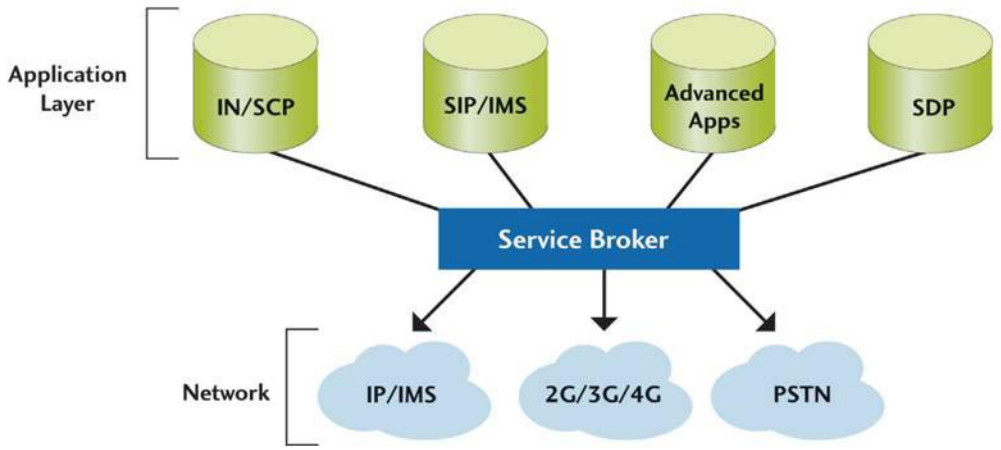
Among the most studied options for voice delivery are:

3GPP IMS (One Voice)

The obvious long-term solution for voice and SMS delivery is based on a migration to IMS, leveraging industry know-how gained as part of the development of UMTS. Deployment of IMS-based LTE voice has been documented since IMS Release 8, and it's viewed as the preferred long-term solution for voice evolution. At the 2010 Mobile World Congress, several manufacturers and service providers stated support for an initiative called One Voice, which specifies an IMS voice and SMS profile, as well as the minimum mandatory feature set. Moving to IMS has the obvious advantage of commoditizing a large portion of the network, bringing with it all the benefits discussed for several years now.

3GPP Circuit Switched FallBack

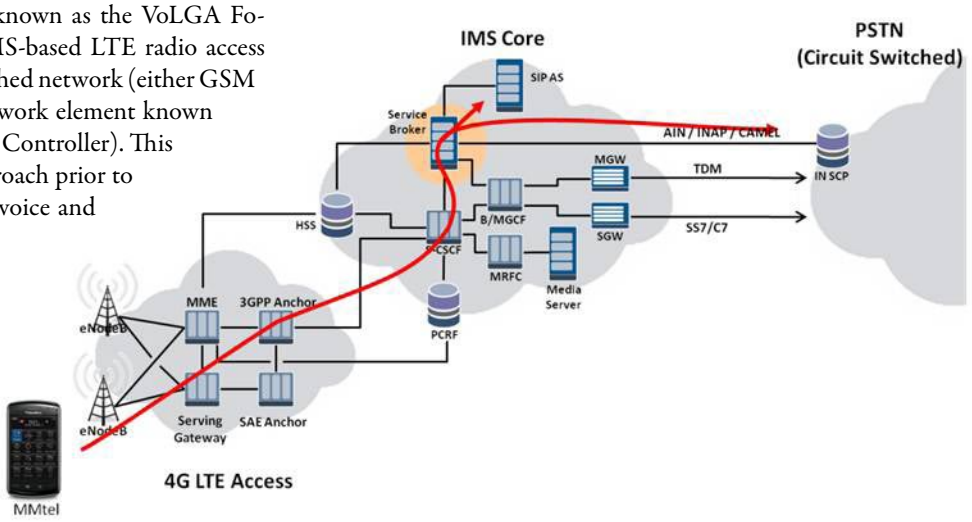
In addition to IMS, 3GPP also has proposed using a technique called Circuit Switched FallBack or CSFB (standardized under 3GPP specification 23.272), whereby the handset normally operates in 4G (LTE) mode when accessing data services and idle, but switches to a 2G or 3G radio when it is informed of an incoming call, or an outgoing call is placed, or for circuit-switched applications such as SMS. The handsets therefore are dual-mode, supporting 2/3G for voice and 4G for data services. A mechanism to inform the handset via 4G (IP data path) that a call is inbound is utilized, but there is some concern regarding longer call set-up times instigated by the necessity of switching radios.



Voice over LTE Generic Access

Another option that has been put forth is Voice over LTE Generic Access (VoLGA),

supported by an industry consortium known as the VoLGA Forum. VoLGA proposes utilizing the IMS-based LTE radio access network, but maintains the circuit-switched network (either GSM or CDMA based) by introducing a network element known as the VANC (VoLGA Access Network Controller). This solution is positioned as an interim approach prior to a full IMS deployment, specifically for voice and SMS delivery.

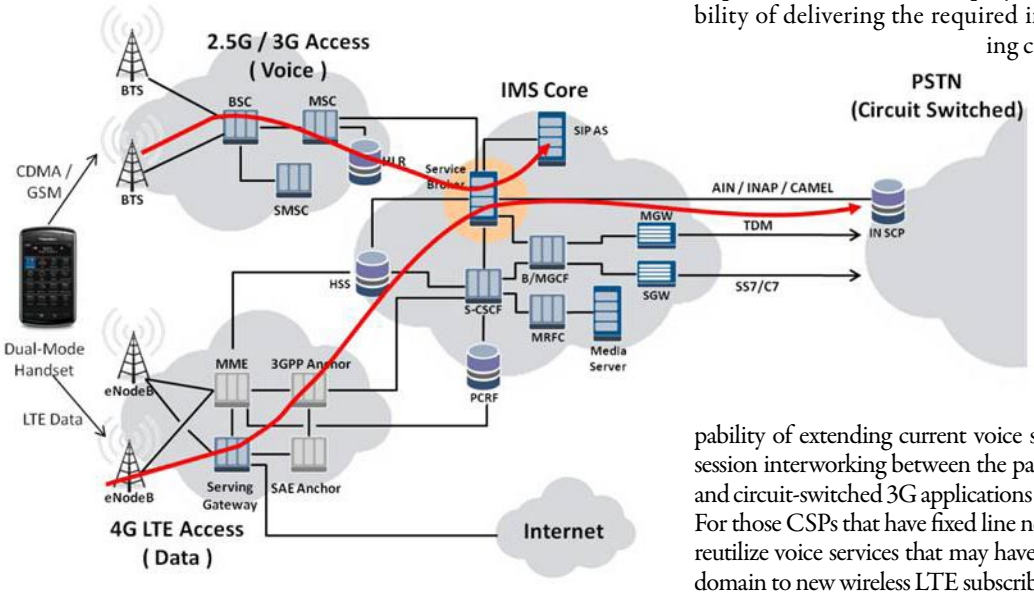


Proprietary Solutions

Other options do exist, such as upgradable IP-enabled MSCs, but those tend to be tied to a specific vendor architecture and may be best approached by current customers.

To be clear, these architecture options address how to marry the packet-switched LTE radio network with the service operator core network for the purpose of delivering voice. What is not immediately apparent is how the CSP delivers voice applications, such as find me/follow me, voice VPN, CRBT and all the critical revenue generating add-ons that subscribers use and would expect to migrate to LTE.

Regardless of the architecture chosen, CSPs will be faced with application delivery challenges created by the transition in LTE to packet based voice. Today's voice services are predominantly delivered via service control points or intelligent network application servers that rely on IN protocols (such as INAP and CAMEL) for complex call control. Those services tend to be highly stable and profitable and also highly customized, and are therefore not easily moved to SIP-based application servers. Recreating the functionality of deployed IN-based applications requires an exhaustive survey, documentation, and duplication of used features and capabilities, a task that may not be easily achieved.



CSPs will need to deliver these same services (down to feature sets and even quirky behavior) on LTE subscribers to ensure migrated users have the same level of service and experience.

As CSPs evolve their networks for LTE, the resulting networks present tremendous challenges in voice services and application delivery. It's the same challenge faced in migrations to NGN and IMS. Realizing this opportunity, the telecom software industry has come forward with a purpose-built network element: the service broker, a solution specifically designed to overcome network architecture challenges and ensure voice service delivery from any network domain to any other network domain.

Service brokers are placed between the application layer and the control layer, with the purpose of delivering and extending the reach of applications to all network domains of the CSP. They do this by performing the signaling, media and call control interworking between the applications and different network domains. Implicit in the successful deployment of service brokers is the capability of delivering the required interworking without necessitating changes to either the applications or the networks. The risk of "breaking something" in the migration of the applications is removed by not touching or modifying existing code.

Let's take a look at how a service broker might fit within two of the most popular network proposals, IMS and VoLGA.

LTE Voice over IMS

Service brokers provide the capability of extending current voice services by providing seamless call/session interworking between the packet switched LTE access network, and circuit-switched 3G applications without requiring changes to either. For those CSPs that have fixed line networks as well, they are also able to reutilize voice services that may have been only offered in that network domain to new wireless LTE subscribers.

LTE clients are able to access all applications they previously used, such as prepaid, CRBT, voice VPN, find me/follow me, etc., and therefore are not required to change their subscribed services. From a network perspective, the service broker enables the IMS network to see the existing applications as new SIP-based applications, by providing the interworking required. As far as the IMS network is concerned, the service broker is the SIP server, while to the existing SCPs the service broker is an existing 3G MSC.

LTE via Circuit Switched FallBack

For those service providers deploying CSFB, the 2G/3G network remains unchanged so existing applications will work unchanged on LTE. Service brokers are therefore not required for those applications but may instead be useful to prepare the core network for the eventual migration toward IMS. New IMS-based application servers can be utilized on the 2G/3G circuit switched networks, ensuring all new application deployments are based on the IMS architecture.

When ready, the service provider may then migrate to LTE over IMS using its IMS-based application servers. Service brokers remain in place to provide connectivity for older applications, and to perform service orchestration and sequencing, thereby extending their useful life.

LTE Voice over VoLGA

For those CSPs that choose to follow an architecture based on the VoLGA forum proposals, the service broker provides as similar benefit as with CSFB, allowing next-gen SIP-based applications to be utilized by the existing 3G network.

Service Broker Functions

Service brokers provide other functionality that, once deployed, can be of added benefit to the CSP. Among the most often delivered features are:

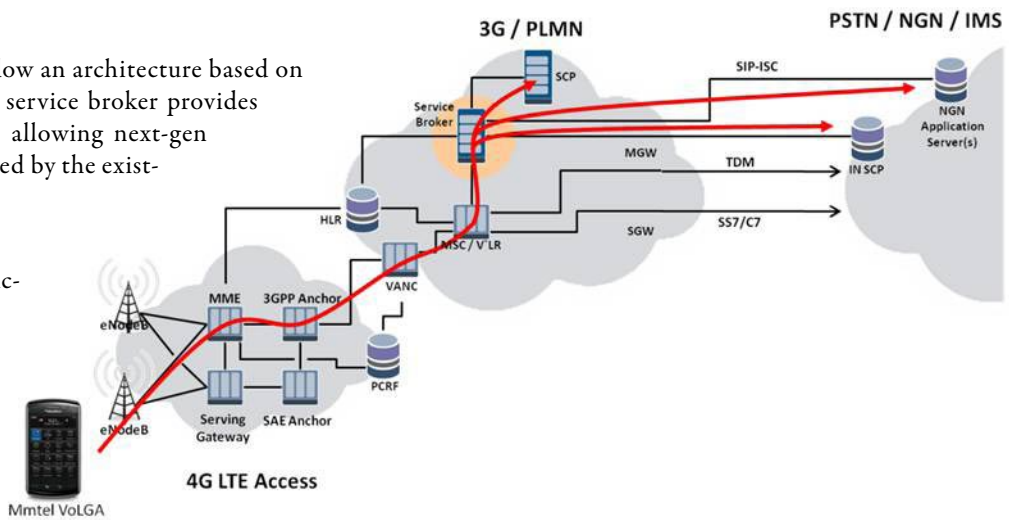
- IMS SCIM (now renamed the IMS service broker)
- IN-IN trigger management
- Real-time charging
- Protocol/call flow management
- Subscriber data management interaction
- Media resource brokering
- Service orchestration

The service broker's ability of performing orchestration and combination of discrete voice applications and services into new combined offerings (voice mash-ups) is particularly exciting. With this capability CSPs are able of create new revenue producing offers to subscribers where they previously were not available: CRBT and prepaid, find me/follow me combined with voice VPNs, etc.

Service brokers also provide the capability of generating real-time charging events, either programmatically (via an API) or automatically as part of service delivery. The challenge facing CPSs is delivering new, innovative services that seamlessly integrate into existing billing platforms. Doing so often means normalizing charging events or even transforming charging events from one technology to another, as is the case in IN-to-IMS migration. Because the service broker is responsible for orchestrating and delivering combinational services, it is often then the responsibility of the service broker to generate a charging event upon successful start/completion of those enhanced services.

CSPs are currently spending a lot of time and energy qualifying LTE radio access network technology, which will ensure live deployments maintain or exceed current mobile reliability.

The next several quarters will prove interesting as CSPs choose LTE voice delivery architectures, much of it influenced by time and their own network designs requirements.



Careful consideration of voice services and applications will ensure high-value customers (early LTE adopters) are able to enjoy the same voice features and services they are currently used to, ensuring they are permanent converts. Service brokers will play a critical role in ensuring CSPs are able to immediately migrate current voice revenue platforms for those early LTE subscribers. **NGN**

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