



Voice over LTE and HD Voice

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Last month we talked about Voice over WiFi, which has been introduced by T-Mobile and Sprint. Over the past couple of months AT&T, Verizon, and T-Mobile have all announced initial market deployments of another wireless Voice over IP technology - Voice over LTE (VoLTE). All three have announced that they will support HD Voice over VoLTE, while Sprint is already supporting HD Voice nationwide.

Since these terms are in the news, you may be wondering whether VoLTE and HD Voice represent significant opportunities for churches and ministries, or are there hidden dangers?

What is Voice over LTE?

As I said last month, I'm guessing that all readers of Christian Computing are familiar with Voice over IP (VoIP). At its core, VoIP allows voice calls to be made across Internet Protocol networks, including the global public Internet. Consumers, businesses, and ministries have many VoIP providers to choose from, including often your local cable provider, Vonage, and Skype. These providers have benefited from

lower cost networks and more favorable regulatory treatment to be able to pass on meaningful cost savings to customers, especially for international calls.

In simple terms, VoLTE is VoIP, but over the 4G LTE networks that the mobile operators have been deploying. While VoIP traditionally uses a computer or a home gateway to connect to a broadband network, VoLTE is accessed using the mobile devices provided by your carrier - primarily smartphones - using the normal dialing mechanism in the phone.

Unlike VoIP and VoWiFi, VoLTE is not a new and separate application on the device, but rather is primarily an architectural change within the network. The mobile operators are changing the way

that they route the calls within their networks. Instead of traditional circuit switched technology, they are moving to an end-to-end IP packet network. With VoLTE, they will eventually be able to replace the traditional voice switches in their networks. They also will be able to eliminate some of the technology in each handset.

As you can imagine, this is a huge change that is fraught with complexity and risk. Especially in the near term, the handsets and the network need to deal with situations where the customer moves into or out of an LTE covered area, or into or out of an area where VoLTE has been implemented. They also need to deal with the fact that not all handsets support VoLTE, so what happens when a VoLTE capable handset calls a non-VoLTE handset? The standards bodies also haven't really started dealing with how to connect VoLTE calls between different mobile operators. Bottom line, it will be many years before VoLTE completely replaces traditional circuit switched voice calling.

What is HD Voice?

As you probably guessed, HD Voice is "high definition voice" - providing a higher quality of sound in phone calls.

The human ear can hear sounds roughly in the range from about 20Hz to about 20,000Hz. As telephone technology matured and became standardized, the telephone network was designed to deliver sound at a frequency range of approximately 300Hz to 3,400 Hz, so a small fraction of the human hearing range, but covering the range of the human voice and good enough to clearly understand conversations.

As you might have guessed, this compressed frequency range was originally driven by the state of technology in the late 19th century,



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but with the migration to digital technology, maintaining these constraints was driven by limiting how much bandwidth was consumed by each call and how much processing power was required in the handset. As network capacity and smartphone processing power have both increased, the opportunity has arisen to dramatically improve the audio quality of the telephone call.

The standard that mobile operators are generally using for HD Voice is G.722 also known as wide-band audio. This standard increases the frequency

range from 50Hz to over 7,000Hz. You can hear the difference with the demo at this web page: http://support.sprint.com/support/article/FAQs_about_HD_Voice_from_Sprint/3b348589-81a4-452d-8758-cd47-d7ddb952

As a rough analogy, you can think about different broadcast radio technologies. AM radio was introduced first with small channel sizes, which meant that the audio frequency range was limited to about 40Hz to about 7,000Hz - which works really well for voice-oriented material like talk radio and sports, but

not so well for the dynamic range in most music. FM came later and supports an audio frequency range of about 30Hz to about 18,000Hz. Of course, both of these are analog technologies, so they are susceptible to noise being introduced into the signal. HD Radio has been introduced for over-the-air radio, increasing the high end for AM to about 15,000Hz and for FM to about 20,000Hz, and shifting from analog to digital to eliminate extraneous noise.

How can VoLTE and HD Voice help churches and ministries?

Last month we talked about the financial benefits of VoWiFi. Because many VoWiFi services are free, churches and ministries could save significantly, especially for international calling.

VoLTE, on the other hand, will not be free. As discussed above, VoLTE is really a new architecture for the mobile operators. You will make phone calls the same way you always have, they will just be transported differently through the network. And you will pay the same way you always have. At some point in the distant future, the carriers will realize savings as they are able to shut down the old circuit switched equipment in their networks and remove technology from the cellphones they sell us, but since they won't be able to do that until all calls can be completed

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with VoLTE, that's still years away.

We will all benefit from HD Voice as it becomes available, however those benefits will be largely intangible. Remote ministry workers likely will feel more like they are really with those on the other end of the phone and may be more encouraged. We may even be able to enjoy music and other non-talk audio content (waterfalls and birds chirping?) across the distances. However, especially as it pertains to people in distant lands, it likely will be years before the carriers work out the interoperability between their systems to enable a HD Voice call to a foreign land.

What is dangerous about VoLTE and HD Voice?

As with VoWiFi, the greatest danger associated with VoLTE and HD Voice is that it simply may not work. To benefit from these technologies, both ends of the call will need to be using handsets that support the technologies, in locations where the technologies have been deployed, and on the same wireless carrier. Unlike VoWiFi however, the risk that it won't work isn't our concern. Our mobile operator will ensure that, if HD Voice isn't available, or VoLTE isn't available, our call will still go through the old fashioned way. We may be slightly disappointed that the voice quality isn't as good as we'd hoped, but we'll still be able to happily connect with our loved one on the other end of the, er, wavelengths.

Unlike VoWiFi, security is not a significant concern for VoLTE. LTE signals are encrypted between the handset and the network so your calls cannot be easily listened to.

It is my hope and prayer that these articles on the power and danger of technology will encourage you in your daily walk with Christ. Whether it is the printing press, radio, television, personal computers, the Internet, the Cloud, smartphones, or voice over WiFi,

new technologies continue to advance our ability to know God and to serve Him, wherever we go. As 1 Peter 4:10 teaches us "As each has received a gift, use it to serve one another, as good stewards of God's varied grace."

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