The Growing Importance of HD Voice

Executive Summary

A new excitement has entered the voice communications industry with the advent of wideband audio, commonly known as High Definition (HD) Voice. Although enterprises have gradually been moving to HD VoIP within their own networks, these networks have traditionally remained "islands" of HD because interoperability with other networks that also supported HD Voice has been difficult.

With the introduction of HD Voice on mobile networks, which at the writing of this white paper (July 2012) has been launched on numerous commercial mobile networks worldwide and many wireline VoIP networks worldwide, consumers can finally experience this new technology firsthand. Because mobile users tend to adopt new technology rapidly, replacing their mobile devices seemingly as fast as the newest models are released, and because landline VoIP speech is typically done via a headset, demand for HD Voice is expected to be high and in turn, availability across both mobile and landline networks is expected to accelerate.

This white paper provides an introduction to HD Voice and discusses its current adoption rate and future potential, including use case examples which paint a picture that HD Voice upgrades to certain network and enterprise infrastructure will be seen as important, and perhaps as a necessity to many.

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What Is HD Voice?

Even though much of what we hear about these days in the communications industry revolves around wireless broadband, LTE, cool new tablets, and the ever increasing video usage on smart devices, it's important to remember that voice services still play a key role overall. In fact, in 2012, it's expected that wireless voice services will be 60% of wireless service provider revenue, and that by 2015, as the worldwide wireless service revenue approaches one trillion dollars, voice is still expected to generate over 50% of that revenue[1] ! So even though voice services are ubiquitous and are no longer seen as the next best thing, voice (and, therefore, voice quality) is poised to continue to be a critical measure for service provider success.

Voice quality can still be a significant differentiator as competition becomes more intense among service providers, enterprises and mobile operators. This is where HD Voice comes in. HD Voice uses wideband audio connections to more accurately reproduce the human voice, resulting in significantly more natural sounding speech. Some have likened hearing HD Voice to a sense of actually being in the same room with the person on the other end of the phone line. Many also feel that HD Voice gives them an increased ability to recognize people by their voices and to understand highly accented speech more easily.

One reason new users sense such a marked improvement in quality with HD Voice is that traditional telephony is constrained by dated standards. In fact, even today's digital telephony standards (e.g. ITU-T G.711) are based on 1960s digital circuit technology and 1930s microphone technology! Until the advent of HD Voice, G.711 was the standard of voice quality, with mobile telephony typically providing even less than G.711 quality.

What do these limitations "sound" like? A major issue is that older standards limit the range of audio frequencies to ~300Hz to 3400Hz. The drawbacks in adhering to this narrow range are:

- Difficulty recognizing "fricative" sounds like "s" and "f" (higher frequencies needed)
- Problems distinguishing "m" from "n" and "p" from "t" (again, higher frequencies needed)
- Inability to hear the fundamental resonances in spoken vowels (lower frequencies needed)

The resulting "telephone speech" sounds harsh and unnatural, but with the wider range of frequency with HD Voice, the limitations of these narrow range of frequencies are removed - even on mobile phones.

Please listen to this demonstration on the Dialogic website to hear for yourself.

Regular Voice Quality

HD Voice Quality

Click on the buttons of this online PDF or scan the QR codes with your smartphone to hear the audio files (Internet connection required).

Where is HD Voice Being Deployed?

In the enterprise, HD Voice usage has been spreading, akin to business telephone system's adoption of VoIP technology. Although telephone handsets from Avaya, Cisco, Grandstream, Gigaset, Polycom, Snom, and others support wideband audio and incorporate a variety of higher-quality audio components, and because headsets connected to Unified Communications Hubs such as Microsoft Lync support HD Voice, many enterprise IP telephony systems operate as islands of VoIP. They connect to calls on the traditional PSTN, which, as noted above, adheres to dated voice standards and operates within a narrow frequency range. As a result, HD Voice is often restricted to internal connections on the network.

On the wireless networks, 41 commercial networks in 33 countries support HD Voice[2] , with deployments accelerating as of May 2012. It is expected that as LTE and Voice over LTE (VoLTE) networks roll out, HD Voice will be the primary codec of choice.

[1] 2G/3G/4G (LTE and WiMAX) Services and Subscribers: Voice, SMS/MMS, and Broadband; Biannual Worldwide and Regional Market Size and Forecasts: 2nd Edition, December 15, 2011
[2] Mobile HD Voice: Global Update Report, GSA, May 21, 2012

Wireline network operators such as Phone.com are also getting into the act, offering HD Voice as a differentiator. In view of the VoIP nature of some wireline networks (like cable) and given that hosting will be over VoIP, it might not be long before we can expect even more widespread wireline deployment.

Use Case Examples

The first use case example is person-to-person calling. In the enterprise, if one person is calling another via the same PBX or Unified Communication Hub that supports HD Voice using either a headset or a desk phone that also supports HD Voice, then it will be an HD Voice conversation. If a call is within the same mobile network that supports HD Voice with mobile phones that also support HD Voice, then the conversation will be with HD Voice. If a call is from one network that supports HD Voice to another that also supports HD Voice, then it might end up being an HD Voice call if the signaling properly supports the call or there is a gateway to convert from one type of HD Voice codec to another. (Please see the section on Implementation Issues below).

A second use case example is utilizing a communications solution like voice mail, conferencing, IVR, call logging or contact center adjunct with the phone call. If a call is made via HD Voice and there is a need to leave a voice mail, then the voice mail system would need to support HD Voice for the voice mail to be in HD Voice format. If an HD Voice caller reaches an IVR system, then the system would need to support HD Voice in order to provide a higher quality interaction. The same situation would occur with a contact center. For instance, a specific example along these lines would be with emergency services. Calling in with HD Voice would yield a higher quality interaction with the emergency service contact center, assuming the contact center is HD Voice compatible. And if there is a call into a conference bridge on an HD capable phone and the conferencing server does not support HD Voice, then the bridge will revert back to the more customary narrow band service.

A third use case example is supporting the previous use case example through a cloud implementation of the communications adjunct. Figure 1 (below) shows this type of example. Given that many communications applications are moving to the cloud, it stands to reason that HD Voice applications should follow.
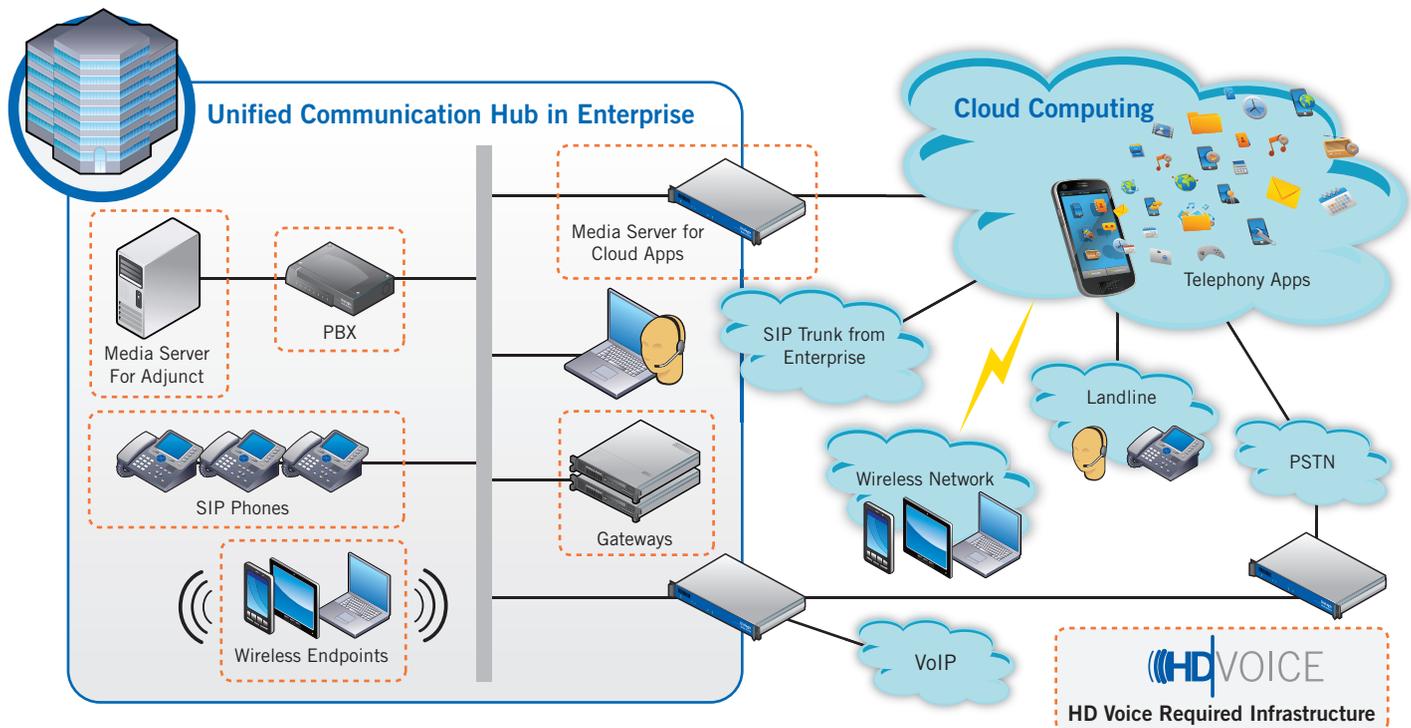

Figure 1: Diagram showing an example of cloud implementation points of HD Voice

A fourth category of use case examples involve innovation. Historically, when new capabilities are rolled out, new innovative services which did not exist before tend to follow. In the case of HD Voice, it depends to some extent on the development community ecosystem's imagination, but types of innovation could be in areas such as voice recognition for the masses or improved outbound text to speech to mobile phones.

Implementation Issues

Figure 1 (above) also gives a good overview of an example of implementation points that address HD Voice.

In the enterprise, HD Voice would need to be supported by the PBX, phones (if not using a headset), and media server (if using a voice mail, IVR, or contact center solution and the full HD Voice experience is desired for the caller). Wideband codecs used in the enterprise (G.722.1, G.722.1c, G.719, RTA, SILK) can vary.

In service provider networks, mobile wideband audio (HD Voice) service has been fully standardized by the 3GPP since 1998. The service uses the AMR wideband (AMR-WB or G.722.2) codec, which must be supported in handsets, the core network's gateways, and the GSM TRAU units (part of the Base Station Controller) to work effectively. Although AMR-WB requires more DSP processing than AMR-NB, the extra horsepower is a small fraction of what a handset needs (because of radio requirements) and can typically be supported as a software upgrade on recently deployed core network equipment. A mobile operator's core network must also be able to support TFO and TrFO signaling. This signaling is already available in core network equipment, or can be implemented as a software upgrade for most systems deployed in recent years. What's more, added radio resources are not required, which means radio re-planning is not needed. Although AMR-WB doubles the audio bandwidth, its bit rates are similar to those of AMR-NB, especially when operating in the mandatory configuration (set 0) of the standard. The takeaway is that AMR-NB and AMR-WB can easily co-exist and operate side-by-side in today's radio infrastructure.

Given that it is likely that two different wideband codecs will be used when trying to connect the service provider and enterprise networks together, a gateway or border element would need to be used in order to transcode one codec to another.

And like the enterprise, a network-based media server needs to support HD Voice codecs for the subscriber to have an HD Voice experience, so that the conference servers, voice mail, IVR and other value-added services can also be supported by HD Voice.

Dialogic's Role

Dialogic has been an early HD Voice supporter, and plays an active role in HD Connect consortium and conferences.

Dialogic currently supports HD Voice in Dialogic® PowerMedia™ Software and in the Dialogic® BorderNet™ 2020 Session Border Controller.

For More Information

Global Mobile Suppliers Association (GSA) provides information on mobile network HD Voice commercial launches and supported handsets.

HD Voice News is a source of industry news.

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