

The two minute guide to mobile HD Voice

Just in time for the Mobile World Congress

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Next week there will be a lot of hype and hot air about HD voice out of Barcelona as the cell phone universe celebrates its annual Baccaus-esque ritual to all things wireless.

France Telecom and 3 UK have been the first vendors to come out of the closet with HD voice service offerings, but other vendors are expected to show their hands next week. Here's a quick cheat sheet to the wonderful world of mobile HD voice for the curious.

What is HD voice?

Your standard POTS call captures and delivers sound in an audio range of 300 hertz to 3400 hertz with standards set back in 1937. The VoIP equivalent of POTS is G.711 and takes up 64 kbit/s of bandwidth.

The baseline definition for wideband voice – typically called HD voice – is G.722. It delivers audio in the range of 30 to 7000 hertz, about twice as good as a typical POTS calls and G.711. Due to a little data compression on the fly, a G.722 phone call only takes up 64 kbit/s of bandwidth.

The combination of upper and lower frequency sounds gives a much clearer and "richer" experience on voice calls with the key marketing-speak phrase used to describe it as, "Conversations sound as clear and natural as if talking to someone in the same room."

Additional/complementary buzz-phrases include "a dramatically improved communications experience" and "Conference calls will be easy to follow and much less exhausting."

Why is HD voice such a big deal?

Current quality of phone calls suck compared to FM radio or CDs and mobile calls suck more. Cellular tech heads started with a 1937-era audio standard and then ran the the quality of experience through a more *via* data compression blender to cram more calls into radio frequency (RF) spectrum.

Implementing HD voice should make everything revolving around voice – conference calls, IVR, speech-to-text, calls to Mum and the wee ones – a much better experience.

How do you deliver mobile HD voice?

First, forget about the POTS network and all that legacy analogue crap. You need an all-IP network with low latency and enough bandwidth to transport a wideband voice call, so you need the latest hot-rocking 3G and 4G-esque data networks.

France Telecom is delivering HD voice over the latest GSM HSPA-alphabet-soup via a soft client, but you can do the same thing on a fast enough WiMAX or LTE network. Qualcomm has done some demos over CDMA, but given the worldwide love of 4G, mobile HD on that tech might be some wishful thinking.

You also need end-user devices (i.e. phones) with a quality microphone to capture 7 KHz of sound, enough CPU horsepower to encode and decode that information on the fly, and a speaker/headphone to deliver the sound to the human ear.

Nokia and Sony Ericsson have announced phones that support AMR-WB, the *de facto* standard of mobile HD voice. You can also do mobile HD voice with a softclient and a sufficiently powerful smartphone; expect to see HD voice clients for the iPhone being demoed by Global IP Solutions (GIPS) and Fraunhofer using codecs other than AMR-WB.

AMR-WB what the hell?

AMR-WB (AMR-wideband) is the codec and heir-apparent replacement for AMR used in "standard" GSM calls to provide mobile HD voice. Also called G.722.2, it is designed to provide an HD voice experience in 24 kbit/s – a big deal to the cellular world that wants to conserve both RF and network bandwidth.

But there's no free beer when compared to G.722. AMR-WB requires more CPU cycles and number crunching for efficient compression which translates to shorter battery life. Further, AMR-WB is a patented codec with intellectual property contributed by France Telecom/Orange, Nokia, and Ericsson and VoiceAge.

Alternatives to AMR-WB have been floated ranging from implementing G.722 to Skype's SILK to Fraunhofer providing an "AAC Enhanced Low Delay" codec based on MPEG.

G.722 has the advantages of being royalty-free and not such a CPU devourer, but it takes up 64 kbit/s – for the cellular RF heads, this is a theoretical show stopper, but since the mobile people are pimping their data networks to support two-way video calling with HD voice, the whole "conserve RF/conserve network bandwidth" argument is crap. Device manufacturers also like the fact that G.722 is a simple piece of code to implement relative to all the different profile flavors for AMR-WB.

Skype wants everyone to use SILK and offers it as royalty-free and open source but after the skeletons as to who owned what IP after eBay bought Skype, well... It doesn't stop people loading Skype clients on mobile phones and running SILK "natively."

And it works just like normal phone calling, eh? If I have an HD voice phone and my bud does- Well...not really, not yet.

Carriers and businesses running HD voice currently operate as islands – you can communicate with someone within your network, but if carrier A has HD voice and carrier B has HD voice, you aren't going to be able to connect an HD voice phone call because the higher level SIP/IP connectivity isn't set up if you are using those old-fashioned phone numbers to "dial" another person.

Some sort of HD voice interoperability / interconnection announcement at Mobile World Congress is purportedly going to take place where a group of mobile carriers have agreed to exchange AMR-WB calls among themselves and if so, this is one of those Key Announcements which will get HD voice moving faster.

HD voice interoperability is not technically hard, since mobile carriers already have ways to exchange MMS and picture mail and all those other multimedia-loaded services via IP; supporting AMR-WB calls is just another data type to exchange via IP. But the politics is another story.

Speaking of ugly, how do calls move between the PSTN, HD voice, AMR-WB, G.722, SILK, and whatever flavor-of-the-day codecs pop up?

Calls need to be transcoded – translated – between codecs. For example, France Telecom already has to transcode between mobile HD voice users and its own PSTN connections to the rest of the world. And you have to transcode between AMR-WB and G.722 (mobile HD voice and broadband HD voice), plus SILK since Skype wants its due for HD voice.

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