Global mobile Suppliers Association

August 13, 2013

Mobile HD voice: Global Update report

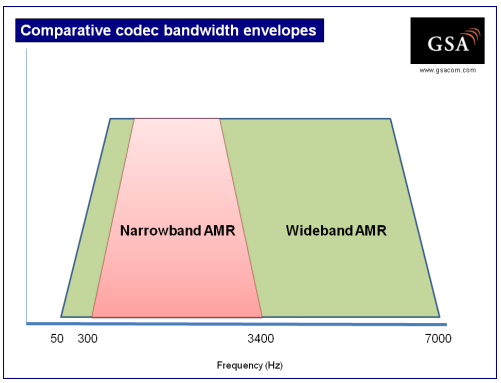
GSM/3G MARKET/TECHNOLOGY UPDATE

Mobile HD voice service using AMR Wideband

Mobile HD voice based on AMR (Adaptive Multi Rate) Wideband technology (W-AMR) enables high-quality voice calls in mobile networks and an improved user experience. It provides significantly higher voice quality for calls between mobile phones supporting the feature and is implemented and market reality today in GSM, UMTS (WCDMA-HSPA) and LTE networks around the world.

The higher voice quality using HD voice improves the call experience, allowing people to better share feelings, do business and communicate information. HD voice transmits a broader spectrum of the human voice; therefore conversation is more natural and is likened to speaking to the other party in the same room. HD voice also helps people hear better in noisy environments.

HD voice helps operators to differentiate their offerings and enable high quality services to voice dependent business like call center services, information services, emergency services, etc. HD voice is ideal for conference calls and can contribute to a reduction in business travel and raise productivity while reducing environmental impact. Calls which are easier to hear and understand reduce fatigue often associated with long conference calls. HD voice represents the greatest advance in voice on mobile networks in decades.



W-AMR speech technology is standardized in 3GPP Release 5. The W-AMR speech-compression algorithm doubles voice bandwidth (50–7000 Hz) compared to the current narrowband speech codec (300–3400 Hz) without extra radio or transmission requirements. According to 3GPP, 12.65 kbit/s or higher coding bit-rates provide high-quality wideband audio (lower bit-rates of 8.85 and 6.6 kbit/s are for temporary use during adverse radio conditions or periods of cell congestion). In subjective tests the HD voice wideband codec produces better results than the best narrow-band codec.

83 mobile networks launched HD voice service
84% growth year-on-year
Now available in 61 countries
26 countries more than one year ago
245 HD voice mobile phones announced

HD voice service is launched on 83 mobile networks in 61 countries:

Armenia, Australia, Austria, Belgium, Bulgaria, Canada, Croatia, Czech Rep., Denmark, Dominican Rep., Egypt, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Israel, Italy, Ivory Coast, Jordan, Kazakhstan, Kenya, Latvia, Lithuania, Luxembourg, Malawi, Malaysia, Mauritius, Moldova, Montenegro, Netherlands, Nigeria, Norway, Philippines, Poland, Portugal, Qatar, Réunion, Romania, Russia, Rwanda, Saudi Arabia, Serbia, Singapore, Slovakia, Slovenia, South Korea, Spain, Switzerland, Taiwan, Thailand, Turkey, UAE, Uganda, UK, Ukraine, and USA.

The maximum benefits from using HD voice on a compatible mobile network are realized when both calling and called party use HD voice-capable phones. Improvements in call quality are also observed even when using an HD voice-enabled phone to call a non-HD voice phone, due to improvements in the acoustic performance and advanced noise reduction capabilities of most HD voice phones. There is a strong business case for Mobile HD voice:

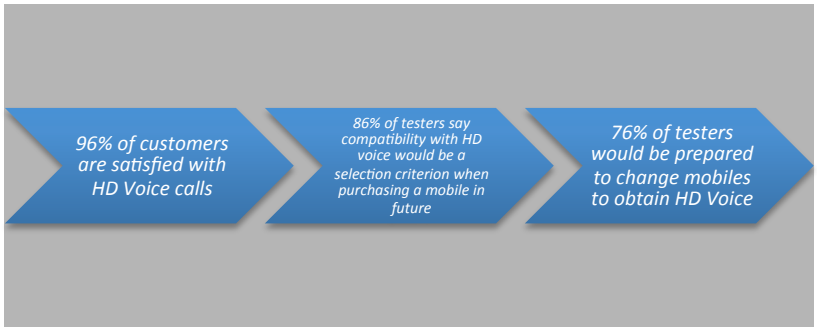
Orange

- In October 2012 Orange confirmed almost 4 million subscribers have switched to HD voice on its networks compared to 1 million a year ago

Telstra

- Telstra advised GSA (January 2012) that 5% of all calls on its network are HD voice and 10 times YoY growth. Given that users need to be calling another HD device it shows that penetration is building and getting towards a critical mass

10.000 Vip (Serbia) customers make HD voice calls daily. Orange Romania reported 10x the number of HD voice calls initiated in Q3 2012 compared to Q3 2011, and 85% of users observed notable differences between an HD and standard call. Orange France stated:



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Network	Country	Launched
Orange Moldova	Moldova	09.09.2009
Orange France	France	19.07.2010
Orange Armenia	Armenia	24.02.2010
Orange UK	UK	01.09.2010
SFR	France	09.2010
Orange Spain	Spain	10.09.2010
Mobistar	Belgium	16.09.2010
VIPNet	Croatia	22.09.2010
Tata DoCoMo	India	03.11.2010
Mobinil	Egypt	09.11.2010
Megafon *GSM from 27.04.11*	Russia	10.11.2010
Orange	Luxembourg	08.12.2010
CSL Limited	Hong Kong	12.2010
Turkcell	Turkey	17.01.2011
WIND Mobile	Canada	18.07.2011
TIM	Italy	27.01.2011
Vodafone Turkey	Turkey	01.04.2011
Orange Mauritius	Mauritius	07.04.2011
Orange Réunion	Réunion	2011
Orange Romania	Romania	13.05.2011
3 UK	UK	05.2011
Orange Dominicana	Dominican Rep	06.2011
Du	UAE	06.2011
M-Tel	Bulgaria	14.06.2011
Telstra	Australia	24.06.2011
Orange Uganda	Uganda	07.07.2011
T-Mobile *GSM & HSPA*	Poland	17.08.2011
Orange Kenya	Kenya	25.08.2011
T-Mobile	Austria	29.08.2011
Mobitel	Slovenia	06.09.2011
VIP *GSM & HSPA*	Serbia	12.09.2011
Orange	Switzerland	13.09.2011
T-Mobile *(planned on GSM)*	Croatia	14.09.2011
TDC	Denmark	26.09.2011
A1 Telekom	Austria	10.2011
T-Mobile	Czech Rep	26.10.11
DT	Germany	02.11.2011
3 Austria	Austria	16.11.2011
Si.mobil	Slovenia	15.12.2011
Bell Mobility	Canada	24.01.2012
Swisscom	Switzerland	01.02.2012
KPN	Netherlands	05.03.2012
Celcom Axiata	Malaysia	07.04.2012
Vodafone Ireland	Ireland	18.04.2012
Kcell	Kazakhstan	2012
Play (P4)	Poland	10.07.2012
T Mobile	UK	08.2012
SK Telecom VoLTE	South Korea	08.08.2012
LG Uplus VoLTE	South Korea	08.08.2012
Orange	Jordan	11.08.12
MTS	Russia	12.09.12
Telus	Canada	21.09.12
TMN	Portugal	28.09.12
Rogers Wireless	Canada	10.12
Smart	Philippines	22.10.12
Bouygues Telecom	France	11.12
DTAC	Thailand	11.12
Q-Tel	Qatar	27.11.12
3 Denmark	Denmark	20.12.12
Airtel	Nigeria	22.12.12
Orange/Partner	Israel	25.12.12
T-Mobile	USA	08.01.13
Axis	Indonesia	22.01.13
DNA	Finland	28.01.13
CHT	Taiwan	05.02.13
Orange CI	Ivory Coast	28.02.13
Airtel	Kenya	05.03.13
Airtel	Malawi	05.03.13
Airtel	Rwanda	05.03.13
StarHub	Singapore	07.03.13
Telenor	Norway	19.03.13
Mobily	Saudi Arabia	Mar-13
STC	Saudi Arabia	Mar-13
Netcom	Norway	Apr-13
Orange	Slovakia	16.05.13
Cosmote	Greece	11.06.13
Crnogorski Telekom GSM and HSPA	Montenegro	24.06.13
Vodafone	Australia	25.06.13
Magyar Telekom	Hungary	01.07.13
Vodafone	Germany	26.07.13
Bitė Lithuania	Lithuania	31.07.13
Bitė Latvia	Latvia	05.08.13
Kyivstar GSM	Ukraine	08.08.13

Table 1: 83 mobile HD voice (W-AMR) service launches
HSPA networks except where stated

Network aspects

The voice payload for transport in the core network is usually PCM-coded at 64 kbit/s (ITU-T Rec. G.711). Narrowband AMR is transcoded to/from PCM but degrades voice quality, adding signal processing complexity. Analog PCM-based transport cannot be used with W-AMR as G.711 only applies to narrowband voice. W-AMR must be based on one of two complementary 3GPP standards: tandem-free operation (TFO) or transcoder-free operation (TrFO). Introduction of W-AMR into GSM systems requires TFO, which is part of 3GPP GERAN, which does not require substantial modification of the core network. W-AMR and TFO can also be introduced into UMTS. A better option however, is to use the recommended TrFO. The combination of TFO and TrFO enables W-AMR calls between all types of 3GPP mobile devices (i.e. GSM/EDGE and UMTS/WCDMA-HSPA).

Voice for LTE users

LTE systems are all-IP, optimized for data transfer and do not have circuit switched capability as used on previous technologies for voice and SMS. Since voice and SMS generate the majority of operator revenues globally, voice service is needed for LTE users. With VoLTE (**V**oice **o**ver **LTE**: GSMA spec. VoLTE IR.92), subscribers can use HD voice and other new richer communication services with LTE smartphones. The operator needs an IMS core network. The LTE radio access network and Evolved Packet Core must also support VoLTE, typically enabled by software upgrade.

VoLTE technology is maturing and user devices are available. SK Telecom confirmed 4.5 million VoLTE subscribers by end May 2013.

Operator	Country	HD voice (W-AMR) deployment status
Telenor	Norway	Deploying in HSPA network
Vodafone	Portugal	Deploying in HSPA network
DTAC	Thailand	Deploying in HSPA network
T Mobile	Austria	Trialling VoLTE in LTE network
Sasktel	Canada	Deploying VoLTE in LTE network
China Mobile	China	Trialling VoLTE for launch Q4 2014
DT	Germany	VoLTE deployment is planned
E Plus	Germany	VoLTE deployment is planned
Telefonica O2	Germany	VoLTE deployment is planned
CSL	Hong Kong	Trialling VoLTE
Bharti Airtel	India	Trialling VoLTE
Reliance Jio Infocomm	India	Trialling VoLTE
NTT DoCoMo	Japan	VoLTE deployment is planned
Alfa	Lebanon	VoLTE deployment is planned
Vodafone	Netherlands	Studying introduction of VoLTE
Mobily	Saudi Arabia	Deploying VoLTE in LTE network
StarHub	Singapore	VoLTE deployment is planned
Telekom Slovenije	Slovenia	Deploying VoLTE in LTE network
KT	South Korea	Deploying VoLTE in LTE network
Telefonica	Spain	Trialling VoLTE
Tele2	Sweden	Deploying VoLTE in LTE network
TeliaSonera	Sweden	Deploying VoLTE in LTE network
Etisalat	UAE	Deploying VoLTE in LTE network
EE	UK	Deploying VoLTE in LTE network
AT&T	USA	Deploying VoLTE (test markets end 2013)
C-Spire	USA	Deploying VoLTE in LTE network
Clearwire	USA	Deploying VoLTE in LTE network
MetroPCS	USA	Deploying VoLTE in LTE network
Sprint	USA	Deploying VoLTE in LTE network
US Cellular	USA	Trialling VoLTE in LTE network
Verizon	USA	Deploying VoLTE (target launch 1H 2014)

Table 2: W-AMR enabled HD voice deployments and trials on 3G and 4G/LTE networks

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HD voice devices ecosystem

GSA tracks vendor announcements about mobile devices that support HD voice service enabled using W-AMR. Several HD-voice phones are available from leading manufacturers, including products for professional broadcasters.

GSA's research (published on August 9, 2013) identified a total of 245 HD voice phones produced by 17 manufacturers, including vendor announcements. The list of all these HD voice phones is included in a free GSA report which can be downloaded by registered site users from www.gsacom.com, following the link: "*GSA survey: 245 HD voice (W-AMR) mobile phones and their suppliers listed - includes VoLTE products*"

The vast majority of HD voice devices operate on 3G/HSPA networks, with some working on GSM networks and a small number on LTE networks. VoLTE-capable HD voice devices are included in the survey and report. Check www.gsacom.com for our latest updates.

Many new models are delivered with HD Voice activated as default. Apple iPhone 5 supports HD voice. All Xperia™ phones are shipping with HD voice turned on for use in HSPA networks. Nokia's Symbian Belle release brought HD voice for GSM operators, enabled by Nokia 600, 700, 701 phones, with HD voice shipping as the default for WCDMA and GSM modes. Symbian Belle is also available as a software update for current models e.g. Nokia N8, E6, E7, C6-01, C7 and X7, giving owners an upgrade path. Lumia phones have W-AMR support for GSM and WCDMA. Nokia also has more affordable products e.g. X3, C3. Mobile operators often list HD voice compatible phones. Some are carrier specific and not compatible for other networks or available in all markets.

This information is for interest/guidance only for readers. Availability of the W-AMR feature for a specific market must always be checked directly with the phone manufacturer concerned.

To continue the market development, GSA advocates that all smartphones need to ship with W-AMR activated by default.

The **HD voice logo** is designed for operators and vendors to market and promote interoperable HD voice capabilities on their networks and end user products. Details about the logo, how to become a licensee, contacts etc., are available on the GSMA (GSM Association) website www.gsma.com/technicalprojects/hd-voice/

Hear HD Voice!

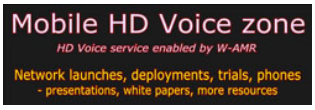
Martin Stanford (Sky News presenter)
www.youtube.com/watch?v=bwVPkt6vwEw&feature=player_embedded

Interoperability between fixed and mobile networks for handling HD voice calls is a priority. A white paper "BT Global IP Exchange" (available in the Mobile HD voice Zone at www.gsacom.com) explains how mobile operators can benefit from the opportunity to deliver and charge for cross-network national and international and roaming HD calls. Since October 2012, Orange customers in Romania and Moldova can make HD voice calls between these countries. Orange supports international HD voice calls between two operators on fixed and/or any mobile network and launched an international HD voice call exchange, which is available to 3rd party operators and service providers. Other IPX providers include iBasis, TI Sparkle, and Tata Communications. According to Information Observatory research commissioned by BT, global retail revenue from cross-network HD voice services could reach GB £1.5 billion by 2015.

GSA on LinkedIN: www.linkedin.com/groups?gid=2313721

HD Voice (W-AMR) discussion group: www.linkedin.com/groups?=&gid=3032759

HD Voice Zone on the GSA website: www.gsacom.com/hdvoice



Maps and charts relating to mobile HD voice are available as PDF files via the links on www.gsacom.com and also as JPEG files at www.gsacom.com/news/statistics.php4

White papers, market updates, graphics www.gsacom.com

White Paper: *Voice Handover in LTE Networks* - shows that the SRVCC technology performance is now mature for commercial launch. It also means good voice quality in LTE network handover scenarios, non-noticeable interrupt time when doing a handover, as well as seamless HD voice between LTE and WCDMA.
www.ericsson.com/news/121026-voice-handover-in-lte-networks_244159017_c

GSA (the Global mobile Suppliers Association) represents GSM/EDGE, WCDMA-HSPA/HSPA+ and LTE suppliers, providing reports, facts, analysis and information explaining market developments and trends. Information for this report was obtained wholly by GSA (Global mobile Suppliers Association – www.gsacom.com), referencing information exchanges with key contacts in mobile network operators, in GSA member organizations, with other industry specialists, and public announcements. More than 250,000 files (GSA reports, presentations, information papers, members documents, etc.) were downloaded from the GSA website www.gsacom.com in the past 12 months.

Errors and Omissions Excepted. *Updates are welcome to info@gsacom.com*

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