

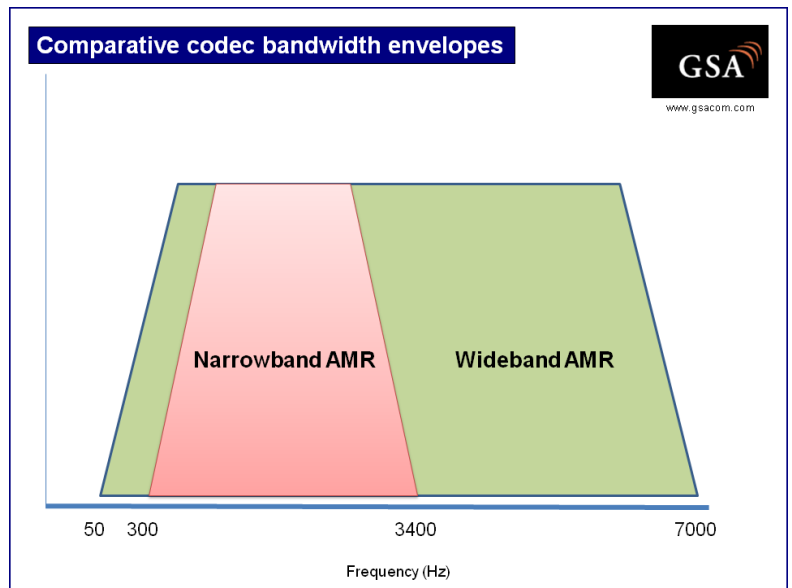
### Mobile HD Voice service using AMR Wideband

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 can be implemented in GSM, WCDMA (UMTS) and LTE networks. 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 clearly differentiate their offerings and enable high quality services to voice dependent business like call center services, information services, emergency services, etc. HD Voice is also ideal for conference calls and can contribute to a reduction in business travel and raise productivity while reducing the environmental impact. Calls which are easier to hear and understand reduce fatigue typically associated with long conference calls. HD Voice changes that and represents the greatest advance in voice on mobile networks in decades.

W-AMR speech technology is standardized in 3GPP Release 5. The new 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.

There is a strong business case for Mobile HD Voice and the momentum for introducing HD Voice is growing. Customers make more or longer calls with HD Voice. Surveys confirm that customers place a high value on HD Voice.



Comparative codec bandwidth envelopes

The maximum benefits from using HD Voice on a compatible mobile network are realized or perceived when both calling and called party use HD Voice-capable phones. Improvements in call quality are also observed even when calling a non-HD Voice phone, due to improvements in the acoustic performance and advanced noise reduction capabilities present in most HD Voice phones.

### Commercial HD Voice services launched on 41 mobile networks

The pace of commercialization of mobile HD Voice services is accelerating.

Leading system vendors are supporting HD Voice in their mobile infrastructure solutions.

From first service launch in 2009, HD Voice service is launched on 41 mobile networks in 33 countries:

- Armenia, Australia, Austria, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Dominican Republic, Egypt, France, Germany, Hong Kong, India, Ireland, Italy, Kenya, Luxembourg, Mauritius, Moldova, The Netherlands, Poland, Réunion, Romania, Russia, Serbia, Slovenia, Spain, Switzerland, Turkey, Uganda, UK.

### Excellent mobile HD-Voice devices ecosystem established

Dozens of HD-Voice enabled mobile phones have been launched in the market by several leading manufacturers, including products for professional broadcasters. Many phones are now delivered with HD Voice activated as default. More details are provided later in this report.

While initial W-AMR enabled phones were designed to support HD Voice services on WCDMA-HSPA networks, phones are now available which support HD Voice on GSM networks.

Operator	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 (Catalonia)	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 (HSPA. 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
M-Tel (MobilTel)	Bulgaria	14.06.2011
Telstra	Australia	24.06.2011
Orange Uganda	Uganda	07.07.2011
T-Mobile/PTC (GSM & HSPA networks)	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	Switzerland	13.09.2011
T-Mobile (HSPA) - planned on GSM	Croatia	14.09.2011
TDC	Denmark	26.09.2011
A1 Telekom	Austria	10.2011
T-Hravtski/T-Mobile	Czech Republic	26.10.11
Deutsche Telekom	Germany	02.11.2011
Si.mobil	Slovenia	15.12.2011
Bell Mobility	Canada	24.01.2012
Swisscom	Switzerland	01.02.2012
KPN	Netherlands	05.03.2012
Vodafone Ireland	Ireland	18.04.2012

Table 1: 41 mobile HD Voice commercial launches (copyright GSA – May 21, 2012)

According to the results of an operator survey:

- 96% of customers are satisfied with HD Voice calls
- 86% of testers say that compatibility with HD voice would be a selection criterion when purchasing a mobile in the future
- 76% of testers would be prepared to change mobiles to obtain HD Voice

\*[www.francetelecom.com/en\\_EN/press/press\\_releases/cp101123en2.jsp](http://www.francetelecom.com/en_EN/press/press_releases/cp101123en2.jsp)

Verizon Wireless demonstrated Voice over LTE (VoLTE) and HD Voice capable user devices at Mobile World Congress 2011 and is one of several operators who are planning to deploy a commercial VoLTE service.

TMN, Portugal	Trialling HD Voice in 3G network
Du, UAE	Trialled HD Voice in 3G network
AT&T, USA	VoLTE planned in LTE network
Sasktel, Canada	VoLTE planned in LTE network
Sprint, USA	Deploying VoLTE in LTE network
Verizon Wireless, USA	Deploying VoLTE in LTE network
LG U Plus, South Korea	Deploying VoLTE in LTE network
KT, South Korea	Deploying VoLTE in LTE network
StarHub, Singapore	VoLTE trial planned by end 2012

Table 2: HD Voice trials or network deployments (copyright GSA – May 21, 2012)

### Network aspects

Ordinarily the voice payload for transport in the core network is PCM-coded at 64 kbit/s according to ITU-T Rec. G.711. Narrowband AMR is transcoded to/from PCM which 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).

### HD Voice ecosystem: wide choice of compatible phones

Dozens of HD-Voice enabled mobile phones have been launched by many leading manufacturers including products for professional broadcasters. An increasing number of phones are now delivered with HD Voice activated as default. Demand has increased and generally operators typically want to maximize HD voice handset availability in all channels. All Xperia phones are shipping with HD Voice turned on for 3G/WCDMA-HSPA operation. Nokia's Symbian Belle release brings HD Voice for GSM operators, enabled by Nokia 600, 700, and 701 phones, with HD Voice (W-AMR) turned on as default for WCDMA and GSM modes. Symbian Belle will also be available as a software update for current models in the market - Nokia N8, E6, E7, C6-01, C7 and X7, giving owners the option to upgrade shortly. Nokia Lumia products have HD support for both GSM and WCDMA. Nokia also has more affordable HD Voice products e.g. Nokia X3 and C3. Operators with commercially launched mobile HD Voice services often list compatible phones for their respective networks. Some recent examples are given below referencing details provided by operators on their websites. Note: certain products may be carrier specific and may not be compatible for all networks or all markets. This information is therefore provided for interest and guidance only:

**Si.mobil:** Nokia N8, C7, C6-01, E7, E6, Nokia 700, Sony Ericsson Xperia Arc, Sony Ericsson Ray, HTC Sensation XL, HTC Rhyme, Samsung Galaxy S II

**Bell Mobility:** HTC Incredible, HTC Sensation, Nokia C6-00, Nokia C6-01

**Vodafone Ireland:** Nokia: N8, C7, E7, C3-01, X3-02, E6, 700, Lumia  
Sony Ericsson: Xperia Arc (LT15j), Xperia Neo (MT15i), Xperia Arc S (LT18i), Xperia Mini Pro (SK17i), Xperia Ray (ST18i), Xperia Play (R800i)

**Swisscom:** HTC Sensation XL, Nokia Lumia 800, Sony Ericsson Arc S

**KPN Netherlands:** Nokia Lumia 800, Samsung Galaxy S II, Samsung Galaxy S Plus, Samsung Galaxy Note, Nokia 300, Nokia 700, Sony Ericsson Xperia arc S

### HD Voice phones: GSA's database

GSA tracks vendor announcements about launched HSPA and HSPA+ user devices including phones. We developed a unique database and analysis tool called GAMBoD. One tool focuses on HSPA devices (GAMBoD-HSPA) and another on LTE devices (GAMBoD-LTE). HSPA devices supporting HD Voice (i.e. with W-AMR) are identified in the GAMBoD-HSPA tool. The GSA database, which is subject to updates, referenced 73 HD Voice mobile phones in early April 2012. Note that certain products may be carrier specific and may not be compatible for all networks or all markets. This information is provided for interest and guidance only.



Log in to GSA's GAMBoD-HSPA tool to review the list and features of HD Voice-enabled HSPA phones

[www.gsacom.com/gambod](http://www.gsacom.com/gambod)

Permission to use GAMBoD is granted to GSA registered website users from GSA member organizations who registered using their corporate email address, and users from network operators who registered using their corporate email address.

The database within GAMBoD is the copyright of GSA.



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/](http://www.gsma.com/technicalprojects/hd-voice/)

### Hear HD Voice for yourself!

Some links are provided to hear HD Voice

#### A1 Telekom Austria:

Standard mobile call:

[http://newsroom.a1telekom.at/celum/1720/download/A1\\_Alt\\_audio.wav](http://newsroom.a1telekom.at/celum/1720/download/A1_Alt_audio.wav)

HD Voice call:

[http://newsroom.a1telekom.at/celum/1721/download/A1\\_Neu\\_HD.wav](http://newsroom.a1telekom.at/celum/1721/download/A1_Neu_HD.wav)

**DT:** [www.telekom.com/dtag/cms/content/dt/de/1097160](http://www.telekom.com/dtag/cms/content/dt/de/1097160)

**SFR:** [www.sfr.fr/innovation/2010-08/voix-hd.jsp#=#=KIRo](http://www.sfr.fr/innovation/2010-08/voix-hd.jsp#=#=KIRo)

**Orange:** [www.orange.com/hdvoice](http://www.orange.com/hdvoice)

**Martin Stanford (Sky News presenter)**

[www.youtube.com/watch?v=bwVPk6vwEw&feature=player\\_embedded](http://www.youtube.com/watch?v=bwVPk6vwEw&feature=player_embedded)

Typically Mobile HD Voice services are only available to customers on the same national network, and where both the calling and

called party each has an HD-voice compatible mobile phone. Many operators are working towards agreements to enable mobile HD Voice calls to be handled across networks. Interoperability between fixed and mobile networks for handling HD voice calls is also a priority.

In order to offer "seamless" HD Voice for its customers, Orange has announced the major steps that the company is taking:

- In 2012/2013, HD Voice interoperability between Orange countries and also between the fixed and mobile networks in a given country
- In 2013, interoperability between the various operators, based on common standards, such as CAT-IQ 2.0 for fixed HD Voice or WB-AMR for mobile HD Voice
- Orange is looking into launching HD Voice on the 2G networks, which would make it possible to offer this service to even more customers

However all IP networks operated by third party interoperability providers can help to facilitate new market opportunities by providing the required inter-network connectivity and interoperability for HD Voice services, both at national and international level. BT is one such provider and BT's Global IP Exchange service provides the necessary seamless connection between service providers. A white paper "BT Global IP Exchange" (available to download in the Mobile HD Voice Zone on [www.gsacom.com](http://www.gsacom.com)) explains how mobile network operators can benefit from the opportunity to deliver and charge for cross-network national and international and roaming HD calls.



Join the discussion – become a member of the GSA LinkedIN group: [www.linkedin.com/groups?gid=2313721](http://www.linkedin.com/groups?gid=2313721)

**Here you will find GSA's HD Voice (W-AMR) subgroup**

[www.linkedin.com/groups?=&gid=3032759](http://www.linkedin.com/groups?=&gid=3032759)

### More HD Voice resources:

Maps and charts relating to mobile HD Voice are available as PDF files via the links on [www.gsacom.com](http://www.gsacom.com) and also as JPEG files at [www.gsacom.com/news/statistics.php4](http://www.gsacom.com/news/statistics.php4)



HD Voice resources in one place

[www.gsacom.com](http://www.gsacom.com)

- **Tutorial** on HD Voice AMR Wideband Technology [www.ericsson.com/article/hd-voice\\_1103876834\\_c](http://www.ericsson.com/article/hd-voice_1103876834_c)
- [www.nokiasiemensnetworks.com/portfolio/products/gsm/mobile-hd-voice-a-windfall-gain-in-user-experience](http://www.nokiasiemensnetworks.com/portfolio/products/gsm/mobile-hd-voice-a-windfall-gain-in-user-experience)

**About GSA:** 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. The GSA website has approaching 50,000 registered users.

Information for this report was obtained wholly by GSA (Global mobile Suppliers Association – [www.gsacom.com](http://www.gsacom.com)), referencing information exchanges with key contacts in mobile network operators, in GSA member organizations, with other industry specialists, and public announcements. Errors and omissions excepted.

Updates are welcome to [info@gsacom.com](mailto:info@gsacom.com)