



FEATURES

Everything You Need To Know About 4G Wireless Technology

By Jose Vilches April 29, 2010

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2.75G	EDGE	175Kbps	30Kbps	384Kbps	60Kbps	Today
	UMTS	226Kbps	30Kbps	384Kbps	64Kbps	Today
	W-CDMA	800Kbps	60Kbps	2Mbps	153Kbps	Today
3G	EV-DO Rev. A	1Mbps	500Kbps	3.1Mbps	1.8Mbps	Today
	HSPA 3.6	650Kbps	260Kbps	3.6Mbps	348Kbps	Today
	HSPA 7.2	1.4Mbps	700Kbps	7.2Mbps	2Mbps	Today
Pre-4G	WiMAX	3-6Mbps	1Mbps	100Mbps+	56Mbps	Today
	LTE	5-12Mbps	2-5Mbps	100Mbps+	50Mbps	End 2010
	HSPA+	-	-	56Mbps	22Mbps	2011
	HSPA 14	2Mbps	700Kbps	14Mbps	5.7Mbps	Today*
4G	WiMAX 2 (802.16m)	-	-	100Mbps mobile / 1Gbps fixed	60Mbps	2012
	LTE Advanced	-	-	100Mbps mobile /	-	2012+

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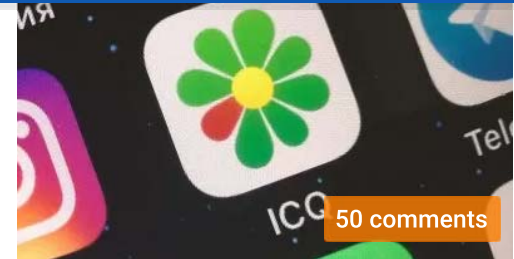
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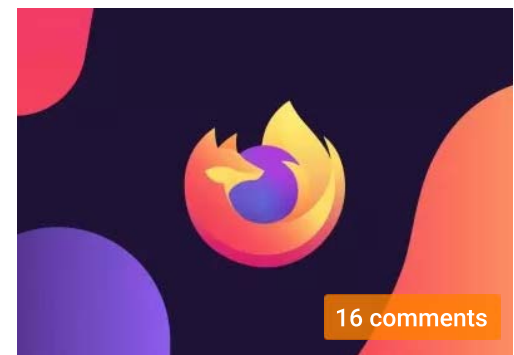
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While most of us are used to getting high speed Internet connections at home, the office or even the local coffee shop, once we are on the road those high speeds have to stay behind. With 4G the promise is that you can get real mobile broadband to go. In this piece we are going to tell you all about the technology and its benefits, who offers it or plans to, how much it costs, and the gear you need to enjoy the next generation of wireless broadband today.

But first, some background: 4G is the short name for fourth-generation wireless, the stage of mobile communications that will enable things like IP-based voice, data, gaming services and high quality streamed multimedia on portable devices with cable modem-like transmission speeds. It's a successor to 2G and 3G wireless, whereby the first signified the shift from analog to digital transmissions, bringing data services like SMS and email to mobile phones for the first time, and the second refers to the advent of things like global roaming as well as higher data rates.

Think of wireless generations as a handful of services that get faster and more feature-rich as newer technology becomes available. The 3G networks that we use today allow us to stream video, download music and files, and surf the web at average download speeds from 600Kb/s to 1.4Mb/s. With 4G you'll be able to do the same but at much faster rates, while the extra bandwidth opens the door for newer applications.

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There are a number of standards and technologies pertaining to each wireless generation – GSM, cdmaOne, GPRS, EDGE, CDMA2000, UMTS (also marketed as 3GSM), HSDPA, among others. For practical reasons, we won't be dwelling on the technicalities of each term and instead will move onto the ones that involve our topic of interest here: 4G.

Although no set of standards have been established as of yet by the International Telecommunication Union (ITU), the authority on such things, two competing technologies have been proposed: LTE and WiMAX. Many service providers often use the term 4G mobile broadband to describe the technologies they are offering based on their own, sometimes distorted definitions. However, current

Besides speed, several other guidelines have been traced for wireless communication standards to qualify as 4G. In a nutshell, they should be very spectrally efficient, should dynamically share and utilize the network resources to support more simultaneous users per cell, have smooth handovers across heterogeneous networks, offer high quality of service for next generation multimedia support, and should be based on an all-IP packet switched network.

LTE

Short for Long-Term Evolution, LTE is considered by many to be the natural successor to current-generation 3G technologies, in part because it updates UMTS networks to provide significantly faster data rates for both uploading and downloading. The specification calls for downlink peak rates of at least 100Mb/s and an uplink of 50Mb/s, but going by real world tests its transfer speeds will more likely range from 5-12Mb/s for downloads and 2-5Mb/s for uploads.

LTE is being developed by a group of telecommunications associations known as the 3rd Generation Partnership Project, or 3GPP, as an eight release of what has been evolving since 1992 from the GSM family of standards.



LteTM

There are two fundamental aspects of LTE. The first is that the technology finally leaves behind the circuit switched network of its GSM roots and moves to an all-IP flat networking architecture. This is a significant shift which in very simple terms means that LTE will treat everything it transmits, even voice, as data. The other big change relates to the use of MIMO technology, or multiple antennas at both the transmitter and receiver end to improve communication performance. This setup can either be used to increase the throughput data rates or to reduce interference.

Many big-name global operators and mobile communications companies are backing LTE in the race for 4G mobile broadband, including Vodafone, Orange, T-Mobile, LG Electronics, Ericsson, Nokia, Siemens, NTT DoMoCo, and others. In the U.S., Verizon Wireless has said it is going commercial with its LTE network in the fourth quarter, with [25 to 30 markets up and ready at launch](#). AT&T and T-Mobile claim they will begin to deploy LTE in 2011, but in the meantime both networks have moved to HSPA 7.2 and the latter plans to [roll out HSPA+](#) beginning this year. Theoretically these can support speeds of up to 7.2 and 21 Mbps, respectively, but in real world scenarios they are only marginally faster than most 3G data services.

The reason behind LTE's strong industry support lies in the relative ease of upgrading from current 3G networks worldwide over to LTE mobile broadband, compared to the significant infrastructure build out that WiMAX has taken thus far. Fewer cell sites have to be built and penetration into buildings is better at the 700 MHz spectrum LTE

WiMAX

WiMAX is a wireless broadband access standard developed and maintained by the IEEE under the 802.16 designation. As its name suggest, WiMAX can be thought of as an extension of Wi-Fi designed to enable pervasive, high-speed mobile Internet access on a wide range of devices, from laptops to smartphones. The current implementation is based on the 802.16e specification which offers theoretical downlink rates upwards of 70Mbps and up to 30-mile ranges.

Again, "theoretical" is the keyword here as WiMAX, like all wireless technologies, can either operate at higher bitrates or over longer distances but not both. Production networks being operated in the United States are seeing average speeds go from 3 to 6Mb/s, with bursts up to 10Mb/s. Like LTE – and Wi-Fi 802.11n for that matter – WiMAX supports MIMO technology, which means that additional antennas can increase the potential throughput.



There is no uniform global licensed spectrum for WiMAX, but three have been listed: 2.3 GHz, 2.5 GHz and 3.5 GHz. In the U.S., the biggest segment available is around 2.5 GHz and is already assigned primarily to Clearwire, a wireless internet service provider in which Sprint Nextel [holds a majority stake](#).

times more than its competitors, which have smaller portions of the 700 MHz band. However, Verizon and AT&T are not too worried about this as they can re-utilize spectrum being used right now for 2G and 3G services by upgrading these to LTE when the demand is there.

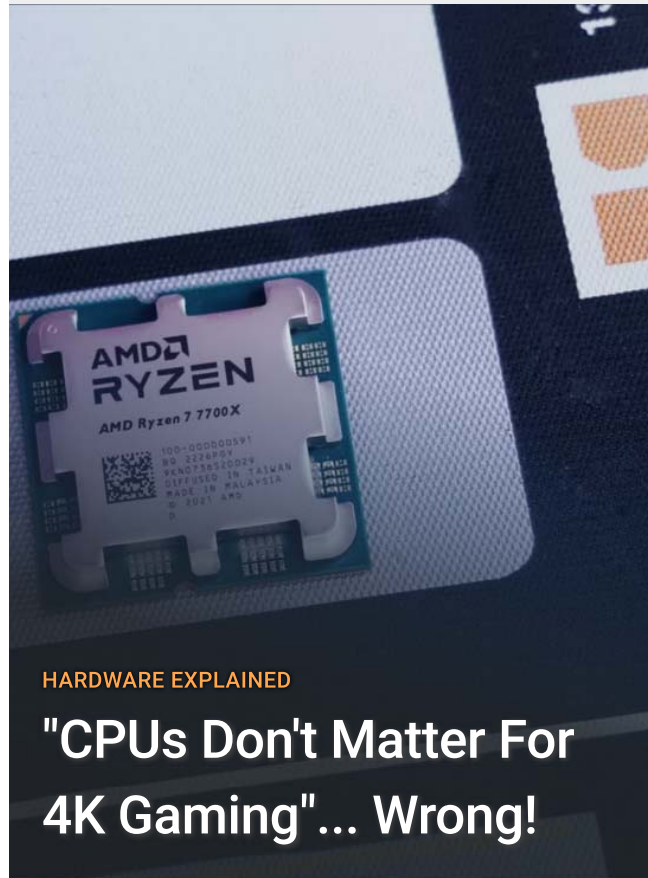
Furthermore, as mentioned earlier, the 700 MHz band that both Verizon and AT&T plan to use has enormously better range and penetration of buildings than the same power of signal at 2.5 GHz. Some experts have said that 700MHz will require as few as one-quarter as many base stations to offer identical coverage to 2.5 GHz.

As you might have guessed, the industry players behind these 4G technologies reflect the history of each standard. Whereas LTE biggest supporters are, in general, telecommunication service companies and handset manufacturers, WiMAX counts the likes of Intel, Cisco and Google among its most important backers. It should be noted though that many companies like Nokia or Motorola are members of both industry groups, with different levels of involvement.

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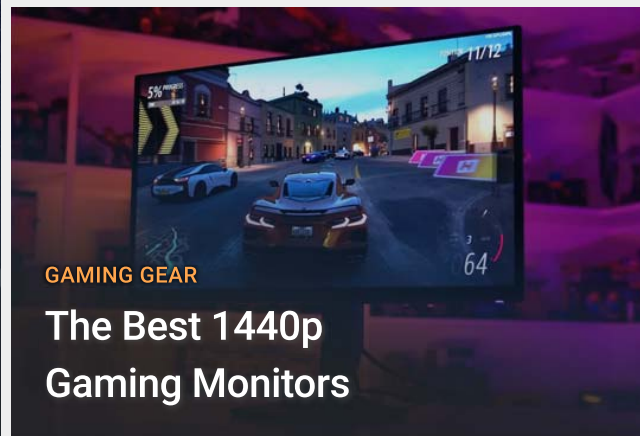
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DISCUSS

Great article, thanks for the education. :approve:

[REPLY](#)

Guest

Apr 29, 2010, 9:50 AM

Indeed, thank you for the great article.

Now I know a little more about 4G and ever 3G, also the 4G chart is really a plus.

Thank you

[REPLY](#)

TorturedChaos

Apr 29, 2010, 10:38 AM

WOW great article.

Although it is a little depressing to see phones in the works with as much processing power as my 5 yr old laptop 😊. In a few years I think I might have to get on the mobile bandwagon.

[REPLY](#)

TomSEA

Apr 29, 2010, 10:48 AM

Excellent article - I've passed it on to a slew of people.

[REPLY](#)

16

League of Legends receives controversial Vanguard anti-cheat, Windows 11 now requires TPM 2.0



12

This third-party app blocks integrated Windows 11 advertising



11

Microsoft's 'Zero Trust DNS' could finally rid Windows of widespread DNS vulnerabilities



11

For Microsoft, it's now security first and everything else second – just ask Satya

Interesting! So much marketing sales hype into 2G, 3G and soon to be 4G. None really no better than 802.11g or 802.11n when it reaches 4G. Should 5G or 6G really make the Cellular industry shine in broadband communication when it comes to streaming media data? Time will tell..

[REPLY](#)

DelJo63

Apr 29, 2010, 12:55 PM

Julio said

With 4G the promise is that you can get real mobile broadband to go.

I didn't see this in the article, but a BIG difference in 4G is the simultaneous read/write is where the improved bandwidth comes from --

3G is like **ethernet half-duplex** (write-then-read-then-write) whereas

4G is like **ethernet full-duplex** (read and write at the same time).

[REPLY](#)

Guest

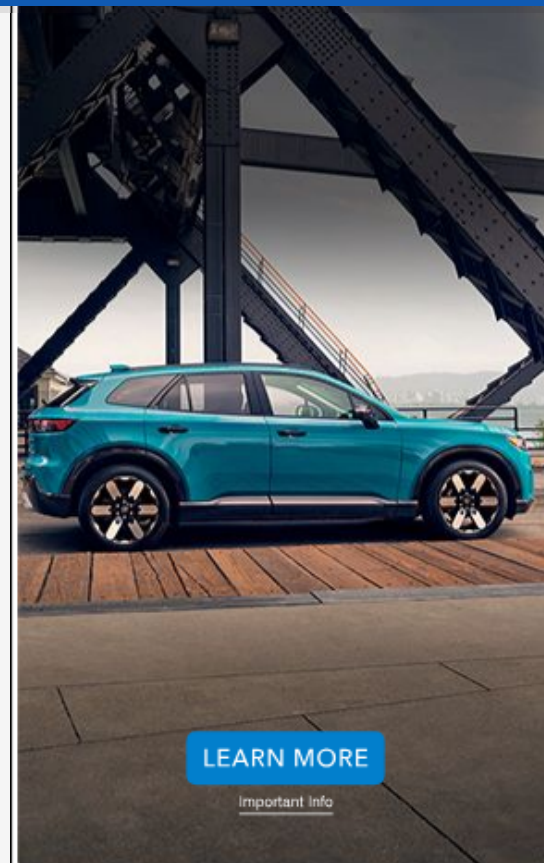
Apr 29, 2010, 7:20 PM

So what's the latency? Currently, the latency with 3G is horrible and is what gives me pause to consider ditching broadband cable.

[REPLY](#)

Guest

Apr 30, 2010, 8:40 PM



Honda

DeJJo63

Apr 30, 2010, 8:57 PM

IMO, that is not a 4G issue, but a service protocol from the provider.
For example, the new iPhone is getting multitasking (ie doing more than one task at the same time).

The reference to iPhone does not really imply hardware support;
it's just a delivery opportunity to sell more hardware by restricting a hi priority feature provided by the software. MS does this all the time too.

[REPLY](#)

Julio Franco

STAFF

May 1, 2010, 5:54 AM

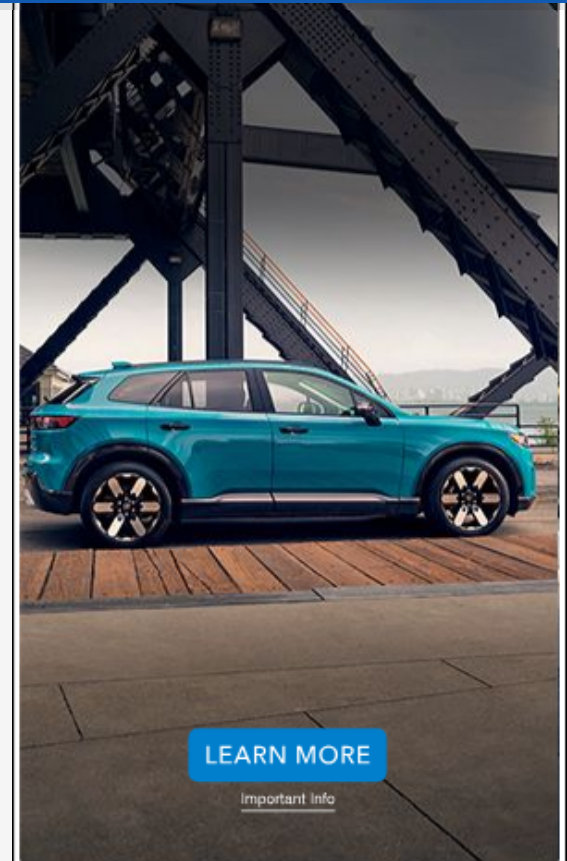
Per the article, because current generation (WiMAX) 4G devices will carry a separate 3G chip dedicated to voice, there shouldn't be a problem handling both data and voice at the same time as long as the hardware supports it, like jobeard just said.

[REPLY](#)

Guest

May 16, 2010, 9:58 PM

I have Clear Wimax currently and while the speeds are decent (3mbps avg down and 2mbps average up).... the latency is bad for voip or gaming... I get about 200-400ms on average.. until they fix the latency, it won't replace cable/fiber.

[REPLY](#)

Honda

Guest said

I have Clear Wimax currently and while the speeds are decent (3mbps avg down and 2mbps average up).... the latency is bad for voip or gaming... I get about 200-400ms on average.. until they fix the latency, it won't replace cable/fiber.

hmm; Gaming via a cell phone connection? I wouldn't expect that to be a viable choice, as some DSL and Cable users suffer from the latency issue and cell phone links are far less robust.

REPLY

ExamsExpert

May 18, 2010, 4:54 AM

Thanks for hard work to write and share this article. appreciated [[image link](#)]

REPLY

ultragrey

May 21, 2010, 8:41 PM

I just wonder what all these new technologies are meant for? They have all the glory and glittering but at the end of the day it's all about profit question. Have we entered an eternal race to buy the best and the latest? Pardon me if the post seem disappointing but what's the choice?

REPLY

Guest

Nov 8, 2011, 9:34 PM

Isn't that a issue to worry by wired internet service providers?

Second issue is ,if i could get the speed of 1gb/sec then why would i require any kind of wired internet? i will always use the wireless. this will overload the wireless network and i will have to compromise with the speed.

Can the author answer my concern!

[REPLY](#)

Matthew DeCarlo

STAFF

Nov 8, 2011, 10:35 PM

Worry about what? I'm hardly an expert on the subject (and I'm not the author) but a few things come to mind:

Wireless providers can barely match the low-end cable speeds I got in 2004.

Legitimate 4G speeds are a ways off.

Wireless networks are pricier to maintain (or so I assume), so wired connections will offer subscribers better value.

Wired connections are inherently more secure because they aren't broadcasting data over the air -- highly appealing.

Wired providers already have the monopolistic advantage. Just look at ClearWire struggling to make headway.

Not only do they have the monopolistic advantage of Internet subscriptions, but that service is bundled with others.

Wired providers are profitable and can diversify when/if necessary (through partnerships, acquisitions or plain old R&D).

...They kind of already are. For instance, Comcast, Time Warner and Bright House Networks are ClearWire investors.

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