

"G" Whiz

THE FACTS ABOUT 3G, 4G & LTE WIRELESS SERVICE

These days, it is almost impossible to avoid the tidal wave of advertisements from the major wireless carriers vying for your business. Verizon Wireless, AT&T, Sprint and T-Mobile are all in a desperate competition for market share, and the key battleground is connection speed – or bandwidth. This is obvious if you pay any attention to the ads. Just about all the providers claim to have the superior network in terms of speed and coverage. But how can that be? The short answer is that it depends on how you present the facts. A more accurate and meaningful response requires an explanation of the details, which we will do our best to sort out in this article.

THE CONTROVERSY

On the surface it seems rather clear. To determine which carrier is fastest, all you have to do is measure its download and upload speeds. Unfortunately, it isn't that simple. There are many factors and variables that must be considered when performing an evaluation. One of the most important, confusing and sometimes misrepresented is the description of wireless service as 3G, 4G and LTE.

While most people are aware of the terms, few have any idea what 3G, 4G and LTE actually mean. To complicate matters further, there are no

industry or governmental requirements regulating how the terms can be used in advertising. That leaves it up to the carriers to apply the labels as they see fit. That is what creates the confusion and controversy. Some of carriers define some of the terms differently, which makes it very difficult for customers to compare "apples to apples."

The biggest confusion, and perhaps even deception, comes from the way AT&T uses the term 4G. There are two particular concerns:

1. AT&T sets a much lower standard than Verizon Wireless for the speed of the devices and service it labels as 4G. The vast majority of AT&T's 4G service is far slower than Verizon's 4G service – as little as one quarter the speed or less. The reason is that most of AT&T's 4G technology is different from, and inferior to, Verizon Wireless's. This comparison is permissible because there are no regulations or governing standards.
2. AT&T's advertisements can be very confusing related to the size of its network. While AT&T's claim of having the largest 4G network is true, the carrier appears to be comparing its older, much slower 4G technology to Verizon Wireless's newer, much faster LTE technology. Verizon Wireless's LTE network is much larger than AT&T's LTE network. Again, there are no standards or regulations requiring the carriers to make this comparison clear and fair to the consumers.



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It is important to make clear that AT&T's claims are technically true, but do a disservice to customers by sometimes being very misleading. In some cases, other carriers also present messages and claims that can leave customers with inaccurate impressions. We will explain the differences between 3G, 4G and LTE in more detail below.

THE HISTORY OF WIRELESS TECHNOLOGY

To make clear sense of today's wireless landscape and the relative speeds of the different carriers it is important to understand the history and evolution of the industry's technology. It all started with the

| Generation | Dates | Speed |
|------------|-----------|--|
| 1G | Pre-1990 | No data capabilities – voice only |
| 2G | 1990s | Data introduced – too slow to be practical |
| 2.5G | 2001-2003 | Speed well below 100 kbps download |
| 3G | 2003-2010 | 1-2 mbps typical download |
| 4G | 2010 | 2-10 mbps typical download |
| 4G LTE | 2010 | 10-20 mbps typical download |

In each generation, the speeds can widely vary by carrier and test. In fact, it is possible to do several speed tests over a few hours or days in the same location using the same device and get significantly different speed each time. Also, the speeds listed above are for downloading data. Uploading is typically much slower – 50% to 90% slower.

G FORCES

As discussed above, the definition of different Gs (generations) has been left up to the carriers. As a general rule, a new G has been assigned when there

development of the Motorola "Brick Phone" in 1973 and the first commercial cell phone service initiated by Ameritech in 1983. Since then, the advancements have been dramatic.

The "G" in the different technologies stands for generation – generation of the technology. The distinctions between the generations (Gs) are relatively arbitrary because it is not regulated or defined by an industry organization. Essentially, a new G is simply an advance in technology as determined by each carrier. Since the 1980s, we have moved through several generations, roughly defined as follows:

has been a significant enhancement of technology, resulting in higher speeds and capabilities.

It is important to know that the transitions through 2G and 3G brought significant improvements in the current technologies. While that created much faster networks and better service, it was not a fundamental change in wireless technology. Carriers were able to use much of their current network infrastructure, with enhancements and alterations. But things changed when 4G approached.



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The market is actually responsible for where we are today. With the higher speeds of 3G and its myriad of new services, customers realized that cell phones could practically transfer large amounts of data, stream video and handle many functions that previously required a laptop computer. Individuals and businesses saw the potential, causing demand for data functionality to explode. So did competition for market share. As a result, carriers worked feverishly to gain a competitive advantage. All the major carriers had access to similar devices from the manufacturers and each could offer comparable functionality, so the clear battleground became their network footprints and connection speeds.

During the 3G years, users got a taste of data functionality on their phones and they wanted more – much more. 3G was a huge improvement over previous networks, but it still left much to be desired when compared to office computers and their much faster connection speeds. Soon, market expectations and demand for the next generation of wireless speed (4G) was intense. The carriers were in an all-out race to develop and deploy the next generation of their networks. But one carrier, Verizon Wireless, decided to take bold risk and go a different direction.

4G vs LTE

AT&T and other carriers took the same approach they had for years in developing their 4G network. They took their existing technology (3G) and enhanced it, significantly increasing its speed,

typically to 1-2 mbps download. Verizon Wireless, however, looked far into the future and realized that the current technology could only go so far, and the accelerating demand for mobile data capabilities would require a new network. Simply beefing up the current network would not be good enough. Their solution was to develop an LTE network. LTE stands for Long Term Evolution, and has quickly become the new standard for wireless technology in Europe, Asia and soon around the world. It typically delivers download speeds of 10-20 mbps.

THE CONTROVERSY REVISITED

The controversy and confusion comes from the fact that Verizon Wireless's new LTE technology and AT&T's enhanced 3G technology are both referred to as 4G. Once again, no standards are in place to prevent such confusion. This has created a situation where advertisements can claim that AT&T has a larger 4G network than Verizon Wireless, without informing customers that the two networks are vastly different. Verizon Wireless's 4G LTE is up to 10 times faster. To further complicate matters, AT&T realized the limitation of its 4G network and has also started developing an LTE network of comparable speed. At this point, AT&T's LTE network is much smaller than Verizon Wireless's – approximately one tenth the size at time of publication of this article.

Another issue is latency, which is the delay that occurs when wireless signals are being transmitted



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to and from a phone through the tower and network. LTE latency is approximately one quarter the latency of 3G service and significantly less than 4G networks that do not utilize LTE. This is especially important for video conferencing, streaming video and other real-time data applications that require latency of less than 50 ms to function effectively. If a distinction is not drawn between 4G LTE and 4G that is simply enhanced 3G, customers can end up with a disappointing user experience.

The bottom line is that few customers are aware of these differences, and without regulations or industry standards, they are vulnerable to highly misleading, yet technically accurate claims.

THE FUTURE

On a very positive note, there are exciting things in store for wireless communications. Advancements in technology are in the works that will make today's LTE speed look slow. It is projected that the new 4G LTE Advanced technology will be able to deliver typical download speeds of 30-100 mbps on smartphones, tablets and other enabled wireless devices. That is favorably comparable to many cable modems in offices and homes, and ten to twenty times faster than DSL. Expectations of upload speeds up to 60 mbps or more are very probable.

The impact of these speeds on businesses is already being felt. Many applications that were previously possible only with a landline connection are now

going mobile. When deployed around 2016 (projected), there will be virtually no barriers to doing almost any kind of business function anywhere there is an LTE Advanced signal. It will even be possible to avoid the high cost of landline data connections for backup, though measured rate (usage-based) billing will probably make it impractical to use wireless for enterprises' primary Internet connections.

SHOULD YOU CHOOSE CARRIERS BASED ON SPEED?

Having explained the issues and controversy related to Gs and connection speeds, we should briefly discuss how you should choose a carrier. The extent to which speed is the determining factor depends on your needs – though just about everyone can benefit from a faster network. If you do much video conferencing and streaming or large data downloads, speed is right near the top of the list. Other suggestions are:

- First and foremost, determine what you need. This ranges from speeds and coverage areas to devices, capabilities and security. If you are not fully versed in these topics, get the assistance of an independent expert who knows the market, carriers and pitfalls.
- Get the coverage you need. You must select a carrier with high enough speed and service in the areas where you do business.



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- Make sure you are comparing apples to apples. Get a clear, definitive description of exactly what you are getting, especially related to 4G and LTE.
- Get your information from a reputable, verifiable source. Be very wary of advertising claims that you have not substantiated and clarified.
- Ask for the typical upload and download speeds of the network in the areas where you will be doing business. AT&T's 4G network is only LTE in selected areas, and the difference is very great. Verizon Wireless is the only carrier whose 4G network is entirely LTE. Others have large parts of their 4G networks that are not LTE.
- Inquire about latency of the network and devices you need. If the latency is above 50 ms, you may be disappointed with its data and video streaming performance.
- Of course compare cost, but in today's market, there should not be large differences.

Summary

The current controversy and confusion about 3G, 4G and LTE is a frustration that can leave customers unhappy with their wireless service. Hopefully, evolving technology will eliminate this situation in the next few years, but for now, it is buyer beware. It is disappointing that the FCC and/or industry groups have not stepped in to rectify the problem. As all the major carriers deploy LTE and newer network technologies, customers will once again be able to make fair, valid comparison of the service the carriers offer. Until then, be diligent in your research or get an expert to help you make the best decisions for your company.

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