

## 5G: Promises, Drawbacks, and Business Applications

5G is the next evolution of wireless digital networks. Part of the so-called [Fourth Industrial Revolution](#) — the current period of rapid technological change — 5G will ultimately replace 4G LTE as the fastest and most reliable method of mobile communication and data streaming.

It is easy to think of 5G as simply an incremental improvement. However, the differences between 4G and 5G are more than just a number. 5G offers enhanced speed and latency, but it also brings new data security risks and infrastructure requirements. Businesses must be prepared for these challenges and opportunities presented by the transition from 4G to 5G networks.

### Five Generations of Wireless Networking Technology

Before exploring the promises and drawbacks of 5G networks, it is helpful to explore how exactly the fifth generation of wireless networking technology differs from its predecessors. The nomenclature is straightforward; first generation tech is 1G, second generation tech is 2G, and so forth.

**1G** launched the first mobile network and supported voice calling.

**2G** expanded 1G networks by allowing users to send data via mobile phones. Telecommunications companies offered SMS and MMS through 2G networks.

**3G** brought the Internet and video streaming to mobile users. With 3G networks, phones began to gain some of the most useful features used today. A stationary user could expect data download speeds around [3.1 megabits per second](#).

**4G** is the most common type of wireless network available in North America and Europe in early 2020. 4G improved upon 3G with superior speed and latency. This increase in speed made data-demanding services like Netflix, Facetime, and Skype possible for mobile users. Most 4G LTE networks offer data download speeds between [20 and 50 megabits per second](#). 4G networks are typically about 10 times faster than 3G networks.

**5G** comes at a critical time when more bandwidth is needed to serve nearly [27 billion](#) mobile devices, security systems, home appliances, vehicles, and other parts of the [Internet of Things](#). The new generation of wireless networks seeks to surpass the data rates of 4G LTE by a very large margin. With 5G, users can expect minimum download speeds of [50 megabits per second](#). In other words, the poorest 5G networks will offer better speed and latency than the best 4G LTE networks.

### Speed and Latency: By the Numbers

#### Speed

Many people realize that 5G networks will be faster than earlier generations, but what does that mean in relative terms? As we briefly mentioned above, the slowest 5G networks will be at least as fast as the fastest 4G LTE networks. However, the maximum data transfer rates depend on factors like geography, weather, and infrastructure.

The absolute maximum download rate of a 5G network is [10 gigabits per second](#). That means that the fastest 5G networks are 200 times faster than the fastest 4G LTE networks. While this upper bound is

impressive, it is unlikely that most 5G users will ever experience download rates beyond a few gigabits per second.

The [factors that affect the data transfer rates](#) of 5G networks are complex, but you can usually expect speeds to be limited by:

- Issues with 5G technology and infrastructure
- User traffic
- Bandwidth limits on connection channels between devices and networks
- Environmental factors like weather and geography

Most 5G users will be most severely limited by the bandwidth of connection channels. While 5G networks have wider channels to send more data, bandwidth allocations are generally not large enough to support download speeds of 10 gigabits per second. In spite of these limitations, 5G networks are significantly faster than 4G LTE networks.

### **Latency**

With the exception of gamers, casual mobile users often do not consider the role of latency when researching network capabilities. After all, a few moments of lag between both ends of a data transfer does not make much of a difference for most activities on the Internet. The [50-millisecond latency](#) of 4G LTE networks is usually sufficient for casual users.

Latency is an entirely different story for businesses. Delays in data transfers can mean awkward pauses during video conferences and VoIP calls. High latency can also prove disastrous for businesses with technologies on the Internet of Things (IoT).

In general, low latency is important in all [tasks that require quick response times](#). Autonomous vehicles, assembly lines, and robotic arm surgeries all require the low latency that 5G can offer.

Consider the example of a factory of industrial robots that are connected to a central interface and each other via the Internet. To successfully assemble and ship products, each industrial robot must know that the preceding step was completed successfully before it performs its task. Otherwise, resources may be wasted on a flawed product. Given the rapid pace of these factories, communication between industrial robots must be instant. This is where latency is important. High latency means that emergency stop commands and error messages may not be received when they are needed.

The low latency of 5G networks makes sending and receiving data a nearly instant process. With 5G networks, all devices on the Internet of Things will be able to communicate more rapidly.

You may be wondering: *what is the difference between 4G LTE latency and 5G latency?* Quite a lot. Under theoretical best conditions, 5G offers a 1-millisecond latency. However, most users should expect their 5G network to offer a [10-millisecond latency](#). In other words, 5G networks are more instantaneous than 4G LTE networks by at least a factor of 5.

### [5G Comes with Some Drawbacks](#)

5G will definitely improve mobile networks by with rapid download speeds, low latency, and support for more traffic. Unfortunately, the transition to 5G does not come without costs.

## **The 5G Rollout Will Be Slow**

Thanks to the [infrastructure requirements of the technology behind 5G](#), it will take several years for 5G networks to be readily accessible in all of the major US cities. Some of the leading telecommunications companies expect 5G to be available in densest parts of up to 30 American cities by the end of 2020. 5G will not begin to reach small towns and rural areas [until 2021](#) at the earliest.

The 5G rollout is moving at such a slow pace because new technologies need to be installed. Upgrading the cellular towers used for 4G LTE networks is not sufficient because 5G depends on the high-frequency millimeter waves instead of the usual radio frequencies.

Millimeter waves allow for more bandwidth, but they do not travel nearly as far as radio waves. They also have trouble passing through things like people, water vapor, and walls. To remedy these problems, devices known as small cells must be installed to relay the millimeter wave from the tower to the destination.

Thousands of small cells must be installed throughout a single city in preparation for 5G coverage. Cellular towers must also be outfitted with a new tech called Massive MIMO — also known as multiple input, multiple output. This new technology can handle at least 22 times more traffic than the towers used for 4G LTE. Yet again, the tech comes with a tradeoff. To prevent Massive MIMO antennas from interfering with each other, a technology known as beamforming must be adopted.

As you can see, the sheer volume of technology upgrades required for 5G means that telecommunications companies, local governments, and regulators will be busy with infrastructure projects for at least a few years.

## **5G Has Some Security Risks**

Due to thousands of small cells in each city and billions of devices on the Internet of Things, 5G potentially opens up entry points that can be exploited by hackers. Some experts are also concerned that suppliers of 5G tech — [such as Huawei](#) — may install backdoors that can later be exploited for espionage or cyberattacks.

## **Businesses Will Need to Invest in Tech Upgrades**

Old phones, routers, and computers cannot access 5G networks. Businesses will need to upgrade their tech to take advantage of the benefits of 5G networks. Expect 5G equipment to be expensive until the new technology is widely adopted, and more competitors enter the market.

## **5G Offers Many Real Business Applications**

### **Communication Software Will Become More Efficient**

With rapid data transfer rates and almost zero latency, businesses can rely more heavily on software. Conferencing software like Skype and Zoom will become more reliable as 5G eliminates audio and video lag. Collaboration tools for editing spreadsheets and documents will also function more smoothly as edits will update across all users in real time.

### **Cloud-Based Software Will Become More Popular**

Businesses should also expect a broad shift from local software to Cloud-based tools. For example, developers will be able to use a Cloud-based version of their favorite syntax editor without experiencing those pesky moments of lag that hindered the virtualization in the past. Cloud-based DevOps software and version control repositories will become more popular when 5G allows online data to be used instantly.

### **Hardware Virtualization Will Become Viable**

5G could change the way many businesses spend their technology budgets. With the low latency of 5G, businesses can virtualize the hardware necessary for tasks such as graphic design, data analysis, and programming. Instead of purchasing computers with sufficient processors, graphics cards, and RAM, companies can pay to remotely use off-site hardware. Hardware virtualization may help companies with small technology budgets enter expensive industries.

### [Plan for a 5G Future](#)

5G will fulfill its promises of high data transfer speeds and very low latency, but the rollout will take a few years in the United States due to infrastructure requirements.

5G offers plenty of opportunities for more efficiency, so businesses can use this time to develop a strategy to potentially switch to virtualized hardware and Cloud-based software. Companies can also use this brief lull for the 5G transition to find ways to offset equipment costs and potential security risks.

5G is no longer a buzzword about the distant future. It is a real tool for real businesses. The time to prepare is now.

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