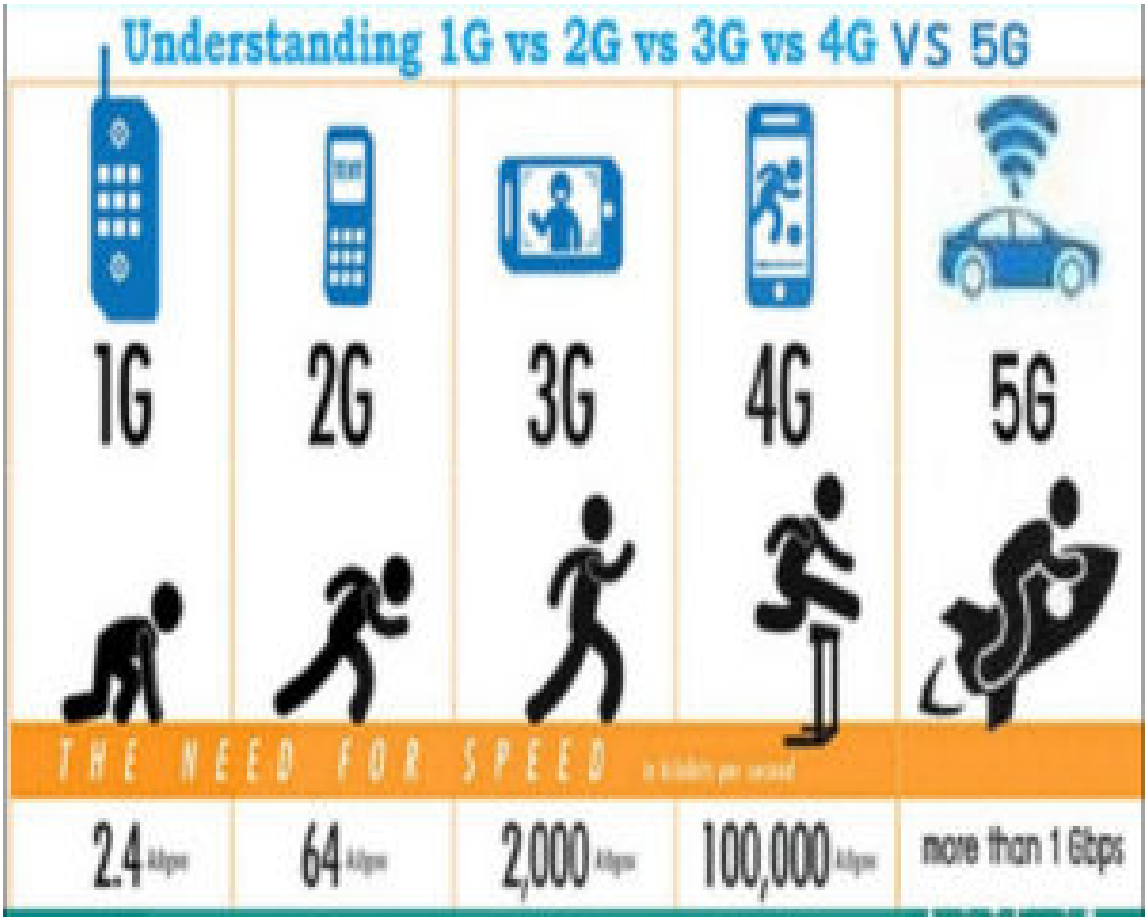
Now Loading—5G Technology

Over the years, cellular technology has improved tremendously. Communication facilities have been upgraded and cellular companies have come up with cheaper ways to provide the masses access to the internet. The last decade has seen an enormous rise in the speeds of connectivity as well as the quality of data transfer. Taking a look at the development of cellular network services, we see a plateau in the network speeds over the last two years. 5G promises to bring a revolutionary increase in these speeds in the future.

The evolution through the various generations has been focused on the transmission speed. The second-generation (2G) of the cellular network was introduced in the year 1991, under the Global System of Mobile Communication (GSM) standard. Initially, 2G was only meant for voice services along with slow data transfer with the help of SMS text messages. After a GPRS (General Packet Radio Service) upgrade, the 2G-GPRS duo enabled a 114kbit/s of download and 20kbit/s upload speeds, known as 2.5G. Furthermore, with the introduction of EDGE GPRS (Enhanced Data Rates for GSM Evolution), the data rates upped the ante to 384 kbps for download and 60 kbps for upload. This combination was also known as 2.75G.



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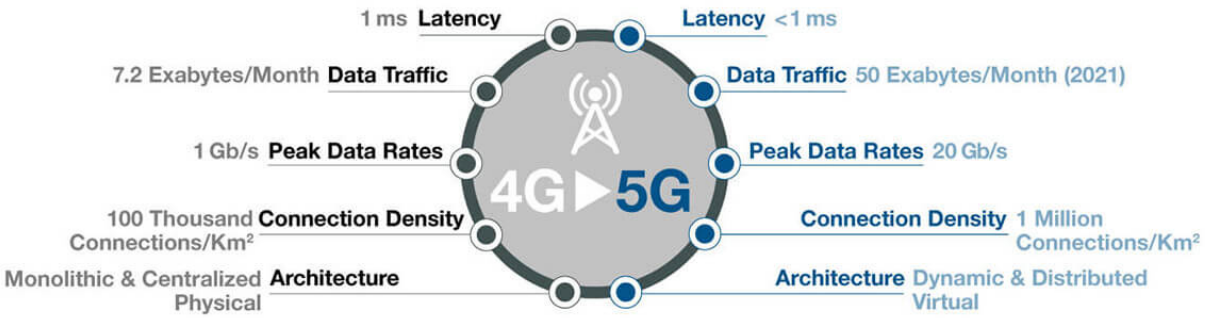
The next innovation was the third generation (3G), launched in 2001 as a UMTS (Universal Mobile Telecommunications System) network. The data transmission speed was improved by introducing the HSPA (High-Speed Packet Access) which allows up to 7.2 Mbit/s for download and 2 Mbit/s for upload speed. This enabled facilities such as live streaming and watching TV on your mobile. HSPA+ was introduced in 2008 and brought the greatest increase in speed, allowing 56 Mbit/s for download and 22 Mbit/s for upload. This was also known as 3.5G. The major difference between HSPA and HSPA+ was the speed, with HSPA+ allowing data rates of 42, 84, and sometimes even 168Mbps for downloads and 22Mbps for uploads.

The current, globally used 4G, had two systems commercially deployed: WiMAX, standing for "Worldwide Interoperability for Microwave Access", and LTE or "Long Term Evolution". WiMAX directly tries to replicate the abilities of a Wi-Fi system. It's basically a hotspot that covers a few miles rather than

the usual few hundred feet. LTE is actually a better competitor for the modern 3G networks as it provides better mobile communications. A key fact about LTE is that it utilizes radio waves instead of the usual microwaves. LTE is currently the major connection utilized by most network companies throughout the world.

In order to get a better understanding of the development of mobile networks, we can take a look at the following statistics. When downloading a movie that's 3 GB in size, the amount of time taken is 1 hour, 8 minutes for 3G, 40 minutes for 4G, 27 minutes for 4G LTE, 61 seconds for Gigabit LTE and 35 seconds for 5G.



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The 5G Network

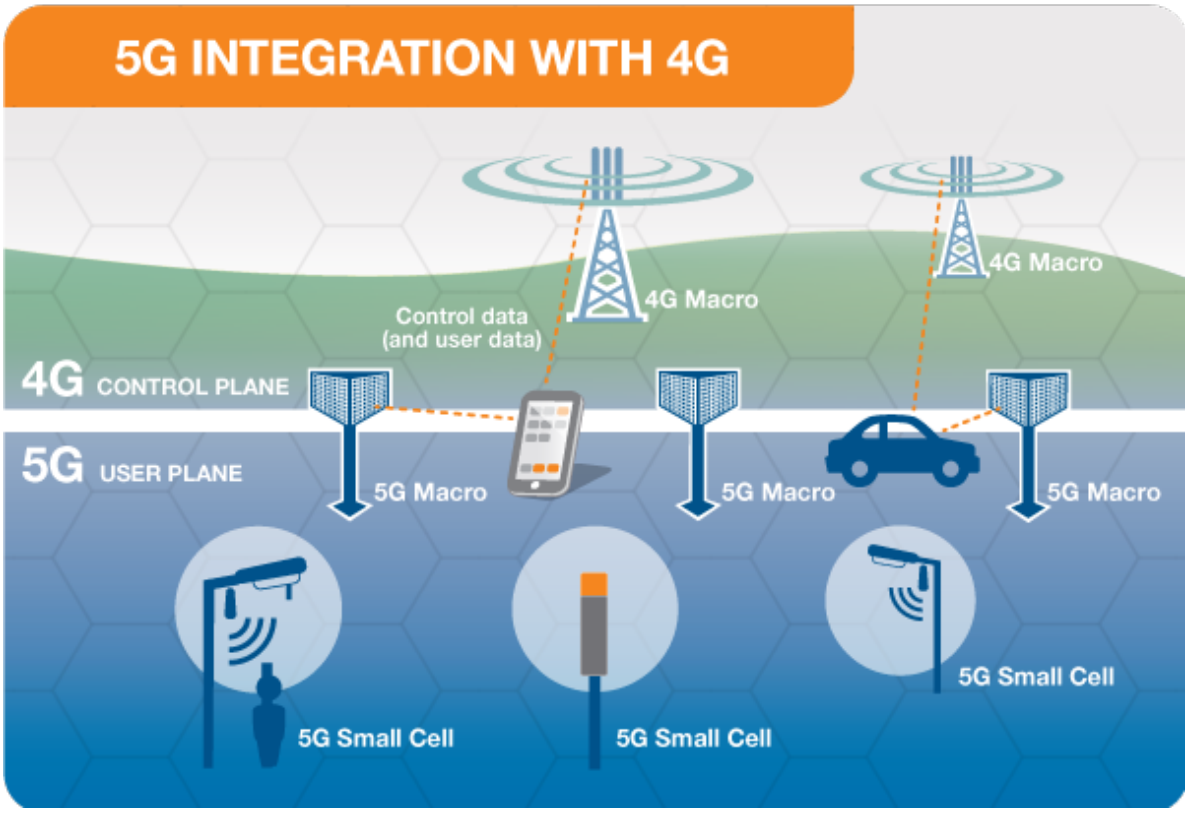
The major focus and key feature of 5G will be the greatly increased speed as well as the responsiveness of the wireless network. The expected speeds of data are supposed to be over 20Gbps, which is greater than the download speeds of WLAN wireline network speeds. While 4G is still improving, what you get is realistically somewhere between 10Mbps and 50Mbps. Netflix recommends 25Mbps for Ultra HD quality whereas we need only 5Mbps for HD. The aim of 5G is to hit 50Mbps as an

average.

In addition to the above-mentioned improvements, a key feature that has been added is the ability for network slicing. Network slicing gives the opportunity to slice a physical network into independent virtual networks to support specific requirements of different applications, servers, customers or operators. This implies that the network will allow mobile operators to form multiple virtual networks with the help of a single physical 5G connection. Though this seems to be an advantage, it will allow mobile operators to sell the network on a serve-as basis, which would result in a more expensive plan for the public.

How The Network Works

The fourth-generation (4G) LTE wireless technology provided for the base of the fifth-generation technology (5G). Both networks transmit data via radio waves and intermediate cell sites. However, there is one major difference between them. 4G utilises large, high power towers which are necessary for the radiation of signals over long distances, whereas 5G technology utilizes a large number of small cell sites located at poles or building roofs, in close proximity. The reasoning behind this is that 5G utilises something known as the millimetre wave spectrum in order to transmit data. The millimetre wave spectrum is essentially a defined bandwidth of radio waves. The range lies between 30 GHz to 300GHz and is heavily relied upon by the 5G data to generate the high speeds. For this to be achieved the cell sites have to be closely located, otherwise, interference can slow down the transmission process. This is a major loss for cities with a load of high buildings, as they seem to interfere with the transmission of 5G data.



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Major Advantages and Disadvantages

One of the major applications of 5G is in the case of self-driving cars. As we have already talked about virtual networks and reduced latency, it is useful to see how it helps autonomous cars. It requires a network slice that offers low latency and extremely fast connections so that the vehicle can navigate in real time. Home appliances could use low power connections in order to be controlled as they do not require high-quality performance. 5G will also help the IoT domain by assisting with higher connection density, thereby allowing networks to handle a large number of devices at any given time.

Contrarily, 5G has also been deemed as a high-risk move. A few months ago, the European cybersecurity agency ENISA warned the public about the high risks that 5G networks could bring, considering that there are not enough security guarantees. According to Euractiv, they insisted that the threats that

already exist in 4G networks will intensify as the number of users, data, and network bandwidth increases. The low latency has also posed a risk. In a recent study, it has come to the notice of people that any 5G using device could be remotely handled over the internet, which means that cyber-attacks become more dangerous since hackers could take advantage of these connections and exploit data. The IoT devices and sensors will hence demand more complex authentication in order to prevent unauthorized access which makes it vulnerable to the hackers.

Another key point that has risen as a result of the emergence of the 5G network, is the disturbance caused to the weather forecast systems. It is speculated that the network will hamper the functioning of weather satellites. Detecting the water vapour concentration in the atmosphere is of utmost importance to weather forecasters while predicting upcoming storms. 5G is supposed to work at a frequency that is very close to that of the satellites detecting water vapour content, which would cause a discrepancy in the forecasts. Hence, the meteorological departments stand against the implementation of the data network.

One of the key factors that have led to the slow progress of introducing 5G, is the high capital and large infrastructure required in order to make the facility available to every user. Only a few countries have bothered to take an interest in the process, and even fewer have invested in it.

Where 5G Has Been Deployed Now

As of June 2019, 5G has been made available in limited parts of the world with South Korea, China, Japan and the United States as the primary users. Very recently, Huawei, a Chinese enterprise, signed a deal with Russia’s top cell phone operator MTS. The Kremlin has deemed it a “memorandum of understanding.” The United States, who had previously blacklisted Huawei, has discouraged its European counterparts

to help the Chinese company, citing concerns over unconsented Chinese surveillance. However, most nations have ignored the US advice and Austria, Belgium, Czech Republic, France, Germany, Greece, Hungary, Ireland, the Netherlands, Lithuania and Portugal are preparing to auction 5G licenses this year.

While most nations want to be a part of this 5G revolution, many of them are also concerned about their security. The world has never seen a network as powerful as the 5G network. It gives nations the ability to empower their people and help develop their industries as well as their quality of life. On the contrary, 5G also presents a threat to the security of the nation and hence, is becoming the focus of countless debates. 5G may become a boon or a bane in what seems to be the near future, and only time will tell.