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5G: What's It All About?

Faster Internet speeds have helped generate innovative new services and products. Think back to the early days of smartphones. Americans learned patience, along with the word buffering, as they waited in anticipation for a YouTube video to load on their phones. Now, 4G networks allow us to watch live events on our handsets and get real-time traffic reports on apps like Waze.

Game Changer

Proponents of 5G say it will be a greater leap than previous upgrades. "5G is a game changer," according to Global Head, Telecoms & Media Alex Holt from accounting and corporate consulting firm KPMG. In a blog post earlier this year, Holt wrote that 5G "will connect everything and everyone and unleash the potential of technologies like artificial intelligence (AI), the Internet of things (IoT), augmented reality (AR), virtual reality (VR), and robotics."

5G will push these technologies forward because of lower latency and greater bandwidth. *Latency* is the time it takes for data to move from one place to another across the network. Greater bandwidth means more devices can be online at the same time, moving us closer to connecting pretty much everything, including appliances, medical devices, automobiles, trucks, and traffic lights. This will push us further down the path of IoT. Experts say IoT will be the key to innovations in energy, traffic management, autonomous vehicles, and manufacturing because it will allow real-time interactions.

However, there is a darker side to IoT: security. More devices mean hackers with nefarious intentions will have more ways to break into systems like the power grid. Such security concerns will need to be assuaged before certain operators and manufacturers jump into the IoT world with both feet.

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Mobile phone and tablet users will experience these advances in the form of very, very fast downloads. For example, Verizon says a video that took over two minutes to download on 4G will take 30 seconds on 5G. That's fast enough to download an entire season of *Game of Thrones* in about a minute.

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Let's look at health care as a sample of the potential of 5G networks. Imagine if you need brain surgery, you're too sick to travel, and the greatest surgeon for your condition is in Europe. The low latency times of 5G combined with advanced robotics will finally make it possible to do precision surgery remotely. In fact, according to the Robotics Industry Association, a trade group, a surgeon in China successfully operated on a Parkinson's patient from 1,500 miles away.

5G experts at the consulting firm McKinsey predict a revolution at home for medicine. Sensor devices on or underneath the skin can send heart rate, blood pressure, glucose level, and oxygen saturation readings to your doctor in real time. This can help patients manage diseases such as diabetes, chronic obstructive respiratory disease, heart failure, and hypertension, and cut down on doctor visits.

5G will also make it easier for artificial intelligence to scan vast amounts of data stored in the cloud or online. This will make it possible for physicians to input symptoms they are seeing in patients and make more accurate diagnoses.

Virtual reality headsets may finally stop making people dizzy and nauseous because images load too slowly. Live performances can incorporate virtual reality experiences that can be seen through the lens of a mobile phone as an overlay on reality; virtual balloons or bouncing balls can appear to be thrown in the air by a performer.

Unfortunately, the road to 5G is filled with potholes. Earl Lum, founder of ELJ Wireless Research, thinks many of the promises of 5G, such as remote surgery, will take a while to reach most people. "Availability of something like that is probably five to 10 years away in terms of someone trusting their life to someone thousands of miles away," he says.

The Lengthy Deployment

Deployment of 5G is being hindered by concerns about security, health, and regulatory issues.

On the health front, there have been some wild conspiracy theories making their way across the Internet, including the belief that 5G causes COVID-19, a claim that has no scientific basis. The Federal Communications Commission (FCC) says "the weight of scientific evidence has not effectively linked exposure to radio frequency energy from mobile devices with any known health problems."

But health concerns about 5G may have some merit, and they may be a real hindrance to its deployment. In fact, more than 400 scientists in Europe have signed a petition asking for a delay in the rollout of 5G until further study of its health impact.

5G INNOVATIONS

There is already some amazing work being done to harness the power of 5G. Below are some of the projects getting attention around the world.

City Infrastructure

The smart city vision includes driverless cars, artificial intelligence, smart street lighting, and smart parking. 5G promises to help towns and cities reduce costs and generate economic growth and resilience while increasing sustainability and improving public services and quality of life. Smart cities will allow city managers to address the needs of citizens efficiently by, for example, forecasting and planning for population expansion and identifying traffic control issues.

Agriculture

The integration of 5G technologies into farming practices will increase the amount of agricultural products available—while optimizing use of water, fertilizers, and pesticides—and raise the quality of food grown. 5G technologies can also improve the quality of life for farm workers by reducing heavy labor and tedious tasks. According to *engineering.com*, agricultural robots—or AgBots— are already taking a load off of farm workers by performing tasks like planting, watering, harvesting, and sorting.

Drones

5G-enabled drones can transmit high-definition footage in real-time to complete hazardous jobs like infrastructure safety inspections, where the drone operator must be able to see patches of rust or smalls cracks or access difficult spaces. Drones using artificial intelligence with computer vision can rapidly scan items in a warehouse and recognize patterns, which can improve efficiency and free up human workers to do more complicated tasks.

Some scientists and lawmakers are skeptical of the FCC's assessment. "The exposure limits aren't even government standards," says Joel M. Moskowitz, director of the Center for Family and Community Health at the University of California, Berkeley. "They were adopted from industry in the 1990s."

Moskowitz argues there is a lot we just don't know: "With regard to electromagnetic radiation, we hardly do any research."

Part of the pushback against 5G has to do with the need for many small cells in order to get the lightning-fast speeds of what's known as high-band or millimeter wave. Current cell towers cover a several-mile radius, but they are the size of tall pine trees. High-band 5G cells are the size of laptops, and they cover only a radius of around a couple thousand feet. Their reach also can be hindered by buildings, trees, and other objects in dense urban environments. So, telecom companies are hanging the cells fairly close together on telephone and light polls, and that is sparking pushback in many communities.

Residents in Northern California have been especially active in fighting against deployment. Cities like Mill Valley have enacted bans on placement of 5G cells in residential areas. However, a recent lawsuit gave the FCC the power to overrule most municipal ordinances, but cities still have some power over the deployment for aesthetic reasons.

There are two other types of 5G that don't require such close placement of cells—mid- and low-band 5G. Neither mid- nor low-band wave has the lightning speed of millimeter or high-band wave, and low-band 5G is only slightly faster than 4G. But, because they need fewer cell towers and the signals are less easily obstructed, mid- and low-band 5G are likely to be much more common than high-band 5G.

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The immediate question most of us may be asking is: Do I run out and get the latest 5G phone? If you're an iPhone user, you're still waiting on Apple to release a 5G phone. For others, "It's an incredible amount of hype from the operators and the industry," says ELJ Wireless Research's Lum.

He thinks most people will be fine with their 4G phones for quite some time. "At the end of the day, you have to ask yourself, what do I really need?" Lum thinks initially the only use for 5G on a handset will be for people who want to take and upload 4K video and photos.

Ultimately, faster speeds have always sparked new innovations—such as real-time traffic maps and live streaming. But it's likely to take a while for entrepreneurs to develop applications that take full advantage of what 5G has to offer. For most of us, the promise of 5G will only slowly materialize over the next decade. That might be just in time for the launch of 6G.

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