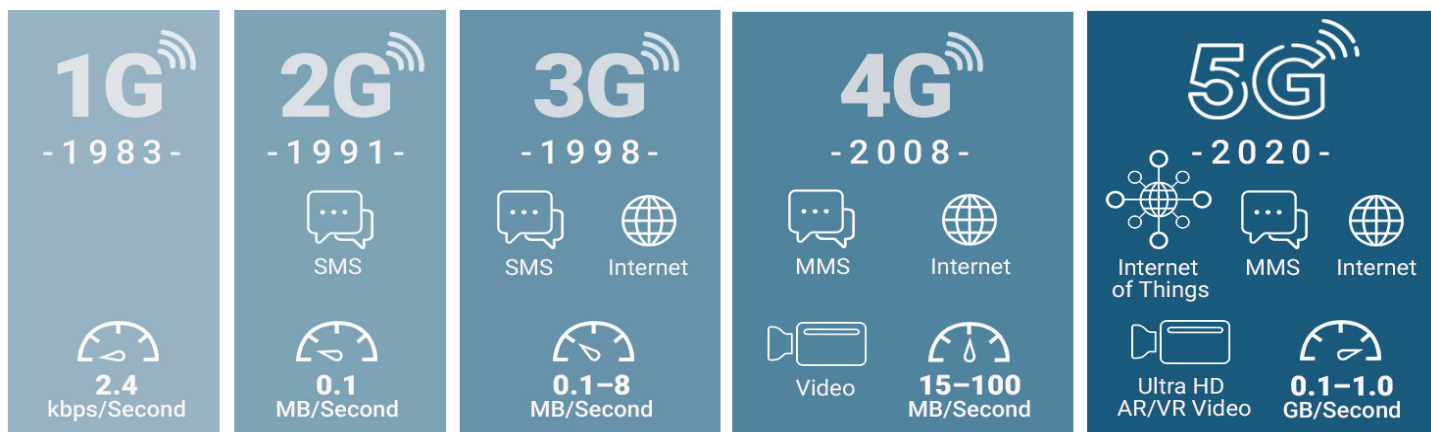


The 5G Timeline





What is 5G?

Everyone's talking about 5G. We've all heard "5G is coming." But what does that mean? What is 5G? When will 5G arrive? What will 5G mean for me? We're here to try to clear up some of the questions and misconceptions surrounding 5G.

What is 5G? Simply put, 5G is the fifth generation of cellular wireless/mobile technology. First there was 1G that was built from nothing — a clean sheet of paper. Every subsequent generation of cellular technology (2G, 3G, and 4G) has been incrementally built on top of the preceding generation and offers increased capacity and speed. 5G will continue this evolution but promises to make large scale improvements. Specifically, 5G promises to deliver 1) speeds in excess of 1 Gbps, up to 10 times faster than 4G, 2) ultra-low latency <1 mSec, and 3) effective IoT to a massive number of devices.

5G will address the ever-increasing demand for more bandwidth, speed, and data traffic. It's estimated that by 2024, 25 percent of mobile data traffic will be carried by 5G networks. That's 1.3 times more than 4G/3G/2G traffic today. It's also estimated that there will be more than 60 times growth in mobile data traffic from 2013 to 2024.¹

It is expected that 5G technology will have the same revolutionary effect on our society as did the introduction of transformative technologies, such as electricity and cars. In healthcare, that revolution will be life changing and will affect every aspect of the healthcare ecosystem from patient care, diagnostics, monitoring, virtual care, and more. 5G will provide the higher speeds, lower latency, and greater bandwidth to enable large video data uploads and downloads with ultra-low latency, such as from MRIs, to take one or two seconds instead of minutes. Or in some cases, have to be made over

hard-wired connections. Applications, such as medical IoT, will become faster, more reliable, and more ubiquitous. 5G will enable critical communications (Cric) with almost no latency. Communications between caregivers at the hospital and emergency personnel in ambulances or life flights will be instantaneous. Remote robotic surgery commands that require immediate responsiveness will become a reality. There can be no latency from when the surgeon issues a command and when it is actually deployed. This is the promise of 5G.

So when does all this happen?

5G is Here, Now

5G is here, now, but it is not widespread. It's been in the works for nearly a decade. Here's a little background. It took about 25 years to go from first generation analog cellular (1G), introduced in the eighties, to the move to digital: 2G, 3G, and then to 4G, which was introduced in 2010 in the US. The first release of 5G, in late 2017 by the 3rd Generation Partnership Project (3GPP), was for non-stand-alone 5G New Radio (NR). In June 2018, the 3GPP finalized Release 15 (R15) for stand-alone 5G.

Currently, all the major carriers are rolling out fixed and mobile 5G services in select cities. As of November 2019, there were 46 5G networks² launched in the US. In 2020, expect more 5G networks to roll out, particularly in densely populated urban areas.

In addition, the ITU (International Telecommunication Union), an agency of the United Nations tasked with establishing standards associated with communications and technology on an internal level, is working on a set of 5G standards known as IMT-2020, which is short for International Mobile Technologies. The standards are expected to be released in 2020.

¹Ericsson Mobility Report November 2018

²TeleGeography, 5G Services Innovation, 5G Americas, <https://www.5gamericas.org/resources/deployments/>, November 2019.



Will 4G Go Away?

The short answer is not now and not for some time.

5G is not replacing 4G. Rather, for the foreseeable future, 4G LTE will work alongside 5G in a complementary manner and there will be no hard cut over. 4G and 5G will coexist. 5G as it exists today, still requires 4G to anchor and coordinate the 5G network and device behaviors. 4G is controlling the current 5G network. For instance, if you have a 5G phone and it drops the 5G signal, the phone will fall back on 4G LTE.

There are three frequency bands that 5G networks can operate on: sub-3 GHz (the low-band), 3 GHz to 7 GHz (the mid-band), and the faster 24-GHz (and above) millimeter waves (mmWave). 4G currently operates on the lower bands, which are the traditional frequency bands used for cellular networks. The mid-bands include CBRS frequencies at 3.5 GHz and the 6 GHz unlicensed frequency.

When Will 5G Really Arrive for Me?

There are a few answers to this question depending on where you live, what carriers you have, the availability of 5G devices, including medical devices, what type of building(s) your organization is in, and most importantly, what type of communications infrastructure you currently have.

If your healthcare system is in a major metropolitan area, expect 5G coverage and the availability of 5G devices to grow in 2020, but slowly. By 2021, you'll start to see more advanced 5G uses cases such as URLL and medical IoT applications.

But first, let's discuss the 5G infrastructure. There are a number of reasons why the 5G infrastructure is taking so long. The first includes the high-cost to physically implement the 5G millimeter wave (mmW) network. Second is the acquisition of local regulatory approvals for construction of the antennas. Because of the shorter wavelengths, 5G requires far more wireless antenna connections than 4G, which is one of the primary reasons it is now only widely available in densely-populated cities.

Over the next 10 to 15 years, 5G will also drive a new global cellular infrastructure. It's estimated that telecom companies will invest as much as \$275 billion into 5G infrastructure before 2025. IHS released a 5G Economic Impact White Paper predicting that 5G's full economic benefit should be realized by 2035 and could produce up to \$13.2 trillion worth of goods and services enabled by 5G mobile technology and support up to 22.3 million jobs.³

5G Devices

In addition to the infrastructure needed for 5G, there is the question of the availability of 5G devices.

2020 should see 5G make a more meaningful impact on consumers, which will drive demand for 5G in healthcare.

³ The 5G Economy: How 5G Technology will Contribute to the Global Economy, IHS Markit, November 2019.

TIMELINE

2018 and prior

- Early fixed wireless access deployment
- Early 5G mobility demonstrations

2019

- First 5G android phones
- Four major carriers roll out 5G islands in 35 cities
- Limited rollout of 5G devices
- 5G operational in 13
- 4G CBRS goes live
- CBRS handsets available

2020

- 5G device ecosystem expands
- 5G handsets reaching 8.9 percent of smartphones
- Expect the first 5G iPhone
- Greater deployment of 5G networks
- 5G coverage: broad areas of 4G equivalence
- CBRS spectrum auction
- CBRS handsets expand
- Wi-Fi 6 expands
- Work progresses on ITU IMT 2020 5G standard

2021

- Early, advanced 5G use cases (URLL and IoT)
- 5G coverage: expanded outdoor urban/suburban
- 5G indoor coverage remains problematic
- CBRS update increases with vertical expansion

2022

- 5G phones hit mainstream consumer
- Advanced networking models
- Hybrid networks start to grow

2023

- 5G subscribers are expected to reach 1.1 billion

2024

- About 25 percent of mobile data traffic will be carried by 5G networks (1.3X more than 4G/3G/2G traffic today)⁴

While there are a few 5G smartphones and devices on the market, major players like Apple and Google have not yet introduced their 5G devices. It's expected that Apple will release a 5G smartphone in September 2020. A report from Strategy Analytics forecasts Apple's introduction will make the company the leader in 5G smartphones, surpassing the current leader, Samsung.

⁴ Ericsson Mobility Report Nov 2018





"As carriers roll out 5G in the United States, a significant number of consumers will adopt the service quickly—if it delivers on its promise of faster speeds and better coverage," said Kevin Westcott, Vice Chairman, Deloitte LLP, U.S. Telecom, Media, and Entertainment

—Kevin Westcott, vice chairman, Deloitte LLP, and U.S. telecom and media and entertainment leader

According to Deloitte's first U.S. Connectivity and Mobile Trends survey, 67 percent of consumers said that they would be more likely to buy a new smartphone once 5G-compatible handsets are available.⁵

As the 5G ecosystem grows, so will coverage and number of medical devices equipped for 5G. These can include wearables, robotics, telemetric equipment, sensors, and more. It's expected that by 2022, 5G devices will become mainstream and that hybrid 5G networks will grow. If consumers have 5G, they will demand it in the workplace. Massive medical IoT may not be functional until a fully native 5G network is operational in parallel with the legacy 4G network—maybe in five years.

The CBRS Factor

Contributing to the growth of 5G is the growth of CBRS, which is often used in conjunction with DAS and Wi-Fi to provide better, more reliable wireless coverage, particularly in healthcare environments. In June 2020, there will be an auction of 70 megahertz of the CBRS 3.5-GHz band. The major mobile operators are looking to the C-band for mid-band spectrum for 5G. This movement to CBRS gives you a better transition path to 5G. An additional 80 MHz of the CBRS 3.5 GHz is already available today by non-mobile operators.

5G and LTE Technologies

Does 5G mean I should avoid investment in LTE technologies? No. LTE growth will continue. Since many bands currently used for 3G and LTE will be reallocated to 5G over the coming years, building a strong RF path today will ensure a solid 5G foundation tomorrow.

The 5G Evolution.

5G can help increase efficiency while reducing costs particularly as IoT fuels innovation in healthcare. A functional 5G network gives any healthcare system a distinct competitive advantage in terms of patient care, clinician satisfaction, and critical-care communications.

Expect 5G technology to make its way into the existing frequency bands over the coming two to three years. Massive IoT may not be functional until a fully native 5G network is operational in parallel with the legacy 4G network — maybe in five years. Remember that after about seven years of deployment, 4G LTE has just now reached maturity and is far from obsolete. You should expect 5G to follow a similar timeline. We are at the beginning of a seven plus-year evolution.

To discuss your 5G implementation, contact us. One of our wireless experts will evaluate your current system and provide upgrade options.

⁵ 2020 Preview: 5G devices go mainstream; Bevin Fletcher, Dec 23, 2019; FierceWireless.com

