

Transition to 5G



5G





What's the Deal about 5G?

5G is the fifth generation of cellular wireless/mobile technology. The question is how did we get to 4G and how will we move to 5G?

Each generation of mobile technology has included a core network, a radio access network (RAN), and end-user devices. The first generation (1G) was built from nothing. Every subsequent generation (2G, 3G, and 4G) has been incrementally built on top of the preceding generation. This is the only logical approach given the financial burden of deploying an entirely new network prior to generating any cash flow from it. No generation change has resulted in an immediate hard cut over. Instead, a portion of the current generation RAN is taken out of service in order to make room for the initial deployment of the new RAN – with the new RAN operating with the existing core network. After a sufficient number of end-users transition to the new generation, then the core network is upgraded and the remaining RAN is transitioned. Once the transition is complete, that generation is then homogenous and ubiquitous. This will happen with 5G too.

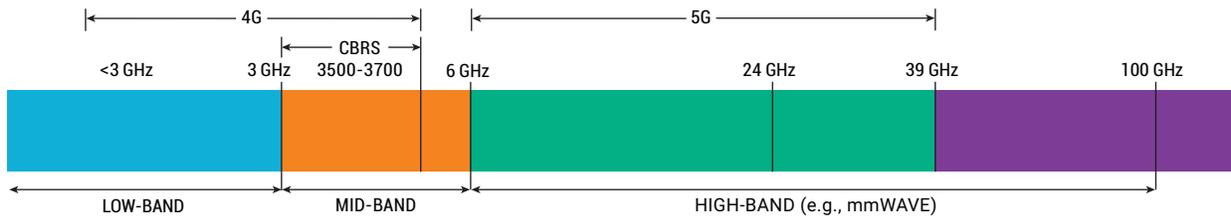
The Three Promises of 5G

The benefits 5G promises the healthcare ecosystem are truly transformational and life changing. But just because 5G is in its infancy now, doesn't mean you should sit on the sidelines and wait for it grow into a teenager. It's very likely that you will be able to benefit from 5G much sooner than you think.

Each generation of cellular technology has increased service provider capacity and increased end-user speed. 5G will continue this evolution but promises large scale improvements. Specifically 5G promises to 1) deliver speeds in excess of 1 Gbps, 2) deliver ultra-low latency <1 mSec, and 3) deliver effective IoT to a massive number of devices. While the three promises of 5G are interrelated, they rely on independent evolutionary paths.

For example, data speeds in excess of 1 Gbps require more spectrum than is available for use by any single service provider at conventional sub-3 GHz frequencies. The answer is the use of millimeter wave (mmWave) frequencies (28 GHz and up) with hundreds of MHz of bandwidth. Ultra-low latency involves moving core application "compute and storage" resources closer to the end-users and making them virtual functions. Massive IoT requires 5G to simultaneously support both narrowband, low power, devices, and enhanced broadband user devices.





The 5G Transition Path

Expect 5G technology to make its way into the existing frequency bands over the next two or three years and to be in widespread use by 2022. What you need to do now depends on your existing system. As 5G networks roll out, carriers will be using different frequency bands for 5G.

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) mmWaves. 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.

The system you are currently using can make all the difference in how you transition to 5G. Here are a few guidelines to give you an idea of what to expect as you move to 5G.

Existing 4G DAS for Low-Band 5G

If you have a modern in-building 4G DAS system (<two years old) and you have access to a 5G network operating in the lower bands, there is a very good chance that the stage one evolution from 4G to 5G will be fairly painless. Depending on your system, you will probably be able to use 5G signals in the low-band frequencies with little or no changes to your equipment or infrastructure. Most equipment manufacturers build in enough performance to comfortably handle 5G. The conversion will most likely be a non event.

A performance review will determine how much capability your system offers. Usually the transition involves an enhancement of your current system. The amount of antennas required in the building will likely be the same or require a few adjustments. These signals in the low band propagate effectively but carrier lower data rates than the mid-band or mmW frequencies.

Existing 4G DAS for Mid-Band 5G

It's when you start to move to the mid-frequency bands, you may have infrastructure concerns and you may need to start thinking about small cell densification and equipment upgrades.

Mid-spectrum frequencies (3 GHz to 7 GHz) propagate similar distances as Wi-Fi, but carry much higher data speeds than low-band frequencies. These frequencies have the best combination of signal coverage and data speeds.

Most 4G DAS systems, even modern ones, don't always have the necessary interface between the DAS and the signal source and will require the addition of amplifiers throughout the DAS. A mid-spectrum 5G system requires more in-building antennas closer together to properly propagate signals because they can have trouble penetrating through walls, doors, and other objects. This small cell densification enables you to increase the coverage while keeping your existing 4G DAS system.

Again, a performance review can tell you what to expect.

High-Frequency mmWave 5G

A high-frequency millimeter-wave band 5G capability will almost certainly require infrastructure re-engineering. But the good news is that the reality of mmWave 5G becoming widespread is at least five years away. That gives you time to start planning and budgeting for it.

Systems Older Than Six Years

If you have an older system, you need start thinking about 5G now. Your system may or may not be upgradeable to 5G. While it's not time to panic, you need to consider the lead time needed to upgrade or implement a new system.

Even if your system is functioning properly now, it's highly unlikely to have the performance needed to support 5G. And, as 3G is going to be turned off, you don't want to be caught short. You'll need to upgrade in the next two years to accommodate mid-band and high-band frequencies.

5G NR TECHNOLOGY SUPPORT			
Age of Current Systems	Low Band	Mid Band	High Band
2 Years or less	Supports 'as is'	Supports 'with additions'	Requires 'major rework'
3 to 5 Years	Probably supports 'as is'	Requires 'additions or overlays'	Requires 'major rework'
6 Years or more	Probably requires 'new system'	Requires 'new system'	Requires 'new system'





The CBRS Factor

Another consideration is if you have invested in CBRS, which is contributing to the growth of 5G. It is often used in conjunction with DAS and Wi-Fi to provide better, more reliable wireless coverage, particularly in densely populated, in-building environments. Adding to the growth of CBRS is the June 2020 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.

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.

The three major components of 5G — core network, radio access network (RAN), and end-user devices — will undoubtedly proceed with their own evolutionary timeline. Expect 5G technology to make its way into the existing frequency bands over the coming two or three years. Similarly, do not expect immediate replacements of core networks just to achieve <1 mSec latency. Do expect ongoing upgrades built on virtual network functions moving towards ultra-low latency. 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.