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Why 5G is out of reach for more people than you think

5G promises to revolutionize mobile, but those super-fast speeds will be hard to get in rural America.

BY SHARA TIBKEN | OCTOBER 25, 2018 5:01 AM PDT



Shara Tibken/CNET

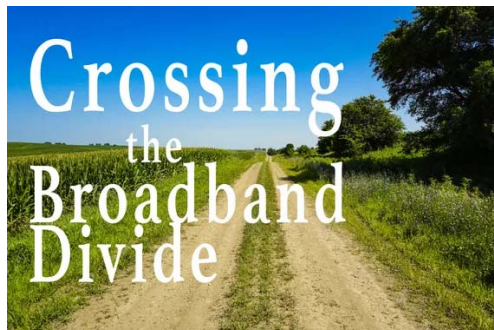
This is part of CNET's "Crossing the Broadband Divide" series exploring the challenges of getting internet access to everyone.

I sit in a massive green tractor, called a sprayer, as we drive down the field. A [tablet](#) in the machine's cabin shows a map with blue rectangles marking where we've applied chemicals. Soon, I can see another

sprayer pop up on the map, with the ground another farmer has covered highlighted in a different shade of blue.

When my machine gets near the other farmer's area, my sprayer automatically turns off to avoid overlapping and wasting chemicals. A third farmer in a remote office is able to monitor our progress on an iPad.

What I'm demoing is John Deere's technology that lets machines talk to other machines, part of an industry-wide push that's known as "precision agriculture." That particular Deere feature, called Section Control, can be found in sprayers and tractors for planting seeds. It lets farmers run multiple machines in the same field, saving time and chemicals. It reduces costs for farmers, lowers the environmental impact and makes everything more efficient.



James Martin/CNET

But that -- and the countless other smarts now in farming equipment -- is pointless if there's no connectivity.

"All of that stuff is useful information that needs to be available in real time," Jeremy Thompson, chief architect for John Deere's intelligent solutions group, tells me at his company's test farm outside Des Moines, Iowa. "Without connectivity, you're kinda flying in the dark."

Smart farming is one of the prime examples of an area that could stand to benefit from ultra-responsive and speedy 5G networks. The technology is on the cusp of reality, and with speeds up to 100 times faster than today's mobile connections, it could radically change our lives.

But the reality for rural America is that many areas are in the dark when it comes to wireless connections. The vast majority of Americans -- 95 percent -- now own a cellphone of some kind, and 77 percent have smartphones, according to a Pew Research report from earlier this year. But only 70 percent of rural areas have 10 Mbps LTE download speeds, compared with 91 percent in urban areas, according to the most recent Federal Communications Commission report, which is based on 2016 data.

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Steven Berry, CEO of the Competitive Carriers Association

So while the US carriers are making their big 5G push now, with providers in Korea, Japan and China to follow in the next 12 months, don't expect the technology to revolutionize rural America anytime soon.

Some experts expect 5G to eventually be a boon for rural parts of the US, including areas that still lack home broadband connections of at least a 25 Mbps connection. But others warn it could take several years or more -- if ever -- for carriers to actually deploy 5G in more remote, sparsely populated parts of the country.

The reason rural areas may miss out on 5G, at least for now, is a combination of technology, geography and finances. The key spectrum needed for 5G only covers short distances, runs into problems when there's even a tree in the way and requires lots of expensive towers installed close to each other.

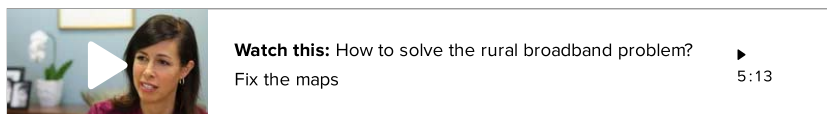
"If we were talking about a digital divide before, now we're talking about a digital divide on steroids," says Steven Berry, CEO of the Competitive Carriers Association, which represents nearly 100 smaller wireless companies, including T-Mobile and Sprint.

So what's 5G anyway?

I hold a rectangular Qualcomm chip in my hand. This little thing, able to pick up new, high-frequency radio airwaves, including so-called millimeter-wave spectrum, is key to letting smartphones tap into 5G.

Many of the key benefits of 5G come from those high-frequency airwaves, since the higher the band, the higher the speeds and capacity.

"The extent of the coverage in 5G is really dictated by the spectrum," says Dean Brenner, Qualcomm's senior vice president of spectrum strategy and tech policy.



The promise of 5G is that it can use higher-frequency bands, called millimeter wave, to send data faster than ever before. Those signals operate on frequencies of 24GHz or higher, compared with the 600MHz to 5.8GHz used for 4G today. They promise speeds of up to 5Gbps, though the more realistic speed you'll see in phones is closer to 1.4Gbps, according to Qualcomm. That's much faster than today's 4G, which is about 70Mbps (on an ideal day).

Another variant of 5G will use sub-6GHz spectrum, the lower-frequency airwaves that are more stable but slower than millimeter wave. Those likely will top out of speeds of 400Mbps to 500Mbps, Qualcomm says.

Read more about the nuances of 5G technology.

Sub-6GHz is nowhere near as fast as millimeter wave, and it's not what many people think of when they picture true 5G. It also can't handle as much capacity as millimeter wave, which makes it ill-suited for crowded cities. But it can travel much longer distances, and it's more stable than the higher-frequency airwaves. Another benefit is that carriers can use spectrum they already own to set up sub-6GHz 5G networks. Overall, it's much cheaper to deploy.

"5G is a real revolution," says Stephen Douglas, lead of solutions and technical strategy at Spirent, a company that works with everyone from chip companies to wireless carriers to test communications networks. It's likely the sub-6GHz variant of 5G that will serve rural areas, at least at first, he and other experts say.

"Rural communities will definitely get better service than they see today, but I don't think they will see the panacea urban communities get out of 5G unless there's some new business opportunities in those areas," Douglas adds.

But when?

For many, the question is when sub-6Ghz 5G connections will come to rural areas.

T-Mobile, for one, aims to power its 5G network in rural areas using a swath of its even lower-frequency 600MHz spectrum. It has committed to building a nationwide 5G network by 2020 and aims to make speeds of 100 megabits a second or faster available to 90 percent of Americans. By 2024, customers will see average speeds jump 15 times over current speeds. That means average speeds of 450Mbps, with some areas exceeding 4Gbps -- though it's unlikely rural areas will see those peaks.

"We wouldn't go after 5G millimeter wave deployment in rural America," says T-Mobile Chief Technology Officer Neville Ray.

 iowa-cornfield

Many parts of rural America, including sections of Iowa, lack reliable, fast internet connections.

Shara Tibken/CNET

Verizon and AT&T, meanwhile, will first focus on millimeter wave for big cities, even though it doesn't have great range. Verizon plans to launch its mobile 5G network earlier next year, while AT&T says it plans to launch the first mobile 5G network by the end of this year. AT&T expects to have 5G in 12 cities by the end of 2018 and seven more in the first half of 2019.

It hasn't yet said when it will expand to rural areas, but Gordon Mansfield, AT&T's vice president of converged access and device technology, said it's reasonable to aim for the 2020 to 2021 time frame as 5G adoption moves at a faster pace than previous generations.

"I don't want to suggest every square mile of the US will ultimately be covered," Mansfield says. "Honestly, that's a very difficult value proposition."

Ted Rappaport, a professor of electrical and computer engineering at New York University's Tandon School of Engineering who conducted some of the early research into 5G, projects there will be major urban rollouts of 5G in 2019 and 2020, followed by midtier markets in 2021. 5G will likely come more broadly to rural areas in 2022 to 2023, he estimates.

Wonky ways to get connected

Late last year, AT&T started trials on an important project in rural Georgia. It had spent years developing its new AirGig technology that would deliver ultra-fast internet service over power lines. Now it needed to see how AirGig worked in the real world.

So AT&T installed special antenna modules on about a dozen electric poles in Enigma, Georgia. For the next six months, AT&T monitored the systems to be sure they didn't hurt the electrical service for 2.5 million Georgia Power customers across the state. It hoped to roll the technology out within a few years but had to see if it really worked first.

"Our goal is to connect people wherever we can, as far as we can," says Andrew Spence, assistant vice president of corporate strategy for AT&T. "AirGig is potentially one way that we can more cost-effectively extend our broadband footprint."

AirGig is one of the many technologies that companies are experimenting with to bring high-speed connectivity to rural and even suburban locations. As long as a home is near a power line, it could have speeds as fast as 1 Gbps with AirGig.

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The technology is aimed more at fixed wireless service -- in other words, a replacement for your home broadband, and not service for your smartphone on the go. AirGig doesn't connect directly to houses, though. Instead, it sends data skipping from power pole to power pole so it can travel long distances. For that final communication link to a house, AT&T will use more conventional wireless equipment like 5G mobile networks.

AirGig also doesn't require a direct electrical connection to the power line, and the technology can be "clamped on by trained electrical workers in just a few minutes," Georgia Power says. It would remove the need to build new cellular towers or bury cables to serve homes and mobile users, and it has the potential to deliver speeds of well over 1 Gbps using millimeter wave technology.

Georgia Power Chief Executive Paul Bowers said during a video at an AT&T event last month that it could reach "almost everywhere in our state" and "usher in a new era of connectivity for millions of customers."

AT&T now has started working with equipment manufacturers to build more refined hardware for a [new round of AirGig testing most likely in 2019](#). It aims to [launch the technology in 2021](#).

Others have looked at deploying [drones](#) or balloons to beam out high-speed signals. [Google's Project Loon](#) aimed to deliver internet to remote locations using a high-altitude balloon network, and Facebook wanted to [use drones and lasers](#) to give users high-speed internet connections.

Balloons and drones have been used in response to natural disasters but aren't seen as the most practical way to bring 5G and broadband internet speeds to rural America. Facebook said in June that it would [no longer build and design aircraft like Aquila](#), a giant drone with the wingspan of a Boeing 737, but that it would continue to work with partner companies like the aerospace manufacturer Airbus to invest in that kind of technology.

Trucking along with 4G

This summer, my mom called me to tell me about a segment she saw on RFD-TV, a rural news channel. In it, an expert said 5G would never come to rural areas. She wanted me to tell her whether that was really true -- though she had a sneaking suspicion it was.

My mother, who lives in rural Iowa, isn't alone in wondering if 5G will ever serve rural areas. In August, Sen. Jon Tester, a Democrat from [Montana](#), spoke at a [Senate Commerce, Science and Transportation Committee hearing](#) about the FCC. He too expressed doubts about 5G ever serving his constituents.

"I am happy that 5G, that Verizon is going into Indianapolis," he said. "I am very concerned that it will never come to Montana. We have advocated to put 5G in our biggest town, Billings, yet we have gotten no response whatsoever."

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More and more John Deere equipment, like the combine on the left and the sprayer in the center, use wireless connectivity to talk to other machines.

Shara Tibken/CNET

As Tester noted, parts of Montana, much like other areas of the rural US, have no cell service at all, let alone [4G LTE](#) or 5G.

"I think the primary challenge ... [is] what are we going to do about communities that are at risk of falling behind?" says FCC Commissioner Jessica Rosenworcel. "In rural America and urban America, too, we've got some places ... that don't have the service they deserve."

At the same time carriers are deploying their 5G networks, they're still building out their 4G LTE networks in rural areas and [constructing public safety wireless networks](#). Qualcomm's latest 4G modems [support 2GB LTE speeds](#), and carriers keep adding new regions. One thing working to 5G's advantage: The same backbone technology used for 4G LTE works for 5G.

"It's easy to upgrade from 4G LTE into 5G," says Erik Ekudden, chief technology officer at networking equipment maker [Ericsson](#).

But that's moot if there's not even 4G LTE in an area.

Back at John Deere's farm outside Des Moines, I learn more about the company's push with precision agriculture. Farming has gotten smarter, with tractors able to drive themselves and combines able to track the yield and ground conditions of fields.

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The aim with precision agriculture is to know, down to the individual plant, what's happening with a crop during planting, the application of fertilizer and harvest. Data is seen as key to the farms of the future, helping farmers predict the best way to run their operations.

But the information is useless if the farmers can't actually access it. Today, if workers don't have connectivity, they often have to load data onto a USB flash drive that they can download onto a computer. But farmers, like everyone else, want more. They want to access data remotely, checking in on employees out in the field or using drones to monitor their plants. All of that would be a lot easier with 5G.

For now, John Deere will keep designing its technology to work on slower 3G connections.

"For rural, [5G] is going to be important, just like everywhere else," Deere's Thompson says. "But today, [even with] 3G, there are a lot of places that still don't have connectivity."

CNET's Roger Cheng and Maggie Reardon contributed to this report.

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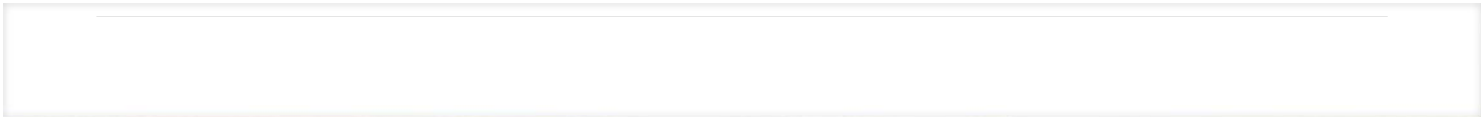
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