The Future of Mobile Networks and 5G

What is 5G?

5th generation mobile networks, abbreviated 5G, are the next generation of wireless telecommunications.. Carriers are marketing 5G for its provision of higher speeds, greater capacity, seamless connectivity, and lower latency, offering 1 gigabit per second or faster for greater numbers of users. 5G technology, according to available descriptions, combines fiber deployment with wireless connections to end-users, with the fiber needing to be within about 1,000 feet of the end user.

What will 5G do?

5G uses significantly smaller cells than traditional wireless network buildouts. At a minimum, 5G small cells provide a means to increase capacity in existing networks. Carriers suggest that 5G will support billions of connected devices, enabling the "Internet of Things," driverless cars, virtual and merged reality, smart agriculture, and other technologies that require heightened network capacity, communication, and data transfer. Verizon says "fixed wireless" (home Internet) will be its first 5G application. AT&T has talked about using 5G to replace its old DSL offerings, enabling the company to deliver a quad play of DirecTV service, 5G home Internet, wireless phone, and home phone.

When will 5G arrive?

Carriers have been announcing 5G's imminence for several years. AT&T, Verizon, and other carriers have announced plans to pilot and field-test 5G in several U.S. locations and have begun to deploy in limited markets. Most industry analysts note that 5G will not be widely implemented until 2020 or perhaps much later. And, then, it will be largely available in population dense, high-income, and fiber-rich areas. For example, it appears that none of the 3 companies (AT&T, Frontier, and Consolidated) accepting $590 million FCC Connect America Fund 2 (CAF2) funds in California will be deploying 5G technology to upgrade or reach 231,825 underserved and undeserved locations, although AT&T will be constructing fixed wireless infrastructure.

Why is 5G important?

A Qualcomm-led study claims that by 2023, when 5G is fully realized across the globe, the technology could produce up to $12.3 trillion worth of goods and services enabled by 5G. The same reports claims the "5G value chain" will generate up to $3.5 trillion in revenue in 2035 and could support 22 million jobs. Other studies question whether 5G services will find a sufficiently sizable market to support 5G's costs.

What will consumers need for 5G?

Existing devices currently won't work on 5G networks and 5G standards haven't been established. Consumer-ready, 5G-compatible devices will need to be developed, manufactured and distributed for public consumption. 5G likely will benefit hardware firms that can produce a new generation of must-have devices.

Is 5G a substitute for wireline broadband?
5G advocates intend 5G to be a substitute for wireline infrastructure to end users. However, every wireless communication ends up as a wireline transmission for backhaul or to the backbone. A January 2017 Vantage Point paper states: *"wireless technologies should be viewed as a complement—a tool in a toolkit—rather than a viable widespread substitute for wireline broadband networks. In fact, newer wireless technologies will rely more heavily than any predecessor wireless technology upon far deeper penetration of wireline facilities. Undoubtedly, 5G wireless technologies will result in better broadband performance than 4G wireless technologies and will offer much promise as a mobile complement to fixed services, but they still will not be the right choice for delivering the rapidly increasing broadband demanded by thousands or millions of households and businesses across America."* It also is generally recognized that 5G will not be a solution for reaching rural unserved communities and more remote areas, such as Tribal Lands, in the foreseeable future.

How will 5G affect rural broadband?
Industry experts caution that both 4G and 5G rely heavily on the wireline network and thus do not, in themselves, solve limitations on rural broadband infrastructure. This reliance on in-the-ground, expensive fiber infrastructure only will increase with 5G because only a small portion of the last-mile customer connection (the "local loop") will use wireless technologies. In other words, 5G networks are predominantly wireline deep fiber networks, with only a small portion of their network using a wireless technology—the connection to the end-user.

Will 5G work in rural areas?
Other than traditional licensed mobile spectrum held by existing carriers, the only spectrum available for use by 5G is so high in frequency that the propagation loss and environmental impacts are extremely significant in rural areas with diverse terrain. These high frequencies also have poor penetration capabilities. To overcome these shortcomings, the 5G wireless cells must be placed very close to the customer (often within 300 to 500 feet or at the most 1,000-1,500 feet), which make 5G deployment more problematic for many rural communities.

What are carriers doing to prepare for 5G?
While technology companies (such as Google and Facebook) have scaled back their fiber-to-the-premises (FTTP) plans, broadband providers—wired and wireless—are seeking to increase the amount of fiber in their network in preparation for 5G. Landline providers are replacing copper cable with fiber, cable operators are replacing coax cable with fiber, and even wireless providers are replacing wireless networks with fiber by placing their towers (or small cells) closer to the customer.

What will be the effect of 5G on the Digital Divide?
The Digital Divide—particularly between rural and urban areas—could widen as 5G rolls out, because there is little economic incentive to provide 5G in areas that are not population dense and fiber rich. Also, given that 5G will require a new generation of 5G-ready devices, low-income consumers will have difficulty paying for the likely higher costs for both computer hardware and wireless and wireline service fees. Thus, as technology evolves, additional effort will be needed to ensure that there is not a widening divide between low-income communities and the rest of California.