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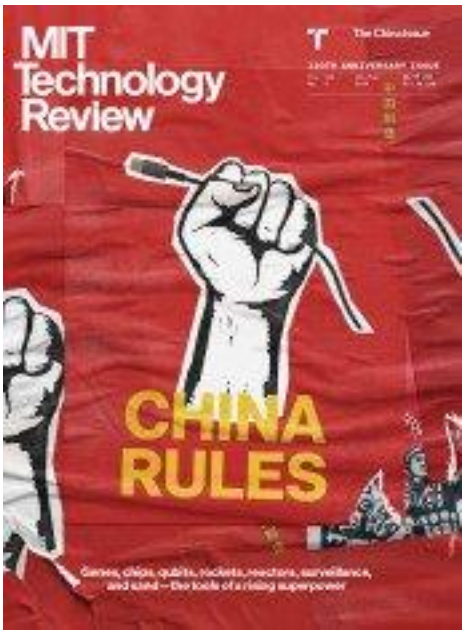

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China is racing ahead in 5G. Here's what that means.

The next generation of wireless technology promises much faster speeds while using less power. No wonder Beijing is throwing everything at getting there first.

by Elizabeth Woyke

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The Fangshan district is a quiet outer borough in southwest Beijing. Until recently it was best known for its petrochemical and steel plants. Today, this neighborhood of sleepy apartment buildings and train tracks is part of a mobile revolution enveloping cities across China: the world's biggest rollout of 5G technology.

Last fall, the Fangshan government and China Mobile, the country's largest mobile operator, outfitted a 6-mile (10-kilometer) road with 5G cell towers. Since September 2018, companies have been using the connectivity to test wireless communications between autonomous vehicles and their surroundings. The 5G network transmits data from car sensors, roadside sensors, and video cameras installed above the road to a local data center, which analyzes the information and sends it back to the vehicles to help them navigate.

How does 5G make this possible? Unlike previous generations of mobile technology, which tended to introduce a single novel feature for users (1G let you walk and talk, 2G let you send texts, 3G got you onto the internet, and 4G let you stream), 5G promises a whole suite of dramatic improvements. It uses entirely new wireless infrastructure to achieve speeds up to 100 times faster than 4G and promises to nearly eliminate any processing delays. It will also kick-start the internet of things, since it was designed to connect billions of machines, appliances, and sensors at low cost without draining their batteries.

China knows this all too well. In its 13th Five-Year Plan the government describes 5G as a "strategic emerging industry" and "new area of growth," and in its Made in China 2025 plan, which outlines its goal of becoming a global manufacturing leader, it vows to "make breakthroughs in fifth-generation mobile communication."

Clearly, China is serious about making this work—and on an epic scale. Here's what that means.

Why is China going all out for 5G?

National pride, for one thing. China sees 5G as its first chance to lead wireless technology development on a global scale. European countries adopted 2G before other regions, in the 1990s; Japan pioneered 3G in the early 2000s; and the US dominated the launch of 4G, in 2011. But this time China is leading in telecommunications rather than playing catch-up. In a TV interview, Jianzhou Wang, the former chairman of China Mobile, China's largest mobile operator, described the development of China's mobile communication industry from 1G to 5G as "a process of from nothing to something, from small to big, and from weak to strong."

Money is another good reason. The Chinese government views 5G as crucial to the country's tech sector and economy. After years of making copycat products, Chinese tech companies want to become the next Apple or Microsoft—innovative global giants worth nearly a trillion dollars.

The China Academy of Information and Communications Technology (CAICT), a government-run research institute, estimates that 5G will create more than 8 million jobs domestically by 2030. The agency thinks major industries, including energy and health care, will spend billions of dollars collectively on 5G equipment and wireless service during that period.

How is China making it happen?

The government controls all three of the country's mobile operators (China Mobile, China Telecom, and China Unicom) and has been "guiding" them to deploy large-scale 5G test networks in dozens of cities, including Beijing, Shanghai, and Shenzhen. China Mobile claims that its tests alone represent the world's largest 5G trial network.

Under government direction, Chinese companies began conducting research on 5G in 2013 and holding technical trials of related technologies in 2016. "Chinese operators see their job as implementing government policy, whereas most global telecom companies try to balance competitive factors and will naturally invest at a slower pace," says Chris Lane, a research analyst for investment management firm Sanford C. Bernstein.

Beijing has also committed to giving Chinese operators large chunks of spectrum for 5G. That's a far cushier arrangement than operators enjoy in the US and many other countries, where they pay regulators billions of dollars for the right to use slivers of spectrum. These radio frequencies carry wireless signals and are critical to cellular service, especially 5G, which will need wide swaths of bandwidth to provide users with superfast speeds.

What will it make possible in China?

China wants to use 5G in smart cities and connected cars—for starters. A prime example is Xiong'an, a new city that the government is building 80 miles (129 km) southwest of Beijing to ease crowding in the capital. China Mobile and China Telecom have already established test networks there. Companies including web giant Baidu are using these networks to live-stream events in virtual reality and, as in Fangshan, enable autonomous vehicles to transmit data to each other so they can avoid collisions. Local authorities have encouraged developers to create 5G-

based applications related to telemedicine and urban infrastructure, while Chinese companies want to use 5G to add connectivity and intelligence to factory equipment.

“Chinese cities are chaotic at many, many levels,” says Paul Triolo, who analyzes global technology policy for the Eurasia Group, a political risk consultancy. “The government thinks 5G will help it manage this population by smoothing the flow of traffic and generally making cities more efficient and livable.”

What will Chinese businesses get out of it?

Early access to robust 5G networks could give China an edge in developing and monetizing services that use them—just as Silicon Valley profited from apps like Instagram, Uber, and YouTube after 4G LTE networks launched. Because the US was the first country to make 4G available on a wide scale, American firms were quick to take advantage of it and sell the resulting apps globally. China’s manufacturing center, Shenzhen, could tap 5G to connect huge volumes of devices to the cloud and become a leader in the internet of things (IoT).

Is the US being left behind?

It depends how you define the 5G race. If you count the launch of commercial service in any form, the US is in front of China. Verizon started selling its own 5G service, which is essentially a wireless version of wired broadband for homes and offices, in four US cities in October. AT&T plans to introduce mobile 5G service in 12 US cities before the end of the year. T-Mobile and Sprint say they will turn on their 5G networks by mid-2019. Chinese operators don’t plan to start selling 5G service until 2020.

However, if you think a country needs to roll out 5G to all its major cities in order to claim leadership, China looks likely to come out ahead. China Tower, a company that builds infrastructure for the country’s mobile operators, has said it can cover China with 5G within three years of the government’s allocation of spectrum. That points to national coverage by 2023.

In the US, the process will probably be far slower because more infrastructure will need to be built out. Chinese carriers will mostly use a spectrum band similar to what they used for 3G and 4G, which will allow them to reuse a number of their existing cell sites, according to Mike Murphy, who heads global 5G technology development for Nokia. But in the US, AT&T and Verizon plan to use a high-frequency band in which signals travel less far, which will require three to four times more cell sites than 4G did. The carriers will need to negotiate contracts to install these sites with each city, and a number have already signaled resistance.

Equipment makers expect China to be able to roll out 5G much more rapidly. “History tells that [Chinese operators] ramp up very quickly,” says Thomas Noren, who heads 5G commercialization efforts for Ericsson, one of the world’s largest manufacturers of mobile network equipment. “They have [already] built more than an order of magnitude larger 4G networks than those in the US.”

No matter which country seizes the lead, network deployments won’t be the only factor that decides the so-called race to 5G. “Creativity and entrepreneurialism will be equally important,” says Lane.

With reporting from Yiting Sun