TECH NEXT™

# NASPO TECH NEXT SERIES

## Fifth Generation Communications Technology (5G)

*In this edition of the Tech Next series, we will explore:*

**What is 5G Technology?**

**What Can Be Done With 5G?**

**What are the Challenges of 5G?**

**What Are State Governments Doing about 5G?**

**A 2017 Accenture Strategy study estimated that by 2024, Fifth Generation (5G) technology will bring to local municipalities an estimated $275 billion in investments, three million jobs, and a $500 billion increase to local Gross Domestic Product (GDP) on top of promises for more connectivity and even faster connections to the internet.**

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## What is 5G?

Fifth Generation (5G) is the newest technology, and it is more than just an increase in speed. It is a whole new system of transmission of data for 5G compatible mobile devices including everything from phones to home thermostats. Here are the basics:

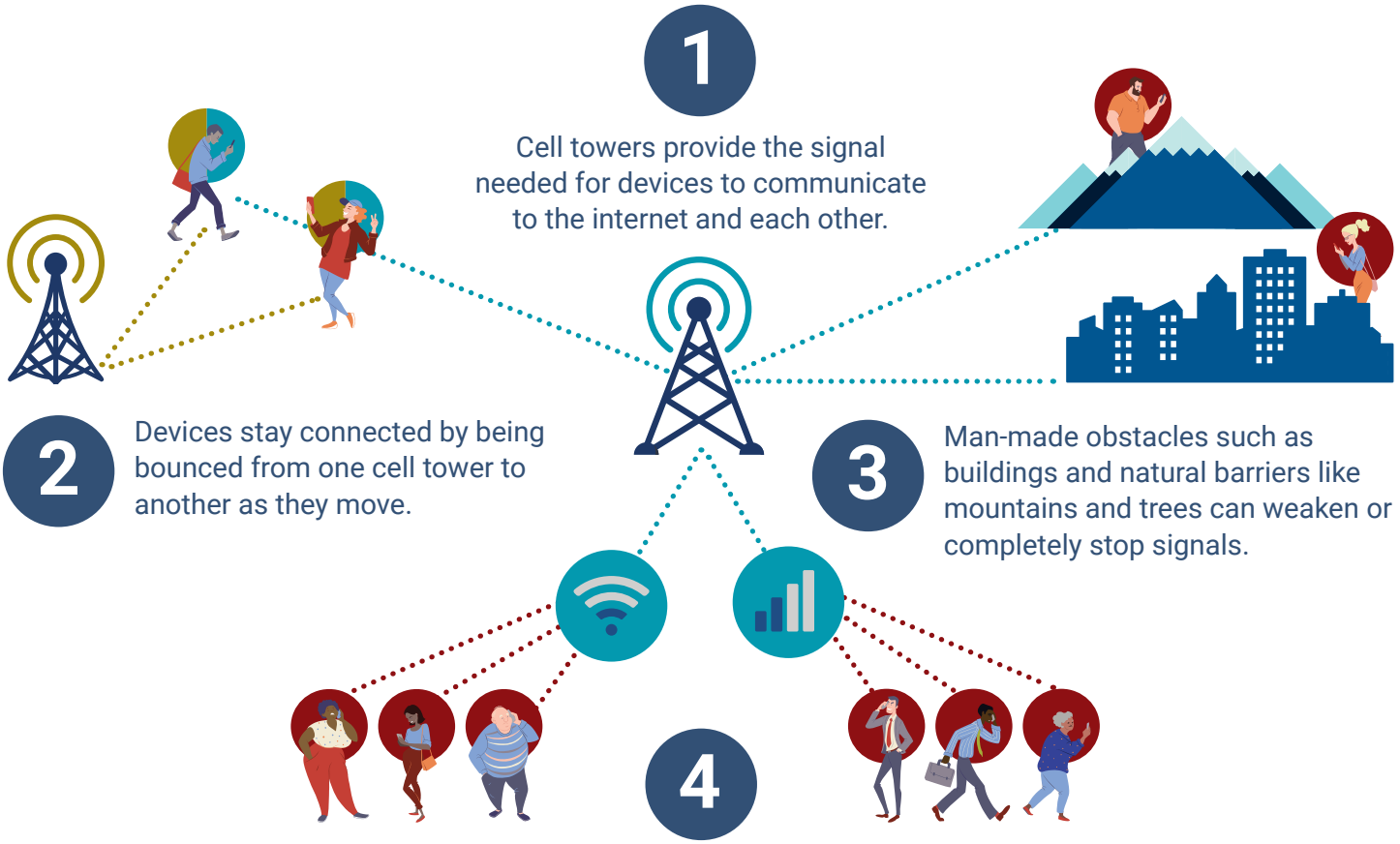
**4G VS 5G COMPARISON OVERVIEW**

| | DATA TRANSMISSION FROM TOWER TO DEVICE | DOWNLOAD SPEED (AT PEAK PERFORMANCE) | RANGE |
|---|---|---|---|
| 4G | 70 milliseconds | 1 gigabyte (Gb) per second | A few miles (depending on factors) |
| 5G | Less than 1 millisecond | 20 gigabytes (Gb) per second | A few hundred feet (depending on factors) |

*Note.* From "5G Bytes: Small Cells Explained" by A. Nordrum, K. Clark, & IEEE Spectrum Staff, 2017, https://spectrum.ieee.org/video/telecom/wireless/5g-bytes-small-cells-explained. Reprinted with permission.

## CURRENT 4TH GENERATION (4G) TECHNOLOGY SYSTEM

**Current 4th Generation (4G) technology and previous mobile communication technology (2G & 3G) relies on an overlapping system of towers throughout the country.**

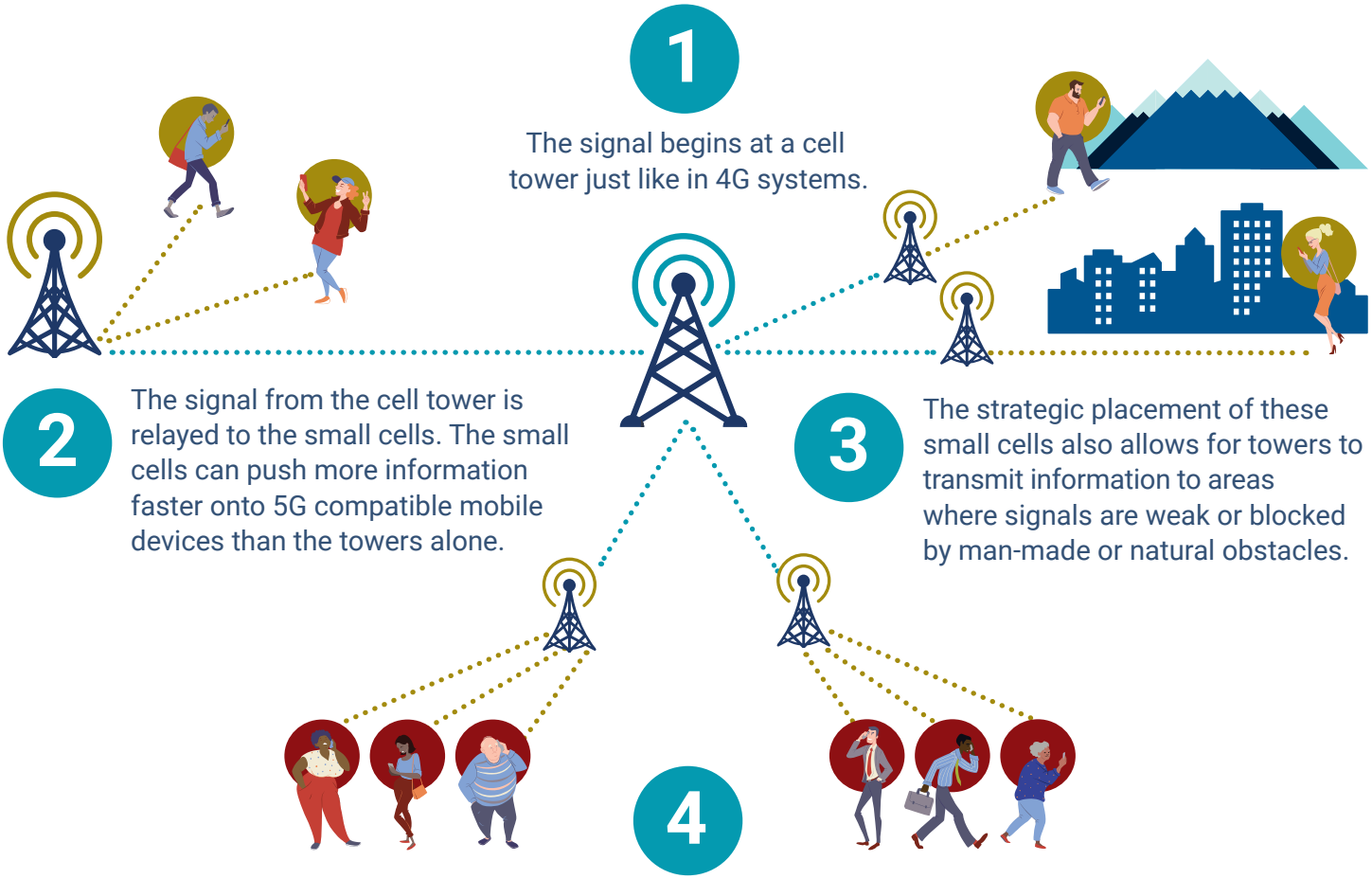


1. Cell towers provide the signal needed for devices to communicate to the internet and each other.
2. Devices stay connected by being bounced from one cell tower to another as they move.
3. Man-made obstacles such as buildings and natural barriers like mountains and trees can weaken or completely stop signals.
4. The number of users around the tower can weaken the signal by overusing it.

*Note.* From Nordrum, A., Clark, K. IEEE Spectrum Staff. (2017, August 19). 5G Bytes: Small Cells Explained. https://spectrum.ieee.org/video/telecom/wireless/5g-bytes-small-cells-explained. Reprinted with permission.

## 5TH GENERATION (5G) TECHNOLOGY SYSTEM

**5G technology enhances the already existing system by using a series of small cells. Small cells are more powerful versions of the cell towers but have a more limited range. Despite their shorter range, these towers allow data to be transmitted faster and increase download speeds.**



1. The signal begins at a cell tower just like in 4G systems.
2. The signal from the cell tower is relayed to the small cells. The small cells can push more information faster onto 5G compatible mobile devices than the towers alone.
3. The strategic placement of these small cells also allows for towers to transmit information to areas where signals are weak or blocked by man-made or natural obstacles.
4. An overlapping network of these small cells supports 993,500 more connected devices to the network than 4G and previous systems.

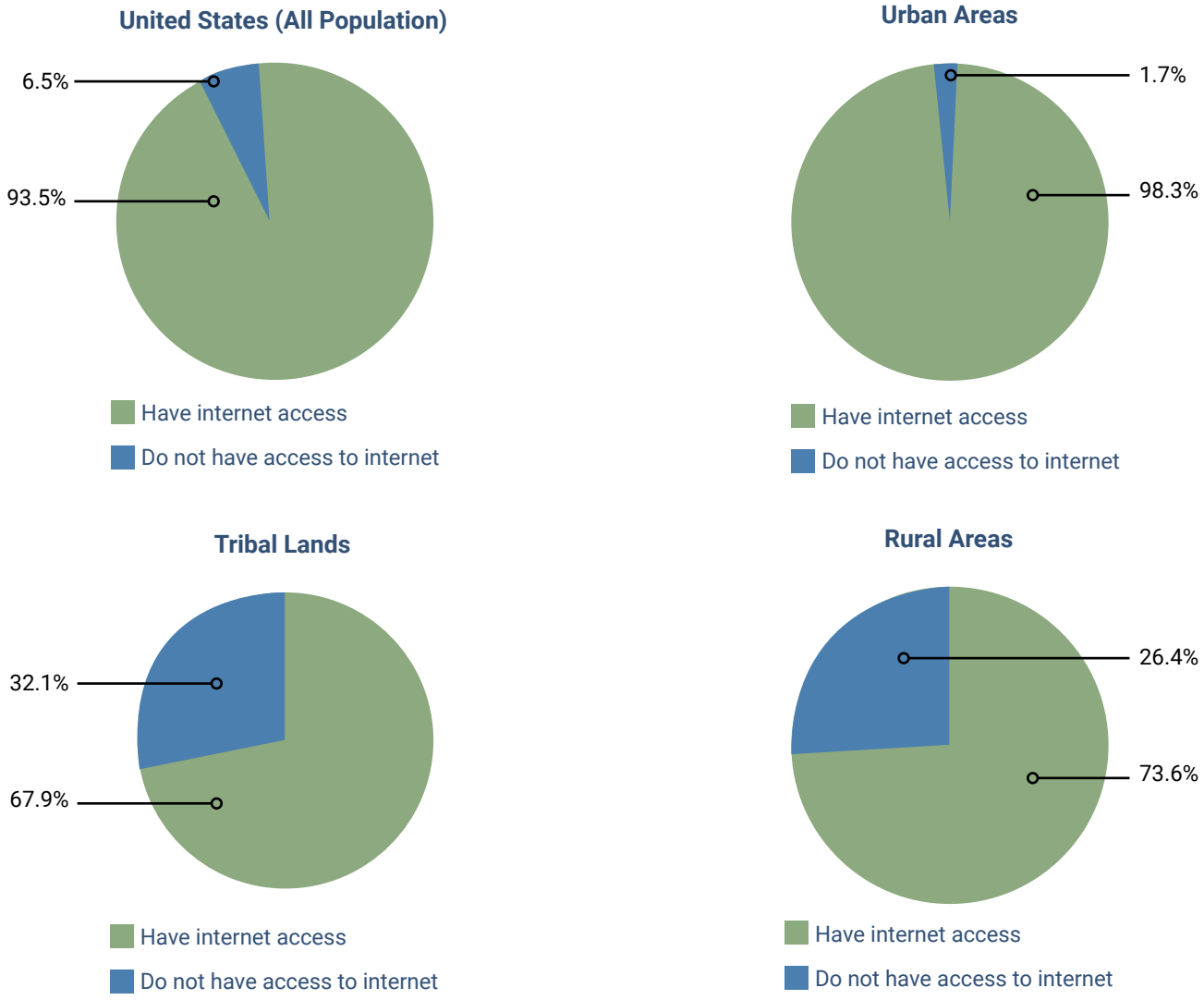
*Note.* From Nordrum, A., Clark, K. IEEE Spectrum Staff. (2017, August 19). 5G Bytes: Small Cells Explained. https://spectrum.ieee.org/video/telecom/wireless/5g-bytes-small-cells-explained. Reprinted with permission.

**The 5G network is only compatible with 5G devices, i.e., not current 4G models. To take advantage of this system, procurement offices will need to purchase an entire family of 5G compatible devices.**

# What Can Be Done With 5G?

## Expanding Access to Fast Broadband Internet

5G can help more people access broadband internet. The **Federal Communications Commission** (FCC) classifies residential broadband internet service as an internet connection that meets the minimum benchmark speed of 25 megabytes per second (Mbps) download speed and 3 megabytes per second (Mbps) upload speed. However, it is important to note that this FCC standard of 25 Mbps download speed is still only 2.5% of current peak 4G download speeds of 1 gigabyte per second (Gbps).




*Note. From Federal Communications Commission. 2019a. 2019 Broadband Deployment Report.* **https://docs.fcc.gov/public/attachments/FCC-19-44A1.pdf.** Reprinted with permission.

Access to even this low speed of broadband is not equal. Urban areas have more access to the internet than rural areas and tribal lands. In the last few years access to broadband internet has increased, but much progress still needs to be made.

Experts say that a combination of 5G and "White Space" broadband could help end the gap between urban areas and rural areas/tribal lands. White Space broadband is an internet service provided through **old analog television signals used before the mandated switch to HDTV signals in 2009**.[1] White Space offers significantly more range but weaker signals than 5G. 5G could give individuals in rural and tribal areas access to faster internet by having customers use individual devices that resemble small cell antenna technology. The White Space broadband could provide the signal, while the small cell antennas could strengthen the signal to meet internet speed standards.[2]

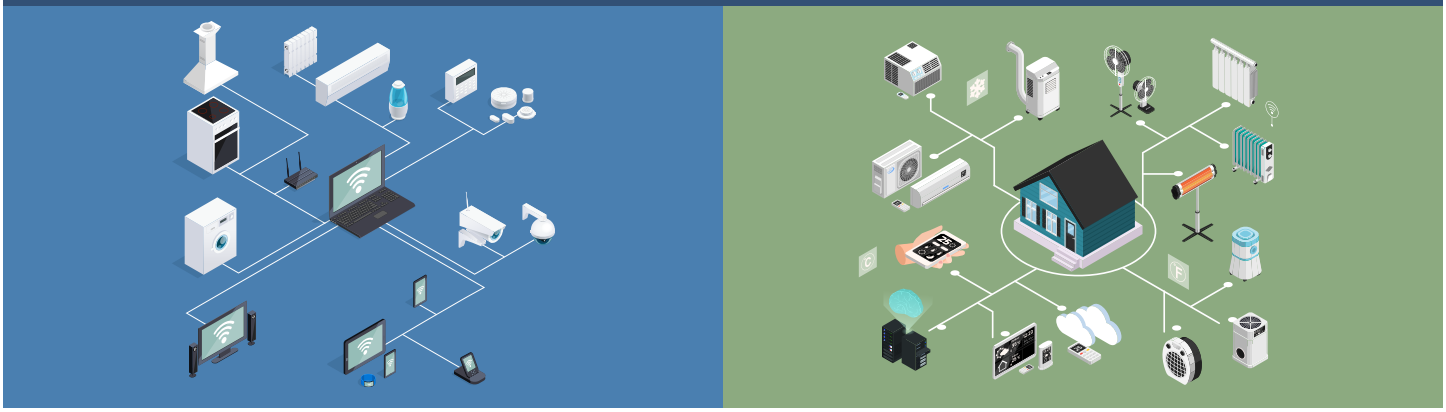
## The Internet of Things (IoT)

The most significant change 5G could bring is the increased connectivity of devices. Devices already in the market that demonstrate this increased connectivity include smart refrigerators that tell us when our food supply is low or smart doorbells with cameras to show us who is at the front door, even when we are not home. Experts call this connection of smart devices the Internet of Things (IoT). However, the IoT system is limited by network speed and the number of devices allowed in the current 4G network. With 5G connections, it is predicted that connections will be so fast that chains of automatic sensor systems could be implemented for the first time so that devices could speak to each other. [3]

A combined robust 5G network with IoT could lead to:

- Self-driving vehicles for seniors to help them age in place (**according to CDC**, "it is the ability to live in one's own home and community safely, independently, and comfortably, regardless of age, income, or ability level")
- Increasing agricultural crop yields with automatic sensors and drones that can make more efficient use of fields
- Smart sensor insulin level trackers for people with disabilities
- Smart home sensors that prevent water and electric waste by automatically adjusting settings[4]

**Read more about the Internet of Things (IoT) in NASPO's Tech Next: Internet of Things paper.**



[1] Pressgrove, J. (2020, March 26). 'White Space' Internet Could Connect the U.S.'s Isolated Places. *GovTech*. **https://www.govtech.com/network/White-Space-Internet-Could-Connect-the-USs-Isolated-Places.html?utm_term=READ%20MORE&utm_campaign=What%20Does%20the%20COVID-19%20Stimulus%20Bill%20Mean%20for%20Tech&utm_content=email&utm_source=Act-On+Software&utm_medium=email**

[2] O'Donnell, B. (2020, April 30). Can 5G Become Your New Broadband Connection? *USA Today*. **https://www.usatoday.com/story/tech/columnist/2020/04/30/5-g-wireless-could-become-home-broadbandconnection/3035386001/**

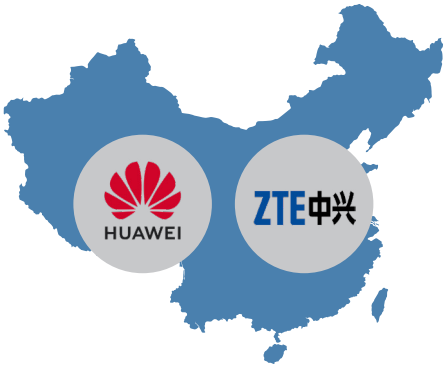
[3] Abbosh, O. & Downes, L. (2019, March 5). 5G's Potential, and Why Businesses Should Start Preparing For It. *Harvard Business Review*. **https://hbr.org/2019/03/5gs-potential-and-why-businesses-should-start-preparingfor-it**

4 Greenberg et al. (2020.) *5G In Government*. Deloitte. **https://www2.deloitte.com/us/en/insights/industry/public-sector/future-of-5g-government.html**


## What are the Challenges of 5G?

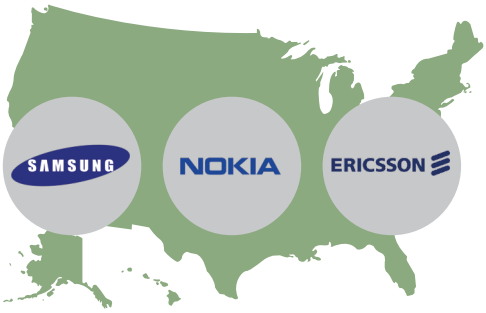
### Limited Market

1




The federal government has claimed that the Chinese government has purposefully put vulnerabilities in 5G devices they manufacture to gain cyber security leverages over other governments. Due to this, the federal government **has banned American individuals and American firms from buying 5G devices** from Chinese firms like **Huawei and ZTE**.

2



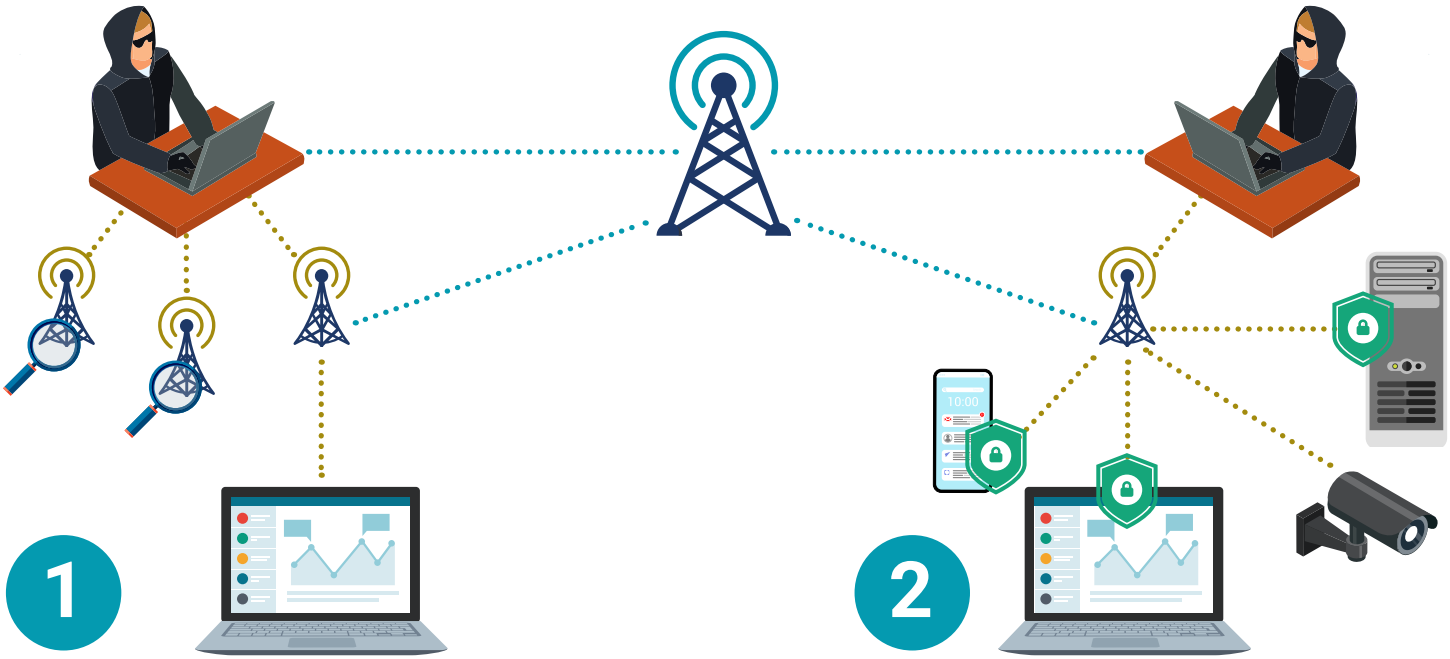

This **has limited the number of small cell station** providers for the American market to Ericsson, Nokia, and Samsung.

3


The Chinese firms **Huawei and ZTE offer cheaper device alternatives to the main western suppliers**. The control of the market by a few firms may keep prices higher, but as the technology becomes more widespread, prices could decrease.

## Security

Vulnerabilities also come with the system because of the speed and number of potential devices connected to the network.



1

The higher speeds and the reliance on many small cell antennas could make it difficult to track system intrusions.

2

More connected devices to the IoT network opens those devices up to security vulnerabilities; for example, hackers can exploit the fact that one device in the network does not have security to enter an entire network.

**Experts point out that many of the vulnerabilities 5G contains are the same ones found in current systems like 4G.**

## Implementation

Utilizing 5G not only requires a compatible device but proximity to a 5G tower. Currently, only major American cities have access to 5G signals, and access is still dependent upon the individual's cell phone provider. Even if there is a 5G provider in a city, the 5G signal might not be available to all residents.

There are challenges on the local level when it comes to implementation as well. Opposition has come in the form of **Realtors Associations and homeowners** on the placement of towers due to a **2019 FCC rule** that would open up cities to lawsuits if they deny small cell permits. Cities around the country have claimed this is an overreach of the federal government into local zoning laws and **some have sued to try to end the FCC rule**. Most homeowner opposition comes from health concerns regarding possible radiation from small cell antennas and a decrease in property values. **The National Institutes of Health and the National Toxicology Program** have not found any evidence of 5G small cells causing health problems. No conclusive study has shown that 5G towers reduce property values either.

## What Are State Governments Doing About 5G?

Some states have started initiatives to explore how 5G can help their governments. Other states have streamlined the process for installing 5G in their states. Here are just a few highlights:

### Connecticut

Connecticut's Governor created the **Governor's 5G Council** through **2019 HB 7152**. The council's main goal is ". . .adopting guidelines for wireless carriers seeking to build on state owned property, concerning the safe placement of personal wireless service facilities and small wireless facilities, the protection of open space land when reviewing for use of state real properties and extensions of time for a determination by the council."

### Hawaii

In 2018, the Hawaii legislature **passed a law** that streamlines the process for placing 5G small cell antennas throughout the state.

In 2021, Hawaii introduced **SB 851**, which allows companies to ignore local zoning laws when placing 5G small cell antennas in an underserved or unserved area.

### Michigan

In 2020, the Michigan legislature passed **omnibus bill HB 5396** that appropriated $500,000 to a 501(c)(6) non-profit for the purposes, "of promoting and developing 5G technology for autonomous ground vehicles, educational purposes in areas of the state with limited internet access, and health care purposes across the state in connection with the convergence of low-earth space satellite technology with one or more space launch facilities and an accompanying command center in this state."

### New Hampshire

New Hampshire's Governor in 2019 created the **Commission to Study the Environmental & Health Effects of Evolving 5G Technology**.

### New York

In 2019, New York passed a bill (**A8988**) directing several agencies to explore how 5G will affect the state government and the citizens of New York.

## Summary

The potential of 5G is very exciting with what seems to be endless possibilities. 5G and its enhancement of connectivity has the potential to solidify the Internet of Things and change the future of technology.

The impact it will have to solve internet inaccessibility could provide opportunities to those communities that have not been able to take advantage of the basic benefits of being connected. In 2020, it became apparent how crucial internet access has become to carry out essential business. It underlined the necessity for all to have access. Experts hope that the advancement in 5G can increase equality by drawing income gaps closer and by equipping more people with the necessary tools to succeed.

Only time will tell how this will directly impact government procurement. Some possibilities include changing the way procurement is done not only in the processes, i.e., software and platforms that procurement will use, but also the kinds of products and services that state governments will procure. Cutting edge technology may impact legislation and the need for lawmakers to amend statutes. Procurement officers will need to stay informed on this rapidly changing technology and the potential impact that it may have on their states.

### Additional Reading

- Every 5G Phone Announced So Far So You Can Get a Faster Internet Connection by *Digital Trends*
- Where is 5G Available? Our 5G Network Map Has the Details by *Digital Trends*
- Accelerating 5G in the United States by *Center for Strategic and International Studies*
- 5G in Government: The Future of Hyperconnected Public Services by *Deloitte*

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