

# **The Fourth Utility**

Integrating 5G into the Federal Government

## AT THE FOREFRONT

As the world becomes increasingly connected, more and more businesses and government agencies are looking for ways to move at pace. The advent of 5G heralds a new era of opportunities for increased connectivity, and a reimagining of what telecom infrastructure can look like—functioning as a utility alongside water, power, and gas. Most importantly, 5G has the capacity to help governments move faster and work smarter.

## 5G: THE BASICS

- The “**fifth generation**” of wireless networks began deploying in the U.S. in 2018.
- The network will **bring bigger channels, lower latency**, and the ability to connect to **many more devices at once**.
- Higher bandwidth means more opportunities to share information faster and easier, eventually at a download rate of **10 gigabytes per second**.
- 5G networks will operate on three frequency bands (low, middle, and high). Moving between bands means **tradeoffs in cost and speed**.

## 5G: THE INFRASTRUCTURE

- **Macro Cells:** Allows more users to access the network using multiple input, multiple output (MIMO) antennas, providing broad coverage.
- **Small Cells:** A short connection range distributed in clusters, providing coverage for high-density areas like buildings or crowded public spaces.
- **Local Servers:** Manages localized data streams. Possible tools include network slicing (segmenting network for particular use) and network function visualization (enabling any network function, including security functions, anywhere on the network at any time without the use of hardware).



# A NEW ERA OF CONNECTION



**FAST AND RELIABLE LOW LATENCY COMMUNICATIONS:** Mission critical real-time control of devices, including those on the edge, such as industrial robotics, safe transport, and even remote medical care.



**ENHANCED BROADBAND:** Enormously expanded connectivity, with rapid download speeds 10 to 20 times faster than 4G, and increasing access in the field.



**INTERNET OF THINGS (IOT):** Enabling machine-to-machine communication and supporting device densities of 1 million per square kilometer, a potential game-changer for agriculture, business, and communication processes.

5G has the potential to change the way that we connect. Investments in smart cities, broadening quality digital access to rural areas, and helping soldiers on the battlefield receive remote medical care are just some examples of how this network could have social and economic effects.



The U.S. could **sustain major gains in employment and economic growth** with widespread deployment of 5G. [...] Potential benefits include increased access and availability to more advanced health care and education, reduced pollution and increased efficiency in transportation, and enhanced public safety response capabilities.”

— GAO<sup>1</sup>

## **5G AND THE FEDERAL GOVERNMENT**

The advent of 5G opens up a range of new opportunities for the federal government, from investments in internet access expansion to updating office network capabilities. The FCC is working to expand spectrum access, including auctioning high-band spectrum, building out mid- and low-band spectrum, and working with unlicensed bands. The Department of Defense has been a leader in 5G innovation, but many agencies still remain wary of 5G adoption.

## DEPARTMENT OF DEFENSE INVESTMENT

The Department of Defense (DoD) is one of the strongest federal proponents of 5G, incorporating it into the National Defense Strategy and experimenting with IoT prototypes.

The National Defense Strategy highlights four key goals— promoting technology development; assessing, mitigating, and operating through 5G vulnerabilities; influencing 5G policies and standards; and engaging partners in their efforts. The military sees strong investment into 5G as a game changer that can offer an insurmountable edge, much like investment into radar technology during World War II. As such, the DoD has implemented policy and designated investments to support the accelerated growth of 5G.<sup>2</sup>

## National Defense Strategy

“5G is important to DoD because it offers higher performance and additional capabilities, particularly for data-driven applications and for machine-to-machine communication. These capabilities will become the foundation for a new networked way of war that brings together sensors and machines that will revolutionize the battlespace and the logistics and support functions behind the front lines. DoD must have access to a 5G defense industrial base that provides trustworthy 5G technologies.”<sup>3</sup>



# DEPARTMENT OF DEFENSE INVESTMENT

## *Experimentation and Prototyping*

In October of 2020, the DoD announced \$600 million in award contracts to test and evaluate 5G technologies at five military installations (“test beds”) across the United States.



### **JOINT BASE LEWIS-MCCHORD, WASHINGTON – AUGMENTED REALITY/VIRTUAL REALITY TRAINING :**

Rapidly fielding a scalable, resilient, and secure 5G network for experimentation with a 5G-enabled Augmented Reality/Virtual Reality (AR/VR) capabilities.



### **NAVAL BASE SAN DIEGO, CALIFORNIA, AND MARINE CORPS LOGISTICS BASE, GEORGIA – 5G SMART**

**WAREHOUSING:** Focusing on increasing the efficiency and fidelity of logistics operations, as well as creating proving grounds for testing, refining, and validating emerging 5G-enabled technologies. In June 2021, the Smart Warehouse Technology Early Capabilities Demonstration successfully delivered high-speed downloads of 1.5 Gbps and sub 15 msec latency.<sup>45</sup>



**NELLIS AIR FORCE BASE, NEVADA – DISTRIBUTED COMMAND AND CONTROL :** Developing a testbed for use of 5G technologies to aid in Air, Space, and Cyberspace lethality while enhancing command and control survivability in agile combat employment scenarios.



**HILL AIR FORCE BASE, UTAH – DYNAMIC SPECTRUM UTILIZATION :** Developing sharing/coexistence system prototypes and evaluating their effectiveness with real-world, at-scale networks in controlled environments, particularly between airborne radar systems and 5G cellular systems.

## *Reshoring the Industry*

These test beds represent not only an opportunity to develop cutting-edge technologies that will give the DoD tactical advantages, but also address security concerns stemming from China’s dominance in the telecommunications industry. Cybersecurity is a top priority for the Department, which is in the process of creating its own set of standards for industry partners that aim to maintain supply chain security. Producing this technology in-house is one step in securing the networks.

# CIVILIAN GOVERNMENT: THE RAMP UP TO 5G

Civilian government agencies have been slower than the Pentagon to embrace 5G, but the opportunities of the network are becoming increasingly apparent. Agencies are facing several considerations as they move forward.



## ***Customized Agency Networks***

The DoD'S 5G rollout was successful in part because the Pentagon customized their network to meet their mission. The first tranche of DoD innovation test beds highlight networks that are adaptable to serve localized needs, rather than being opened up. Other federal agencies can take advantage of this customized approach as well, ensuring that the infrastructure they create is specific to their needs and mission.<sup>7</sup>



## ***Software-Defined Architecture***

The move to a software defined architecture will likely radically shift where and how government agencies can work. Enabling technology from anywhere, including the edge, also signals a need for a culture change in understanding what is needed and what is possible. However, this architecture also means that security is not the sole responsibility of the network provider anymore — mission owners must be ready to think about security early, ensuring that they are protected at every point along the chain.<sup>8</sup>



## ***5G as a Force Multiplier***

Beyond increased access and lower latency, 5G can enhance the opportunities presented by other emerging technologies, including artificial intelligence, machine learning, and multi-access edge computing (MEC). Hyperconnected public services can increase rural access to the internet, provide key real-time information for first responders, and support smart cities.



## ***Spectrum Sharing Technologies***

With the proliferation of 4G as well as rapid growth in 5G, demand for spectrum access far exceeds supply. This makes spectrum access a precious commodity. Sharing the spectrum — being able to intelligently and automatically prioritize and deprioritize usage seamlessly and efficiently — will be a key tool to maximize efficiency, ensure security, and maintain regulatory compliance.<sup>9</sup>

# WHAT IS NEEDED?



## ***In-Building Connectivity***

The physical aspects of many federal buildings both pose challenges to connectivity. Age and outdated infrastructure both make it harder for signal to penetrate walls, particularly with building materials like concrete, drywall, and metal that disrupt reception. In order to access the signal with these impediments, agencies will need to invest in distributed antenna systems and small cells to ensure coverage throughout the building.



## ***Fiber Optic Requirements***

While much of the focus on 5G has been on its wireless capabilities, fiber optics is a foundational aspect of building out this infrastructure. Cell densification and increasing antennas require backhaul connections to the network through a central space, where wireless signals will be decoded and routed to the appropriate data center. Expanded transmission backhaul capacity will require more fiber optics in both the data center and external fiber network.

Advanced fiber networks will be able to take advantage of Wavelength Division Multiplexing (WDM), which allows fiber to use different wavelengths to transmit multiple signals on the same strand. This allows more connection with different devices at once with low latency, maximizing use of the fiber.

The federal government has already made significant investments into fiber optics, both for its buildings and as a way of expanding high-speed internet access nationwide. These investments are largely seen as “futureproof” infrastructure, both for the government itself and for the communities they serve.



## ***Security***

Security is one of the largest challenges facing 5G expansion. Without the traditional firewall, the threat surface grows considerably; the supply chain is more susceptible to inadvertent or malicious introductions of vulnerabilities; and there is a higher risk of threat actors influencing design, among other concerns. The Cybersecurity & Infrastructure Security Agency (CISA), in conjunction with the National Risk Management Center, has identified potential threat vectors to 5G implementation, and is working on a risk management strategy for industry and public sector agencies to limit exposure. Security will always be a consideration as federal agencies adopt the network.

## CONCLUSION

Like water, power, and gas, access to the internet will likely become a necessary utility for the public.

The federal government has a vested interest in being at the forefront of this wave, working to not only develop tools that help maintain a tactical advantage, but those that can improve the speed and efficiency of government processes, and become a public good that ensures access for all citizens. Investing in this infrastructure in a timely manner is key to staying ahead of the curve. 5G is a tool that can be customized for each agency to support their key missions and help move them forward into the next era of connectivity.



## INDUSTRY PERSPECTIVE

5G will enable government agencies to send and receive large amounts of data at lightning speeds. In addition to faster transmission, 5G offers low latency and defined quality of service to support next-generation capabilities such as artificial intelligence, advanced analytics, virtual reality, and other mission-critical applications. That said, to fully-deploy 5G inside a building, agencies need to consider the infrastructure layer including distributed antenna systems (DAS) and fiber cabling.

This Issue Brief positions 5G as a “new era of connection.” This era can start with CommScope’s ERA® all-digital DAS, which delivers high-performance in-building connectivity with speed and simplicity. The modular system supports today’s cellular coverage and capacity demands and scale to deliver 5G when ready. This allows agencies to migrate with confidence—without ripping and replacing infrastructure.

CommScope’s all-digital ERA is a next-gen, future-ready solution that minimizes head-end space and power consumption and fiber runs. ERA is easy to install, manage and operate—all while providing the flexibility to upgrade, expand and grow.

Additionally, the true promise of 5G is heavily dependent on a robust fiber infrastructure. The fact is that many agency networks still feature legacy copper and wireless technology—which is no match for the formidable performance provided by 5G. CommScope knows how to retrofit agency networks to enable the power of 5G.

For more information on how we can support your wireless initiatives, visit: <https://www.commscope.com/federal-wireless>.

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# ENDNOTES

1. <https://www.gao.gov/assets/gao-21-26sp.pdf>
2. <https://www.nextgov.com/ideas/2021/04/why-military-leading-charge-5g/173438/>
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