The Future of 5G tech in Defense is here.

AT&T

5G

5G is considered a whole of government initiative and a national priority. Defense agencies have begun implementing this next-gen mobile technology in a series of pilot programs designed to improve mission effectiveness.

In this report, industry experts share their insights on the long-term vision of 5G in the DOD, highlighting the importance of sharing spectrum and fostering long-term working relationships between government and the private sector.

For the DOD, moving away from purpose-built systems and relying on commercial innovation such as 5G can ultimately lead to a unified approach for command and control. Take for example:

- Robotic dogs patrol and monitor the perimeter of a military installation and send an alert to the base patrols' devices to inform them of a possible intrusion or breach.

- Advanced sensors on building infrastructure detect and alert drone breaches in real time, sending data to the base operations center.

- Automated flight line entry control point monitoring of land for Air Force pilots at missile bases can reduce the burden on personnel resources.

From the improbable to the seemingly impossible, these are projects that are already in the works thanks to the promise, potential and power of 5G.

Introduction

The fifth generation of wireless networks and technologies is predicted to usher in major advances in data speed, volume and latency over current 4G and LTE networks—setting the stage for sweeping transformations across nearly every industry.

In fact, AT&T Public Sector is already working with the Defense Department on 5G initiatives that will change how the DOD, the White House and commercial partners tackle national security.

"When we think about the DOD's primary mission and that it is national and global in nature, quick access to large volumes of information and data is imperative to conduct their mission," says Jill Singer, vice president of defense and national security for AT&T Public Sector and FirstNet.

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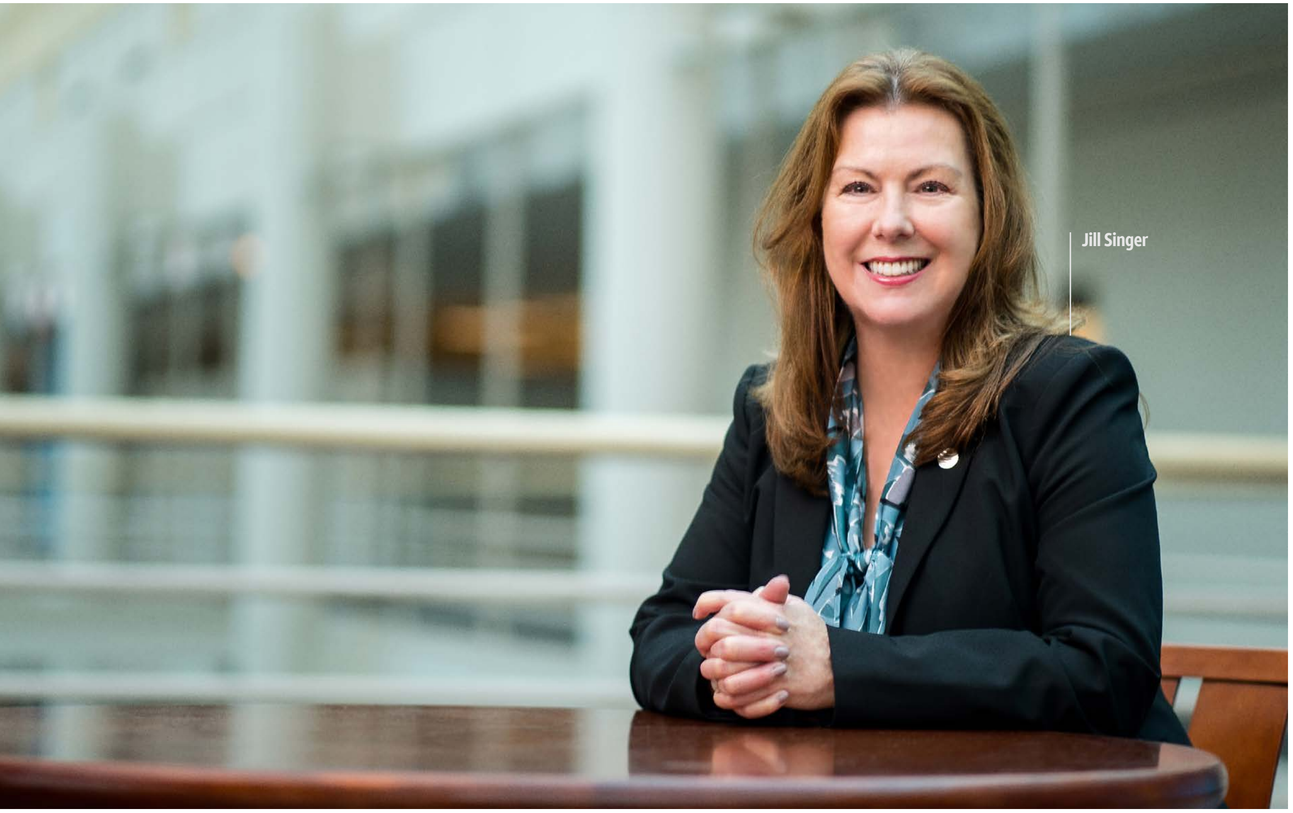
Traditionally, in order to access the large amounts of data needed to gain advantage, warfighters and agents for the DOD have had to be tethered to a machine that can house that data.

"5G becomes a game changer for them," says Singer.

Having untethered access to data, information, applications, cloud and other capabilities, with the necessary security and speed of access, is just one of several ways 5G is changing the future of the DOD.

The 5G collaboration between AT&T and the DOD has already begun as AT&T expands 5G capabilities and access across the nation. As of March 2021, AT&T's 5G network covers 230 million Americans in 14,000 cities and towns, and 5G+ is available in parts of 38 U.S. cities.

Industries from health care to business, gaming and entertainment are already benefiting from AT&T 5G connectivity. FirstNet, the nationwide high-speed wireless broadband network built by AT&T and dedicated to public safety, will be upgraded to allow first responders to access reliable, secure 5G—currently, first responders in Houston are experiencing the early benefits of 5G+ on FirstNet.



Eager to tap into the power of the 5G network in order to improve decision making and operations, the DOD began taking action on its 5G plans last year. It has selected five military bases to serve as testbeds for experimenting with and implementing real-world 5G projects, and they are well underway.

"The military does not operate alone," Singer says. "There's a huge commercial enterprise behind the military. All of that is going to 5G—the whole economy of the world is transforming with 5G. To leverage those force multipliers and conduct their operations in the future, the DOD really needs a commercial 5G enterprise."

In other words, the future of 5G in the DOD isn't coming—it's here.

Powering an industry-backed DOD network

Of course, you can't talk about 5G without discussing spectrum.

"We should certainly highlight the importance of spectrum and spectrum assets," says John Dillard, senior program manager for Air Force enterprise services at AT&T Public Sector. "Whether it's provided by the commercial industry, DOD, or it's unlicensed spectrum, there are several models that AT&T is able to bring to the table, so that the DOD can take full advantage of spectrum in any of those capacities."

Indeed, earlier this year AT&T unveiled that during the recent C-band auction, the company secured 80mhz of spectrum and a 29% share of the available licenses. AT&T plans to deploy this mid-band spectrum to complement its low-band nationwide 5G network, starting at the end of 2021 and into or beyond 2022, ultimately allowing the company to deliver faster average speeds across the country.

Right now, 5G capacity is being built to take advantage of two specific areas of the nation's spectrum wavelengths. One area is the mid-band chunk of spectrum, known as sub-6, where existing 4G and 4G LTE networks are already concentrated. The 5G solutions using the high-band are known as millimeter-wave, or mmWave, and could be even more game changing. Those high-band solutions can process significantly larger volumes of data and can communicate and transmit at extremely high speeds.

"AT&T is well-positioned to lead 5G initiatives and partner with the DOD," adds Lance Spencer, client executive vice president for Defense at AT&T Public Sector. "There are so many aspects of 5G in which AT&T has taken a leadership position—through invention, launch or charter."

Bringing AT&T's massive investment—more than $105 billion in the U.S. including capital investment and acquisitions of spectrum and wireless operations between 2016 and 2020—will be critical for the DOD.

That's because it will take a village to bring 5G capabilities to fruition, especially in an operational capacity. The relationship between the DOD and AT&T will be even more critical as "we learn how to develop the right business model and standard operating procedures to deploy 5G on a battlefield," Dillard says.

And the DOD isn't going in alone. It has launched a number of pilots and prototype initiatives with AT&T and others that will help to vet and inform the technology before full deployment, so that 5G can be used to its fullest capability.

In addition to the $600 million for five 5G testbeds at U.S. military sites that the DOD had previously announced, the Department announced a second tranche of awards at seven more test sites this year.

This is part of the DOD's 5G to Next-G Initiative, just one project AT&T is involved in through the Office of the Secretary of Defense. The other is Spectrum Forward Other Transaction Authority, for the development, adoption and deployment of next-generation technologies, including 5G and spectrum access technologies. AT&T was awarded this contract through the National Spectrum Consortium, of which it's a member, along with 384 U.S. companies and academic institutions.

Here's a deeper dive into these initiatives and how the DOD is exploring the possibilities and potential of 5G technologies.

Moving from 5G to Next-G

What if warfighters could train for real-life scenarios with augmented reality goggles, if the DOD could enhance its logistics operations with a better warehouse or if pilots could refashion the flight line operation with automation?

These are no longer ideas of the future but advances already in motion. The 5G to Next-G initiative incorporates two tranches, and for AT&T, five contracts ranging from smart warehousing and logistics to artificial and virtual reality.

These installations at military bases were announced last year and include piloting 5G-enabled augmented/virtual reality for mission planning and training, testing 5G-enabled smart warehouses and evaluating 5G technologies to enhance distributed command and control.

Tranche 1 included 5G augmented and virtual reality training at the Joint Base Lewis-McChord in Washington, as well as 5G smart warehousing at the Naval Base San Diego in California and at the Marine Corps Logistics Base in Albany, Georgia.

AT&T was also involved with Tranche 1.5, which was at Nellis Air Force Base, Nevada, focused on disaggregated command and control and desegregated and decentralized command and control.

As the DOD moves forward with Tranche 2, it's further exploring disaggregated and decentralized command and control with Marine Corps Air Station Camp Pendleton in California and 5G-related telemedicine at Joint Base San Antonio in Texas, among other projects.

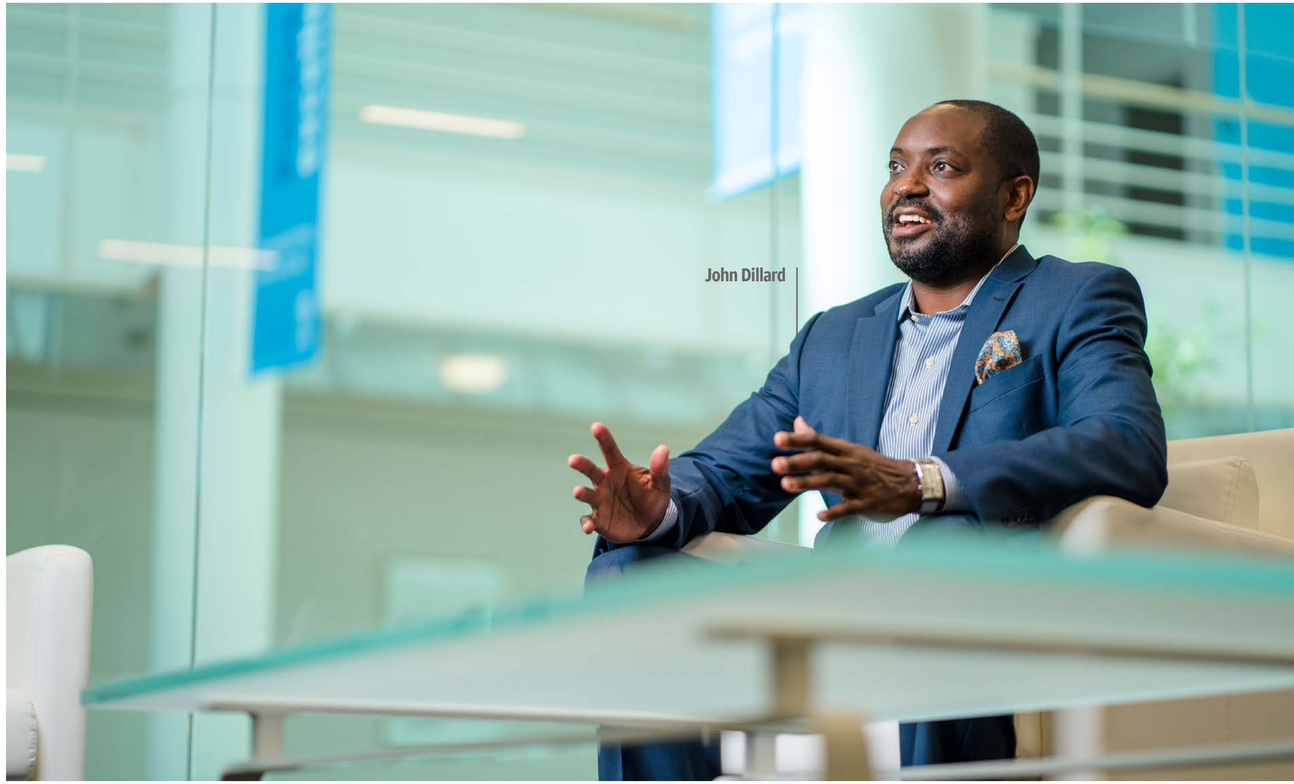
The Air Force is also testing AT&T's commercial networking-as-a-Service capabilities with 24,000 military personnel on Buckley Air Force Base, Colorado; Joint Base Elmendorf-Richardson, Alaska; and Offutt Air Force Base, Nebraska.

The network is being tested to transform and modernize infrastructure that supports air, land and cyber operations. It falls under an OTA from the Air Force to fund its enterprise IT-as-a-Service program, which plans to use commercial networking services to deliver faster speed, enhanced security and more capabilities with near-ubiquitous wireless connectivity across the bases.

These initiatives will deploy and accelerate 5G technology at scale. The U.S. military has the biggest logistics operation in the world, and 5G-enabled technologies can enhance processes across the board.

Delivering the base defense operations of the future

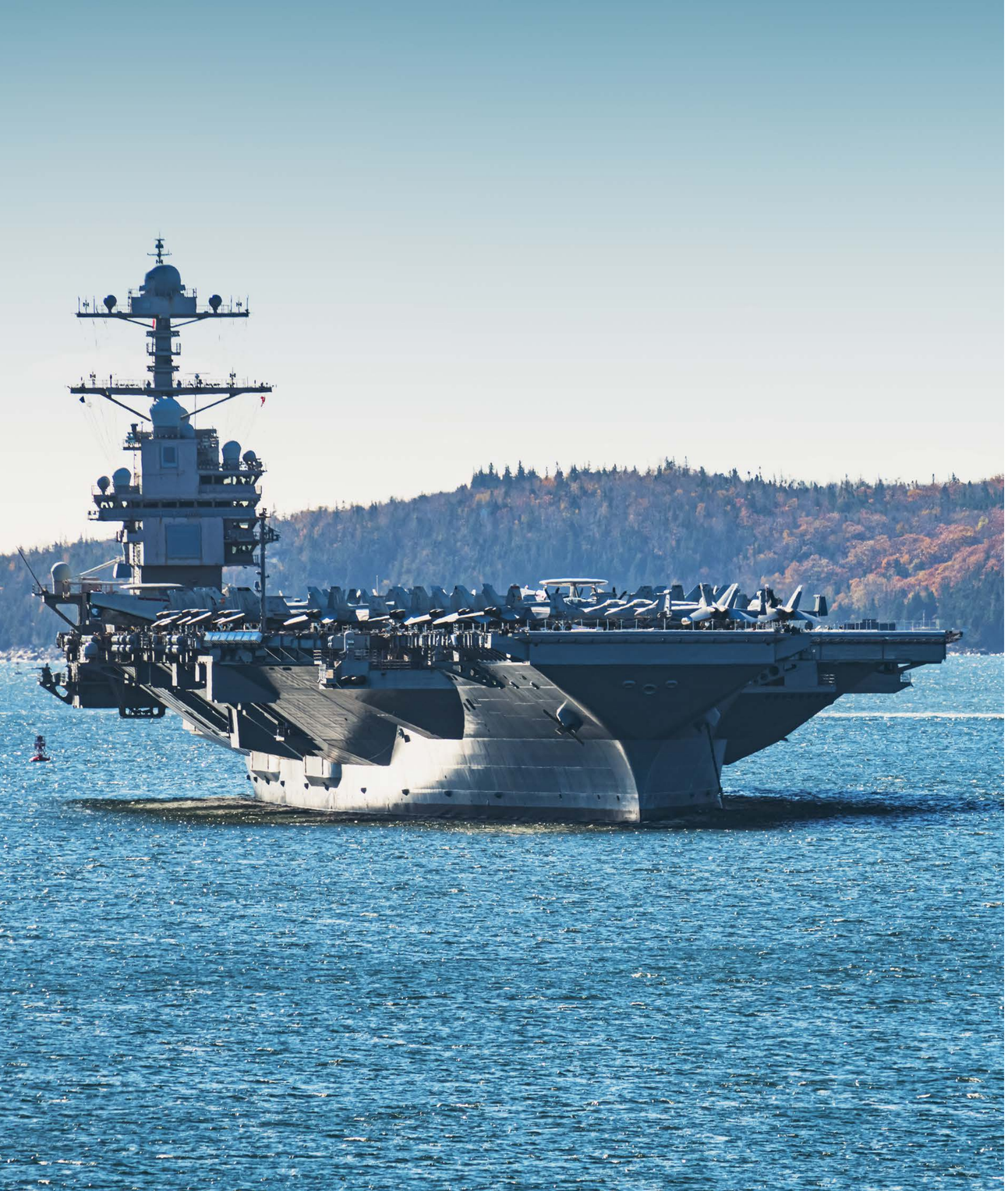
Drones are breaching the perimeter of military installations around the world. Sometimes, base personnel may not be aware that they've been breached by a drone until periodic maintenance inspections of the buildings reveal the intrusion.



"There are AT&T solutions that can detect a drone breach on the perimeter and alert the staff at the base defense operations center, so they can act immediately," Dillard says.

Using its 5G network, AT&T can build an ecosystem that links base defense operation center personnel using tablets that connect to sensors around the base, along the perimeter and on building infrastructure, so they can respond to a breach in near real time.

"Even a robotic dog can alert of intrusions on or around the base and send the base patrol an alert to their smartphone and or tablet," Dillard says. This way, personnel don't have to drive around the base surveying their sectors, as they have done in the past.



"It becomes a more intelligent and predictive way of policing, rather than just sitting in one spot or driving around," Dillard says. Plus, it offers fuel savings and a relief on personnel resources.

This could also benefit flight line entry control point monitoring. AT&T has technology that can scan a certain percentage of acreage at the flight line or missile base, so base defenders don't have to drive long distances to monitor land.

"Why not just automate that process?" Dillard says.

Rethinking pier connectivity

The Navy is working with AT&T to rethink the way ships connect to the Navy's network when they dock, as part of an initiative that explores smart piers. Rather than physically connecting the ship to fiber-optic cables in order to upload data from the Navy network, the Navy is exploring 5G capabilities that may allow them to go completely wireless—essentially providing pier connectivity-as-a-Service.

Similar to revamping the Navy's ship-to-shore communications infrastructure, the Air Force is examining how 5G-enabled automation can refashion the flight-line process.

"The same type of model could apply from the anchor to the flight line," Dillard says. "It could be a blend of defense installation resilience, and more importantly, higher-speed data offloaded from the aircraft to the maintainer, intelligence officer or operations center."

Air Force aircraft are outfitted with increasingly sophisticated technology. But as planes get smarter, they're generating ever more data. And the Air Force needs to find a way to download that data quickly when planes land.

Enhanced connectivity with 5G would allow a host of processes to be automated, including fleet management or the use of autonomous vehicles on the flight line to haul heavy equipment and machinery.

In fact, 5G can bring advanced inventory management, supply chain tracking and even blockchain as a user service. Consider AT&T's efforts with the Fleet Logistics Center San Diego at the Naval Base Coronado, for instance. The agency is rapidly developing a prototype for advancing and exploring 5G-enabled technologies to improve warehouse operations, using IoT devices and other sensors to track the supplies, among other capabilities. A fully connected smart warehouse could one day see drones perform laborious tasks, such as inventory, and autonomous vehicles haul shipments around.

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Similarly, interconnecting every piece of the flight line—from the onboard sensors to every switch on the ground—aligns with the grand vision of Air Force leaders for what they call a Global Sensing Network. This was part of Tranche 1.5—building out 5G infrastructure at Nevada's Nellis Air Force Base, a hub of experimentation and operational development. The next big step is a fully overhauled 21st-century smart base, with 5G fully integrated into the infrastructure from the beginning.

Adopting 5G to retain global leadership

The importance of public-private partnerships takes on new meaning in terms of preparing the DOD to adopt 5G.

"There are coverage gaps within the DOD bases, compared to the surrounding communities outside their boundaries," Spencer says. "Frankly, there are some unnecessary processes hampering access on DOD bases. And we need faster resolution." This is why it's critical for the DOD and wireless carriers to work closely together to determine how to accelerate 5G adoption.

"A fast, wireless buildout takes 18-24 months once the project is approved and funded," Spencer says. "Considering the time frame, I think the base access issues really deserve prompt action to implement 5G."

Adopting commercial standards and technical specifications is also critically important. The more commercial standards that are adopted throughout DOD use cases and solutions, the better the private sector can work with the DOD to run interoperability, resiliency and operations.

"I think the technology discussion can often blur the operations discussion, which is why it's important to focus on actually delivering data and content dynamically to multiple sources and multiple locations," Spencer says.

AT&T has artificial intelligence built into its delivery platforms to do that, and if the commercial standards are extended into the DOD enterprise, then AT&T can help the DOD provide that same level of robustness and reliability within its own infrastructure.

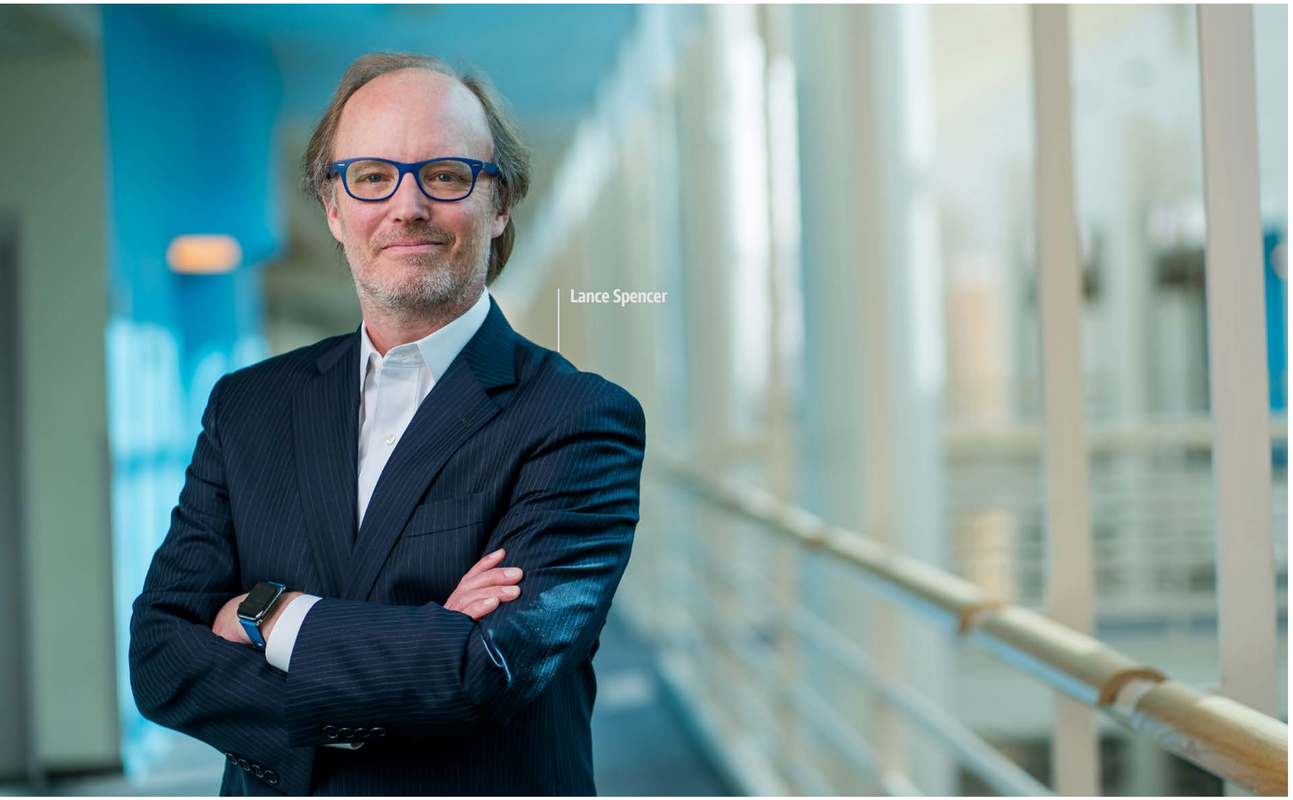
"Adopting commercial standards is critical to the DOD's success on a global scale," Spencer adds.

Here, global scale is key.

AT&T has roaming agreements for voice and data in more than 225 countries, and its consumer customers can roam in all of those countries with different spectrum regulations and compliance.

"Our spectrum relationships and roaming agreements can be an invaluable resource to the DOD, especially as they scale for the future," Spencer says.

Trust in this relationship is also critical. For example, the Air Force will play a key role in piloting solutions for sharing DOD-owned spectrum between operators in the private sector and the federal government.



In the solicitation issued in 2019, the DOD announced it was looking at hardware, software and systems that would allow for spectrum sharing between some of the DOD's airborne radar systems and 5G cellular systems in the same bands of spectrum.

Details of the plan, provided in a notice to industry, indicated that the Air Force would construct and operate a localized full-scale 5G mobile cellular network to evaluate the impact of spectrum sharing on both DOD radar systems and vice versa at Hill Air Force Base, Utah.

And AT&T knows a thing or two about spectrum sharing.

Under the 25-year agreement with the First Responder Network Authority, AT&T was selected to deploy, operate, maintain and improve the first high-speed, nationwide wireless broadband network dedicated to public safety—FirstNet. This reliable, highly secure, interoperable, and innovative public safety communications platform will bring 21st century tools to public safety agencies and first responders. That means first responders in all 50 states, 5 territories and the District of Columbia are gaining access to the only nationwide, high-speed broadband communications platform dedicated to and purpose-built specifically for them.

Two of the key public safety features of FirstNet are priority and preemption.

"Priority and preemption allow first responders to communicate with minimal or no interruption."

Priority and preemption allow first responders to communicate with minimal or no interruption, essentially giving their data 'lights and sirens' to cut through network congestion. With FirstNet, public safety's traffic is separated from non-public safety traffic via the FirstNet Core and is always prioritized over commercial traffic. This feature is automatic and always on, 24/7, with no action necessary from FirstNet users.

The FirstNet model of preemption is an important step in demonstrating how AT&T can accommodate the DOD's unique needs in the 5G realm. This model allows the military a view into how it can move past relying solely on itself and instead take advantage of commercial innovation and trust in private industry relationships.

The same can be said for user equipment. AT&T has experience adding other spectrum bands in the global operation arena.

When Spectrum Band 14 was added to the FirstNet ecosystem, 20 MHz of highly desirable spectrum in the 700 MHz, it was foundational. AT&T works

with the device manufacturers and the chip manufacturers to incorporate Band 14 into the basic product line and other user equipment.

"AT&T has an integrated spectrum offering that works in all those areas," Spencer says. "If you consider the splinters of potential unique spectrum, there's a cost of fabrication for deploying those end user devices."

This can get expensive, so working with a service provider like AT&T on a spectrum arrangement can be highly valuable for the DOD.

Establishing a zero-trust environment

Security is a top priority for the Pentagon and for AT&T.

"One of the challenges is demonstrating that 5G can meet the security requirements and the cybersecurity posture that the DOD requires," Singer says.

For AT&T, that means showcasing via prototypes how its 5G implementation supports a zero-trust architecture and meets additional security requirements.

AT&T is among several companies collaborating on a 5G testing site to write the book on 5G cybersecurity with the National Cybersecurity Center of Excellence (NCCoE), a part of the National Institute of Standards and Technology (NIST).

5G already has standards for cybersecurity set by 3GPP, a global partnership of telecom standards bodies. The NIST project is different. It is working on real-world tests with a group of equipment and software vendors, mobile operators and security service providers. It plans to literally demonstrate and document the strong security than can be achieved in 5G networks.

Having 3GPP involved in global requirements and standards also puts the U.S. in a stronger global position, given that there are consortiums, standards and requirements worldwide.

"It's absolutely imperative that the U.S. carriers and others stay involved in standards bodies and pull our allies along with other like-minded countries into these groups," Singer says.

"This really becomes a whole of government and a whole-of-nation discussion," Spencer says. "This is an area in which government needs to work very closely with the private sector, which has strong relationships and positions in global forums to help defend U.S. interests."

Gaining dominance with 5G

Moving forward with Tranche 2 and beyond, AT&T is focused on flexible, open architectures and increased security for the future of spectrum access and 5G—from a zero-trust architecture to next-generation security tools.

"AT&T, I believe, is uniquely positioned to provide the level of security needed for these open flexible architectures," Dillard says.

"[We are] uniquely positioned to provide the level of security needed for these open flexible architectures."

There are going to be multiple vendors, from traditional core brand and transport vendors to experienced multi-network operators. And AT&T is ready.

"It's imperative that the DOD work closely with us to operate in a secure networking environment, particularly as they determine how they're going to deliver capabilities on a global scale," Dillard says.

Again, that global scale will be key for the DOD as it relies on leveraging spectrum on bases around the world and considers who is best positioned to help the military gain a full spectrum portfolio to link 5G and fiber, so that the Pentagon can see what the warfighter sees.

Learn more about how AT&T is primed to help the DOD take security, operations and more to the next level with 5G.

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