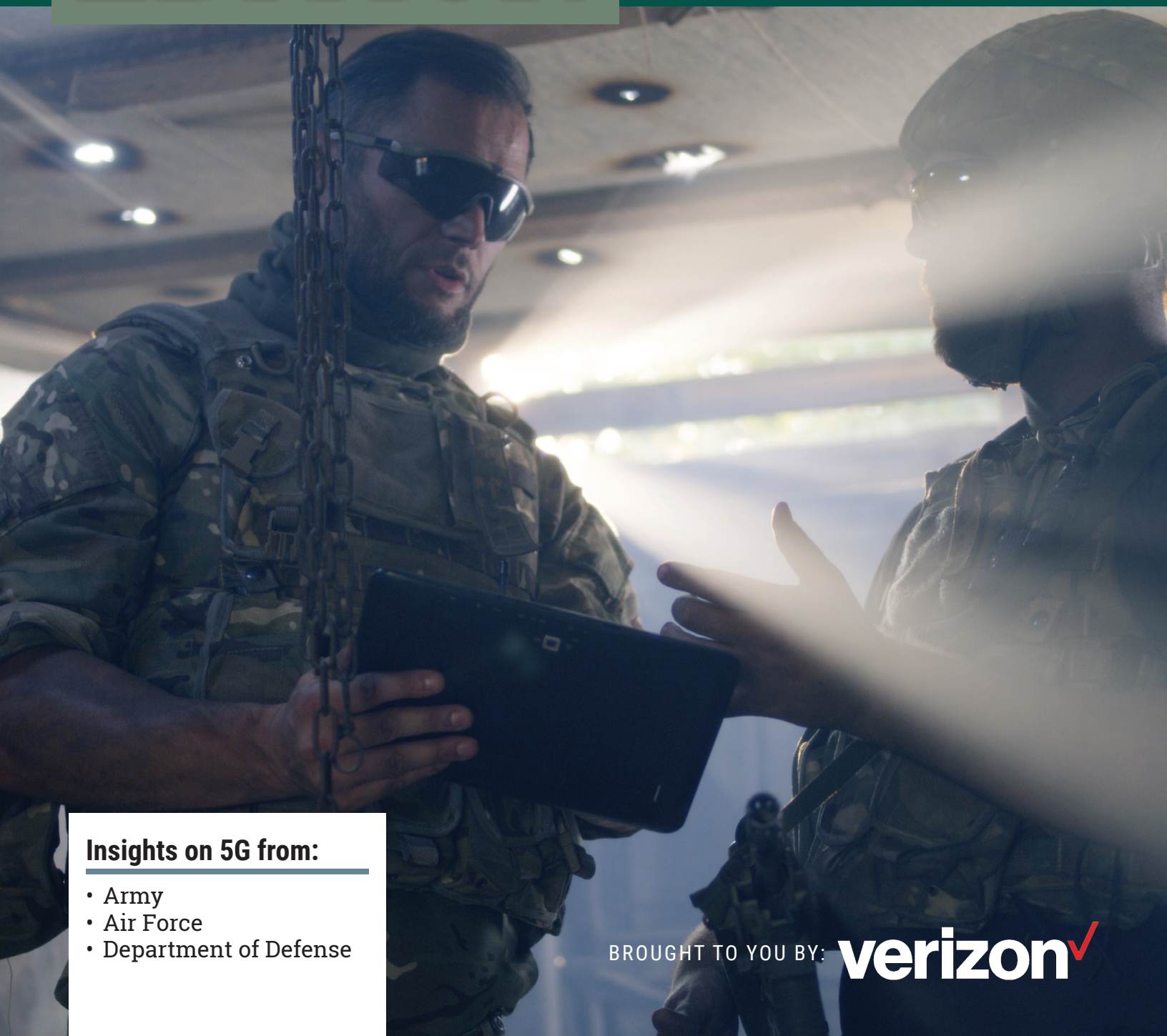
FEDERAL NEWS NETWORK

# EXPERT EDITION

## Anatomy of a 5G Smart Base



**Insights on 5G from:**

- Army
- Air Force
- Department of Defense

BROUGHT TO YOU BY: verizon

## TABLE OF CONTENTS



The Defense Department's 5G testbeds aren't just proving the value of the infrastructure technology. The nearly dozen pilots are showing non-technical people what the future looks like.

Whether it's families relying on 5G infrastructure to communicate with loved ones or perform their jobs or schooling remotely, or to run warehouses and maintenance systems, it's clear the military services and defense agencies are on the cusp of creating the smart base of the future.

"5G brings mobile edge computing closer to the end user, or the application via the cloud. This really removes a lot of historical latency that prevented us from applications being able to make near real-time decisions," said Cornelius Brown, Verizon's Department of Defense sales director.

DoD already is experiencing the benefits of the low latency and high speed access 5G provide through these test beds.

For example, Doug Babb, Army G6 senior program lead for 5G Experimentation and Integration, said the service is excited about the possibilities to "enhance the command posts and command post operations by trying autonomous vehicles, both drone aircraft, as well as unmanned platforms and sensors. Doing this integrates autonomous and robotic platforms that set the condition to provide greater protection for our soldiers."

At Joint Base San Antonio (JBSA) the Air Force is testing capabilities that could be the future of medicine.

And James Beutel, Air Force deputy chief technology officer, said 5G is going to be the tissue that opens speedways for data to enable everything from artificial intelligence to heads up displays for airmen.

The stories in this e-book demonstrate not only the progress that the Pentagon is making in finding real value out of 5G, but begins to paint the future picture across DoD.

***Jason Miller***
***Executive Editor***
***Federal News Network***

# 5G is changing the way the military connects its bases and its people

BY SCOTT MAUCIONE

As 5G begins to roll out in civilian and military spaces, the Defense Department is testing 5G networks at a handful of bases to ensure connectivity and security.

Since last year, the Pentagon has had contracts for 5G experimentation at nearly a dozen different installations to make "smart bases."

"In essence, a smart base of the future is the integration of connected technologies that will fundamentally improve the performance and efficiency of assets and services across a military installation," said Cornelius Brown, Verizon's Department of Defense sales director, during the Federal Insights discussion *Smart Base of the Future,* sponsored by Verizon. "As we define smart bases, we can essentially view them as mini cities in itself, where infrastructure, building transportation, energy management, are all factors of a city and a base. What drives a smart base is that they're all hyper connected, it's an ecosystem where everything becomes connected."

That kind of system is what the Pentagon is aiming for when it comes to its future weapons systems, artificial intelligence and how it wants everything to be interconnected with data and interoperability.

**"5G brings mobile edge computing closer to the end user, or the application via the cloud. This really removes a lot of historical latency that prevented us from applications being able to make near real-time decisions."**

**— CORNELIUS BROWN, DEPARTMENT OF DEFENSE SALES DIRECTOR, VERIZON**

"There's a large collaboration with multiple industry players to really enable various use cases around energy management, drone management, autonomous vehicles, and it's really a collaborative effort to really prove out what the customer wants to accomplish," Brown said. "5G brings mobile edge computing closer to the end user, or the application via the cloud. This really removes a lot of historical latency that prevented us from applications being able to make near real-time decisions."

It's not just the Pentagon's weapons systems that will see changes with 5G. Military personnel will also see their connected lives move in a different direction as well.

"For military personnel living on the base, they'll be able to take an autonomous shuttle or bus that will get them around, all that cool stuff," Bryan Schromsky, a managing partner for 5G public sector at Verizon said. "More importantly they'll see it in connection. If they're using a video calling platform on these connected devices, they'll just have a much better experience. They'll be in high definition video, they'll have faster bit rates, so they can do more videos. They can upload information, all of that good stuff and couldn't ask for much more to have a very intimate and immersive experience in a personal way."

With that new power and ease also comes new responsibilities and challenges, however.

**"Having a coordinated security policy is the right approach... We want to make sure we have a valid, secure supply chain and also work with industry standards. Most importantly we want to have outreach in working with public sector agencies, federal, state and local to make sure that we meet their needs and their challenges."**

**— BRYAN SCHROMSKY, MANAGING PARTNER FOR 5G PUBLIC SECTOR, VERIZON**

By adding more devices to the network, it creates more opportunities for malicious actors to get into the network. DoD will need to protect its assets from outside attacks like hackers and inside attacks like a faulty supply chain.

"Having a coordinated security policy is the right approach," Schromsky said. "We want to make sure we have a valid, secure supply chain and also work with industry standards. Most importantly we want to have outreach in working with public sector agencies, federal, state and local to make sure that we meet their needs and their challenges."

DoD will need to rely on future technologies as 5G develops to better security measures.

Schromsky said quantum computing will have a large role to play in encryption and not only making military bases safe, but also securing financial transactions and personal data.

# Army is testing multiple avenues to implement 5G on bases

BY SCOTT MAUCIONE

The Army is embarking on a handful of 5G tests that it hopes will bring the service into the future with networking technology.

The service is partnering with industry to use 5G for telemedicine, travel and training.

"5G as a whole is nested within the overall Army modernization efforts," Doug Babb, Army G6 senior program lead for 5G Experimentation and Integration, said during a Federal Insights discussion sponsored by Verizon. "Across different capability sets the Army is looking at how we invest and modernize our capabilities. This increased connectivity has potential to create greater efficiencies and greater capabilities."

The Army is working 5G testbeds at multiple bases, along with other military services, to try 5G advancements and test security.

For example, at Fort Carson in Colorado, the Army is testing automated vehicles "to evaluate how automated technology can enhance mission readiness, and assess the potential to reduce base operating costs, improve safety and enhance quality of life for military service members and their families, and provide transportation services more efficiently and effectively," according to the Army Corps of Engineers.

**"What that really means is that we're making sure we secure networks, all types of networks, because with the 5G architecture, you're looking at bringing in a lot of different networks together and really enhancing and creating that security posture."**

**— DOUG BABB, G6 SENIOR PROGRAM LEAD FOR 5G EXPERIMENTATION AND INTEGRATION, ARMY**

It's not just new technologies that soldiers have access to with 5G. The 5G networks also helped with existing technologies, especially during COVID-19.

"Things that are critical, we're talking about personnel records, we're talking about medical access, telemedicine, as we've seen through the COVID environment have to be able to connect with a provider," Babb said. "It's been critical, especially when we need to work on the social distancing aspect of COVID and make sure we remain as safe as possible. Telemedicine is just a great example of the capability we're talking about and greater access."

Babb said the Army is looking at 5G from a holistic point of view to offer interconnectedness for soldiers in the future.

"We see great opportunities to enhance the command posts and command post operations by trying autonomous vehicles, both drone aircraft, as well as unmanned platforms and sensors," Babb said. "Doing this integrates autonomous and robotic platforms that set the condition to provide greater protection for our soldiers."

Of course, as more devices are connected to a network, the surface area grows making it vulnerable to attack.

Babb said cybersecurity is paramount for the Army when it comes to 5G.

"What that really means is that we're making sure we secure networks, all types of networks, because with the 5G architecture, you're looking at bringing in a lot of different networks together and really enhancing and creating that security posture," he said. "Let me use an example. Banking is one of those things that we're all familiar with. When you log on to your bank account, the first thing they do is text you a second security password. They're authenticating you before you get into the information that's contained within your account. And this is along the same lines of that we're looking at implementing. These types of strategies and capabilities to enhance the security posture of our networks and our information."

**"We see great opportunities to enhance the command posts and command post operations by trying autonomous vehicles, both drone aircraft, as well as unmanned platforms and sensors...Doing this integrates autonomous and robotic platforms that set the condition to provide greater protection for our soldiers."**

**— DOUG BABB, G6 SENIOR PROGRAM LEAD FOR 5G EXPERIMENTATION AND INTEGRATION, ARMY**

# Telemedicine with 5G could be a game changer for military health

BY SCOTT MAUCIONE

Telehealth became an even bigger industry during COVID-19. Doctors were forced to think of creative ways to see patients as people were forced to stay home to avoid the spread of the virus.

However, as 5G is starting to roll out, telehealth may be breaking into a completely new plane. At Joint Base San Antonio (JBSA) the Air Force is testing capabilities that could be the future of medicine.

"5G brings a whole new paradigm and architecture to the table. From what we've seen before even up through the current 5G non-standalone that you see advertised on TV today," Jody Little, executive program manager for 5G NextGen at JBSA, said during a Federal Insights discussion sponsored by Verizon. "Now you can bring large amounts of data forward or back to it and operate in the forward edge. You can virtualize these applications and get very ultra-low latency. And now you're supporting lots of sensors. Whereas in, say, 4G, you could support maybe 100. Here, you can support 1000s."

**"Now you can bring large amounts of data forward or back to it and operate in the forward edge. You can virtualize these applications and get very ultra-low latency. And now you're supporting lots of sensors. Whereas in, say, 4G, you could support maybe 100. Here, you can support 1000s."**

**— JODY LITTLE, EXECUTIVE PROGRAM MANAGER FOR 5G NEXTGEN AT JOINT BASE SAN ANTONIO**

That means that doctors have the opportunity to monitor patients like never before. Doctors across the country can sit in on surgeries and experience them as if it were almost in-person by looking at multiple sensors and using virtual reality.

"If you think about advanced gaming, and you think about 5G telemedical applications, you'll be able to push those forward so they can operate in real time, see the data, whether that's a virtual reality application or augmented reality application and it'll be in real time whether interacting with the patients," Little said. "5G promises significant improvement in the ability for the Defense Department to support critical care at the point of care. What that means is that they'll be able to provide more care in real time and bring more expertise to the table than they currently are."

Doctors will be able to layer models on top of patients and be guided by experts from anywhere in the world.

Putting important information like medical sensors and personal information in the network creates new challenges for security.

Little said patient security is of utmost importance and DoD is going beyond traditional security measures to protect it.

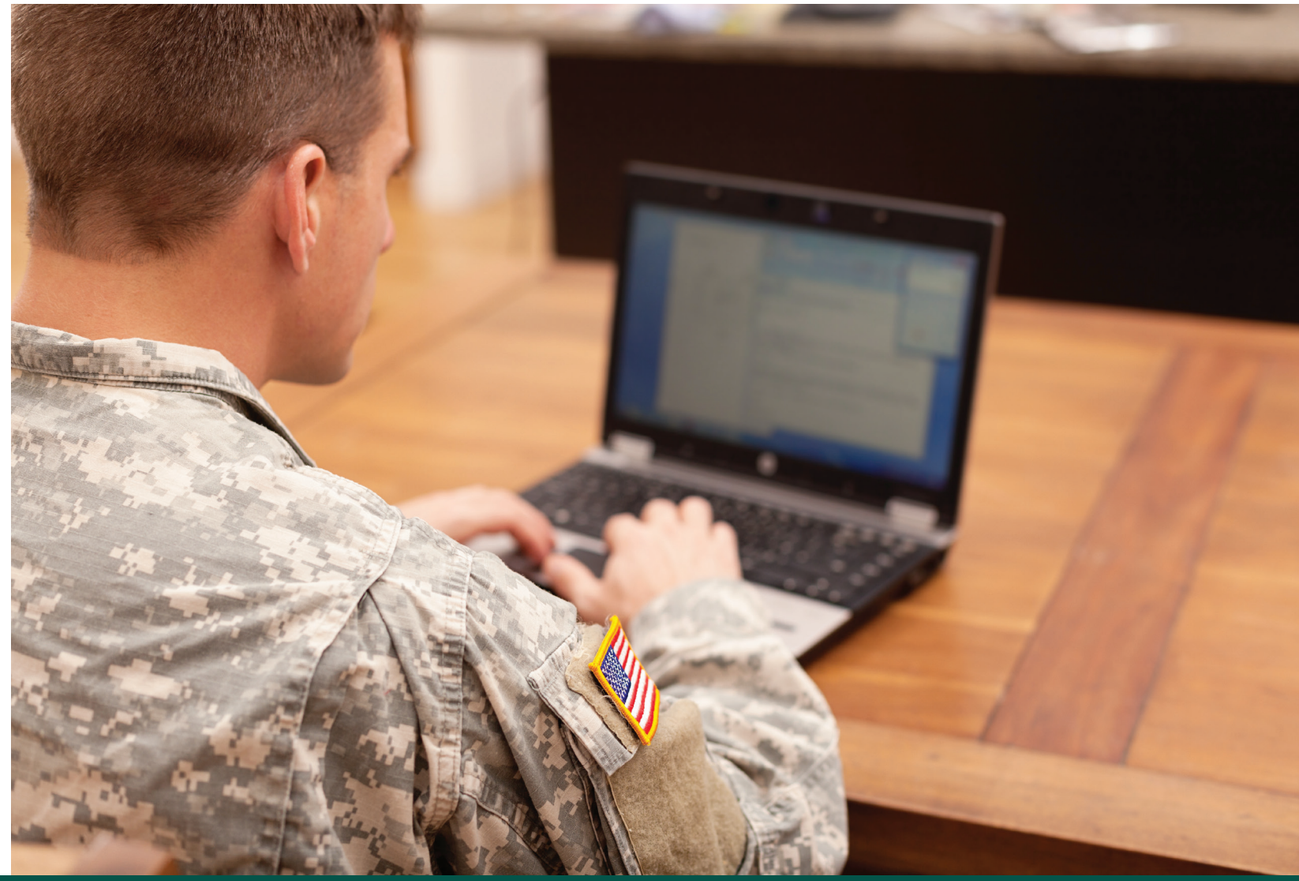
"The international body that manages the 5G standards has some very good 5G security standards," Little said. "From a DoD perspective, we need more and we need better in some cases. Our perspectives run from the user equipment all the way back to the cloud or from the cloud all the way up to the user equipment. The whole capability from end-to-end needs to operate in a secure zero trust architecture."

**"5G promises significant improvement in the ability for the Defense Department to support critical care at the point of care. What that means is that they'll be able to provide more care in real time and bring more expertise to the table than they currently are."**

**— JODY LITTLE, EXECUTIVE PROGRAM MANAGER FOR 5G NEXTGEN AT JOINT BASE SAN ANTONIO**

Little said it also takes some work on the part of users as well to ensure networks remain safe.

"What we're going to have to see is the architecture, and the interfaces support better cybersecurity," Little said. "We can't allow things to happen that would cause malicious activities within the 5G network or the applications that are running. It's really difficult to change the users' habits. But, it has to start early and continue through and we see that all the time in training."



# 5G is the future of military connectedness and the Air Force is relying on providers to make it happen

BY SCOTT MAUCIONE

The Air Force, and the Defense Department writ large, are expecting 5G to be a game changer in the way it delivers information and connects platforms.

James Beutel, Air Force deputy chief technology officer, said 5G is going to be the tissue that opens speedways for data to enable everything from artificial intelligence to heads up displays for airmen.

"5G will really enable a lot of the things we see on sci-fi movies today, where pilots and airmen and other people have screens or virtual reality," Beutel said during a Federal Insights discussion sponsored by Verizon. "Troops will be able to see data and sensors in real time extremely quickly. You talk about how much of force multiplier that is when one person can see that much data at one time and be able to share it and talk to with leaders in real time."

Beutel said 5G's ability to deliver information quickly opens the aperture for what the military and civilian world can accomplish.

One of the things 5G will be able to expand is artificial intelligence, which needs to digest massive amounts of data to make complex suggests and decisions.

"At the heart of AI is data and especially from a machine learning perspective, it's only as good as its data and the amount of data you have," Beutel said. "5G is going to be able to get you much more data and much more timely data. That is going to make your AI much more effective, because no matter how good that AI algorithm is, if it doesn't have the data to train on and understand what it needs to do it's just not going to be as effective. On the flip side, because 5G now is no longer about the hardware, it's about software in the backend, it's a virtualized environment, you're going to have edge data centers all over the place based on it and having that AI in place is going to be a huge enabler to make 5G more effective."

**"At the heart of AI is data and especially from a machine learning perspective, it's only as good as its data and the amount of data you have. 5G is going to be able to get you much more data and much more timely data. That is going to make your AI much more effective, because no matter how good that AI algorithm is, if it doesn't have the data to train on and understand what it needs to do it's just not going to be as effective."**

— JAMES BEUTEL, DEPUTY CHIEF TECHNOLOGY OFFICER, AIR FORCE

**"We expect to fully have 5G publicly available on every base, and also to have figured out how we're going to bring private 5G in for things like warehouses, depots, things along those lines."**

— JAMES BEUTEL, DEPUTY CHIEF TECHNOLOGY OFFICER, AIR FORCE

The Air Force and DoD are still a bit away from realizing that dream, however.

DoD has about a dozen testbed installations where it is just starting to experiment with 5G.

The Air Force is also awarding leases to companies to bring 5G to needed areas.

"We expect to fully have 5G publicly available on every base, and also to have figured out how we're going to bring private 5G in for things like warehouses, depots, things along those lines," Beutel said. "In these lease agreements the Air Force owns nothing. In this case, what we're doing is giving the provider a 25-year lease to come in and build their towers. We are doing that for a couple reasons. One, is the Air Force doesn't want to be in the business of maintaining cellular towers. Two, it incentivizes the providers to come in to those bases."

Beutel said the Air Force is also encouraging providers to sublease so that providers have an opportunity to increase coverage as much as possible.

# Creating the smart base of the future with 5G

THIS CONTENT HAS BEEN PROVIDED BY VERIZON

The Department of Defense is aimed at creating the smart base of the future. Bases are essentially miniature cities, with all the same infrastructure needs like transportation, on-base personnel services and energy management, coupled with specific military needs. The idea is to use a 5G infrastructure to connect all of these elements, as well as cybersecurity and physical security, to become fully integrated and agile.

4G LTE networks will still provide the backbone for digital communications and connectivity on these bases; it's 5G that will help provide the high-speed, low-latency connectivity required for emerging use cases and technologies on the intelligent edge. For example, at Marine Corps Air Station Miramar in San Diego, California, DoD has teamed up with Verizon to introduce the first 5G Ultra Wideband instances deployed on a military installation. With 5G Ultra Wideband, the teams are enabling various use cases like energy management, drone management and autonomous vehicles.

*Bryan Schromsky, managing partner for 5G public sector, Verizon*

*Cornelius Brown, Department of Defense sales director, Verizon*

"With our 5G Nationwide, and our 5G Ultra Wideband, we're now operating on low and high band spectrum for 5G. It gives the ability for a military installation and military personnel to use various networks, depending on the use case," said Bryan Schromsky, managing partner for 5G public sector at Verizon. "We're seeing new DoD use cases around smart energy and base perimeter security that will use 4G or 5G. And with 5G Ultra Wideband using millimeter wave, the DoD is beginning to test new innovative technologies like augmented reality/virtual reality (AR/VR), machine learning, unmanned aerial vehicles and high-speed video. That's where you'll see 5G Ultra Wideband really taking hold."

It's those sensor technologies that DoD is specifically leveraging to form the foundation for its smart bases.

"Devices are continuing to become smarter, which means that they're going to generate larger amounts of data, they're going to be capable of delivering more services. When you pair that with multi-access edge computing, now you have the ability to process information closer to the end user, or the application via the cloud. And this really removes a lot of historical latency that prevented applications from being able to make near real time decisions," said Cornelius Brown, Verizon's Department of Defense Sales Director. "Paired with 5G, artificial intelligence and machine learning will eventually help users process terabytes of information, make data driven decisions, while providing actionable insights that they can take action on like predictive maintenance, enhanced safety and even threat detection."

**"Paired with 5G, artificial intelligence and machine learning will eventually help users process terabytes of information, make data driven decisions, while providing actionable insights that they can take action on like predictive maintenance, enhanced safety and even threat detection."**

**— CORNELIUS BROWN, DEPARTMENT OF DEFENSE SALES DIRECTOR, VERIZON**

But turning a standard military base into a smart base is not without its challenges. The first is security, which has to be factored into the architecture and design. It can't be an afterthought for the military. The second is budget, because this level of technology and infrastructure requires a large initial investment. The third is deployment and implementation, which has to be carefully planned, including ensuring operators can continue to scale into a phased approach.

But 5G can add capabilities to deal with these challenges as well. While it may increase the threat surface of a network by extending the perimeter and adding countless new endpoints like IoT sensors, it also can provide faster response times and better network visibility to respond to threats.

"There's more encryption in 5G with mutual authentication and there's some new things coming out in terms of 5G in relation to the standalone core that opens up the potential for network slicing, which we're very excited for," Schromsky said. "But you can take it one step further when it comes to security by incorporating a zero-trust architecture and a software defined perimeter where you have security platforms that overlay that radio access network (RAN) security; you have a more comprehensive model that it's very exciting for DoD."

**"There's more encryption in 5G with mutual authentication and there's some new things coming out in terms of 5G in relation to the standalone core that opens up the potential for network slicing, which we're very excited for."**

**— BRYAN SCHROMSKY, MANAGING PARTNER FOR 5G PUBLIC SECTOR, VERIZON**

But the benefits of 5G on military bases aren't limited strictly to the personnel. It's easy to forget that families also live and work on these bases, and they'll benefit as well. For example, 5G could help enable better distance learning, which can help provide stability and opportunity for families and personnel that aren't always able to maintain a more traditional in-person educational regimen. They'll also have the potential for better video capabilities and connectivity, which will allow them to be more connected if they're separated from family members on deployment.

That connectivity should also enable things like augmented and virtual reality for training and remote applications. That has multiple benefits, like better preparing warfighters for combat situations through more immersive training, or helping maintenance personnel to work on equipment with near real time assistance or from a distance, sometimes using unique parts 3D printed onsite. 5G could provide new medical platform infrastructures enabling next generation telehealth applications and medical procedures.

"When we rolled out 4G LTE, Uber and Lyft or Airbnb weren't thought of. And all of that experience now is done through a mobile device," said Brown. "So now that we have that 5G technology, this is a 10-year project. We've got a lot of runway."