

EXPERT EDITION

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How 5G technology could revolutionize government communications

5G

The increasing reliance of government on wireless technologies to provide everything from internal networking to always-available citizen services is straining the existing infrastructure. Verizon is responding to this challenge with the advent of 5G technology that can deliver a quantum leap in speed and capacity, but which will also require new spectrum, hardware and technologies.

The federal government's upgrade to 4G technology nearly a decade ago represented a big advancement from previously available technology, enabling higher speeds and reliability, as well as new standards like Long-Term Evolution (LTE). LTE increased capacity and bandwidth from CDMA using 3GPP open standards and more available spectrum. The now-standard 4G technology really did change the world by empowering every mobile innovation and advancement of the past decade.

As impressive as the leap to 4G wireless technology seemed in 2010, it was actually almost a linear progression from 3G. Moving to 5G is going to be a lot different. To achieve the estimated 20-times increase in speed will require everything from a wider range of frequencies to

stronger signals. 5G Ultra Wideband technology will reduce latency and offer additional connectivity options with fiber-like speeds.

Beyond raw speed, one of the most appealing features of 5G is its substantially lower latency, which is the delay that occurs between giving an instruction to transfer data and when the transfer actually occurs. Currently, anything less than 100 milliseconds is considered good latency on 4G technology, although some intense government applications like simulations cannot have more than a 50- or even 30-millisecond latency to work properly. Verizon's 5G service promises latencies as low as ten milliseconds, which would enable not just live simulations but augmented and virtual reality for training.

To achieve those results in government, Verizon will deploy a new millimeter wave spectrum technology that will allow for more devices to connect at the same time without hurting the speed or reliability of the network. Verizon has already tested this new technology with deployments in the cities of Chicago and Minneapolis, and plans to deploy it to 30 more cities over the next few years.

Verizon officials predict 5G will be a huge boon for government agencies, and are willing to work with them to tailor 5G offerings to focus directly on their specific needs. There will be a lot of benefits across the entire government as well, like the ability to use 5G in the place of wired communications. That should allow agencies to provide fast communications anywhere, even inside buildings they don't own, or to remote outposts and workers performing their duties off-site.

Other possible applications include things like high definition or ultra-high definition video surveillance without the need for a wired infrastructure. Even things like autonomous air and land based drones for inspections and disaster recovery are possible once 5G is in place. Verizon officials are confident agencies will come up with amazing applications for the new technology to complement exponential improvements to existing applications and services. As Verizon deploys the new 5G infrastructure nationally, the company looks forward to partnering with government agencies to revolutionize how government connects employees, services and the citizens it serves.

How Verizon's 8 currencies of 5G can help agencies modernize their IT

5G is getting a lot of hype right now. It's been described as "transformational" and "revolutionary." But what exactly is it, and what does it mean to federal agencies?

"We're working very hard to engineer, build, design and deploy a technology differentiator that will enable what we believe to be the fourth industrial revolution connecting people to people, people to devices and devices to devices," said Mike Maiorana, senior vice president of Verizon Public Sector.

Toward that end, Verizon has eight performance attributes, or "currencies," that describe the potential of 5G.

1 Throughput

"We've been taking our award-winning 4G network to new heights, delivering faster speeds, particularly through 4G LTE advanced technology. Well, 5G has the potential to deliver speeds many, many times faster, empowering use cases such as intelligent video, remote diagnostics and mobile command," Maiorana said.

Maiorana said with 5G's throughput, agencies will be able to use high-definition remote surveillance, even in areas where they don't have an established fiber network. They'll be able to use augmented and virtual reality to improve training. They'll be able to conduct real-time data and information transfers and analysis.

2 Service Deployment

"Virtualization: using software to perform network functions enables service and application deployment without having to install additional hardware, thus significantly reducing the typical installation time," Maiorana said.

5G will help federal agencies to put more applications into the cloud, specifically workload-dependent applications, in a more secure way. 5G and Multi-Access Edge Compute will give federal agencies more options to put applications and decision making closer to their end users. And they won't have to sacrifice reliability or performance to do so. In fact, Maiorana said agencies with temporary facilities or offices will get the same connectivity as they would from fiber, but without the permanent investment that can be difficult with temporary facilities.

3 Mobility

Building off that, 5G is designed with mobility in mind. In fact, it can enable devices traveling up to 310 miles per hour to remain connected to the network. That's going to enable autonomous vehicles, like self-driving cars, as well as improving the capabilities of existing drones.

4 Connected devices

The number of connected devices that can be on a single network will increase exponentially. In fact, the number of devices that can connect to 5G is three times as much as the global population. By 2022, Maiorana said it will be capable of supporting one million devices every 0.4 miles.

5 Energy efficiency

Maiorana said sustainability is one of Verizon's core values. As such, 5G will have lower energy requirements for network operators, up to 90% less than 4G.

6 Data volume

"The 5G standard is designed to support up to 10 terabytes per square kilometer," Maiorana said. "That means the 5G network can carry a massive amount of data for a large number of simultaneous users."

And it can help federal agencies in their ability to keep track of all that data more efficiently. As more data winds up in the cloud, Verizon and 5G can help federal agencies manage not just the understanding of where their data is, how their data transits those networks, but also the security of that data across all the networks through their software-defined networking.

"We often hear about the overload of data and how agencies have to deal with that," said Nick Nilan, director of product development for Verizon Public Sector. "It's about delivering the right data to the right user when they need it most. And that's what all of that extra bandwidth and the network slicing can really do for an agency."

7 Latency

Latency is just as important as download speeds when it comes to network performance, especially in situations where information is sent back and forth between endpoints.

"5G's rapid end-to-end latency - the time it takes for data to travel from one user, or from the user over the network, to the central processor and back again - will be one of the drivers for true technological change: Autonomous driving, computer vision, robotics," Maiorana said.

8 Reliability

"What Verizon has become best known for is reliability," Maiorana said. "It's the core of what we do. We have engineered, designed and supported our network so government customers can depend on that reputation for reliability."

Many federal agencies have been working to modernize their IT infrastructure and processes for some time now, with varying amounts of success. More of them have become reliant on data for decision making, and as more data is generated, stored and analyzed, 5G will help enable federal agencies to achieve many of their IT modernization goals through these eight currencies. ✓



How Verizon's 5G can deliver cybersecurity through software-defined networking

As federal agencies prepare for 5G and its possibilities, one concern persists, no matter which technological advancements come to fruition: cybersecurity. Speed does not matter if agencies' networks and data aren't safe while in rest or transit. That's why Verizon is building software-defined networking into its 5G networks.

“5G software defined networking, virtual network services is the next generation that will enable our government customers to put more applications in the cloud, specifically more workload-dependent applications in the cloud in a secure and efficient way, while not sacrificing the reliability and performance that they become certainly used to,” said Mike

Maiorana, senior vice president for Verizon Public Sector. **“And they need particularly our mission critical customers that are serving our citizens every day.”**

And security isn't just an afterthought with Verizon.

“It is baked in and that's because Verizon shifted to software-defined networking on our backbone four years ago,” said Nick Nilan, director of product development for Verizon Public Sector. “And so as we moved to a software-defined networking, we moved to network function virtualization. We've made our own networks more secure ... [and improved] processing for our federal agencies' data. And now we're enabling that for our customers.”

Software-defined networking flips the script on the standard TCP/IP procedure, where the user connects with the asset, presents credentials, and is authenticated. Instead, with software-defined networking, the user is authenticated first, and then allowed to connect to the asset. And this is the primary benefit: the user is connected to the authorized asset, and only that asset, after being authenticated. It's like an elevator that will only travel to the floor you've been cleared for.

“Software-defined networking is really the first step in realizing and confronting this challenge where you have networks that you may own -- fiber networks, broadband networks, Ethernet networks, cellular networks -- and be able to deliver application-aware routing across any of those networks,” Nilan said.

“So we can move your data securely and efficiently regardless of which network you're on. With 5G, you can enable software-defined networking, software-defined WAN -- wide area networking -- over multiple networks, including 5G. And then with network slicing, we're able to separate out the traffic that goes over those networks. So you can put mission-critical network traffic over one network and less important traffic over another.”

Network slicing is something that's been used on fiber networks in the past, but wireless technology has never had the bandwidth to support the practice before 5G. It allows Verizon to segment different users on its network, and give each the kind of bandwidth and flexibility they need to perform their missions, without compromising security.

That means, for example, a law-enforcement or disaster response agency using a drone could split the controls for that drone between multiple people, and customize their connections. So one person would have the command and control aspects of the drone to fly it, one person would have access to the video feed from the drone, and a third could have access to the drone's payload. And those connections could be customized. The video connection could have higher bandwidth, while the payload connection could have lower latency.

“And then you expand that into, ‘What else can I do with software-defined networking?’ I can move into a virtual network services world,” Nilan said. “Basically, being able to move my firewalls on demand, to be able to move my perimeter in my network on demand, and then be able to software-define specific data within my network. So using a software-defined perimeter to protect my high-value assets, and only giving people access when I know their role, or their role at a certain time, so I know where they are on the planet. And so should they have access when they're traveling? Should they have access when they're on TV? Why? So that I know who's accessing the data, when and where, and be able to have granular-level control of my data now that it's in a software-defined environment.”

“And you expand that out into, ‘How do I protect the data when it leaves the network?’ So that software defined-networking can now flatten your networks and see it across all, but then it also allows you to get out to the cloud more efficiently and securely through secure cloud inner-connects, where we have a direct pipe into the major data centers, and then secure cloud gateway protecting that data traffic across those pipes. All of that [comes] together to take what used to be known as a trusted internet connection, and [expand] that into trusted data everywhere, built on a zero trust networking platform.”

These are some of the cybersecurity provisions Verizon is baking into 5G, and can offer to federal agencies who take advantage of 5G as it's deployed. But that's just the beginning.

“We want to be known as a trusted provider of underlying network reliability and have an eye on innovation,” said Maiorana. “So that's to meet the needs of our government customers who are typically somewhat risk averse, that have very important missions, that measure twice before they cut once. We do that too, but we also have an eye on innovation and we're pushing the envelope to enable amazing things.” ✓

5G is not just an evolution, it's a revolution

Experts in 5G say it's not simply a technological evolution; it's a revolution. Mike Maiorana, senior vice president for Verizon Public Sector, actually likens it to a fourth industrial revolution that will bring together the cyber and physical worlds.

"Think of the 4G LTE phone you have in your pocket today," Maiorana said. "Your ability to hail a stranger on your piece of glass in your pocket to drive you to a destination, you weren't thinking of that in 2007 when you had your first 4G LTE phone. The sky is really the limit."

Exciting use cases for 5G already exist, of course. Maiorana is quick to emphasize that 5G isn't just an upgrade for your 4G phone. It's transformational. It can enable augmented and virtual reality for training and other applications, high-definition video surveillance, near real-time data and information transfers, and more.

But it's the ideas that haven't been thought of yet that are most exciting.

"The really creative use cases, the innovators in this space, are thinking about things we never could have done on 4G, never could have done on legacy networks," said Nick Nilan, director of product development at Verizon Public Sector. "And it's a matter of what other ideas people have to better enable missions for federal agencies with 5G."

Agencies are already working on precisely that. Verizon has been having conversations with federal agencies for some time about what 5G can do for their respective missions, and there's no shortage of concepts.

For one thing, numerous agencies are excited about the ability to replace fiber connectivity with wireless 5G.

"The federal agencies that are really going to benefit are agencies that have offices and buildings they don't own," Nilan said. "Being able to get fiber into a building that you don't own is very difficult ... or offices where they're only there for a short amount of time – three, six or nine months – and a fiber drop doesn't make a lot of sense. But now ... 5G can give them very quick connectivity, fiber-like speeds."

Some agencies are also excited about the ability to deploy high-definition video surveillance without being limited to where they have an established network. With 5G, this can be deployed anywhere. The same goes for Internet of Things-based sensors. That kind of situational awareness can benefit security and defense missions in obvious ways, but it can also facilitate scientific data gathering and analysis missions, like better weather forecasting.

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It can also apply to disaster response.

"Just think of the emergency response use cases: agencies like FEMA, other first responders, public safety organizations out facing harm's way, being able to have better command and control, better situational awareness, better network connectivity and throughput to be able to conduct missions in dire conditions," Nilan said. "The ability to connect drones to a 5G network to do surveillance of a disaster area, the ability to understand the application ecosystem

we are ultimately going to let loose with 5G, is something we are asking government and industry partners --small, medium and large -- to come to the table and help us develop."

Maiorana and Nilan also said 5G can enable the federal training programs of the future.

"The government is always looking to have a better-trained, better-enabled workforce. Through the ultra-low latency that 5G offers and the high bandwidth, you're going to be able to deploy better augmented reality capabilities for folks in their jobs. And virtual reality for folks to train," Nilan said.

And again, this is just what people have already thought of. In 2007, when 4G LTE was deployed, nobody could have predicted the new paradigms it would create, like being able to rent someone's home instead of a hotel room, or the disruptive effects they'd have on business models and society as a whole.

"What's really exciting to me is the folks out there driving the mission for the agency, because they're the ones investing in Internet of Things technologies today, they're the ones using mobility in brand new ways today that they couldn't years ago," Nilan said. "And so these applications for employee and workforce modernization, and the training and enablement programs that exist today are just incredible. That's really what's driving the use cases for 5G ... the IT department. The chief information officers are absolutely going to have to figure out how to enable those missions using 5G. But it's the innovators on the front line [who] know their challenges, know their mission, [who] are going to drive the use cases, and that's to situational awareness or anything else." ✓

Featured Thought Leaders



Michael Maiorana
Senior Vice President
Public Sector
Verizon

Mike Maiorana is senior vice president, public sector at Verizon Enterprise Solutions. In this role, he manages a team of sales, engineering

and sales support personnel, and is responsible for sales and customer satisfaction for public sector customers across the U.S. Verizon is the leading provider of communications services to the U.S. federal government, and offers a broad portfolio of intelligent networking, mobility, business communications, managed services, Internet of Things (IoT) and cybersecurity solutions to the public sector.

Previously, Maiorana was president of the Washington-Baltimore-Virginia region for Verizon Wireless, with responsibility for sales, marketing, customer service, retail stores and the expansion of the company's wireless network.

Prior to that, Maiorana was vice president of national government sales and operations at Verizon Wireless, where he led sales and customer service for federal, state and local government customers, including those in law enforcement, public safety and municipalities.

Maiorana began his career in 1990 as a sales representative and moved on to assignments of increasing responsibility, including regional director of corporate and government accounts, director of retail sales, and director of sales operations and training. He is a five-time winner of the Verizon Wireless President's Cabinet award for sales achievement.

He is currently serving a second term as a member of the board of directors of the Northern Virginia Technology Council. He also serves on the Metropolitan Washington-Baltimore USO board of directors since 2013.

Maiorana earned a Master of Business Administration in finance from Montclair State University, and holds a bachelor's degree in marketing from Rutgers University.



Nicholas Nilan
Director of Product
Development for
Public Sector
Verizon

He is responsible for the development and deployment lifecycle of innovative and mission impacting products and solutions for Federal, State

and Local, and Education customers. Previously, he led Federal Marketing strategy at Verizon, and before that, engineering teams supporting mobility and Internet of Things deployments in the Department of Defense. He has been in the telecommunications industry for over 15 years and holds an MBA in Finance and Accounting from Regis University and an undergraduate degree in Political Science from York College of Pennsylvania. Additionally, he is on the Board of Directors for the Public Safety Technology Alliance and the Board of Directors and the Chair of the Emerging Technology Working Group for AFCEA DC.

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