

5G: Building the Environment for JADC2 Success

BY PATIENCE WAIT

The U.S. government has begun to harness commercial network technology for mission readiness. The goal: to ensure that the United States can maximize productivity and reduce costs while minimizing risks to national security.

The government is designing policies to support and complement its strengths, innovating and investing in network technologies from commercial vendors that are investing billions of dollars in 5G, private wireless, tactical private wireless and more. For instance, the Commercial Solutions for Classified (CSfC) program established several years ago by the National Security Agency, is leveraging commercial technologies and products to deliver cybersecurity solutions quickly for the Department of Defense (DoD) and the intelligence community.

Another highly visible example: the DoD's Joint All-Domain Command and Control initiative, or JADC2. This program is a re-envisioning of the battlespace where all military resources, from manpower to air, land, sea and space assets to weapons systems, operate in a shared data environment. The rethinking of what it means to have integrated operations is driven by the same engine as the global economy—the power of data. JADC2 is built intentionally on the premise of using innovative technologies. It is not a stretch to see this as an embrace of commercial solutions, since the JADC2 strategy itself embraces “a willingness to modify existing policies, authorities, organizational constructs and operational procedures.”

Shifting the Balance Between GOTS and COTS

In the early days of the Fourth Industrial Revolution—that is,

the birth of the IT industry—the importance of government investment, usually for military purposes, cannot be overstated. The imperative to meet military needs pioneered numerous advancements, from radar and walkie-talkies in the 1930s to digital photography and satellite navigation in the 1960s and 1970s. The DoD played a central role in developing its own products and technology directly or via government contractors. Once the DoD developed a solution for a specific mission, the technology was made available to be reused for other government missions. Thus was born government off-the-shelf (GOTS) technology.

“Think about wireless communications. If you go back 30 or 40 years, the DoD was probably the biggest research and development engine for wireless technology globally,” said Steve Vogelsang, chief technology officer (CTO) of Nokia Federal. “Aviation, lunar missions and military communications—they were the big engine driving wireless technology advances.”

Today the government embraces the premise of COTS, or commercial off-the-shelf, solutions. While the Defense Advanced Research Projects Agency (DARPA) is the best known example of military research and development efforts, the DoD Innovation Ecosystem seeks the latest advances in dual-use technologies that can advance the battlefield capabilities of the United States and its allies and partners. Because the DoD no longer invests as much in technology research and development (R&D) as the private sector, the military prioritizes identifying and acquiring commercial technology. IT and related technologies have become so pervasive in consumer and business markets, companies all over the world collectively are investing more in R&D than the Pentagon.

First, Sense—and Share—the Information

The summary of the JADC2 strategy released by the Pentagon in March 2022 stated the purpose of the initiative is “to optimize the availability and use of information to ensure that the commander’s information and decision cycle operates faster relative to adversary abilities.” In simpler terms, it has been described as, “Sense, make sense and act.”

By “sense,” the DoD means the ability to integrate information coming from all domains and the electromagnetic spectrum—land, sea, air, space and cyberspace. The strategy describes the ability to “discover, collect, correlate, aggregate, process and exploit data from all domains and sources (friendly, adversary and neutral), and share the information as the basis for understanding and decision-making.”

Modern battlefield networks increasingly must not only handle voice communications but also large and varied data types, including still images, video, sensor data, maps, situational awareness data and inventory information. In addition to transporting the raw data itself, the networks must redistribute the analysis of all this complex and multifaceted data from remote compute resources back to the battlefield. But the collective volume of data transmission is competing for limited network bandwidth on a contested battlefield. To address the growing demand for battlefield bandwidth, the DoD is looking to employ military and commercial technologies, including 5G.

Two distinct challenges exist to meeting the need for bandwidth. First is figuring out how to transport data over disparate networks. One of the handicaps first responders face in large-scale events such as 9/11 and mass shootings, for instance, has been incompatibility

between police and firefighter communications systems, leaving each confused as to the other group’s actions. That obstacle is far bigger within the armed services; Army, Air Force and Navy/Marine Corps communications systems and IT networks were not built to communicate with each other.

“One of the reasons JADC2 has become a big focus, for wireless communications in particular, is because different branches used different technologies from different manufacturers, and none of them talked to each other. That was always a big challenge,” Vogelsang said. “When the Internet and Internet Protocol becomes the standard, that changes the picture—IP works over any transport, for all those waveforms. 5G uses IP, so it easily plugs into JADC2.”

That leads to the second challenge: how to integrate all these information channels into a secure and unified data-centric network of networks.

Traditional military communications systems were built for single-channel, voice-based command and control. For instance, the Single Channel Ground and Airborne Radio System (SINCGARS) made its debut in the early 1980s. It is still in use today, 40 years later, and it can’t transmit or receive data. By contrast, 5G is designed to provide high-speed data connections to many devices and users simultaneously, while also handling voice communications.

In addition, Vogelsang said, “5G is the first wide-scale technology that has the security for mission-critical services [as well as] industrial uses. When we start to think about tactical deployment, there are other security issues—what can an adversary do to keep me from connecting? Finding my location? You can actually address those concerns with 5G.”

The other part of security, ensuring data privacy, is handled by encryption, so that if someone manages to penetrate the transmissions, whatever is being sent is sufficiently encrypted.

“The DoD has much more stringent encryption requirements than commercial Internet,” Vogelsang

said. “Fifteen years ago, the cost of encryption was prohibitive because it burned CPU cycles. ... Now it’s embedded in the silicon. What the government has recognized is that they can use commercially developed encryption if they architect it right to protect classified communications.

“The idea is why would we (DoD) invest in our own proprietary technology, which tends to be slow, costly and behind the market, when we could use commercial technology if we use it in the right way,” he said. The NSA’s CSfC program “provides a blueprint for how to use it the right way. For Nokia in particular, in our IP routing and optical networking solutions we’ve embedded the encryption technology required by the CSfC blueprint. You can enable it at little to no incremental cost.”

Finding ways to capitalize on commercial technology also is about the DoD gaining financial leverage and control. Historically, when the Pentagon specified a proprietary radio system, for instance, the company designing and building it had to recover its investment through device purchases as well as billing for development costs (the infamous “cost-plus” contract). Because the volume of devices would be miniscule, at least as compared to those made for commercial markets, the price of each device would be high.

“Smartphones, tablets, cars, trucks, and even some routers and home Internet gateways all have 5G—5G is going to be built into billions of devices,” Vogelsang observed. “That has a huge impact on the cost curve.”

A Quick Look at the Big Picture

In 2016, Nokia acquired one of the legendary companies of American technology—Bell Labs. “A lot of fundamental technology in this field has come out of Bell Labs, and it has been working with the DoD for a very, very long time,” Vogelsang said. The company spends almost \$5 billion per year on R&D, and develops its own dedicated silicon for many of its products including encryption technology.

It is important to recognize that JADC2 may be a DoD initiative, but the United States also relies on its allies and partners. Organizations such as NATO (31 member countries), the 5/9/14 Eyes alliances (intelligence alliances) and U.S. treaty allies in the Pacific region, the Middle East and elsewhere, also have a role to play in protecting the national security of all.

The JADC2 vision includes partners and allies. For Nokia, headquartered in Finland—which borders Russia for more than 800 miles, and joined NATO this year—playing a role in JADC2’s success is about more than just the success of the company.

Conclusion

Including 5G in the baseline JADC2 initiative brings the latest in data and voice technologies to the battlespace. It should be seen as part of the overall communications capability, not as something separate.

Inherent in the JADC2 vision is the idea of gateways, nexus points that connect different waveform radios and data flows from everything from sensors to satellites to weapons systems. Data transmission increasingly is the challenge as volume grows and factors such as latency become more important. And the communication flow is in both directions, from the battlespace to command centers, which needs to ensure the data is accurate so it can be turned into actionable information and returned to the battlespace.

In the 1990s, the global chemical company BASF ran a lengthy ad campaign about how it didn’t make a lot of the products people use—it made them better. When it comes to JADC2, that’s how Vogelsang envisions the role of 5G.

“It’s how can 5G enhance capabilities and integrate into the existing command and control—5G has to be a part of that picture, not replace it.”

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