

Innovation in Action: How Agencies Are Accelerating Mission Delivery

Edge computing. Artificial intelligence (AI) and machine learning (ML). Data science. Cloud. In recent years, each of these fields has spurred innovations in how agencies deliver on their missions. Increasingly, however, we are seeing how these fields are coming together to drive even greater advances.

Moving computing as close to the source as possible has benefits, including greater efficiency and cost effectiveness, often thanks to AI and ML. After all, edge computing saves agencies from having to transmit data to a data center for analysis. As a result, many have turned to the edge to speed responses and achieve goals.

Fundamental to edge computing is cloud, and although many agencies have adopted cloud in some form, it still comes with its challenges, which extrapolate to the edge. This e-book, based on the [Red Hat Government Symposium 2022](#), looks at how agencies are adapting to make the most of modern technological opportunities.



Innovation at the Edge: Benefits and Challenges

Not so long ago, Air Force communications meant radios that transmitted information about where to go and what was happening. “Fast-forward a few decades and we started to introduce more digital input into the cockpit so that pilots could see more than just what they were being told about,” said Winston Beauchamp, Deputy Chief Information Officer for the Department of the Air Force. “Now we’re talking about a situation where edge capability expands the envelope of the missions that we can get accomplished and changes the ways in which we can accomplish them.”

A major benefit of the edge is communicating through more ways than voice, especially in battle zones where connectivity may be denied, disrupted, intermittent and limited. “We’re talking about ... giving the operators the opportunity to adjust their plans dynamically, based upon what was seen not just by them, but by other sensors in the field, whether they were other pilots in previous sorties, or even sensors in the air and space environment that tell them about where the other side is, has moved or changed their posture in some way,” Beauchamp said.

Currently, the service uses edge computing in its [Agile Combat Employment](#), a scheme of maneuvers aimed at increasing survivability while generating combat power. If warfighters are under threat at fixed bases, they must move to alternate locations quickly – and those might not have all the infrastructure of a traditional base. “Edge technologies enable you to deploy to that location that you need to accomplish that mission without a huge footprint,” Beauchamp said.

NASA has applied edge computing to the International Space Station (ISS), increasing how fast data can be exchanged between it and Earth to “the speed of relevance,” said Jeff Winterich, Chief Technologist at Hewlett Packard Enterprise for the Defense Department Team and AI Ambassador for HPE Public Sector. That’s done by enabling the data to be analyzed at the edge — on ISS — so that only actionable information is sent back and forth.

That’s because in edge computing, “latency is a killer,” he said. One solution to the challenge of reducing it is the use of Kube Frame, or the Kubernetes Framework. It can put teraflops of computing power at the edge, such as in tools that developers or data scientists need.

But when warfighters are operating in theater, they may not have a Kubernetes expert on hand to manage edge environments, making automation key, said Evong Chung, Director of Solutions Architecture for Red Hat U.S. Public Sector. “Having that automation to maybe even just hit the reset button and for it all to come back up is going to be really critical,” Chung said.

Security is another challenge, she added. Although the NIST 800-53 standard for accrediting systems security has been adapted to cloud, edge presents a fresh set of issues. “I think edge is ... very much an ecosystem play,” Chung said. “We need to bring hardware vendors together, software vendors together, integrators together with government to really tackle some of these use cases.”

Use Case: Innovation at the Point of Care

To improve patient outcomes for the 9 million people enrolled in Veterans Affairs Department (VA) health care programs, officials are turning to AI and ML models.

Here are three ways that's happening:

- VA has rolled out its **Clinical Assessment Management Portal** to more than 100 facilities. Built by the National Intrepid Center of Excellence at Walter Reed National Military Medical Center, it's used to measure and predict health outcomes for various medical issues.

For instance, when patients visit an amputee clinic, it collects outcome measures to help clinicians understand where they'll be in six months, a year or five years. "We have millions of what is called PROs, patient-reported outcomes, that we're using, supporting different clinical communities so they understand the outcomes within the patient," said Jesus Caban, Chief of Clinical and Research Informatics at the center.

- The center maintains the VA Traumatic Brain Injury Veterans Health Registry, which contains standardized medical records on every patient since 1999 who has had a concussion. Researchers use that data to study how many of them develop mental health conditions after having a concussion and how long symptoms take to show up.

To do this, Caban and his team meet with clinicians to ask what features they think would benefit potential models. "Having standardized definitions [of medical conditions] has been the single most important thing that we have been able to do, with the help of providers, to be able to input good data to our models," he said.

- Mission Daybreak, a \$20 million effort to reduce veteran suicides, studied how patients engage – or don't – with VA care systems, plus social factors and employment to understand what contexts present greater risks.

"Maybe if we took this information together, did some analysis and pulled it together in a particularly interesting way, it would help to leverage an insight that would help change the inflection from going left to going right, and really improve the care pathway for that veteran," said Amanda Purnell, Director of Data and Analytics at VA.

Part of the effort included using synthetic data, which involved running ML on real data to generate an artificial dataset that can be used to test solutions without changing the original data.



Use Case: Innovation in Modernization

Until 2016, the National Flood Insurance Program's (NFIP) Pivot General Support System was hosted on a mainframe. After several failed attempts to get it off, the Homeland Security Department selected Pivot, a web-based system designed to facilitate and consolidate in one system NFIP's core business processes, as one of five agile modernization projects.

The agency opted to use OpenShift Container Platform 3.11 to facilitate the move, which proved helpful when NFIP had to move the system to the cloud a couple of years later because it didn't have to do a full rebuild. "We didn't have to change the applications or databases; there were minimal architecture changes," said Sam Hultzman, System Owner at Red Hat for Pivot. "It's a lot like moving the mobile home from one lot to the next."

The cloud has its own benefits, he added: Network performance is about five times faster and the agency saves money that it can reinvest in additional modern technology. "We can't stay static on our architecture and software stack, so we're going to be looking ... at is whether there are other tools out there that we need to invest in that can help us," Hultzman said.

Agencies like NFIP that have success with cloud migration typically take three steps, said Dominic Delmolino, Vice President for Worldwide Public Sector Technology and Innovation at Amazon Web Services:

- **They're committed to using all the cloud offers.** "Cloud providers ... [provide] a breadth of services, a depth of services, innovates on your behalf, invests on your behalf and also gives you that access to new innovations as they appear," Delmolino said.
- **They acknowledge that cloud is a team sport.** This means not only development teams but also operations and security teams, and vendors and partner. "Your developers are probably super excited about the opportunity to get to the all-you-can-eat buffet of services and opportunity and innovative options that are available on the cloud," he said. "But, quite frankly, you need to have a team by your side."
- **They go fast.** "Pave the road with an incremental approach, using early smaller systems to do the learning, to make sure you can pave the road for the next system to get there faster," Delmolino said.



Innovation in Cybersecurity

Wherever compute happens, it must be secure. Here's where three entities are focusing their efforts on cybersecurity:

- Software supply chain security has been a top priority at the **National Institute of Standards and Technology (NIST)** recently. In February 2022, the agency published the Secure Software Development Framework, a set of secure software development practices. "One of the beauties about the framework is it is workable for all types of maturity of an organization, so if you're a very mature organization and you're already using a lot of secure software development practices, it's plug-and-play," said Jon Boyens, Deputy Chief of NIST's Computer Security Division. "If you're new, it refers to different standards that can help you get going."
- The **Cybersecurity and Infrastructure Security Agency (CISA)** is working to get security kits to those who need them faster. Traditional kits require a freight shipment to put onsite, which could take a week. "What we've been working on is leveraging cloud to take parts of the kit that don't really need to be on location and just deploying sensors so we can stream back to either the network I run in Virginia or into one of our cloud environments," said Ken Bailey, Section Chief for Capabilities, Data and Integration at CISA.
- Sandra Lopez, Chief Technology Officer at **Leidos**, an engineering firm, has her eye on zero trust, the "never trust, always verify" concept, including how agencies will apply the new DoD Zero Trust Strategy. "I see some

investment in ... dynamic decision-making with respect to the data that is being produced by the sensors in zero trust," Lopez said. "That thinking will allow us to now be continuously assessing the worthiness of those accesses, those individuals, those endpoints and the endpoints of different kinds – human and nonhuman – that are going to be out there."



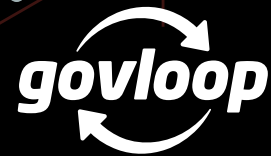
To learn more, check out the on-demand version of the Red Hat Government Symposium 2022.



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