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Putting Boots on the Edge to Support the Modern Warfighter

Modern warfare stretches far beyond the battlefield. With fronts located around the world and in cyberspace, Department of Defense (DoD) branches and agencies are tapping into technology innovation to maintain a tactical advantage over those looking to harm our country.

To keep enemies at bay, today's warfighters rely on a growing number of connected devices that allow soldiers to operate more efficiently and effectively. As the threat landscape circles the globe, devices like unmanned drones, satellites, sensors, and laptops are spread far and wide – collecting data and sending and receiving information and orders from remote places known as the network's edge.

What is Edge Computing?

Edge computing is computing that takes place outside the data center and close to the physical location of either the user or the source of the data. The battleship collecting data from its on-ship radar is on the edge. The satellite monitoring threat movements is on the edge. The remote field hospital treating soldiers on the ground is on the edge.

Issues arise when massive quantities of data collected at the edge need to travel back to headquarters or central command to be analyzed and sent back to the edge location before teams can make decisions based on the information. The time lag can cost a tactical advantage. When factoring in issues with sorting through all that data – with often only a portion of it being relevant – and the bandwidth needed to send and receive that information, the inefficiencies of relying on central command for real-time data analysis become apparent.

"Edge computing brings the data collection and compute functions to the physical edge locations," explains Anne Dalton, SSP, data science and edge computing, Red Hat. "Data analysis happens where the data is collected, offering real-time insights and better situational awareness while improving efficiencies and significantly shortening the time to make critical life or death decisions."

JADC2 on the Edge

As the DoD moves to modernize its widespread resources, interoperability across branches will deliver greater insight and a tactical advantage. Toward this end, the Joint All-Domain Command and Control (JADC2)[1] initiative, is designed to connect sensors and weapon systems from all the military services—Air Force, Army, Marine Corps, Navy, and Space Force—into a single network, as opposed to each service developing and maintaining their own systems that don't communicate with each other. DoD leaders hope to incorporate emerging technologies (machine learning and artificial intelligence) into JADC2 initiatives.

Through JADC2, commanders in the field will be able to make quicker decisions based on the best available sensor data collected, gathered, and analyzed from all sources in the field. While JADC2 is still in the early stages and there are challenges to overcome, analyzing real-time sensor data in the field to fulfill the vision of JADC2 will be achieved through edge computing.

Edge in Action

The DoD is putting edge computing in action across a variety of applications – with significant opportunities for future use cases and growth. For example, edge computing is enabling predictive analytics for aircraft maintenance in some circumstances. In the traditional environment, if an aircraft is not operating properly or needs regular service maintenance, it is pulled out of commission, taken to the testing center, and analyzed before the problem can be discovered and resolved.

For fleets using edge computing, the compute function is in a box that is either stored on the plane or can be easily taken directly to where the plane may be in service. Edge computing offers continuous monitoring in real-time while the plane is deployed, discovering and analyzing issues and offering solutions. Updates can be pushed to the plane through the device.

In another example, edge computing can help battleships determine if an object in the water is harmless or a real threat. The onboard command has real-time data to support quick decisions.

Edge Pillars

As IT teams build out edge computing infrastructure, there are four key pillars to consider: analytics, data, security, and networking.

Analytics at the Edge: Not every piece of data that is collected is relevant to the mission. Edge devices can analyze data in real-time at the source – sorting through the information, pulling out what is meaningful, and relaying that intelligence back to the mission teams. This process occurs in a fraction of the time those analytics would have taken if the data was sent to the command center.

Data at the Edge: Gaining control of data and using it effectively is the key to mission success. Edge computing devices with containerized workloads can gather and store data at the collection point, distributing data processing away from the cloud and resolving bandwidth and connectivity constraints. This same technology can be used to push updates to the edge with little to no downtime.

Security at the Edge: Edge computing collects and analyzes data at the source instead of sending it to the central command. Sensitive data stays where it was gathered, reducing the possibility of that data being compromised in transit.

Networking at the Edge: Remote personnel, stations, and devices can't always rely on strong connectivity. Moving networking capabilities to the edge allows for data to be stored and processed where it is collected – and needed – without the need for the network connection to central command.

Walking on the Edge with Red Hat

Red Hat establishes edge computing solutions that can be managed using the same tools and processes as the centralized infrastructure yet can operate independently in a disconnected mode. Red Hat's broad portfolio provides the connectivity, integration, and infrastructure that form the foundation of edge computing use cases across all branches of the DoD. Here's how:

Develop the Foundation
Red Hat Enterprise Linux

Foundation of edge computing solutions

Provides: Ecosystem of tools, applications, frameworks, and libraries for building and running applications and containers

Build Containerized Workloads
Red Hat OpenShift

A container-centric, high performance, enterprise-grade Kubernetes environment

Enables: Technology teams to build, deploy, and manage container-based applications in edge locations

Automate
Red Hat Ansible Automation Platform

A universal automation language with cloud services and certified content

Enables: Technology teams to automate, deploy, and operate edge infrastructure

> *"DoD branches that move to edge computing workloads can reduce network costs, avoid bandwidth constraints, reduce transmission delays, limit service failures, and provide better control over the movement of sensitive data," says* ***Anne Dalton, SSP, data science and edge computing, Red Hat****. "Together with our partners, we are committed to supporting the DoD in realizing the full potential of edge computing."*

Red Hat also offers the highest levels of security to support DoD teams transitioning to edge computing capabilities. Red Hat OpenShift is the only enterprise container platform with Federal Information Processing Standards (FIPS) compliance and multiple layers of federally certified security hardening. Red Hat solutions align with the DoD Enterprise DevSecOps Reference Design (DEDSORD).

Learn More at RedHat.com/DoD

[1] Joint All-Domain Command and Control (JADC2), Congressional Research Service