

Decision dominance in multi-domain operations

**“Decision dominance...
is the ability for a
commander to sense,
understand, decide, act,
and assess faster and
more effectively than
any adversary.”**

—
John M. Murray, US Army General¹

“Project Convergence is a campaign of learning to aggressively pursue an artificial intelligence and machine (AI/ML) learning-enabled battlefield management system. Because whoever can see, understand, and act first will win.”²

The US Army’s need for decision dominance in multi-domain operations (MDO)

Through Army Futures Command efforts like the [Artificial Intelligence Integration Center \(AI2C\)](#) and [Project Convergence](#), the United States Army has demonstrated a demand for machine-assisted decision-making in edge computing environments. The US Army’s top modernization priorities from the AI2C include:

- ▶ Intelligence support for long-range precision fires (LRPF) missiles.
- ▶ Automated threat recognition for the Next Generation Combat Vehicle (NGCV) program.
- ▶ Human resources and talent management.
- ▶ Predictive equipment maintenance.

Red Hat believes that the five V’s of data (or DV5)—data volume, variety, velocity, veracity, and value—will significantly impact performance in the unique edge environments in which the Department of Defense (DoD) operates. Together, these five factors determine how well edge information systems deployed in the field can harness data to deliver valuable, actionable insights.

- ▶ **Data volume:** Data services need sufficient network bandwidth to push and pull data from the various sensors, decision-making systems, and military fires systems. The more systems and data sources, the greater the data volume needs that will be placed on the network.
- ▶ **Data variety:** As networks extend and grow, disparate systems and sensors accumulate and communicate data they have collected. Often, the communication and integration standards, methodologies, or ontologies needed to handle data variety do not currently exist in traditional systems.
- ▶ **Data velocity:** As sensors in the field produce more data volume, systems will need to quickly triage and process that data to speed data analysis and machine-assisted decision-making. The connectivity and number of systems and sensors on the network, as well as the type of data they are collecting, will determine data velocity in edge environments.
- ▶ **Data veracity:** Accurate data that is not received in a timely manner is less valuable than actionable data received at the speed of relevance. Data veracity is a measure of the accuracy and effectiveness of data delivery—a key factor in accelerating the kill chain for the sensor-to-shooter cycle.
- ▶ **Data value:** Stale data or sparse data points will be less valuable than richer, consistent data. But, data alone is not valuable. Intelligence must be developed and refined from the volume and variety of sensor data. The value of data is extracted from a combination of human and machine-assisted decision-making systems.

1 Freedberg, Jr., Sydney. “Army’s New Aim Is Decision Dominance.” Breaking Defense, March 2021.

2 “Project Convergence.” Army Futures Command, accessed Sept. 2021.

Technology imperatives for decision dominance

- **Cloud adoption:** Standardizing behavior across on-premise, cloud, and edge environments helps accelerate innovation and control costs, allowing organizations to deliver better decision-making capabilities instead of troubleshooting equipment failures.
- **Modern development:** Red Hat has experience helping DoD agencies significantly accelerate application development through agile processes and tools, including microservices.
- **Automation:** Automating routine tasks like server patching allows skilled staff to focus on higher-value, mission-critical work.
- **Cost reduction:** Cloud migration, consolidation, and automation are helping government IT teams deliver more and better services—for the same or lower costs.

Why Red Hat?

- **Military-grade security and compliance:** Our solutions meet stringent security requirements such as FIPS 140-2 validated crypto and Common Criteria certified platforms.
- **Broad partner ecosystem:** An extensive network of hardware, software, and cloud partners to meet your needs.

Architectural and operational decisions supporting MDO initiatives

Data volume requires networks that support the throughput necessary to handle large streams of data. Networks, and almost all assets in an MDO environment—including sensors and fires systems—often vary from one event to another. These heterogeneous systems and environments demand networks, sensors, and fire systems that are recomposable and configurable. And to support the on-demand nature of military and wartime operations, recomposable systems architectures and integrations must take advantage of automation to provision repeatable, recomposable, on-demand networks under tight time constraints.

Data variety is another challenge that is affected by the variable nature of battle. No two engagements will be guaranteed to have the same assets available and fielded from one battlefield to another. Developing direct, unique integration capabilities between a given sensor and system is not a feasible approach. Additionally, military operations teams need to consider where the integration point should reside, at the sensor or at an integration nexus. Ultimately, size, weight, and power (SWaP) concerns will play a part in this decision—an application programming interface (API)-based integration technique is vital to integrating the disparate, isolated systems. Systems with more resources can perform data transformations locally before communicating via APIs. More SWaP-constrained systems can use unique API endpoints that incorporate data transformation capabilities for the API host endpoint.

Data velocity requires intelligence built on top of the network. To deliver the right data to the right shooter at the speed of relevance, network architectures must also prevent the wrong data from being delivered to the wrong shooter. APIs and messaging infrastructure can incorporate intelligent data routing and processing, reducing network crosstalk and saturation and improving network throughput.

Data veracity is monitored and assessed by the systems triaging the data. As with data variety, SWaP concerns will play a part in determining how data variety should be handled in military information systems. In combination with where and how data is transformed, triaged, and stored, data veracity capabilities in MDO also depend on the ability to field systems in edge environments. If data has to be transmitted from the battlefield to a central datacenter, latency and bandwidth limitations will prevent responsive decision-making, undermining MDO teams' decision dominance. To act on time-sensitive data, decision-making systems must be as close to the source of data creation and decision performance as possible. To this end, edge deployments must be able to support the execution of sophisticated workloads, including AI/ML.

Data value is derived from combining and analyzing the data generated from sensors and realized through the influence of emergent intelligence. Data value requires timely data, and the ability to generate insights from multiple data sets. The closer to the edge sites of the battlespace the analysis systems are, the better these systems can handle data volume, variety, velocity, and veracity and the more valuable insights they will be able to generate.

Enterprise datacenter and edge operations for AI/ML

Whether operating at edge sites or in a traditional enterprise datacenter, AI/ML systems demand greater maintenance and operational management than traditionally fielded IT systems.

While a traditional enterprise information system may see updates on a semi-annual to annual periodic basis, AI/ML systems are far more dynamic and must regularly be updated, modified, and adjusted to maximize the accuracy and value of the insights these systems deliver. This accelerated,

- **Cultural transformation:**

We collaborate with the DoD in applying agile software development principles to create organizational change.

- **Experience:**

We have worked with many DoD and civilian government agencies to modernize their application development processes.

About Red Hat

Red Hat helps customers standardize across environments, develop cloud-native applications, and integrate, automate, secure, and manage complex environments with [award-winning](#) support, training, and consulting services.

North America

1 888 REDHAT1
www.redhat.com

Europe, Middle East, and Africa

00800 7334 2835
europe@redhat.com

Asia Pacific

+65 6490 4200
apac@redhat.com

Latin America

+54 11 4329 7300
info-latam@redhat.com



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@RedHat
in linkedin.com/company/red-hat

redhat.com
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continuous release schedule requires a platform that supports configurable, automatable, and consistently repeatable deployments and infrastructure. Tooling around AI/ML should be focused on containerization, data management, and configurable, automatable infrastructure deployable on-premise and in edge environments.

How Red Hat solutions support decision dominance in MDO

Automation is a vital tool in the ability to rapidly field consistent, dynamic infrastructure with a recomposable architecture. [Red Hat® Ansible® Automation Platform](#) provides an enterprise framework for building and operating IT automation at scale. While many vendors offer proprietary automation tools for only their products, Ansible Automation Platform integrates with existing investments in proprietary vendor automation and supports the authoring of custom automation tasks. Many hardware and software vendors [publish Ansible Automation Modules](#) for their products. Implementing a common automation toolset across heterogeneous environments can significantly reduce the time required to deploy on-demand infrastructure, networks, and workloads needed for successful MDO.

Using Ansible Automation Platform, military IT operations teams can accelerate and improve their ability to reliably and repeatedly deploy short-lived networks at the infrastructure edge. Implementing IT automation reduces the maintenance and human labor efforts required to deploy and configure these networks, saving operations teams time and money and preventing incidents of human error associated with manual network configuration.

Together, Ansible Automation Platform and the rest of the Red Hat portfolio help MDO initiatives to deliver on DV5 demands and achieve decision dominance:

- ▶ To manage data variety, [Red Hat Integration](#) provides a lightweight framework that is both cloud-native and edge deployment-ready to integrate existing systems and to create and manage APIs, whether hosted on an edge device, at an integration nexus, or on a cloud service provider's infrastructure.
- ▶ Red Hat can meet the demands of data velocity through real-time messaging provided by [Red Hat AMQ](#).
- ▶ To meet the data veracity needs of MDO, scalable, cloud-native, edge-capable applications benefit from event-driven microservice architecture designs that work across various environments. [Red Hat Runtimes](#) is a collection of application frameworks that meet these demands. Finally, data value will be delivered from the analysis systems consuming the data produced by sensors. These systems may be custom-built, traditional applications, or machine-assisted decision making systems using AI/ML.
- ▶ To gain the most value from AI/ML, systems should be easy to deploy and manage. [Red Hat OpenShift®](#) delivers a consistent development and operational experience across AI/ML models, frameworks, and deployment environments, streamlining how military DevOps teams develop, run, and manage traditional and AI/ML workloads.

Learn more

See how [Red Hat helps the DoD](#) improve data availability and integration in multi-domain operations, innovate with agility, and standardize interoperable solutions across all branches and agencies.