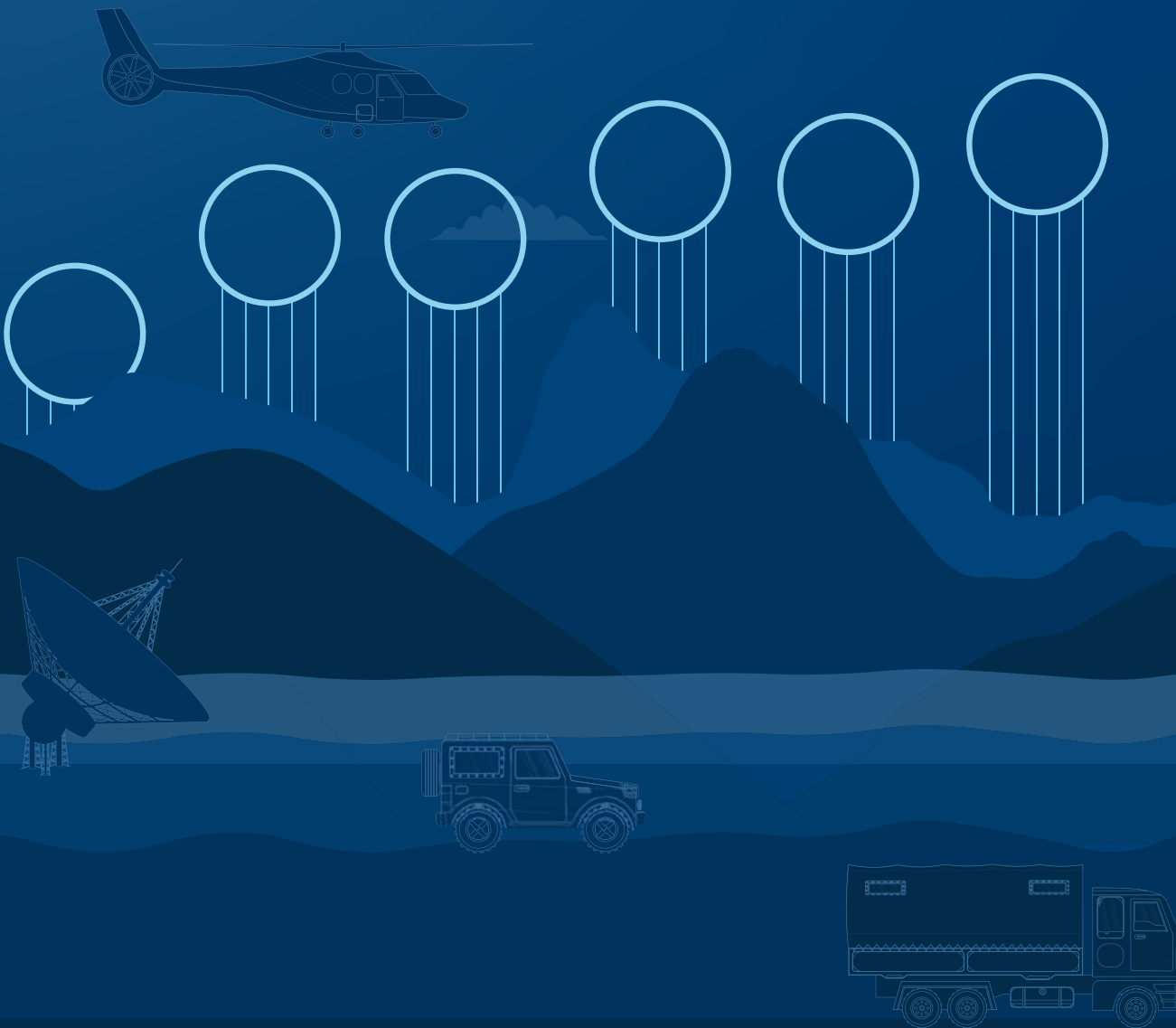


How to Support Data-Driven Decision-Making at the Tactical Edge



Introduction

Military and tactical deployments increasingly operate on vast amounts of data, generated by an array of ground, air and sea forces, including both manned and unmanned vehicles. Managing, analyzing and prioritizing that data – from multiple sources and in numerous formats – is the key to effective real-time decision-making.

Like agencies throughout government, the Department of Defense is striving to perform data processing and AI analytics at the edge for a number of reasons. Target accuracy and time-critical response are crucial in contested environments, whether for smaller tactical units or large-scale operations.

At one extreme, the Navy's [Replicator](#) initiative could deploy thousands of autonomous vehicles – including aerial, ground, surface, sub-surface as well as satellites – to try and counter the numerical advantage an adversary would have. The ability to process data at the edge will be critical to make our systems individually more effective, resilient and lethal on a unit-by-unit basis against our adversaries.

To learn more about the emerging trend of edge computing, GovLoop worked with Dell Technologies and Intel to conduct a survey of our community. The survey received 138 responses from within DoD and the intelligence community, federal civilian agencies and state and local governments, as well as industry.

While the survey shows that agencies across the board are pursuing data-driven decision-making, this report looks at why DOD services and components need data at the tactical edge, and how they can best make use of it.

Data-Driven Decision-Making Emerges as High Priority

“Real-time data-driven decision-making has always been a part of all tactical operations,” said Stan Mo, Intel’s Senior Systems Architect for Federal, Aerospace and Defense, and Public Sector Programs. “The biggest difference has been the breadth of networking communications technologies, along with the computer, artificial intelligence (AI) and sensor revolution, that has allowed for more information to become available more rapidly across all echelons of combat operations.”

Military units at the tactical edge need to collect real-time local data from a variety of sources and prioritize, corroborate and make decisions from it. And they need to do it as quickly and effectively as possible, because enemy combatants likely have similar capabilities raising the bar on operational tempo and shrinking the window of time available to decide on what to do and act.

“To achieve all of that, the DOD has to modernize,” said Gregory Rahaman, OEM Solutions, Senior Engineering Manager at Dell Technologies. “We need to speed up the kill chain by giving the warfighters the data where and when they need it.”

The growing importance of data-driven decision-making is the primary driver for moving data processing to the edge. A full three-quarters of respondents in the survey said it was either a growing priority (42%) or a top priority (33%) for their organizations (Figure 1). Forty-two percent said the interest in data-driven decision-making had increased significantly in the past two to three years, with another 31% saying it had increased somewhat.

Using data in the field or at the tactical edge is also increasingly important, and was cited as a top priority by 22% of respondents and as a growing priority by 47%.

Respondents are aware of the emergence of AI and machine learning (ML), with 87% saying AI and ML would be used to some extent in the next three to five years (Figure 2). Forty percent expect to see growing use in many areas, while a third see limited use in selected areas. But 14% expect AI and ML to quickly become essential.

Modernization, especially in the form of automation, will be critical to making the best use of AI and ML because of the challenge of processing vast amounts of data at the edge. “It has to be autonomous, it has to be, to some degree, heuristic, adapting to conditions and new situations,” Mo said. “The system must be resilient, able to operate and heal itself, and to regenerate and resist attack. This is critical in an environment where we may be numerically outnumbered and therefore cannot afford to attrit systems at the rate of our enemies. AI and ML will certainly be a contributing factor to helping us achieve greater resilience and unit effectiveness.”

Agencies Are Bullish on Data-Driven Decision-Making, AI

Figure 1: In general, to what extent is your organization looking to use data to drive better decision-making in support of mission readiness?

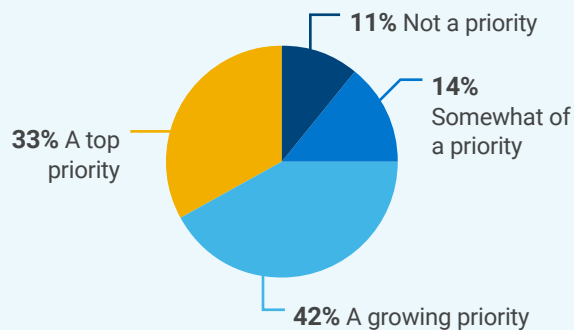
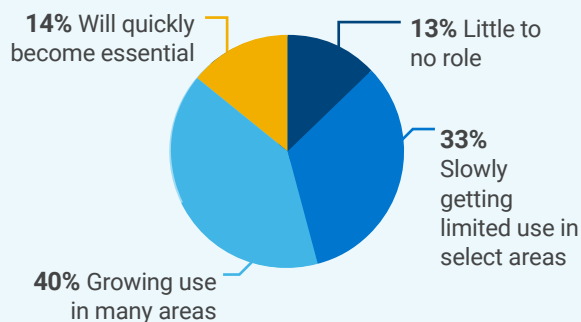


Figure 2: Over the next three to five years, what role do you see for AI/ML in supporting decision-making in the field?



Commercial Tech Goes to the Edge

The challenge for units in the field is the size, weight and power (SWaP) requirements of bringing computing platforms and communications with them. They need smaller, lighter servers that are hardened for rugged environments and capable of operating on less power than typical data center servers.

DoD always has the option of customizing equipment, such as ruggedizing servers, but the less that's done, the better. Because customized equipment is often proprietary tech, it can be difficult to swap out in the event of damage. It's also more costly, adding a "C" to SWaP considerations. "SWaP-C is the foundation for decisions around what kind of systems you're going to build and how much customization you can afford," Mo said.

The alternative is commercial systems that are built for deployments in the field and at the tactical edge — small and light, with the flexibility to draw from a variety of power sources and perform a variety of functions, Rahaman said.

Respondents to the survey recognize the advantages of using commercial technology, with nearly two-thirds saying they expect to use commercial tech at least in some cases, and the largest cohort (33%) saying they expect to use it to the greatest extent possible.

When it comes to IT capabilities, respondents were very sure about what they need. Remote data access was named as very important or must-have by 87.3% of respondents, followed by cloud computing at 71%, integrated server and storage stacks at 66.1% and 5G connectivity at 59.7%.

Among other categories, high-performance processors were very important or must-have for 70.5% of respondents, followed by expandable components at 64.5% of respondents, reduced SWaP at 53.2% and certified MILSTD810 ruggedization at 39.7%.

Every feature was deemed at least somewhat important, with each being rated as not important by less than 10% of respondents, except for certified ruggedization, which was deemed not important by 17.5%.

Commercial Tech's Growing Role

Figure 3: In moving data to the edge, does your organization expect to leverage commercial technology for storing, managing and processing data (e.g., servers, desktops, tablets and storage)?

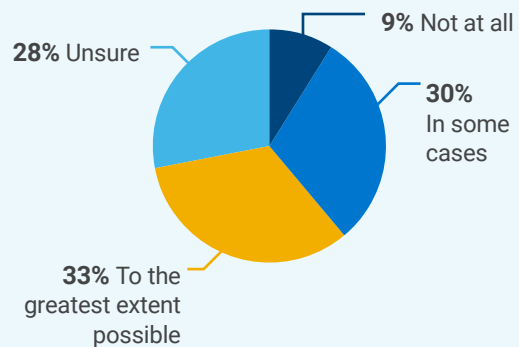
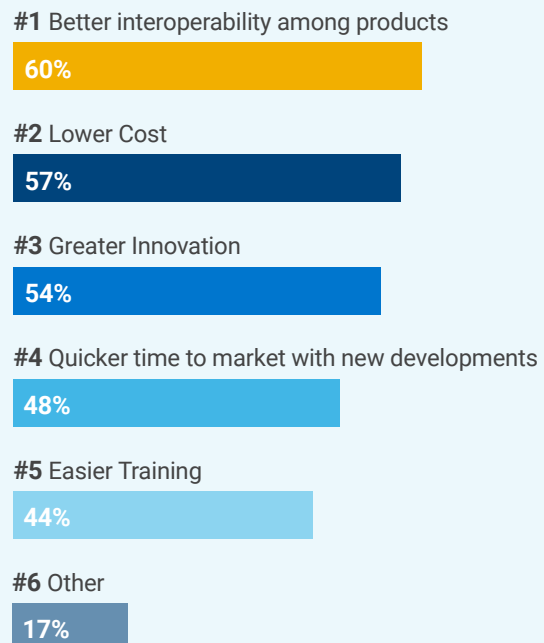


Figure 4: What do you see as the most important benefits of buying commercial technology vs. custom hardware? (Select the top three.)



High-Powered Processing in Harsh Environments

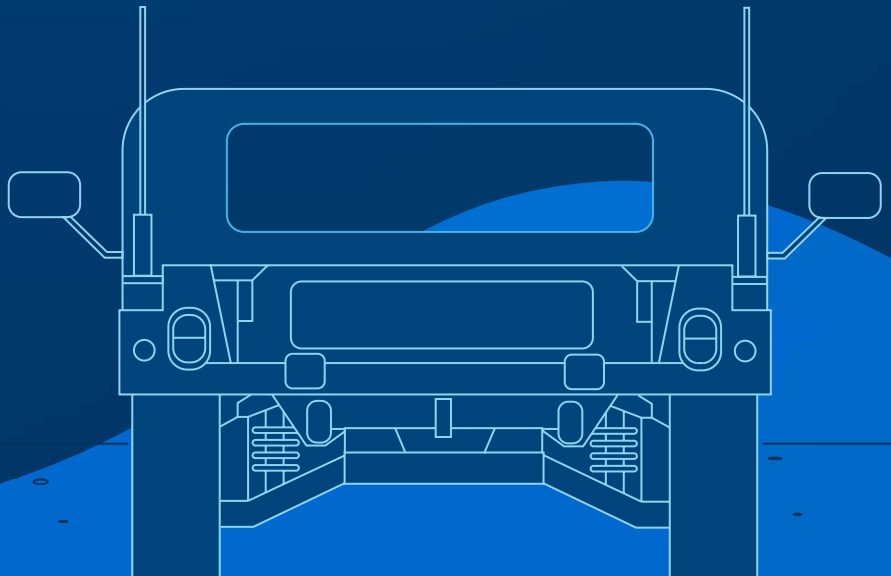
Modern military and tactical operations in the field rely heavily on servers for communications, data processing, real-time analytics and mission-critical decision-making. But when temperatures exceed 35°C (95°F), traditional data center air-cooling methods fail, potentially leaving units stranded in hostile territory.

A special forces unit in remote terrain, for example, needs real-time intelligence, terrain mapping and coordination with the base, as well as communication with drones and unmanned aerial vehicles (UAVs) that relay information for processing. If the servers overheat, the unit will have limited information on potential threats or the location of someone they are trying to rescue. Losing communications with UAVs could lead to the loss of expensive equipment or, worse, unintended collateral damage if they act without proper command and control.

Thermal-related failures are common in austere environments, as the limitations of air-cooling systems often result in server throttling or overheating. Units would be better served by self-contained direct-to-chip liquid cooling, which enables military and tactical teams to deploy anywhere — and without the plumbing required for typical liquid-cooling systems.

JetCool's SmartPlate System is integrated into Dell's PowerEdge servers, powered by Intel Xeon Scalable processors. This innovative system successfully reduces chip temperatures by up to 30% and slashes fan power consumption by 50%. As a result, the servers operate with significantly cooler chips, which not only enhances performance but also results in energy savings of 100W per server.

The SmartPlate System allows these servers to run at full turbo speed outside the data center without the need for external liquid cooling infrastructure, allowing them to deliver communications, data processing, real-time analytics, and real-time decision support even in the harshest environments.



Data Centers at the Tactical Edge

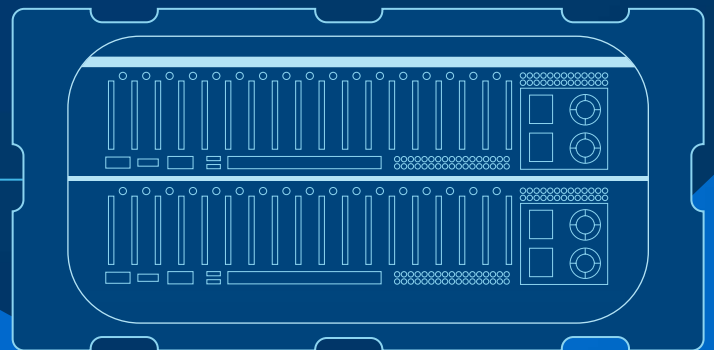
Warfighters at the tactical edge need cloud capabilities and computing platforms that are engineered to function in whatever specific environment their mission demands. Rugged, challenging environments give new meaning to edge computing. But if you look a little deeper, you'll see that in many cases the edge is not really the edge anymore — it's home to a new type of data center.

Military and tactical units in the field have the same needs as they would in a traditional data center environment and bring many of the same capabilities with them, including enterprise-grade computing power, reliability, scalability and powerful systems management tools. But many of those capabilities rely on the cloud to get real-time data to where it is needed most across organizations in a secure manner. Units also need a common interface, allowing them to work with data from multiple sources.

Tracewell's Tactical Azure Platform, built in partnership with Dell Technologies, can meet those needs, bringing the capabilities of the Azure Stack Hub to tactical, remote and harsh environments. The Dell for Microsoft Azure Stack delivers a powerful hybrid cloud platform built on an enterprise-class hyperconverged infrastructure.

For warfighters, there is no difference between Tactical Azure and that data center version of Azure Stack Hub. They can take advantage of a consistent experience using Azure services in the field, employing the same skill sets they use in a data center environment. The systems are electrically identical with one common footprint across all deployed environments.

As cloud capabilities continue to evolve, Tracewell is focused on platform innovations that will be required for Tactical Azure to support warfighters as edge computing needs become more vital to missions. The company is also working closely with Dell Technologies to create new kinds of platforms capable of delivering data center functionality and digital services to a host of edge environments, including tactical missions involving standalone 5G systems, modular and portable high-performance computing and innovative and ruggedized network solutions, to name a few.



As Data Moves to the Edge, So Must Cybersecurity

Data security is a primary tenet of the DoD and government in general, and officials at every level recognize the importance of investing in security. Intel’s 4th Generation Xeon Scalable processors have advanced, hardware-enabled security technologies to help protect data while unlocking new opportunities for business collaboration and insights.

Nearly all respondents to the survey put a heavy emphasis on security, with more than 90% saying it was at least somewhat likely that they would invest in data, network, endpoint, server/storage and supply chain security. In most cases, each of those categories was rated a top priority by the largest swath of respondents.

But at the tactical edge, maintaining data security is compounded by the distributed nature of communications and the sometimes degraded environments in which they operate. The preferred approach – as it is at every level of government – is to follow a zero-trust philosophy, which essentially shrinks the perimeter around small sets of critical assets, which can be watched closely.

“It’s basically about establishing the smallest set of firewalls around the most critical asset, or assets, you have in the network,” Mo said. If an intruder gets in, they have limited access to the most critical assets in your data center and network, which minimizes the impact. Ultimately not just systems but important data itself will require some form of credentialing to establish provenance, authenticity and relevance at the tactical edge.

Dell is helping organizations accelerate zero-trust adoption with its [Project Fort Zero](#), which complies with DoD’s Zero Trust reference architecture and addresses the 152 activities (91 targeted activities and 61 advanced) set out in the [DoD Zero Trust Strategy](#).

Project Fort Zero is designed to integrate the scores of products from dozens of vendors that are used in securing a distributed environment.

“There’s no single solution here,” Rahaman said. “DoD uses many tools and software packages to protect their environments today.” Project Fort Zero is part of an effort by the company’s Zero Trust Center of Excellence, its partner ecosystem of more than 30 tech companies, to develop a DoD-validated zero-trust solution by early next year.

DoD to Invest Big in Cyber, Zero Trust

Figure 5: To what extent do you expect to invest the most resources in improving cybersecurity?

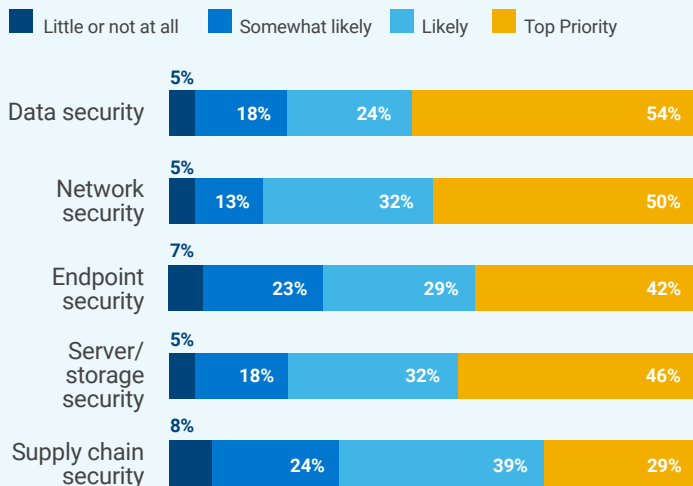
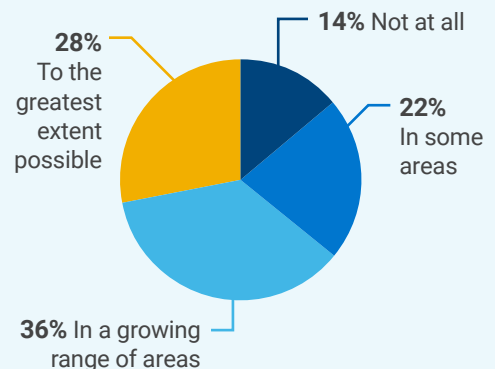


Figure 6: To what extent is your organization shifting toward a zero-trust approach to cybersecurity?



Conclusion

Data-driven decisions are at the core of today's military and tactical missions, which means real-time data collection and processing must happen at the tactical edge. Warfighters need access to high-powered computing and advanced analytics, using data from sources ranging from individual squads to unmanned aerial vehicles via interoperable platforms to get the right information to the right people at the right time – and do it securely.

The DoD needs to modernize its approach to operating at the tactical edge. Fortunately, the tools are available to support real-time data-driven decision-making even in the most remote, austere environments.



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