

Accenture Federal Services

# Extending IT to the mission's edge

Edge computing, bolstered by  
the Internet of Things and 5G  
connectivity, is transforming  
government operations





How does [Disney deliver an exceptional, immersive user experience](#) for guests at its legendary theme parks? The same way that [BP ensures the safety of remote workers](#) operating in some of the world's most dangerous environments. Like many other industry leaders, both organizations are using edge computing to bring the power of the cloud to users operating at the network's last mile.

Once viewed primarily as a network accelerator for field-based sensors, edge computing is emerging rapidly as an intelligent orchestrator of more complex processes and applications operating beyond the traditional perimeter. Given the need to execute a highly distributed mission—whether patrolling the battlefield, protecting our borders, or optimizing transportation networks and monitoring the environment—the U.S. federal government is especially poised to benefit from these maturing technologies.



To seize this opportunity, federal IT leaders should actively assess how their architectures and networks can enable and capitalize on edge computing. And program leaders should consider how data generated by Internet of Things (IoT) devices like cameras and sensors can be enriched in the field to enable smarter, more autonomous operations.



Already, federal leaders have high expectations, according to Accenture research, with more than **9 in 10** saying that edge solutions are very or extremely important to meeting their agency's mission needs.

Edge computing enhances the value of the growing number of smart devices operating at the network perimeter by enabling more complex data processing at the point of collection. For some use cases, it makes more sense to process and analyze this data locally rather than relying on centralized resources. Primary drivers include the need to accelerate data processing or otherwise overcome latency and network capacity and availability issues, with potential cost-savings, better security, and improved compliance as additional benefits.

A key growth driver is the increasing quantity of data being created and consumed at the edge.

According to IDC, data creation at the edge is expected to grow **33%** (CAGR) through 2025, accounting for **22%** of all digital data being created, captured, and replicated globally.<sup>1</sup>

And Gartner® [predicts](#) that, by 2023, "over 50% of the primary responsibility of data and analytics leaders will comprise data created, managed, and analyzed in edge environments."<sup>2</sup>

To effectively take advantage of edge solutions, government needs to think beyond piecemeal solutions and one-off fixes. Rather than solving individual problems—and risk duplicating their efforts—agencies need to look toward integrated, platform-based solutions and strategies. Then, they can begin to build the common infrastructure needed to support the mission across a range of edge use cases. There's a window of opportunity to put in place a shared set of building blocks to support edge needs across the enterprise.

Accenture surveyed 115 federal technology leaders to understand how they are using or planning for edge solutions. This report shares that data, as well as uses cases, challenges, and next steps for agencies.

<sup>1</sup> IDC, Worldwide Global DataSphere Forecast, 2021–2025: The World Keeps Creating More Data — Now, What Do We Do with It All? (Doc #US46410421), March 2021

<sup>2</sup> Gartner Press Release, Gartner Identifies Top 10 Data and Analytics Technology Trends for 2021, March 16 2021.



# When milliseconds matter

Edge solutions are especially valuable where real-time decision-making is critical, and quick response times with low latency are needed.

Another essential edge capability is compensating for poor or unreliable network connectivity, where systems need the ability to operate independently or off the grid. Likewise, edge computing can be the right solution when too much data is being generated, such as video surveillance, to transmit effectively to a centralized site. Finally, security or compliance concerns dictate that data should be kept and processed locally in some instances.

## Edge solutions have three primary components:

**1 Localized computing:** Distributed compute and storage that brings processing closer to where needed to enable more autonomous operations.

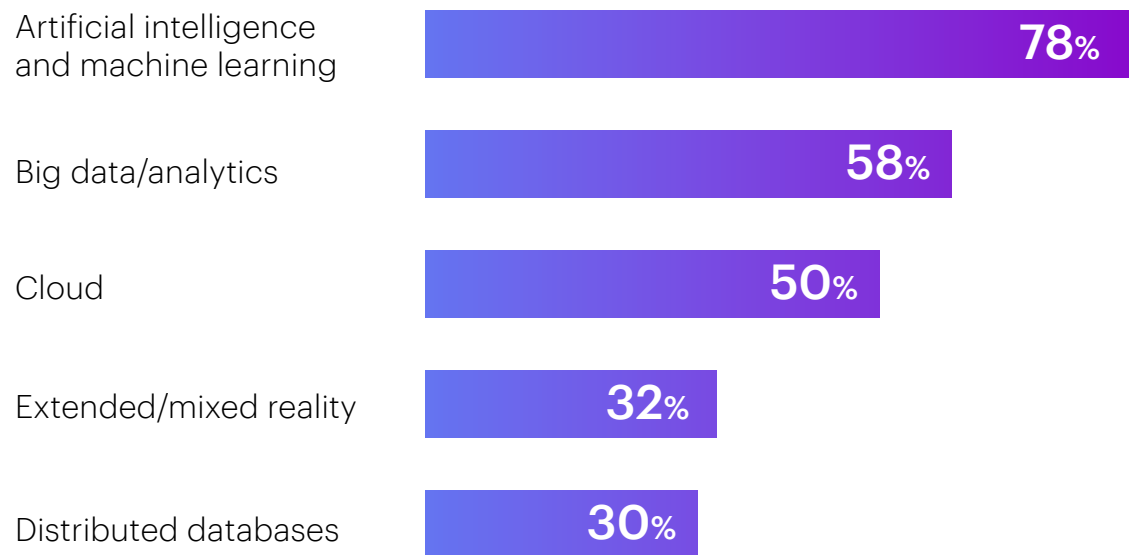
**2 Internet of Things/IoT:** Smart devices to sense, communicate and act on information.

**3 5G and other networking:** Offers the lower latency and higher bandwidth needed to take advantage of this data.

The growing ubiquity and capacity of IoT devices, coupled with the introduction of 5G networks, has brought edge computing to an inflection point for government agencies, making it viable for an increasing number of new use cases. Specifically, 5G connectivity supports dramatically more data, including video, with lower latency for real-time decision support and action. This enables massive scaling of existing infrastructure to support a far greater number of devices, increasing the fidelity and control of these networks.

And while simpler, rules-based decision-making can be valuable, edge computing's most significant potential is in bringing advanced analytics, machine learning (ML), and artificial intelligence (AI) to the network edge. This can enable smarter systems that can operate more independently while also parsing data being shared upstream to reduce bandwidth and storage needs.

**In our research, federal technology leaders shared this perspective, predicting that edge solutions will have the most impact on:**



For example, AI and ML can facilitate automated monitoring and management of remote facilities and locations, going beyond simple rules-based alerts to identify meaningful changes in the environment warranting closer inspection and responding accordingly. It can also aggregate sensor data with other information sources to provide more complex analysis and insight at the point of need.

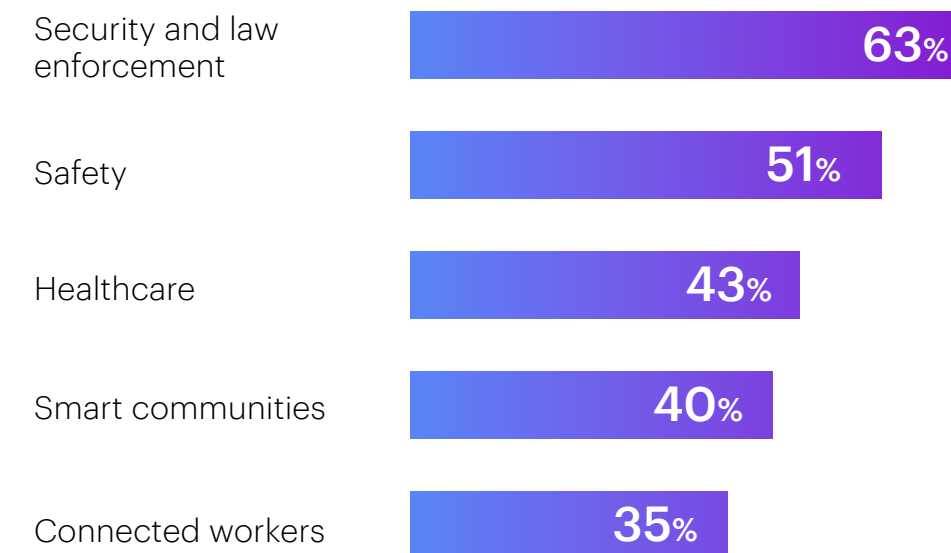
Supporting applications requiring low latency is one of edge computing's principal value propositions. For example, processing at the edge can eliminate lag in virtual reality systems operating in the field, such as those used by deployed troops or remote workers. Likewise, edge solutions can also operate autonomously in environments with poor or unreliable network connectivity to enterprise systems, such as an offshore windfarm.

Another critical benefit of edge computing is enabling more intelligent data sharing—for example, uploading only unique data—to reduce networking and storage requirements and costs (and analyst fatigue). At the same time, this approach can improve security and compliance by limiting the amount of data that is collected and transmitted across the network.

Edge solutions build on cloud capabilities, providing a common control plane for both centralized and distributed computing. They are the next step on a connected continuum that will allow powerful data processing capabilities from the core to the edge—within the IT perimeter and in the field.

# Federal use cases for edge solutions

Accenture found that the top agency use cases for edge solutions right now include:



What's clear is that edge solutions can address use cases as diverse as the many missions of the U.S. federal government.

While many federal agencies are still in the exploratory stages when it comes to edge solutions, others have seen this moment of opportunity and have begun using edge solutions to enhance key aspects of the mission.



## Safety and connected workers

AI and computer vision can enhance workers' performance when deployed via edge solutions. For example, consider how edge solutions can be used to combat forest fires more safely and effectively by tracking resources and teams in remote locations, allowing integration with existing firefighting resources, and offering recommendations.

FEMA has already [used edge computing for disaster response](#). For example, the agency "can set up a portable tactical network that is satellite-based, and can use it to collect visual data from drones before they send human rescue attempts forward."

## Warehouse and industrial settings

Agencies can leverage edge solutions to improve efficiency, replacing human eyes-on-scene with machine-driven capabilities.

For example, how does the U.S. Postal Service identify packages in their wide network? In 2020, USPS handled roughly 7.3 billion shipments. The agency cannot efficiently scan and identify this volume of shipments from one location; the distributed nature of the postal network requires a different approach.

For the past two years, the USPS has worked on the [Edge Computing Infrastructure Program](#), or ECIP, implementing edge compute capabilities in key distribution centers around the country. This GPU-based compute provides computer vision capabilities at the edge for reviewing packages. The result is an immediate ability to identify packages and take action.



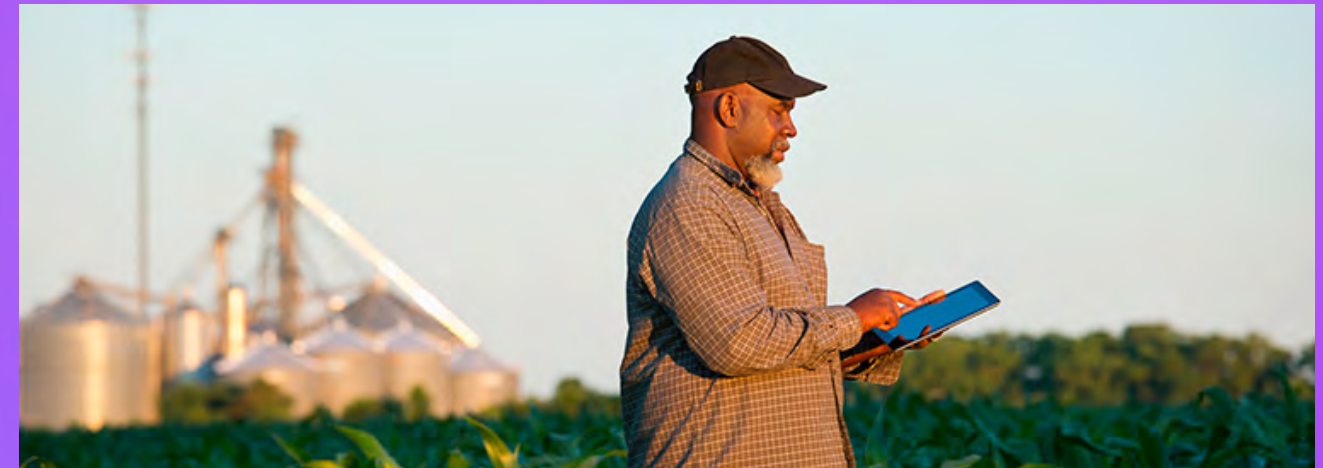


## Healthcare and telemedicine

Imagine, for example, a dynamic, high-volume medical center, where staff is tasked to keep track of patients and critical equipment and supplies. In such an ever-changing medical environment, edge solutions could help to optimize scheduling or to pre-position equipment where it's needed most.

Edge also supports medical robotics. Accenture recently leveraged edge solutions to prototype [robot-assisted surgery](#). In this use case, technology at the edge coordinates with the cloud to determine which controls are deployed on the robot, what data is used, and what information is ultimately transmitted back to the cloud.

Edge solutions also are seeing increased usage in telemedicine. Home medical devices can track patient progress and report back to medical practitioners, easing the travel burden for patients and alleviating volume at busy medical facilities.



## Field inspections

Agricultural inspections, environmental oversight, infrastructure evaluations—all could be augmented using intelligent edge solutions. These tasks require flexible, mobile IT capabilities since they often happen in remote locations or are spread out geographically.

USDA is leveraging edge computing and IoT to better monitor and analyze conditions on farms. For example, the agency funded a North Carolina State University project to use [a network of low-cost sensors, called a "StressCam system," to take photos of crops at intervals throughout the day](#). The cameras use a Raspberry Pi computer to run a simple machine learning algorithm, analyzing the images for drought stress signals. Then, data is sent to a web platform for further analysis.

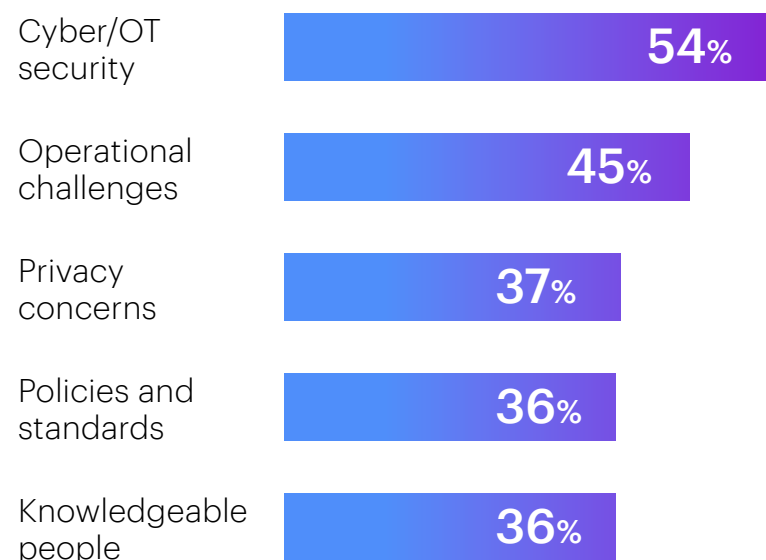
The military, meanwhile, has been aggressive in seeking ways to bring computing power to those on the front lines. The Air Force, for example, has said it plans to turn some of its [first KC-46 tankers into flying "hotspots"](#) to offload new data to F-22 and F-35 fighters at the same time they're being refueled.

COVID-19 has increased remote work in the federal government, bringing new urgency to the need for technology solutions at the edge. Our research found that 60 percent of federal technology leaders say the pandemic has increased their agencies' interest in, and adoption of, edge solutions to enable remote work.



# Meeting the security challenges for federal edge solutions

**For federal agencies looking to embrace edge computing, there are potential hurdles. Accenture's research found that agencies' top obstacles to increasing adoption of edge solutions are:**



Edge solutions raise cybersecurity and privacy concerns because mission-critical data may be generated and analyzed outside the traditional IT perimeter. Nearly 9 in 10 federal technology leaders believe that by bringing data storage and processing closer to the end-user, edge solutions will increase security vulnerabilities for their agency.

More broadly, the emergence of edge computing is another element in the continued convergence of operational technologies (OT) security, such as those safeguarding industrial control systems, with traditional IT security systems. A recent National Security Agency (NSA) alert highlighted the risk from "...stagnant OT assets and control systems installed and used throughout the USG and DIB, many of which are past end-of-life and operated without sufficient resources." According to the agency, "...system administrators should ensure only the most imperative IT-OT

connections are allowed, and that these are hardened to the greatest extent possible."

In this context, it is important to remember that edge solutions can actually reduce and consolidate the number of independent endpoints interfacing with core computing resources, limiting the amount of data traversing the network and ultimately allowing for more responsible data management. At the same time, the use of common control planes and security controls across both cloud and edge computing can work to standardize the security posture throughout the entire environment.

Edge computing systems should be managed with the same care and rigor as any information management system. By taking effective approaches, a potential liability can be turned into a building block for a zero trust architecture providing in-depth defense.

# How to get started

Agencies should carefully plan their edge computing strategy early in their efforts to better ensure success down the line. Even as agencies build out their small-scale proofs of concept, they can be putting in place the building blocks for long-term larger-scale implementations.

**Agencies can take a few key steps to develop a platform-based approach and avoid future issues:**



# 01

## **Reimagine your mission at the edge**

Focus on how field operations can be transformed through faster or more complex data processing as and where it's being generated. Specifically, look for areas where data can be enriched with added context or where systems could potentially operate with greater autonomy and intelligence.

The impetus for edge deployments should position mission owners in equal partnership with IT: Mission owners can help to determine the potential mission and operational benefits for processing outside the perimeter. Business line owners will typically be best situated to understand how emerging edge solutions can be leveraged to drive more effective outcomes, whether in support of the citizen, the soldier, or the front-line federal worker.

Discovery and facilitation models associated with human-centered design (HCD) can be used to uncover these unmet needs and to build consensus and prioritization for potential solutions.

# 02

## Harness the power of 5G+

High-speed, low latency networking, such as that offered by 5G, is critical to edge computing.

According to our research, **98%** of federal executives agreed that “widespread 5G network coverage will increase my agency’s ability to integrate edge solutions into operations.”

5G networks encompass a host of technologies that are generally designed to work together but with each offering unique strengths and drawbacks. A careful assessment is often needed to optimize the performance of a proposed solution for the strengths of a specific network. Likewise, a similar review can be used to identify untapped capabilities within an existing 5G network that can be unleashed to support new, transformative services, such as in a Smart City model.

We also shouldn’t limit our thinking to just 5G for our edge network as several complementary technologies may have a role to play.

For example, WiFi 6’s bandwidth and latency performance are similar to 5G, with the added advantage of providing strong coverage of enclosed spaces like warehouses. Other technologies like LoRaWAN are differentiated by their low power consumption, which is especially important for remote implementations, such as pipeline sensors, where you may only want to change the battery every 10-to-15 years. And for genuinely remote locations, satellite connectivity, such as Starlink or Iridium, may be needed to cover the gaps in existing 5G and LTE footprints.

For these reasons, federal agencies need a comprehensive 5G+ network strategy that selects and seamlessly integrates 5G and other heterogeneous technologies, optimizing them to the use case requirements. Ideally, you will operate smoothly across all of these wireless technologies by taking advantage of communications gateways that dynamically mix & match protocols based on changing environmental conditions. Likewise, it is also important to work closely with telecommunications providers as they expand their 5G networks and make their spectrum available for private network deployments.



# 03

## Architect a platform-based approach

Edge solutions build upon a number of core cloud computing concepts, such as serverless architectures, application containers, and microservices, deployed in a localized environment. Taking advantage of this more modular, 'plug & play' interoperability can make it simpler and faster to develop mission or agency-specific edge solutions using a platform-based approach. It also creates a more extensible architecture that can be easier to maintain in the long run.

So even as agencies build out small-scale proofs-of-concept, they should be putting in place the components for long-term, larger-scale implementations. This means federal agencies should consider edge computing as an extension of their existing enterprise architecture and develop standards accordingly.

Gartner predicts that through 2022, "a lack of standards or broadly accepted architectures for edge computing will ensure that **over 85%** of enterprises will deploy multiple, incompatible technology stacks."<sup>3</sup>

A platform-based approach to edge will help agencies to sidestep this potential pitfall.

<sup>3</sup> Gartner, 2021 Strategic Roadmap for Edge Computing, Bob Gill, 3 November 2020.

# 04

## Capitalize on commercial innovations

Edge solutions require many technologies and services to operate effectively in the field. Fortunately, a growing number of technology vendors are investing significantly in their offerings to support and advance edge computing.

To take advantage of this innovation, federal agencies will need to create their own edge ecosystem. These strategic partners may include network equipment providers, telcos, hyperscalers, specialized software companies, and traditional compute providers.

The challenge for many agencies will be integrating these innovations, as they stem from many disparate fields, in both individual solutions and a sustainable architecture. This makes the role of a system integrator, like Accenture, critical to the program's success.

In fact, when asked whether their agencies would solicit support from industry to assist with edge solutions in the coming year, **98%** of federal technology leaders agreed.



# 05

## Secure by design

While many agencies have relied historically on perimeter-based security, they are increasingly shifting towards a zero trust architecture. The emergence of edge computing is just one reason why. Specifically, with more computing taking place outside of the traditional secured environment, new approaches are needed to safeguard both the deployed edge solution and core enterprise systems and data.

Given that edge solutions often run autonomously, they should be developed using zero trust principles. Zero trust assumes that no component is to be implicitly trusted and that we need to authenticate, authorize, and protect all data and communications.

Agencies should seek to ensure that their edge solutions are secure by design. Every building block—from hardening the operating systems for IoT devices and securing connectivity through safeguarding the edge compute and distributed data and protecting backend cloud systems—should be addressed from the start.

Edge computing must also be tightly integrated into the enterprise's cybersecurity fabric. Grounded in a zero trust mindset, this perspective reflects the need to recognize the convergence of traditional IT-focused cybersecurity with OT to ensure the security of medical devices, military applications, and other mission-critical edge implementations.



# Off the edge

The value proposition and imperative for edge computing are clear—making data more valuable and actionable at the point of use while making systems more intelligent and autonomous. Given the need for many of its missions to operate outside of the traditional network boundary, government is particularly well-positioned to benefit from edge computing.

Federal agencies can embrace a platform-based approach to edge computing by building upon existing cloud architectures and taking advantage of commercial innovations. This approach simplifies the process of developing specific solutions while ensuring the overall architecture is sustainable, scalable, extensible, and secure. It also enables a more agile adoption model, including integration of future advancements as they become available.

**The promise is real: Edge will empower agencies to reimagine mission execution by extending compute resources and emerging tools such as AI and machine learning from the cloud and large data centers to the edge, increasing the availability and quality of data collection, and leveraging enhanced network reliability and bandwidth in the most mission-critical situations.**



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