

Government
Business
Council

The Intelligent

EDGE

PLAYBOOK

Underwritten by:

intel®

INTRO

This playbook is designed to assist federal employees in understanding the rise of edge technology and how it affects their data operations. Specifically, it provides insights based on a survey of federal decision-makers conducted in 2020 to understand the growing urgency around edge computing.

FAST FACTS

41.6B

connected devices are expected to be generating 79.4 zettabytes (ZB) of data by 2025.¹

Over 3K

non-tiered data centers and 200 mid-tiered data centers were eliminated between 2016 and 2019 in pursuit of the federal Data Center Optimization Initiative (DCOI).²

75%

of enterprise-generated data will be created and processed outside a traditional centralized data center or cloud by 2025³

PURPOSE

The purpose of this playbook (and the companion research study it draws from) was born from a desire to understand the urgency, motivations, and common use cases associated with agency progress toward intelligent edge computing environments. By capturing insights from federal employees, the playbook aims to illustrate what is gained by enabling compute capability in remote locations beyond the reach of an agency's data center and cloud ecosystem. By creating a pipeline from cloud to edge, agency end users can gain situational awareness to make more informed decisions on a moment's notice.

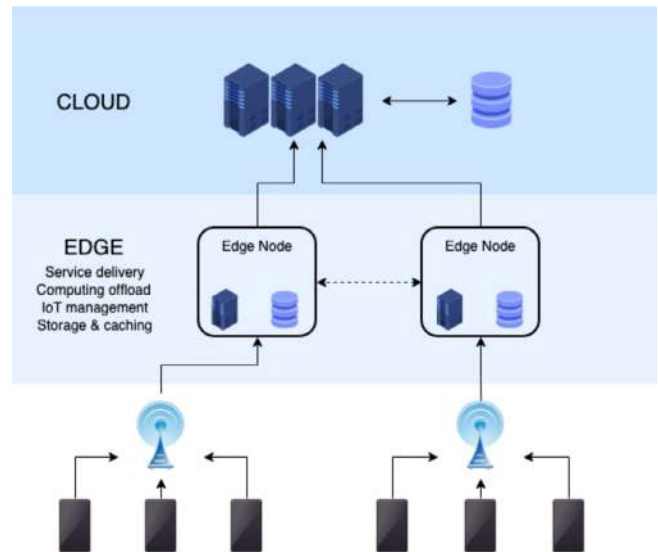
WHAT IS INTELLIGENT EDGE?

Recent years have seen a massive spike in the volume of remote Internet-connected devices used by federal agency networks. As government agencies expanded their mission footprint, a surge in devices and edge sources enabled greater amounts of data to be collected in the field or at remote installations.

However, with some exceptions, the model by which such data were being processed still assumed that a central data center or cloud infrastructure was required to store, interpret, and relay insights back to edge users. This model resulted in high latency, low bandwidth, and disabled users from acting in real-time on information acquired that could affect the decision cycle.

To be clear: the intelligent edge does not dispose of the cloud, but rather provides a much needed companion capability that enables smart processing of information where it is collected at the source.

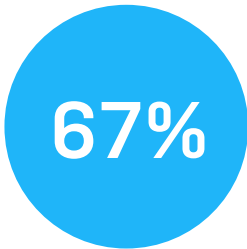
This is critical for the success of emerging technologies like computer vision, natural language processing, and other instances of artificial intelligence that must economize how to handle extreme volumes of data in distributed locations traditionally lacking the bandwidth generated by a primary data center.



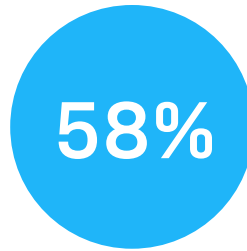
Edge Computing



AUDIENCE PROFILE

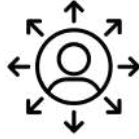


are GS-13 or above
(including Senior Executive Service)



are Managers with
at least one or more
direct reports

Job Representation



Program Managers



Administrative Officers

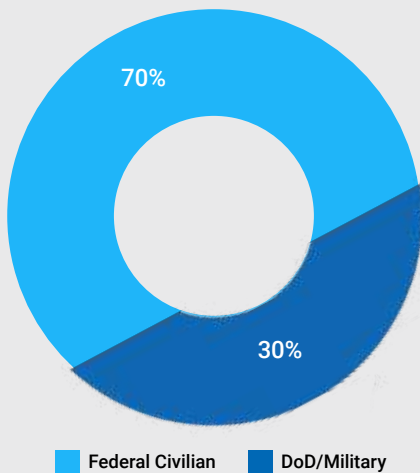


Technical/Scientific Specialists

Participating Federal/DoD Agencies

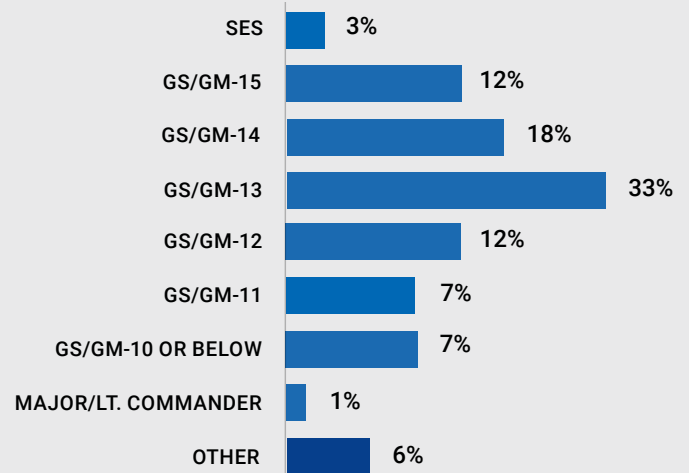
- Agriculture
- Central Intelligence Agency
- Commerce
- Congress/Legislative Branch
- Air Force
- Army
- Combatant Commands
- Joint Chiefs of Staff
- Marine Corps
- Navy
- Office of Secretary of Defense
- Energy
- Environmental Protection Agency
- Office of Management and Budget
- General Services Administration
- Government Accountability Office
- Health and Human Services
- Homeland Security
- Housing and Urban Development
- Interior
- Justice
- Labor
- NASA
- Office of Personnel Management
- Social Security Administration
- Small Business Administration
- State
- Transportation
- Treasury
- Veterans Affairs

Employment



Percentage of respondents, n=250
Note: Percentages may not add up to 100% due to rounding

Grade/Rank



Percentage of respondents, n=100
Note: Percentages may not add up to 100% due to rounding

PLAY ONE

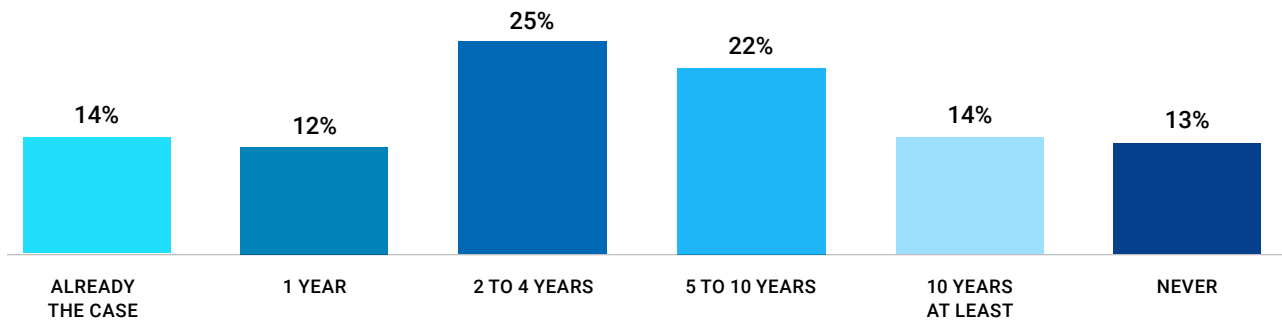
Recognize where your data needs are most pressing

THE PROBLEM

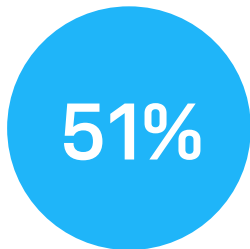
The volume of data collected at the edge will shortly overtake the amount of data being generated and processed at government data centers and in the cloud, potentially overwhelming existing storage solutions and bandwidth capacity. The pandemic has also rapidly accelerated the importance of remote capabilities.

GBC DATA

How soon do you believe your agency will reach a point where it is generating more data at edge locations than at on-site locations (i.e. its own data centers)?

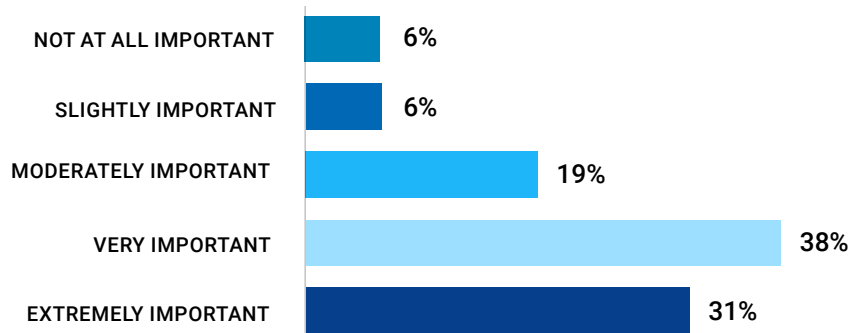


Percentage of respondents, n=228
Note: Percentages may not add up to 100% due to rounding



believe their agency will generate MORE data at the edge than at on-site locations by 2024

When it comes to your mission, how important is capturing and sharing information from devices/data sources used in the field or at remote locations?



Percentage of respondents, n=150
Note: Percentages may not add up to 100% due to rounding

PLAY TWO

Lay the groundwork for edge data-driven architecture

THE PROBLEM

While cloud computing is ideal when it comes to resource-intensive data processing and workloads, it presents issues with latency and performance when data must travel all the way to the data center and back again. While more agencies are establishing cloud environments, there is less documentation of established edge ecosystems that can analyze, aggregate, and interpret data closest to the physical source of collection.

GBC DATA

"My organization is constantly pushing to expand computing power (beyond the data center) to reach remote locations."



Percentage of respondents, n=150
Note: Percentages may not add up to 100% due to rounding

"Investments in edge computing (i.e. Internet of Things sensors, AI, analytics) could help my agency generate actionable insights faster."

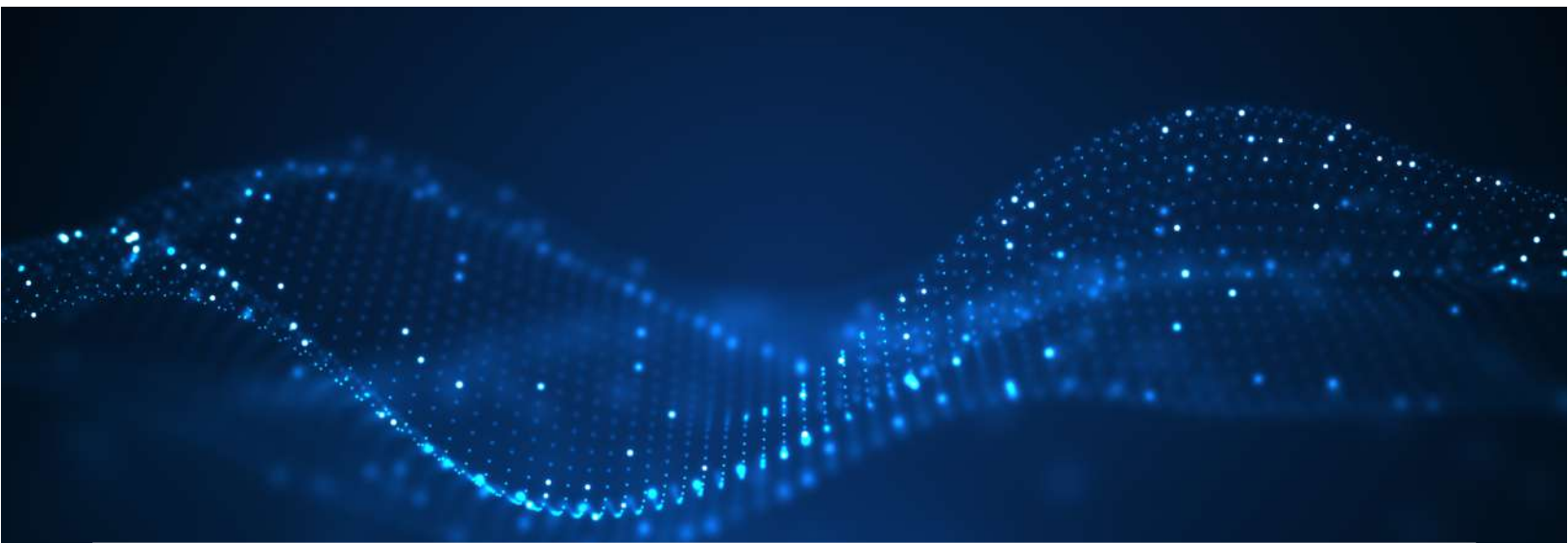


Percentage of respondents, n=142
Note: Percentages may not add up to 100% due to rounding

■ Agree ■ Neutral ■ Disagree

CASE IN POINT

The establishment of the Joint All-Domain Command and Control system aims to use edge technology to improve situational awareness and near real-time decision cycles in the Air Force.⁴



INDUSTRY PERSPECTIVE

Intel is known for making the CPUs that power our world. But it's the hardware we surround our CPUs with—from programmable accelerators and purpose-built ASICs, to high-speed connectivity and storage—that enables complete edge systems. These open and agile systems scale up and out with ease. Our full-stack, edge-ready technology lets you build—and evolve—your resilient edge.

MOVE FASTER

with high-speed connectivity at the latency-constrained edge

The biggest data bottlenecks are in how we move and access data to keep compute “fed.” In addition to our widely deployed Intel® Ethernet Network Adapters, Intel's high-speed connectivity options include edge-hardened 100G silicon photonics transceivers and Barefoot Networks programmable switch ASICs.

STORE MORE

and access data faster in hyperconverged architectures

Intel® Optane™ technology has revolutionized decades-old memory and storage hierarchies. It provides dense, extremely responsive, highly predictable data access for Intel® Optane™ technology has revolutionized decades-old memory and storage hierarchies. It provides dense, extremely responsive, highly predictable data access for new paradigms like low-latency AI inference at the edge.

PROCESS EVERYTHING

in-network and at the edge with the most diverse silicon

Intel offers the most diverse range of programmable and purpose-built compute to meet broad application performance, latency, and efficiency needs. For example, Intel® Movidius™ VPUs are built for low-power, low-latency computer vision at the edge. Versatile Intel® FPGAs can be reprogrammed again and again to meet various performance and power needs, security, I/O, and networking capabilities. Our structured and programmable ASICs provide rigorous in-network acceleration. And flexible, performant CPUs seamlessly run AI applications side by side with your other applications.

PLAY THREE

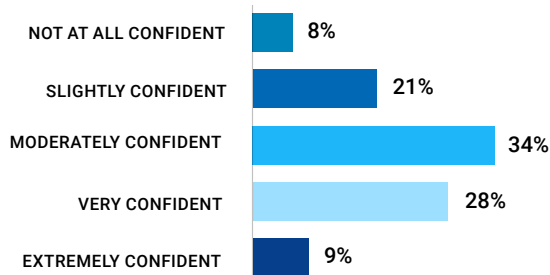
Prioritize security for edge devices

THE PROBLEM

Federal policies are traditionally written to enforce security of technologies that are operated on-site or in proximity to headquarters locations, thus making remote devices more vulnerable to cybersecurity attacks. Simultaneously, cybercriminals are exploiting a remote workforce and using more sophisticated attacks to breach networks via poor cyber hygiene at the network's edge.

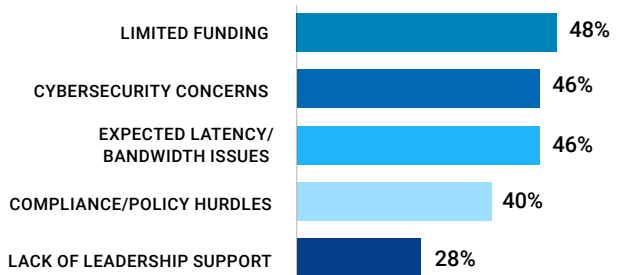
GBC DATA

How confident are you that the devices and sensors your agency already deploys at the edge are SECURE?



Percentage of respondents, n=100
Note: Percentages may not add up to 100% due to rounding

What concerns or pain points do you have that might derail continued expansion of your network's edge? Please select all that apply.



Percentage of respondents, n=99
Note: Percentages may not add up to 100% due to rounding

THE LESSON

Agencies must implement smart security that protects devices at the source of information collection.



PLAY FOUR

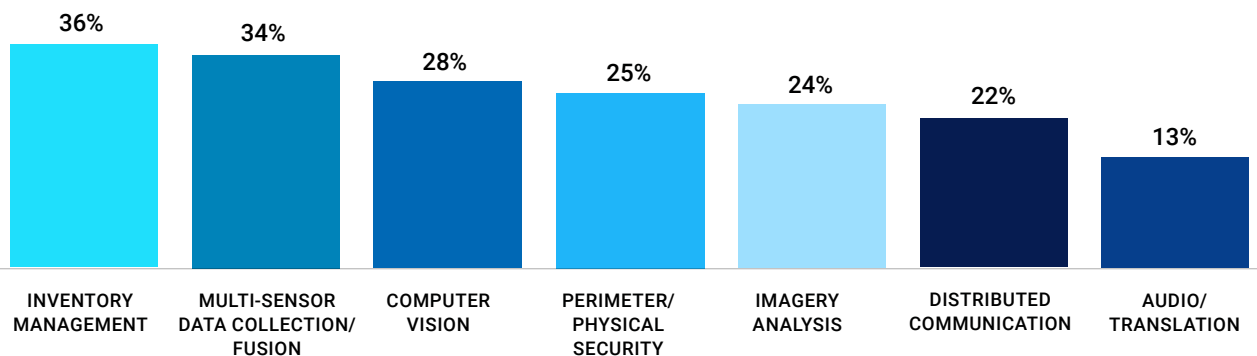
Provide middle tier servers to build advanced edge capabilities

THE PROBLEM

While a majority of agencies possess edge devices and sensors that can collect data remotely, many still lack the edge servers that fill a key intermediary role between the edge, the cloud, and the data center.

GBC DATA

What are your organization's edge technology use cases? Please select all choices that apply.



Percentage of respondents, n=56
Note: Percentages may not add up to 100% due to rounding

CASE IN POINT

The Army Research Lab is procuring mid-tier edge servers to allow soldiers to analyze data streams in near real-time.⁵

INDUSTRY PERSPECTIVE

ENHANCED SECURITY FOR MOBILE DEVICES

Intel security solutions provide end-to-end protection for computer equipment and networks. These solutions help deliver trusted data through a tight integration of hardware- and software-based security technologies that safeguard valuable data and computing devices against malware attack, tampering, and theft. These Intel technologies include:

INTEL[®] ENHANCED PRIVACY ID

Intel[®] EPID

helps establish a chain of trust between edge devices and a government agency data center (or the cloud). This solution allows cloud-based applications to authenticate a device for a given level of access while allowing the device to remain anonymous.

INTEL[®] AES NEW INSTRUCTIONS

Intel[®] AES NI

improve on the Advanced Encryption Standard (AES) algorithm. These instructions accelerate data encryption to help better protect confidential data at rest and in flight without the typical performance penalty associated with software-only security solutions.

INTEL[®] SOFTWARE GUARD EXTENSIONS

Intel[®] SGX

protect selected code and data from disclosure or modification. Government agency applications can use these instructions to establish private regions of code and data that are shielded against direct malware attacks.

PLAY FIVE

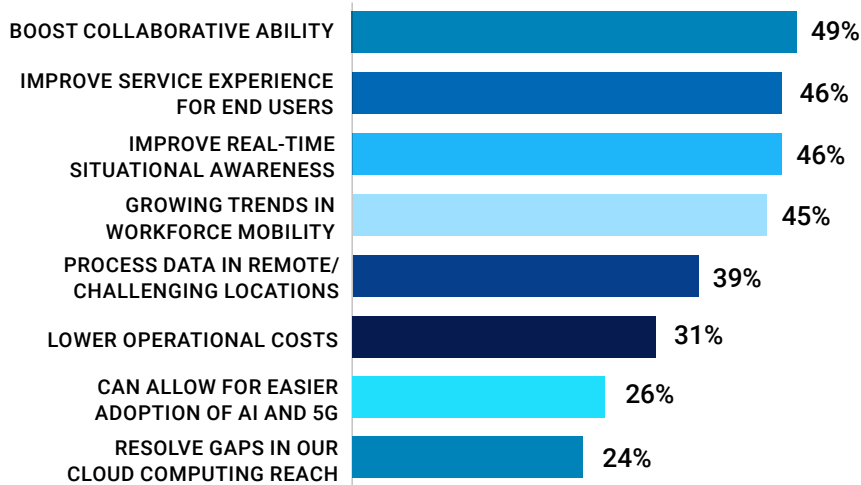
Demonstrate the value of intelligent edge to the end user

THE PROBLEM

For the indefinite future, federal employees will operate remotely as a result of the COVID-19 pandemic. Even when employees return to an office environment, the workplace will likely never be the same. It's important that agencies provide their workers with the resources and training to use AI tools and edge capabilities in a way that is secure and in service to the overall mission.

GBC DATA

What opportunities are motivating your agency to expand computing power at the edge?



Percentage of respondents, n=100
Note: Percentages may not add up to 100% due to

Checklist: Benefits to Edge Computing

- Real-time insights and situational awareness
- Intelligent workload placement
- Low latency
- Scalability
- Localized security
- Responsiveness
- Reduced transmission costs

CASE IN POINT

- FEMA's portable tactical network is satellite-based and collects visual data from drones before sending human rescue attempts forward. FEMA can also use edge computing to do facial recognition onsite to collect information about disaster survivors.
- USDA uses edge computing to perform onsite soil sample analysis in heavier geological surveys.⁶

COMMENTARY FROM SURVEY RESPONDENTS:

Can you provide any other thoughts on your organization's edge, network, or computing needs?

"We have MANY security restrictions. That said, we are finally moving to the cloud."

"Remote access to all of our agency's data and systems is of critical importance when we are required to support one of our litigation teams during trials across the country in the US District Court system."

"The DoD, especially the Army, runs at least 2 years behind industry. Really need to close the gap!"

"Depleted resources are causing us to address our needs by office rather than corporately and thinking about the end user."

"As far as our current [office] where I work, my agency has a strong need to upgrade current technologies due to increased maximum telework at present. Of course, the main issue is procuring the funding to upgrade and/or acquire new systems to continue to foster the IT aspect."

"My organization is yet to use cloud capabilities as there is the threat of hacking and cyber attacks. And the lack of funding makes it difficult to keep up with new technology or better network availability."

"Since we are on NMCI for most of our communication, we are restricted by many sites due to security and breaches of confidential information. It would be nice to have interaction that meets or exceeds the security necessary for government employees, especially now when we are teleworking more. This impedes our mission, and is a detriment."

Endnotes

1. IDC: "The Growth in Connected IoT Devices Is Expected to Generate 79.4ZB of Data in 2025, According to a New IDC Forecast." June 18, 2019. <https://www.idc.com/getdoc.jsp?containerId=prUS45213219>
2. American City and County: "Edge computing, 5G and AI – the perfect storm for government systems." April 8, 2020. <https://www.americancityandcounty.com/2020/04/08/edge-computing-5g-and-ai-the-perfect-storm-for-government-systems/>
3. FedTech: "The Benefits of Edge Computing for Feds." April 22, 2019. <https://fedtechmagazine.com/article/2019/04/benefits-edge-computing-feds>
4. CSIS: "Making the Most of the Air Force's Investment in Joint All Domain Command and Control." March 6, 2020. <https://www.csis.org/analysis/making-most-air-forces-investment-joint-all-domain-command-and-control>
5. Nextgov: "How the Pentagon is Bringing the Cloud Down to Earth." Feb 8, 2019. <https://www.nextgov.com/emerging-tech/2019/02/how-pentagon-bringing-cloud-down-earth/154728/>
6. FedTech: "Edge Computing: Air Force and FEMA Take Advantage of the Intelligent Edge." Feb 28, 2019. <https://fedtechmagazine.com/article/2019/02/edge-computing-air-force-and-fema-take-advantage-intelligent-edge-perfcon>



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About Intel

Intel understands that data takes many forms and exists in many places and the AI hardware you choose can make a difference by eliminating performance bottlenecks, memory and power constraints, and scalability roadblocks in the real world. Intel has the industry's most comprehensive suite of hardware and software technologies that deliver broad capabilities and support diverse approaches for today's AI applications and more complex AI tasks in the future. www.intel.com.

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