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UNLEASHING THE EDGE:

Use Cases, Challenges, and Requirements in Edge Infrastructure and Environments

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ENTERPRISE STRATEGY GROUP

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Research Objectives

Edge IT and application environments are often described as the location where “the real work gets done.” Edge locations may serve as the face of the business, creating and delivering the key customer experience. Edge environments also often serve as the core location of essential operations, determining operational efficiency. In an era when nearly every business is a digital business, digital operations at the edge are crucial to achieving competitive success in the market.

To understand the key trends in, challenges of, and demands on edge IT environments, TechTarget’s Enterprise Strategy Group surveyed 374 IT, OT, and DevOps professionals responsible for purchasing IT infrastructure in their organization’s edge environments.

This study sought to:

Identify the key drivers and demands within edge IT environments.

Establish the direction of edge infrastructure investment, application modernization, and data usage.

Determine the top local and global expectations of IT decision makers for edge environments.

Monitor the priorities and challenges inherent in managing edge infrastructure and application environments at the edge.

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KEY FINDINGS

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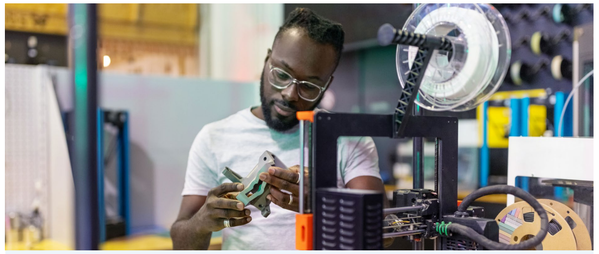

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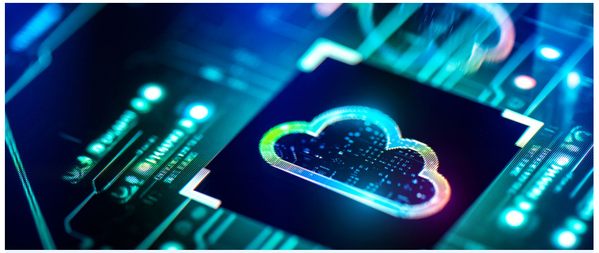

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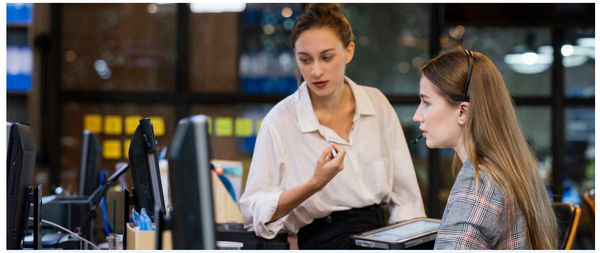

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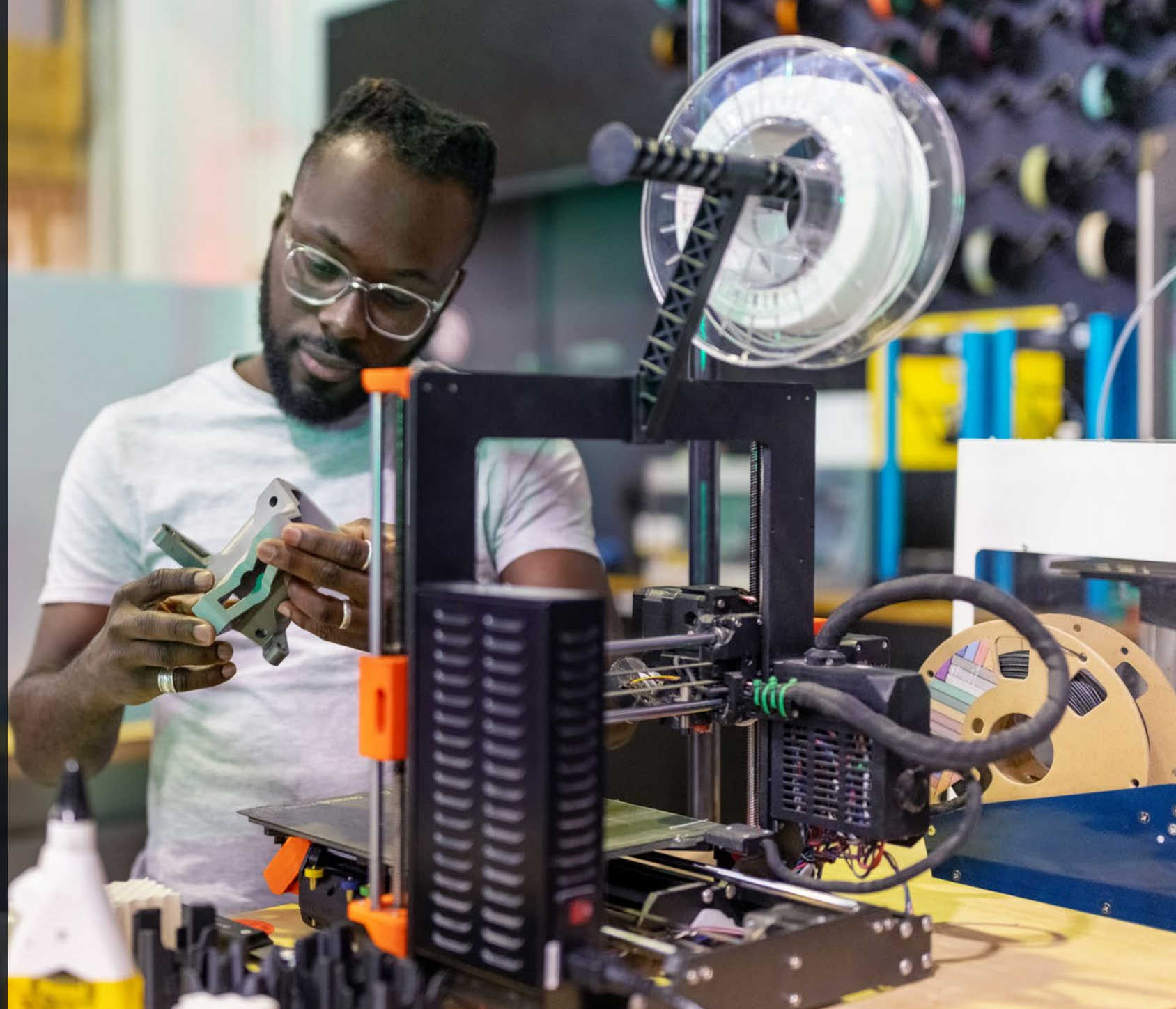
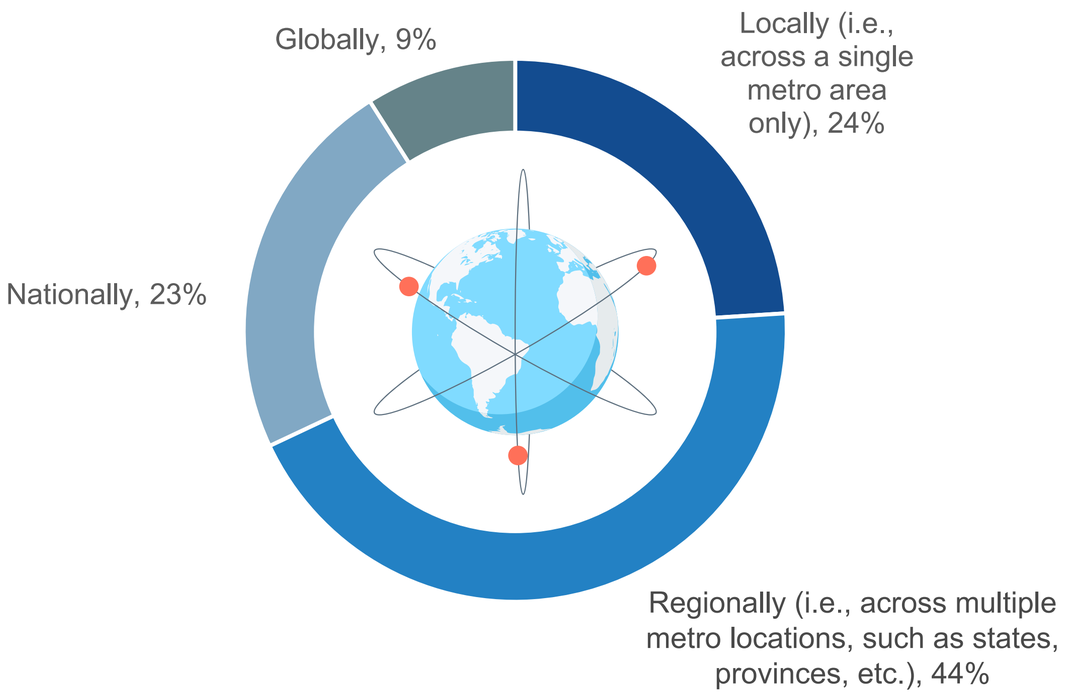


Regardless of Reach, Edge Often Represents a Small Percentage of IT Budgets

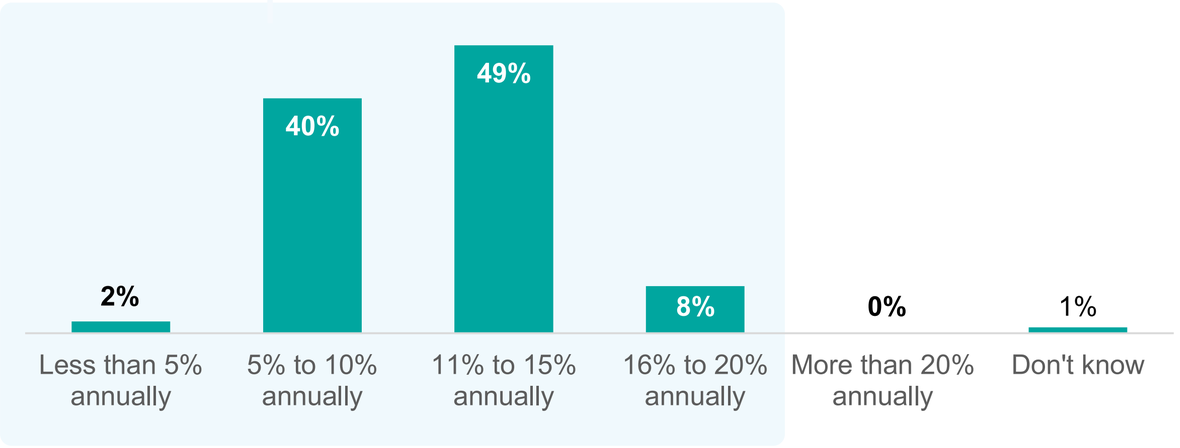
While edge operations typically span states, countries, and the globe, 99% of organizations said the edge comprises 20% or less of their overall budgets. Despite the relatively limited budget presence, organizations share nearly universal agreement that data analyzed at the edge provides a competitive advantage.

Distribution of edge environments.



Percentage of overall IT budget dedicated to edge.

99%
of organizations said the **edge comprises 20% or less of their overall budgets.**



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Security and Privacy Most Likely to Drive Decisions in Edge Environments

Data security (40%) as well as data privacy and regulatory requirements (33%) top the list of factors in edge decision making, which makes sense given the importance of data security and privacy across nearly every industry. Beyond those top two factors, however, priorities often vary by scale and industry.

Factors influencing decision making for edge environments.

40%
Data security

33%
Data privacy and regulatory requirements

31%
Cost of managing/maintaining the infrastructure at each remote site

28%
Cost of deploying physical infrastructure at each remote site

28%
Ability to centrally manage edge environments

28%
High availability requirements

27%
Need for real-time data processing

24%
Energy efficiency requirements

24%
Existing investments in infrastructure

23%
Cost of the network to transport all data

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Industries Show Variance in Factors Influencing Decisions

Just as use cases across different industries are highly diverse, the factors that influence decision making are also diverse. For example, energy efficiency requirements more commonly influence organizations in the transportation industry, while mining, oil, and gas firms are more commonly influenced by the need for high availability. Despite differences, most industries are likely to prioritize data security and data privacy.

Healthcare (n=51)

- Data security (37%)
- Existing investments in infrastructure (33%)
- High availability requirements (33%)
- Ability to centrally manage edge environments (33%)
- Data privacy and regulatory requirements (31%)

Manufacturing (n=84)

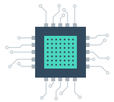
- Data security (45%)
- Ability to centrally manage edge environments (36%)
- Data privacy and regulatory requirements (32%)
- Cost of managing/ maintaining the infrastructure (e.g., compute, storage, etc.) at each remote site (32%)
- Need for real-time data processing (e.g., too much latency to process remotely)

Mining, oil, and gas (n=62)

- High availability requirements (37%)
- Cost of deploying physical infrastructure (e.g., compute, storage, etc.) at each remote site (32%)
- Data security (31%)
- Ability to centrally manage edge environments (31%)
- Energy efficiency requirements (29%)

Retail/wholesale (n=71)

- Data security (35%)
- Data privacy and regulatory requirements (32%)
- Cost of deploying physical infrastructure (e.g., compute, storage, etc.) at each remote site (31%)
- Cost of the network to transport all data (30%)
- High availability requirements (30%)



Technology (n=33)

- Data security (58%)
- Data privacy and regulatory requirements (42%)
- Cost of managing/ maintaining the infrastructure (e.g., compute, storage, etc.) at each remote site (33%)
- Need for real-time data processing (e.g., too much latency to process remotely) (30%)
- Cost of the network to transport all data (24%)

Transportation and logistics (n=36)

- Energy efficiency requirements (47%)
- Cost of managing/ maintaining the infrastructure (e.g., compute, storage, etc.) at each remote site (44%)
- Existing investments in infrastructure (36%)
- Data privacy and regulatory requirements (28%)
- Ability to centrally manage edge environments (28%)

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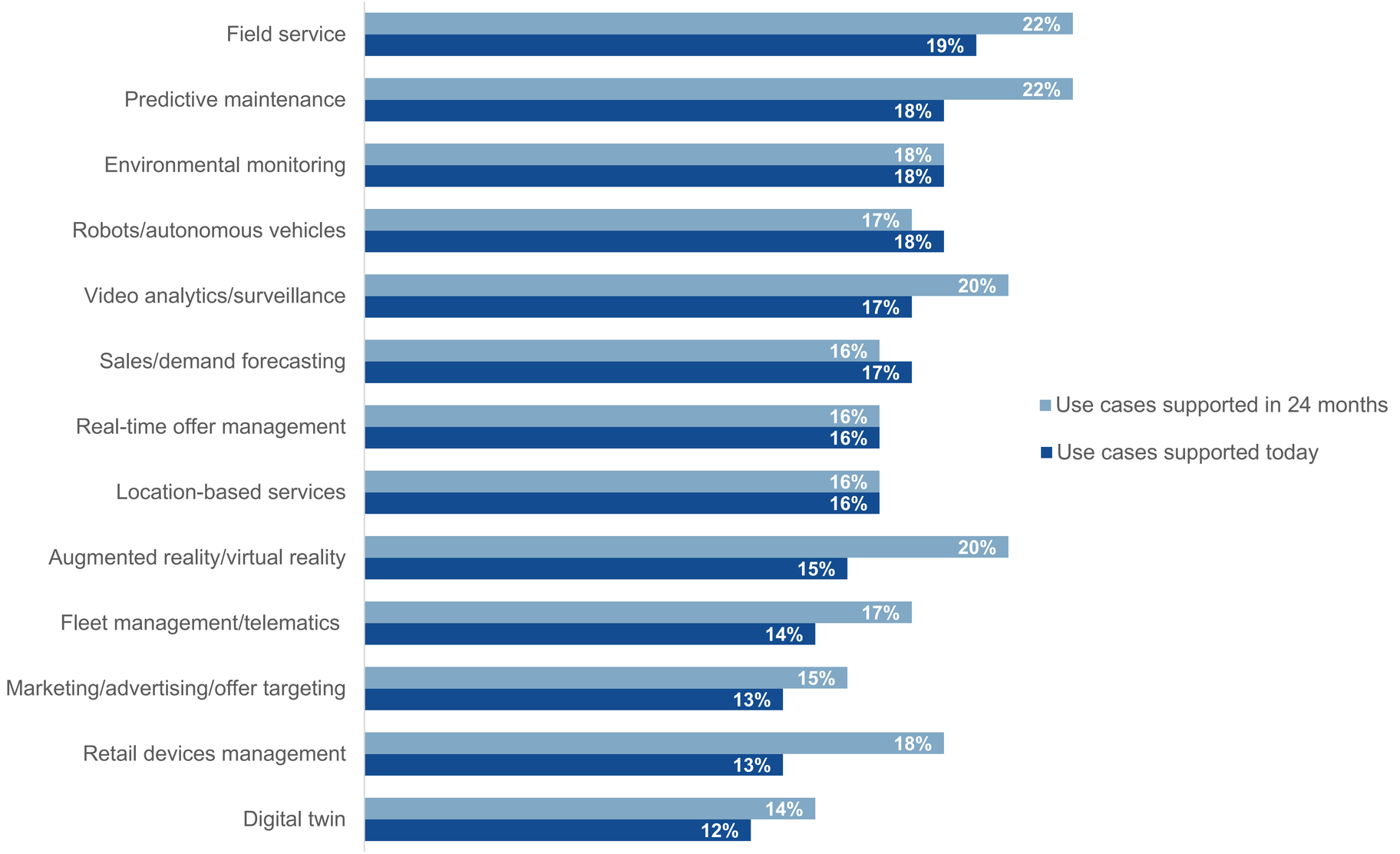
Industry Usage Varies But Common Trends Span Most Environments

Use Cases at the Edge Often Include Management and Security, Followed by Industry-specific Priorities

Organizations with globally distributed edge environments are typically more interested in data management use cases (43%). Data at the edge is incredibly valuable, and addressing the challenges of data management often requires increased investment and prioritization at larger scale.

Use cases supported by edge infrastructure today and in 24 months.



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Top Five Edge Infrastructure Use Cases by Industry Reveal Common Motions

Edge IT management, monitoring, and automation are common use cases for edge infrastructure across most industries, with some differences. For example, healthcare organizations are more likely to use infrastructure to support physical security, while mining, oil, and gas firms more commonly use edge infrastructure for industrial process automation.

Healthcare (n=51)

- Physical security (e.g., location access control and video surveillance) (39%)
- Edge IT management/ monitoring/automation (35%)
- Cybersecurity (35%)
- Location-based services (27%)
- Building automation (27%)

Manufacturing (n=84)

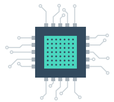
- Edge IT management/ monitoring/automation (40%)
- Cybersecurity (39%)
- Data management (36%)
- Supply chain/logistics (processed/analyzed at edge using edge-generated data) (33%)
- Production analytics (33%)

Mining, oil, and gas (n=62)

- Industrial process automation (e.g., manufacturing, assembly, inventory, and quality) (21%)
- Edge IT management/ monitoring/automation (21%)
- Physical security (e.g., location access control and video surveillance) (19%)
- Customer experience optimization (19%)
- Environmental monitoring (18%)

Retail/wholesale (n=71)

- Edge IT management/ monitoring/automation (25%)
- Cybersecurity (25%)
- Physical security (e.g., location access control and video surveillance) (25%)
- Robots/autonomous vehicles (24%)
- Environmental monitoring (23%)



Technology (n=33)

- Edge IT management/ monitoring/automation (64%)
- Cybersecurity (36%)
- Data management (36%)
- Customer experience optimization (33%)
- Production analytics (33%)

Transportation and logistics (n=36)

- Edge IT management/ monitoring/automation (33%)
- Robots/autonomous vehicles (28%)
- Data management (25%)
- Real-time offer management (25%)
- Supply chain/logistics (processed/analyzed at edge using edge-generated data) (25%)

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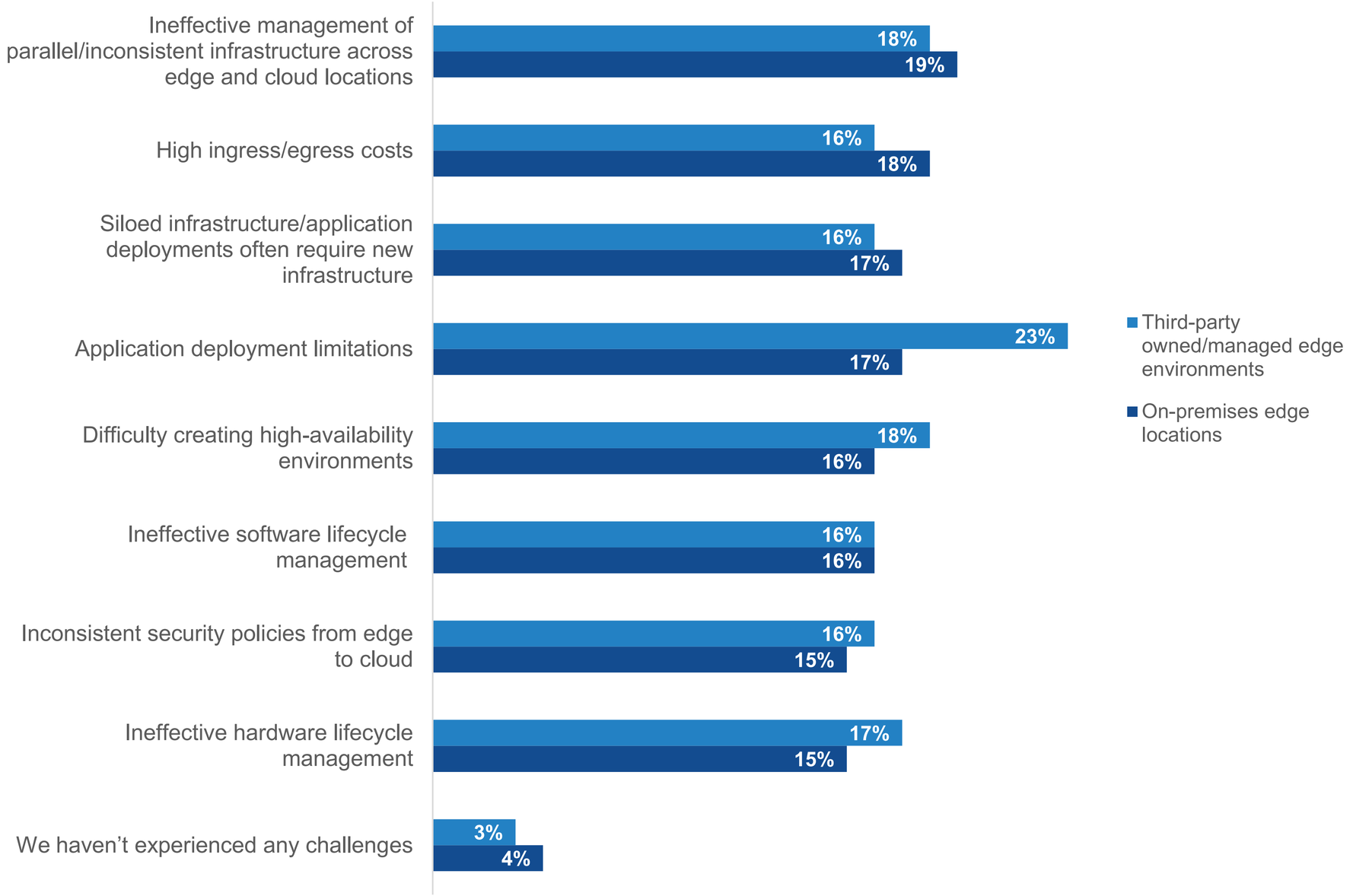
Managing Applications at the Edge Is Complex

Challenges Are Varied as Organizations Seek Efficiency at the Edge

Challenges are many across edge locations, but they can vary depending on third-party/managed locations and on-premises edge locations. For example, on-premises locations tend to experience challenges related to cost, while third-party locations are more likely to struggle with onsite resources. Both types of locations struggle with support for application developers.

IT-related challenges encountered at edge locations.



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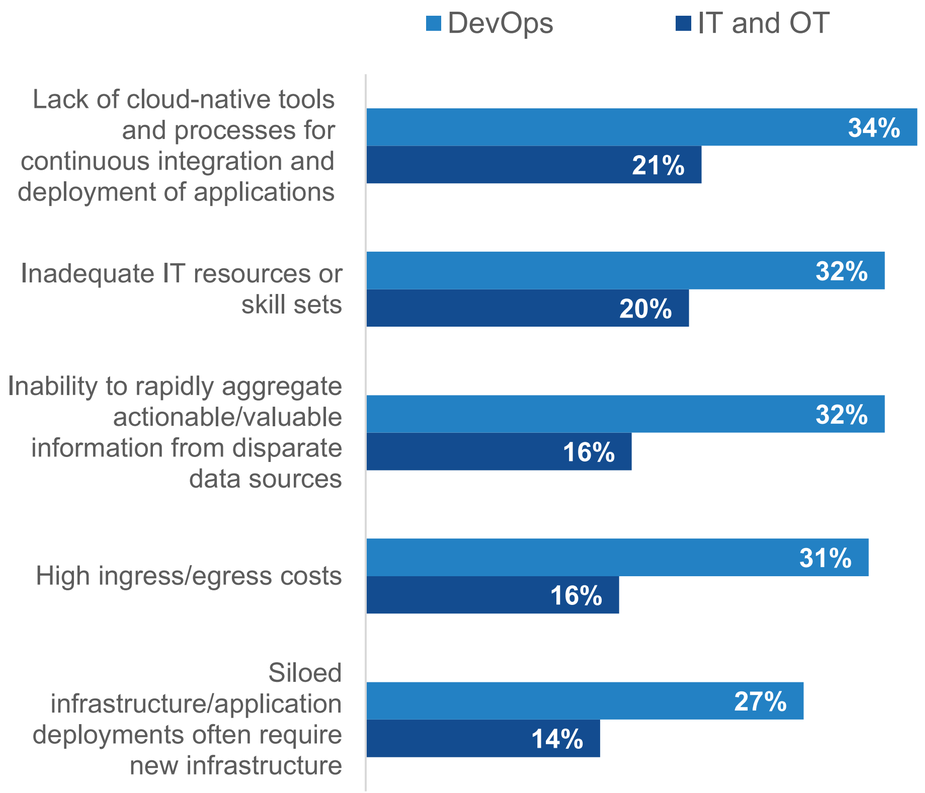
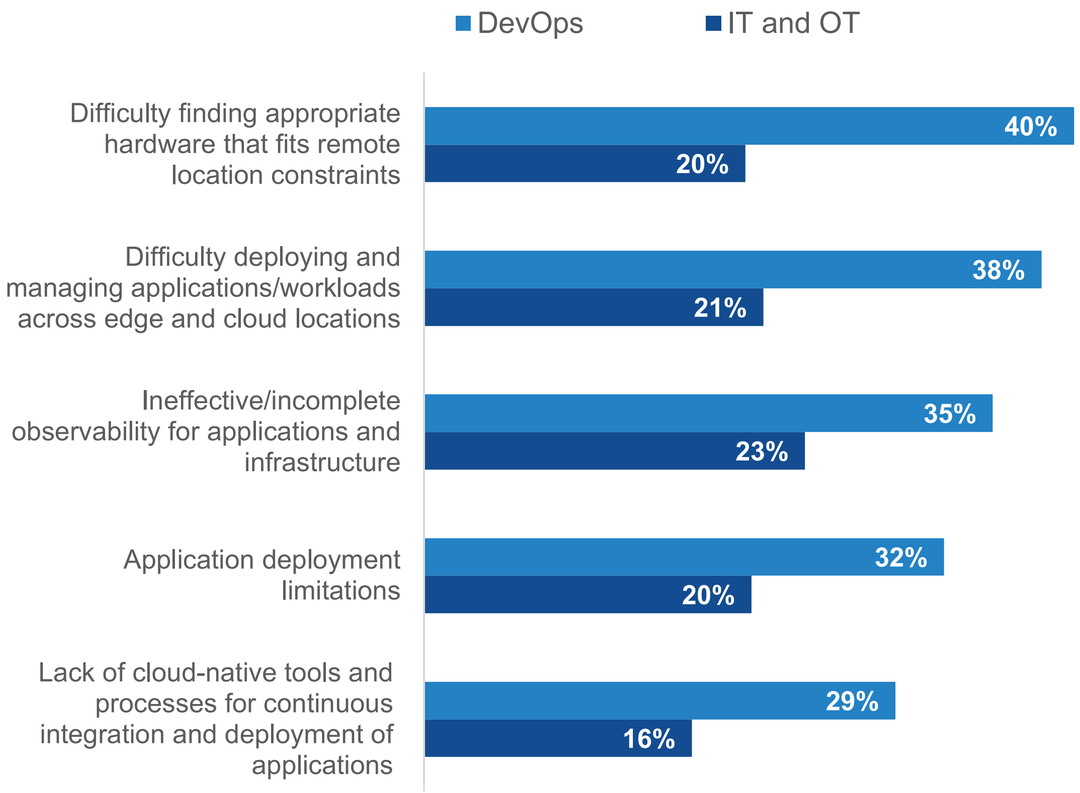
Edge Challenges More Likely for DevOps Personas

While IT and OT teams have adapted organizationally or via the use of tools to effectively manage edge infrastructure environments, investment is still needed to improve the management of applications at edge environments for internal application and development teams.

IT-related challenges encountered at **on-premises** edge locations.



IT-related challenges encountered at **third-party** edge locations.



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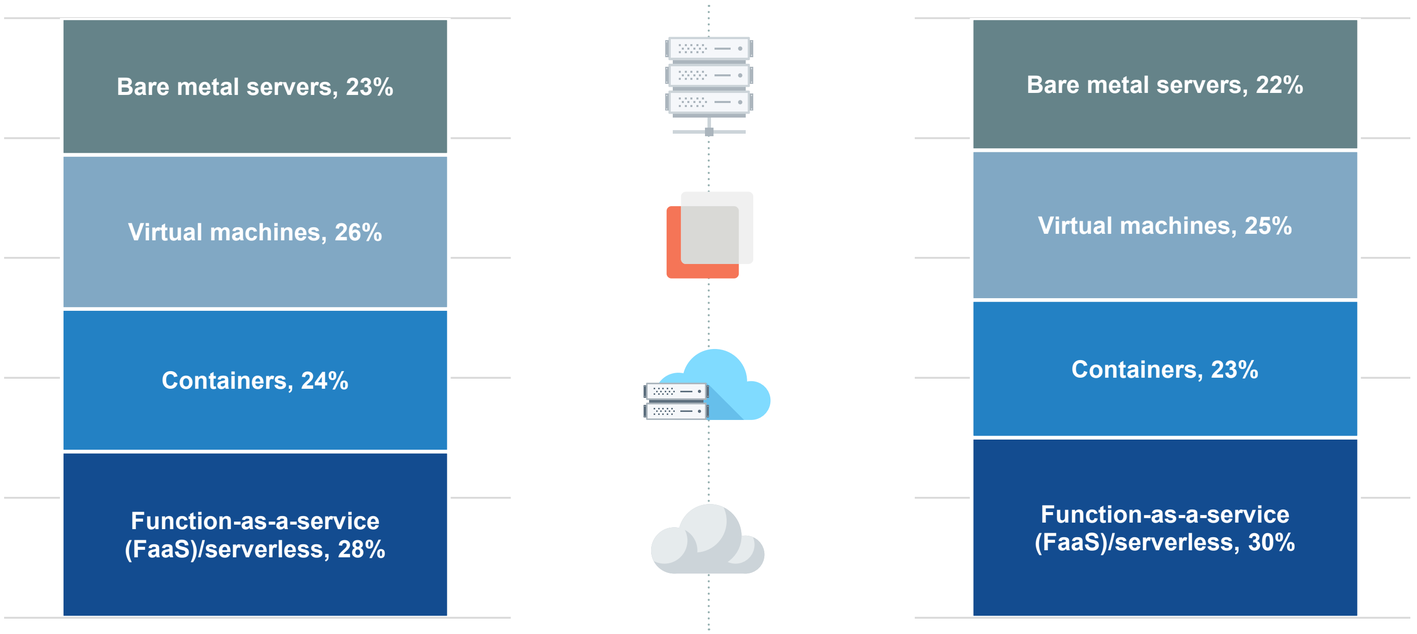
Application Modernization Becomes a Priority at the Edge

Cloud-native Applications Comprise Majority of Edge Apps

With application environments at the edge in a state of near constant evolution, cloud-native modernization appears to be a priority for most organizations. For the average organization, over half of edge applications are either container-based or serverless.

Percentage of production applications run at edge locations.



Percentage of production workloads run at edge locations

Percentage of production workloads run at edge locations in 24 months

For the average organization, **over half of edge applications are either container-based or serverless.**

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Complexity Challenges Are Common for Container-based and Serverless Applications

While IT and OT teams often have established expertise addressing concerns at the edge, application development teams struggle with outdated infrastructure and identifying, isolating, and resolving application issues at remote edge locations. This data highlights the need for additional investment at the edge to address the challenges of deploying, managing, and troubleshooting cloud-native applications at the edge.

Challenges with container-based and serverless applications at the edge.

35%
Difficulty integrating with existing infrastructure

31%
Difficulty debugging application code

30%
Lack of skill set(s) to deploy/manage/secure

28%
Inconsistent support for legacy equipment

28%
Difficulty providing secure configurations

27%
Unpredictable costs

27%
Lack of additional modern app architecture components

25%
Ineffective performance monitoring

23%
Inconsistent security policies

23%
Inconsistent support for vendor applications

16%
Vendor lock-in

28%
We haven't experienced any challenges with our container- and/or FaaS-based applications

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Infrastructure Diversity Is Common—As Are Outages

Organizations Report Broad Distribution of Hardware at Edge Locations

The use of edge gateways was considerably higher in organizations with global (63%) and national (52%) distribution of edge locations, suggesting that at scale, the management and maintenance benefits of gateways become a more important priority.

Infrastructure deployed at edge locations.

49%
Servers/workstations

45%
Edge gateways

42%
Three-tier architecture

42%
Hyperconverged infrastructure (HCI)

34%
Converged infrastructure

32%
Industrial PCs

30%
Blade servers

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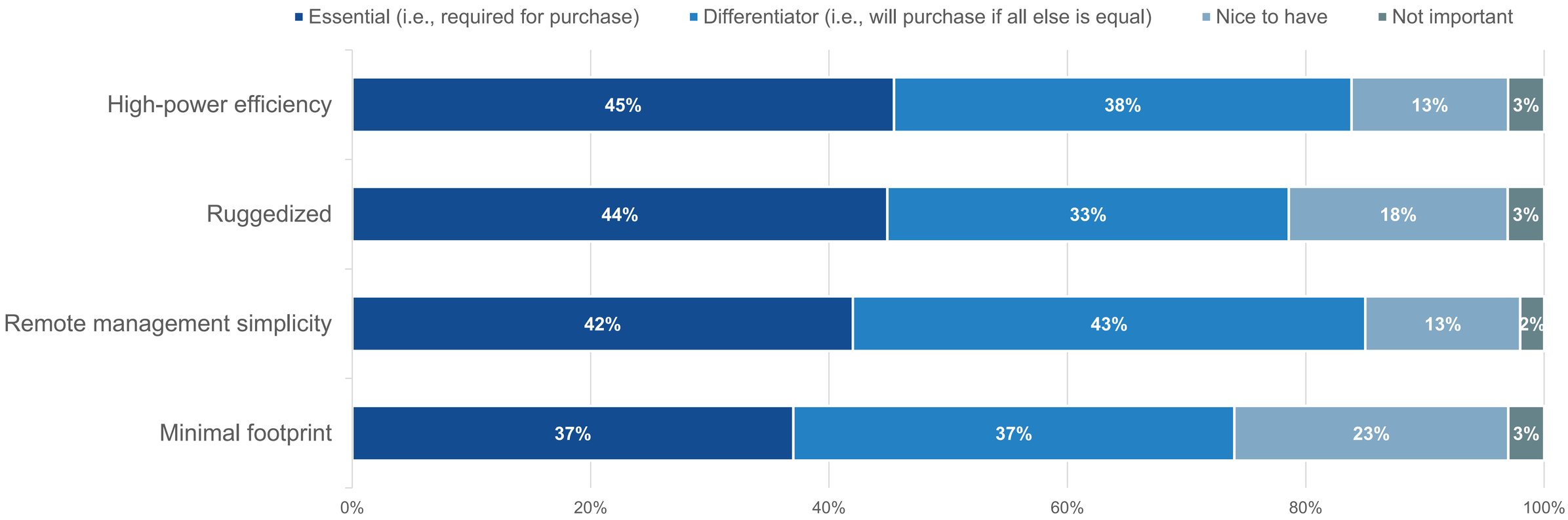
Environmental Capabilities Are Important for Edge Environments

Organizations report a common need for environmental capabilities for their edge infrastructure, but these requirements can vary depending on the distribution of the locations. For example, ruggedized capabilities are far more likely to be essential among local (52%) edge locations versus global (29%) locations.

Importance of environmental capabilities for edge infrastructure.



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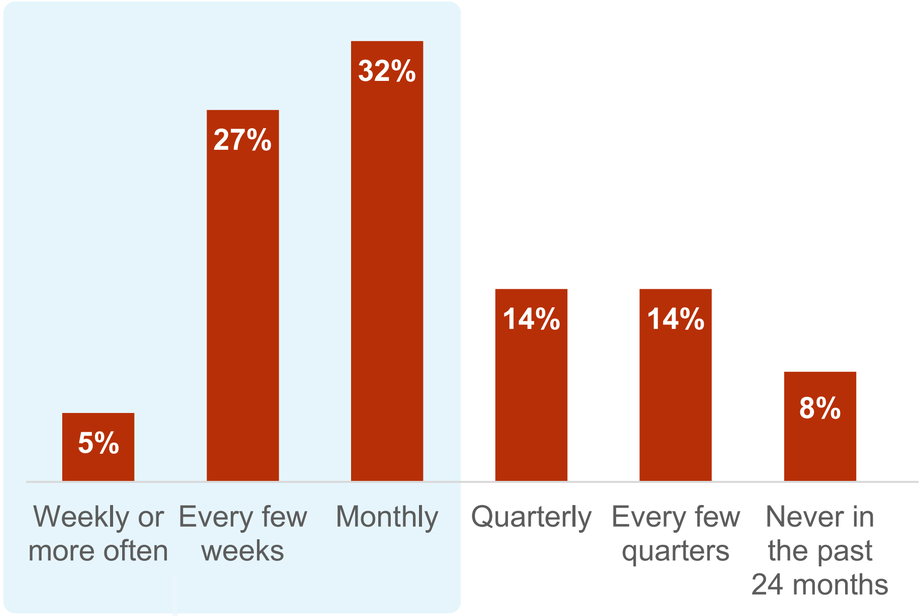
Many Organizations Experience Outages on a Monthly Basis at a Minimum

Nearly two-thirds of organizations experienced outages on at least a monthly basis, with 45% of organizations indicating those costs exceeded more than $10,000 per hour. Meanwhile, 82% said that outages of edge infrastructure would likely result in negative revenue impacts to their organization.

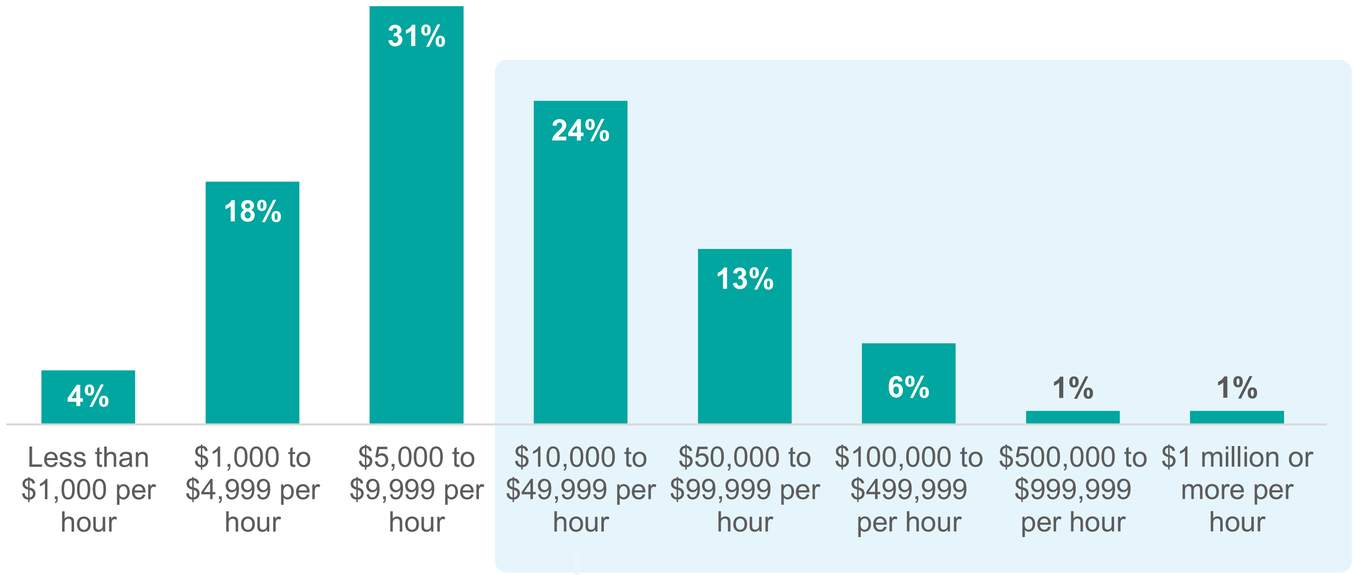
Frequency of edge outages in last 24 months.



Nearly two-thirds

of organizations experienced outages on **at least a monthly basis.**

Average estimated cost of each edge outage.



45%

of organizations indicate those costs **exceeded more than $10,000 per hour.**

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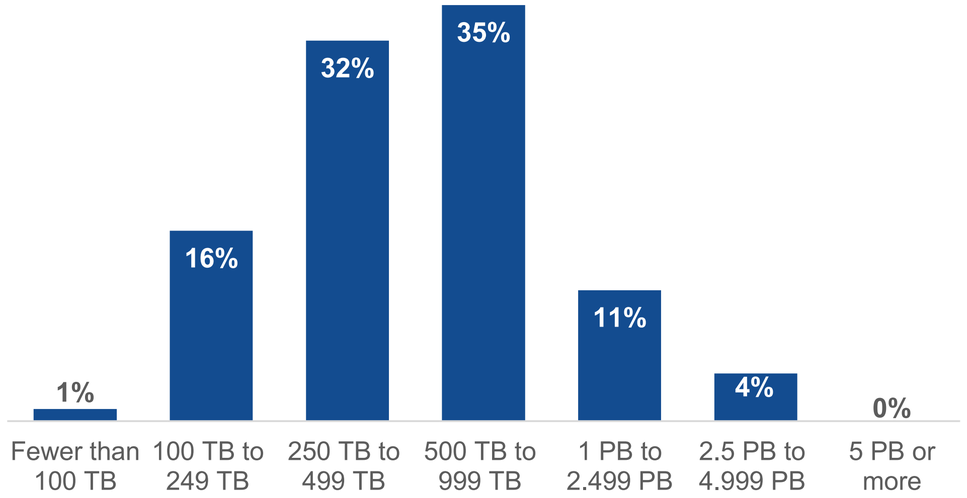
Extensive Data Usage Leads to a Profusion of Challenges

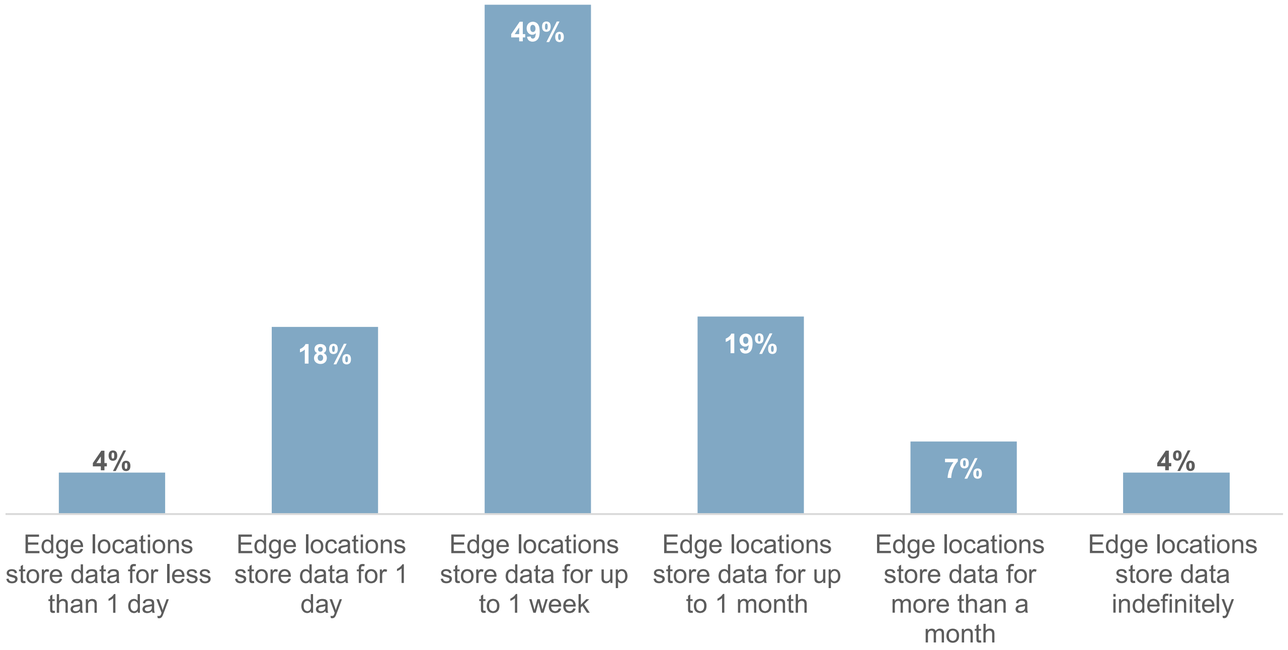
Edge Locations Process and Store Large Amounts of Data with Short Retention Policies

Organizations with global distributions of edge locations tend to be far more data-rich and data-centric as they are more likely to store large amounts of data, with 36% storing more than 1 PB. These organizations also are more likely to store data longer, with 45% storing for more than a week and 24% for more than a month. Meanwhile, 91% of organizations say that analyzing data generated at the edge provides them with a competitive advantage.

Amount of data storage at typical edge location.



Data retention policy at typical edge location.



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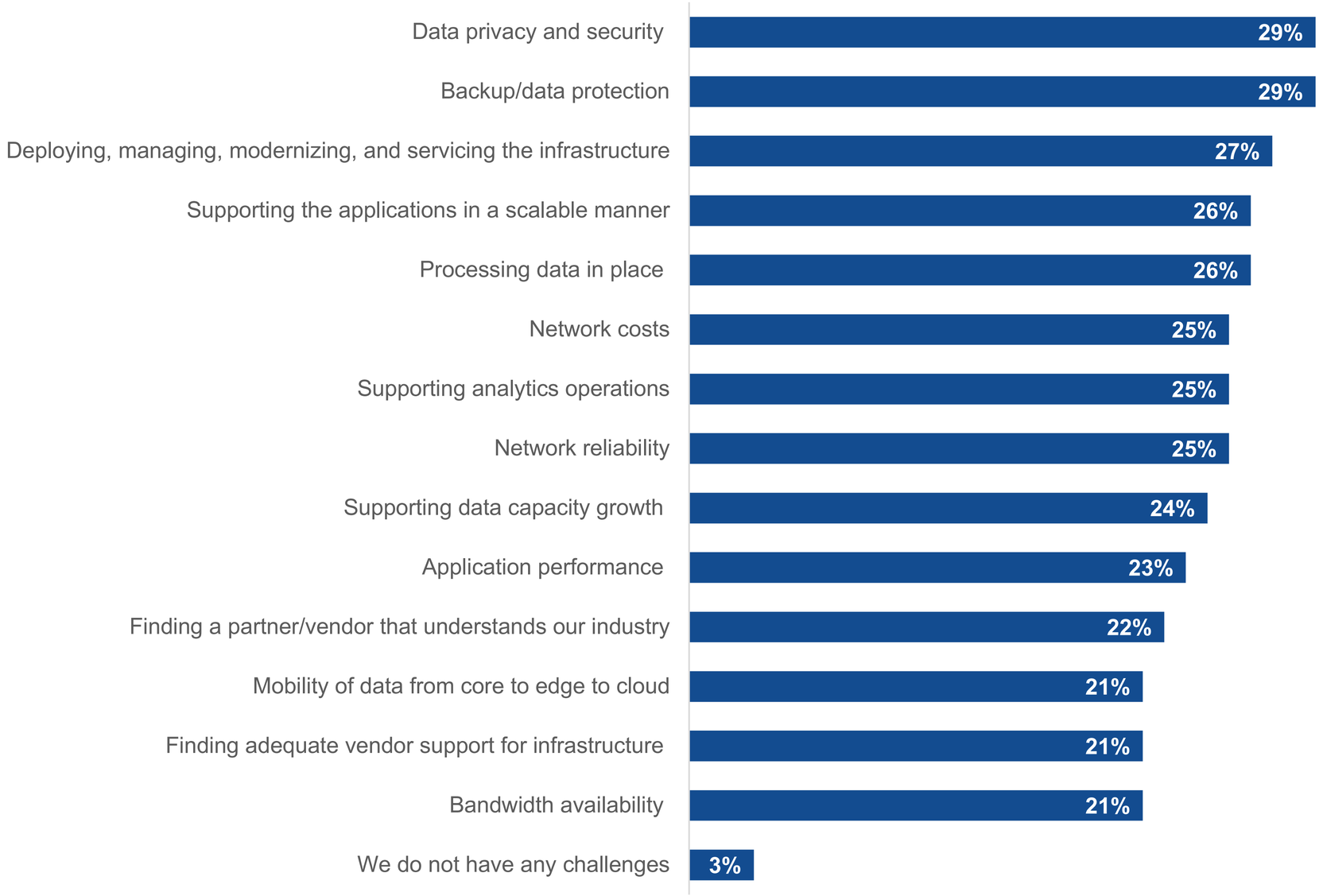
Security, Protection, and Infrastructure Management Top the List of Data Challenges

Given the importance of edge data and its analysis, the creation and use of data at the edge is expected to continue to grow. This evidence also ties into another trend identified in this research that shows larger organizations with global or nationally distributed edge environments tend to prioritize data management capabilities, given the combined importance and complexity of managing large amounts of data at the edge.

Most significant challenges when managing edge data.



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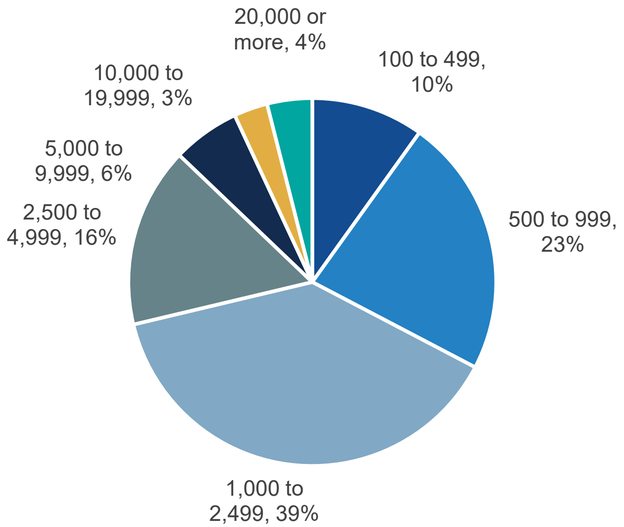
TechTarget's Enterprise Strategy Group is an integrated technology analysis, research, and strategy firm providing market intelligence, actionable insight, and go-to-market content services to the global technology community.

Research Methodology and Demographics

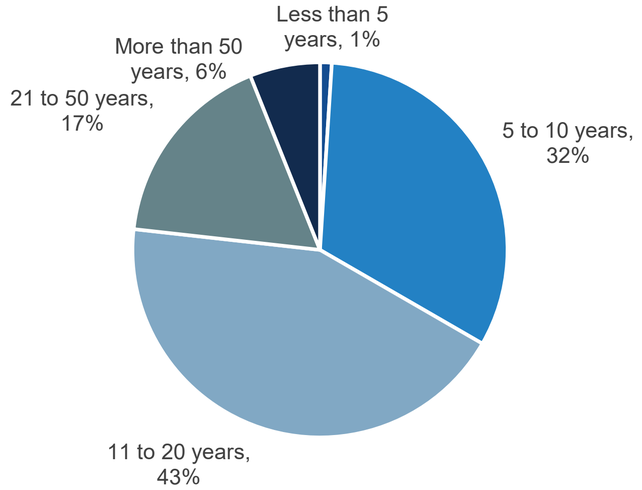
To gather data for this report, Enterprise Strategy Group conducted a comprehensive online survey of IT, OT, and DevOps professionals from private- and public-sector organizations in North America (United States and Canada) between July 10 and July 17, 2023. To qualify for this survey, respondents were required to be IT, OT, and DevOps professionals responsible for purchasing IT infrastructure in their organization's edge environments. All respondents were provided an incentive to complete the survey in the form of cash awards and/or cash equivalents.

After filtering out unqualified respondents, removing duplicate responses, and screening the remaining completed responses (on a number of criteria) for data integrity, we were left with a final total sample of 374 IT, OT, and DevOps professionals.

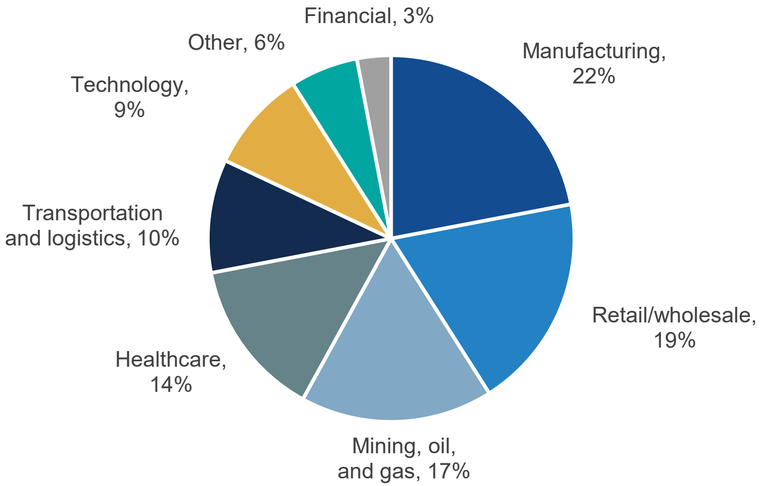
RESPONDENTS BY NUMBER OF EMPLOYEES



RESPONDENTS BY AGE OF COMPANY



RESPONDENTS BY INDUSTRY



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