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IDC ANALYZE THE FUTURE

Edge Computing: Transforming Healthcare by Increasing Resilience

RESEARCH BY:

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Executive Summary

Edge computing will transform how healthcare manages the exponential explosion of structured and unstructured data and the proliferation of medical IoT and mobile devices. Advances in precision medicine, genomics, and imaging, along with widespread adoption of electronic health records, will also drive the importance and quantity of data. Big data is most valuable when extracted and analyzed in a timely manner to identify the next best action. Healthcare workloads have strict latency requirements. Consider, for example, telemedicine, virtual visits, or retrieval of medical images or patient data stored in electronic health records. Immediate access to data is critical for clinical decision-making.

Limited bandwidth adversely impacts cloud, network, and application performance, which in turn negatively affects clinician and patient satisfaction. Data security is imperative in healthcare. Healthcare organizations face steep financial penalties, remediation costs, and brand damage due to data breaches. Moving data processing to edge datacenters closer to where data is generated optimizes network data traffic, thus increasing data transmission efficiency while reducing the size of the attack surface, which improves security.

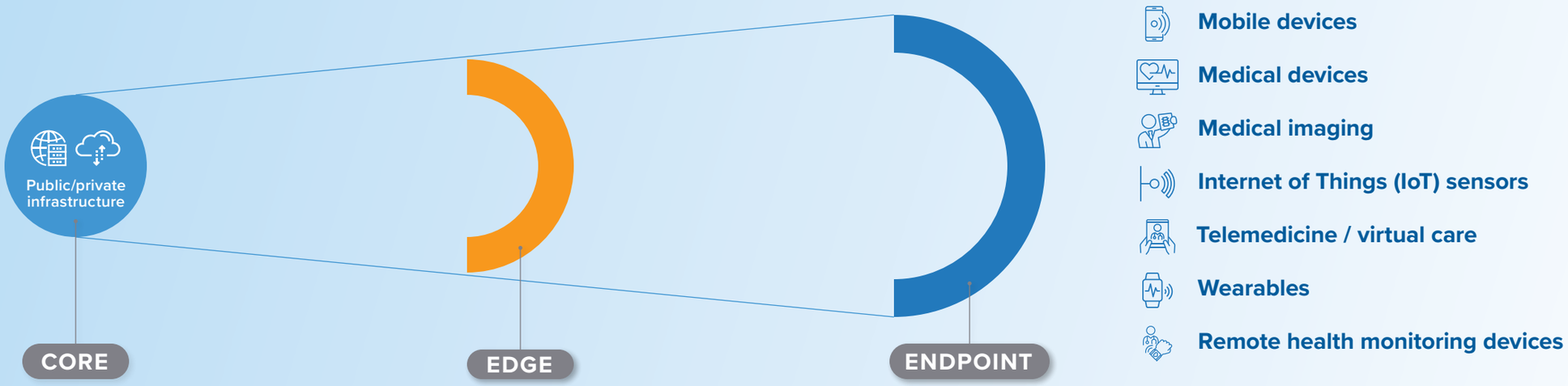
Key Findings:

- Advantages of edge computing include increased bandwidth, immediate access to data through latency improvements, reduced costs associated with transmission and storage infrastructure, and improved security.
- Cloud computing and edge computing are complementary architectures.
- Edge computing architectures are highly dependent on business objectives. Telemedicine and virtual visits, clinical and business collaboration, the digital front door, real-time location services, emergency medical services, and smart medical campus are enhanced with edge computing.
- Edge computing will play an increasingly important role in building operational resiliency to respond to the global pandemic and beyond in the "next normal."

What Is the Edge?

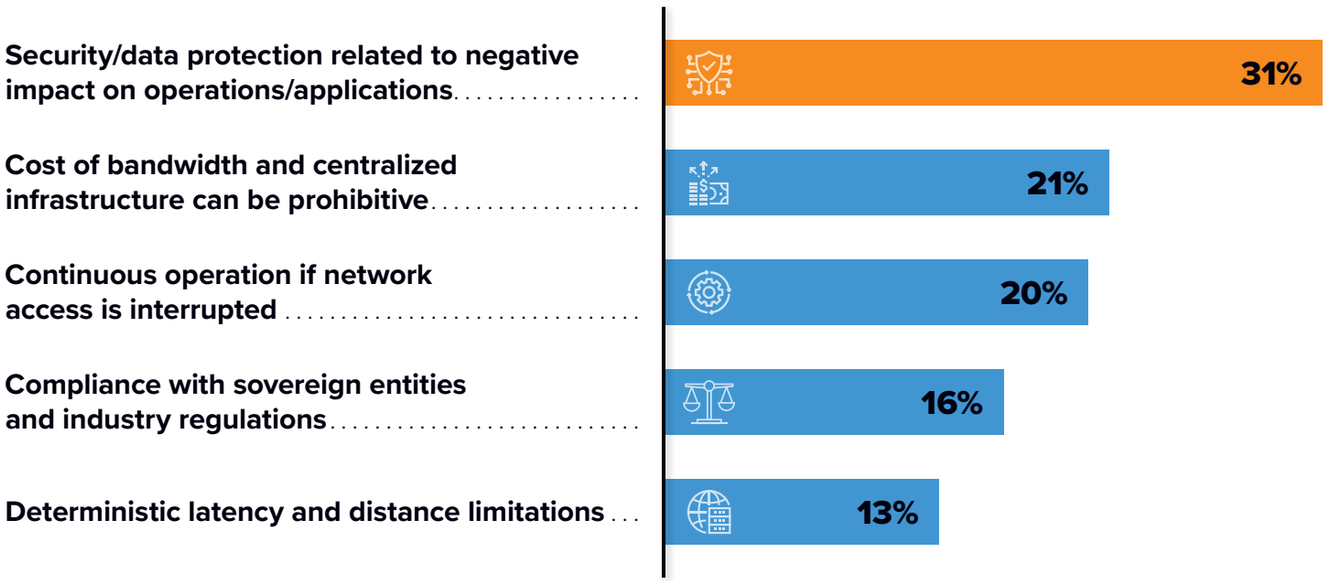
IDC defines the edge as a **distributed computing paradigm** that includes the deployment of processing and storage resources outside of centralized datacenter and cloud infrastructure, as close as possible to **where data is generated and consumed.**

The industrywide deployment of the Internet of Medical Things (IoMT) has resulted in an **explosion of endpoints generating data that needs to be collected and analyzed in real time** to provide insights about the next best action to take.



Security and Data Protection Drive the Deployment of Edge Solutions

Q. What is your organization's primary motivation for deploying edge solutions?



Note: % corresponds to number of respondents; total may not sum to 100% due to rounding.
n = 101, Source: IDC's *Edge Services Thought Leadership Survey*, September 2020

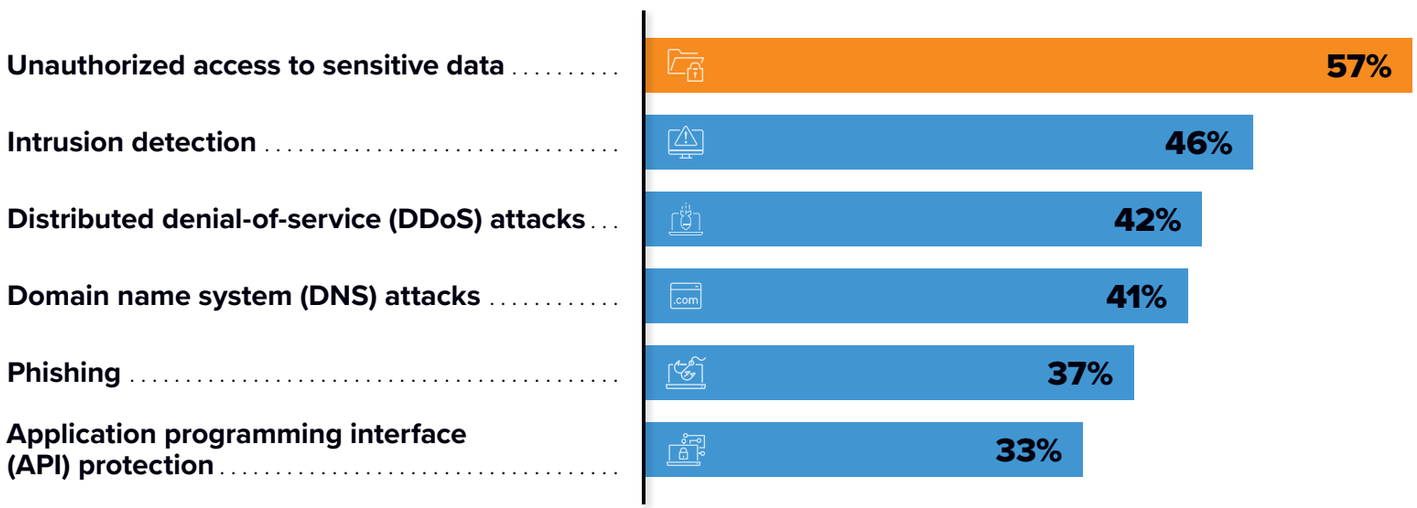
Distributed edge computing:

- **Improves security and latency** because data does not have to travel to the cloud and back
- **Increases operational resiliency to cyberattacks** because edge computing presents a smaller attack surface than centralized cloud computing
- **Is less attractive to bad actors** looking to attack massive stores of valuable, protected health information
- **Reduces costs of bandwidth and infrastructure** because it does not require large data transmission or storage capacity

Protecting Sensitive Data Is a Key Priority for Healthcare Organizations

The value of health information, which can be used to commit medical fraud, has surpassed the value of Social Security and credit card numbers on the dark web. Privacy and security regulations, such as the Health Insurance Portability and Accountability Act (HIPAA) and the General Data Protection Regulation (GDPR), impose stringent controls over data access, use, and portability. Enterprises that fail to protect personally identifiable information face steep penalties, including multimillion-dollar fines, civic lawsuits, and, in extreme cases, criminal lawsuits.

Q. What types of security vulnerabilities are most important to mitigate?



Note: % corresponds to number of respondents; multiple dichotomous table; total will not sum to 100%.
n = 101, Source: IDC's *Edge Services Thought Leadership Survey,* September 2020

According to IDC's *Edge Services Thought Leadership Survey:*

- Almost one-third (32.7%) of healthcare respondents reported that reduced costs were a key compliance benefit provided by edge security services.
- They averaged a 20% improvement in compliance and expected to realize a 29% compliance increase from using edge security services.

Managing Medical Devices at Scale Is Inherently Complex

10–15 connected medical devices per bed

X

920,000 total staffed U.S. hospitals beds

=

9.2–13.8 million total bedside medical devices

The sheer variety of devices and the volume of data streaming from them creates challenges that can be addressed by edge computing. Local processing of data in edge datacenters increases the efficiency of transmitting and integrating data streaming from medical devices to clinical systems. When combined with artificial intelligence (AI) and machine learning, connected medical devices—including consumers' personal devices and wearables—will be instrumental in detecting and predicting deteriorating health and initiating clinical interventions as fast as possible.

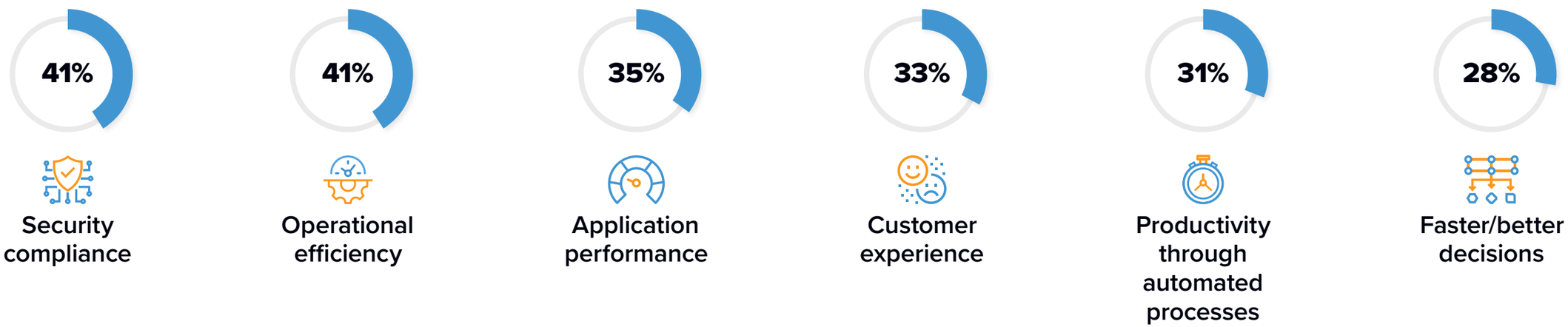
The vulnerability of medical devices is well known to bad actors, making the devices (and other poorly secured endpoints) extremely attractive threat vectors from which to launch attacks and penetrate the rest of the network, in hopes of accessing valuable healthcare IT assets. Edge computing simplifies network segmentation by essentially creating "mini networks" that are connected to the main network by edge computers. Data flow is controlled at the application level, not the more vulnerable network level.

Source: www.aha.org/statistics/fast-facts-us-hospitals

Operational Resilience Is Essential for Mission-Critical Entities

Data is the lifeblood of healthcare organizations; downtime is not an option. As mission-critical entities, hospitals need to provide clinicians with secure, immediate, 24 x 7 access to electronic health information to enable expedient clinical decision-making. This information is collected and aggregated by a wide range of medical devices (IoMTs) at the edge and stored in numerous clinical applications. Fully realizing the benefits of edge computing will ultimately result in improved patient outcomes and overall positive clinician and customer experiences.

Q. What benefits do you expect edge adds or will add to your organization?



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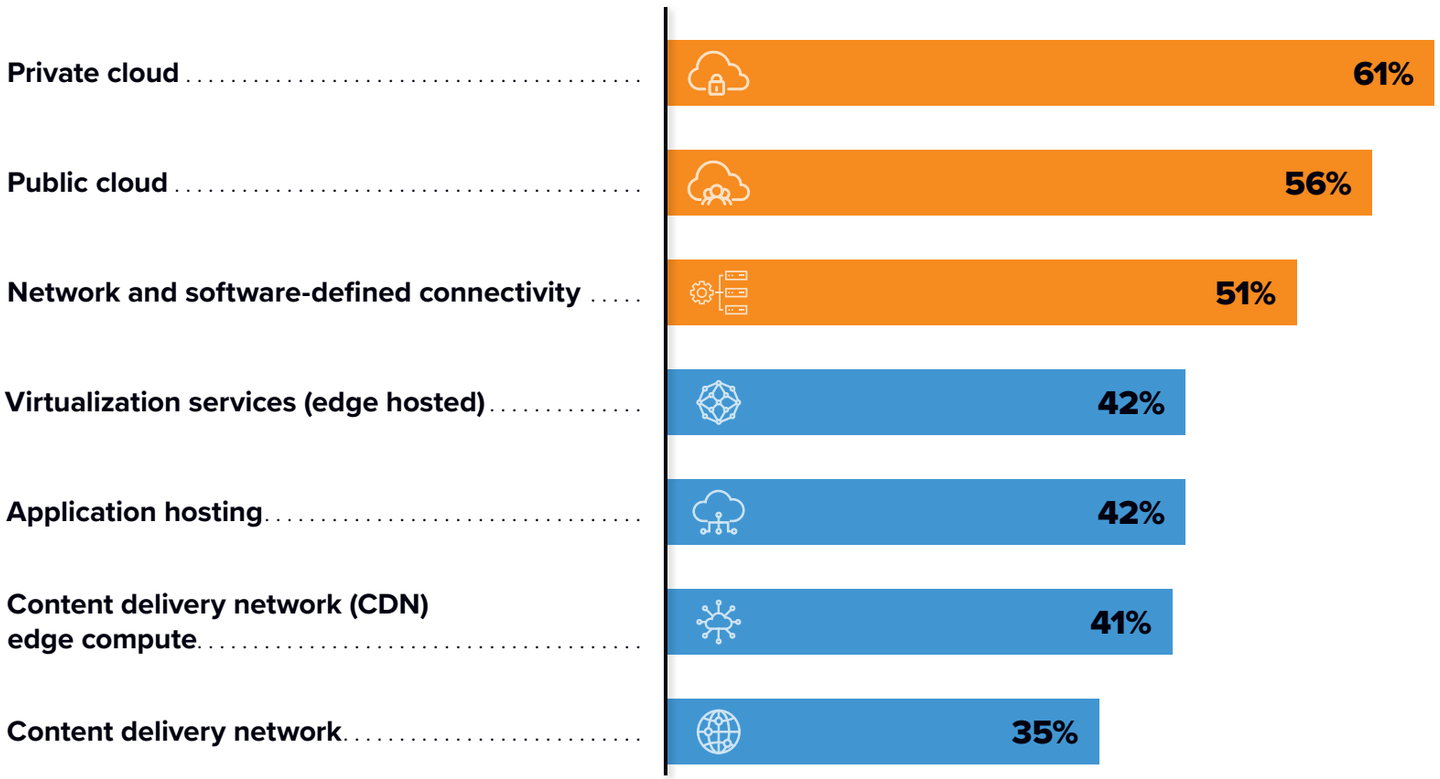
Laying the Foundation for Edge Computing

Edge computing complements cloud computing; it does not replace it.

Q. What key enabling technologies are relevant to your environment?



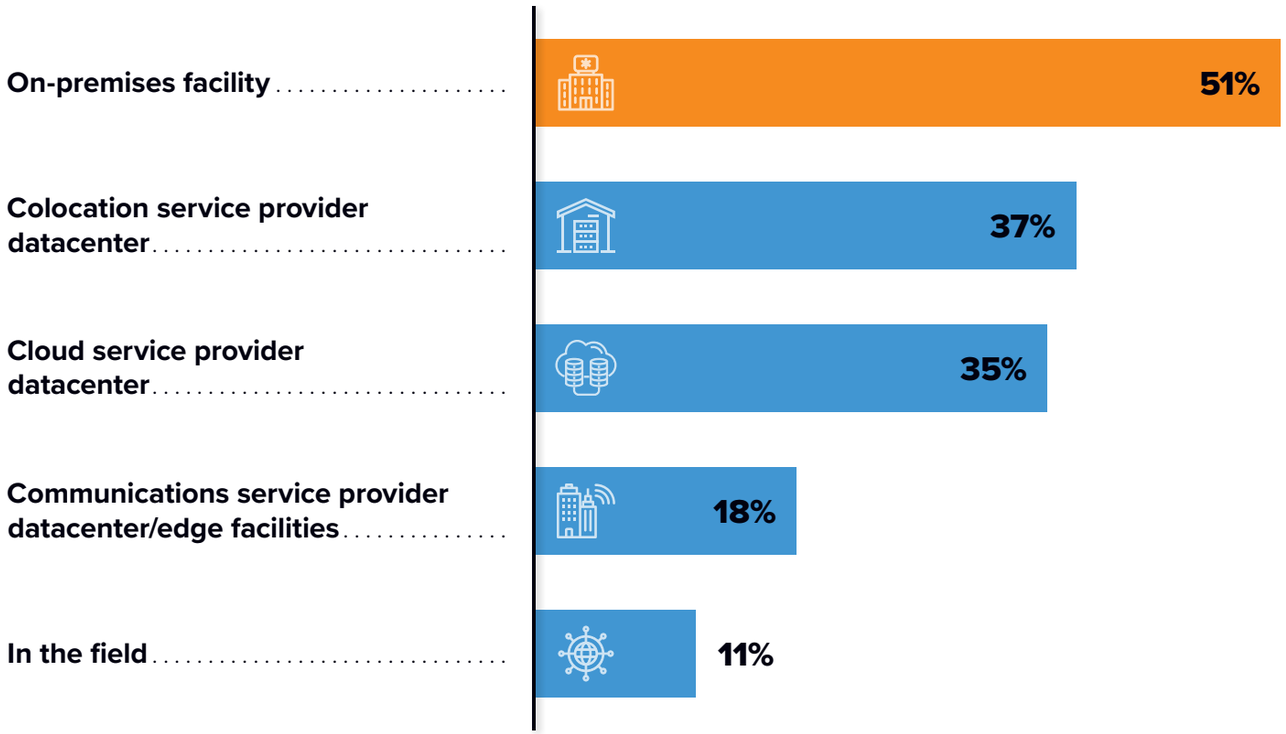
Note: % corresponds to number of respondents; multiple dichotomous table; total will not sum to 100%.
n = 101, Source: IDC's *Edge Services Thought Leadership Survey,* September 2020

Healthcare organizations have made **steady progress in embracing cloud technology.** Because of security concerns, they tend to **favor private over public clouds,** especially for managing and storing sensitive data.

Moving workloads to the cloud and connecting to multiple cloud environments are **major catalysts for deploying software-defined networks.**

How are Healthcare Organizations Deploying Edge Services?

Q. Where does your organization deploy edge solutions?



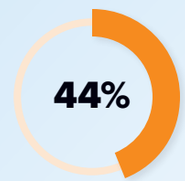
Note: % corresponds to number of respondents; multiple dichotomous table; total will not sum to 100%.
n = 101, Source: IDC's *Edge Services Thought Leadership Survey*, September 2020

Production of Edge Services:

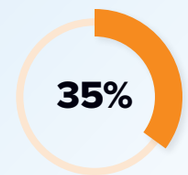
in a single location

in multiple locations

Management of Edge Services:



fully managed



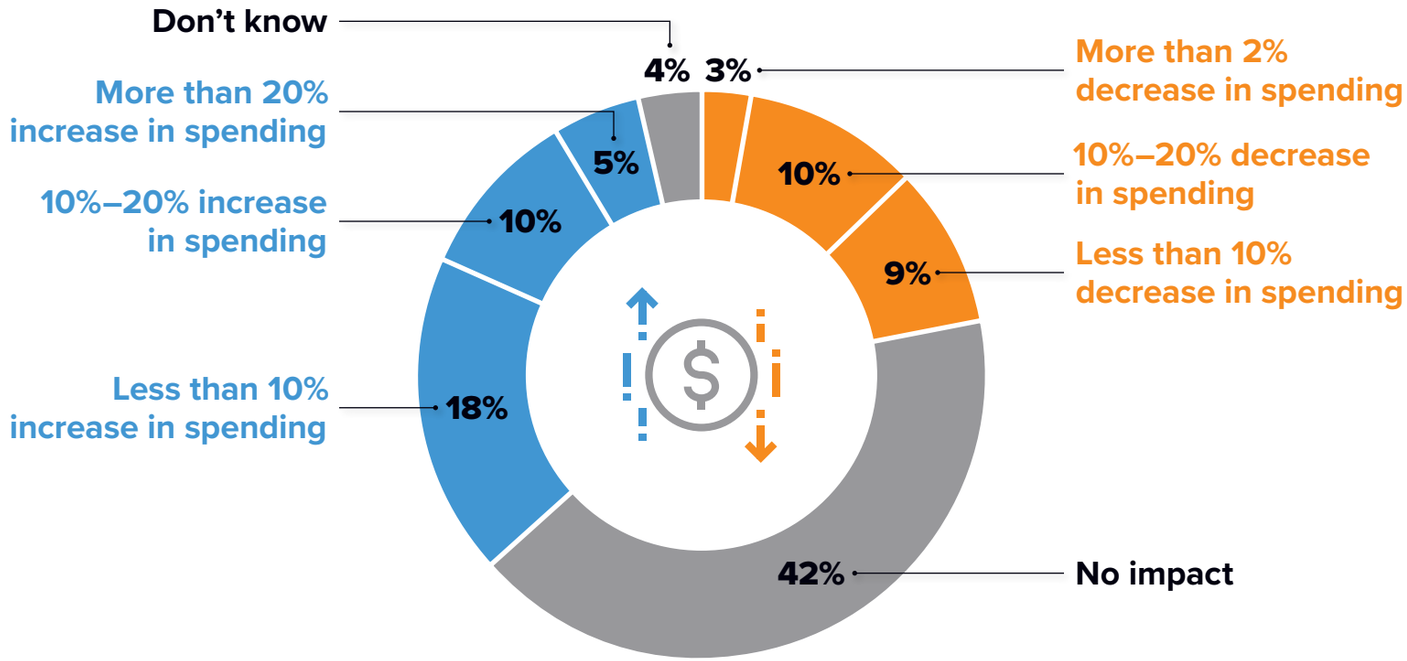
comanaged

The COVID-19 Pandemic Exposed Weaknesses in Network Infrastructure

Q. Compared to your organization's original 2020 IT budget, how do you think your organization's actual spending on edge computing will be affected due to COVID-19?

overall increase in spending: **33%**

overall decrease in spending: **22%**

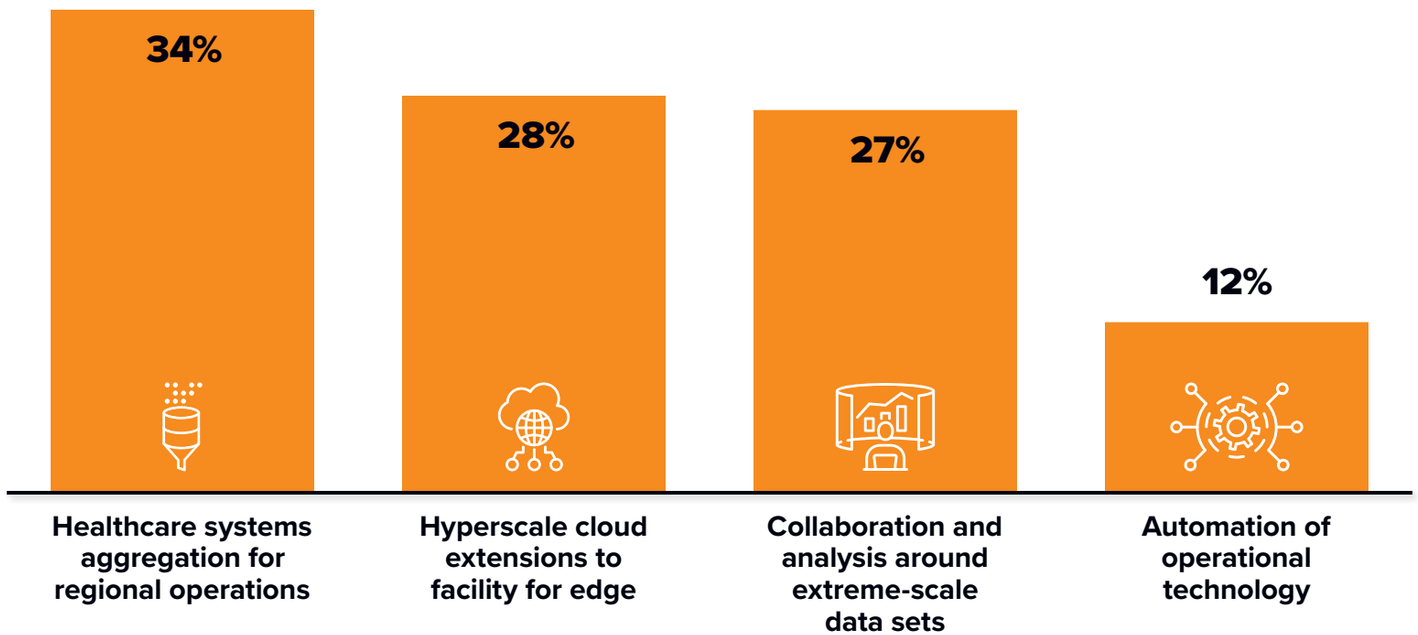


Note: % corresponds to number of respondents; total may not sum to 100% due to rounding.
n = 70, Source: IDC's *COVID-19 Impact on IT Spending Survey* (conducted August 26–September 6), September 2020

Edge Computing Enables Superior Outcomes

Healthcare workloads involve large sets of structured and unstructured data that need to be accessed by care teams collaborating across the institution and, in the case of telemedicine, across the country. Downtime between systems or slow app performance is not an option.

Q. Which use case is the highest priority to your industry?



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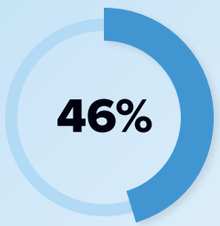


of healthcare respondents to IDC's *Edge Services Thought Leadership Survey* **stated that the maximum latency required for their organizations' edge initiatives is less than 5 milliseconds.**

EDGE COMPUTING USE CASE:

Digital Front Door

A vast array of technologies and capabilities contribute to the digital front door. Across the entire provider continuum of service, Third Platform technologies (cloud, big data, social, and mobile) bring it all together.

- Through digital touchpoints, providers can digitally interact with patients to **drive better access, engagement, and experience across the service continuum.**
- **Service capacity scales beyond the physical walls of a facility.**
- Edge computing can **generate less costly, more rapid, and higher-satisfaction responses** to service demand.
- Organizations **build operational resilience to meet shifting demands** for a digital first experience.

Source: The Individual Health Experience: Framework and Toolkit (Doc# US46949220, October 2020)

EDGE COMPUTING USE CASE:

Telemedicine and Virtual Care Services

Increasing volumes of video-based visits and clinical collaboration require greater bandwidth and reduced latency offered by edge computing.

- **Reduced video jitter due to latency issues** during video transmission improves clinician and patient experience.
- **Collection and analysis of data** is facilitated by centralized monitoring of patients.
- **Resources are conserved** while providing clinical expertise around the clock from any location.
- **Reduced exposure to COVID-19 and other pathogens** boosts clinician and patient safety.

EDGE COMPUTING USE CASE:

Emergency Medical Services

When seconds matter, bandwidth, latency, and app performance can be a matter of life and death.

- **EMS teams receive clinical instruction** from the Emergency Department team on how to treat the patient.
- **Crucial health information can be transmitted** while en route to the ER, such as the patient's vital signs, diagnostics, ECG, or video.
- **Emergency vehicles can be optimally routed** to avoid traffic delays and coordinate traffic signals at intersections.
- **Critical diagnostic time is saved** as the Emergency Department team prepares for the patient's arrival.
- **Patients can be triaged to appropriate care setting,** including mass casualty victims across multiple hospitals.

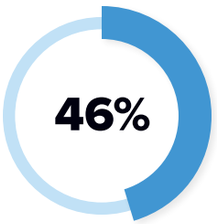
EDGE COMPUTING USE CASE:

Smart Medical Campuses

Smart building technologies are connected assets that collect vital information about the status of buildings. They need to be managed securely.

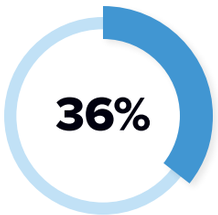
- **Physical occupancy can be quantified** to ensure that staff, patients, and visitors comply with social distancing guidelines.
- **Lifesaving equipment can be tracked down,** including personal protective equipment (PPE) and ventilators, using location-based services.
- **Avoid unnecessary wandering** using wayfinding to help visitors and guests find the quickest route to their destination.
- **Ensure pathogens are not present** using sensors that monitor air quality.

Let's Get Started: The Strategic Road Map for Edge Computing



of healthcare organizations are **planning their next investment in edge computing within the next year.**

while



of healthcare organizations **plan to invest in edge computing within a year or more.**

WHY:

Edge computing **improves bandwidth, latency, and security,** enabling healthcare organizations to **increase their operational resilience.**

WHAT:

A distributed computing architecture features **processing and storage resources closer to where data is generated and consumed.**

WHO:

CIOs, CTOs, CISOs, and key line-of-business executives should help define requirements. **Biomedical engineers, telemedicine, and Emergency Department services** have insights, as well as **compliance and data governance VPs.**

HOW:

All critical stakeholders and domain experts **define key performance metrics by use case** to justify the investment.

Essential Guidance

Articulate a vision for using edge computing and identify appropriate use cases to prioritize investments

Define key performance metrics for use cases to prioritize investments in edge computing and measure success

Include stakeholders and domain experts to define requirements

Take inventory of devices already connected to the network

Embrace data governance, establish data definitions, and determine how data from edge devices flows across the enterprise

Take a holistic approach to security; edge locations have less physical security than traditional datacenters

Seek a strategic relationship with your edge computing technology and services supplier

About the Analyst

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Lynne A. Dunbrack is group vice president for Public Sector, which includes IDC Government Insights and IDC Health Insights. She manages a group of analysts who provide research-based advisory and consulting services for payers, providers, accountable care organizations, IT service providers, and the IT suppliers that serve those markets. Lynne also leads the IDC Health Insights' Connected Health IT Strategies program. Specific areas of Lynne's in-depth coverage include mobile, constituency engagement, interoperability, digital transformation, privacy, and security. Technology coverage areas include clinical mobility (physician facing) and mobile health (consumer facing), end-to-end remote patient health monitoring for health, wellness and chronic conditions, Internet of Things (IoT), telemedicine and virtual care, and digital therapeutics.

More about Lynne Dunbrack

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