

White Paper

Extending Digital Transformation by Delivering Services at the Edge of Your Business

Sponsored by: CenturyLink

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EXECUTIVE SUMMARY

Along with growing adoption of cloud solutions, organizations continue to increase their investments in information technology (IT) assets deployed in edge locations such as server rooms, local datacenters, and local colocation facilities. These investments are directly linked to enhancements in operational technology (OT) and customer experience (CX), which are deployed near the edges of business.

A business' edge can be made up of urban cores, hospitals, factories, transportation hubs, and a wide range of spaces where connected people or "smart" things are concentrated. The ability to connect, secure, and deliver agile IT services at the edge will be key to boosting business velocity, enabling dynamic business scaling, and ensuring greater business operational flexibility in the future. Edge IT environments must be easy to deploy and maintain while delivering extremely low latency and high availability, despite network degradation/failure, and local data placement to meet data governance requirements.

Competition and new market dynamics are driving the demand for new revenue streams, improved customer experiences, and efficiencies. The enterprise network edge must become a dynamic focal point that ensures business performance. It becomes a critical link to support customer engagement and the shift to a data-driven business. For many organizations, the ability to adopt these new business models means that the security strategy and supporting technologies also must change. Unless security is embedded into the process from the edge to the cloud, it will hinder these new experiences.

Integration of security at the edge must not be an afterthought, so organizations must take a holistic view of security, focusing on implementing security in the beginning of the development process. As organizations begin to implement new digital capabilities, they must think of new ways to implement security to properly protect new IT architectures and critical data sources while building new revenue streams. They must also establish and continually demonstrate trust for customers, partners, regulators, and other parties. The significant impact that data control/protection and security have on these new technologies is crucial to the business and adoption of the new business models being implemented.

The building of a road map to develop expertise in assessing, deploying, and managing information technology at increasingly "smart" edge locations is critical and must be done as soon as possible. The right technology and service partner can accelerate edge IT initiatives and support some of a business' most critical digital business transformation efforts.

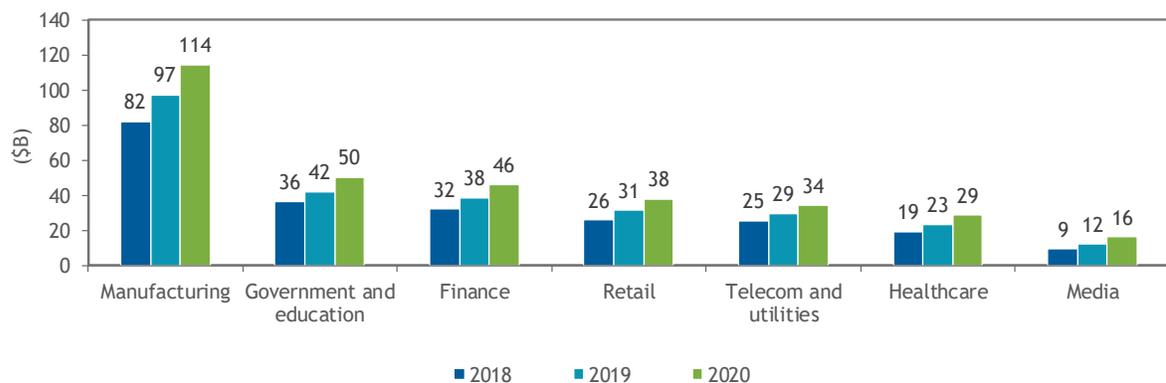
HOW DIGITAL BUSINESS IS CHANGING THE BUSINESS CONVERSATION

In just a few short decades, IT has moved from the back office to the front office and is now embedding itself into nearly every aspect of people's business and personal lives. We are entering an era where the technologies and the processes that businesses deploy are so tightly linked to their customers and markets that the boundary between the enterprise's internal operations and the enterprise's external ecosystem (e.g., customers, markets, competitors, partners, and regulators) is rapidly disappearing.

Business leaders are challenged to move their enterprises to the next level, that of digital business transformation, employing digital technologies coupled with organizational, operational, and business model innovation to create new ways of operating and growing businesses. Enterprises in all verticals are planning sizable investments in technologies that support digital business initiatives in 2019 (see Figure 1).

FIGURE 1

U.S. Spending on Technologies to Support Digital Business by Leading Verticals



Source: IDC's Worldwide Semiannual Digital Transformation Spending Guide, November 2018

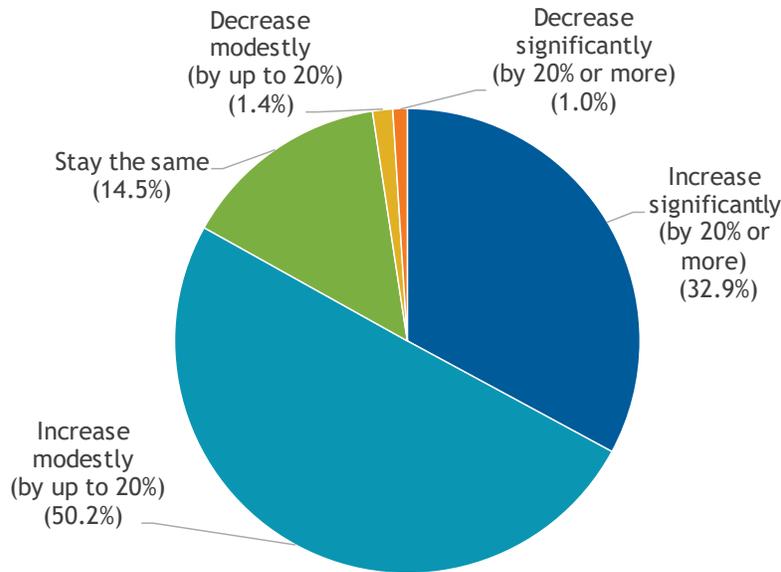
Success in digital business requires new thinking about the consumption of IT resources in increasingly "smart" edge locations. These are urban cores, hospitals, factories, transportation hubs, and a wide range of spaces where connected people or "smart" things are concentrated. Such edge environments are the foundation for innovation in augmented reality/virtual reality (AR/VR), Internet of Things (IoT), robotics, 3D printing, and cognitive/artificial intelligence (AI). Preparing for delivery of IT at the edge will be the key to boosting business velocity, enabling dynamic business scaling, and ensuring greater business operational flexibility.

In a recent IDC survey of 400 IT and business leaders in U.S. organizations, virtually all of those surveyed indicated that they would be increasing their investments in IT assets deployed in edge locations such as server rooms, local datacenters, and local colocation facilities (see Figure 2). These investments aren't in support of classic remote office/branch office IT services. Rather, these investments are being driven by new digital services (see Figure 3).

FIGURE 2

Plans for Future Expansion of Edge

Q. Do you expect the number of edge deployments will ...



n = 207

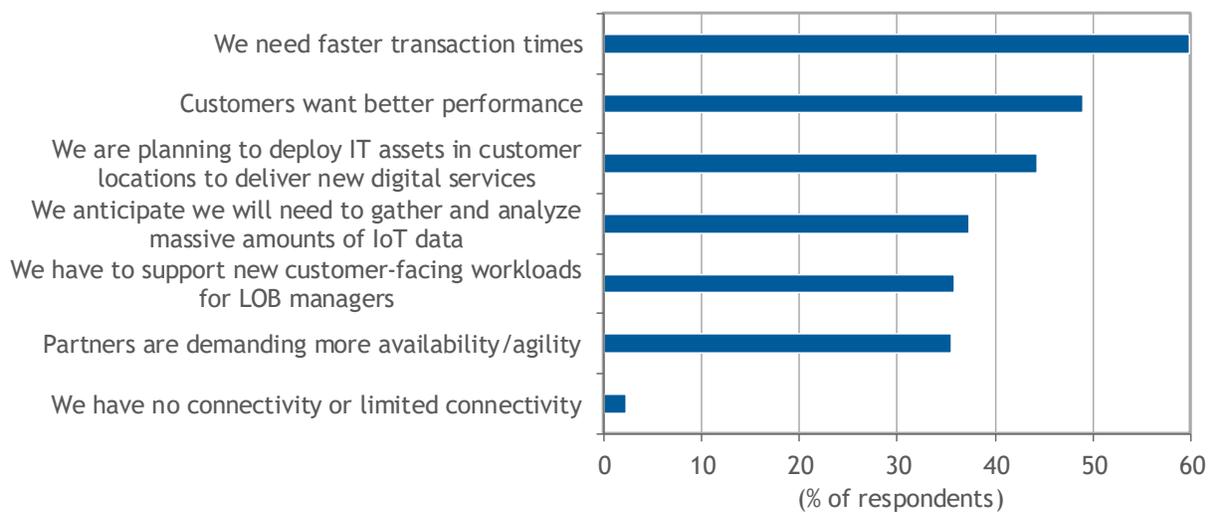
Base = respondents with active edge deployments

Source: IDC's *Enterprise Datacenter Edge Survey*, March 2018

FIGURE 3

Factors Driving Edge Strategy

Q. What is driving your edge strategy?



n = 400

Source: IDC's *Enterprise Datacenter Edge Survey*, March 2018

DELIVERING DIGITAL SERVICES AT THE EDGE OF YOUR BUSINESS

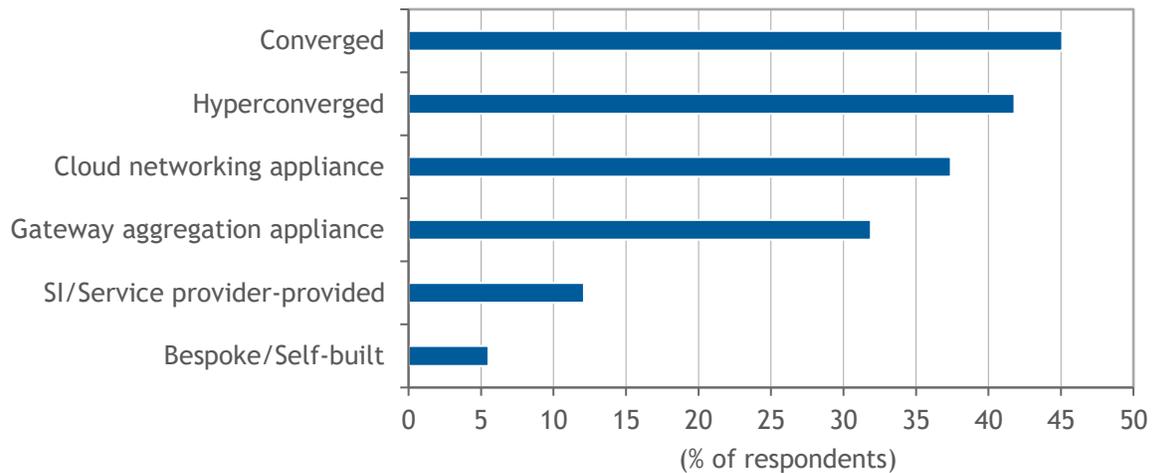
As companies increase their investments in the creation of new digital services, the major implication for IT organizations relates to increased investment in systems used to enhance operational technology and/or customer experience. These engagement systems are more likely to be deployed near the edges of the business and will require even greater investments in advanced IT systems deployed at edge locations and in modern network services that interconnect those edge locations.

Consequently, ensuring the availability of smaller datacenters optimized to support specific workloads, rather than general IT services, will become critical. This shift will spur expanded investments in deploying modern compute and storage systems as well as modern network services (see Figures 4 and 5).

FIGURE 4

IT Infrastructure Types to be Deployed at Edge

Q. Future Deployments: What type of IT infrastructure do you plan to use in your edge deployments?



n = 91

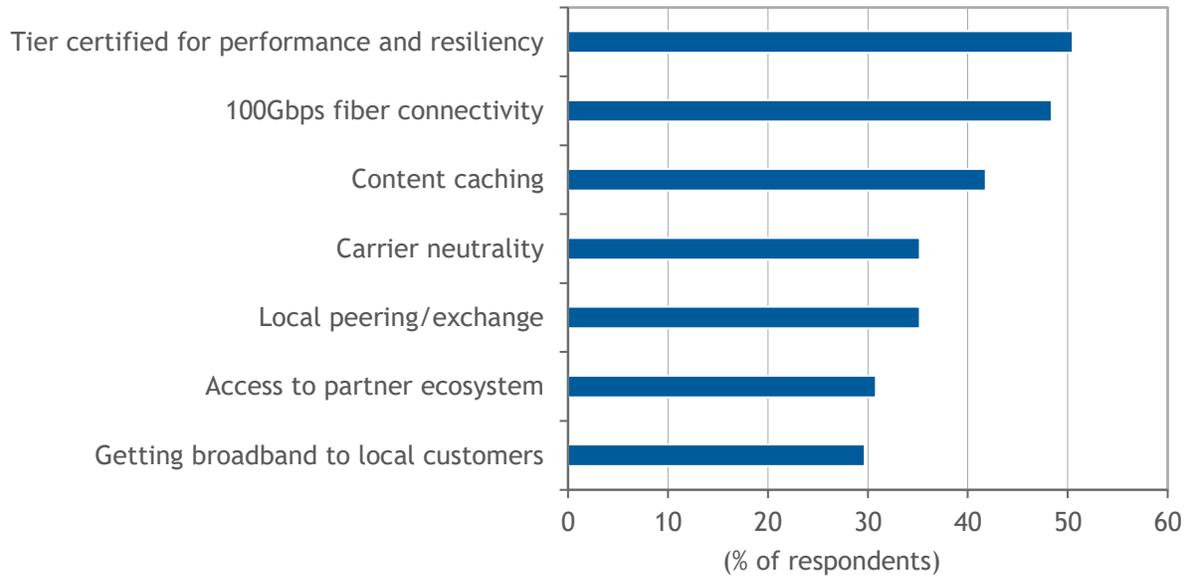
Base = respondents who do not currently have but are planning edge deployments

Source: IDC's Enterprise Datacenter Edge Survey, March 2018

FIGURE 5

Networking Requirements for the Edge

Q. What networking and connectivity requirements do you have for your upcoming edge deployments?



n = 91

Base = respondents who do not currently have but are planning edge deployments

Source: IDC's *Enterprise Datacenter Edge Survey*, March 2018

The Three Keys to IT Transformation Success at the Edge

IT organizations in companies that are expanding their investment in digital services delivered at the edge are acutely aware of the need to continuously enhance their IT and network strategies and have adopted a vision for agility, automation, security, and resilience as they strive to deliver the optimal digital experience at all their edge locations. They are leveraging:

- Solutions for enhancing IT agility that make it practical to deploy compute/storage resources in many remote locations
- Adaptive/automated networking that ensures edge locations are integrated with central cloud- and core-based facilities
- Next-generation network security that gives IT organizations the confidence to deploy systems and applications at edge locations without jeopardizing security and privacy (digital trust)

IT Agility at the Edge

The local building/campus/storefront is a critical, though not often well-defined, transition point when it comes to IT. These edge locations often already include IT systems (compute, memory, storage, and network) that provide IT services such as basic file/print services for local employees as well as OT services such as local inventory management or store-specific point-of-sale (POS) systems. The

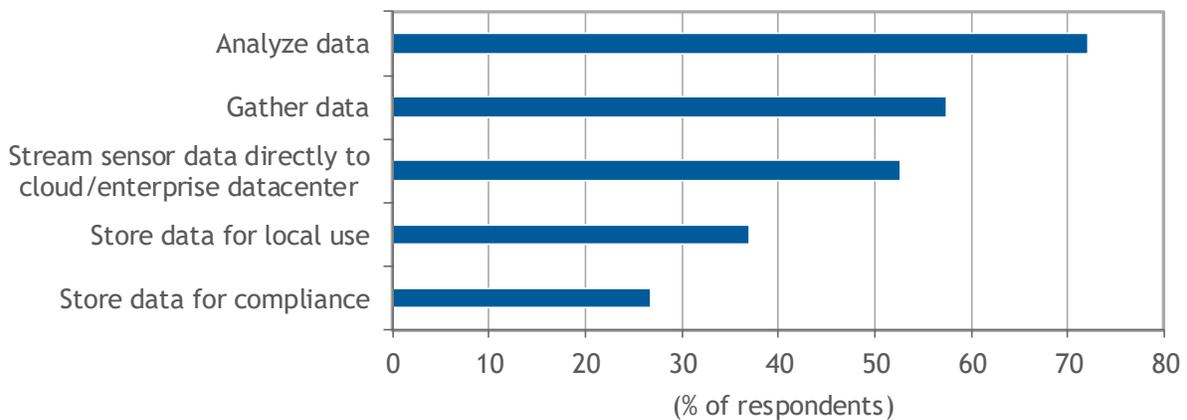
maintenance and management of these assets remain major burdens for overburdened local facilities teams and centralized IT organizations.

In a world of digital transformation (DX), innovative, location-specific digital services delivered at the edge are at the core of new business initiatives (see Figure 6). Over 70% of the surveyed U.S. companies actively deploying IT at edge locations are locally analyzing OT data. Almost 60% of the companies are gathering (and preprocessing/cleansing) data at their edge locations, while over half are streaming that local data via optimized network links back to core and cloud datacenters.

FIGURE 6

What Organizations Are Doing with OT Data Collected at the Edge Site

Q. *What does your organization do with OT sensor data collected at the edge site (not at a centralized datacenter)?*



n = 390

Base = respondents indicating they are responsible for OT

Source: IDC's *Enterprise Datacenter Edge Survey*, March 2018

Examples of such systems include:

- Collection, processing, and onsite viewing of electronic images/records in hospitals and HD video streams used for airport security, in-store customer tracking, or factory process monitoring
- Management and coordination of activities for the fleets of autonomous cranes/vehicles/robots/drones in a container port, warehouse, or mine
- Short turnaround downloads and analysis using machine learning (ML)/inferencing of aircraft/jet engine data during unloading/loading of commercial aircraft
- Deployment of augmented reality platforms at major construction sites to enable a faster and more reliable review/alignment of structural, electrical, HVAC, and plumbing design elements

To scale, these new local systems must be built on a highly standardized and automated hardware/infrastructure software platform that supports the easy deployment and maintenance of cloud-native applications in a specific location. They must meet the following requirements:

- Extreme low latency

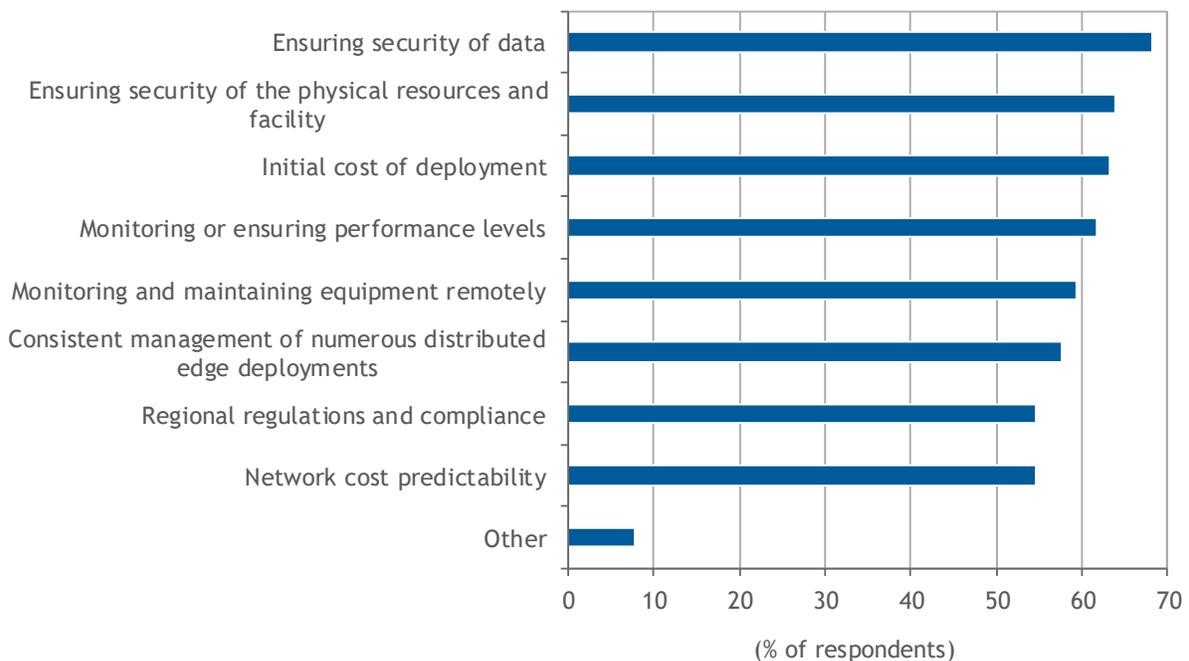
- High availability and continuous operation despite network degradation or failure
- Local data placement to meet data governance requirements

When IDC speaks with IT teams, they are frank about the concerns they have with existing edge IT options. Not surprisingly, data security and physical asset security were the most frequently cited concerns (two-thirds of respondents) in IDC's *Enterprise Datacenter Edge Survey*. More than 60% respondents also noted that overcoming the initial capital costs associated with broad deployment and continually monitoring/ensuring service performance are critical concerns (see Figure 7).

FIGURE 7

Top Concerns

Q. What are the top 5 concerns for edge deployments?



n = 390

Base = respondents indicating they are responsible for OT

Source: IDC's *Enterprise Datacenter Edge Survey*, March 2018

All of these concerns are due, at least in part, to the following shortcomings:

- Inconsistency in configuration of systems that increase operational costs and reduce reliability
- Inflexible deployment options that lead to over-deployment of under-used assets
- Limited usefulness as a platform for new service creation

IT agility is at the heart of any efforts to address these issues. Today, a new generation of IT options are emerging, built on a standard hardware (e.g., hyperconverged) platform and software-defined foundation. They deliver a standard portfolio of cloud services (instances, containers, and serverless) and automation tools that can be deployed not just in central datacenters but also near the edge of the business.

IDC defines these new platforms as local clouds. Today, many cloud service and infrastructure hardware/software providers are already offering first-generation local cloud solutions that focus on infrastructure and integration/data management-level services required in each location. Within the next 18 months, a growing number of local cloud options will include more SaaS and disruptive digital services.

To capitalize on IT agility solutions built for the edge, IT teams must address management issues associated with deploying and managing compute/storage and network resources underpinning digital services in individual edge locations. They must do so without wasteful duplication of infrastructure or administrative staff while managing the delivery of the same digital service in many edge locations. Only then can IT organizations and their technology partners extend new cloud services to edge locations in places where there is very low latency while ensuring data privacy/control and continuous operation despite network degradations.

Adaptive Networking

Impact on IT Organization

The transition to multicloud and diverse access protocols requires a flexible and secure communications infrastructure. The adaptive network is focused on optimal application performance. It is driven by dynamic software-defined, cost-effective, and agile allocation of network resources. Implementation of adaptive networking is impacting IT organizations in many ways. Hybrid IT is changing the networking and IT requirements of the enterprise. The migration of applications, compute, and storage requirements to the cloud is stimulating new configuration and architecture requirements for enterprises. As such, the role of IT is changing: It is less the maintenance of hardware infrastructure and more so the development of agile IT that has a heavy reliance on software-defined functionality. As such, it requires a DevOps organization and structure, where the networking requirements are increasingly aligned with the overall business objectives.

A key component of agile IT is in the networking sphere and includes an acute awareness of the benefits of on-demand bandwidth. The proliferation of on-network datacenter and fiber connectivity has contributed to the appeal of bandwidth on demand. This facilitates network as a service (NaaS), which is the management of hybrid IT ecosystems that include premise-based and cloud environments for flexible demand requirements. Use cases that can leverage "on demand" dynamic bandwidth include retail pop-ups that require temporary additional bandwidth and special events such as seasonal sales or entertainment or sporting events that require additional bandwidth for a short period such as a few hours or even a few days. In healthcare, transmitting high-resolution images may require additional bandwidth on a short-term basis.

Analytics to handle network quality of service (QoS) is critical for managing network assurance and business outcomes. Understanding network performance through the ability to analyze an abundance of data facilitates a wide range of dynamic capabilities, including automation, service assurance, and application optimization. The latter allows end users to source and optimize network resources based on specific applications and use cases that can provide the required level of predictability.

The advent of IoT has upended edge networking. Connected edge will produce a prodigious amount of data that will be consumed at the edge rather than be transported back to centralized datacenters. As such, the network will require new autonomous capabilities to process and analyze the majority of data consumed at the edge. For example, over 90% of the daily multi-terabytes of data produced by connected cars will be analyzed and discarded at the edge. Smart video capabilities will leverage AI to analyze body and object movements to analyze useful data in traffic, retail, and other environments. Over time, machine learning at the edge will optimize the networking requirements to transmit critical data at the optimal time.

Key Product/Tech Developments Required

Network virtualization is transforming the way enterprises are implementing next-generation networks. They are migrating from an appliance-based architecture to a software-defined network. Virtualization can optimize the delivery of virtual network functions based on a flexible deployment spanning customer premises equipment (CPE), provider edge, and core. SD-WAN is an important use case for the evolution of the network to a fully virtualized software-driven network.

Enterprises are changing the way edge networks of geographically distributed branches are managed. As more network functions shift to the cloud, there is less reliance on premise-based infrastructure. An end-user portal provides an important self-service capability and delivers a streamlined and improved CX. It can be used to configure access protocols, adjust bandwidth, and prioritize applications.

The importance of edge computing will be magnified with the proliferation of IoT devices. With billions of connected devices coming onstream over the next decade, processing information leveraging AI/ML is increasingly important. Currently, over 50% of enterprises are leveraging edge computing for data analysis. This reduces the networking resources required to transport data back to centralized datacenters.

Benefits Gained

The enterprise network edge is becoming an increasingly dynamic focal point that is critical to business performance and outcomes. The digital network platform has become an integral aspect for customer engagement and a key determinant of data-driven business outcomes.

Digital platforms enable a diverse array of enhanced, omni-channel customer engagement methods. Near-real-time call center and ecommerce applications, chatbots, notifications, and multifactor authentication – all enhanced by artificial intelligence and machine learning – require robust and responsive IT platforms. These, in turn, rely on a complex blend of hybrid IT architecture that leverages an optimal environment based on ubiquitous service provider edge fiber and cloud infrastructure platforms.

Implementing intelligent edge IT infrastructure, including cloud applications, can improve network responsiveness. Software-defined configurations can facilitate application priority for network resources that can boost network responsiveness and enhance application performance.

Network Security

As companies implement new digital capabilities, they must think of new ways to implement security to properly protect new IT architectures and to help build new revenue streams while demonstrating a level of trust for customers, partners, regulators, and other parties. Companies that undergo digital transformation initiatives, including cloud computing and IoT, are having a significant impact on security strategy.

For many of these organizations, the ability to adopt these new business models means that the security strategy and supporting technologies also must change. Competition and new market dynamics are driving the demand for new revenue streams, improved customer experiences, and efficiencies. Unless security is embedded into the process from the edge to the cloud, it will hinder these new experiences.

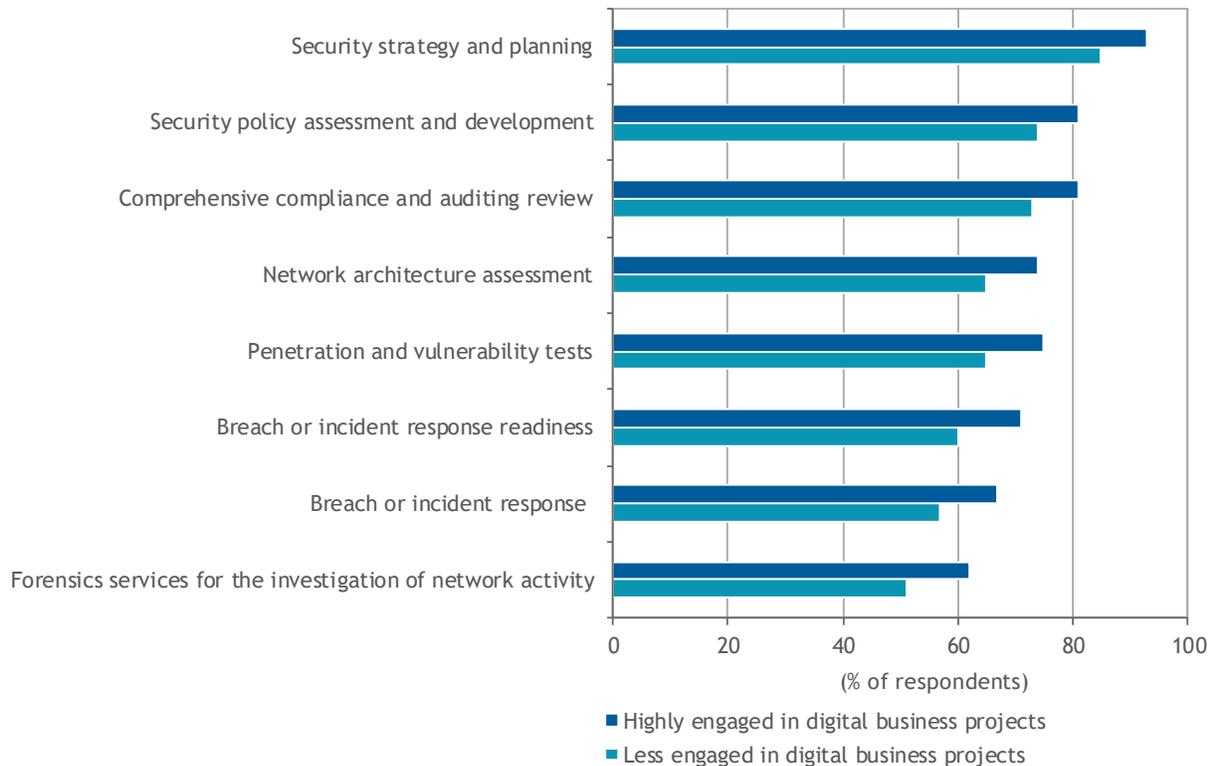
Without appropriate security built into development processes, the door is open to sophisticated, determined attackers that aim to steal intellectual property (IP), damage reputations, and threaten customer relationships and revenue. Successful cyberattacks and breaches are disruptive and costly to the tune of an average of \$550,000 per application downtime occurrence, according to IDC research.

In the digital business surge, everything will speed up and security may be viewed as an obstacle in the rush to market. Some enterprise leaders are willing to roll the dice, forgo security, and turn threats and breaches into a back-end problem. Some enterprise leaders will check the basic security boxes and believe they are adequately protected, and some will delegate security to IT. None of these courses is viable. Furthermore, IDC research shows that organizations that are highly engaged in digital business projects use more strategic security services than organizations that are less involved in digital business projects (see Figure 8).

FIGURE 8

Companies Performing Digital Business Projects Are More Engaged with Strategic Security Services

Q. Have you engaged with a security services provider for the following advisory/consulting services? Yes, in the past 12 months.



n = 1,003

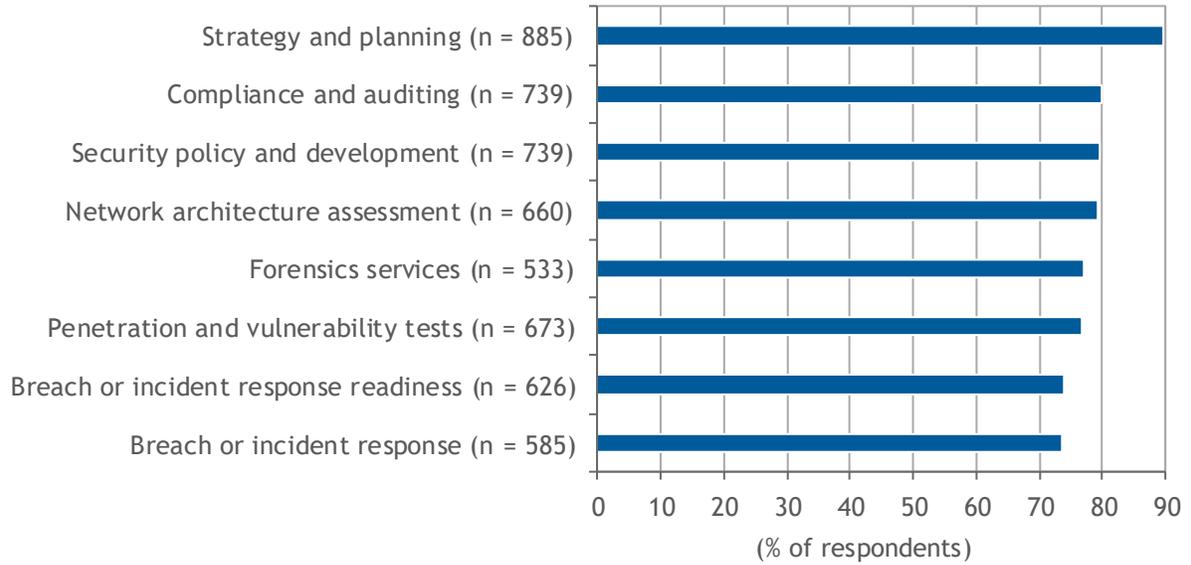
Source: IDC Security Services Survey, 2017

About 75% or more of firms purchase technology as a result of advisory services. The leading advisory service is strategy and planning in which 89.5% of engagements lead to a technology purchase (see Figure 9).

FIGURE 9

Advisory Services Led to Technology Purchase

Q. For each advisory/consulting service you've engaged in the past 12 months, did the service lead to a technology purchase?



Source: IDC's *Global Security Services Survey*, 2017

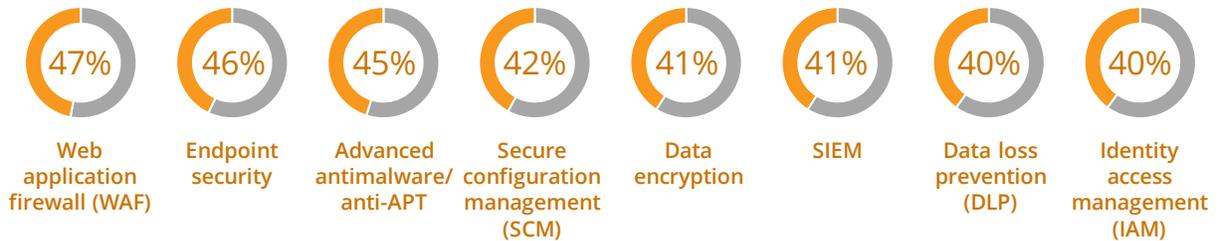
Integration of security across different environments or at the edge must not be an afterthought. Security investments should be focused around the specific needs of the business and risks and built in from the beginning of the project. It is becoming increasingly important for enterprises to take a holistic view of security.

IDC's 2018 *Cloud and AI Adoption Survey* shows that as organizations move workloads to the cloud, a new portfolio of managed services is required (see Figure 10). Organizations are demanding services that can protect the data from an end-to-end perspective.

FIGURE 10

Cloud Demands a New Portfolio of Managed Services

Top Security Services



n = 400

Source: IDC's *Cloud and AI Adoption Survey*, January 2018

Enterprises are turning to service providers to assist them along their transformational journey as a means to gain access to expertise and to ensure they have the right people, processes, and technologies in place.

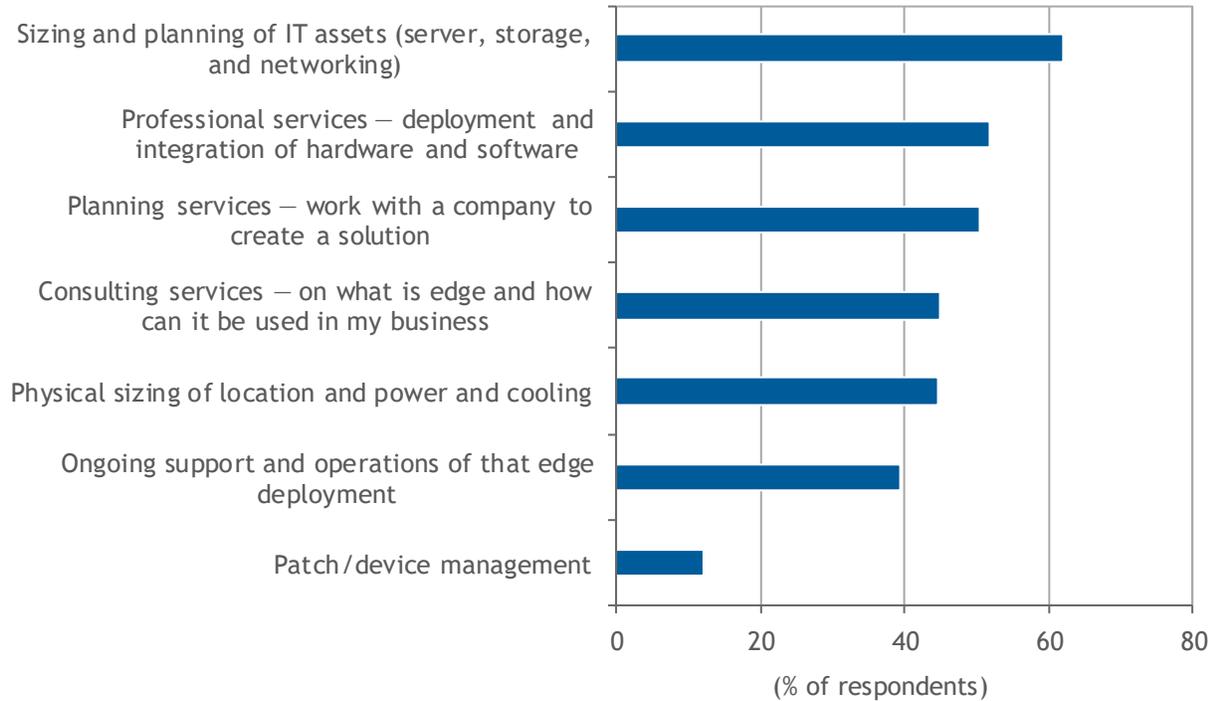
- Organizations are turning to outsourcing all or part of their advanced threat detection to a third party to gain access to emerging and advanced technologies.
- Organizations will turn to providers to access new security technologies that are becoming more important as they move their business to the edge.
- Companies want to improve customer experience by ensuring the workforces have all the tools, data, and insight needed.
- Companies require the ability to provide security across multiple types of delivery models (private cloud, public cloud, and hybrid cloud).
- Organizations require greater automation, integration, and end-to-end visibility.
- Enterprises should extend the security workforce.

IT leaders must assess themselves and their teams with respect to what it will take to develop a world-class "IT at the edge" strategy. They also need to decide when it is more effective to leverage partners such as CenturyLink with defined professional services (see Figure 11) that can speed the design, deployment, and ongoing delivery of services at the edge.

FIGURE 11

Services Needed to Accomplish Edge Goals

Q. What services do you need to help accomplish your edge goals?



n = 400

Source: IDC's *Enterprise Datacenter Edge Survey*, March 2018

ESSENTIAL GUIDANCE

Business leaders and CIOs must establish a road map to develop expertise in assessing, deploying, and managing IT at increasingly "smart" edge locations. The ability to connect, secure, and deliver IT at the edge will be the key to boosting business velocity, enabling dynamic business scaling, and ensuring greater business operational flexibility.

IT at the edge is not about specific devices (sensors, vehicles, or machines), nor is it about a specific location (building/campus, city, or region); rather, it's about quickly delivering data and resources to people and things.

All edge IT efforts require is a flexible and scalable network foundation that ensures secure and rapid movement of data and services between all devices and locations.

The most consistent and recurring barrier to effective execution of this "IT at the edge" strategy remains executing on security, visibility, governance, and policy control elements for devices and data sets. Security and governance practices and policies must extend across all locations and data sets to ensure consistent service delivery and data control regardless of the range of engagement and analytic services offered at each edge location. IT teams must:

- Begin to establish closer links between IT and critical systems in factories, hospitals, and airports and many edge locations.
- Establish connectivity and security strategies and policies for dealing with third parties that may want to deploy edge IT assets in the organization's facilities.
- Establish a corporate-wide set of security and data controls (policies and practices) that can help automate edge-to-core data placement and movement activities.

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