

CONTENTS

4	INTRODUCTION
6	2020 KEY FINDINGS
7	KEY FINDING 01: DIGITAL TRANSFORMATION
10	KEY FINDING 02: MULTI-CLOUD
14	KEY FINDING 03: AUTOMATION
17	KEY FINDING 04: APPLICATION SERVICES
21	KEY FINDING 05: ORGANIZATIONAL ROLES
25	CONCLUSION



TABLE OF FIGURES

8	FIGURE 01: The importance of applications to the business	18	FIGURE 08: Top five application services deployed today
9	FIGURE 02: Strategic trends according to senior leaders	19	FIGURE 09: App services currently deployed based on existence of digital transformation project
11	FIGURE 03: Best cloud for the app	20	FIGURE 10: Security confidence in protecting APIs based on number of API calls per month
12	FIGURE 04: Multi-cloud challenges	22	FIGURE 11: Primary responsibility for deploying app services in the public cloud
13	FIGURE 05: App portfolios are diverse and multigenerational	23	FIGURE 12: IT organizational structure
15	FIGURE 06: State of the deployment pipeline	24	FIGURE 13: Preferred form factor for app services on premises
16	FIGURE 07: Primary and secondary characteristics desired of app services		



INTRODUCTION

Applications are the engines that power the digital economy.

Through what is broadly referred to as digital transformation, all businesses across all industries are becoming application centric with the goal of moving faster, boosting efficiency, and securely delivering the digital customer—and employee—experiences the market demands. While the pace of change varies by organization, most digital transformation journeys follow a similar path:

Phase 1: Automating individual tasks to improve efficiencies by digitizing IT and business processes.

Phase 2: Integrating those discrete automated tasks and taking advantage of cloud-native infrastructures to scale the process with orchestration.

Phase 3: Harnessing and analyzing telemetry from application services to provide actionable business insights that prevent loss, predict capacity, optimize resources, and increase revenue.

In order to accelerate organizations' progress through this journey, the industry is responding with new solutions. Today, we see tremendous innovation in the application services that support every step in the lifecycle of an application, including development, deployment, management, and operations. There is similar innovation in terms of application architectures (e.g., containers, serverless, function-as-a-service) and infrastructure environments (e.g., public clouds, Red Hat OpenShift, VMware Project Pacific). These innovations are delivering new capabilities, agility, and scale that were not possible before.

Still, several challenges and questions remain for organizations in the throes of digital transformation:

- How do they balance speed to market of new digital capabilities with the requirements of stability, security, and compliance?
- How do they minimize the tool sprawl that comes with deploying and operating an application portfolio that spans different architectures and multiple infrastructure environments?
- How can organizations achieve visibility into their application portfolio? For example, how many apps they have, where they're deployed, how those apps are secured, and how they're meeting app-level availability and performance objectives.
- What's the effect of the growing number of APIs on the application landscape?
- How do they manage and automate an expanding portfolio of apps across multiple environments?
- Who should oversee ensuring the availability, performance, and security of their applications?

For our sixth annual survey, we heard from nearly 2,600 respondents globally—across a range of industries, company sizes, and roles—about the challenges and opportunities presented by the ongoing process of digital transformation. Their responses provide a unique view of the trends shaping the application landscape and how organizations around the world are transforming to meet the ever-changing demands of the digital economy.

Welcome to the 2020 State of Application Services Report.

2020 KEY FINDINGS



01

80% of organizations are executing on digital transformation—with increasing emphasis on accelerating speed to market.



02

87% of organizations are multi-cloud and most still struggle with security.



03

73% of organizations are automating network operations to boost efficiency.



04

69% of organizations are using 10 or more application services.



05

63% of organizations place primary responsibility for app services with IT operations, with more than half moving to DevOps-inspired teams.



01

80% of organizations are executing on digital transformation—with increasing emphasis on accelerating speed to market.

As organizations progress through their digital transformation, IT and business process optimization initiatives mature. But what exactly are they doing? Many organizations are moving beyond the first phase of digital transformation—business process automation—and scaling their digital footprint with cloud, automation, and containers. This transformation results in the creation of new ecosystems and skyrocketing API call volumes. Organizations able to harness the application (and API) data and insights generated will be rewarded with significant business value.



The Application Economy Evolves

According to senior leader respondents, 4 out of 5 organizations are embarking on digital transformation. Consistent with our findings last year, IT optimization and business process optimization are the top reported benefits of these initiatives. This demonstrates that IT organizations continue to re-evaluate their structures, processes, and workflows to set the stage for the next phase in their digital transformation journey.

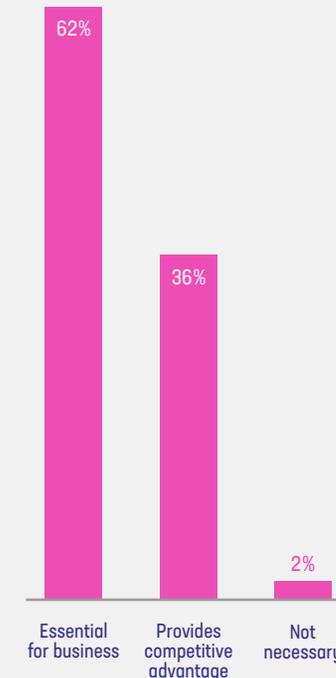
With organizations beginning to breach the second phase of digital transformation—a period marked by an increase in applications and an expansion of automation—their growing dependence on applications should be no surprise. When we asked organizations why they wanted to engage in digital transformation, it came down to business agility and differentiated customer experiences: the primary driver for organizations was improving the velocity of new product/service introductions (67%), followed by responding to emerging competitors (32%), and the behaviors of new buyers (31%).

As digital business activities mature, organizations are looking to combine digital services from previously unconnected industries or segments, forming new ecosystems to create value.

That every business today is an application business is not just a catchy marketing phrase. For 62% of organizations, applications are essential to business; without applications, they cannot operate. And 36% tell us applications support their business and provide competitive advantage. Only 2% of respondents globally reported they do not need applications to operate—a group primarily composed of organizations with fewer than 100 employees.

WE ASKED:

Please select the statement that represents how your organization views/treats its application portfolio. Select one.



WE LEARNED:

Applications are essential for just about every organization.

FIGURE 01 : The importance of applications to the business



It's important to note that the use of the term “business” here is not restricted to revenue-generating applications. External-facing applications make up less than half (45%) of an organization’s app portfolio. The rest are internal facing and include productivity, process-related, and, increasingly, operational applications. These internal-facing apps are critical to digitizing business processes—and making them consistent, repeatable, and scalable. As digital business activities mature, organizations are looking to combine digital services from previously unconnected industries or segments, forming new ecosystems to create value. Senior leaders reported that cloud, automation and orchestration, and big data analytics will be the top three strategic trends in the next two to five years.

F5 INSIGHTS FOR KEY FINDING 01

It is time to manage the application portfolio like the business asset it is.

First, focus on the application services required to secure, scale, and digitize IT and business processes. Automation and orchestration are key foundational tenets in this first phase of digital transformation. As organizations transition to the second phase, it is important to instrument application services to emit telemetry for unified visibility and control over policy enforcement.

In the third phase, this telemetry from application services can be studied by cloud analytics tools to provide actionable operational and business insights such as predicting capacity, preventing loss, and delivering differentiated customer experiences.

WE ASKED:

Which technology trends do you think will be strategically important for you over the next 2-5 years? Select all that apply.



WE LEARNED:

Cloud, automation and orchestration, and big data analytics will be the top three strategic trends in the coming years.

FIGURE 02: Strategic trends according to senior leaders



02

87% of organizations are multi-cloud and most still struggle with security.

Whether they are responding to government mandates or C-level demands, organizations use the public cloud to participate in industry ecosystems, leverage cloud-native architectures, and deliver applications at the speed of the business. Despite the strategic imperative, organizations are much less confident in their ability to withstand an application-layer attack in the public cloud versus in an on-premises data center. This discrepancy illustrates a real need for easy-to-deploy solutions that can ensure consistent security across multiple environments.



Organizations Struggle With Security in the Cloud

Following through on their strategic initiatives, organizations continue to adopt cloud platforms at a high rate, with 27% of respondents reporting that they will have more than half of their applications in the cloud by the end of 2020.

When we asked organizations how they decide which cloud is best for their applications, the number one answer was on a “case-by-case, per application” basis. This approach necessitates using multiple providers, and three out of four respondents report that they have applications in two or more cloud providers.

This per-application strategy is required because each application is unique and serves a specific function within the business. Each can have end users that scale from less than a hundred to into the millions. And each has a different risk exposure—from a breach, to public embarrassment, to costing the business billions of dollars in damages.

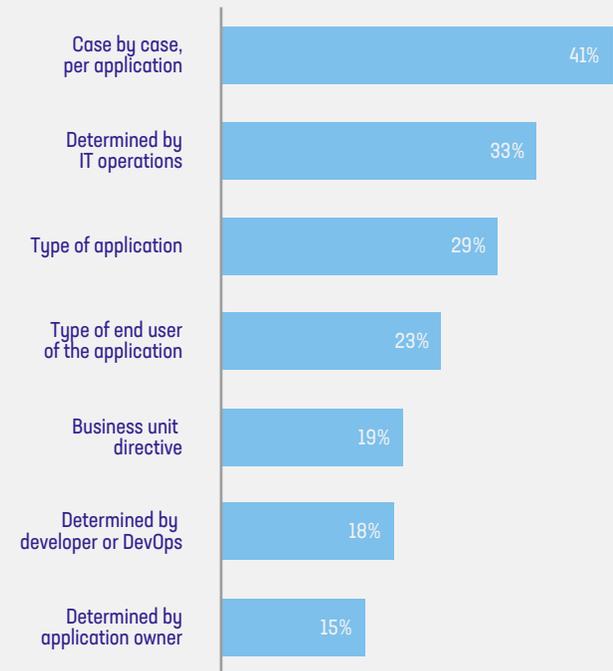
It is imperative to have application services that span multiple architectures and multiple infrastructures to ensure consistent (and cost-effective) performance, security, and operability across the application portfolio.

There are many challenges in managing a multi-cloud environment, and maintaining security, policy, and compliance are chief among them as reported by respondents:

- Applying consistent security policies across all company applications
- Protecting applications from existing and emerging threats
- Complying with regulations

WE ASKED:

How does your organization decide which type of cloud is best for each application? Select all that apply.



WE LEARNED:

Businesses tailor their use of cloud infrastructure to the needs of their business.

FIGURE 03: Best cloud for the app



This is not surprising as evidenced by 71% of organizations reporting a skills gap in security. The highest skills gap lies in the discipline of protecting their applications from attack and breach according to 54% of respondents. The location of those apps matters as well. Organizations report a much lower confidence in their ability to withstand an application-layer attack in the public cloud. While 62% report they are confident in their ability to protect applications in an on-premises data center, only 45% of organizations are confident in their ability to protect applications in the public cloud.

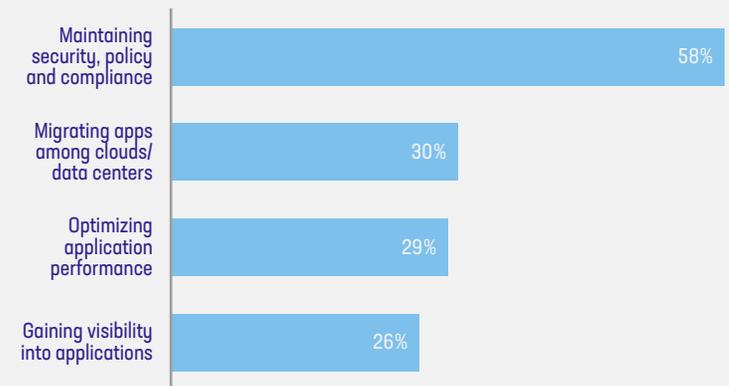
The challenge of providing security parity across all application architectures and infrastructure is brought into even sharper relief by taking a snapshot of the average application portfolio.

According to the survey respondents, no single application architecture has the majority. Three-tier web and mobile app architectures come in first at 40%, with client-server following right behind at 34%. Microservices/cloud-native architectures are on the rise at 15%, but old school mainframe/monoliths still account for 11%. With each new generation, additional business value is created and captured, yet the investments, value, and insights arising from the previous generation of architecture is still necessary—which leads to organizations having a diverse application portfolio.

Given the heterogeneous mix of application architectures in a typical organization's portfolio, it is understandable that over a third of respondents reported that refactoring legacy applications for modern environments is a priority for digital transformation. Additionally, it highlights the fact that multi-cloud will be the norm for the long term. It is imperative to have application services that span multiple architectures and multiple infrastructures to ensure consistent (and cost-effective) performance, security, and operability across the application portfolio.

WE ASKED:

As you think about managing applications in a multi-cloud environment, what parts of managing the application do you find the most challenging, frustrating, or difficult? Select all that apply.



WE LEARNED:

Organizations need consistency across environments—security most of all.

FIGURE 04: Multi-cloud challenges

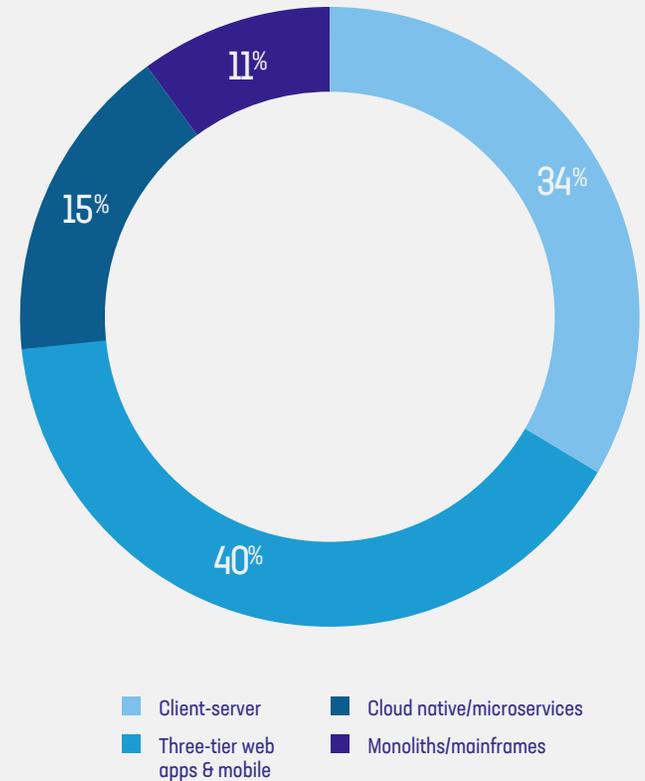


F5 INSIGHTS FOR KEY FINDING 02

The notion of achieving a single application architecture or uniform infrastructure environment is a pipedream for most organizations of scale. Instead, leading organizations recognize that the most efficient and effective way to treat each application uniquely while operating and securing applications across heterogeneous architectures and environments is through a set of application services that abstract the application logic from the underlying infrastructure.

WE ASKED:

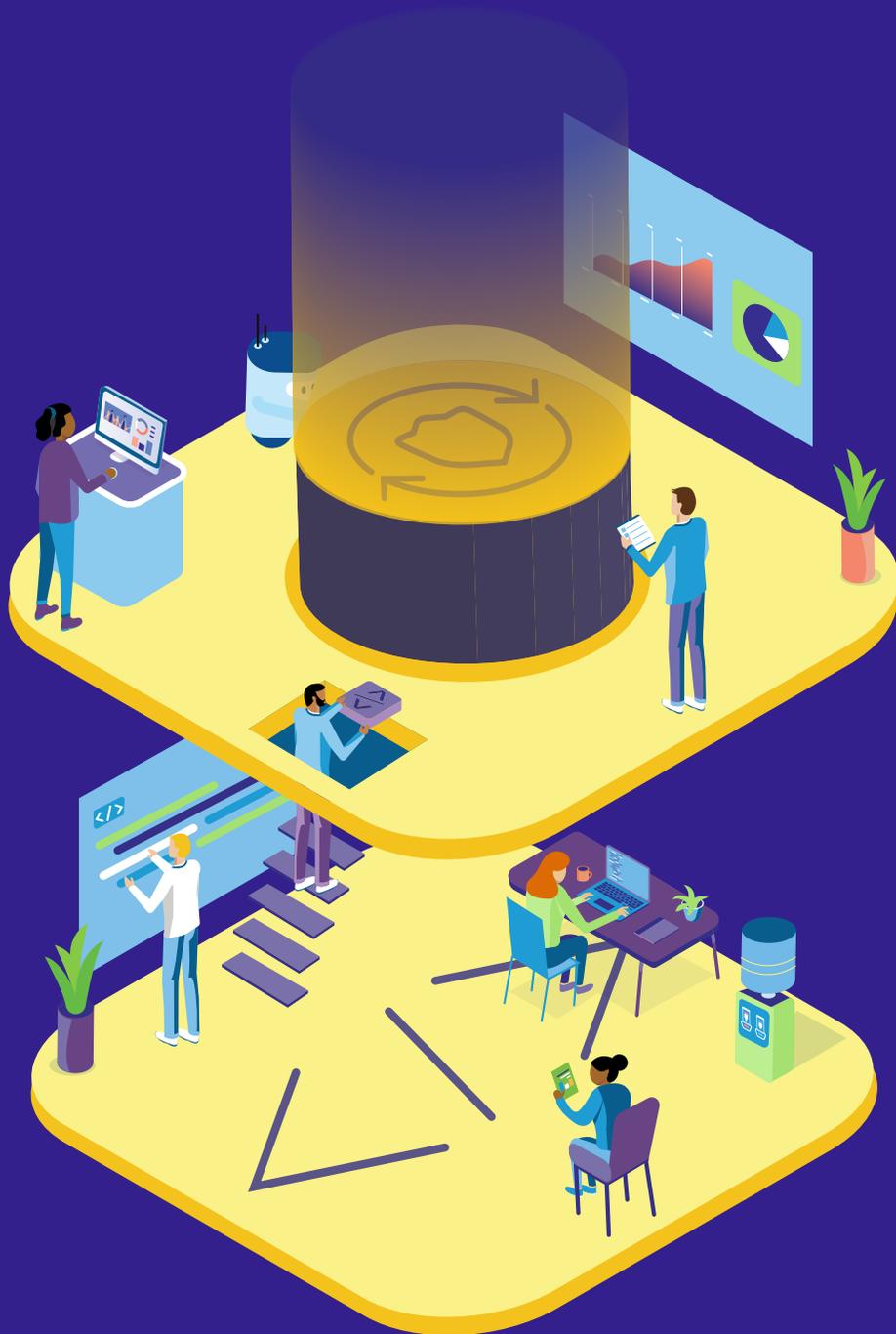
Of those applications deployed today, roughly what share fit into the following categories?



WE LEARNED:

A diverse mix of application architectures is the reality for every organization.

FIGURE 05: App portfolios are diverse and multigenerational



03

73% of organizations are automating network operations to boost efficiency.

Unsurprisingly, given that the primary drivers of digital transformation are IT and business process optimization, the majority of organizations are automating their network operations. Despite challenges, they're gaining proficiency and moving toward continuous deployment with more consistent automation across all four key pipeline components: app infrastructure, app services, network, and security.



Automation and Orchestration Go Mainstream

Network automation continues to increase as organizations seek to realize gains in speed and consistency in their race to deliver applications to the market more quickly. We see more consistent use of automation in the deployment pipeline this year than in previous years; at approximately 40%, automation is nearly equal across all four key component areas—application infrastructure, network, application services, and security—which illustrates a level of maturity that has grown year over year.

Despite the fact that network automation continues to rise, we are still a long way from the continuous deployment model necessary for business to really take advantage of digital transformation and expand beyond optimization of processes to competitive advantage in the marketplace.

The tools of choice for network automation remain proprietary solutions such as VMware, Cisco, and public cloud, but open source and CI/CD solutions are not far behind. CI/CD darling Jenkins has captured an impressive 18% of the network automation user base.

Repository usage as part of the automation toolset remains low, with 12% of respondents using GitHub Enterprise and 8% using GitLab Enterprise. The lackluster use of these repository-first offerings in the automation toolchain is unsurprising as they tend to be considered developer tools. Organizations should, however, give these tools a hard look when considering how best to manage deployment artifacts—particularly when adopting an infrastructure-as-code approach that takes advantage of declarative methods of provisioning and configuration.

WE ASKED:

Which of the following infrastructure components have you automated within the continuous deployment pipeline? Select all that apply.



WE LEARNED:

Organizations are gaining proficiency and moving toward continuous deployment with more consistent automation.

FIGURE 06: State of the deployment pipeline



Despite the fact that network automation continues to rise, we are still a long way from the continuous deployment model necessary for business to really take advantage of digital transformation and expand beyond optimization of processes to competitive advantage in the marketplace. The most frequently reported obstacles to achieving continuous deployment remain a lack of necessary skill sets, challenges integrating toolsets across vendors and devices, and budget for new tools.

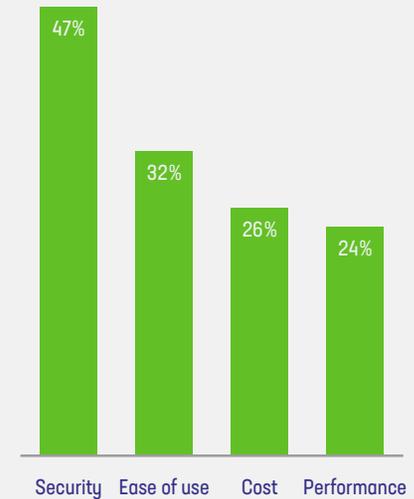
We see this frustration clearly in the position of “ease of use” as a preferred characteristic of app services, second only to security. With skill set and integration challenges slowing automation and orchestration initiatives, this desire for app services that are easy to use makes sense.

F5 INSIGHTS FOR KEY FINDING 03

The increasing use of CI/CD tools in the deployment pipeline points to a preference for open ecosystems as a way to address the skill set gap plaguing enterprise IT. Organizations look for application services that are compatible with open ecosystems and bridge the skill sets of operations and DevOps.

WE ASKED:

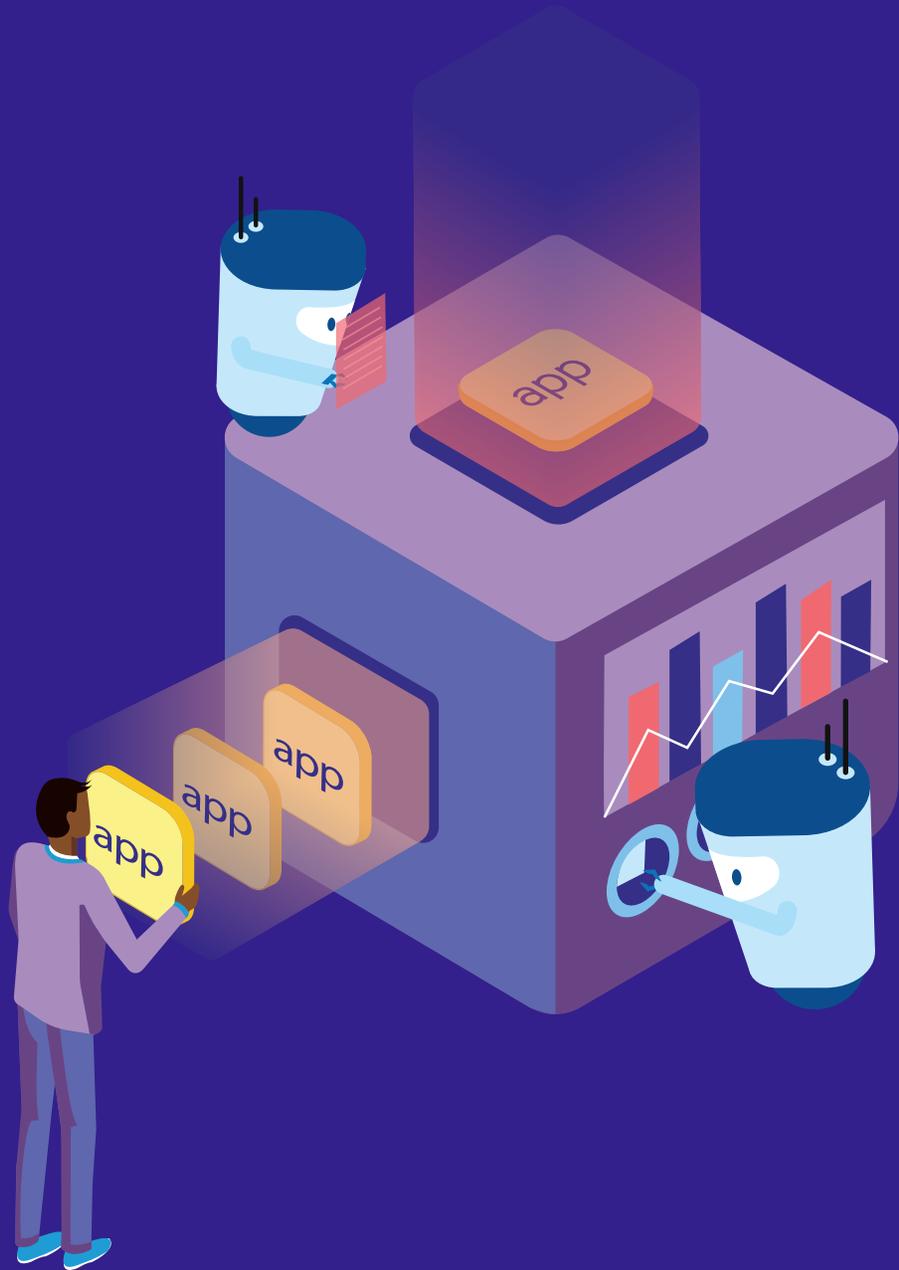
When you are deploying application services, please select the first and second most important characteristic of the offering.



WE LEARNED:

Organizations demand security and ease of use to accelerate time to value.

FIGURE 07: Primary and secondary characteristics desired of app services



04

69% of organizations are using 10 or more application services.

Digital transformation, cloud platforms, and modern architectures are driving adoption of app services. As cloud- and container-native application architectures mature and scale, more organizations are deploying related app services, such as Ingress control and service discovery, both on premises and in the public cloud. Modern applications require modern app services to support scale, security, and availability requirements.



Complex Environments Drive Adoption of New Application Services

We see the impact of the distribution of applications across multiple environments in the current and planned deployment of app services.

It is no surprise to note that the most widely deployed application services—as well as those that will be deployed in the next 12 months—are largely services that provide corporate and per-application security. For the third year running, respondents told us by a wide margin (over 30 percentage points) that the worst thing they could do is deploy an app without security services.

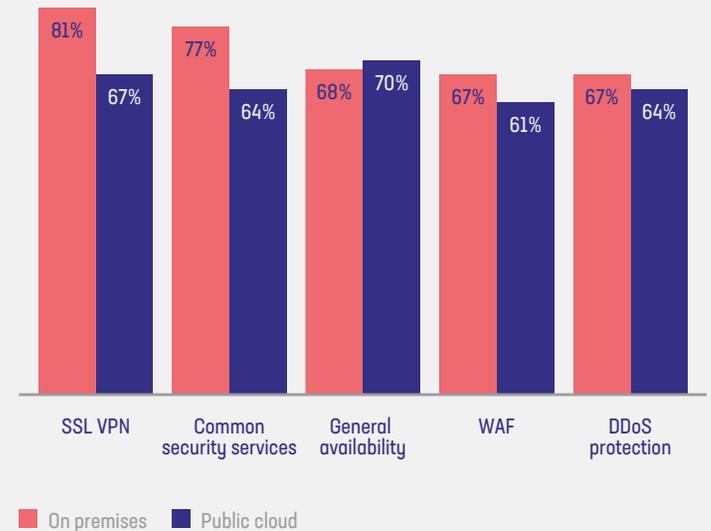
On premises, security app services continue to dominate the top five application services deployed today: SSL VPN (81%) and common security services like firewall, IPS/IDS, antivirus, and spam mitigation (77%) lead the way, followed by general availability (load balancing, global server load balancing, and DNS) at 68%. WAF and DDoS protection, each at 67%, take the last spots in the top five. In the public cloud, we see the same five app services, but note that—predictably—general availability tops the list.

When we shift our view to the next 12 months, however, we see the impact of cloud and modern app architectures on application services deployment plans. Of note, performance needs are rising to challenge security. SD-WAN (41%) takes the top spot with DNSSEC (37%) and service mesh (37%) close behind. Botnet protection, anti-fraud, and common performance optimization services fill out the top six, with 36% of organizations planning to deploy each.

While most application services related to modern app architectures didn't make the top five, they are on the rise. Service mesh, Ingress control, and API gateways (along with HTTP2 gateways) all saw significant gains over our 2019 results both in actual and planned

WE ASKED:

Which of the following application services does your company currently deploy in an on-premises data center/private cloud or the public cloud. Select all that apply.



WE LEARNED:

Security dominates the list of top five app services deployed today.

FIGURE 08: Top five application services deployed today



deployment rates. We see this trend being driven by digital transformation initiatives that are pushing organizations toward adoption of public cloud and modern (cloud- or container-native) architectures.

Backing up that assessment is the fact that only 39% of those with no digital transformation projects in place have deployed Ingress control, while that number rises to more than half (58%) of those with a digital transformation project in place. API gateways show similar results, with only 29% of those with no digital transformation project having deployed the app service while 44% of those immersed in digital transformation have. This pattern also holds true for other cloud- or container-native app services, including service discovery and service mesh.

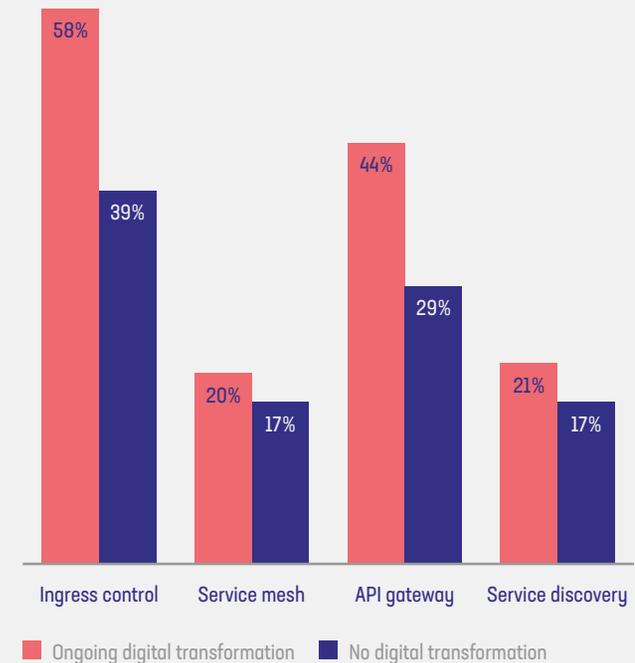
More than 80% of organizations with high API call volumes have deployed Ingress control on premises today.

We can't talk about applications today without simultaneously talking about APIs. It may be an application economy, but APIs are the glue that enables organizations to use apps to improve productivity, generate revenue, and run the business. APIs have a significant impact on the adoption of application services, perhaps more so than any other technology today. And it's telling that organizations with significant API call volumes (more than 10M per month) are heavily investing in those application services required to operate, scale, and secure cloud-native applications.

For example, Ingress control is a relatively new application service that has arisen due to specific routing and scalability needs within containerized environments. More than 80% of organizations with high API call volumes have deployed Ingress control on premises today. That falls just a bit to 67% in the public cloud. The strong adoption of Ingress control speaks to increasing adoption rates of container- or microservices-based applications, which now make up a healthy 15% of enterprise app portfolios.

WE ASKED:

Are you executing on digital transformation, and which of the following application services does your company currently deploy in either an on-premises data center/private cloud or the public cloud? Select all that apply.



WE LEARNED:

Organizations undergoing digital transformation are more likely to deploy modern app architectures and app services at higher rates.

FIGURE 09: App services currently deployed based on existence of digital transformation project



For service mesh—another container-native app service—54% of organizations with more than 10M API calls per month have deployed it in the public cloud and 51% on premises. As a service mesh enables visibility and availability across complex container-native applications, it makes sense that we see high adoption rates both on premises and in the public cloud where visibility is consistently cited as a significant challenge. Organizations with lower API call volumes (under 1M per month) have significantly lower deployment rates for these modern app services in both environments.

As important as APIs have become, security remains a challenge in all environments. Unsurprisingly, the confidence to withstand an attack increases with the maturity of an organization's API practice. Those organizations with over 10 million API calls per month report the highest confidence to withstand an attack (64%).

F5 INSIGHTS FOR KEY FINDING 04

Achieving a successful application deployment necessitates taking full advantage of the wealth of application services available across categories (security, availability, performance, identity) and across generations of application architectures. Choosing the appropriate strategy means selecting application services that can be leveraged across these dimensions to reduce complexity and overcome skills deficits. This is especially true in security and performance use cases that tie directly to business outcomes of reducing risk and fraud, as well as enhancing customer experience.

WE ASKED:

On a scale of 1-5 (with 1 being lowest and 5 being highest) how confident are you in your company's ability to withstand an attack against your APIs?

	Confident	Not Confident
Less than 1 Million	43%	19%
1 Million to 10 Million	48%	14%
More than 10 Million	64%	8%

WE LEARNED:

API practice maturity corresponds with an organization's confidence to withstand an attack.

FIGURE 10: Security confidence in protecting APIs based on number of API calls per month



05

63% of organizations still place primary responsibility for app services with IT operations, with more than half moving to DevOps-inspired teams.

As we've long suspected, operations and infrastructure teams continue to shoulder primary responsibility for selecting and deploying application services. However, as organizations expand their cloud- and container-native app portfolios, DevOps groups are taking more responsibility for app services.



IT Operations and DevOps Want Choice in Application Services

With all the hype surrounding DevOps and subsequent “Ops” movements, it is ironic that the one group left out is IT operations. This is fascinating given that our research has confirmed what we’ve long suspected: IT operations teams are primarily responsible for deploying app services—whether on premises or in the public cloud.

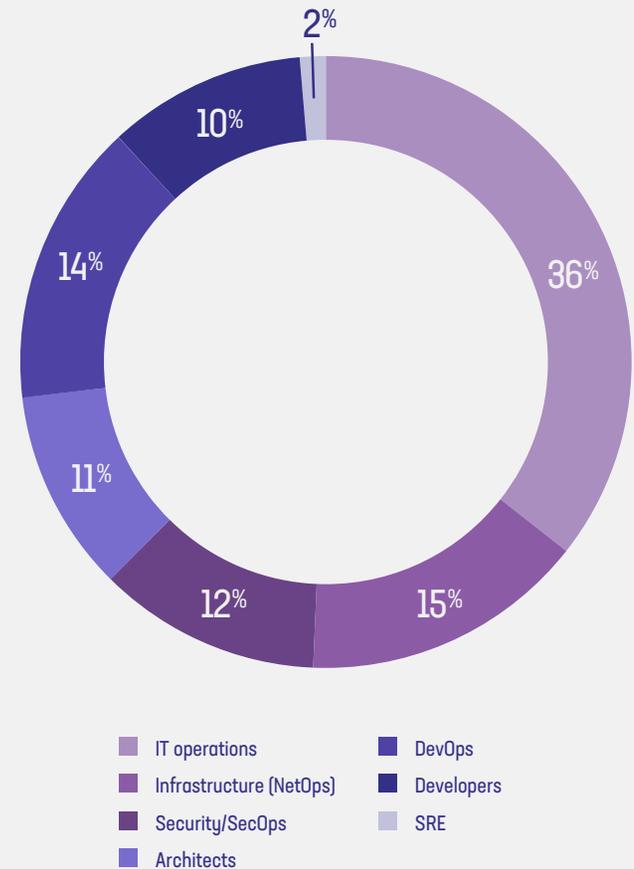
However, it’s also no surprise to find that as organizations transform from single-function to modern ops-oriented team structures, responsibility begins to shift from IT operations and NetOps to SecOps and DevOps. This dynamic is proof of the next phase of maturity we are starting to witness in DevOps. Initial projects are beginning to scale, and the need to demonstrate business value and meet defined performance metrics necessitates a focus on application services.

One obvious reason for this change in focus is the ongoing shift of application services into modern architectures. Cloud- and container-native applications are in many ways more dependent on infrastructure for scale and availability than previous app architectures. DevOps teams are intimately involved with the CI/CD pipeline, which, for cloud- and container-native apps, includes a growing portfolio of application services such as ingress control, service mesh, service discovery, and good old-fashioned load balancing. As application services continue to distribute across the data path and become integrated with app infrastructures, we expect DevOps teams to increase their responsibility for securing, optimizing, and managing applications.

That IT operations is primarily responsible for the deployment and operation of app services may offer insight into the explosive preference for containers as a form factor. Containers deliver the platform independence and native support for a modern

WE ASKED:

Which roles within your organization are primarily responsible for deploying and operating application services in the public cloud? Select one.



WE LEARNED:

IT operations and infrastructure teams retain primary responsibility for app services.

FIGURE 11: Primary responsibility for deploying app services in the public cloud



infrastructure-as-code approach that eases the day-to-day role of IT operations. This provides the ability to establish repeatable deployments at scale, a critical capability for organizations making progress on their digital transformation efforts. We've seen this preference grow from a mere 6% in 2017 to 18% this year—surpassing virtual machines (15%) and hardware (15%).

What's striking is the strength of the preference for containers over virtual appliances across roles. Cloud-related roles, developers, and SRE/DevOps are all twice as likely to prefer containers over virtual appliances. This dramatic shift toward containers speaks to the rising number of cloud-native applications dependent upon an architecture that relies on app services for execution and operation.

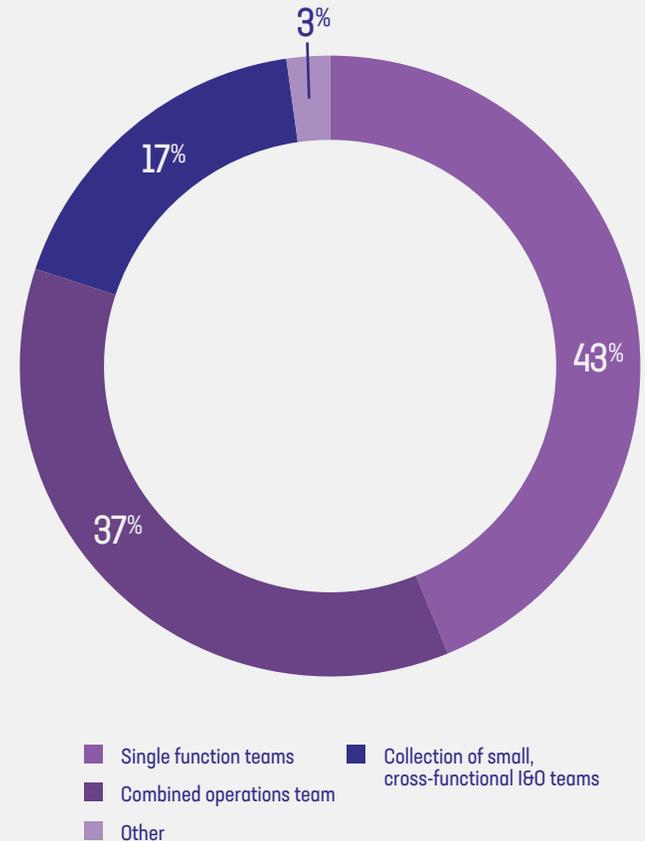
As application services continue to distribute across the data path and become integrated with app infrastructures, we expect DevOps teams to increase their responsibility for securing, optimizing, and managing applications.

Additional form factor options for app services on premises should not be dismissed lightly. One in ten respondents indicated a desire for app services “as a service,” while 6% would prefer a web/app server plugin. Another 4% would like to consume app services as an application library.

With no clear “favorite” form factor, the winner here remains choice. This freedom of choice is necessary for the operations roles. They are tasked with deploying and operating a platform for the entire organization, a platform that is flexible enough to deliver legacy applications without significant modernization or refactoring, as well as capture new application workloads—all while simultaneously minimizing organizational risk.

WE ASKED:

How would you best describe your IT infrastructure and operations (I&O) organization? Select one.



WE LEARNED:

More than half of IT organizations utilize DevOps-inspired teams.

FIGURE 12: IT organizational structure

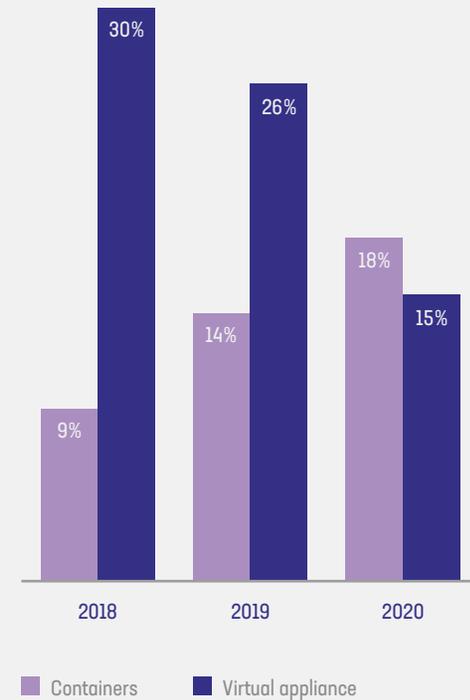


F5 INSIGHTS FOR KEY FINDING 05

As application portfolios transition to more modern architectures and IT organizations begin to align around more collaborative team structures, application services must evolve to provide ease of use for all skill sets within IT organizations. Maintaining a consistent set of app services while supporting choice in their infrastructure and platforms is key for both IT operations and DevOps teams as they work together to support the business.

WE ASKED:

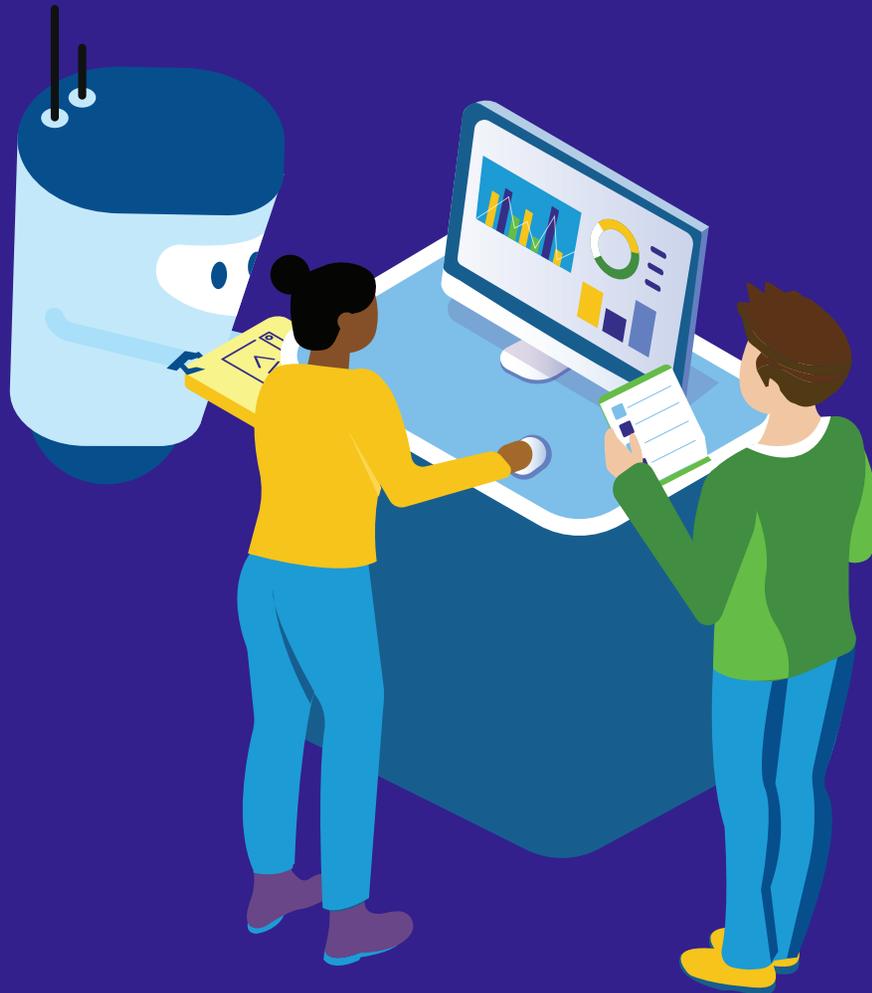
For on-premises application services, what is your preferred form factor? Select one.



WE LEARNED:

Organizations show a rapidly growing preference for containers over virtual appliances for their application services.

FIGURE 13: Preferred form factor for app services on premises



CONCLUSION

Most organizations engaged in digital transformation expect similar outcomes.

First, it's vital to be able to deliver a superior (and secure) customer experience that will help attract and retain customers. Second, enterprises want to see improvements in business agility that allow them to nimbly pivot and respond to new opportunities or changes in the market. Lastly, they expect a tangible time to value that benefits everyone—from the developers building the code to the DevOps teams delivering it to the operations teams in charge of deployment and ongoing operations.

Enterprises face several challenges as they evolve. Infrastructure lock-in limits their autonomy and ability to move at the speed of the business. Complex compliance requirements and an ever-evolving threat landscape slow speed to market and sometimes impact the end-customer experience of their applications. And each new application architecture or infrastructure environment introduces dozens of new tools along the data path from the application code to the customer experience. These tools help organizations develop, deploy, manage, and secure their applications. But, if implemented wrong, they can also increase operational complexity, require new skills, and, as a result, raise costs.

As shown by the responses to the 2020 State of Application Services survey, most organizations are just now entering the second phase of digital transformation, automating more parts of the network and incorporating continuous deployment principles to improve productivity and enhance customer experiences. While the current gains may feel modest—and the challenges intense—organizations are persisting toward the third stage of digital transformation to create completely new business opportunities. Given the heterogeneity of application architectures and infrastructures in use, the most efficient way to do this is through a consistent set of multi-cloud application services that empower organizations to leverage data and applications while laying the groundwork for dramatic improvements in the future.

Once complexity is reduced and applications can be supported, optimized, and managed with a consistent set of application services that spans application architectures and infrastructure environments, organizations can really begin to leverage the data captured by these apps using AI-driven analytics. The scale, agility, and complexity of the digital enterprises of today and tomorrow require that applications have the ability to automatically adjust to operating and business conditions. We predict that these new capabilities will breed the next wave of application services designed to collect, analyze, and act on the telemetry generated by apps and their infrastructure.

And so, while we remain enthusiastic about the automation and process optimization that's changing business now, our sights will soon turn to the next phase of digital transformation in which insights and data create massive opportunities. In this next stage of the journey, we believe that organizations will use these new application services to enhance the performance, security, operability, and adaptability of their apps—which will help grow the business and deliver the digital experiences that customers demand.

Until next year...



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