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PATHFINDER REPORT

Cloud Native

Enabler of Mission-Critical Applications in the Cloud

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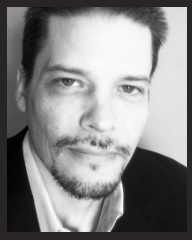
About this paper

A Pathfinder paper navigates decision-makers through the issues surrounding a specific technology or business case, explores the business value of adoption, and recommends the range of considerations and concrete next steps in the decision-making process.

ABOUT THE AUTHOR



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Jay Lyman is a Senior Research Analyst with the Cloud Native and Applied Infrastructure & DevOps Channels at 451 Research, a part of S&P Global Market Intelligence. He covers infrastructure software, primarily private cloud platforms, cloud management and enterprise use cases that center on orchestration, the confluence of software development and IT operations known as DevOps, Docker and containers. Jay's analysis encompasses evolving IT operations and software release models, as well as the technology used to create, deploy and support infrastructure and applications in today's enterprise and service-provider markets. Key areas of research also include OpenStack, PaaS and enterprise end users.

Executive Summary

Today's enterprise faces an array of choices and strategies when modernizing mission-critical applications and migrating them to the cloud. Successful digital transformation requires organizations to leverage the latest and greatest, not only for net-new or simple web applications, but increasingly for legacy and mission-critical applications that, until recently, were typically relegated to on-premises environments behind the firewall.

A growing number of enterprises are casting a wider cloud transformation net across their application portfolios – including mission-critical applications – through in-place modernization and refactoring and shifting using cloud-native technology and methodology. These are among the leading approaches to digital transformation, but they are most effective when supported across hybrid infrastructures that span on-premises, private cloud and multiple public cloud environments. Applications can then run on the optimal infrastructure to drive performance and efficiency at scale while reducing cost.

Cloud-native technology and methodology – including containers, microservices and Kubernetes – can also enable organizations to more effectively leverage cloud architectures with capabilities such as API-driven provisioning, auto-scaling and automation. Strategic advantages such as IT operations efficiency, improved security, lower cost, and developer speed and productivity are also driving cloud-native approaches as organizations seek to modernize and move more applications to the cloud.

In order to fully leverage cloud native, enterprise organizations must ensure they are addressing critical aspects such as security and compliance concerns, complexity and a general lack of skills. Driven by their desire for full support, increased observability and access to talent, many organizations are turning to managed services, including managed Kubernetes. Given enterprises are deploying Kubernetes both on-premises and over multiple clouds, managed services can make sense to reduce complexity and drive consistency.

While cloud native can be integral to application modernization and migration to the cloud, it had until recently been largely limited to web and stateless applications. Thus, cloud-native approaches have not generally been applied to more data-rich and stateful applications. However, with improvements to Kubernetes (such as persistent data volume support) and a desire among enterprises to give more of their applications (including mission-critical ones) the cloud-native treatment, a second wave of containerized stateful applications is building.

By leveraging managed services and greater levels of automation and abstraction, enterprises are better positioned to use cloud services, focus on applications and leverage open source software components without having to worry about building, maintaining and securing infrastructure.

Key Findings

- Enterprises are increasingly moving beyond 'lift and shift' approaches to modernization and cloud migration, instead opting to 'modernize in place' and 'refactor and shift' to more effectively meet digital transformation goals.
- This highlights the need to support different environments so applications can run on the most appropriate infrastructure based on cost, performance, data sovereignty, geographic location or other factors.
- Cloud-native technology such as containers and Kubernetes can be key enablers to supporting mission-critical applications across hybrid architectures. Cloud native is also expanding beyond simpler, stateless applications to include more stateful and mission-critical applications.
- As organizations address challenges such as complexity, scale and lack of skills, many of them are turning to managed services, including managed Kubernetes, to offload operational concerns and focus on new features, products and innovation.

Application Modernization

The decision of whether – and if so, how – to modernize legacy mission-critical applications is one of the most difficult for today's enterprise IT leaders. Many companies consider a digital transformation strategy to be incomplete if a large number of their applications (and the infrastructure that supports them) with foundational business processes remain untouched for decades or more. The benefits that such modernization promises – greater agility, more scale, lower operating costs – are well known, but complexity, technical debt, organizational inertia and choosing the 'best' path forward from multiple options can all combine to inhibit such transformation.

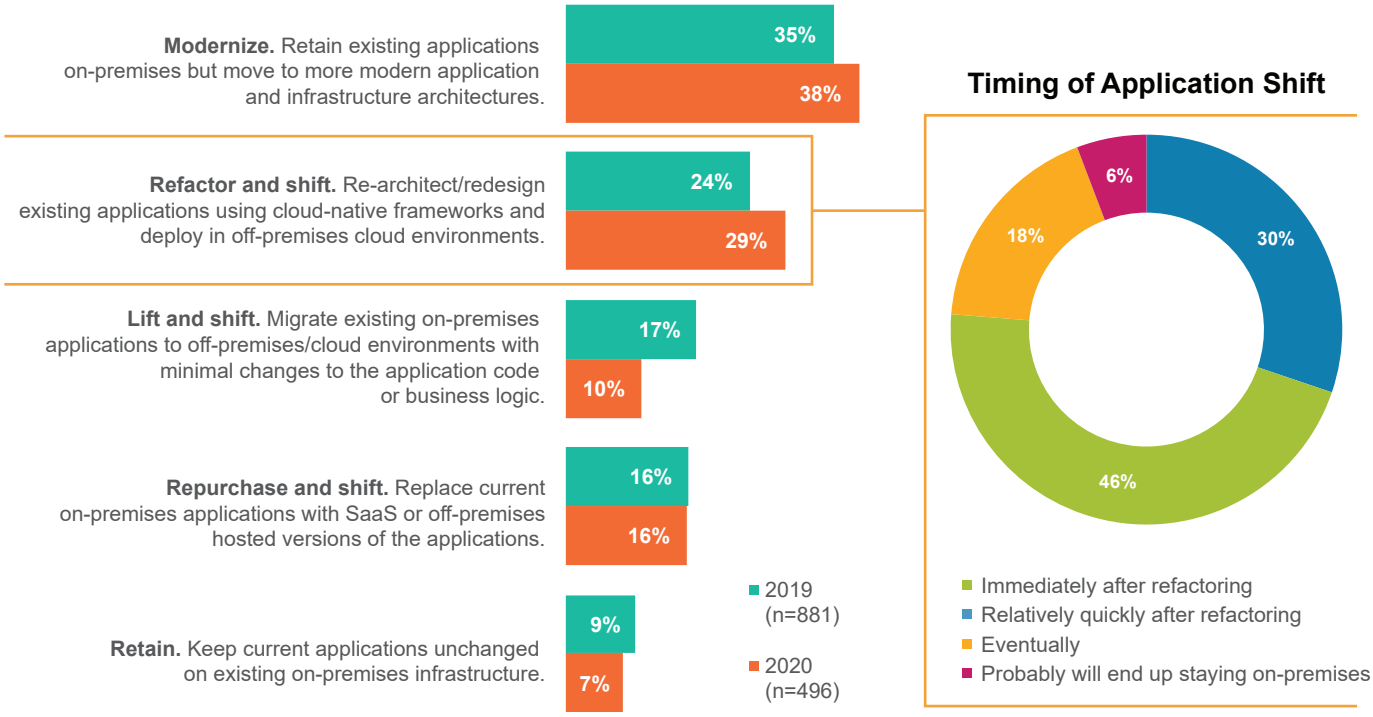
While digital transformation can take many different forms, tackling legacy mission-critical applications has for many organizations required a strong plan and even stronger nerve. After all, these are often still the company's crown jewels, and any modernization process is not to be entered into lightly. Nonetheless, our research shows that two forms of application modernization are emerging as clear favorites: in-place modernization, and refactoring and shifting using cloud-native frameworks (see Figure 1). We see notable growth in the usage of these modernization paths that, combined, account for two-thirds of total responses. There was year-over-year growth of the percentage of respondents choosing to modernize in place (38%), typically by moving to newer application and infrastructure architectures (something we used to call 'private cloud').

Figure 1: Approaches to mission-critical legacy applications

Source: 451 Research's Voice of the Enterprise: Digital Pulse, Workloads and Key Projects 2020

Q. Which of the following best describes your organization's approach to mission-critical legacy applications and workloads going forward? Base: All respondents

Q. Once the application has been modernized, which of the following best describes the pace of shifting the application to an off-premises cloud environment? Base: Refactoring & shifting mission-critical legacy apps/workloads (n=139)



This on-premises IT evolution is supported by data from infrastructure-focused 451 Voice of the Enterprise (VotE) surveys that show increased adoption of next-generation technologies such as hyperconverged infrastructure (HCI) and all-flash array (AFA) storage systems. Despite the modernization-in-place crowd's intention to maintain on-premises IT for mission-critical applications, we believe hybrid environments will be part of the mix as enterprises' digital transformation efforts lead to the creation of composite applications featuring workflow processes such as database lookups, payment processing and artificial intelligence/machine learning (AI/ML) that may be distributed across different workload execution venues.

The survey data also shows a five-percentage-point year-on-year increase in the number of respondents selecting 'refactor and shift' (29%) as their approach to legacy mission-critical applications. This method involves application refactoring using cloud-native frameworks prior to redeployment in off-premises cloud environments. Although application refactoring is generally regarded as a time- and resource-intensive process, many organizations seem to view this as a good investment to transform what are often their most complex and most important 'run the business' applications. Our research and conversations also indicate that the alternative to 'lift and shift' is not as effective in terms of modernizing mission-critical applications that typically behave the same way and bring the same challenges in different environments.

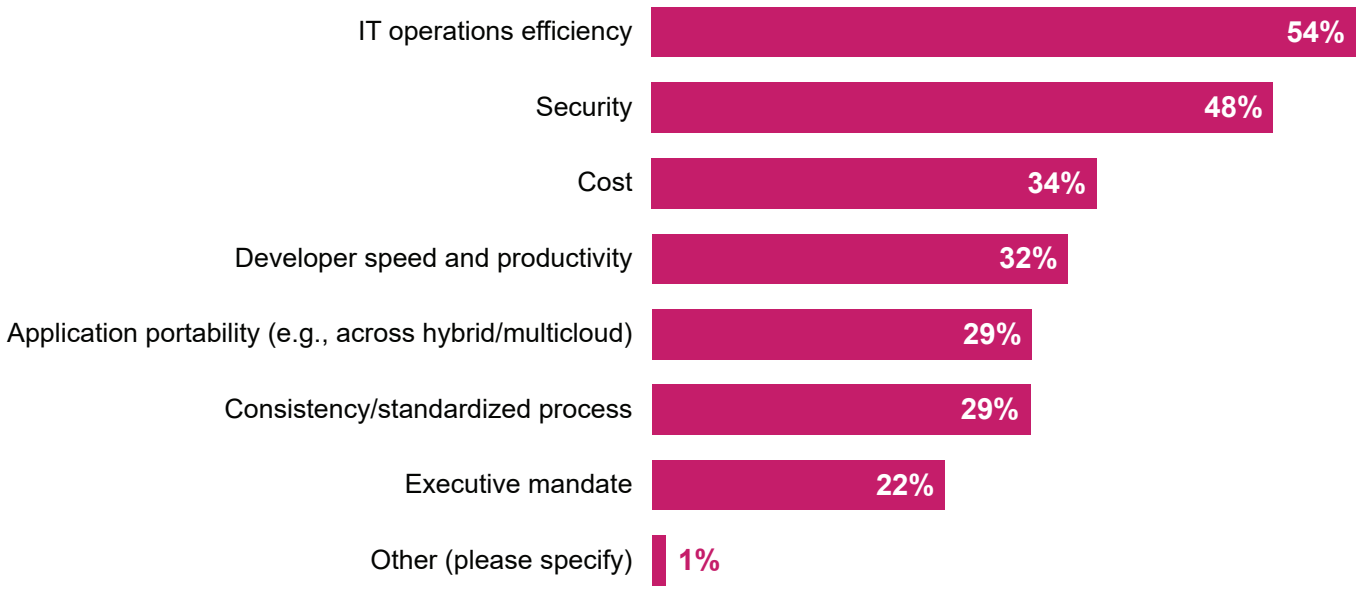
The Rise of Cloud-Native Technology

Cloud-native technology, including containers and Kubernetes, have also emerged as critical components of successful digital transformation. For example, containers and microservices are integral to the move away from monolithic applications, so they can be optimized and managed across on-premises and cloud infrastructure. Software designed and deployed in a cloud-native manner is built, or perhaps re-built in the case of modernizing in place and refactoring and shifting, to take advantage of cloud capabilities such as API-driven provisioning, auto-scaling and automation.

Our research indicates the top drivers of cloud native are IT operations efficiency, security and cost (see Figure 2). These advantages are consistent with our research and end-user conversations that indicate cloud native can help organizations scale up and manage larger infrastructures with smaller teams. In terms of security, cloud native delivers a simpler, more lightweight software package with a smaller attack surface. As for cost, many organizations are leveraging containers to slice up virtual machines the same way they were previously used to slice up physical servers, thus driving efficiency and cost savings. And from an economic perspective, cloud native can produce the true value of cloud by allowing applications to scale and evolve in much shorter time frames than they could previously.

Figure 2: Primary drivers/benefits of cloud native

Source: 451 Research's Voice of the Enterprise: DevOps, Workloads and Key Projects 2020
Q: What are the primary drivers/benefits of cloud-native technology, such as containers, Kubernetes or serverless, for your organization? Please select all that apply.
Base: All respondents (n=508)

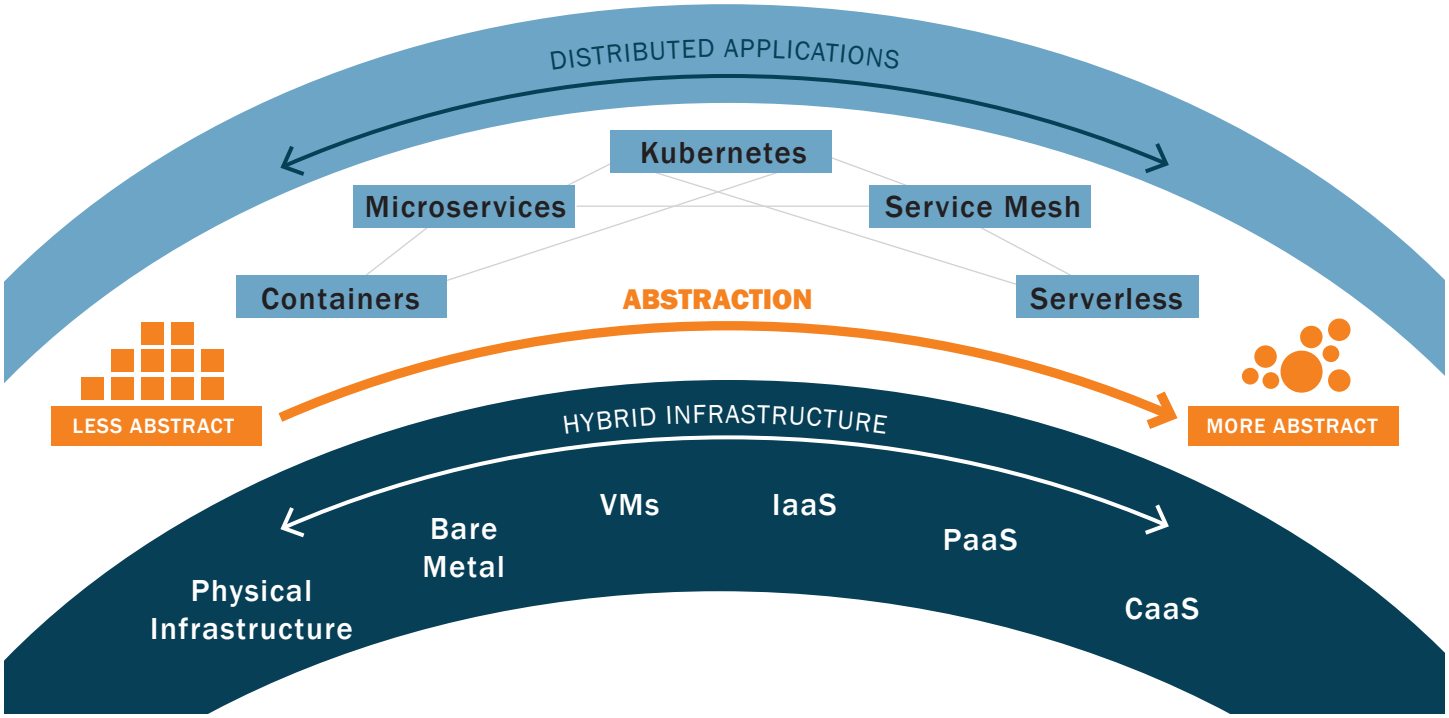


We've also seen use of Kubernetes grow not only as container orchestration, but also as a distributed application framework that delivers consistency across on-premises, private cloud and multiple cloud infrastructures. Our research shows organizations are running Kubernetes in all of these environments, and we expect this will continue to drive the need for support across on-premises and cloud deployments.

It is also important to note we do not see the different approaches and technologies within cloud native competing with or eliminating one another. The main distinction between them is the level of abstraction provided to the end user. Thus, we can also describe cloud native as a set of technologies that fall somewhere on what we call the 'spectrum of abstraction' (see Figure 3). On one side of this spectrum is the do-it-yourself containers approach, whereby organizations leverage custom code and services and make their own choices on languages, frameworks and APIs. This approach is attractive for certain applications that require low latency, run longer compute jobs, or those with high traffic rates. On the other end of the spectrum, as functionality becomes more abstracted and invisible, are serverless functions and events, for which there are standardized opinions and choices that are abstracted from the end users. In between these two ends of the spectrum are other levels of abstraction, such as managed Kubernetes services that offer some degree of abstraction, but less than that of serverless.

Figure 3: The spectrum of abstraction

Source: 451 Research



Since the advent of modern application containers five years ago, targeted applications have consisted mostly of web applications that do not require data persistence (stateless apps). However, as cloud native has continued to evolve and mature, the technology is advancing to support more data-rich and stateful applications. For example, Kubernetes now supports persistent data storage volumes, and this is part of what's driving this second wave of containerized stateful applications. In addition, enterprises are eager to increase consistency by giving the cloud-native treatment to more of their application portfolios, including those considered mission-critical.

Our research reflects this widening net of cloud native. For example, 56% of respondents to our Voice of the Enterprise: DevOps, Workloads and Key Projects 2020 survey reported that at least half of their containerized applications are stateful. Our research has found that databases and data services, such as Apache Hadoop, Spark and Kafka, are among the top stateful workloads that are containerized. This is another area where we see crossover with mission-critical applications that are central to an organization's business and competitiveness and are now also moving to cloud computing and cloud-native constructs.

Cloud-Native Challenges

Cloud native is still relatively new in the enterprise, and companies are at different stages of adoption and use. Younger, cloud-first companies are often better positioned to put all of their applications in the cloud, while traditional enterprises across a variety of verticals have greater legacy investment and a larger portfolio to consider. Nevertheless, nearly all organizations are leveraging cloud-native approaches as they modernize and migrate more applications to the cloud. Our research indicates the key challenges are: security and compliance, where VMs set a high bar in terms of multi-tenant security; cost, typically regarding the lack of skills and premium for talent; complexity, such as the many configuration and deployment choices of Kubernetes; and lack of personnel with cloud-native experience. Other cloud-native challenges have to do with cultural issues such as resistance to change and the belief that existing processes – e.g., VM tooling and management – are sufficient.

Managed Services

Managed services have emerged as a popular and effective way to leverage cutting-edge cloud and cloud-native capabilities and services without having to be an expert or employ an army of cloud or cloud-native practitioners. This can be critical as organizations leverage a variety of software components and IT infrastructures, including on-premises tools that are retained, public cloud services, software as a service (SaaS) and open source software. By reducing complexity and improving consistency, managed services often represent the most direct path to effectively leverage the various tools and rapidly realize benefits.

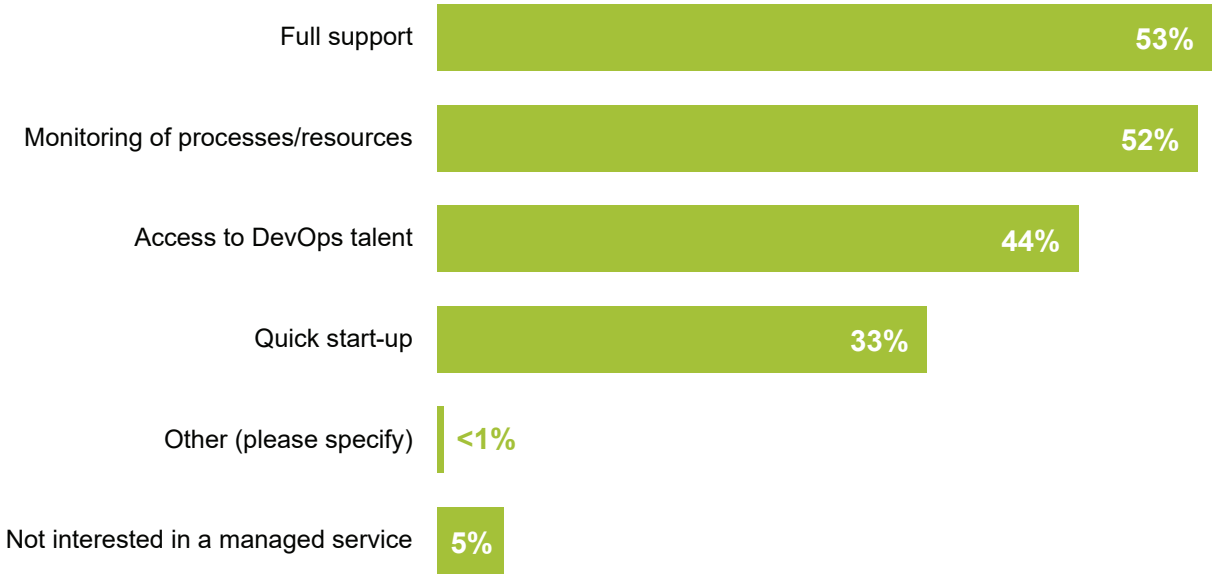
Most managed services offer users the opportunity to tailor a hosted solution for their needs, which can be critical in supporting self-service for developer teams. Managed services also present an ideal way to leverage open source software components without necessarily employing or connecting with core contributors and maintainers since commercial support is included. Our research shows that demand for full support, monitoring of processes and resources, and access to talent are among the top influencers for choosing managed services (see Figure 4).

Figure 4: Influences for managed services

Source: 451 Research's Voice of the Enterprise: DevOps, Workloads and Key Projects 2020

Q: Would or did any of the following features influence your organization's decision to use managed services for your DevOps implementation? Please select all that apply.

Base: DevOps adopters and potential adopters (n=502)



These factors are again consistent with the challenges of cloud native, modernization and digital transformation. Organizations are eager to have end-to-end support for their software development and DevOps processes. One of the keys to that is observability through monitoring so organizations can make informed decisions on where applications should be deployed. Finally, our research consistently highlights a lack of talent and need for skills when it comes to cloud-native approaches. Organizations seem eager to replace the burdens of attracting, hiring, training and retaining people with managed services that can enable the employees they do have to focus on new features, products and innovation.

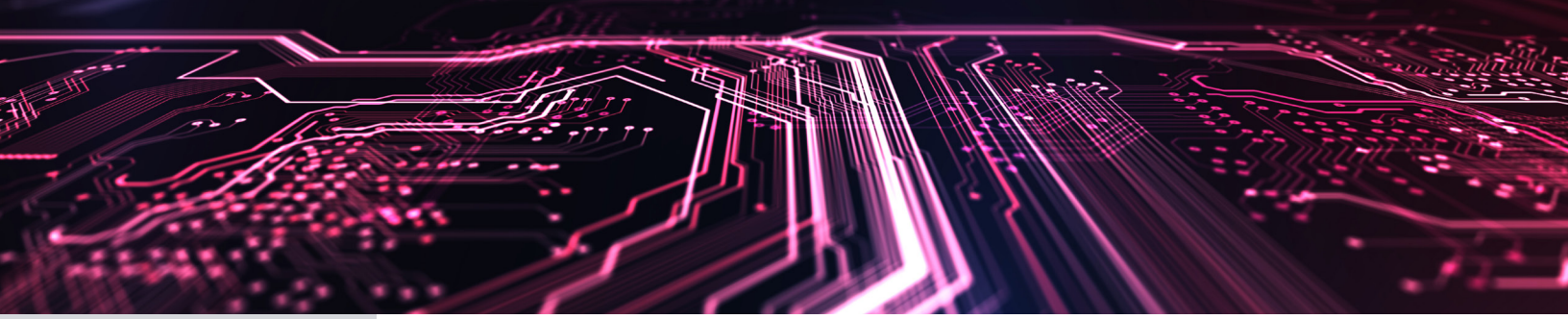
Conclusions

There seems to be no easy path to digital transformation. The attempt to 'lift and shift' applications to the cloud without changing them significantly has proven largely ineffective in terms of modernizing those applications in a meaningful way so that they are simpler and more consistent to manage. However, organizations are finding that they can 'modernize in place' and 'refactor and shift' to truly achieve cloud benefits for legacy mission-critical applications.

Cloud native can be integral to effective modernization and cloud migration, and it is increasingly used not only for web and stateless applications, but also for stateful and data-rich applications that are part of many companies' mission-critical portfolios. As more applications fall under the cloud-native umbrella, we expect to see more data-rich and mission-critical applications supported in cloud and hybrid and infrastructures, including databases, data services, payment processing and AI/ML workloads. In addition, those same cloud-native approaches are also proving effective in additional deployments, such as data science and edge/Internet of Things.

As organizations address challenges with security and compliance, complexity, and lack of skills, it seems clear that managed services will continue to be a big part of the solution. By leveraging third-party managed services – primarily SaaS and public cloud services – and support along with their internal operations, organizations can have the best of both worlds. Their on-premises and existing infrastructure and operations are integrated as they reach a more complete cloud migration that largely, through the use of cloud-native technology and methodology, includes legacy mission-critical applications as well as net-new applications.

Additionally, if implemented correctly, cloud native enables enterprises to deliver a better experience for users, whether they are employees or paying customers. Cloud-native approaches can allow organizations to quickly respond to users' demands and improve their experience – delivering value with the ability to scale to massive numbers.



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A properly designed managed service solution allows developers to get started quickly and develop apps faster while business leaders benefit from increased operational efficiency and decreased complexity. Red Hat OpenShift Service on Amazon Web Services (AWS) is a fully managed Red Hat OpenShift service deployed and operated on AWS that allows customers to quickly and easily build, deploy, and manage Kubernetes applications on the industry's most comprehensive Kubernetes platform in the AWS public cloud. Red Hat OpenShift Service on AWS provides an AWS-native experience for cluster creation and management in the AWS console; on-demand, hourly billing; a single invoice for AWS deployments; integration with other AWS cloud-native services; and joint support from Red Hat and AWS.

AWS and Red Hat have invested in a number of capabilities to make it easier for customers to adopt containerization and deploy their applications. With Red Hat OpenShift Service on AWS, customers will have additional options on AWS to immediately implement their solutions with integrated tooling, from build through deployment. In addition to services already available on AWS, Red Hat OpenShift provides build and automation tooling including container image repositories, monitoring solutions, prescriptive security, and more to enable customers to immediately get started with application deployment.

Learn more at *https://www.openshift.com/products/amazon-openshift/*.

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