Cloud Native Hits the Mainstream

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Cloud native has become established as the mainstream approach to modern application and infrastructure architecture, but a majority of the effort lies ahead in what we believe to be a "golden decade" of opportunity. Significant deficiencies remain, but these are being addressed by the community, by vendors and consumers alike.

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Executive Summary

Introduction

Cloud-native technologies and practices are becoming increasingly common among enterprises, with operational efficiency and security among the objectives driving adoption. Organizations investing in cloud native broadly expect to deepen their commitments, with these practices spreading to a greater portion of their applications over the next several years. While cloud native is now the mainstream approach to modern application and infrastructure architecture, significant deficiencies remain, and addressing them will take time. As most of the effort lies ahead, we foresee a "golden decade" of opportunity for market participants.

About This Report

Reports such as this showcase insights derived from a variety of market-level research inputs, including financial data, M&A information, and other market data sources both proprietary to S&P Global and publicly available. This input is combined with ongoing observation of markets and regular interaction with vendors and other key market players.

This report specifically includes data from the following sources. See the Methodology section at the end of the report for more details.

- **451 Research's Voice of the Enterprise: Cloud Native, Adoption & Usage 2022** — a survey of approximately 230 IT decision-makers at organizations currently making use of cloud native technologies, conducted from May 24 to July 8, 2022.

Key Findings

- **Use of cloud-native tools is widespread with a strong pipeline for adoption.** Nearly half of organizations surveyed (48%) indicate that they have cloud-native technologies and methodologies currently in use. Another 15% indicate they are in discovery or proof of concept, and approximately 20% say they plan to implement within the next two years.

- **Many organizations using cloud native expect their adoption of these technologies and architectures to become ubiquitous over time**. Improvements to efficiency and security are viewed as the biggest benefits of cloud native, while security and cost are considered the biggest barriers to greater use of cloud-native technologies.

- **Access to talent remains a key constraint.** Mastering cloud-native skills and capabilities will involve outside help for the majority of organizations.
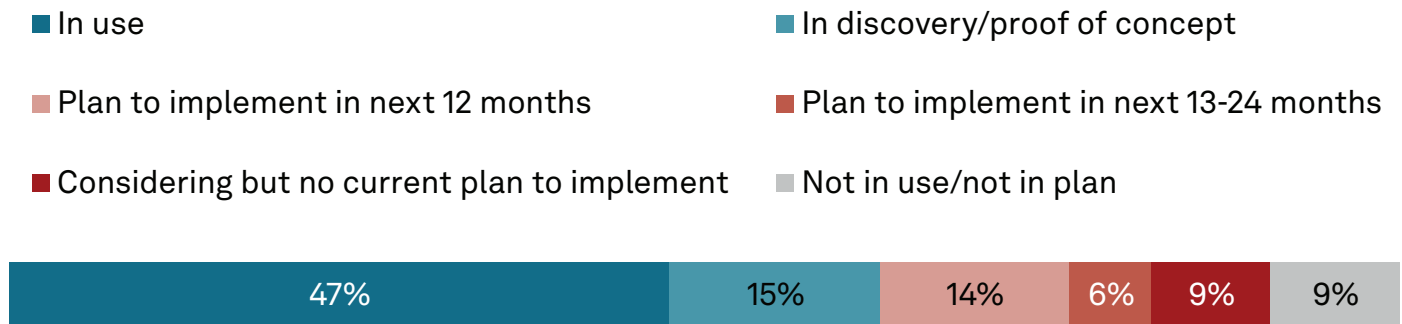
The Take

It has taken less than a decade to reach the point where cloud native is now the prevailing mindset and methodology for application and infrastructure architecture. While almost half of organizations have cloud-native technologies and methodologies currently in use, most of the opportunity in this sector likely remains ahead as the industry re-platforming to cloud native will take a decade or more. It is still early days in this market, and while deficiencies such as security, complexity and cost are being addressed, the outstanding challenge — as elsewhere in the cloud ecosystem — is the skills shortage, which is driving substantial partner opportunity to provide the expertise that organizations lack. This is a market on the move with plenty of opportunity still to hitch a ride.

Enterprises Anticipate a Growing Embrace of Cloud-Native Practices

Looking at our survey data, the synopsis as of August 2022 is that use of cloud-native tools is now widespread, and the outlook is good: There is a strong pipeline for adoption. Nearly half of organizations surveyed (48%) say they have cloud-native technologies and methodologies currently in use (see Figure 1). Another 15% indicate they are in discovery or proof of concept, and approximately 20% say they plan to implement within the next two years.

Figure 1: Cloud Native Is Mainstream

- In use
- In discovery/proof of concept
- Plan to implement in next 12 months
- Plan to implement in next 13-24 months
- Considering but no current plan to implement
- Not in use/not in plan

47%	15%	14%	6%	9%	9%

Q. Overall, what is the state of adoption of cloud-native technologies and methodologies for application development or deployment within your organization today?
Base: All respondents (n=539)
Source: 451 Research's Voice of the Enterprise: Cloud Native, Adoption & Usage 2022
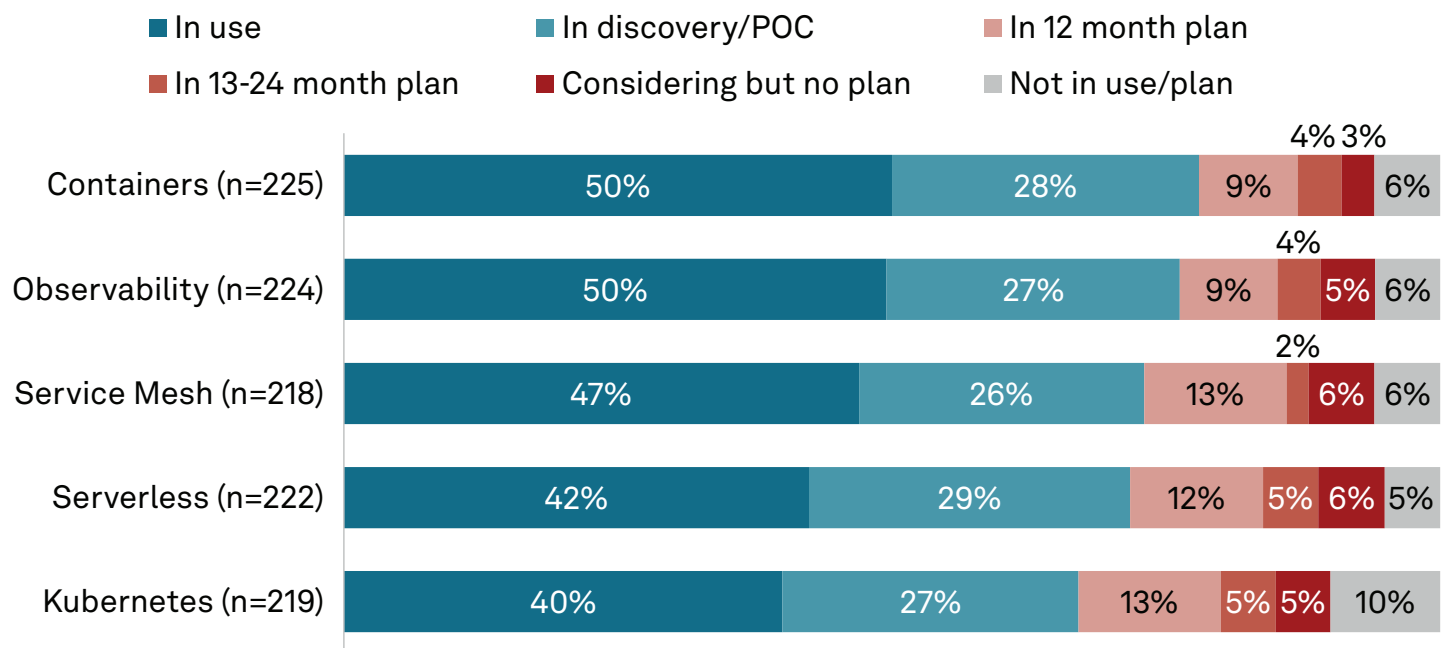
Major deltas point to current cloud-native adoption being strongest at the largest organizations (63% among organizations with more than $1 billion in revenue, versus 42% among those with less) and among digital transformation leaders (61% among leaders, and just 33% among laggards). We believe the strong adoption of cloud-native tools by IT teams is accelerating a process aided in no small part by the industry's ongoing enthusiasm for the mindset, methodology and benefits of cloud native, the continued leadership of the Cloud Native Computing Foundation, and the ingenuity and enthusiasm of the open-source community. Many organizations using cloud native expect their adoption of these technologies and architectures to become ubiquitous over time.

Among companies using cloud-native resources, 81% say more than half of their applications are currently architected using cloud native, while 19% say all their applications are cloud native today. Those numbers rise to 90% and 29%, respectively, when organizations project two years into the future. Freed from a concrete timeline, nearly all respondents using cloud native (93%) agree that they expect their organizations to adopt cloud-native technologies or methodologies for 100% of their applications, with more than half (58%) indicating they strongly agree. The maturation of cloud-native technologies, additional innovations and the elevation of developer enablement to a strategic priority means organizations are now tooled to attack wider transformation and modernization projects.

Enterprise Adoption of Cloud-Native Technologies Reaches a Milestone

The use of cloud-native technologies for application development and deployment should now be considered mainstream. They have reached or are approaching a 50% threshold of use at organizations, with about another quarter of respondents in discovery/proof of concept and 13% to 18% in plan for the next two years (see Figure 2). While containers, serverless, service mesh, observability and Kubernetes can augment existing systems, they are mostly displacing legacy architectures and controls.

Figure 2: Cloud Native Adoption

- In use
- In discovery/POC
- In 12 month plan
- In 13-24 month plan
- Considering but no plan
- Not in use/plan

	In use	In discovery/POC	In 12 month plan	In 13-24 month plan	Considering but no plan	Not in use/plan
Containers (n=225)	50%	28%	9%	4%	3%	6%
Observability (n=224)	50%	27%	9%	4%	5%	6%
Service Mesh (n=218)	47%	26%	13%	2%	6%	6%
Serverless (n=222)	42%	29%	12%	5%	6%	5%
Kubernetes (n=219)	40%	27%	13%	5%	5%	10%

Q. Overall, what is the state of adoption of cloud-native technologies and methodologies for application development or deployment within your organization today? - Containers
Base: Organizations with cloud-native technologies in-use or proof of concept for application development/deployment
Source: 451 Research's Voice of the Enterprise: Cloud Native, Adoption & Usage 2022

The benefits associated with loosely coupling infrastructure, logic and data in cloud-native environments enabled by containerization can greatly enhance development and runtime execution flexibility. Containers are the atomic unit here, the abstraction making all of this possible.

As cloud-native deployments scale and customers grapple with the operational challenges of increasingly complex applications spanning hybrid and multicloud environments, observability has become a crucial capability. The benefits of observability are clear: understanding what is happening in a system and why by asking questions of and querying collected data without having preemptively determined what questions will be asked. Confusion around the term — and how it differs from the approaches organizations were already taking for monitoring, log management and tracing — is subsiding.

While still in its early phases, service mesh using sidecar proxies is currently the best way to apply policy and control to disparate IT resources. However, there remain a large number of service mesh implementations, making it a confusing market for buyers. Moreover, expanded options for application networking beyond service mesh are also underway.

Cloud Native Hits the Mainstream

Reduced operational overhead and cost (usage-based) and increased efficiency (focus on business logic, not infrastructure) are the key benefits of serverless, which is becoming an increasingly important option for enterprise workload deployments. These benefits make serverless compelling, and its deficits are being addressed, which will make it more suitable for use by general-purpose applications.

Just as containers shifted the IT conversation away from virtualized infrastructure, Kubernetes itself is fading into the background as vendors use it to deliver cloud-native services (connectivity, developer tools, security, etc.) across distributed environments. Attention is turning toward what Kubernetes enables, as more enterprises embark on re-platforming to cloud native, but most enterprises haven't started that journey yet.

Kubernetes was not created as a product per se but as a foundation for building platforms that can provision and scale cloud resources in response to application needs. IT teams are evolving in kind, but a gap remains between what developers and operations teams want (to write code and deliver features in a secure way) and what the Kubernetes ecosystem provides (a multitude of projects and technologies with varying degrees of maturity and interoperability). Part of the job, as ever, is making Kubernetes in cloud easier to use with additional abstractions, unified APIs, a common dashboard and developer portal — all of which are underway to different degrees at commercial vendors and as CNCF projects. One way enterprise IT departments are meeting this challenge is through platform teams, whose role is to curate managed Kubernetes environments that support business-specific workflows with a suitable balance between standardization/automation, and the openness needed to safely incorporate new technologies when justified. For example, enterprise-grade technologies are now being delivered for managing Kubernetes clusters as they scale, while developer definitions can now be automatically turned into running Kubernetes pods.

Interestingly, 451 Research's [Voice of the Enterprise: DevOps, Workloads & Key Projects 2022](#) survey finds that, when considering the adoption of cloud-native technologies and processes across 100% of the organization, serverless and service mesh lead containers and Kubernetes. The difference between Figure 1 and this finding is twofold. First, it's important to recognize that DevOps teams are the ones charged with implementing serverless, while containers are more general purpose across a broader range of teams. Second, the data in Figure 1 addresses adoption anywhere in the organization, whereas the DevOps survey finding refers to full adoption across 100% of the IT team.

Shift in Modern Cloud-Native Software Development Delivers Key Benefits

Improvements to efficiency and security are viewed as the biggest benefits of cloud native (see Figure 3). Among users of cloud-native technologies and practices, the benefits most commonly identified as important are efficiency in IT operations (61%) and improvements to security (52%), followed by improved time to value (43%). Benefits to cost (37%) and standardization (33%), as well as meeting organizational mandates (30%), are still recognized, but by significantly fewer respondents.

Figure 3: Primary Benefits of Using Cloud Native

Benefit	Percentage
IT operations efficiency	61%
Security improvements	52%
Improved time to value	43%
Application portability	40%
Developer speed and productivity	39%
Cost reduction	37%
Consistency/standardized process	33%
Satisfaction of executive mandate	30%
Other (please specify)	1%
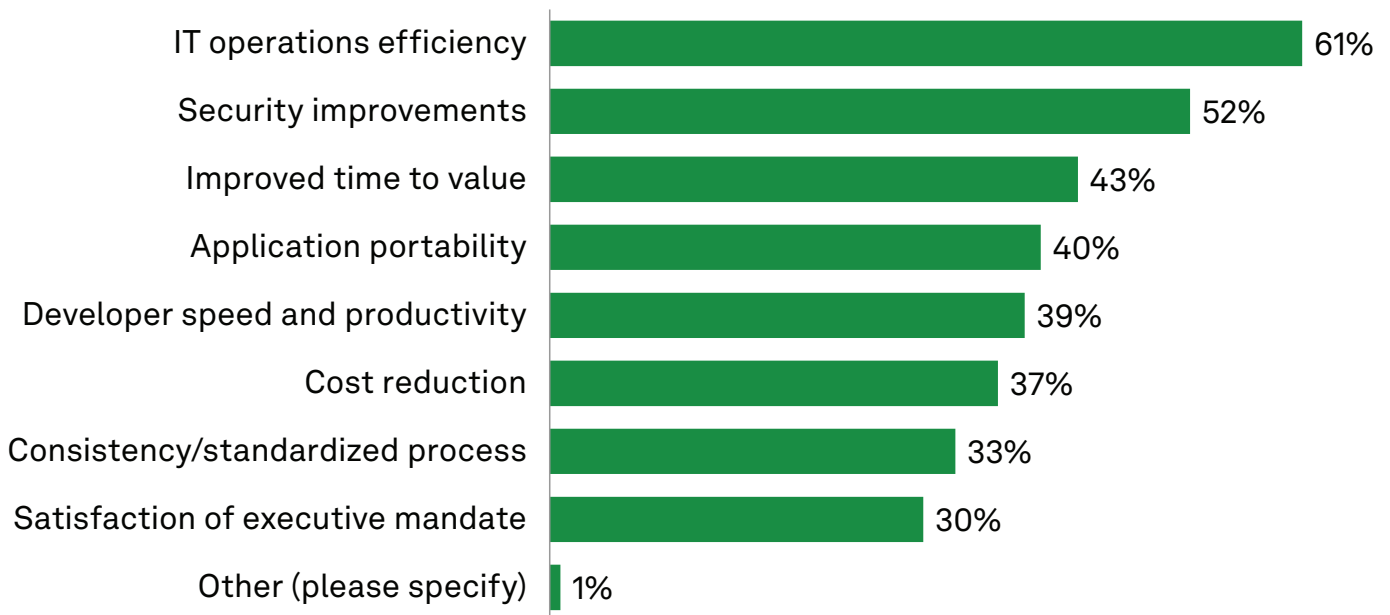
Q. What are the primary benefits of cloud-native technology such as containers, Kubernetes or serverless for your organization? Please select all that apply.
Base: Organizations with cloud-native technologies in-use or proof of concept for application development/deployment (n=230)
Source: 451 Research's Voice of the Enterprise: Cloud Native, Adoption & Usage 2022

Collectively, these benefits are accruing because cloud native has shifted the modern software development focus — from a model shaped by browser-driven consumption concerns to a focus on optimizing the software architecture to achieve improved longevity, security, supportability and resilience. It enables successful enterprise DevOps and "shift left," where developers and IT operations teams collaborate for faster releases, greater efficiency and readiness for market changes. Moving testing and quality assurance earlier (or to the left) in the development process improves velocity and continuous delivery. This move complements cloud-native development, where the code in composable applications can be instrumented with security, connectivity cost and more — there is now a universal "shifting left" into all of the "ops" (DevOps, SecOps, FinOps, MLops, etc.). The use of consistent, standardized processes for creating, deploying and operating containers and serverless enforced by DevOps greatly improves portability and integration, and reduces cost by eliminating the need for multiple frameworks, tools and the associated expertise required to maintain multiple approaches. Developers can focus on logic and quality of application development, free from having to understand underlying IT architectures. All of this directly improves IT operations efficiency, developer speed and productivity. The cloud-native approach lets organizations abstract away functional components of applications as microservices and upgrade them and maintain them independently, and that opens up a world of innovative possibilities, especially given the tools that the cloud providers are supplying, such as applying machine learning and AI.

Security and Cost: The Universal Challenges in IT Also Apply to Cloud Native

Security and cost are considered the biggest barriers to greater use of cloud-native technologies (see Figure 4). While security is recognized as among the top benefits to cloud native, security and compliance concerns are also the most commonly cited barrier (45%) to greater use by organizations using or adopting cloud-native practices, followed by cost (43%), a lack of skills or staff (38%), and complexity (38%). Organizations identified as leaders in digital transformation are even more likely (51%) to view security and compliance as a hurdle.

Figure 4: The Challenges to Cloud Native Adoption

Challenge	%
Security and compliance concerns	45%
Cost	43%
Lack of skills/personnel	38%
Complexity	38%
Resistance to change	34%
Existing processes are sufficient	29%
Other (please specify)	1%
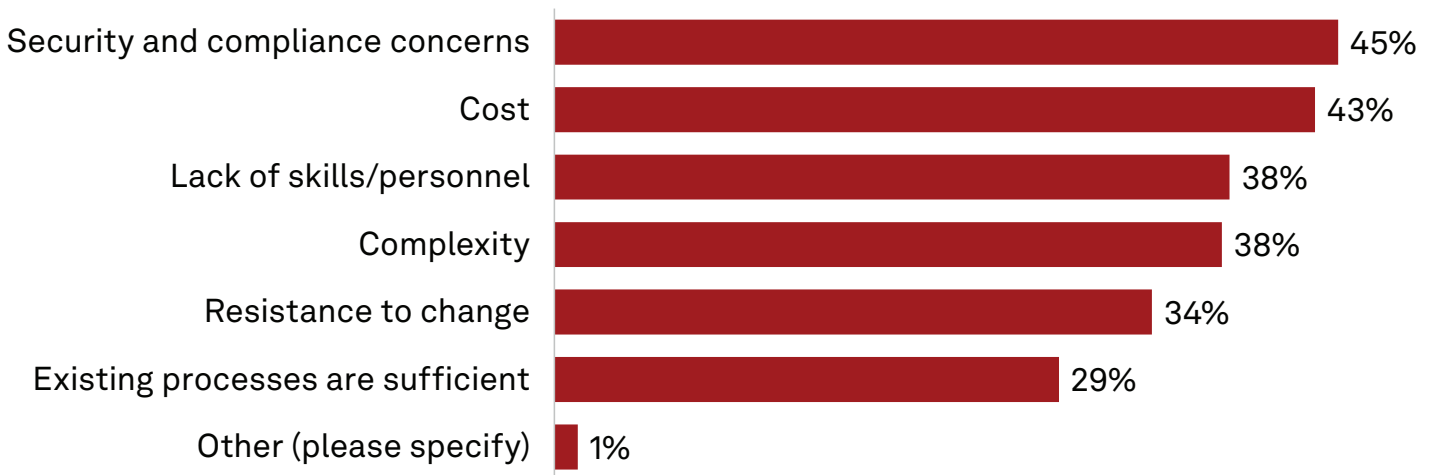
Q. What are the primary barriers to greater use of cloud-native technologies such as containers, Kubernetes or serverless in your organization? Please select all that apply.
Base: Organizations with cloud-native technologies in-use or proof of concept for application development/deployment (n=226)
Source: 451 Research's Voice of the Enterprise: Cloud Native, Adoption & Usage 2022

The scale and velocity of cloud-native infrastructure creates challenges for effective and efficient security management, but these have to be overcome to protect digital resources. The focus of cloud-native security is building in security capabilities early in the deployment process to "shift left" the guardrails and protections that can keep development and operations teams operating at speed. The market is complicated by vendor expansion into new areas of controls, creating overlaps in coverage and duplication of functionality as they vie for competitive position.

As workloads are developed and modernized using cloud native, they can be untethered from specific execution venues to run "here, there and everywhere," whether private or public, centralized or edge. This creates IT complexity and operational challenges that undermine the efforts to execute on digital transformation strategies. Within the various venues are whole sets of additional compliance and data management challenges. The specific location of private, public and edge cloud environments, it turns out, is less important than the challenge of integrating the infrastructure/application resources in a way that provides a consistent experience across the IT estate and the ability to move data and workloads freely and securely between them with low-latency and high-performance interconnections. All of this is leading us into a storm of complexity, compounded by the vast number of services and components spread across the major public clouds. The market is thrashing, complex and confusing. The next steps for this industry must be to reduce its complexity and improve integration of its parts to drive increased developer productivity.

Partners Will Help Users 'Go Faster' To Achieve Benefits of Cloud Native

Mastering cloud-native skills and capabilities is likely to involve outside help (see Figure 5). More than three-quarters of respondents currently using or adopting cloud-native practices (85%) agree that their organizations will rely on outside services, such as consulting or managed services, to address the need for cloud-native skills and capabilities, with 45% indicating they strongly agree. Strong agreement is most pronounced (67%) among companies younger than 10 years.

Figure 5: Use of Third-Party Services To Address Skills Shortage

- Strongly agree
- Somewhat agree
- Somewhat disagree
- Strongly disagree

45% 40% 11% 4%
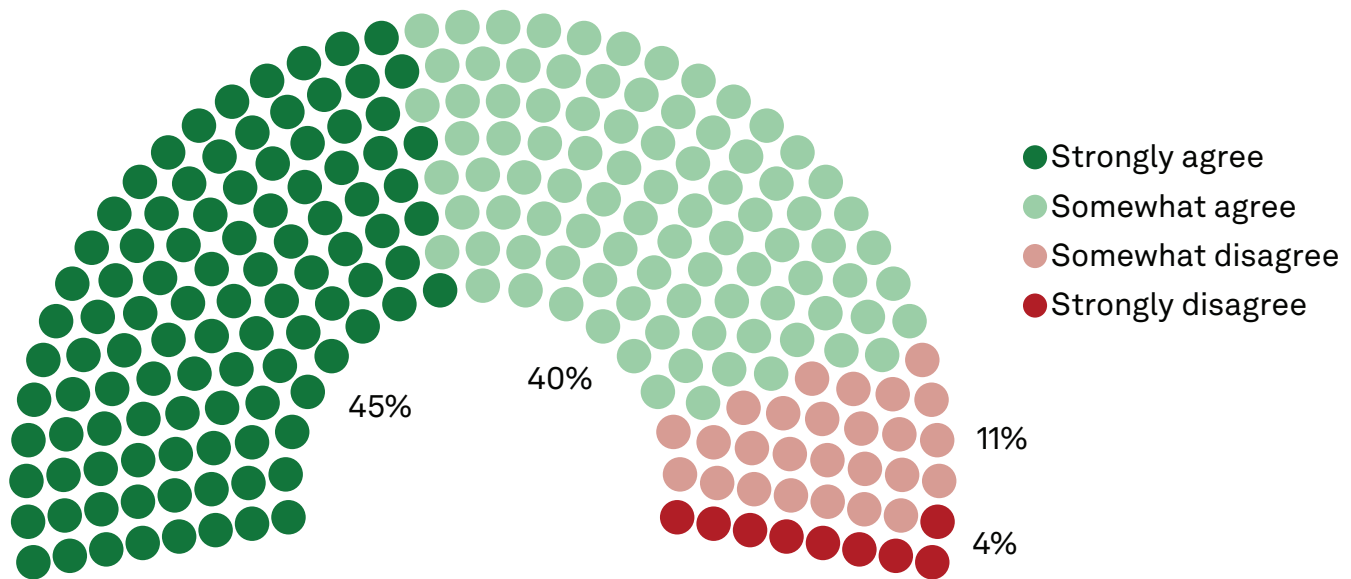
Q. Please indicate whether you agree or disagree with the following statements. - My organization will rely on outside services (e.g., consulting, managed services) to address the need for cloud-native skills and capabilities.
Base: Organizations with cloud-native technologies in-use or proof of concept for application development/deployment (n=230)
Source: 451 Research's Voice of the Enterprise: Cloud Native, Adoption & Usage 2022

The skills shortage is one of the hardest things to overcome. You cannot magic your way into cloud native; it needs specialized skills, in addition to the software and hardware abstractions themselves. We see cloud-native services such as serverless reducing some of these challenges by eliminating the overhead, costs and difficulties of maintaining infrastructure and databases and simplifying the operational experience, but this is only one part of the answer. As enterprises increasingly identify cloud-native skill sets as key to the execution of future IT objectives, those skill sets are also becoming more difficult to develop and acquire. Skills shortages also scale with organizational complexity — enterprises with multiple business units, each with multiple workloads, applications or products, face a management crisis in short order without some level of organizational discipline. This, together with the need for governance, automation and control across these activities dictates the use of a modern cloud partner with a deep bench of certified competencies. This requires providers to have a degree of specialization; however, the need for skills augmentation, developer enablement and knowledge transfer will open ample service revenue paths. At the same time, enterprise engagement with managed services will reveal additional opportunities for application modernization and innovation that add ongoing value to the relationship. Recognizing this need, service providers offering managed and professional services for public cloud are developing capabilities specifically around enabling the cloud-native efforts of their customers. Upskilling in a cloud-native context must therefore supplement existing expertise, not only replace it.

Cloud Native Hits the Mainstream

The cloud remains strategically atop the list of IT technologies viewed as most transformative, and the COVID-19 pandemic has spurred acceleration in the re-platforming to cloud infrastructure and modern cloud-native application development. As a result, a vastly greater number of cloud specialists than are available today will be required to support the enterprise re-platforming to cloud and cloud native. With access to talent now more of a constraint than access to capital, it is now more important than ever for partners to bring cloud expertise, application and infrastructure modernization skills, and value-added services that encompass both operations and development that can be applied at any stage of a customer's journey. This must encompass strategy and assessment, migration and modernization, modern cloud management, and optimization. Specific demonstrations of value — including security, improved automation, cost control and new revenue streams — will be most impactful.

Implications

We are entering an era when cloud will no longer be seen as a separate IT category: Quite simply, cloud is IT. And, importantly, it is the cloud "operating model" that delivers the cloud experience, not the venue per se. New levels of abstraction delivered by cloud nativity are the key to organizations being able to build, operate, manage and secure workloads "here, there and everywhere" across venues (public, private, edge). As the survey data suggests, this is fast becoming the prevailing mindset and methodology. However, much work lies ahead to deliver the benefits of "better, faster, cheaper" in the context of cloud native.

Re-platforming to cloud native is similar to the re-platforming to the internet and web, which every business undertook in the 1990s and 2000s. As the majority of effort still lies ahead, a golden decade of opportunity beckons for those that can help enterprises get out of the starting gate by accelerating and scaling software delivery, abstracting away complexity and securing software supply chains. With many companies struggling to find and retain IT staff, undertaking cloud transformation can seem like a herculean effort. But as time passes, legacy applications accrue technical debt and make companies vulnerable to disruptive competition. The sooner a business starts transitioning to cloud-native deployment models and ways of thinking, the faster it will develop the knowledge and productivity gains to propel it to the next level.

Further Reading

Voice of the Enterprise: Cloud Native, Adoption & Usage 2022

– [Survey Data Hub](#)

– [Enterprises anticipate a growing embrace of cloud-native practices – Highlights from Voice of the Enterprise: Cloud Native](#)

Voice of the Enterprise: DevOps, Workloads & Key Projects 2022

– [Survey Data Hub](#)

– [Business objectives and benefits become top priority – Highlights from VotE: DevOps](#)

Methodology

Voice of the Enterprise: Cloud Native provides you with actionable data and insight to understand the key dynamics driving enterprise adoption of cloud native architectures and tools.

The VotE: Cloud Native, Adoption & Usage 2022 survey wave examines the state and pace of adoption for key cloud native technologies such as containers, Kubernetes, service mesh, serverless, and observability, as well as the intent of cloud native, and its impact across the organization.

This survey wave was completed between May 24 to July 8, 2022. The survey represents approximately 540 surveys, approximately 230 of which are from pre-qualified respondents that currently use cloud native technologies at their organizations.

Demographics

For full survey demographics, [click here to go to the Survey Data Hub](#).

About the Author

William Fellows

Founder & Research Director, Cloud Native

As Research Director, William is responsible for the Cloud Native Channel at 451 Research, a part of S&P Global Market Intelligence. With a 20+ strong team of collaborators, this Channel provides a point of intellectual convergence for 451 Research around cloud native computing and offers customers a direct path to understand its adoption and impact across all sectors.

William has a long history of tracking cloud infrastructure, beginning with its foundational elements such as distributed and grid computing and virtualization, establishing and running 451's Cloud Transformation Channel for more than a decade. He created 451 Research's early adopter research program, working with enterprise end users and innovators, and he created 451's Digital Economics Unit in 2014 and the Blockchain Center of Excellence in 2017. In 2020 he formed the Cloud Native Channel to focus on the re-platforming to cloud native constructs and such as containers, service mesh, Kubernetes and serverless, from application and infrastructure perspectives. William has been a member of the European Commission Cloud Expert Group, co-authored The Future of Cloud Computing Report and worked on various EC-funded cloud projects.

Prior to starting 451 Research, William was a financial and technology journalist with ComputerWire (now part of Informa) in London and New York. He has held various senior management roles at 451 Research since 1999. William has a master's degree in computing science from the University of Portsmouth, and a BA in Government and Sociology from Essex University.

About 451 Research

451 Research is a leading information technology research and advisory company focusing on technology innovation and market disruption. More than 100 analysts and consultants provide essential insight to more than 1,000 client organizations globally through a combination of syndicated research and data, advisory and go-to-market services, and live events. Founded in 2000, 451 Research is a part of S&P Global Market Intelligence.