Research Insights

Mastering hybrid cloud

IBM Institute for Business Value

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Mastering hybrid cloud

At IBM, we're fortunate to have a global view of how businesses are faring with hybrid cloud adoption to create business value. Our most interesting and challenging work is with clients that are turning the corner from the early phases of cloud adoption to a much deeper, business-driven mastery of hybrid cloud.

Let's set the stage with a few big ideas.

John Granger
Senior Vice President, IBM Consulting

Mastering hybrid cloud: big ideas

Hybrid cloud is a powerful strategy for business transformation and innovation across a modern enterprise.

Unlocking transformational business performance improvement requires being able to securely employ software and data at scale and with speed across the enterprise IT landscape. That, of course, is cloud. For a big enterprise, especially one rapidly transforming into a virtual enterprise, the bar is higher. We set out the Virtual Enterprise as the target destination for next-gen business transformation in a related report.[1]

Because of data gravity, security and regulatory requirements, and the complexity of mission-critical applications, a single public cloud is rarely adequate. Transforming enterprises demands open innovation and expanded business value. That's hybrid cloud. A solution that spans conventional data centers, mainframes, multiple clouds (private and public), software as a service (SaaS) applications, and applications and data running at the edge.

That pragmatic hybrid cloud approach yields 2.5x more value than the use of a single public cloud alone.[2] A hybrid cloud platform can integrate applications that run across multiple clouds, moving data securely across the cloud estate, and improving business processes and workflows that span multiple clouds. A hybrid cloud platform simplifies and integrates diverse elements of a large cloud estate into a single, coherent fabric of capabilities.

So, simplification and integration of the IT landscape is what mastery of hybrid cloud is all about, and that mastery can confer 4 distinctive levers of value:

- Build applications once, deploy them anywhere.
- Manage applications once, host them anywhere.
- Skill once, deploy them anywhere.
- Innovate anywhere, with anyone's technology.

Hybrid cloud simplification and integration also deliver broader access to a bigger range of value propositions. Let's break that down.

By broader access, we mean that more people can build and deploy more software, and access and use the underlying data. So how does broader access intersect with hybrid cloud? Think of hybrid cloud like a city's transportation network: as multiple routes expand a population's access, so multiple forms of cloud make valuable cloud capabilities accessible to everyone across the enterprise.

By a bigger range of value propositions, we mean that hybrid cloud can take you to many more of the places you want to go in your search for business value. Currently, you can easily move only a small proportion of your application estate to public cloud. Consequently, we see this big movement toward hybrid cloud.

We're very bullish on the journey to value with hybrid cloud.

There is value to be had from the early stages of cloud adoption, but we believe that hybrid cloud will drive your business' most transformational, software- and data-driven roadmaps for improving product and service delivery to your customers.

Even further, by promoting openness and cohesion across the ecosystem, hybrid cloud opens the door to increased business value by expanding innovation.

Consider some recent data:

- Hybrid cloud has become the way big enterprises do cloud, with 97% of organizations now operating on more than a single cloud.[3]
- Hybrid cloud has become a top-tier enterprise investment. Our latest data shows spending on hybrid cloud as a share of IT spend has increased by double digits, while spending on public cloud as a share of IT spend has recently declined in some industries.

– Mastering hybrid cloud has become a central driver of transformation. In fact, another recent IBM study estimates the value of hybrid cloud investments multiplies up to 13x on average when combined with other levers of transformation. For some industries, the value multiplier is as high as 20x.[4]

When the cloud journey stops short of hybrid cloud mastery, deep sources of value remain out of reach.

Too often, cloud adoption programs lose momentum before program investments start to pay off. Dabbling-level adoption stops short of a tipping point where the ROI from improvements in business performance balances and then outpaces cloud implementation costs.

To illustrate: in a recent survey, almost a third of cloud adopters report being stalled in the middle of their journeys, and another 37% report being "done" after only minimal workload migration.[5] Why? One reason is that they're seeing unexpected increases in operating costs as they add more cloud vendors or cloudify more business functions.

There are many reasons why hybrid cloud adoption can fall short of expectations, but there's a consistent theme in every story from the field: the hybrid cloud journey's archenemy is complexity. As with every archenemy, complexity can be overcome. We've identified 5 key challenges and what you can do to navigate your way through—how hybrid cloud mastery can accelerate business value with increased openness, innovation, and transformation.

The definitive word

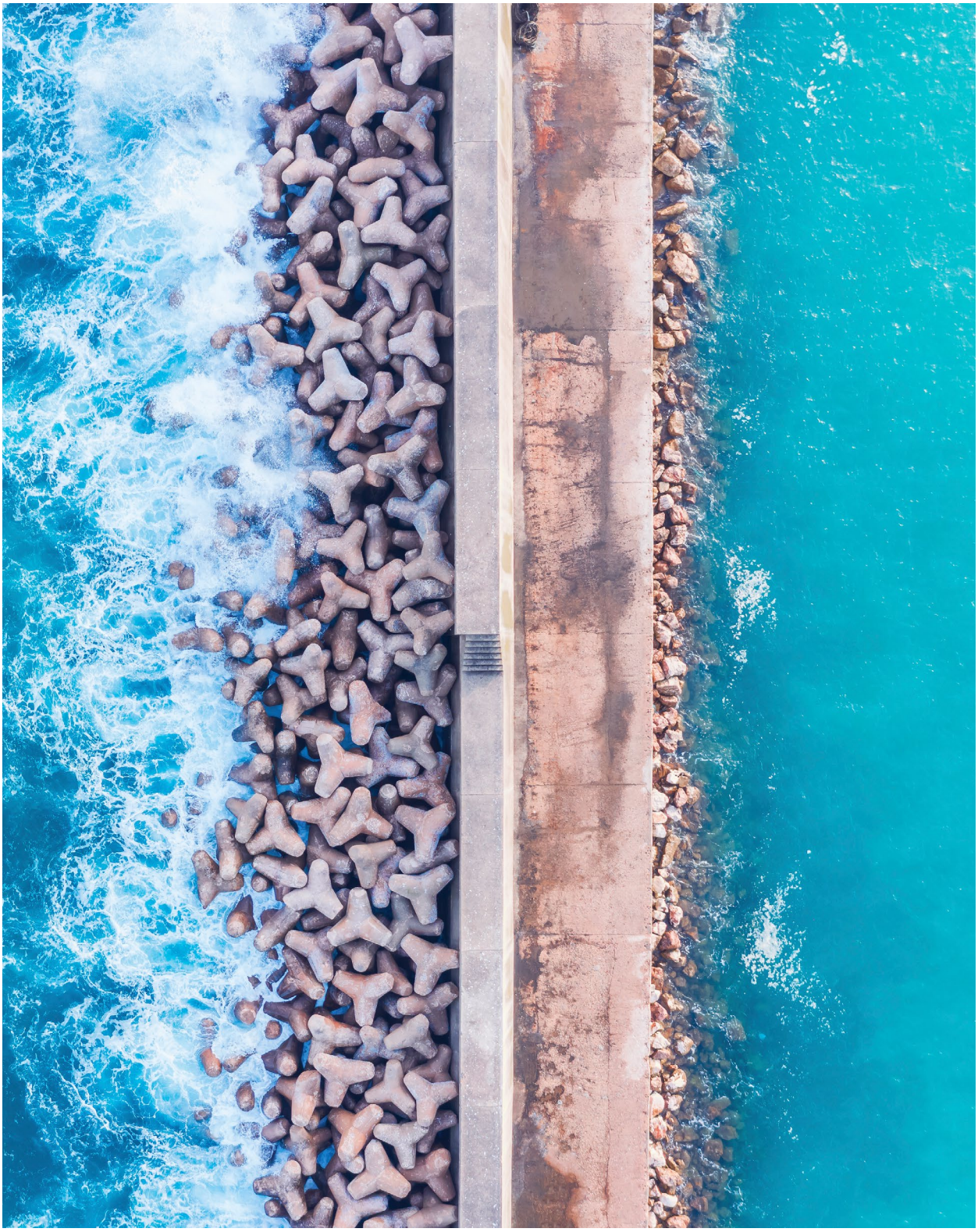
What is hybrid cloud?

We use the term *hybrid cloud* to describe a mix of cloud environments that includes public, private, and multicloud, as well as on-premises infrastructure. Our data shows that during the pandemic many organizations became hybrid cloud users as a simple consequence of tactical decisions by user departments, IT, and procurement.

Beyond this mix of environments, however, we use the term *hybrid cloud platform* to describe some level of integration that spans public, private, multicloud, and on-premises infrastructure, and increasingly edge computing and distributed cloud. Done right, a hybrid cloud platform provides a fabric for orchestration, management, and application portability across these environments. The result can be a single, unified, open, and flexible distributed computing environment where an organization can run and scale its traditional and cloud-native workloads on the most appropriate computing model.

Finally, we use the term *hybrid cloud mastery* to describe a highly evolved way of operating your hybrid cloud platform that fundamentally improves —and even transforms—business performance.

5 common challenges on the
journey to hybrid cloud.



The 5 challenges

The path to mastering hybrid cloud

As we work with clients around the world, we see 5 common challenges on the journey to hybrid cloud. But they aren't insurmountable. The truth is that you've probably solved similar challenges before, just not in the specific context of a hybrid cloud strategy. There are 5 simple, pragmatic things you can do today that can get you to mastery of hybrid cloud.

	Challenge	Adoption	Mastery
1 The architecture challenge	How to bring order to a crowded cloud estate, to simplify the IT landscape, and to define an architecture for delivering a single, secure hybrid cloud platform.	Cloud adoption just piles cloud upon clouds.	**Mastering hybrid cloud integrates cloud assets according to a clear and compelling hybrid cloud vision, starting with a hybrid cloud platform architecture that defines a "fabric" of cloud services across multiple environments.**
2 The people and operations challenge	How to tame the Frankenstein's Monster of each cloud generating its own operating silo and constraining the efficiency and effectiveness of people's work.	Cloud adoption simply assembles cloud talent piece-parts in siloed working practices.	**Mastering hybrid cloud develops cadres of cloud-savvy smart creatives, designs workflows that free those people to do their best work—efficiently and effectively—across the platform, and guides the evolution of a single hybrid cloud operating model.**
3 The security challenge	How to manage and advance hybrid cloud security as a team sport, integrating separate cloud security domains into a comprehensive game plan to defend against cyber adversaries.	Cloud adoption risks expanding the security attack surface and is prone to failure in a multicloud environment.	**Mastering hybrid cloud develops a unified security program that steers business initiatives, optimizes security resources, and transforms the operating culture to be security-first.**
4 The financial challenge	How to understand cloud investments, costs, and returns, and manage across the hybrid estate as one unified portfolio.	Cloud adoption just manages individual cloud bills.	**Mastering hybrid cloud manages all cloud costs through a single view and captures opportunities to optimize costs and reallocate resources.**
5 The partner ecosystem challenge	How to bring the right partners to a dedicated Captains Table to build social capital and to put the client's success above each player's self-interest.	Cloud adoption simply administers individual partner contracts.	**Mastering hybrid cloud brings all of the partners together in a voluntary, multilateral ecosystem, aligned under one strategy for success.**

Mastering hybrid cloud integrates cloud assets according to a clear and compelling hybrid cloud vision.

Challenge 1

The architecture challenge

How to bring order to a crowded cloud estate, to simplify the IT landscape, and to define an architecture for delivering a single, secure hybrid cloud platform.

Cloud adoption just piles cloud upon clouds. ***Mastering hybrid cloud*** *integrates cloud assets according to a clear and compelling hybrid cloud vision, starting with a hybrid cloud platform architecture that defines a "fabric" of cloud services across multiple environments.*

COVID-19 has been a flashpoint for hybrid cloud adoption. The pandemic has demanded that more businesses get more of their products and services online, and that they get them online now—so much so that 97% of organizations now report being on more than one cloud.[6] In fact, the average enterprise is expected to have 10 clouds by 2023, up from 8 in 2020.[7] SaaS applications have also exploded, moving many standard business processes to the cloud.

Unfortunately, this urgent need for action prompted organizations to assemble their current cloud estates in an ad hoc mix of public, private, and on-premises assets—that may or may not work together in useful ways. Without architectural guard rails, implementation pressures lead to corner-cutting, making the IT landscape more complex and costly, less secure, and less likely to deliver better business outcomes. Little wonder that, for instance, 71% of executives see data integration across the cloud estate as a problem.[8]

The problem isn't the computing assets themselves. Public clouds are foundational to a hybrid cloud strategy and there are good reasons to have more than one public cloud. Private clouds are essential in heavily regulated industries. Some assets can't be moved to a public cloud, but can still benefit from the basic cloud principles of cloud computing. For instance, a mainframe can be operated "as a service" where consumers pay as they go.

Bringing order to a crowded cloud estate

When you have a collection of individual cloud components but no cohesive structure to bind them, it's as if you have a messy shop floor that's littered with random auto parts. You might have everything you need to build a working vehicle, but you're a long way off from actually having one, let alone driving it to where you need to go.

A single, integrated hybrid cloud platform and application architecture is the chassis on which to mount and connect all the parts. Instead of discrete components that accomplish little on their own, it's the whole system that can get you where you need to go—meaning a dramatic improvement in software application development and production. It can mean more agility, speed, and business innovation. Your cloud investments could start returning real business value. Perhaps even more than you expected.

Start with these 3 steps to bring order to a crowded cloud estate.

Step 1: Envision a single integrated hybrid cloud platform and application architecture fully aligned to the business.

Mastery means moving from a "hybrid of clouds"—multiple clouds that compete with rather than complement each other—to a single, integrated hybrid cloud platform. The platform provides highly integrated, deeply automated software production services to users across the enterprise. The platform streamlines service provisioning and consumption through a convenient and cost-effective "marketplace" for hybrid cloud services. It also defines landing zones that empower users to get up and running on the platform with a reduced level of technical and administrative burden.

Complement the platform with a business-aligned application architecture supporting open innovation. A hybrid cloud platform architecture needs a complementary, business-driven framework that guides decisions about how applications work in a hybrid cloud environment. Does an app go to a public cloud? If so, which public cloud? Does it belong in a private cloud? Does it need to stay in the data center? Could the app be retired? And how do the applications and data interconnect across business domains and ecosystems?

Hybrid cloud mastery offers a very different option. Ideally, some applications should be redesigned as a set of reusable components so that the application becomes a "composable" assembly of small chunks of business logic. This is not a new idea (see "service-oriented architecture" in your IT history books), but today's microservice, container, and hybrid cloud platform technologies make it feasible at an enterprise scale. This is one way the hybrid cloud "build applications once, deploy them anywhere" superpower comes into play. Developers build microservices once and can then reuse them in applications that run anywhere in the cloud estate.

Composable applications aren't just for developers: there's a big business value idea under the techie-sounding surface. Seeing applications as chunks of business logic requires a deep understanding of what applications need to do in order to improve business performance: how will the software development capabilities you're building return value to business sponsors? Making this connection is what practices such as domain-driven design (DDD) are about: the "domain" is a business domain we're improving with rapid releases of composable applications. And those composable applications are products assembled from microservices.

> *Lumen Technologies, a US-based multinational telecommunications company, sought to expand and improve support of new sets of client compute-intensive applications at the edge, but was concerned with the resilience and speed of its existing capabilities.*
>
> *Embracing robust hybrid cloud capabilities to improve speed and security, Lumen was able to offer clients a new, centralized cloud console through which edge applications could be readily developed and orchestrated across its global enterprise.*[9]

Step 2: Build your hybrid cloud platform the same way you would build a customer-facing product.

Everything you know about building digital products (as we discussed in Step 1) transfers directly to the work of building a hybrid cloud platform. Keep in mind that the hybrid cloud platform—the product you're building—is a platform for service delivery. You're delivering those cloud platform services to customers, and it's the customers who define what "value" looks like. Defining customer-centric design thinking principles at the outset of platform development can pay big dividends when you begin to launch platform services.

To illustrate, a *postcard from the field*: we see many large enterprises with big, expensive, heavily-hyped-in-the-IT-press cloud platforms. Yet hardly anyone is using the platform. Despite it looking like an enterprise-standard approach, it's not operating that way.

Why? Maybe the platform builders forgot to get input from their customer—the developer who must use the system. To be most useful, an open hybrid cloud platform should be "crowdsourced"—built by developers for developers. They've figured out how to deliver software in your current environment, so your new platform has to offer better, faster, easier ways for them get their jobs done. As Andrew Clay Shafer of Red Hat says, "If *you* build it, they will run. If you let *them* build it, they will come."

Focusing on developers' jobs-to-be-done in the same way you develop products for your paying customers doesn't mean that enterprise IT's needs can't be met also. Just make the compliant way of working on the platform the easy way of working. Tailor platform service design so that the path of least resistance is to develop on the new platform versus developing in the old silos. Then the platform will start to hum—in a compliant, consistent way that enhances security.

Step 3: Define the sweet spot where enterprise IT's roadmap for hybrid cloud platform development moves in lockstep with the business' roadmap for performance improvement.

The sweet spot is where your platform development, services delivery, cloud-native technical practices, etc., are limited to matching cloud-driven performance improvement and innovation initiatives sponsored by the business.

As you build your hybrid cloud platform, the golden rule is to design, test, build, and deliver the service that the business needs most right now so that the service gets consumed by lots of customers quickly. Then continue to use experimentation to validate your architectural design decisions, delivering engineering proofs of concept and MVP technical architectures that test platform design alternatives. All the while, you can build more business value.

Mastering hybrid cloud develops cadres of cloud-savvy smart creatives and designs workflows that free those people to do their best work.

Challenge 2

The people and operations challenge

How to tame the Frankenstein's Monster of each cloud generating its own operating silo and constraining the efficiency and effectiveness of people's work.

Cloud adoption simply assembles cloud talent piece-parts in siloed working practices. ***Mastering hybrid cloud*** *develops cadres of cloud-savvy smart creatives, designs workflows that free those people to do their best work—efficiently and effectively—across the platform, and guides the evolution of a single hybrid cloud operating model.*

Frankenstein's Monster is the outcome of cloud operations cobbled together from pieces and parts of skills, practices, methods, and workflows. Work gets done in small, bespoke pockets and silos across the enterprise. Pre-cloud ways of working have ossified over time, cloud-native ways of working have not yet taken root, but different skill silos are emerging. So, we're a long way from the integration and interoperability afforded by hybrid cloud. Frankenstein's Monster is big, strong, and hard to kill. It's often the overwhelming force blocking progress to mastery of hybrid cloud.[10]

Research data validates the power of the Monster. In a recent survey, 84% of executives acknowledged their enterprise struggles in eliminating silo-to-silo handoffs.[11] And 78% of executives say that an inadequate operating model impedes successful adoption of their multicloud platform.[12]

One way the Monster shows up is in the form of a talent shortage. There just aren't enough cloud architects, microservice developers, and data engineers to go around, especially if the pool of talent is spread across cloud silos. In fact, 4 out of 5 executives in our research say they have insufficient talent to manage a hybrid cloud platform.[13]

The Monster can also be a source of operating model confusion. It's not so hard to understand the current operating model—and there always is one, even if it's not written down. Nor is defining a target state of the future insurmountable. Managing how you get from Point A to Point B can be tricky: What do the interim states look like? And how does each interim state clear the path for the next evolution?

Done right, operating model design can become an organization's superpower for incorporating cloud-native, efficient, and connected working practices across the hybrid environment, addressing gaps in skills, talent, and experience.

Here are 3 steps you can take today to continue your journey to hybrid cloud mastery.

Step 1: Empower a Cloud Center of Excellence to bring the hybrid cloud operating model to life and to accelerate execution.

Hybrid cloud operating models have many moving parts, and most enterprises don't have a lot of experience with operating model design and execution. If you try to tackle operating model design, roadmapping, and implementation all at once, it can be overwhelming. We recommend creating a Cloud Center of Excellence (CCoE) to house cross-disciplinary subject-matter experts who will define and lead the transition to a new operating model and working practices.

The CCoE must be empowered to work across all of Frankenstein's Monster cloud silos; otherwise, there is little chance that the Monster can be tamed. If your program has silos that have had time to grow and harden, getting back on the path to a single hybrid cloud operating model may require strong intervention from the CCoE. The goal is to dissolve silos into an integrated, common way of working that serves customers and employees better than a fragmented approach can offer.

Keep in mind that changing how people work causes friction. As you design hybrid cloud service delivery workflows and apply outcomes of experimentation, treat delivery teams as customers. Help them answer the questions: How is this new way of doing things better than the old way? How is my experience working this way making me willing to try something new, even if it's uncomfortable?

To accelerate hybrid cloud operating model execution, it helps to be able to "see around corners," and to anticipate the range of outcomes that can result from operational changes. Seeing around corners requires investing in scouts—a small team that stays one or two steps ahead of current implementation. The scout's role is to validate next steps in the implementation plan based on how today's work is going—including anticipating what comes next, gathering data, and applying lessons learned during program execution. If the plan needs to pivot, the scouts need to make the case for doing so.

Step 2: Empower your people with the skills and experience they'll need to thrive in a hybrid cloud operating model.

There are big differences between conventional cloud-ways-of-working training programs and programs that empower people to pursue hybrid cloud mastery. The most important difference is that with hybrid cloud, a consistent DevSecOps toolchain, and a coherent operating model, you don't need to train everyone on every silo of technology and practice. You are able to build skills and conduct training more efficiently and at scale within a garage environment or elsewhere.

This integration dividend means you can employ some empowerment program design principles that might otherwise have been unaffordable, such as:

- Offering hybrid cloud training, badging, and certifications "just in time," so learners apply new skills quickly. Making learning more experiential by making sure that people get coaching in how to apply new skills directly in the context of their role in the hybrid cloud operating model.

– Driving toward true DevSecOps practices by emphasizing how the skillsets and practices involved need to be applied in an integrated, cross-disciplinary operating model.
– Going beyond training and coaching people to work in a team; train and coach teams to work with other kinds of teams. Many organizations start by "coaching up" agile, cross-disciplinary cloud-native development teams, but this is only the start. As a hybrid cloud operating model evolves, it becomes clear that those cloud-native teams don't work in isolation. They need to work with a network of different types of teams: business analyst and product owner teams, conventional back-office IT teams, project management office (PMO) teams, centers of excellence, etc. The quality of interaction among those diverse "team topologies" is at least as important as the interaction of the people within each team.

Here's an example of how to connect talent and technology:

> *Orange France developed a comprehensive Orange Campus program to enhance employees' digital competencies. Using co-creation studios, 150 distinct roles were narrowed down to 30, while 80 digital competencies for tomorrow's workforce were identified. Orange France reorganized training paths and boosted career mobility by helping employees acquire new—and critical—digital skills. Results? 50% of the workforce achieved new digital skills and there was a 150% increase in customer sales on digital channels with +10 Net Promoter Score (NPS) points.*[14]

Step 3: Design the work required for hybrid cloud operations first; adjust your organization chart second.

Don't confuse your hybrid cloud operating model with your organization chart.

Operating model design is not new; it's a mash-up of business model design, workflow design, and service design, with some lean production principles mixed in. But for most enterprises, their last pass at something like operating model design was preparing business process maps to support ERP implementations. Our experience in the field reveals genuine confusion about the difference between an operating model and an organization chart.

Operating models and organization structures are different animals. An operating model is primarily concerned with how the work of service delivery flows from customer request to fulfillment. By contrast, the primary concern of an organization chart is how the hierarchy is structured and how power and control are distributed.

At the outset of operating model design work, some stakeholders will focus on whose names —and how many names—will be in which boxes on the organization chart. This is no surprise; they're assessing whether the new way of operating will be good for them or not. But it can prevent a fresh, unbiased exploration of operating model design and needs to be managed skillfully.

Make it very clear that the operating model work comes first. Then, as you define not just the target state, but also the operating model implementation roadmap, think through any necessary changes to the organization chart.

Mastering hybrid cloud tests
execution assumptions, learns fast,
and is always prepared to pivot away
from trouble and toward opportunity.

Challenge 3

The security challenge

How to manage and advance hybrid cloud security as a team sport, integrating separate cloud security domains into a comprehensive game plan to defend against cyber adversaries.

Cloud adoption risks expanding the security attack surface and is prone to failure in a multicloud environment. ***Mastering hybrid cloud*** *develops a unified security program that steers business initiatives, optimizes security resources, and transforms the operating culture to be security-first.*

Security threats in a hybrid environment

Before enterprises began using public clouds, their security concerns—although significant—were limited to applications, the data center, and the network. Adding even a first public cloud created a new set of security risks and a need to share security responsibilities with a cloud service provider. Things got a little more complex and some high-profile incidents ensued. Why? According to our research, 80% of executives struggle to engage information security and operations disciplines early enough to prevent rework or said incidents.[15]

Fast-forward to the pandemic, where most big businesses are moving to become multicloud, SaaS-heavy, hybrid cloud users; where numerous business functions have moved online; and where the workforce is working from home or the local coffee shop. We have a dramatically expanded security attack surface, further enabling bad actors in the ransomware attack and phishing business. And by the way, some of those bad actors are state-sponsored cyberwarfare experts.

Businesses that have assembled a crowded, unintegrated cloud estate have taken on greater security risks: risks that are an obstacle to hybrid cloud mastery and that threaten the resilience of the business.

Modern cloud security from obstruction and toward abstraction

The new model for security required for hybrid cloud mastery is about moving from obstruction to abstraction. Done right, security becomes an abstraction in the same way “infrastructure as code” has made physical infrastructure an abstraction. The technical complexity hasn’t ceased to exist, but the user isn’t directly confronted with it.

To illustrate: today, developers, data scientists, and data architects can provision a server, virtual machine (VM), or container in a few minutes. And they can’t wait for weeks or months for obstructive security to catch up. So, a modern security model must align with a dynamic hybrid cloud infrastructure, while moving at the same pace as innovation happening at the data and application layer. Modern security is becoming ambient, working in the background across the hybrid cloud estate.

An ambient approach embeds security into the hybrid cloud product development process. It keeps system owners and developers accountable for employing security and privacy best practices in each code release, all the way down to the level of the workload.

Hybrid cloud mastery demands a whole-team approach to security

Our research tells us that a significant majority of business executives—73% to be precise—believe that improving cybersecurity and reducing security risks are critical for the successful execution of digital initiatives in their cloud portfolio.[16] But they're not always directly linked in execution. It's common to see a security modernization program running in parallel with a cloud adoption program, but under different sponsors and without explicitly integrated roadmaps.

The path to hybrid cloud mastery, however, requires that enterprise security and hybrid cloud security are playing on the same team, with shared security responsibilities and a co-created security playbook. Ideally, hybrid cloud investments act as a catalyst to improve enterprise security and to link security investments to tangible business value.

The roster of players on a hybrid cloud security team goes way beyond the CISO, the CIO, and the CTO. It includes line-of-business program sponsors and product owners. It includes security operators, cloud platform builders, and software developers across the hybrid cloud estate, as well as owners of enterprise cloud assets. Playing as a team means that security becomes an explicitly shared responsibility, leaving the "I had my stuff in my cloud covered—it must have been your fault" mindset behind.

Securing data fabrics is an illustrative example of a whole-team approach. One of the ideas behind data fabric is to stop thinking of databases (or data lakes, data warehouses, data marts, etc.) as fixed stores of data and to start thinking of data as more of a broad network through which data runs "on tap" across the IT landscape. Data fabrics and well-mastered hybrid clouds are a natural and powerful combination, since data fabrics help to reduce the level of "data gravity" that can constrain application modernization efforts.

This decentralization of data helps to unlock the performance improvement potential of hybrid cloud, but it requires rethinking how to secure that data in the context of specific, business-focused use cases. So no matter who is leading a data fabric initiative (the CDO, CTO, CIO, etc.), designing and implementing a secure data fabric needs the engagement of the whole team.

A whole-team approach is easier and more effective when it's grounded in a broader security-aware, security-first culture. One element of building this culture is providing learning resources that recognize the needs of diverse stakeholder audiences. Business leaders might respond well to simulation-based awareness-level learning. Digital-generation stakeholders may do better with gamified training. Security operators may need formalized cloud certification. Take full advantage of the benefits of having a single cloud platform and consistent, harmonized security policies and procedures: the learning resources you provide can be much more specific, practical, and relevant to each learner's role on the team.

Perspective

Innovation driven by hybrid cloud

The 5 challenges to hybrid cloud mastery that we outline in this paper are worth solving because of the innovation they make possible. The economic value of today's businesses is heavily driven by their ability to run marketplace experiments very quickly using data, software, and platforms. A well-mastered hybrid cloud platform makes this rapid-cycle innovation much more flexible, dramatically faster, more productive, and less expensive, while making data accessible to more innovators inside the enterprise. Truly, a hybrid cloud platform can enable you to innovate anywhere with anyone's technology.

The way hybrid cloud works with data is critical to software-driven innovation. Hybrid cloud mastery opens access to data across the enterprise, unlocking innovation that would otherwise have been stymied by inaccessible data silos. Further, the hybrid cloud platform allows innovators to envision data through different lenses: data that lives in an ERP environment (like SAP), on a mainframe, or on the edge can now be seen as connected information that generates potential new insights about customers, new market opportunities, or the viability of new business models.

In siloed cloud environments, businesses can use automation tools to optimize *parts* of a workflow. Reinventing end-to-end workflows in very heterogeneous environments—using AI, automation, and customer data—is simply not possible without *hybrid cloud mastery*.

Hybrid cloud mastery enables you to innovate at an entirely higher level:

- Bring together the strength of different cloud platforms and technologies
- Organize around diverse cross-functional and cross-partner teams to co-create and co-execute
- Generate cross-platform insights across processes and workflow partners to drive virtually instantaneous transparency
- Give users access to more diverse data and ecosystem platforms
- Allow for next-level human and artificial intelligence, unlocked through cross-platform algorithms and data
- Establish and run marketplaces very quickly
- Enable businesses to run fast fail-pass experiments

To master hybrid cloud security, start with these 3 steps.

Step 1: Harmonize the security posture across the estate.

Security posture is the sum of security policies, capabilities, and procedures across the various components of a hybrid cloud estate: individual clouds, cloud platforms and management controls, software production environments, the network, data, containers, landing zones, and so forth.

In a pre-mastery condition, the hybrid cloud security posture is inconsistent. Some components—a private cloud, for instance—may appear to have a sound security posture, but others may not. Some may meet specific regulatory compliance standards, but others may not. So, when we push the "start" button and ask the specific cloud or components to interoperate in a productive way, the lack of harmony among security postures can expose serious problems.

For instance, business functions often depend on multiple hybrid cloud components, and a bad actor can attack any part of the hybrid cloud's "surface." When the security posture of those components isn't harmonized, it's hard to tell where the weakest link in the security chain is. And without that knowledge, it's nearly impossible to take preventive action.

From an architectural point of view, harmonizing requires strong, logically segmented security enclaves that control user access and protect hosted assets. It requires a "zero trust" approach that rigorously governs access to protected data, applications, and components of the cloud estate.

Harmonizing the security posture across the entire hybrid cloud builds a fabric of protection that helps keep bad guys from entering through the weakest link. And it can make it easier and less expensive to respond to regulatory demands.

> A postcard from the field: *Advancing a major digital transformation, a large European bank made a strategic decision to introduce a new public cloud into its hybrid environment. But as the bank accelerated migration, the bank's CISO was alarmed to discover that security was not being considered at the onset, or implemented uniformly across the organization. It was falling short of regulatory requirements and leaving the bank vulnerable to misconfiguration exploits and cloud shadow IT. It needed to be remediated and quickly. The bank also realized that hybrid cloud mastery was imperative to helping ensure data and services across the cloud ecosystem were being managed consistently and with high levels of security and regulatory compliance. A hybrid cloud platform approach was embraced. Consistent security practices across public clouds, private clouds, and data centers were enforced. And, as a consequence, the bank was easily able to demonstrate compliance to regulators.*[17]

Step 2: Create visibility through a single pane of glass.

Even with a comprehensive security posture, it's difficult to protect what you can't see, and it's hard to chase a bad actor away if you don't have accurate security insights across the cloud estate. This is the visibility challenge in hybrid cloud security.

In the market for cloud security command-and-control tools, many types of data fusion engines and dashboards are available to illuminate security threats. But as with hybrid cloud's security posture in general, these tools and the information they generate need to be aggregated so that security anomalies can be detected, assessed, and resolved with high velocity. This aggregated visibility capability is known as a "single pane of glass."

A single pane of glass is especially important when a security incident does happen: Where is the source of attack? What is the impact? A single pane of glass can allow action owners to quickly determine the "what, where, when, and who" of the incident so they can launch mitigation actions.

Step 3: Leverage AI to predict vulnerabilities for preventive actions.

A coherent view of hybrid cloud security and a single pane of glass is more powerful if we can also make better, faster sense of the security we're seeing. Artificial intelligence (AI), machine learning, and automation can ingest high volumes of complex security data and enable near-real-time threat detection and prediction. These tools and approaches provide security operators with validated threat insights and action recommendations, relieving them of the need to hunt down every abnormality detected.

Specifically, AI tools can be "trained" to detect cyberattack patterns that have preceded incidents in the past. When those patterns recur, AI can trigger alerts or even provide actions for self-healing well before a human operator could have detected and acted upon a potential incident.

Keep in mind that in a hybrid cloud environment, security operators become a community of partners that includes cloud service providers, asset owners, and third parties such as independent software vendors (ISVs). A single pane of glass empowered by proactive threat prediction helps coordinate security response actions across the hybrid cloud ecosystem.

Mastering hybrid cloud manages all cloud costs through a single view and captures opportunities to optimize costs and reallocate resources.

Challenge 4

The financial challenge

How to understand cloud investments, costs, and returns, and manage across the hybrid estate as one unified portfolio.

Cloud adoption just manages individual cloud bills. ***Mastering hybrid cloud*** *manages all cloud costs through a single view and captures opportunities to optimize costs and reallocate resources.*

Our research shows that 81% of executives struggle to manage and optimize cloud spending.[18] Software code, containers, and data are not the only things moving around a hybrid cloud operating model. Money—lots of it—also moves around, and as the scope of hybrid cloud adoption continues to grow, the financial side of cloud can become a bigger opportunity to generate operations-based competitive advantages. But it's often the least understood, least-monitored element of mastery of hybrid cloud.

The path to hybrid cloud mastery faces some financial challenges, including these:

- During the early phases of cloud adoption, stakeholders expect to see costs go down once workloads move from data center to a hyperscaler's cloud. But often, those costs go up, creating significant angst, if not buyer's remorse.
- The cost of moving data—once largely hidden in on-prem data centers—in a cloud environment can drive data costs up by as much as 50%, according to recent client conversations we've had.
- ROI in business cases requires predicting cloud and service delivery costs reliably. But when cloud costs prove to be unpredictable, it erodes confidence in new investments and the hybrid cloud journey as a whole. No surprise, then, that 79% of executives in a recent survey acknowledged difficulty developing business cases for their hybrid cloud initiatives.[19]

Combined and left unaddressed, these financial challenges can impede business transformation and generate a great deal of friction, draining program energy and momentum.

Employ FinOps practices to design a hybrid cloud financial management capability

Cloud financial operations (FinOps) is a set of financial and sourcing practices that help enterprises manage and optimize cloud service consumption and spending. FinOps is critical to hybrid cloud mastery because it enables businesses to see how and where cloud services are being consumed across the entire cloud estate. FinOps makes it possible to forecast demand for cloud services and to optimize spending so that cloud costs are well-matched with business priorities. And FinOps helps engineering, finance, technology, and business teams to collaborate on data-driven spending decisions across the enterprise hybrid cloud estate. Over time, cloud FinOps can be fully meshed with existing financial management practices.

The end-to-end operational and financial view that FinOps provides is important to a majority of IT executives, with 79% in a recent survey saying that achieving visibility, governance, and control across multiple clouds is crucial to establishing an effective multicloud orchestration platform.[20]

Here are 3 steps you can take now to address the financial challenge.

Step 1: Get started with developing a FinOps capability.

When FinOps becomes part of a hybrid cloud operating model, it provides financial visibility on and across each of the components of the hybrid environment. FinOps is not just about cost; it's about obtaining the best value from each unit of cost. It's not just about saving money; it's about using money to make more money.

However, FinOps is not a miracle cure and it's not something you can just purchase, install, and forget. A good place to grow financial management competencies is within the previously mentioned hybrid cloud CCoE, where FinOps practices can evolve into a well-defined set of decision-support services that stakeholders consume across a hybrid cloud operating model.

Business and IT leaders should recognize that initially, FinOps expertise can likely be constrained due to a lack of skills, talent, or experience. So in the short term, keep FinOps services focused on the hybrid cloud CCoE's highest-impact/highest-risk cost and finance challenges. And initiate FinOps training, education, and recruitment.

Step 2: Optimize costs now. And as your FinOps capabilities grow, use them to dive deeper on cloud spending optimization.

Once the CCoE has begun to provide cloud financial management services based on FinOps principles, build and deliver a single version of the truth for all external cloud service providers in the hybrid cloud estate. Make cloud billing and cost reporting as simple and easily understood as possible. Be able to explain the invoices from your cloud service providers and begin optimizing those variable costs now by proposing simple changes to how those costs are being generated. For instance, are cloud platform services making it easy for customers (developers and engineers) to run up costs without knowing they're doing so? Are there still cloud silos where there are no real controls on (and no accountability for) cloud service purchases?

As your FinOps capabilities grow, use them to target a broad spectrum of cloud operating model-related and hybrid cloud costs. Some could be available in the form of better discounts on cloud services empowered by FinOps financial acumen. Consider this *postcard from the field* that shows FinOps practices can help identify 20% or more cost savings from sources, including:

- Reduced managed service costs
- Reduced infrastructure costs
- Reduced software incidents
- Benefits realization from automation
- Improved economies from self-service
- Better, less expensive security certification and compliance projects
- Fewer people spending time on automated service delivery tasks

Step 3: Pair FinOps with AIOps.

AIOps refers to the application of AI to enhance IT operations. Specifically, AIOps uses big data, analytics, and machine learning capabilities to track and make sense of the application performance-related data that hybrid cloud operations generate in profusion. And as with most promising technologies moving up the maturity curve, AIOps investments require some experimentation and proof-case development.

Since the desired outcome of many AIOps use cases is cost reduction, AIOps pairs naturally with FinOps. Basically, the pairing of FinOps and AIOps serves to keep AIOps in the sweet spot where the program does just enough implementation to support desired business benefits. FinOps can provide the initial problem sets and hypotheses for experimentation ("applications resource management incidents are costing $X, but with AIOps automation they could be reduced to $Y"), and FinOps can provide the data required to measure the effectiveness of AIOps investments. And where AIOps succeeds in reducing operational costs, the proceeds can be reinvested in other parts of the program.

TSB Bank, which is rapidly moving from a branch-heavy strategy to a digital-first strategy, invested £120 million over 3 years to build a hybrid cloud solution that simplified technological infrastructure and allowed movement and management of data, services, and workflows across multiple clouds. Operating on a unified cloud platform for all banking channels and applications, TSB launched new channels like conversation banking and added digital features on mobile and web channels more frequently to drive 90%+ digital self-service, while bolstering security and confidentiality of critical customer data.[21]

Mastering hybrid cloud brings all of the partners together in a voluntary, multilateral ecosystem, aligned under one strategy for success.

Challenge 5

The partner ecosystem challenge

How to bring the right partners to a dedicated Captains Table to build social capital and to put the client's success above each player's self-interest.

Cloud adoption simply administers individual partner contracts. ***Mastering hybrid cloud*** *brings all of the partners together in a voluntary, multilateral ecosystem, aligned under one strategy for success.*

Enterprise cloud journeys can be like a kitchen full of cooks where each cook thinks they should be top chef. The resulting competition makes diners wait a long time for their order, and the quality of the food is hit-or-miss.

The diverse cast of ecosystem players involved in your hybrid cloud journey can create a similar dynamic. Internally, multiple line-of-business leaders and a variety of IT organization leaders will seek to use the program's resources to their advantage. Externally, implementation partners, hyperscalers, SaaS providers, and ISVs will bring their own biases, divergent perspectives, and vested interests. One thing is for certain, though—and in our recent survey, 88% of executives agree: ecosystem collaboration is critical to successful multicloud management.[22]

Managing these diverse interests may be partially addressed by existing business and IT governance structures and PMOs, but only partially. Competing stakeholder priorities, conflicting incentives, partner finger-pointing, and the like often require a more direct solution—a game changer.

Consider this *postcard from the field:* One successful approach we've seen in the field could be called a Captains Table.[23] Picture a round table where each constituency of your hybrid cloud mastery journey (your hybrid cloud ecosystem) is represented by a senior "captain." Chaired by an enterprise executive overseeing the hybrid cloud journey, the internal stakeholder executives and external partner executives at the table keep the program on the right track by agreeing that the most critical program decisions (and the resolution of disputes) be made collaboratively, consistently, and with enough transparency to maintain the trust of all parties.[24]

One of the table's objectives is to turn what could otherwise be a zero-sum game for each captain into a bigger pool of value for everyone at the table and across the ecosystem. Mastering hybrid cloud gets naturally competing interests—line of business, IT, lead integrator, and technology vendor constituencies—to embrace open innovation and co-creation to deliver a successful program.

Here are 3 steps you can take to create an effective Captains Table.

Step 1: Select your Captains Table participants.

To get started, you need to decide which ecosystem organizations should be at the table. Obvious choices include your major sponsors from the lines of business, your lead integrator, your primary cloud service providers, and the managed service providers that play a role in software production, application management, and data center operations. Think in terms of a Captains Table about the size of an agile squad.

Select the specific senior executive you want to represent each partner. You've probably met a variety of execs from each partner already, but talk to your partner program managers before making any invitations. The executive you want as a participant has the right level of seniority and the power to represent the partner in making decisions required to resolve current and upcoming ecosystem issues.

When your partners are large organizations, don't be impressed with titles. You need executives who can "play above the silos" of their organizations. They need to be able to make decisions about partner delivery and make them stick. You already have someone from each partner who can "check with headquarters." For your table, you need someone who can *act as* headquarters. "I have a good relationship with so-and-so" is not a high enough bar.

Step 2: Develop a Captains Table vision and charter.

A Captains Table needs very clear shared thinking about the table's objectives, norms, and processes. To that end, we recommend engaging design thinking practitioners to plan and facilitate a sprint for developing a vision and charter that's co-created by your executive sponsors and the participants you've selected. The vision and charter should anticipate provocative and critical questions such as:

- How are the captains' performance incentives (bonus plans, business KPIs, budget allocations, OKRs, SLAs, revenue targets, "land and expand" objectives, etc.) affecting program decision-making and execution?
- How well are line-of-business performance-improvement roadmaps aligned with the hybrid cloud implementation roadmap? Do line-of-business demands on IT need to be re-prioritized in order to get optimal value from investments in hybrid cloud?
- How should the captains communicate their expectations for whole-program collaboration and empower their people to make that happen in their day-to-day interactions?

We recommend engaging a qualified and trained facilitator to design the meetings and interactions for members of the Captains Table. Keep a clear eye on improving communication and collaboration, as well as improving meeting quality and outcomes in general. Set a tone and culture for the Captains Table. Constantly emphasize that the quality of your program can't be better than the quality of the conversations you're having about the program.

Step 3: Use your Captains Table to take aim at the primary challenges to mastering hybrid cloud.

Once the Captains Table is up and running, it's time to get strong returns on your investment. One clear payoff of an effective Captains Table is that it can help your program address each of the challenges to hybrid cloud mastery we've explored in this paper. Looking back at those mastery challenges, it's clear that each challenge intersects with your whole ecosystem of partners. And it's clear that the best way to engage each partner requires working in a gray area that probably won't be covered in each partner's contract. So each challenge presents a great way to focus your Captains Table on addressing issues that could otherwise generate a great deal of friction. An open collaboration garage model can be highly effective. To illustrate:

- For the architecture challenge: define the role each partner plays in hybrid cloud platform architecture, paying close attention to the inevitable partner overlaps and dependencies that arise as you design a single, integrated platform.
- For the people and operations challenge: define the role each partner plays in training people on the technology and practices they bring to the platform. Each partner will have user support services, but how can they be brought to bear in an integrated manner tailored to your program? How much coaching and direct, on-the-ground support will each partner provide?
- The Captains Table can't be involved in the day-to-day work of designing and implementing a hybrid cloud operating model, but it should get involved in cases where one or more partners face a big change to the services they provide as the operating model evolves.
- For the security challenge: we have made the argument that a transformative security program needs to be a team sport, and a Captains Table can be a powerful way to make it so. Harmonizing the hybrid cloud security posture and adopting a security-first mindset requires material give and take among all members of the partner ecosystem and can surface issues that require the table's attention.
- And finally, for the financial challenge: the program's efforts to build and evolve a FinOps capability should mesh directly with the Captains Table's sphere of concerns. By capturing a single version of the financial truth, FinOps data provides the captain with a way to engage partners in constructive conversations about cost optimization that apply the FinOps principle of getting the most value from each unit of cost.

> *Faced with rapidly growing demand for data at a compound annual growth rate (CAGR) of over 70%, Airtel—one of India's largest integrated telcos—has embraced modern hybrid cloud architecture to deliver faster, bigger, more responsive networks to customers. Airtel's open hybrid cloud platform enables new revenue streams onboarding third-party services, including gaming, remote media production, and other enterprise services. Airtel is improving time-to-market of services and reducing operating and capital expenses. The network cloud positions ecosystem partners, including B2B and B2C application developers, to create value-added services, including new edge offerings.*[25]

Step into mastery.

In conclusion, you are now ready to

Step into mastery

This paper has made the case that hybrid cloud is a powerful strategy for business transformation. As highlighted at the beginning, we're very bullish on the journey to value with hybrid cloud. And beyond the near-term benefits of hybrid cloud, consider that "exponential" business technologies—AI, IoT, and edge computing, and then blockchain and quantum computing—all require hybrid cloud mastery as a prerequisite to generating new value. Even the earliest of new-tech adopters can't skip the work of getting hybrid cloud right.

So when we see enterprise journeys stopping short of hybrid cloud mastery—leaving deep sources of value out of reach—it makes us ask, "What is holding programs back?" The 5 challenges we've discussed —while not exhaustive—do capture the most common obstacles we see in the field and the "get-rights" that can most strongly tilt the odds in your favor.

So let's close with a call to action for all enterprises on this journey to mastery, and especially to those that are on their second or third pass at capturing the value available from hybrid cloud. Consider the 5 challenges and change your current course to address them. Once you've achieved initial balance between a roadmap for building hybrid cloud capabilities and a roadmap for helping your business perform better in a software-driven world, stay in that sweet spot and keep delivering value. And don't settle for less than what's proven to be possible.

A recent IBM Institute for Business Value study estimates the value of hybrid cloud investments multiplies up to 13x on average when combined with other levers of transformation. For some industries, the value multiplier is as high as 20x.[26]

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For more information

To learn more about this study or the IBM Institute for Business Value, please contact us at iibv@us.ibm.com. Follow @IBMIBV on Twitter. And for a full catalog of our research, or to subscribe to our monthly newsletter, visit: ibm.com/ibv.

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