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Distributed Cloud: A Modern Operating Model for an Empowered Edge

Edge computing relies on a distributed ecosystem that delivers computation, networking, and storage close to where data is created.

For many organizations, data collected and analyzed at the edge is the engine of digital business, enabling real-time decision-making, operational efficiencies, and innovative use cases that drive competitive advantage.

Now, as cloud takes center stage, distributed computing is reemerging — a reimagined operating model for hybrid and multicloud environments that can uplevel the value of edge deployments. In a distributed cloud, multiple clouds are used to meet compliance needs and performance requirements or to support edge computing while being centrally managed by the public cloud provider.

In a distributed cloud model, the key elements of the distributed landscape are visible and accessible through single-pane-of-glass management. This greatly simplifies the typical siloed IT landscape, ensuring that federated resources can be monitored and managed easily from a central command center, regardless of whether they reside in multiple public clouds, on-premises data centers, colocation facilities, remote locations, or edge deployments.

Distributed cloud tackles the operational and management inconsistencies common to hybrid and multicloud environments while also modernizing legacy on-premises infrastructure as part of a phased cloud migration. Distributed cloud also serves as the optimal foundation for edge computing, as it eases management complexity and enables compute resources and applications to run more effectively close to where data is created.

This e-book dives into what's driving the need for distributed cloud and edge computing and helps IT leaders chart the best course to this evolved operating model.

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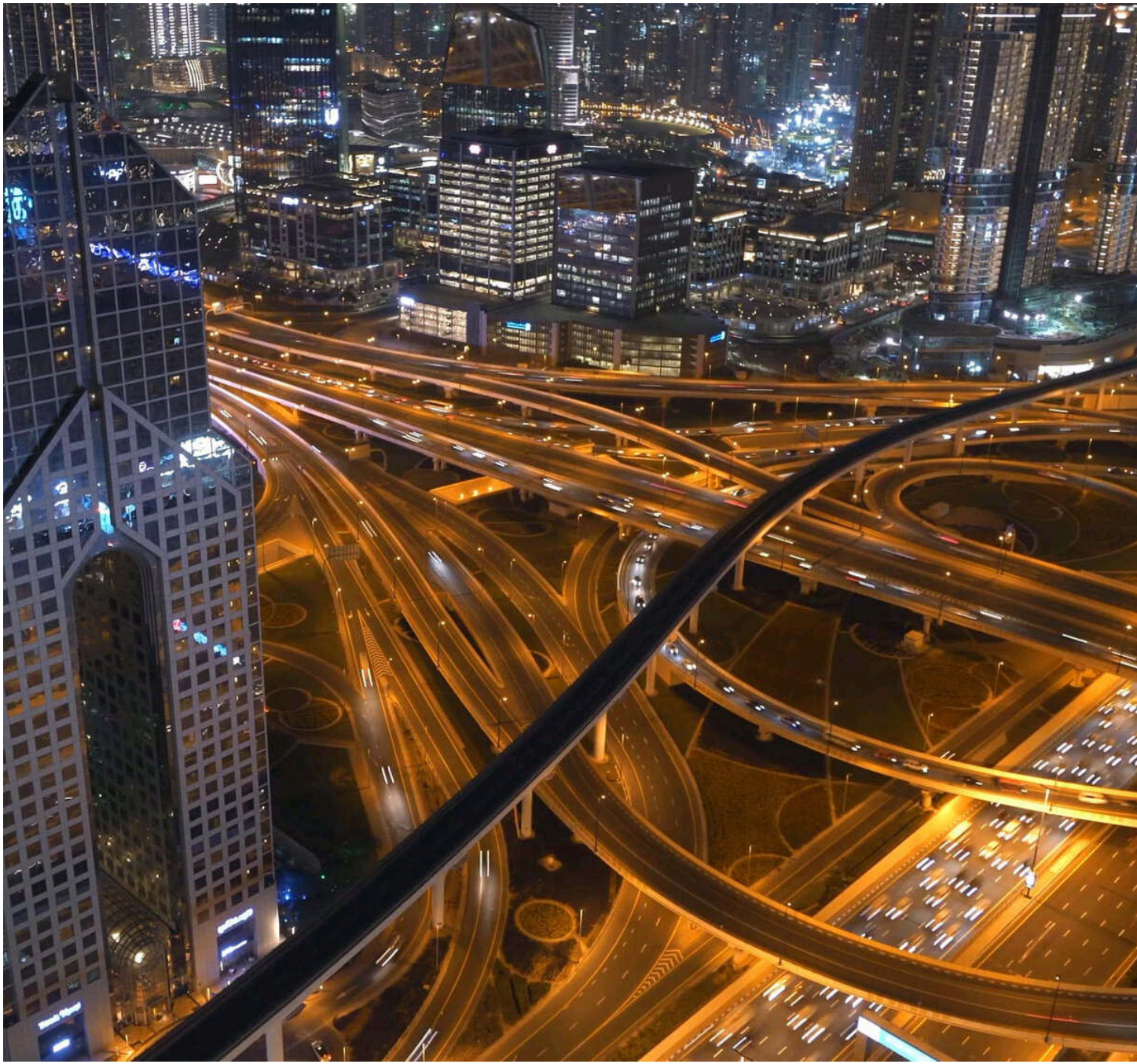
The Case for Distributed Cloud

The demand for public cloud services is continuing to increase as organizations look to modernize more advanced workloads and deliver resources to remote and edge locations. Gartner says enterprise IT spending on public cloud is poised to overtake traditional IT spending. The research firm estimates that 51% of spending across application software, infrastructure software, business process services, and system infrastructure will shift from traditional platforms to public cloud by 2025, compared to 41% in 2022.

Deeper integration between cloud services is now prevalent, enabling a fabric or mesh of interconnected resources and data. As resource silos come down, data is free to flow between sources to centers of analysis and business intelligence, giving new life to the promise of edge environments for more robust and timely business insights and addressing the shortcomings of past implementations. “Today there’s greater integration and synergy between cloud



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— Edgar Haren, Offering Manager, Kyndryl Distributed Cloud

services, so the opportunity for a data fabric or mesh is as close to reality as we've ever had. We have elevated the interconnectivity of disparate systems," notes Edgar Haren, offering manager for Kyndryl Distributed Cloud.

At the same time, public cloud providers are building bridges that enable organizations to connect diverse cloud environments to other deployment types, including other public clouds, on-premises, or the edge. Here is a snapshot of how the different cloud models line up:

- **Hybrid cloud** is where workloads are running in a combination of public cloud and private cloud environments. You get the benefits of a public cloud along with the greater control and security of keeping assets on-premises. With hybrid cloud, although organizations get public cloud benefits, they may be limited to a single public cloud provider's services.

- **Multicloud** empowers organizations to tap best-of-breed technologies from different cloud vendors and adhere to geographical and location-based requirements without vendor lock-in. However, this highly mixed IT landscape can be extremely complex and difficult to manage.

- **Distributed cloud** delivers the benefits of both models with less complexity. It leverages cloud-native tools and processes; provides consistent security and governance policies; and ensures deployment flexibility to support multiple public clouds, private clouds, and remote and edge uses cases. At the same time, single-pane-of-glass management enables workloads to be monitored and administered across all environments, greatly reducing IT architecture complexity.

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Industry Drivers Set the Stage for Distributed Cloud

The requirement for greater business intelligence at the edge has created an urgent need for local high-performing compute and related IT resources.

Driven by technology developments such as the internet of things (IoT), artificial intelligence/machine learning (AI/ML), and advanced analytics, remote and edge sites are being transformed into revenue engines, generating insights that help companies improve operations, drive growth, and disrupt markets with innovative as-a-service revenue streams. IDC projects that 55.7 billion IoT devices will be deployed by 2025, capable of generating almost 80 zettabytes of data and furthering the opportunity for business innovation and insights at the edge.

Given the influx of connected devices, IDC predicts that the total spending on edge infratructure will grow to $41.7 billion by 2025. Manufacturing operations, production asset management, and smart grids are among the key use cases fueling edge deployments, IDC says, with emphasis on business intelligence/data analytics, content delivery, text and image analytics, and networking and security.

Driven by the push for edge computing to drive real-time insights and localized actions, Gartner anticipates, nearly 75% of enterprise-generated data will be created and processed outside of a traditional data center or cloud by 2025. Companies pursuing cutting-edge use cases see the potential for distributed cloud to up-level the value of edge deployments and address new operational challenges. Examples include augmented reality (AR) for optimized maintenance and repair work, ingesting machine data for predictive maintenance, or gathering medical images and pushing them to the cloud for retention and compliance with HIPAA regulations.

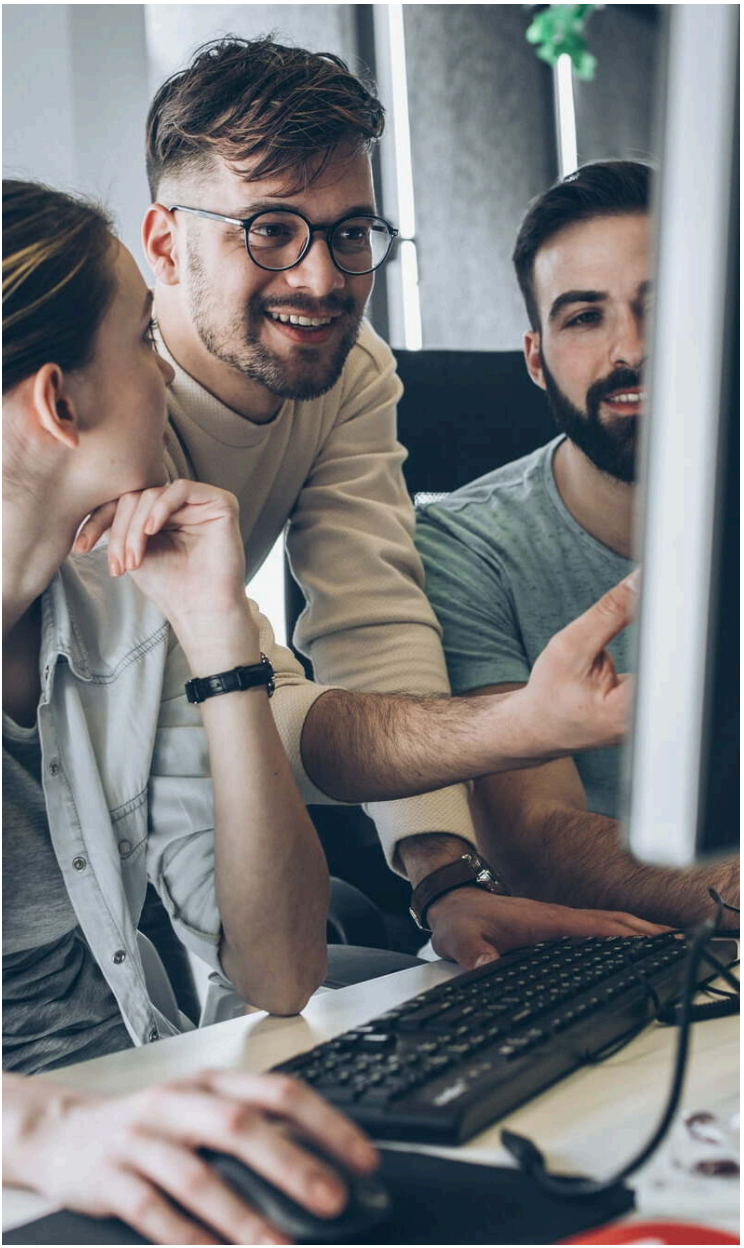
At the same time, the distributed cloud model holds potential for traditional workloads,

enabling organizations to modernize on-premises systems as they advance on a tiered cloud journey. Specifically, a distributed cloud model can refashion legacy systems with a cloudlike experience, including deployment flexibility, pay-as-you-go utility-based billing, and automation that reduces the number of operational and administrative tasks.

According to ESG, 46% of organizations plan to invest in technologies that deliver a "cloud-like" experience for their on-premises data centers over the next three years.

Enterprises have an appetite for alternative deployment models, given the challenges associated with cloud sprawl. Research shows that companies enlist, on average, 2.6 public and 2.7 private clouds. The complexity exists even as most companies have migrated initial workloads such as web servers, backup, disaster recovery, and productivity applications. Even with the rise of software as a service (SaaS), 92% of companies indicate that they expect on-premises software spending to grow, especially for enterprise applications such as enterprise resource planning (ERP), customer relationship management (CRM), supply chain management (SCM), and business intelligence (BI) still residing in company data centers. However, these workloads may run on legacy infrastructure that is costly to run and maintain: An estimated 72% of IT budgets are spent on maintenance and administrative tasks, and the perpetual cycle of deployment, maintenance, and hardware refresh can lead to ballooning total-cost-of-ownership (TCO) metrics.

Different IT environments and differing system silos are putting pressure on IT organizations to develop skills mastery in two universes. They must acquire new skills in areas such as containerization, cloud security, automation, and orchestration. At the same time, they are challenged by the need to maintain expertise to manage legacy on-



Distributed cloud allows organizations to tap into best-of-breed cloud services, by giving them access to those solutions through a centralized management engine.

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premises infrastructure, which still requires significant manual administration.

Data regulatory mandates such as the General Data Protection Regulation (GDPR) in Europe are creating yet another burden for IT organizations as they confront data compliance, sovereignty, and proximity challenges. Regulations are changing with greater frequency, so many companies are seeking to repatriate workloads back on-premises for greater risk mitigation.

All this momentum tees up nicely for distributed cloud growth. According to MarketDigits, the distributed cloud market is projected to reach $5 billion by 2026, up from $1.3 billion in 2020 and growing at a CAGR of 26.4% during 2021–2026.

The key benefit to customers: flexibility and choice without being locked into any specific provider ecosystem or tied to one specific deployment model. “Distributed cloud allows organizations to tap into best-of-breed cloud services, by giving them access to those solutions through a centralized management engine,” notes Haren.

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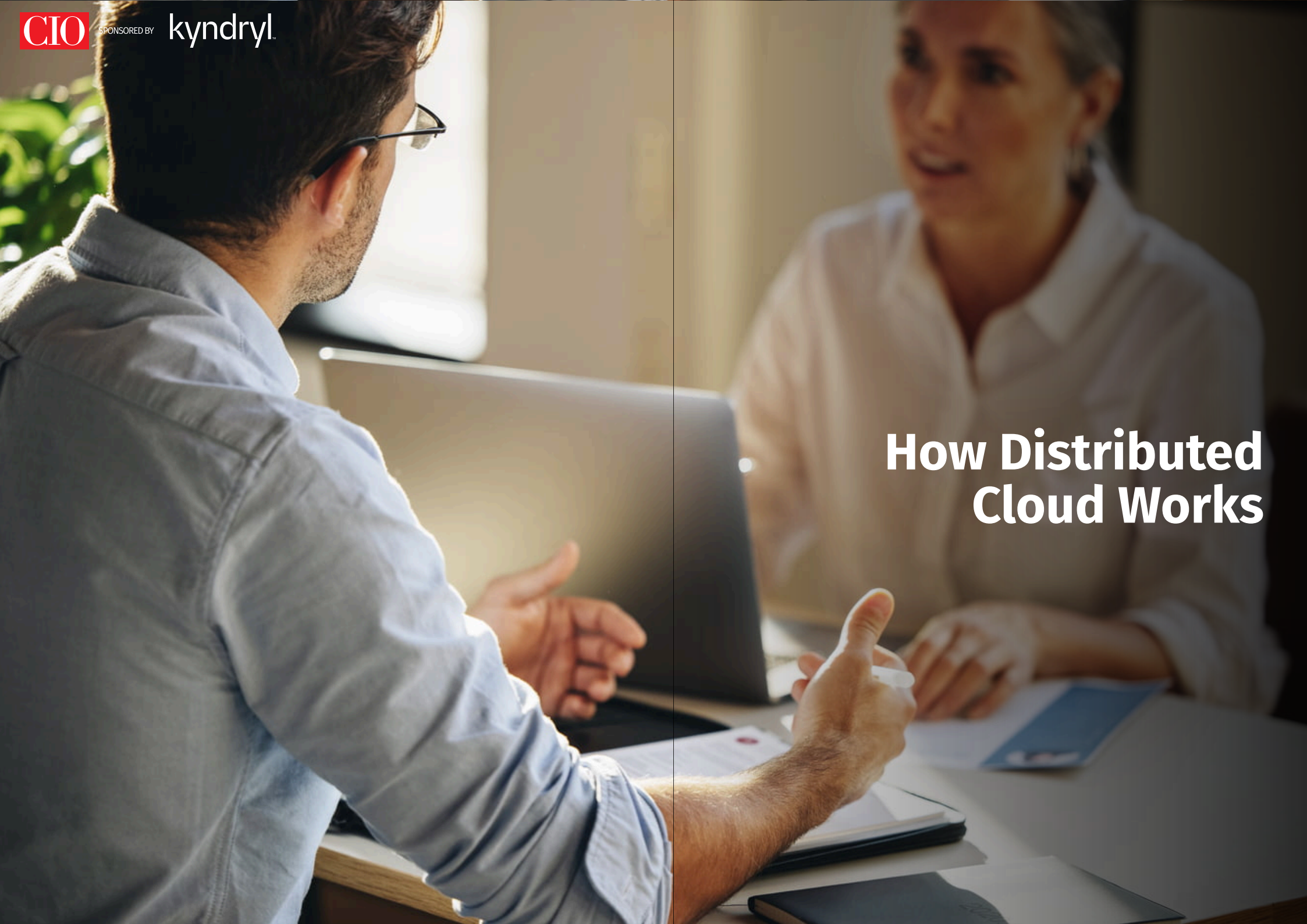


How Distributed Cloud Works

The emerging distributed cloud model delivers cloud services and tools in another public cloud, on-premises in a private cloud, in a colocation facility, or at an edge location.

These distributed microcloud satellites can be centrally managed, as if they were a single cloud, through a common control plane, facilitating operations, updates, governance, security, and reliability across the distributed environment.

"With a distributed cloud operating model, you can manage multiple clouds as one. You can be on-premises as well as at the edge and manage everything through a single pane of glass," explains Kyndryl's Haren. "It doesn't force one deployment model over another and helps accelerate innovation and deliver the promise of edge."

Among the key benefits of distributed cloud:

- **Centralized management of distributed IT assets.** A distributed cloud enables organizations to maximize the value of the edge, taking advantage of lower latency to enable real-time insights without the complexity of managing multiple locations. The model delivers centralized orchestration, monitoring, management, and remediation capabilities without having to tap local resources. There is also more granular control over infrastructure and data, ensuring improved security and performance.

- **End-to-end automation.** Cloud automation capabilities help reduce the number of operational and administrative tasks. A distributed cloud model extends those capabilities to on-premises IT environments, which typically lack such functionality. With greater automation, IT staff members are freed up to focus on higher-value activities and there is less chance of human error.

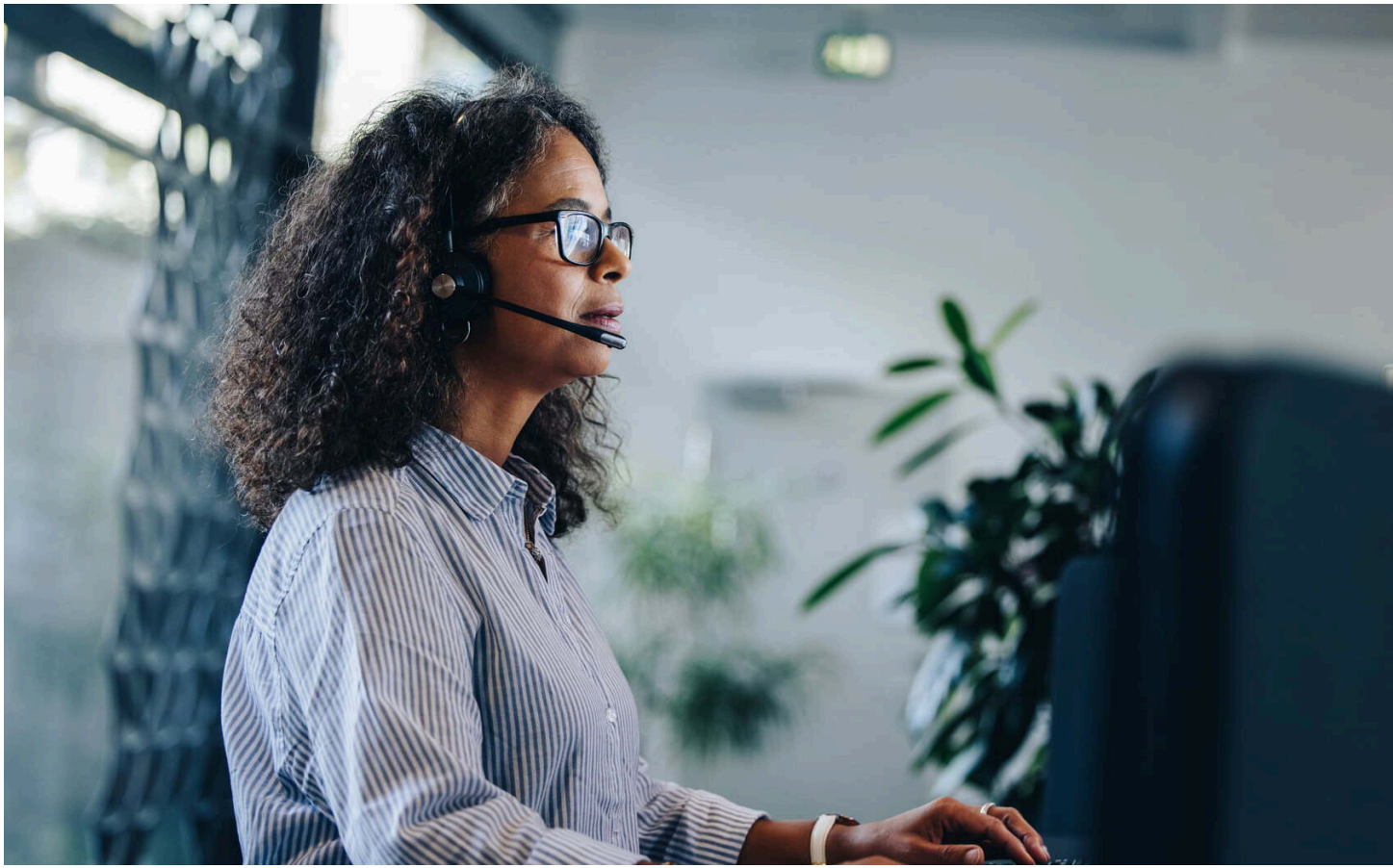
- **A modernization path for legacy infrastructure.** Existing on-premises data center infrastructure or remote office and branch locations can be reimaginined with

modern capabilities as part of a multiphase transition to cloud. Distributed cloud modernizes legacy environments with cloudlike scalability, connectivity, and resilience. It also helps in the transition to an OpEx model and a cloudlike billing structure that charges only for resources used.

- **A purpose-built environment.** Organizations gain greater flexibility to enlist private cloud deployment, shift data and workloads to a public cloud, and take advantage of best-of-breed tools, based on their specific workload requirements and service-level agreements (SLAs). Flexibility and choice without reliance on a single cloud provider's ecosystem or a unitary deployment model are the hallmarks of distributed cloud.

- **Minimization of the skills gap.** IT organizations are no longer burdened by having to learn different tools, user interfaces, and skills to manage and maintain multiple disparate environments.

A distributed cloud enables single-pane-of-glass management and a consistent user interface across the diverse IT landscape. This enables IT organizations to focus on innovation rather than day-to-day operations.



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Distributed Cloud at Work at the Edge

Distributed cloud has an impact on nearly every vertical industry, fueling innovative use cases and creating a newly empowered edge primed to deliver transformative business value through new revenue streams or business models.

At the same time, distributed cloud can help organizations modernize traditional IT environments by removing data silos and enabling data to flow freely, fully delivering on the promise of the edge. Moreover, for organizations in highly regulated industries such as banking and financial services, distributed cloud can create highly performant hybrid cloud environments that maintain compliance with strict data privacy regulations.

Here is a look at how distributed cloud is powering new uses cases across a spectrum of industries:

Manufacturing.

There is a big push among manufacturers to build connected factories to gather real-time machine data and drive insights related to product quality and predictive maintenance. Factory-floor downtime is a huge disruption to production and is costly, whether it means dollars channeled to repair damaged equipment or negative revenue impact when customer orders are delayed or of poor quality. AR sofware deployed at the edge can facilitate real-time maintenance and repair work on pieces of equipment on the factory floor as well as those located out in the field. Research shows that companies deploying AR for real-time maintenance and repair (ARMAR) are seeing a 30% decrease in service time and a 90% boost in service quality.

Clusters deployed at the edge and managed through distributed cloud can power video systems to help improve security and prevent safety hazards while reducing human error. Legacy infrastructure can also be modernized with a distributed cloud to build an enterprise data pipeline from the edge to analytics or business intelligence services to extract operational insights to boost production performance.

Financial sector.

Small remote branch clusters are key for modernizing bank branch offices with new smart-branch technologies such as interactive teller machines, videoconferencing, banker tablets, and service terminals. Larger clusters come into play for virtual desktop infrastructure (VDI) for remote employees and to handle customer-facing applications and databases that might be brought back on-premises due to risk concerns associated with federal compliance regulations. A distributed cloud can also aid in continuous backup

and replication to the cloud for compliance with regulatory requirements and create a path for decoupling legacy, monolithic systems and creating a modern microservices environment.

Retail.

There are many instances where edge computing empowered by a distributed cloud is driving new, innovative use cases. Distributed cloud solutions provide a foundation for enabling smart retail solutions such as smart fitting rooms that enable customers to try on an article of clothing and, with a simple tap on a mirror, see the item in a different color or find a related accessory. As an example, Ralph Lauren is leveraging IoT via smart fitting rooms. They installed connected fitting rooms in their Fifth Avenue flagship store in Manhattan, developed by Oak Labs. According to Digiday, the store saw a 90% engagement rate in just five months—which blew expectations out of the water. Customers want augmented reality as part of their shopping experience, so much so that 40% of customers have indicated that they would be willing to pay more for a product they could experience it through augmented reality. Other emerging solutions include mobile point of sale (POS) devices, shelf automation, self-checkout, smart asset tracking, smart kiosks, and electronic shelf labels that can easily be updated with the latest promotional pricing.

In addition, large clusters can be employed to modernize application development environments with microservices that

connect development and test environments in the cloud with production environments that are on-premises.

Energy and utilities.

Small clusters deployed at remote locations help digitize assets such as oil rigs and natural gas exploration sites, setting the stage for collection of IoT sensor data for predictive maintenance, hazard, and safety management. Scalable clusters in a data center can deliver virtual desktop infrastructure (VDI) capabilities for graphics-intensive use cases such as visualization of exploration data. A distributed cloud can also facilitate real-time backup to support disaster recovery and business resilience initiatives.

Telecommunications.

In addition to gathering IoT data to assist with predictive maintenance and facilitating AR for real-time maintenance and repair applications, distributed cloud can play an enabling role in monitoring drone traffic to prevent damage to 5G infrastructure. Small clusters can provide on-site support of 5G edge locations, serving as a gateway for telemetry data to the cloud as well as for retail storefronts to power POS, inventory management, or digital signage software. Large clusters can optimize workloads waiting to be migrated to the cloud or those running in a hybrid cloud — for example, databases, enterprise-scale virtualization, or custom applications.

“Distributed cloud isn’t just about reducing operational expenses and inefficiencies. There are a great many opportunities to use the edge to drive top-line growth as well,” Haren says.

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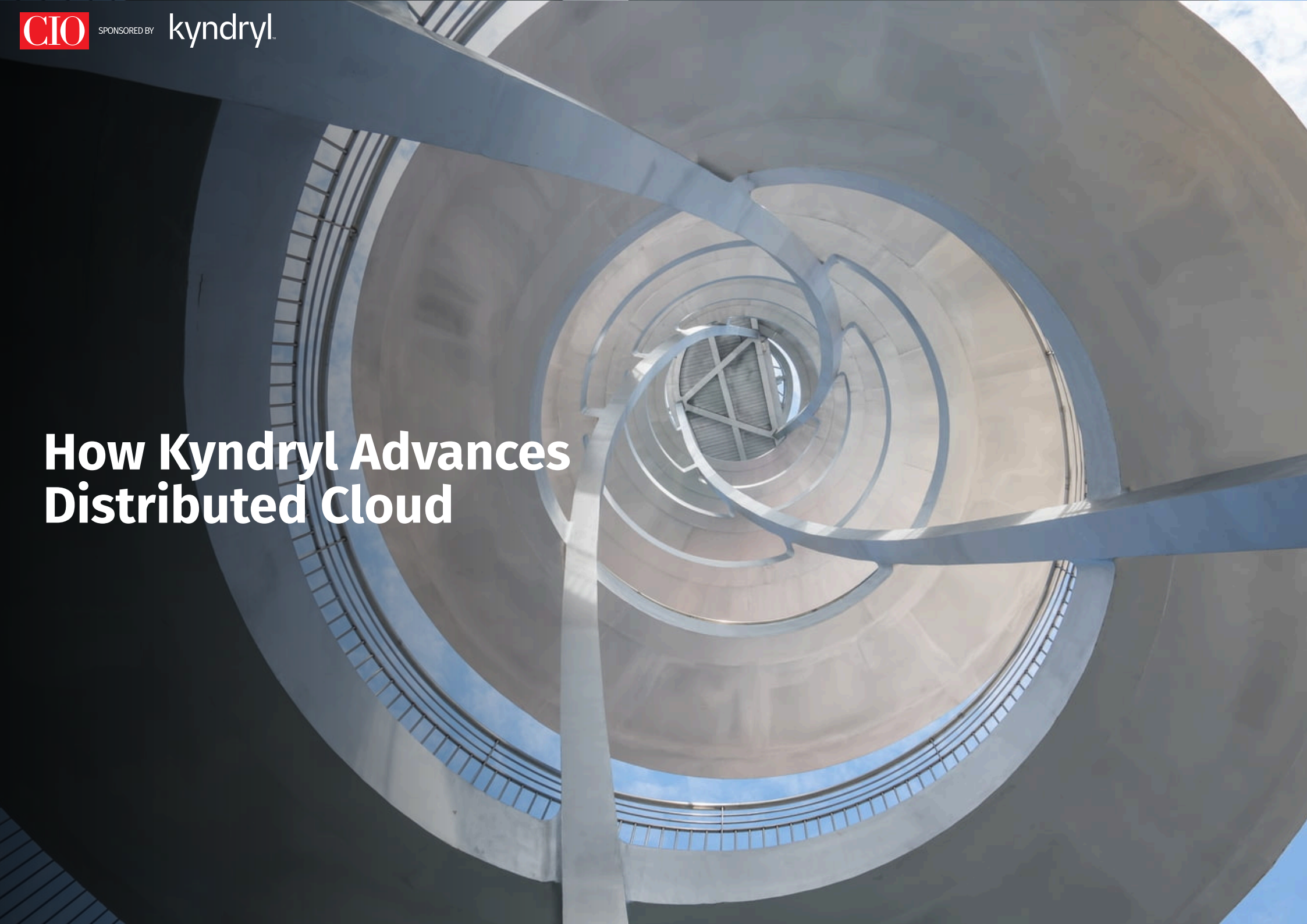


How Kyndryl Advances Distributed Cloud

Kyndryl delivers a full complement of building-block solutions and services to help organizations plan, implement, and manage a distributed cloud operating model.

Kyndryl Distributed Cloud for Microsoft Azure Stack hyperconverged infrastructure (HCI) with Azure Arc is the centerpiece of Kyndryl's distributed cloud portfolio. The offering, created in partnership with Microsoft, Dell, and Lenovo, leverages Dell and Lenovo integrated systems for Azure Stack HCI. The solution is designed to help businesses transform on-premises data centers, remote- and branch-office locations, and edge workloads through fully managed distributed cloud services, high-performance operations, and full-stack life cycle management.

Networking and edge expertise are essential to distributed cloud, and here too, Kyndryl offers a range of expertise, consulting services, and technologies. By provisioning software-defined and 5G-enabled edge services, Kyndryl builds a "core-to-edge" foundation, covering end user device integration, cloud-based application delivery, high-performance security options, and innovative network services. The result is simplifying today's complex IT environments. The network is pivotal across any transformation conversations, the edge and the network are the key enablers for innovation and digitalization, and the edge

Learn how Vodafone and Kyndryl are delivering a joint innovation lab for customers to test Multi-access Edge Compute (MEC) technologies.

MEC technology enables real-time data processing at the network edge, enabling organizations to create low-latency services that aren't possible on today's traditional network infrastructure.

Use cases enabled by MEC include autonomous vehicles, autonomous factory operations, immersive augmented and virtual reality, remote medicine, cloud gaming, and drone transport.

Click *here* to learn more.

helps in achieving greater organizational agility by bringing decision-making closer to the source of data generation.

Kyndryl Private Cloud delivers services for compute, storage, and data center networking, all with the convenience of monthly billing and charges only for the infrastructure consumed. Kyndryl's Public Cloud Services practice comes into play to help determine which workloads are ripe to deploy in public cloud. Kyndryl Applications, Data, and Artificial Intelligence Services can be tapped to transform and modernize legacy platforms and architecture by utilizing full-stack services to enable an enterprise data fabric, with Kyndryl managing the complex data platforms to ensure that they are reliable, secure, and cost-effective.

Kyndryl Consult services are critical for accelerating digital transformation with distributed cloud. Kyndryl consultants align business outcomes with the proper technologies, underpinned by decades of mission-critical experience across industries,

> **"We are building best-in-class digital distribution platforms to provide flexibility and ease of work for customers' workforce and end users to meet their growing business demands.**
>
> — Chris McReynolds, VP, Global Offerings, Network & Edge Practice, Kyndryl

along with a shared culture of continuous improvement and modernization. In addition, Kyndryl subject-matter experts are steeped in detailed design processes, world-class project management methodologies, and vertical industry best practices to ensure success with distributed cloud across the widest range of environments and industries. Kyndryl also closely collaborates with partners such as Microsoft that offer ready-to-use reference architectures. These configurations are based on partner

recommentations and best practices and ensure shorter time to value.

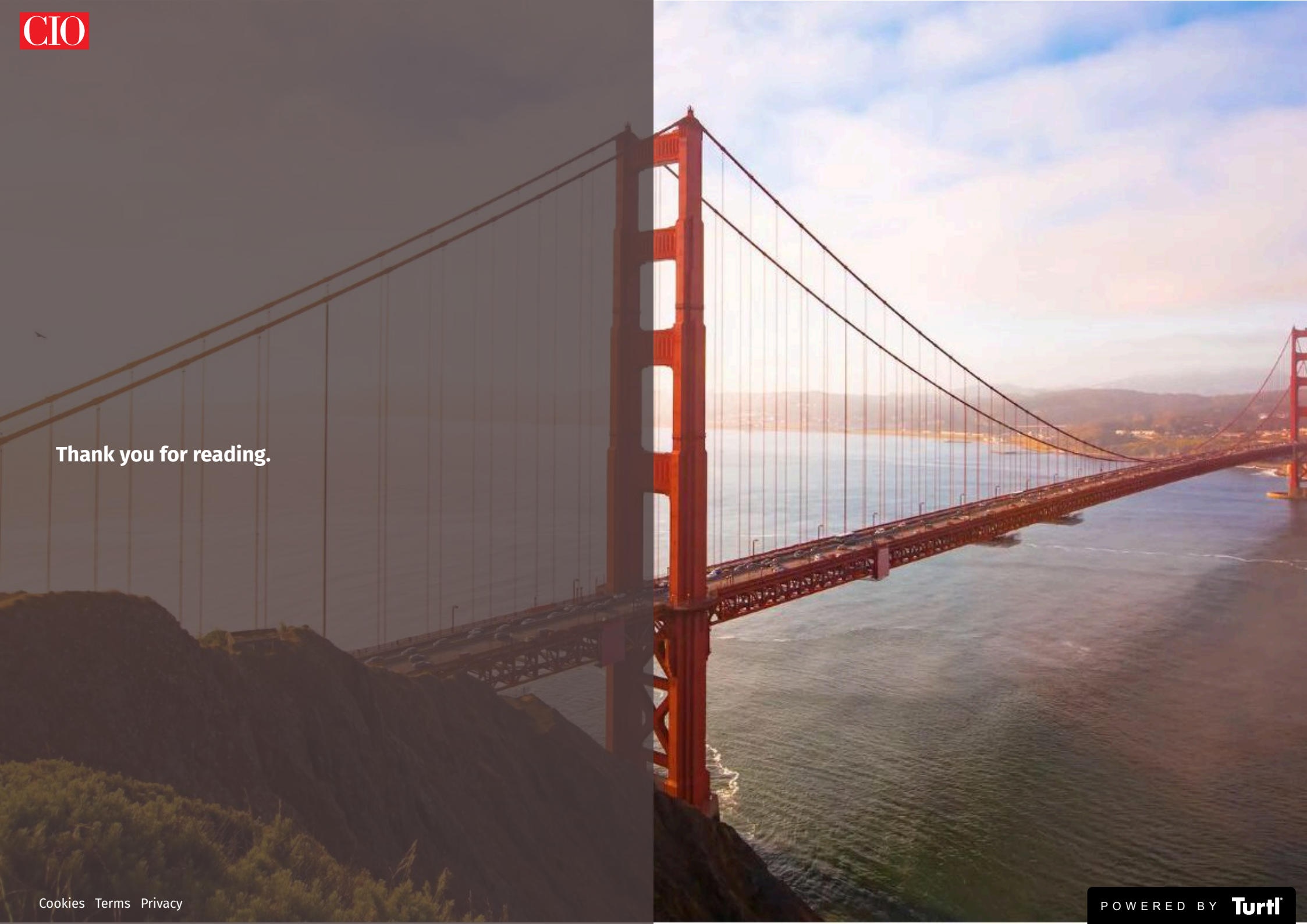
The Kyndryl Bridge open integation platform leverages decades of expertise, operational data patterns, and IP to generate actionable insights that simplify the management of increasingly complex IT estates, helping connect previously disparate tools, workflows, and processes. Kyndryl Vital, an open, collaborative cocreation experience, is designed to help organizations create next-generation technology systems built with human-centered design principles.

To complete the picture, Kyndryl Digital Workplace delivers modern device management, virtual desktop services, workplace collaboration services, contact-center-as-a-service capabilities, and IT support.

The bottom line

All signs point to a hybrid, multicloud future, full of promise but fraught with a lot of IT complexity along the way. Distributed cloud can streamline the multicloud experience, creating flexibility, enabling choice, and providing a tiered path to IT modernization, all while empowering innovation designed to secure a competitive edge.

Visit our website to connect with an expert or schedule a consultation on Kyndryl's distributed cloud offerings and services.



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Thank you for reading.