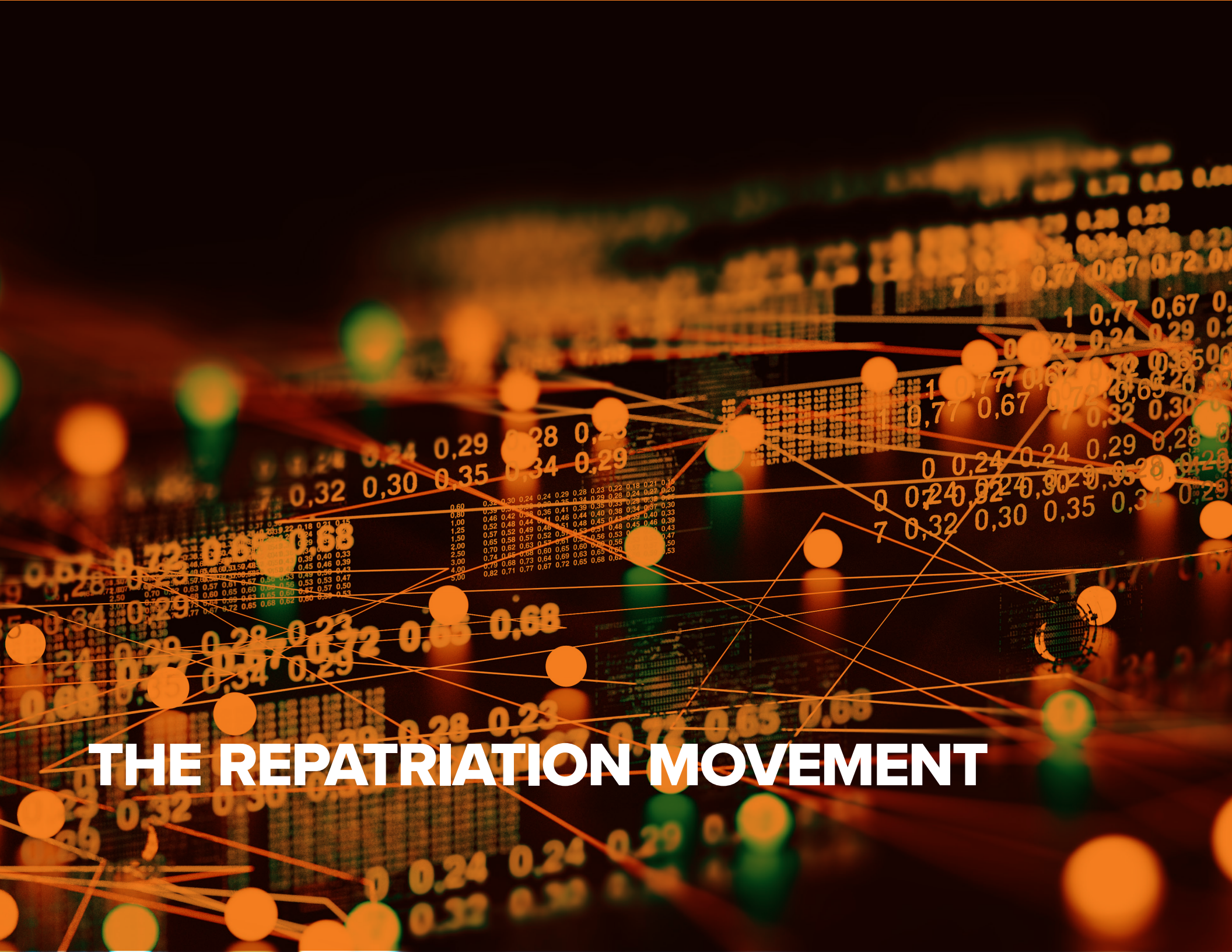


STRATEGIES FOR REPATRIATING YOUR ESSENTIAL DATA

Achieve Cloud Benefits in Your Own Data Center
with a Hybrid Cloud Approach



Quantum



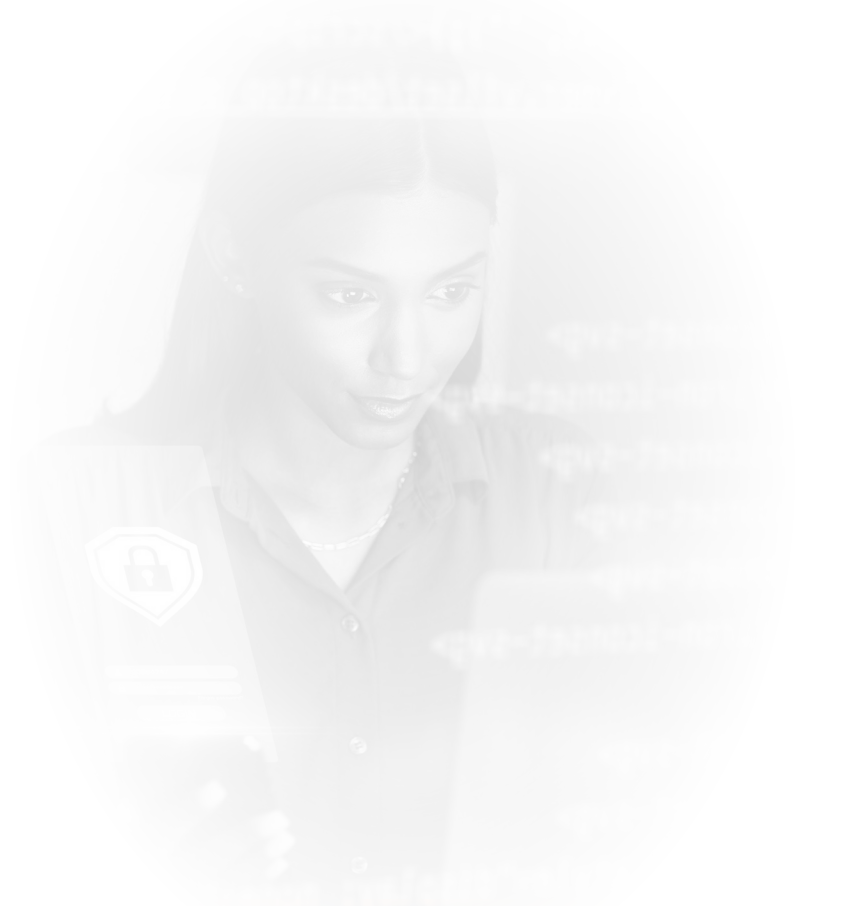
THE REPATRIATION MOVEMENT

Organizations are choosing to shift some of their data sets back from public clouds as part of a revamped infrastructure strategy.

The flexibility, scalability, and capital expenditure savings of cloud services have led many organizations to choose the public cloud for key technology resources. Some organizations have built their business entirely with public cloud services, while others have migrated data from their own data centers to cloud environments.

But today, **a growing number of organizations are rethinking their cloud strategies and shifting to a more hybrid cloud approach.** These organizations are contemplating repatriation—moving some of their apps or data sets back from public clouds into environments they can more tightly manage and control.

This trend is not restricted to businesses of any particular size, but large enterprises, in particular, are exploring the possible benefits of repatriation, shifting some workloads and data to their on-premises data center environments or to colocation and hosting centers.

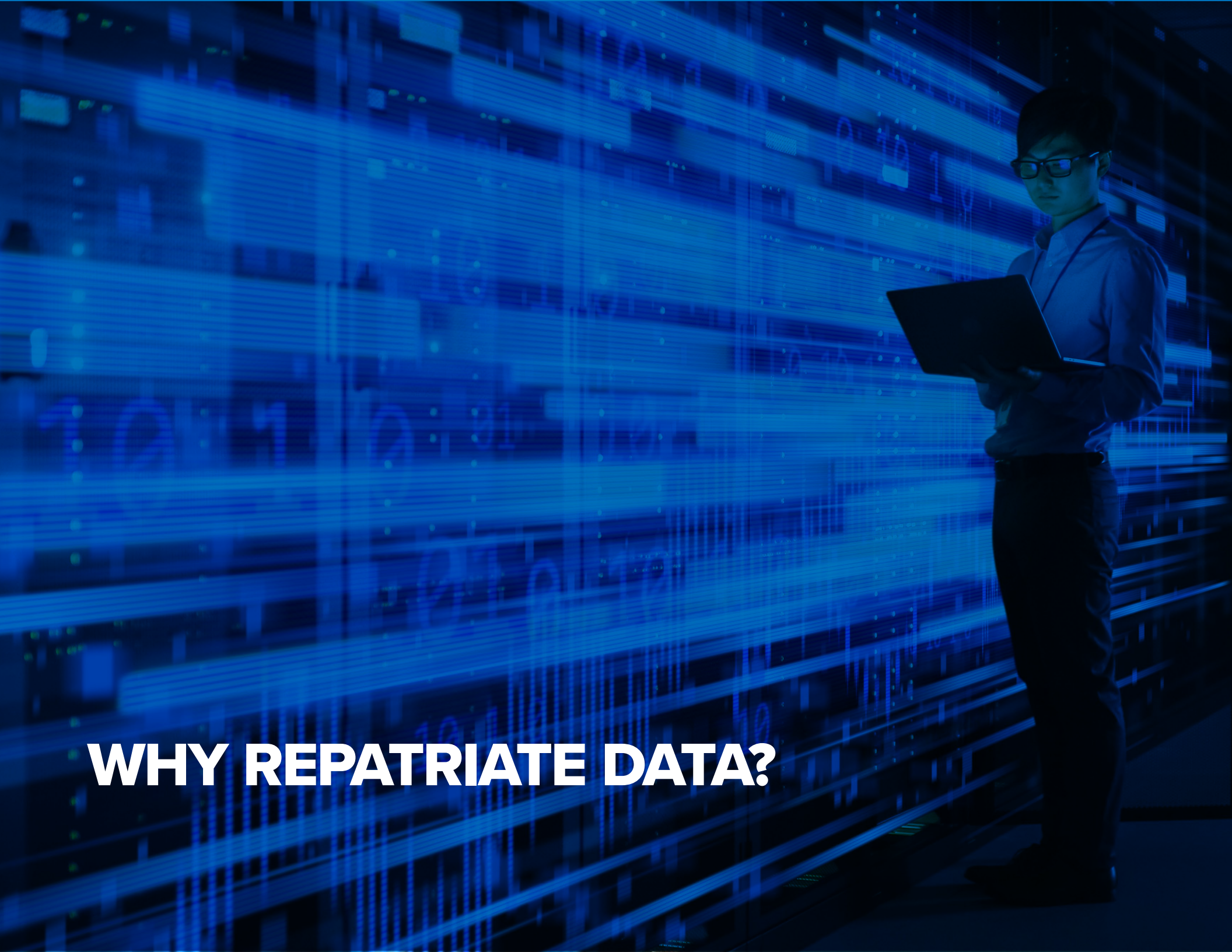




Reasons Why Infrastructure Strategies Are Shifting

There are multiple reasons why organizations are considering this change in strategy. Some need to comply with **data sovereignty laws or exert greater control over security**. Others are hoping to **reduce costs or improve spending predictability**: In particular, costs can become an issue when organizations experience substantial data growth and realize that they need to retain data indefinitely, from years to decades. **Technical challenges with cloud tools or architectures** can also spur a change.

Still, these organizations often want the best of both worlds. They want to continue to experience cloud benefits while also addressing specific business, technical, or legal requirements.



WHY REPATRIATE DATA?

There are multiple factors driving organizations to bring data back in-house.

Approximately 60 percent of all data that enterprises store is infrequently accessed. But that data still might need to be used at some point in the future. Inactive or “cold” data might range from corporate legal, financial, or HR records, old, archived project files, and increasingly, ever-growing data sets from a wide array of digital sensors like cameras, satellites, and medical imaging systems. In many cases, organizations are required by law to maintain certain types of data for years or even decades. In other cases, the data is considered so valuable that it is ostensibly to be retained forever.

Organizations that are acquiring data from digital sources are uniquely challenged by the massive volume of incoming data and also its potential value. They need to preserve this data for the long term, not only to comply with laws but also to potentially leverage that data in the future. With the rise of AI, organizations need to retain most if not all data to fuel these new applications and to derive the most competitive advantage that lies in their unique data.

For more than a decade, many organizations have chosen to store inactive data in public clouds. With a public cloud, they were able to ship data to a distant data center and forget about it until it was needed. Today, however, there are several reasons why organizations are repatriating this data from public cloud environments.

SECURITY

Some organizations repatriate data so they can increase control over security. In general, these organizations recognize that public cloud services offer robust security capabilities. In fact, public cloud providers spend millions of dollars ensuring that their infrastructure is secure—and they offer advanced tools to protect data in their environment.

But to safeguard your data, your in-house team must use those cloud-based security tools. And your team might not have the resources or skills to operate them. Repatriating data enables you to select familiar, preferred tools and configure them to meet your requirements.

DATA SOVEREIGNTY

Numerous countries have enacted laws designed to protect their citizens' data. Data sovereignty laws assert that data created in a particular geographic location is subject to the laws of that location. Data localization laws, which can function alongside data sovereignty laws, mandate that organizations must store and process data in a specific geographic location—like within the borders of the country where that data was created.

Data sovereignty and localization laws have forced many organizations to alter their cloud strategy. While public cloud providers might offer several data center locations around the world, they might not have a location in one or more of the countries where an organization is doing business. Your organization might need to stand up your own data center, or use a colocation or hosting environment, to ensure that you are keeping data in the location prescribed by law.

SPENDING PREDICTABILITY

Many organizations that have migrated apps or data to the cloud have at some point been surprised by cloud bills that are higher than anticipated. It can be very difficult to precisely determine cloud costs in advance, especially since application and data usage can fluctuate over time due to expensive access and egress charges that can easily double monthly cloud storage bills.

The unpredictability of cloud spending is a key reason that many organizations move forward with repatriation. Bringing data back from your public cloud environment, or at least, limiting cloud storage growth for the future, can help you more easily predict and control ongoing spending.

COST SAVINGS

Many organizations initially moved data to the public cloud with the goal of saving money. There's no doubt that using public clouds can help eliminate capital expenditures: You trade large, upfront costs for lower payments that are spread out over months and years. But as data growth is accelerating across a variety of sources, the desire to retain data is lengthening into decades, and as hardware costs continue to fall, it can be far less expensive for organizations to invest in on-premises private storage cloud solutions rather than to pay ongoing cloud service costs.



Storing data on premises can eliminate additional fees associated with cloud services. For example, by adopting a hybrid approach, you can avoid the transaction and egress fees you pay to cloud providers when you need to access your data.

TECHNICAL CHALLENGES

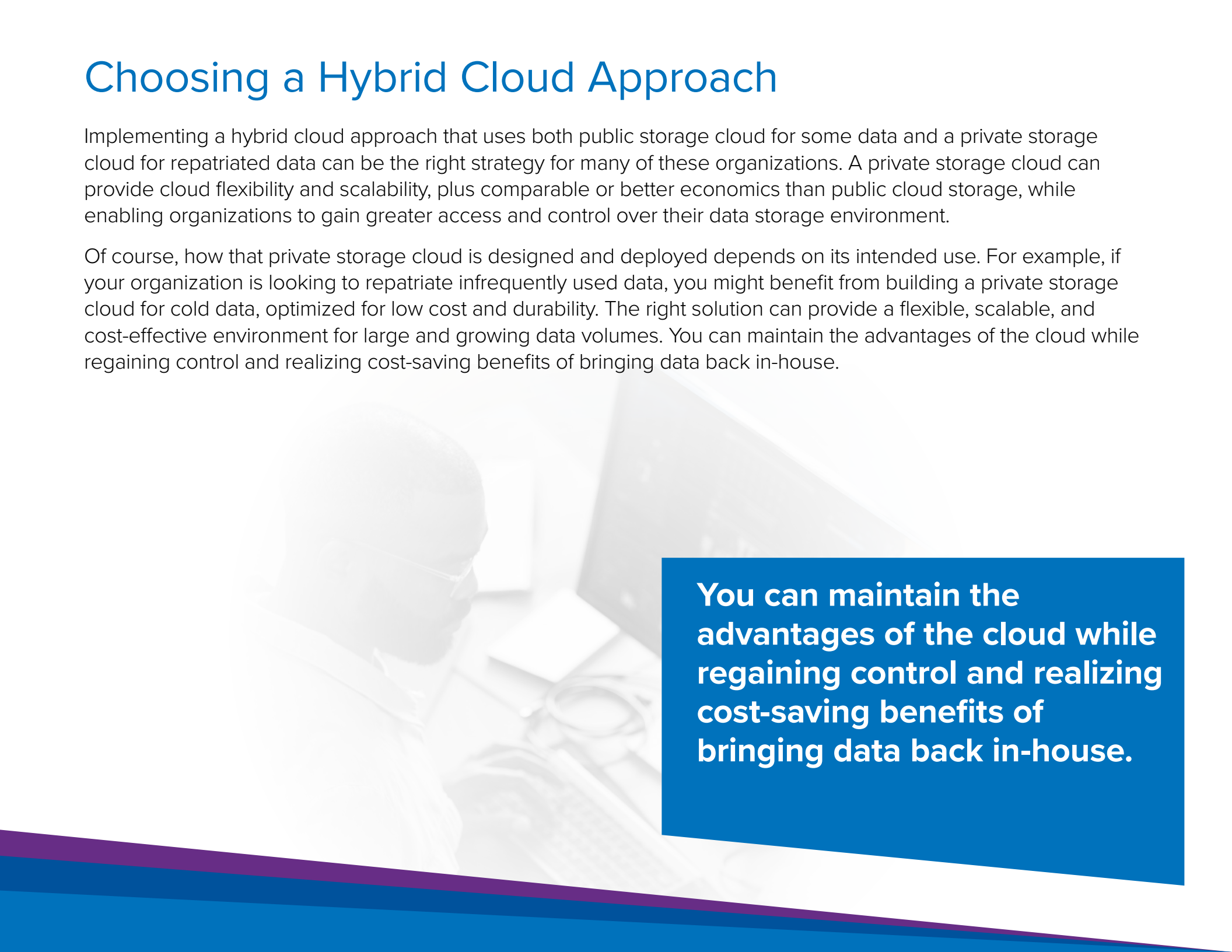
Some organizations encounter technical challenges that drive them to repatriate apps or data. For instance, to make the most of public cloud services, your apps must be architected for cloud environments: You need cloud-native apps that are designed to use data residing in the cloud.

If you have traditional apps running in your data center but drawing from data stored in the cloud, you might incur egress fees. It might be more cost effective to repatriate data than to continuously pull terabytes of data down from the cloud to support your existing apps.

Choosing a Hybrid Cloud Approach

Implementing a hybrid cloud approach that uses both public storage cloud for some data and a private storage cloud for repatriated data can be the right strategy for many of these organizations. A private storage cloud can provide cloud flexibility and scalability, plus comparable or better economics than public cloud storage, while enabling organizations to gain greater access and control over their data storage environment.

Of course, how that private storage cloud is designed and deployed depends on its intended use. For example, if your organization is looking to repatriate infrequently used data, you might benefit from building a private storage cloud for cold data, optimized for low cost and durability. The right solution can provide a flexible, scalable, and cost-effective environment for large and growing data volumes. You can maintain the advantages of the cloud while regaining control and realizing cost-saving benefits of bringing data back in-house.

A background image showing a person in profile, wearing glasses and a light-colored shirt, working at a desk with a computer monitor and keyboard. A blue callout box is overlaid on the right side of the image.

You can maintain the advantages of the cloud while regaining control and realizing cost-saving benefits of bringing data back in-house.



**WHERE SHOULD REPATRIATED
DATA RESIDE?**

Building a private storage cloud with active and cold storage tiers – the right balance of cloud flexibility, scalability, and cost effectiveness.

Deciding where to put your data. Once you've made the decision to adopt a hybrid cloud approach and repatriate some of your data, you need to decide where to put that data. You could deploy a storage environment in your own data center. Or you could use a colocation or hosting center, which might be a good approach if you need to comply with data sovereignty laws and do not have an existing data center in a particular location.

Deciding what type of storage architecture to use. You'll also need to decide what type of storage architecture to use. After experiencing the flexibility and scalability of the cloud, few organizations are willing to revert to traditional network-attached or direct-attached storage. Many organizations choose to build their own flexible private storage cloud based on object storage technologies.

MULTI-TIERED OBJECT STORAGE

Building a private storage cloud with object storage can provide a highly flexible, scalable, and cost-effective architecture for large volumes of data. A private storage cloud based on a mature, enterprise-proven architecture can provide many of the same advantages offered by public cloud services. For example, it could enable applications to consume data through REST interfaces; offer S3 access to objects; and provide a single-namespace, scale-out architecture. Modern object storage solutions also have geospreading and replication features to protect data offsite, either by distributing data across multiple sites, or by replicating to a partner site or to the public cloud as a hybrid solution.

The best private storage cloud solutions would also employ multiple tiers of storage at different price points so you can optimize costs and performance throughout the data lifecycle. Storing your cold, inactive data on solid-state or hard disk resources dramatically increases your total cost of ownership. But if you incorporate a tier designed specifically for cold storage, you can drive down costs dramatically.

OPTIMIZING COLD STORAGE FOR PERFORMANCE, EFFICIENCY, AND DURABILITY

When hyperscalers build public storage clouds, they embrace multiple storage tiers. Why? Offering multiple storage tiers offers the right balance of performance, cost, durability, sustainability, and security for storing both active and infrequently accessed data. In-house storage clouds must also be optimized for both active and cold data. While scale-out architectures are well understood for active data access, cold storage architectures are less well understood. Cold storage must be optimized across multiple design targets.

Performance:

A cold storage tier does not need to provide the same level of performance as hot or warm tiers, which would likely use flash and disk-based storage, respectively. Users can generally wait several seconds or even minutes to retrieve archived files. Cold storage tiers provide sufficient performance to meet these user expectations for accessing cold data.

Cost:

Cold storage tiers use and optimize low-cost storage mediums, which currently means tape. Tape is expected to continue as the industry's lowest cost media for the foreseeable future, even as the cost of disk-based storage declines and other cold storage technologies mature.

Durability:

Cold storage solutions, like tape, are designed to maintain data integrity over long periods of time. With the right solutions, your data will be accessible for years and decades to come.

Sustainability:

Cold storage solutions must minimize power usage, especially for the massive amounts of data that is not being accessed.

Longevity:

Cold storage solutions must embrace an evolutionary storage architecture that can seamlessly adopt and decommission across multiple generations of platforms and technologies for years and decades to come.

Why is object storage on tape the right choice for cold storage solutions?

- **5x** less expensive
- **5x** lower carbon footprint
- **20x** power savings



DEFINING THE OPTIMAL SOLUTION

The best object storage solutions for repatriated data maximize cost savings across active and cold storage tiers.

How can you make the most of object storage for cold storage? There are several solutions that enable you to implement object storage with cold storage, but some have important tradeoffs.

PERFORMANCE WITHOUT EXCESSIVE CAPACITY

Object storage solutions targeting cold data typically store incoming objects on a disk cache and then write those objects to tape. Some solutions write each object, in its entirety, to a single tape. This approach is great for performance. The disadvantage is that protecting this data can require a lot of capacity. To fully protect a 100-GB object, you might need to write copies of the data, i.e. 300 or 400 GB, to multiple tapes.

The right solution will enable you to gain the performance benefits of writing a single object to a single tape—without requiring you to write that full object multiple times to protect data. You should be able to achieve suitable performance without losing the cost benefits.

EFFICIENCY WITHOUT NUMEROUS DRIVES

A more sophisticated approach applies erasure encoding to objects, and then spreads erasure-encoded chunks across multiple tapes. This approach is more efficient than storing multiple copies of full objects. But you still need multiple tapes in multiple drives to store data. For example, you might use five tapes in five drives to write erasure-encoded chunks for a single object. Performance cannot effectively scale in this architecture.

The right solution will allow you to **capitalize on the benefits of erasure encoding without requiring you to buy many, relatively expensive drives. You shouldn't have to choose between slow performance and excessive costs.**

OPTIMAL APPLICATIONS PERFORMANCE

Many solutions have a transparency problem. Applications do not know that they are accessing a cold storage tier. They employ an S3 standard-class API, and the application expects data to be retrieved within a particular—relatively short—time frame. A better approach is to use the S3 Glacier API. The Glacier API is designed for cold storage and takes greater latencies into account.

REDUCED MANAGEMENT COMPLEXITY

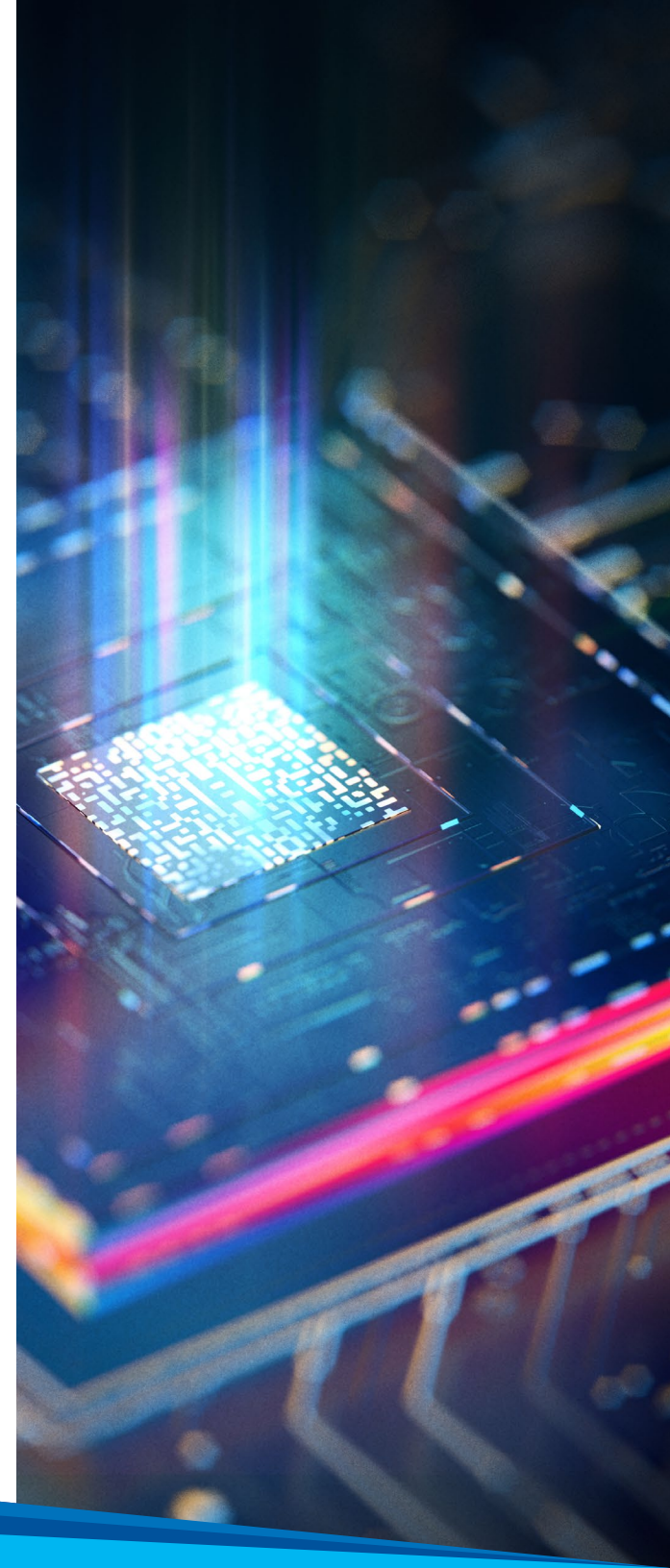
Some solutions are complex to manage. For example, if you are employing one object storage solution for warm data and another object storage solution for cold data, you need to manage both storage systems that your application is using.

Software-only solutions add further management complexity. You would need to build the system, buying a disk tier for the cache, a gateway, and of course a tape library. That means you must purchase from multiple vendors, construct the system yourself, troubleshoot it yourself, and figure out which vendor to call when something breaks.

The best approach is selecting an integrated solution that can support both warm and cold data, while unifying management. That solution would provide all the hardware components and capabilities you need from a single vendor.

“AS-A-SERVICE” OPTION

Few existing solutions are available as a service—but you should have that option. A private storage cloud solution should allow you to offload management if you choose, just as you had an option for managed services with the public cloud.



A man with a beard and glasses is kneeling in a server room, working on a laptop. He is holding a smartphone in his right hand. The room is filled with server racks and a dense network of white cables. The entire image has a green color overlay.

BUILDING ON QUANTUM ACTIVESCALE

Quantum ActiveScale® helps deliver cloud benefits while maximizing the value of object storage using active and cold storage classes.

The Quantum ActiveScale solution provides a flexible, durable, and extremely low-cost storage solution for both active and inactive, cold data. It enables you to combine the advantages of cloud services across multiple storage classes—all within your own data center, a colocation facility, or a hosted environment.

UNIFIED ARCHITECTURE

ActiveScale is the only object storage system that has been built for both active and inactive data. It has an active storage class based on solid state and hard disk technologies that is accessed with S3 standard-class APIs plus a cold storage class accessed with S3 Glacier-class APIs, which help optimize app performance for data residing on tape. You can scale both active and cold tiers seamlessly as your data volumes grow. And you can minimize complexity by implementing this single, integrated object storage solution from a single vendor.

FLEXIBLE DEPLOYMENT

ActiveScale gives you the flexibility to store your data wherever you need to. You can use ActiveScale on-premises or host it in a colocation or hosting center. Quantum also offers a fully managed service where Quantum will deploy, run, and maintain the system and you just pay periodically on a monthly, quarterly, or an annual basis.

AVAILABILITY AND SERVICEABILITY

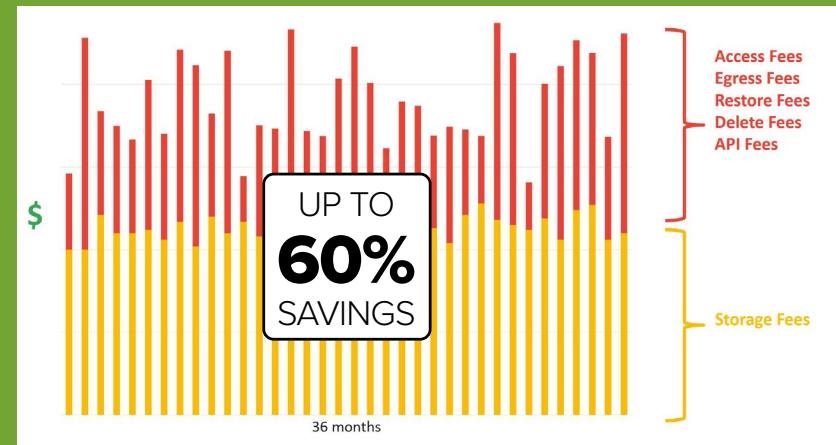
ActiveScale provides performance and availability using its RAIL (redundant array of independent libraries) architecture. RAIL uses multiple libraries working in parallel to improve performance. This scale-out architecture enables you to add resources in a modular fashion, even across multiple geographies. When combined with two-dimensional (2D) erasure encoding, RAIL enhances data durability and availability by spreading data across numerous libraries.

PERFORMANCE AND DURABILITY

ActiveScale enhances data durability with patented 2D erasure coding. As cold data comes through the Glacier API, ActiveScale applies erasure encoding to that data and then optimally streams it to an individual tape, then distributes object and parity information across multiple tapes to maximize data availability and durability.

You can recover individual objects from a single tape, which provides high performance. If necessary, you can also recover objects using the cross-tape parity from other tapes. This approach provides greater durability than multicopy approaches while also maximizing storage efficiency.

Reduce Your Cloud Storage Costs Up To 60% With ActiveScale



Overcome the unpredictable costs and limited data accessibility of public cloud storage. Quantum ActiveScale helps you achieve up to 60% savings with fast, easy access to all your data.

The background is a dark blue gradient. It features several faint, semi-transparent elements: a candlestick chart with blue and white bars, a green curved line representing a trend or wave, and a dotted line with small circles. On the right side, there is a vertical column of binary code (0s and 1s).

BRING DATA HOME WITH QUANTUM

There are many important reasons why organizations are implementing hybrid cloud strategies and repatriating some of their data sets from public cloud services—from the need to comply with data sovereignty laws and better control security to the desire to reduce costs and decrease complexity. Still, few organizations want to return to the world before cloud flexibility and scalability. For many data repatriation initiatives, building a private storage cloud with active and cold storage classes will offer the best approach to retaining cloud benefits in a more controlled environment.

ActiveScale is the only object storage solution architected for both active and cold data. It capitalizes on the cost-effective advantages of multiple storage classes plus the flexibility and scalability of object storage. With ActiveScale, you maintain the benefits of the cloud while bringing essential data back in-house.

Ready to Learn More?

For more information about Quantum ActiveScale, visit: www.quantum.com/object-storage

Quantum.

Quantum technology, software, and services provide the solutions that today's organizations need to make video and other unstructured data smarter – so their data works for them and not the other way around. With over 40 years of innovation, Quantum's end-to-end platform is uniquely equipped to orchestrate, protect, and enrich data across its lifecycle, providing enhanced intelligence and actionable insights. Leading organizations in cloud services, entertainment, government, research, education, transportation, and enterprise IT trust Quantum to bring their data to life, because data makes life better, safer, and smarter. Quantum is listed on Nasdaq (QMCO) and the Russell 2000® Index. For more information visit www.quantum.com.

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