

A photograph of two men in a server room. The man on the left, with dark skin and glasses, is wearing a light blue button-down shirt and a lanyard. The man on the right, with light skin and glasses, is wearing a dark grey long-sleeved shirt. They are both looking at a tablet held by the man on the right. The background shows rows of server racks with many colorful cables (orange, red, blue, green) plugged into them. The lighting is dim with blue and purple hues from the server environment.

Embracing hybrid multicloud

Storage edition



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A hybrid multicloud world

The role of data has changed. Businesses across the globe are continuing to see an exponential increase in the vast amounts of data they produce. The agility with which they use, maximize and optimize their oceans of data will continue to play a pivotal role in their long-term success.

For today's enterprise business, hybrid multicloud is a reality. You are beyond the decision to implement a multicloud IT infrastructure strategy. Now the most critical questions you can ask relate to aligning your hybrid multicloud infrastructure with business priorities:

- How well do you understand and control your IT infrastructure, including on and off premises?
- How can you make adjustments easily and quickly to speed up business agility?
- How confident are you that you are taking full advantage of all multicloud resources?
- How can you lower IT costs and increase efficiencies so you can dedicate more resources to innovation?

This guide covers the importance of data storage within a hybrid multicloud environment. Learn why organizations are adopting multicloud architectures. Explore an array of multicloud storage infrastructure options available and see how embracing multicloud storage solutions can help you solve your IT and business challenges.



Data storage solutions will play a powerful role in your overall multicloud environment.



Why storage for hybrid multicloud?

Journey to cloud

The next generation of cloud will center around multicloud environments, spanning private, public and hybrid cloud. An optimized hybrid multicloud storage solution will support the security, orchestration, and management needed to integrate, extend and automate a client's environment.

Why hybrid multicloud?

The move to a hybrid multicloud environment is driven by the need to modernize and transform the way IT interfaces with and supports the entire enterprise and its business initiatives. The changing economics of data as insight are transforming how core and new business applications are stored, shared and developed across an organization.

A hybrid multicloud environment enables the movement and collaboration needed to leverage business data and applications across all areas of the business. Many businesses are adopting hybrid multicloud to improve overall agility and control costs.

According to research conducted by the IBM Institute of Business Value (IBV) surveying over 1,000 executives in 19 industries headquartered in 20 countries, 85% of companies were already operating some workloads in a multicloud environment, and by 2021, 98% of organizations expect to be embracing multicloud architectures.¹

The same study found that organizations that are already using multiple clouds regularly to deliver one or more business functions outperformed their counterparts on several key metrics, including revenue growth and profitability.¹

It's clear that hybrid multicloud infrastructure presents many opportunities to help organizations maintain a competitive advantage. Let's take a look at some of the business and IT challenges that drive modern organizations to consider hybrid multicloud architectures.

By 2021,

98%

of organizations expect to be embracing multicloud architectures¹



Challenge 1: Growth of data

It's very likely that one of the most important business challenges your organization faces right now is the rapid growth of data. And while next-generation applications are accelerating the pace of data growth, for many organizations, IT budgets are not growing at the same pace. Much of the information generated by business activities has come from (1) customer transactions, and (2) supporting internal activities such as Customer Relationship Management (CRM) data, sales records and employee information in HR/ERP systems.

Today, it's expected that you collect both traditional and new data streaming in from traditional as well as new sources like the Internet of Things (IoT). In order to store, manage, protect and derive all the value from all your data types—structured and unstructured—you'll need to create a hybrid approach that combines the benefits of on-premises and cloud storage.

Challenge 2: Cybersecurity and resilience

A modern storage solution needs to keep your data available while protecting against both traditional and modern challenges—from power outages to natural disasters to cyberattacks—and do so cost effectively.

To protect against threats, you may be considering completely replacing your infrastructure. But replacing your entire infrastructure can be both expensive and potentially disruptive to customers, partners and staff. Modern storage solutions should make what you have more resilient to the dangers old and new while maintaining your mission-critical systems.

Challenge 3: Modern application development/ containerization

Data analytics applications and AI have recently taken center stage as business multipliers for the modern enterprise. Analytics applications will often need to draw from both on-premises and cloud resources. You can leverage container technology for these analytics applications for portability, along with the use of microservices to simplify and speed development and updates.

How does a hybrid multicloud environment differ from hybrid, private, public, and on-premises?

Understanding cloud environments and making decisions about multicloud management can be complex. Many questions arise, such as: What resides on premises? What lives in a private cloud vs. public cloud? Why did your IT team deploy some applications in those respective environments and was it the right decision?

With that in mind, let's first take a moment to explore the different types of environments.

On premises

On premises refers to compute and storage resources physically located on a company's own property. With on-premises infrastructure, the responsibility of running, maintaining and supporting storage backup and recovery is maintained by the onsite owner.

Private cloud

A private cloud is a cloud computing environment in which access is limited to members of an enterprise and its partner networks. Many private clouds exist on premises, but you can also run a private cloud on infrastructure from a public cloud provider.

Public cloud

In a public cloud environment, access to standardized resources such as infrastructure, multi-tenant hardware, and services, is available to subscribers on a pay-per-use basis. In other words you're renting your own slice of an infrastructure that is available to the general public. Public cloud services can be provided at no cost, as a subscription or as a pay-as-you-go model.

Hybrid cloud

A hybrid cloud combines resources from private cloud, public cloud and traditional environments, regardless of whether they are located on premises or off premises. With hybrid cloud, businesses can take advantage of the agility and cost-effectiveness of off-premises, third-party resources without exposing all applications and data beyond the corporate intranet.

Hybrid multicloud

When your data is moving across multiple public clouds and your private cloud, your architecture is no longer just hybrid cloud—it's hybrid multicloud. Hybrid multicloud environments utilize multiple public clouds from several vendors, in addition to private cloud and traditional resources, all of which are interconnected and work together to avoid data silos. If your hybrid multicloud architecture is optimized properly, you can quickly access reliable and accurate data whether it resides on premises or off premises.



The benefits of consistent storage for your hybrid multicloud environment

No one provider can be everything to everyone. That's why a hybrid approach can help you manage your entire storage environment whether your data is on premises or in multiple clouds. A hybrid multicloud storage approach can optimize the movement, placement and management of your data. Here are the greatest potential benefits of having a consistent storage strategy across your hybrid multicloud environment:

1. Greater value from data

Your hybrid multicloud storage architecture can be a powerful tool to help you handle the massive data flows from your software and solutions and transform them into value for your business and your customers.

Storage capacity

When it comes to data economics, the first challenge that your IT team will face is simply storing all your data. More data requires more storage capacity. So, where do you store it?

Storage capacity in the public cloud is effectively unlimited. When you use public cloud resources you don't buy the actual storage devices, you don't supply them with power and cooling, and you don't repair and replace them. You just pay a monthly fee for what you use. Leveraging the power of your hybrid multicloud storage solution, you can buy more storage capacity as you need it. And, you can negotiate with cloud providers to get the levels of performance, security and other factors that match your business requirements and your budget.

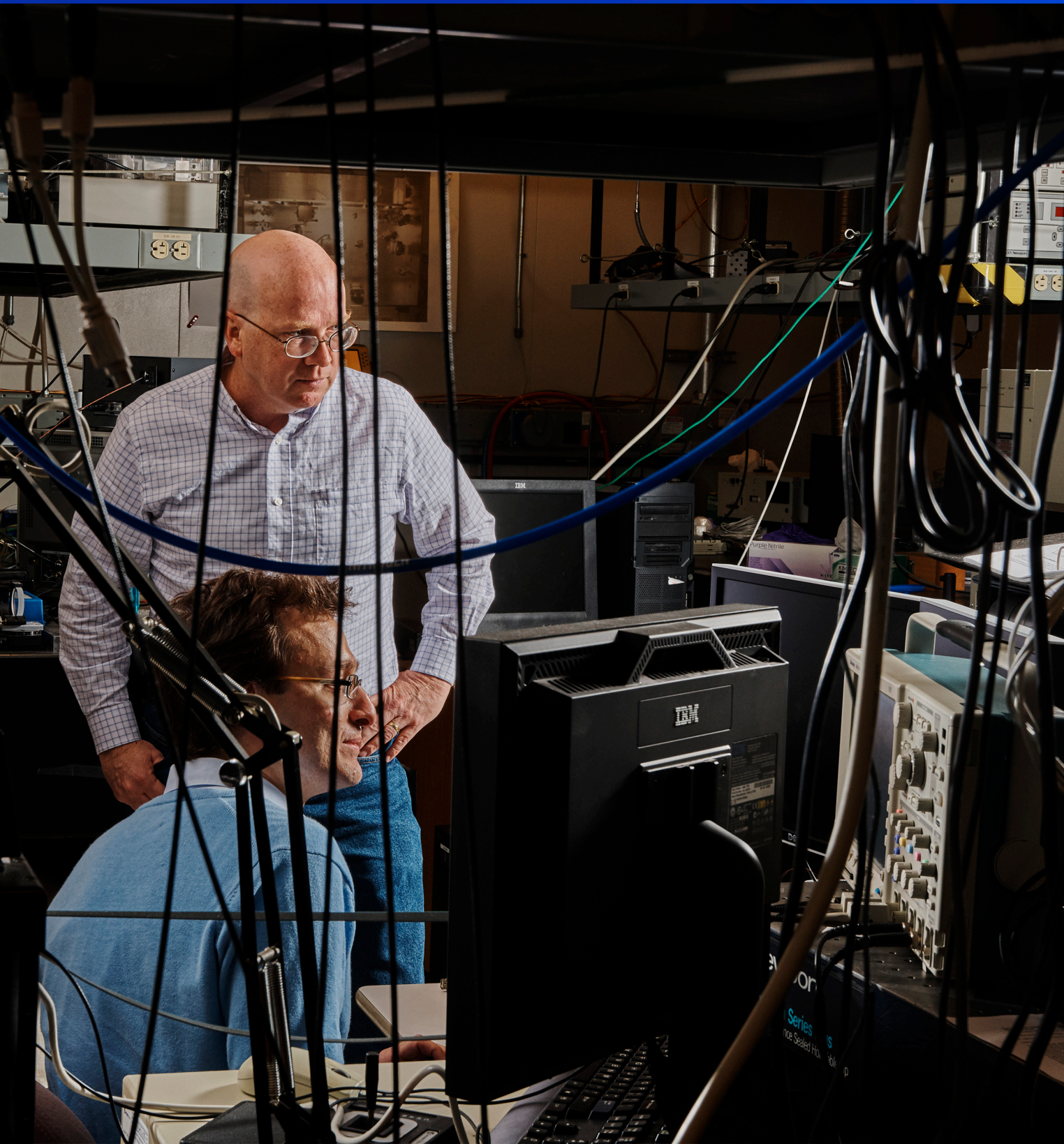
It's important to note that these benefits will only integrate with your storage solution if you have implemented the proper hybrid multicloud management tools.

Data mobility and agility

Better data sharing and movement can mean better business. There are all kinds of reasons you will need to move data without disruption among storage systems—lease expirations, performance optimization, technology or vendor changes, and tiering to place the right data on the right hardware just to name a few. If your multicloud storage solution has the latest technologies and capabilities, you can quickly, perhaps even automatically, move data sets between cloud providers to improve your own data economics.

Will your data architecture accommodate new business intelligence tools without major overhauls and upgrades? The right multicloud storage solution with a supporting software foundation can facilitate and accelerate enterprise-wide agility. One administrator can see where all your data assets are located, as well as their status. You can give permissions, or you can establish system policies that limit or facilitate data access anywhere, anytime. Your corporate private cloud can integrate transparently with multiple public cloud resources to create separate data lakes from your overall corporate data ocean. Those lakes can then become the data sources for your business intelligence, cybersecurity or application development solutions.





Performance

Finally, different applications with different business use cases have different performance requirements. Some need to run as fast as possible while others can work at a more leisurely pace. As noted earlier, for the highest performance, data needs to be located as physically close as possible to application hosts to minimize network latency. When you create a data lake from your vast amount of corporate information as the source for any particular application or use case, an effective hybrid multicloud storage solution will enable agile data movement from wherever any particular data set may be stored.

A modern hybrid multicloud solution can also increase performance via automation. You can manage multiple clusters across different technology platforms for public and private clouds, containers and Kubernetes. Having the ability to access this information when and where you need it can increase efficiency and save you valuable time.

2. Business resilience

Two valuable aspects of a hybrid multicloud storage architecture are its high availability and disaster recovery (DR). Many organizations of all types and sizes have already leveraged the convenience, cost-efficiency and flexibility offered by cloud-based business resilience solutions. One major benefit is that capital outlays are cut to a minimum. Cloud services providers offer a wide range of recovery site options. These should figure prominently in your decisions about system recovery point and recovery time objectives (RPO/RTO).

System availability and disaster recovery

You can choose zero for both and implement a DR solution that doesn't lose any time or data from the instant that your

production system goes down until your recovery system is operational—but that is costlier and can affect application performance if data is synchronously replicated to multiple DR locations. Instead, many organizations choose low or less costly options.

Tools within the multicloud environment may provide the choice of synchronous or asynchronous replication, automatic two or three site replication and metro or global replication distances. With all these choices already native to your storage infrastructure, you can craft business resilience solutions that meet your business objectives and budget constraints.

Data protection

Data protection is another area where a robust hybrid multicloud environment can pay real dividends. Tools are available now that provide pervasive encryption, which means that your data can be encrypted both at rest and in flight. A key to any effective multicloud solution is that it relies heavily on software-defined storage (SDS) technologies and capabilities. This means that a layer of software always exists between application hosts and the basic underlying storage hardware. This SDS layer provides flexibility and additional functionality, including various encryption capabilities. But a key aspect of SDS is that it can be updated and enhanced much more easily than the underlying hardware.

Another important data protection mechanism that a hybrid multicloud storage solution should offer is centralized management of file permissions. This allows you to break down data silos, giving you a single source of truth for your data. By having this implemented, you can quickly manage access control lists and grant or deny access to data for specific business units or users.

On top of that, all of these features mentioned can help keep your data as safe as possible while maintaining various compliance regulation standards, such as General Data Protection Regulation (GDPR).

As new data protection technologies become available, either as downloadable tools deployed on premises or on cloud-based offerings, your hybrid multicloud storage solution can adjust to your specialized needs.

3. Modern application deployment

Analytics and AI

You need to be able to apply analytics to all your data to uncover efficiencies and identify potential vulnerabilities and failure points. Hybrid multicloud environments support the flexibility that lines of business need for their new products, services and business models—which leverage AI infrastructure, big data, analytics and mobile. The value that AI applications offer stems from their ability to make sense of enormous data streams. The more data used to train the AI algorithm, the better it performs.

So, how do you ensure you have control of your data?

Data unification

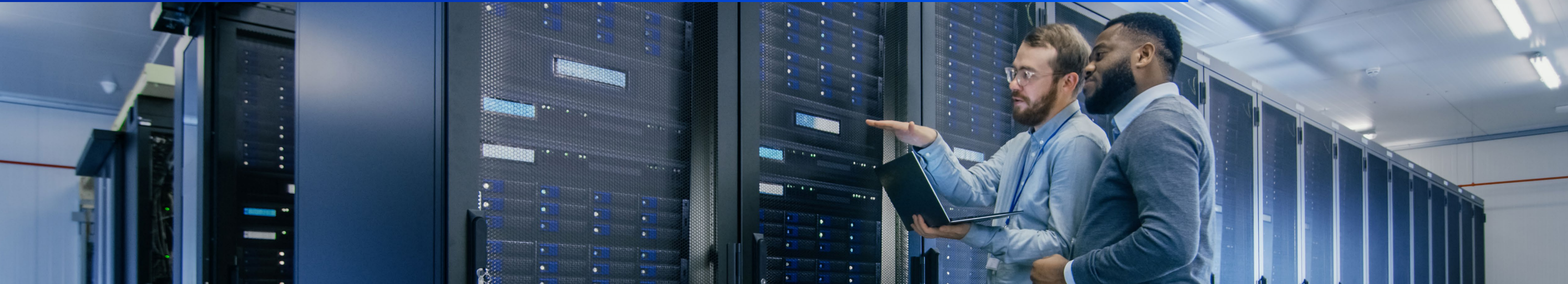
When you have silos unnecessarily creating duplicate data, it gets out of sync. As a result, it's hard to tell what sets of data are the latest and most accurate. A hybrid multicloud strategy with storage virtualization can deliver on data unification and a single source of truth, giving you a centralized view of all your data—no matter where it sits within your enterprise. From the virtualization layer, you can begin to unify your data across your enterprise and gain the insights you need for AI and big data analytics.

Containerization

Containers are technologies that allow you to package and isolate applications with their entire runtime environment—all of the files necessary to run. This makes it easy to move the contained application between environments (dev, test, production, etc.) while retaining full functionality, so developers can build once and deploy anywhere. You'll need Kubernetes, an open source system maintained by the Cloud Native Computing Foundation, to orchestrate deployment and management at hybrid multicloud scale. Containers can help reduce conflicts between your development and operations teams by separating areas of responsibility. Developers can focus on their apps and operations can focus on the infrastructure.

[A hybrid multicloud storage approach can optimize the movement, placement and management of your data.](#)





Developing your storage plan within hybrid multicloud

Although every organization's journey to hybrid multicloud is nuanced, there are similarities in the stages of adoption. Let's take a look at these entry points into the shift toward hybrid multicloud infrastructure:

1. **Migrate.** This stage in the journey is centered around lifting and shifting existing applications and their data to the cloud. The focus here is on less complex applications that do not have extensive dependencies, such as email, and thus does not require redesigning the applications or purchasing new hardware.
2. **Modernize.** This stage is when organizations begin rewriting applications to run on the cloud. Using containers and microservices brings greater agility and ease to the updates and data migration needed to make the application cloud-ready.

3. **Innovate.** At this point in the journey organizations begin building new cloud-native applications. Storage that facilitates greater data mobility and security is crucial.
4. **Manage.** Now working with a mix of cloud and on-premises applications, clouds, and vendor applications, organizations must ensure that they are able to provide the same level of service quality and resilience while continually delivering new features. This stage requires the adoption of software as a service as well as new tools, processes and skills. Smooth operations require flexible storage with a consistent approach to operation, automation and management.

A few new challenges and considerations can arise:

Storage connectivity: It's critical to be concerned with how your storage connects to the cloud. Remember, containers can move an application and its runtime, but when the application gets to where it is going, it needs access to the data. Replication, snapshots and data migration all need to work across the hybrid multicloud.

Storage location: Where storage is located in the hybrid multicloud matters depending on data security, regulatory environments, performance, and availability requirements.

Speed of adoption: The pace of vendor innovation in storage infrastructure is picking up, and hybrid multicloud has made it important to rapidly adopt the latest innovations. Your storage needs to facilitate that.

The specific storage choices you make along the journey can impact your hybrid multicloud future.

Modernizing the storage you already have

But rather than detailing strategies that would require new hardware purchases, let's focus on modernizing the storage you already have—because in many cases, the software foundation you select is of equal if not more strategic importance than the hardware you run it on. Storage systems traditionally had capabilities tied to them, but going forward, those capabilities can be portable. Choosing a strategic software foundation gives you the

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The strength of a software foundation

With a strong software foundation that extends across your hybrid multicloud, you can actually simplify your operations. If you're like most IT organizations today, you likely have storage systems from multiple vendors on your floor. You might also stand up a separate vendor-specific monitoring and management platform for each of these vendors, as well as different APIs and procedures. The resulting complications can lead to downtime.

With a consistent software foundation to support your hybrid multicloud, you can think differently about monitoring and management tools. You can choose a consistent software-based approach that supports all of your hardware with the same set of APIs, procedures and interfaces regardless of vendor, giving your applications and operations a consistent experience across your on-premises and cloud infrastructure.

Second, think cloud. Some clouds have AI services that can bring greater automation to your storage management and monitoring. And if your tooling is running as a SaaS service on the cloud, it's like having an extension to your operations team.

The right storage software foundation can:

- Improve data agility by facilitating data movement across storage systems without disruption
- Through updates, accommodate and adapt to technology shifts (such as Linux, containers and Kubernetes)
- Deploy in traditional data centers and across a hybrid multicloud using APIs
- Extend data reduction across all your storage, old and new, to store more data on the storage you already own
- Improve cyber resilience by encrypting data at rest across all of your storage

Finally, if your infrastructure is based on a strategic software foundation that happens to support nearly every hardware platform, then you can react quite quickly to absorb new hardware innovations, inserting new elements into your infrastructure without having to change APIs or procedures.



Things to consider when choosing hybrid multicloud storage

1. Data permanence
2. Data governance
3. Strong on-premises vs on-cloud
4. Backup and disaster recovery
5. Security
6. Management
7. Cost

Assessing your storage maturity for a hybrid multicloud environment

Your time, effort and research have been thorough. You've dotted the Is and crossed the Ts, and now it's time to engage in conversations with your C-suite. To make the best case for your hybrid multicloud storage strategy with C-level stakeholders, you need to understand **what is important** to them and **what moves the needle** to invest in a hybrid multicloud storage solution.

Four steps to consider

1. How does your storage maturity stack up?

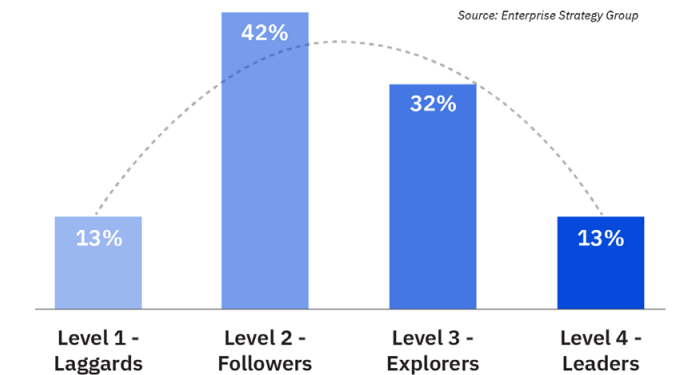
Assess your current storage maturity. Why does this matter? ESG research has found that storage maturity can result in many valuable business benefits, such as improved business outcomes, enhanced IT effectiveness and the ability to zero in on storage KPIs.² Therefore, even if you're lagging in terms of your technology solution, this information is useful to have, as it indicates there is room for improvement.

In fact, according to ESG, organizations earning a Leaders designation reported the best results across many key performance indicators (KPIs) and characteristics, including: business success, IT operations effectiveness, achievement of multicloud agility and advancement of artificial intelligence initiatives.²

The market is wide open. The graph to the left indicates that very few IT organizations have achieved enough progress with storage maturity. ESG found that the majority of respondents' organizations fell into either the Followers (42%) or Explorers (32%) categorizations, showing progress in some storage maturity characteristics, but with additional advancement needed. Mirroring Leaders, ESG rated just 13% of respondent organizations Laggards in terms of storage maturity.² (See graphic to the right.)

Storage Maturity Distributions

Respondent organizations, by maturity level (Percent of respondents, N=800)²



2. Align with C-suite goals

Continue to tie your narrative to storage maturity. Utilize the information from step one to kick off the conversation. It will serve as your big-ticket technology item. Ideally, all the benefits you touch on will lead to C-suite investment.

Understand C-suite business goals and align with strategic initiatives. You don’t want to go into the meeting with inaccurate information. You’ll want to align and speak to the business case as well as technology priorities. Example:

- **Business priorities:** Delivering better customer experience, creating a digital business model, building AI training models, or implementing thorough security mechanisms to remain compliant with current regulations.
- **Technology priorities:** To not only modernize technology but to build agility between teams. Therefore, know how DevOps connects to cloud,

data analytics to AI, data protection to security and resiliency, and so forth.

Provide key data points to those goals and initiatives. Take, for example, the following:

- **Business priorities:** Being a leader with storage maturity can lead to better business outcomes. When ESG asked respondents how successful they felt their companies were at using data to predict changing market dynamics, respondents at Leaders were 20 times more likely to report their company was “very successful” than Laggards.²
- **Technology priorities:** Being a leader with storage maturity can modernize your infrastructure as well as bring internal teams together. According to ESG, 67% of respondents at Leader organizations reported that storage and data services support application development initiatives like DevOps “very well,” compared to 13% of Laggards.²

3. Share your plan

Be direct and concise. State the key takeaways from your research efforts in the following areas:

- Why hybrid multicloud for your data storage?
- Key differences between on-premises and the various hybrid, public and private clouds
- What an optimized hybrid multicloud storage environment offers
- Your hybrid multicloud plan
- The importance of storage maturity and its overall effect on business

Prepare for the C-suite Q&A. This is your research and meeting, so make sure you are ready for any question that may come your way.

Press for investment/clarify timeline. Armed with data, take the opportunity to encourage investment urgency. With

limited storage maturity leaders in the market, there’s a great opportunity to be one of the few pioneers in storage innovation.

4. Conclude and reiterate business value

Restate the business benefits as a result of implementing a mature hybrid multicloud storage solution.

- Unify data to gain a single source of truth
- Ensure applications are delivering accurate insights
- Derive greater value from unstructured data to enable better business outcomes
- Ensure greater business resilience
- Deploy modern applications
- Drive line of business satisfaction
- Enable data scalability as business grows

Follow-up actions. With the meeting over, be sure to have follow-up action items and encourage any and all feedback from stakeholders.





Where does your business want to go?

To get there, you will need to take control of your growing multicloud environment and leverage its power to accomplish your business and technology objectives. You'll know that your hybrid multicloud environment is optimized for your success when:

- Your data moves where and when you need it in real time
- Your IT infrastructure provides the flexibility, performance, and cost-efficiency you need to capture and keep a competitive advantage
- You are gaining all the value you can from your data assets

Are you ready to meet a technology partner to begin your storage transformation?

IBM is intent on helping clients create an infrastructure-independent storage environment for hybrid multicloud. We are accomplishing this through orchestration integration with cloud operating environments through APIs like the new Container Storage Interface for Kubernetes and Red Hat® OpenShift®. We are also deepening integration with VMware³. IBM Storage Insights provides a consistent, AI-infused management experience and IBM Spectrum® Virtualize provides a consistent set of storage capabilities and data mobility both on premises and in the public cloud regardless of your choice in hardware suppliers. And IBM Storage cloud-like pricing provides a consumption-based financial option for your on-premises storage infrastructure to mirror that of public cloud storage.

Embracing a hybrid multicloud strategy is a huge advantage for any data-driven enterprise up to the challenge. Yet, even with the will to lead on digital transformation, a project of this scale demands the tools to support your every move. With the right team, goals and solutions in place, your data-driven enterprise can benefit from cost reductions, added reliability, simpler data management, more rapid provisioning and a faster time to market for your products and services.

To learn more about how IBM Storage solutions can help you, [schedule a consultation](#) or contact your IBM business partner today.

Resources

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2. ESG Research Insights Paper Commissioned by IBM, [Analyzing Outcomes Delivered by Modern Multicloud Storage Environments Optimized for Next-generation Workloads](#), December, 2018
3. VMware is a registered trademark of VMware, Inc. or its subsidiaries in the United States and/or other jurisdictions.

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