

# STORAGE

# IN A HYBRID

# MULTICLOUD

# WORLD

Now is the time to create an on-premises  
and off-premises storage plan

**C**loud computing has opened up new ways of running workloads and serving internal and external clients. Storage has evolved to complement the capabilities that cloud provides, both on premises and off premises. Advances in flash storage technology have created new tiers of storage that can be cost effectively used by organizations.

More enterprises are opting for a hybrid multicloud environment to provide the agility to meet changing demands. Storage offers more flexibility than ever before to satisfy business and data needs. This e-book examines why hybrid multicloud is becoming a popular configuration for enterprises and how storage is rising to the new challenges of handling data and workloads.

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Key types of cloud are:

1. Private
2. Public
3. Hybrid
4. Hybrid multicloud

## WHAT IS HYBRID MULTICLOUD?

Because it offers many deployment choices, cloud has evolved to become an important tool for businesses. Cloud configurations can be combined in many ways to suit an enterprise's needs.

Key types of cloud are:

- **Private:** An on-premises or off-premises cloud infrastructure where access is limited to an organization and perhaps selected partners. If the private cloud is on premises, the enterprise manages the cloud. If it's off premises, the cloud may be managed by a third party.
- **Public:** The off-premises infrastructure is shared by the general public. Anyone can purchase a piece of a cloud run by a cloud service provider.
- **Hybrid:** This combination of public and private clouds as well as traditional IT that are connected together enables data and application portability.
- **Hybrid multicloud:** Many public and private clouds are joined together to enable the movement of data between these clouds.

Flexibility and fluid movement of applications and data are the hallmarks of today's cloud configurations. Hybrid multiclouds also are being used to help the business with workload and analytics.

## MAIN DRIVERS FOR HYBRID MULTICLOUD

The move to hybrid multicloud is being driven by both the C-suite and IT, says Ron Riffe, program director, Worldwide Storage Solution Sales, IBM. IT drives many technical shifts (like it did for server virtualization). What's different about hybrid multicloud is that the C-suite is also interested because it helps create new revenue streams and improve margins. Hybrid multicloud is seen as a means of business survival. The C-suite participation is helping drive the rapid industry transition. Organizations adopting a hybrid multicloud model are more competitive. They can innovate more quickly, bring up new products and services, and reach new client sets compared to those with traditional IT structures. "The idea of hybrid multicloud is seen as a means of business survival," Riffe notes.

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Currently, 85% of companies use a multicloud environment, according to an IBM Institute for Business Value (IBV) study<sup>1</sup>. IBV forecasts that in three years, 98% of enterprises will use hybrid multiclouds.

Many parts of the enterprise benefit from hybrid multiclouds' capability to move applications and data between clouds, including finance, human resources, supply chain management, marketing, sales and customer service.

According to an **IBM Institute for Business Value study**, multicloud users in all industries except government and education saw revenue grow 59% and profitability increase 44%, the report says. Those in government and education experienced a 117% rise in efficiency and 138% increase in effectiveness.

Cloud flexibility allows these enterprises to migrate existing applications to the cloud, modernize applications to run on the cloud, innovate with new cloud applications, and use processes, tools and skills to deliver new features and apps.

Many companies are moving to hybrid multicloud environments to take advantage of performance improvements or move workloads closer to the data's entry point, notes Ted Letofsky, enterprise architect at Evolving Solutions. Some are using the cloud as a repository for archive data.

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**“Clients need to think about work. That work becomes the defining characteristic for data storage for the business.”**

**-Ted Letofsky, enterprise architect, Evolving Solutions**

1. [IBM Institute for Business Value \(IBV\) study](#).

Organizations rely on hybrid multicloud for compliance and regulatory reasons or for vendor flexibility. “Some clients use hybrid multicloud because regulatory requirements prevent them from using a single vendor or a single cloud in a single region,” Letofsky says.

For hybrid cloud practitioners, cloud is an acquisition model and a consumption model as well as a delivery model for storage networking, compute and applications. “Cloud is meant to be fully automated, orchestrated from the beginning of lifecycle to the end,” he adds. With traditional infrastructure, the amount of time it takes to move from any one phase to another phase might take much longer.

## Factors Affecting Storage

Storage administrators grapple with rising demand for storage due to artificial intelligence (AI), the Internet of Things, big data and the sheer volume of data, notes Riffe. These issues are affecting not only on-premises IT decisions, but also those in the hybrid multicloud:

- IT storage budgets aren't increasing. As a result, storage admins are looking to trim infrastructure costs on a dollar-per-terabyte-basis.
- Storage admins often prefer to have one storage vendor to reduce complexity. The reality of IT is that to leverage existing investments, a multivendor strategy often prevails.
- As computing ramps up its speed, organizations need faster access to stored data. I/O latency continues to be an issue, as it is often driven by data-hungry applications (e.g., AI, analytics, etc.) that need a lot of data very rapidly.
- Storage connectivity issues crop up as admins need to handle data stored on premises and in the cloud. The physical location of data storage affects security, performance and availability.
- Hybrid multicloud enables developers to create new applications faster, putting a greater demand on storage. Storage admins must adopt the latest technologies more quickly to keep up with demand.
- The location of storage in a hybrid multicloud environment must take data security, performance, regulatory requirements and availability into consideration.

## THINKING ABOUT DATA IN NEW WAYS

Besides innovating how applications are created, hybrid multicloud requires enterprises to handle data more flexibly. Enterprises need “a storage infrastructure that facilitates data movement across the hybrid multicloud, on premises and to multiple public clouds, in such a way that applications can continue to operate the same way regardless of where they happen to be deployed,” notes Riffe.

Containers make applications portable from one environment to another. Like applications, data must be able to move between on-premises storage and off-premises storage in the hybrid multicloud.

Storage choices need to be made with cloud use cases in mind. For business continuity, some organizations are using cloud for disaster recovery by connecting on-premises storage to cloud storage and replicating between the two.

## A Pragmatic Approach to Storage

The latest technologies improve an enterprise’s IT when approached in a pragmatic way. An organization must define its needs, workloads and processes before making storage decisions and purchases.

Organizations need to take a step back and review their entire storage structure. While many clients don’t consider cache or buffering to be storage, it certainly is storage, Letofsky says.

Storage challenges are data challenges. What kind of data is being stored? How accessible does the data need to be? How is it protected? How does the client want to use that data? “When organizations begin to understand all of the aspects of storage, they realize they need to think in broader terms than just the file

folder full of data,” he comments. They need to consider workflow and workloads as they create a storage plan.

Many enterprises can move data to and from their data centers for protection, migration, heuristics and analytics. But moving production data around isn’t as simple as moving production workload. “Moving production data is an entirely different animal in terms of the amount of data and how quickly it can move to respond to company needs,” Letofsky says.

Data gives businesses insight when it’s in a useable form. “As business models evolve and change, cloud IT practitioners need to be able to respond with the business,” he says.

# “Strategic storage choices are more about the software foundation you select than the hardware it happens to be running on at the moment.”

–Ron Riffe, program director, Worldwide Storage Solutions Sales, IBM

For DevOps and analytics, data is temporarily copied from on premises to the cloud. For workload migration, data permanently migrates to the cloud.

## HYBRID MULTICLOUD NEEDS A NEW STORAGE APPROACH

With data in hybrid multicloud moving between clouds and workloads, storage needs to adapt to changing requirements. The traditional storage model no longer satisfies the organization’s needs. In a traditional model, IT would purchase a disk with set capabilities and install it in the data center. On-disk storage has been commonly adopted for data and workloads kept on premises.

However, in a hybrid multicloud world, storage must be on premises as well as in hybrid multiclouds. On-disk storage capabilities alone don’t meet today’s requirements. Pulling data from on-premises disks to the cloud is cumbersome. “Enterprises need a set of capabilities that will operate on premises on whatever disk is chosen as well as up in the cloud,” says Riffe.

When storage is defined as a software foundation, it can operate on disk, regardless of your choice in on-premises hardware vendors, and in the hybrid multicloud environment because it’s portable. Such an approach offers several benefits:

- Gain agility by moving data without disruption among storage systems
- Build a bridge from traditional storage to new technologies (e.g., Kubernetes and containers)
- Adopt storage capabilities that can be deployed across hybrid multiclouds
- Store more data on the storage that’s already owned
- Boost security and improve cyber resiliency by encrypting data at rest across older, existing storage as well as new storage systems

With software as a foundation, enterprises can do all of these things regardless of the hardware on premises or the clouds that make up the hybrid multicloud environment. A commonality can exist among storage capabilities, the

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APIs that are being programmed, the procedures and training for operations people regardless of the physical infrastructure.

It also simplifies operations. An organization may have had two or three vendors that each had a different set of APIs, procedures, automation and training. IT administrators would need a different approach for each vendor and a monitoring solution for each vendor. With a single strategic software foundation, IT administrators can choose a single approach, and also choose to consume it from the cloud as a SaaS service. A cloud-based management solution can include analytics offering insights on best practices as well as AI services to help administrators be more proactive in managing their environment and resolving problems.

Such an approach enables the enterprise to adopt the latest hardware technologies easily. When a new hardware technology comes to market that suits the enterprise, IT can purchase the hardware from the vendor of their choice and put it up under the common software foundation. "The organization can take advantage of the new hardware technology without changing any of its automation, training or procedures," says Riffe.

Storage can also add a security layer for the enterprise's data. If data is moving from on premises to the hybrid multicloud, a software system that encrypts the data wherever it resides, not just on

premises, is needed. "If you pick a strategic software foundation, it can encrypt data regardless of the hardware on premises or the clouds being used," Riffe says.

## VIRTUALIZING THE DATA CENTER

In today's cloud-oriented world, the data center is the focus of innovative architectures to deliver IT services. Using a virtualized approach, the data center can respond to business needs quickly.

The software-defined data center (SDDC) is a virtualized architecture that runs independently of routers, network cables, servers and HVAC units. "The enterprise can customize the structure of an SDDC based on the needs of the business," according to Letofsky.

An SDDC facilitates workload automation. Orchestration, templatization and automation are keys to its creation. In an SDDC, computing, networking, physical resources and storage are combined into one process. Templates are designed to standardize new or existing workloads and infrastructure. Automated processing reduces the time required to deploy a workload.

## TYPES OF STORAGE FOR HYBRID MULTICLOUD

An SDDC relies on virtualized data storage known as software-defined storage (SDS). Using APIs,



SDS works along with software-defined networking, software-defined computing, computer virtualization and automation software to make up an SDDC. SDS adapts to changing workloads quicker than hardware-based storage systems. It also collects metadata to provide analytics and help organizations meet changing demands.

Software-defined technology is part of existing solutions such as IBM Spectrum Storage. SDS also can be configured within a physical server, a converged appliance or already existing virtual server.

Besides software-defined technologies, interface advances enable data to move faster between storage and servers. The internet, AI, machine learning, big data and analytics have created the need for a way to move data more quickly than is possible with traditional disk systems and Small Computer System Interface (SCSI) protocols.

In 2012, IBM and others developed custom-built flash storage. This new class of flash moved data so rapidly, it was outrunning the SCSI protocol. “The industry developed a new protocol called non-volatile memory express (NVMe) to fully recognize the speed of this flash storage,”

notes Riffe. “Because NVMe delivers more predictable and faster throughput, one of the top reasons IT managers are adopting it is that it helps increase infrastructure density.”

The NVMe protocol is spurring the next generation of flash memory storage called Storage Class Memory (SCM). When SCM is available commercially, it’s expected to be 5x to 8x faster than today’s flash, Riffe says. Many enterprises are purchasing systems with SCM capabilities. When the new storage is brought to market, it can be plugged in to the system.

SCM will provide cost savings for storage handling. Imagine if an enterprise has 5% of its total capacity in SCM, the AI built into the software foundation would move the most demanding data into SCM. The rest of the data could stay on NVMe flash or even spinning disks. “The performance would go up like a rocket,” Riffe says. Lower demand data could be moved to cheaper storage, dropping the total cost.

#### **MAKING DATA VISIBLE AND ACCESSIBLE**

Today’s storage options offer varying levels of accessibility and visibility, and can be tailored to the enterprise’s needs.

**“A Software Defined Data Center (SDDC) is setting the new standard of IT excellence and operability.”**

**–Ted Letofsky**

Object-based storage can place data on premises or off premises to be accessed quickly or to be stored in slower access archives. The SDS reporting layer yields granular data on workloads and workflows for analytical purposes.

Data accessibility is a big consideration as the enterprise wants to move production data in the hybrid multicloud flexibly and responsively. Data egress is a factor affecting the cost of data accessibility in the cloud. While it's fairly inexpensive to put data into the cloud and work with it there, it's more expensive to move data out of the cloud.

To keep costs down, data sets can be imported to the cloud and manipulated there. The data itself remains in the cloud, but the insights about the data are egressed. "The enterprise will gain new and innovative ways of working on the data cost-effectively," Letofsky points out.

SDS can keep costs down while maintaining storage accessibility by enabling an enterprise to:

- Upgrade to a better performance tier of storage
- Utilize hierarchical storage management where data is automatically transferred from one storage media to another
- Ensure that storage layer capabilities can operate with few interruptions

## Crafting a Storage Solution

Many questions must be addressed in building a storage solution on premises or in the cloud, says Klubertanz. These include:

- What are the client's performance and availability needs?
- How will you protect the data?
- What are the restrictions for sensitive data?
- What data needs to be on premises and what can be moved to the cloud?
- What is the performance requirement for the workload? Is it high performance with a lot of reads?
- What type of application is running against the workload?
- Is new data being created? If so, where is that data originating?

**“Clients need to be creative. Think about the peripheral applications that support the app or the business unit as well as the primary application. Are any of those good candidates for something different like public cloud?”**

**-Tim Klubertanz, solutions architect, Evolving Solutions**

### **IMPLEMENTING THE BEST STORAGE FOR YOUR HYBRID MULTICLOUD**

With so many variables, it can seem daunting to choose the right mix of on-premises and off-premises storage options for the enterprise. A thorough needs analysis is necessary, followed by a review of storage options.

Many times, it's a good idea to have an outside consultant work with the enterprise to create the optimum storage plan to further the business goals and accommodate future demand.

Evolving Solutions helps clients craft the best storage solutions for their businesses. “We help clients identify cloud functions and how their business will benefit from them,” says Tim Klubertanz, solutions architect, Evolving Solutions. “We also look at existing capabilities and how those fit into a cloud scenario. We help the client start blending cloud into their operations.”

Storage is more than drives and interfaces now as it contains many intelligent functions for replication and duplication. These intelligent features can help the business in many ways. “The business can worry more about writing their application in business logic rather than being concerned about where the data is and how it will be archived,” explains Klubertanz.

After the workloads and needs analysis is done, storage solutions can be assessed. Flash storage is less expensive now, and multiple types are available. A consultant can help the client identify which workloads are good candidates for high-capacity, multilevel flash and how those solutions can be used effectively. “We can deploy integrated tiering to make the best use of high-performance capacity or to archive stale data out,” Klubertanz says.

Organizations can use tiering because the metadata will indicate if the data isn't widely used after the first few weeks

or months. “The client can decide to use lower cost storage options sooner in their cycle rather than waiting months or a year to do so,” he notes.

For companies looking to use an unfamiliar solution, it’s helpful to do a proof of concept. “A proof of concept is a good opportunity for the client to learn where the right places are to apply the technology,” says Klubertanz.

It’s also possible to take advantage of cloud incrementally. Rather than moving all data to the cloud, performance metrics could be put into the cloud so the client could use cloud-based monitoring as part of the solution. “That’s a good first step to using public cloud and gives the client a hybrid cloud experience,” he notes.

Public cloud solutions are good for situations where the client needs data to be accessed now but won’t need that access over time. The data can be automatically decommissioned after a set period of time, which helps minimize costs.

Enterprises must consider storage as a dynamic part of the data center rather than a static, on-disk solution. Hybrid multicloud offers many exciting opportunities for enterprises. Evolving storage options are keeping pace with the fast changes in workloads, applications and cloud.

This is a good time for the business to assess current storage and create a plan for handling on-premises and off-premises storage. Organizations that incorporate the latest storage technologies will see benefits in responsiveness, reduced costs and a competitive advantage.

### **FORMULATE THE BEST STORAGE PLAN**

Are you ready to discuss your storage solutions? You don’t have to do that alone. IBM and solution providers such as Evolving Solutions are ready to help formulate the best plan for your business. We take the time to evaluate your technology environment, learn your goals and understand your needs, so we can meet you on your transformation journey. We can help you get where you want to be tomorrow.



Contact **Evolving Solutions** to set  
up an evaluation today.