As enterprises adopt hybrid cloud strategy, unified block and file storage simplifies migration, consolidates workloads, and supports AI-ready, high-performance applications, providing a consistent infrastructure foundation across on-premises and cloud environments.

Bridging Hybrid Cloud Storage: Using Unified Block and File Storage for Enterprise Modernization

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Introduction

The enterprise cloud landscape is transforming, with organizations under pressure to modernize legacy on-premises infrastructure, migrate to the public cloud, support hybrid cloud or multicloud models, and derive greater value from data for AI, analytics, and high-performance applications. IDC's research indicates that the public cloud infrastructure-as-a-service (IaaS) market is expected to grow by 21.1% in 2026. The strong growth underscores the growing importance of storage solutions that support both traditional and AI workloads.

As organizations move beyond exploratory pilots and embrace production-grade AI and agentic systems, the demand for high-performance, secure, and compliant storage infrastructure is intensifying. Traditional cloud storage models often force a choice: use file storage (NFS/SMB) or block storage (iSCSI) — but rarely is the use of both allowed with the same level of performance, management simplicity, or enterprise features. As a result, organizations often face storage sprawl, multiple management consoles, refactoring of applications, higher operational costs, and greater complexity in hybrid/cloud migration.

AT A GLANCE

KEY STATS

» 70% of enterprises now take a hybrid cloud or multicloud approach to data storage infrastructure.

» The worldwide public cloud infrastructure-as-a-service storage market is projected to grow at a CAGR of 18.3%, reaching $139 billion by 2029, according to IDC.

WHAT'S IMPORTANT

Managing block and file storage separately across hybrid environments is complex, leading to operational inefficiencies and migration obstacles for enterprises. A unified approach to management can address this challenge.

Managing the complexity inherent in hybrid cloud and multicloud environments is a central challenge for CIOs and IT leaders. IDC research indicates that 70% of enterprises now take a hybrid cloud or multicloud approach to data storage infrastructure, underscoring the need for solutions that bridge silos and enable seamless workload migration. As the market progresses toward production-grade AI and agentic systems, the requirements for storage infrastructure are evolving. Enterprises now demand storage solutions that can deliver sub-millisecond latency, high throughput, and robust data protection while supporting compliance and sovereignty requirements.

The ability to seamlessly integrate with AI tools and frameworks is becoming a key differentiator as organizations seek to leverage their data assets for advanced analytics and intelligent automation.

Strategic investments in intelligent storage infrastructure are a top priority for enterprise IT decision-makers. These investments enable organizations to modernize their infrastructure, support legacy and next-generation workloads, and maintain operational simplicity and cost governance. The ongoing evolution of storage platforms is reshaping the enterprise cloud landscape, providing the foundation for business agility, resilience, and innovation in an increasingly complex and distributed environment.

Definitions

A clear understanding of key terms is essential for evaluating the capabilities and relevance of unified block and file storage solutions in hybrid cloud environments:

- » **Block storage** refers to a method of storing data in fixed-size blocks, each with a unique address, enabling high-performance access for databases and transactional workloads. Block storage is commonly used in storage area network environments and supports protocols such as iSCSI and NVMe/TCP. This approach is particularly well suited for applications that require low latency and high throughput, such as enterprise databases and virtualized workloads.

- » **File storage,** on the other hand, organizes data as files within directories, making it suitable for shared access and collaboration. File storage is typically used in network-attached storage environments and supports protocols such as NFS and SMB. This model is ideal for applications that require hierarchical organization and concurrent access by multiple users or systems.

- » **Unified storage** represents a storage architecture that consolidates two or more storage protocols within a single platform or management interface. This consolidation allows organizations to manage diverse workloads and data types through a common control plane, streamlining operations and reducing complexity. Unified storage becomes increasingly important as enterprises seek to standardize their infrastructure and support various application requirements.

- » **A storage management console** is a centralized interface or platform that provides unified visibility, control, and automation for storage resources across on-premises and cloud environments. By streamlining operations and policy enforcement, management consoles reduce operational overhead and enable organizations to maintain consistent governance and security across distributed infrastructure.

Trends

IDC projects that the public cloud IaaS storage market will grow at a CAGR of 18.3% from 2025 to 2029, reaching $139 billion by 2029. This sustained growth reflects the increasing reliance on cloud storage for traditional and AI-driven workloads, as enterprises seek scalable, resilient, and cost-effective solutions.

Block storage consumption is expected to grow at a CAGR of 19.1% from 2025 to 2029, highlighting its relevance for transactional and high-performance workloads in hybrid cloud environments. The ability to support databases, virtualized workloads, and real-time analytics is driving the demand for block storage platforms that deliver low latency and high throughput.

File storage consumption is projected by IDC to grow at a CAGR of 23.9% from 2025 to 2029, underscoring its strong adoption for enterprise workloads moving to the cloud. File storage remains essential for collaborative applications, content management, and hierarchical data organization, making it a critical component of unified storage strategies.

Enterprises are prioritizing unified infrastructure management and single-pane-of-glass observability, seeking solutions that provide consistent policy enforcement, integrated monitoring, and seamless workload orchestration across hybrid cloud and multicloud environments. This trend reflects the need to simplify operations, reduce complexity, and maintain governance as infrastructure becomes more distributed.

The rise of AI and agentic AI systems, along with production-grade inferencing, is driving the demand for storage platforms that support real-time data ingestion, vector-native indexing, and hybrid memory architectures. AI-optimized storage is emerging as a key differentiator, enabling organizations to accelerate analytics, improve decision-making, and support intelligent automation.

Regulatory and sovereignty requirements are prompting cloud providers to offer region-specific AI stacks and support for local partnerships. For example, EMEA recorded the highest annual growth of 23.5% in the IaaS total market in 2024, according to IDC's research, reflecting the impact of compliance and data residency mandates on infrastructure investments.

Operational complexity and skills shortages are fueling the adoption of platforms that simplify onboarding, automate rightsizing, and provide integrated cost governance. Organizations are seeking solutions that help manage distributed infrastructure efficiently, reduce the burden on IT teams, and accelerate time to value. The market is witnessing a shift toward open APIs, cross-cloud abstraction, and portable services, enabling enterprises to avoid vendor lock-in and maintain agility across diverse environments. Investments in orchestration frameworks, service meshes, and standardized identity management are supporting seamless integration and workload portability.

Considering Google Cloud NetApp Volumes — Unified block and file storage

Enterprises today operate in an increasingly complex hybrid cloud and multicloud landscape, where data is distributed across regions, platforms, and workloads. As organizations modernize infrastructure, one of the most persistent challenges is managing disparate storage environments that support traditional enterprise applications and emerging AI or analytics workloads. The unified block and file storage solution is a direct response to this challenge by providing a single, consistent framework for managing data, ensuring performance, and enabling business continuity.

Google Cloud NetApp Volumes exemplifies this shift by bringing block and file protocols under a unified, cloud-native service. This approach allows organizations to support a full spectrum of workloads, from electronic design automation, high-performance self-managed databases, and virtualized environments to shared file repositories, all without maintaining separate storage silos or re-architecting applications. This is also useful for environments that include both legacy applications and modern, containerized, or AI-driven systems. The integration of the iSCSI protocol extends the service's reach into latency-sensitive environments, such as financial systems, engineering design, and healthcare analytics.

A central element of this model is unified management. Through a single management console, IT teams can oversee on-premises and cloud storage operations, enforce policies, and monitor usage across environments. The unified view streamlines governance, reduces operational overhead, and enables faster response times for scaling or policy changes. Large organizations benefit from maintaining consistent data management practices across locations. The option to use

either the Google Cloud Console or the NetApp Console for management offers operational flexibility, enabling IT teams to administer resources through the interface that best aligns with their existing tools and expertise.

Cost efficiency is achieved through auto-tiering, independent scaling, and unified storage pools. Auto-tiering is designed to dynamically move infrequently accessed data to lower-cost tiers. This ensures that high-performance storage is reserved for active workloads while archival or backup data resides in cost-optimized capacity tiers. Independent scaling of capacity and performance adds flexibility in managing resources. In Google Cloud NetApp Volumes, storage capacity can be increased incrementally, while throughput and IOPS are adjusted separately, supporting up to 5GBps of throughput and 160,000 IOPS per volume. This level of control allows storage to be matched more closely to workload demands, helping prevent resource shortfalls and excess allocation. It supports predictable performance during demand spikes without requiring additional infrastructure provisioning. Unified storage pools allow both block and file volumes to share the same resources, decreasing the need for additional separate pools.

Google Cloud NetApp Volumes seeks to enable a hybrid cloud environment by consolidating storage management, supporting protocol-agnostic performance, and allowing migration from on premises to the public cloud, providing caching across sites, and offering a unified global namespace, so organizations don't need to treat cloud as an isolated silo. It also embeds data protection through snapshots, replication, and policy-based retention.

Beyond operational gains, unified storage aligns with the broader industry trend toward AI-ready infrastructure, which involves systems capable of feeding data-intensive workloads while maintaining governance and cost control. This foundation supports capabilities such as Gemini Enterprise data connector (a preview feature announced last year), which allows Gemini Enterprise applications to securely access data stored in Google Cloud NetApp Volumes and avoid creating duplicate data copies.

Challenges

Organizations with data and workloads spread across on-premises and cloud environments face significant challenges in managing both block and file storage. Different workloads have different performance, access, and scaling requirements, which can make provisioning, monitoring, and maintaining consistency difficult. When data is distributed across heterogeneous storage systems, operational complexity increases and can contribute to data silos, limited visibility, slow analytics, and increased administrative efforts. These challenges can impede decision-making and the ability to respond quickly to business priorities.

Google Cloud NetApp Volumes provides a unified block and file storage platform that consolidates workloads under a single framework. This enables consistent policy and data protection enforcement, simplified management, and independent scaling, improving data accessibility across hybrid environments. By reducing fragmentation, organizations can better leverage their data for AI and analytics and business initiatives while reducing operational complexity.

Conclusion

The evolution of storage solutions is reshaping the enterprise cloud landscape, enabling organizations to address the dual challenges of operational complexity and performance demands in hybrid cloud and multicloud environments. IDC's research highlights the strategic importance of unified management, protocol flexibility, integrated data protection, and AI-ready infrastructure. As enterprises accelerate investments in scalable, secure, and compliant storage platforms, solutions that support seamless migration, granular resource optimization, and consistent policy enforcement will play a critical role in driving business agility and resilience.

Addressing the new cloud storage needs will require a solution that allows organizations to support legacy and emerging workloads while consolidating their infrastructure. This requires a platform that offers protocol flexibility, independent scaling of capacity and performance, integrated data protection, and centralized management. Unified storage delivers the operational consistency, resource efficiency, and regulatory compliance needed to maintain predictable performance, manage costs effectively, and respond to changing business needs while minimizing disruption during migration or scaling.

While adoption requires planning for integration, operational processes, and compliance oversight, the unified model addresses long-standing challenges associated with fragmented storage environments. For executive leaders, it represents a practical approach to modernization that supports hybrid cloud and multicloud strategies, improves operational visibility, and establishes a foundation for future workloads, including AI, analytics, and global scalability.

> Unified storage delivers operational consistency, resource efficiency, and regulatory compliance.

About the analysts

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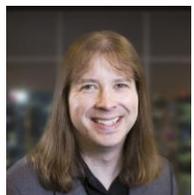
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