

Flash Forward

Making Flash Storage a Reality for
the Mid-Sized Business



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INTRODUCTION

Our world is exploding with data

IDC predicts that by 2020, there will be 44 trillion gigabytes of digital data in the world. [1]

Organizations capture more of it every day, from a massive range of sources. Aside from structured corporate files, they ingest huge quantities of unstructured information. Everything from corporate websites and email platforms to customer surveys and employee opinion polls generates data.

Meanwhile, emerging technologies like machine-learning, artificial intelligence (AI) and the Internet of Things (IoT) have prompted a spike in the volume of data.

It all has potential value to the business.

Yet, keeping up with the expanding data universe isn't a simple matter of finding more space. How organizations store and manage data is as important as the capacity for storage. Analyzing these data resources empowers the business to make better, data-driven decisions.

This new reality has led to widespread adoption of big data and predictive analytics. It has also meant a rapid growth in the number of business applications that rely on data-intensive workloads. In many environments, the performance of core IT applications is critical. To gain the most from data analytics, the business needs almost-instant access.

In the enterprise space, sometimes one minute is too long. Time-sensitive applications need to harness data as it streams into the organization.

This demand puts tremendous pressure on the data center. Storage systems unequipped to handle data-intensive workloads may put the business at risk.


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INTRODUCTION

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Flash comes to the rescue. IBM introduced the first commercial hard disk drive (HDD) in 1956. Since then, the industry has improved disk capacity while reducing physical footprint.

But, capacity is not the only important consideration. The limitations of spinning disk media cap their speed at 15,000 RPM. This is no longer enough to keep pace with advances in computing power.

This gap worries IT managers who need to support critical applications and databases. With an explosion of data, mid-sized organizations have an enterprise-like need to power intensive workloads. But unlike some of their enterprise counterparts, many of these companies work with limited IT budgets.

Flash storage promises to address these issues. A solid-state drive (SSD) uses flash memory for persistent storage. Because it has no moving parts, it yields a much higher read-write performance. It's also safer, eliminating the vulnerabilities to heat, humidity, shock and vibration.

Price and/or perceived costs of flash has hindered adoption by mid-sized organizations with limited IT budgets.

This paper examines the data storage performance challenges facing mid-market organizations. It also explores how IBM's Flash technology helps mid-sized businesses achieve enterprise-class performance despite budget constraints.

“*..perceived costs
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FLASH

The Promise of Performance

In most IT environments, core applications are “make-or-break” for the business. They support the most important day-to-day operations. As such, organizations hold these applications to the highest performance requirements. They often need to perform thousands of read and write operations to glean meaningful results from data.

When HDD-based storage systems fail to meet these standards, IT managers often try one or more of the following:

- *Adding more servers or faster CPUs*
- *Expanding server memory*
- *Installing more disks to the storage area network (SAN) for key files*

Some may also embark on lengthy and expensive efforts to optimize performance by making changes to the application code itself. But these approaches all fail to address the usual culprit: I/O bottlenecks.

Storage administrators may conclude that disk performance falls within the “minimum acceptable range.” But, many mid-sized organizations can’t afford the waste involved in performance-tuning or server upgrades. Throwing more disks at the problem inflates costs in rack space, power, cooling and IT personnel.

Meanwhile, the 2 to 10 milliseconds (ms) per I/O response leaves users waiting for critical output.

Flash storage overcomes the performance limitations of spinning disk drives by design. It achieves this by storing and accessing data directly from a semiconductor, rather than a disk or magnetic tape.

As a result, it’s common to see flash perform an impressive 25x faster than spinning disk in input-output operations per second (IOPS). HDDs deliver hundreds of IOPS while their solid-state counterparts clock in at hundreds of thousands of operations per second.

“Flash storage overcomes the performance limitations of spinning disk drives by design.”

FLASH

Continued



40% Less energy & floor space requirements



35% Savings in admin. & operating costs



Over 6 times improvement in reliability & availability



Over 4x better CPU utilization on application servers



30% Less servers to meet the desired performance level agreements



30% Savings in software licensing costs

Random IOPS Performance with Disk Drives Compared with Flash:

Device	Interface	IOPS
7,200rpm HDD	SATA (3GB/s)	~75 to ~100
10,000rpm HDD	SATA (3GB/s)	~125 to ~140
10,000rpm HDD	SAS	~140 to ~170
15,000rpm HDD	SAS	~175 to ~210
15,000rpm HDD	FC	~240 to ~275
IBM FlashSystem 900 w/Min. Config	MicroLatency Module	~100k

Flash arrays have the power to improve application and database performance by orders of magnitude. They represent a straightforward way for IT managers to reduce response times from milliseconds to microseconds. They achieve this without changing existing servers, applications or other existing infrastructure components.

Flash allows for real-time compression of data. This means flash drives can store up to 5x more data within the same physical space.

Happier Users - *Much more reliable, responsive applications and analytics*

Happier Data Center Admins - *Improved performance with minimal change to existing architecture*

Happier IT Managers & CEOs - *Lower TCO due to savings in physical floor space, energy, and admin costs*

*SOURCE: Justifying Investment in All-Flash Arrays. IDC August 2016

CLEARING THE BARRIERS

“Flash prices continue to fall as the technology improves its ratio of capacity-to-physical space.”

When IT managers hear the word “flash” they often think two things: fast and expensive.

When data growth begins to outpace budgets, IT managers in small and mid-sized organizations can face a resource crunch. Given unlimited resources, most would choose to store all data on the fastest media possible. But this option is often open only to the best-funded enterprise IT departments.

For mid-sized companies, the higher cost-per-gigabyte for flash compared to traditional disk storage is often a barrier to adoption.

Yet, the difference can be offset by reduced time spent by engineers and storage admins allocating workloads. At the same time, flash prices continue to fall as the technology improves its ratio of capacity-to-physical space.

In this context, flash storage begins to make sense for a lot of medium-sized businesses. But, migrating to a pure flash array may not suit every organization.

A successful storage solution is always a balance between capacity, performance and cost. Before proceeding, IT managers should assess their current needs and anticipated growth.

There are two types of flash array:

All-Flash: stores all data on high-speed solid-state drives to achieve optimal performance per square foot of rack space.

Hybrid: merges a smaller number of flash drives for heavy-duty workloads and uses spinning disk media for data accessed less often.

	All-Flash	Hybrid
Pros	- Optimal I/O speed - Minimized Latency - Highest Performance - Reduced hardware footprint - Lower operating cost - Suited to scenarios where performance is the primary concern	- Performance benefits of SSD plus capacity benefits of HDD - Lower cost-per-GB - Automatic tiering moves data where it needs to be - Suited to scenarios where capacity is the primary concern
Cons	- Higher cost-per-GB - Higher upfront investment	- Reduced performance boost compared with all-flash - Potential for overcrowding if multiple apps compete for flash storage tier

CLEARING THE BARRIERS

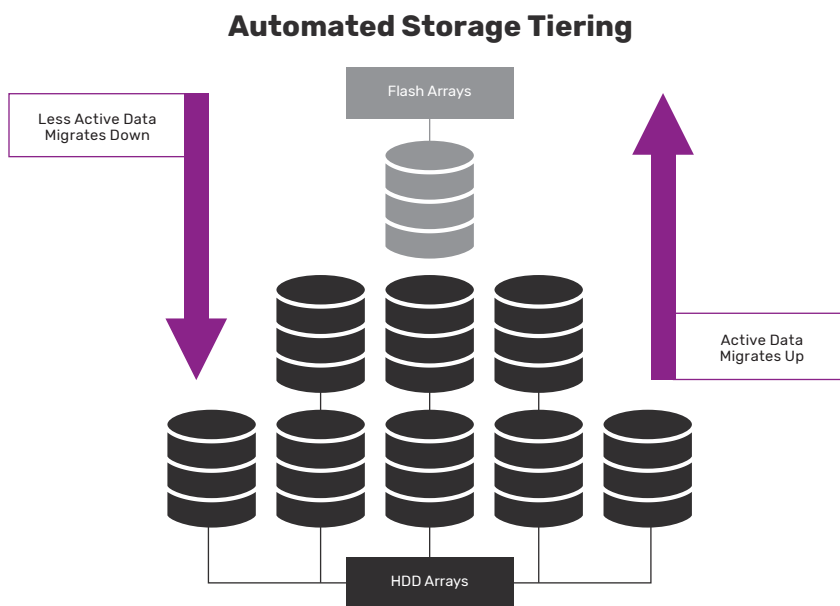
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Many IT managers envy the power of all-flash arrays to speed up business-critical workloads. Others prefer the more cost-efficient hybrid approach combining hard-disk and solid-state drives.

The hybrid array also permits IT managers to configure storage in tiers. The tiering process ensures data sits in the most appropriate type of storage based on performance requirements. High-access or “hot” data lives in higher-performance SSDs. Meanwhile, less-accessed or “cold” data remains in higher-capacity hard disks, migrating into flash memory when it becomes more active.

Automated storage tiering solutions take over the process of identifying and allocating “hot” and “cold” data to the appropriate storage. They do so via continuous monitoring of I/O performance. This includes metrics like IOPS, latency and throughput. It also controls dynamic placement onto performance-optimized storage without disrupting application performance. IBM’s Easy Tier technology provides analytics-driven tiering for both IBM and non-IBM storage devices.

The result is better performance and efficiency with a lower upfront investment than migration to a pure flash array. This is an enticing option for IT managers with limited budgets.



THE VIRTUE IN VIRTUALIZATION

Supporting the growth of core business applications becomes a challenge with a limited budget. Replacing your storage outright is rarely an option. Yet, maintaining a mix of capabilities on heterogeneous storage systems also has its drawbacks.

As capacity and performance requirements expand, managing several solutions becomes time-consuming and difficult. In response, many IT managers turn to software-defined or “virtualized” storage. In general, virtualization refers to the separation of a device’s functions from its physical components.

Storage virtualization pools the resources in the SAN environment so that they appear and behave as a single device. This enables the SAN controller to interact with many different physical disks as though they are a single unit.

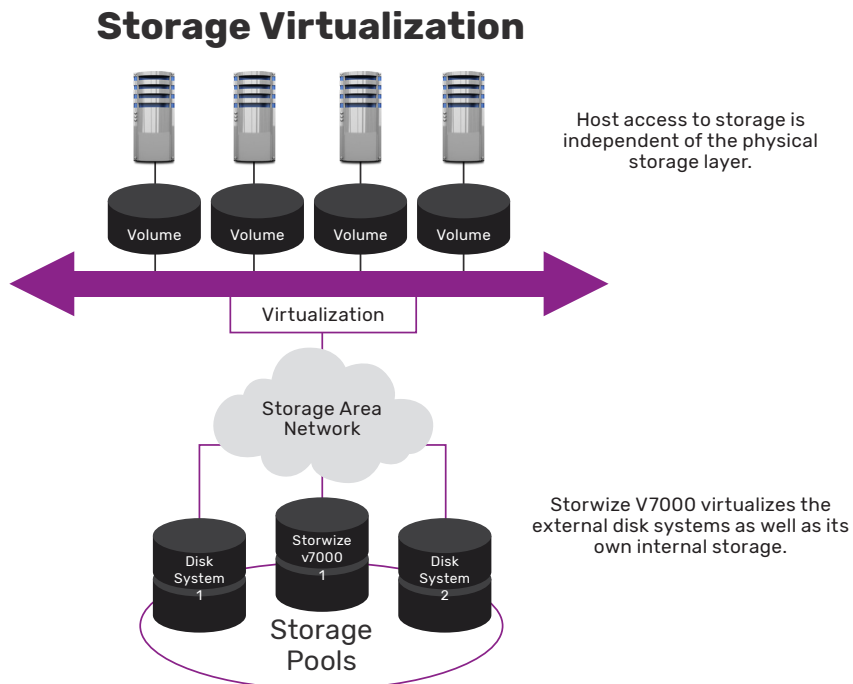
In a traditional system, moving data from drive X to drive Y would involve taking X offline. Next, you would transfer the data on X to drive Y and then bring Y online. The result is a lengthy manual process.

In a virtualized system, you redirect the logical unit number (LUN) associated with drive X to drive Y. The virtual disk begins transferring the data from X to Y. Meanwhile, all new I/O requests proceed directly to drive Y. This functionality eliminates the time and cost associated with planned downtime for manual migration.

“*The result is lower equipment costs & fewer infrastructure issues.*”

THE VIRTUE IN VIRTUALIZATION

Continued



A virtualized system allows administrators to operate mixed-capability systems from one management layer. The result is lower equipment costs and fewer infrastructure issues. Virtualization also complements tiered storage systems by simplifying the migration of data between storage devices as needed.

An example of this is IBM Spectrum Virtualize. The software runs on a wide range of flash storage products from IBM. And, it activates software-defined storage features for both IBM and third-party platforms.

It provides a software layer that allows for consistent management across the system. At the same time, it functions regardless of the hardware vendor. As such, IBM Spectrum Virtualize enhances your data storage system independent of the choice of infrastructure by extending the features and functionalities of software-defined storage to your existing hard disk drives. These include thin provisioning, simple configuration and automatic migration between storage tiers.

MEET THE IBM STORWIZE FAMILY

Enterprises contend with intense data processing and analysis requirements on a minute-by-minute basis. But today, every company is becoming a technology company in some respect. This translates into a growing need for these capabilities outside the enterprise tier.

IBM Storwize devices are purpose-built to offer enterprise flash capabilities to growing businesses. Storwize uses IBM Spectrum Virtualize, IBM's software-only solution enabling advanced storage tools and functionality, regardless of hardware. This means it enhances environments while allowing organizations to scale to their needs. It also allows for fewer resources dedicated to IT infrastructure, and more to supporting core applications.

Storwize devices, combined with IBM Spectrum Virtualize, allows the virtualization of your existing storage. This allows your on-premise environment to enjoy Storwize features and capabilities. These include advanced replication, high-performance thin provisioning, data migration and real-time compression. The result is much-improved data center performance without the need to replace the infrastructure in place.

“IBM Storwize devices are purpose-built to offer enterprise flash capabilities to growing businesses.”

IBM Storwize V5030

Uses a new category of affordable, high-density flash storage to offer enterprise-level security and availability to mid-sized organizations.

Features

- Powerful data compression yields consistent results across a wider range of application workload patterns
- “Five-nines” availability (99.999%) plus at-rest data encryption and distributed RAID for a 10x reduction in disk rebuild times
- Single UI for configuration, management and servicing tasks covering mixed storage systems

Ideal for: Mid-sized organizations looking to boost their system over performance hurdles with a simple, cost-effective solution.

MEET THE IBM STORWIZE FAMILY

Continued

IBM Storwize V7000

Offers enterprise-class storage performance built for scalability up to 204 drives per system

Features

- *A 10 core CPU and integrated data compression accelerator card for enhanced storage throughput and performance*
- *Enhanced flash drives and UI equipped for synchronous and asynchronous replication, thin provisioning and snapshots*
- *Support for integration into existing clustered systems using previous generation V7000 systems*

Ideal for: Organizations ready to reach the next level of performance with a hybrid array anchored on an enhanced all-flash solution.

IBM FlashSystem V9000

Represents true enterprise-tier data storage power and innovation. The VF9000 is not part of the Storwize family. But, it does offer software-defined capabilities from IBM Spectrum Virtualize along with ultra-low latency and optimal performance.

Features

- *Hardware-accelerated inline data compression technology for enhanced data reduction across any workload*
- *Scalability to many petabytes and millions of input/output operations per second with a variety of scale-up and scale-out options*
- *Integration with the IBM Spectrum Storage suite as well as leading host-side virtualization and container platforms*

Ideal for: Organizations looking to tackle new data-intensive workloads without compromising performance.

SOFTCHOICE STORAGE TECHCHECK ASSESSMENT

*Practical Intelligence
on Your Data Center*

Data drives your business. To stay ahead, your organization needs real-time insights into the growing volume of information. Your storage infrastructure must support the rising demands of core applications. And, it must be ready to scale as your needs evolve.

Softchoice's Storage TechCheck allows you to better understand your data storage needs and select the best solution for your needs. In-market data center experts then lay the groundwork for the continuing evolution of your environment.

Our Process

Discovery: *a non-disruptive assessment of your current state using agent-less data collection*

Analysis: *comprehensive review of data center software, server and storage interdependencies*

Workshop & Report: *in-depth report on opportunities for optimization and improvement*

Recommendations: *for innovative technologies, including business case and ROI analysis*

The Storage Tech Check is the most efficient way to understand your current state and potential options. We support our Tech Check sessions with a community of experts well-versed in emerging trends and technologies in data storage.

To learn more about Softchoice TechChecks visit
www.softchoice.com/techcheck

[1] <https://analyticsweek.com/content/big-data-facts/>

[2] <https://www.forbes.com/sites/tomcoughlin/2016/07/24/the-costs-of-storage/#4d7ff02b3239>

