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The Next Revolution in Data Protection

IBM® FlashSystem™ with Tributary Systems' Storage Director® Delivers Breakthrough Performance

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The Confluence of Old and New

Several technology currents, some old and some new, have begun to merge in the present day data center, bringing a solution that lowers both complexity and cost while dramatically increasing performance to the level demanded by today's high velocity business.

Tape-based storage was pronounced dead on numerous occasions, having been around for half a century. In fact, it has continued to evolve and thrive in an information technology (IT) world constantly seeking the lowest possible data storage costs. Tape remains especially attractive in an arena where everyone needs a solution but no one wants to invest heavily – data backup.

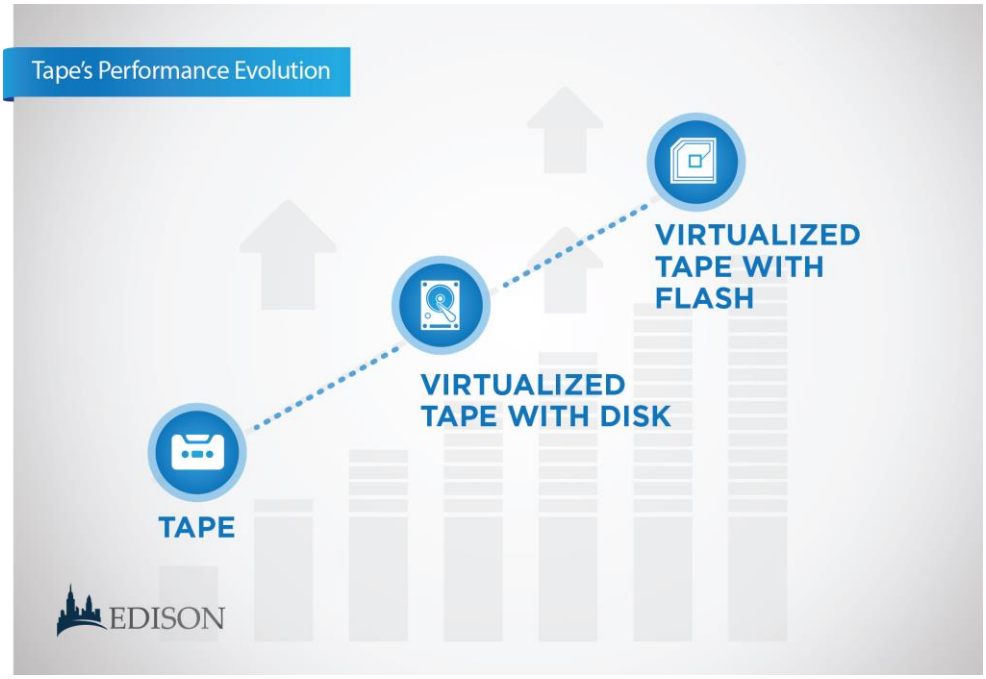


Figure 1: Tape undergoes its next evolution with flash

Flash storage arrays are the hottest new storage technology in the marketplace. Though solid state storage appliances have been around for decades, recently several trends, including falling prices, enterprise-grade reliability, richer feature sets, and the ever increasing need to accelerate business critical applications have rendered flash appliances more attractive than ever.

Thanks to a partnership between IBM and Tributary Systems, the paths of tape and flash have come together in a confluence of technologies, resulting in a high performance data protection solution composed of IBM® FlashSystem™ and Tributary Systems' Storage Director®.

Storage Director: "Business-savvy Data Protection"

Leveraging the advantages of tape while mitigating its liabilities is a task that has been revolutionized by Tributary Systems, a global leader in providing backup storage virtualization, data compression, encryption, remote backup, and disaster recovery solutions for enterprise computing platforms.

Tributary's product, Storage Director, is software-defined storage that virtualizes and consolidates data backup. Storage Director applies appropriate protective services to data in a "business-savvy" way, enabling financial institutions, retailers, healthcare providers, and others — even those with the most complex and demanding needs — to take an intelligent approach to storage. In other words, organizations can establish a custom set of rules that govern where different kinds of data are stored and how quickly they can be retrieved.

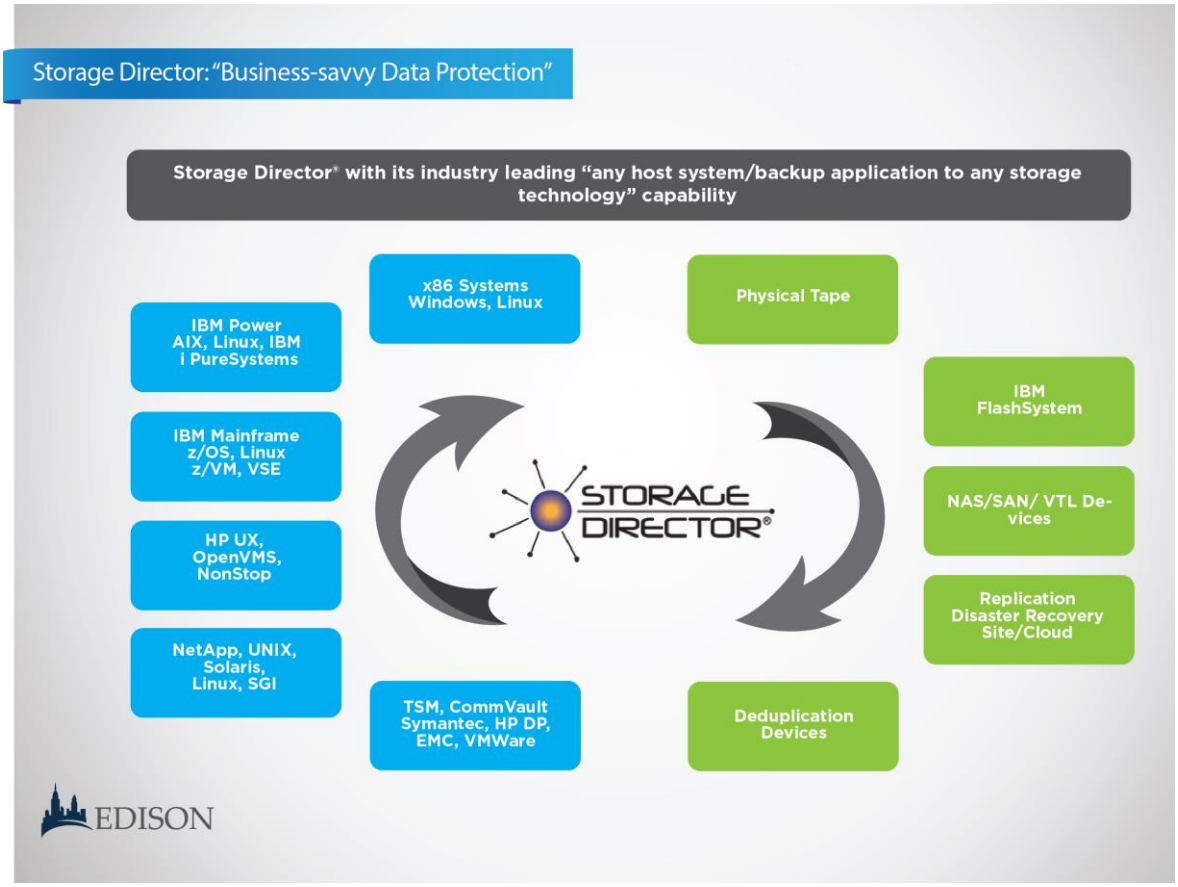
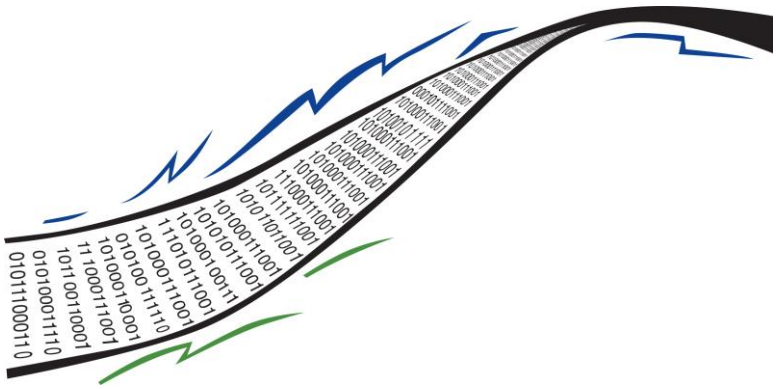


Figure 2: Storage Director connects host systems to storage systems

Storage Director is designed for fault-tolerant, high-availability computing environments, and it meets or exceeds most data backup requirements for speed, capacity, compatibility, and reliability. Though Storage Director can be used with any storage medium, it is especially effective as a tape storage virtualization engine. Storage Director can connect to almost any host platform – including IBM z/OS, IBM i, AIX, Linux, and Windows – and to almost any back-end storage media or devices in heterogeneous data centers.



A key ingredient in Storage Director's architecture is its InfiniCache® data pool/buffer. InfiniCache provides a disk-based pool or cache where data resides temporarily and can be staged for off-loading to the back-end storage media as part of the backup/archiving activity or toward the various hosts/applications during system recovery. Typically, InfiniCache has used hard disk drive storage, which has led to limitations in the overall capabilities and performance of the cache, and thus Storage Director itself. Now, FlashSystem is liberating InfiniCache from the limitations imposed on it by mechanical disks.

IBM FlashSystem: "The Great Enabler"

Flash technology has transformed storage dramatically, enabling enterprises to extract extraordinary value from complex data sets. IBM FlashSystem all-flash storage arrays provide industry-leading performance, reliability, and Microlatency™. FlashSystem offers the full spectrum of enterprise-grade management and feature-rich storage services, providing multiple options for addressing high-speed data requirements, removing performance bottlenecks, and increasing productivity.

Figure 3: Industry leading characteristics of IBM FlashSystem

Exceptional performance and enterprise-grade reliability make FlashSystem "the great enabler," broadening the capabilities, accelerating the performance, and lowering the operational costs of many data center components, such as Tributary's Storage Director.

Heart of a Business-savvy Solution

Working together, IBM FlashSystem and Storage Director make a powerful solution that improves enterprise data storage performance, increases data protection, facilitates and simplifies storage management, and lowers IT costs.

Storage Director is essentially a virtualization layer, but optimized for tape. It also interfaces well with disk (and now with flash), and it can be used both for caching and even as a virtual tape device. As shown in Figure 4, Storage Director leverages the ultra-low latency and high throughput of FlashSystem to create a flash/tape solution architecture that IBM calls "tape at the speed of flash."

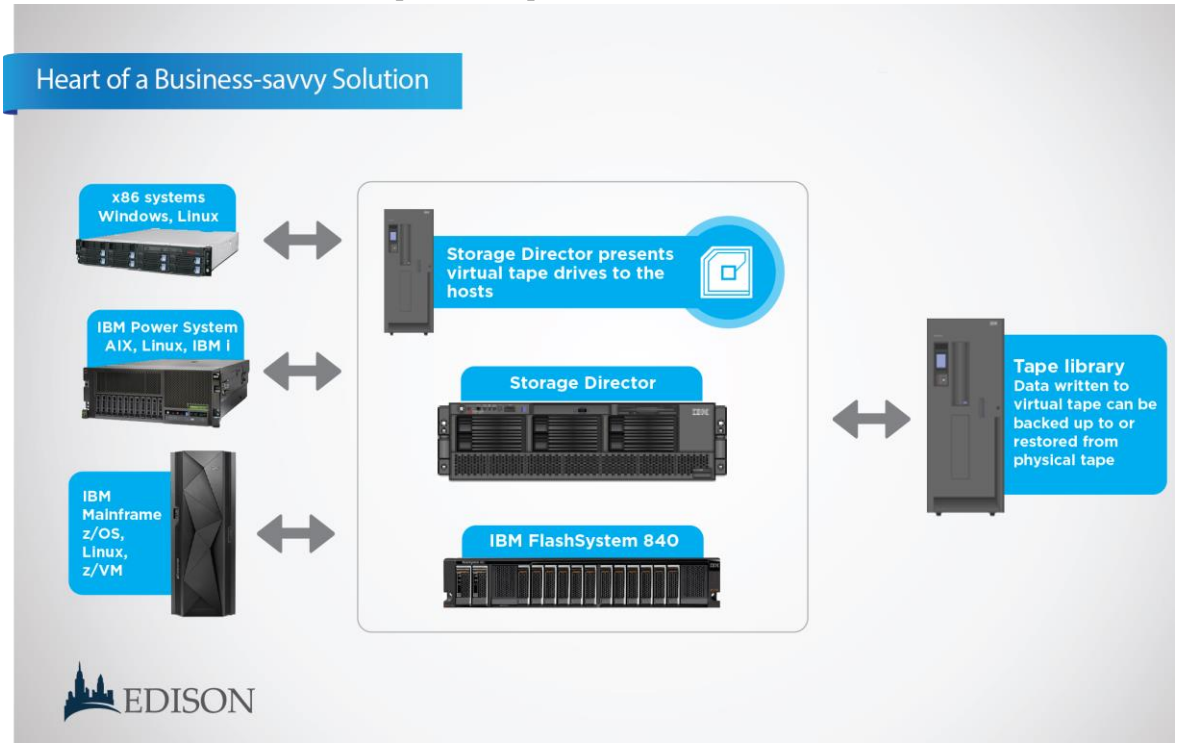


Figure 4: Tape at the speed of flash solution architecture

Tape at the Speed of Flash

The IBM FlashSystem team is working with Tributary Systems to create "tape at the speed of flash" solutions. The use cases fall into five broad categories:

- **Batch window reduction** - Batch processing duration is typically bandwidth dependent. Because FlashSystem dramatically increases Storage Director's potential throughput, customers running these types of processing workloads will see substantial decreases in batch processing times. This benefit should prove especially important for customers such as financial and healthcare enterprises running z/OS and IBM i systems.
- **Simultaneous host system access** - Storage Director is designed to enable simultaneous access by multiple systems; however, before FlashSystem, the performance of disk and tape throttled bandwidth essentially to a single host system. With FlashSystem, the increased bandwidth enables multiple systems to comfortably access Storage Director concurrently.
- **Multiple tape volumes mounted simultaneously** - Storage Director was designed to manage multiple data streams and multiple storage targets, but when using disk storage for its InfiniCache, throughput limitations unacceptably slowed system performance. Using FlashSystem for the working cache, Storage Director can easily facilitate multiple users accessing storage volumes simultaneously, so this use case should quickly grow in popularity with customers.
- **Scratch tape processing** – Temporary data volumes can be easily and quickly configured on FlashSystem storage to be reused or erased after the completion of a job or processing run.
- **Pinned volumes** – Storage Director can pin hot data sets to FlashSystem to ensure the fastest data access and retrieval.

A value driver in any FlashSystem/Storage Director implementation will be the solution's data compression capabilities. Storage Director offers built-in hardware-assisted compression that can run with almost no latency penalty. According to Tributary Systems, customers running Storage Director on IBM Power Systems with IBM i environments have achieved a typical 5:1 data compression ratio. Compression changes the economics of the solution, essentially enabling a 40TB FlashSystem to provide 200TB of storage capability, cutting the effective cost of flash storage in this environment by 500%.

Tests Prove the Value

IBM and Tributary Systems are working together to develop and test the most effective solution architectures. FlashSystem has been tested with two Storage Director (SD) products: one available today, SD 4.32, and a product available in the near future, SD 5.0. While SD 4.32 saw a 2 GB/s vs 1 GB/s improvement in both backup and restore performance with FlashSystem 840 compared to disk, the truly impressive numbers were achieved with SD 5.0 and FlashSystem.

SD 5.0 can fully utilize the entire FlashSystem array by offering improvements such as the newest x86 chip design, performance tuning, and a 16Gb Fibre Channel interface. Figure 5 shows the backup and restore performance of FlashSystem versus disk with 2:1 compression enabled. FlashSystem was over three times faster than disk, achieving backup performance of 10.4 GB/s and restore performance of 9.6 GB/s. Additionally, FlashSystem continues to scale as the number of streams increases, while disk plateaus.

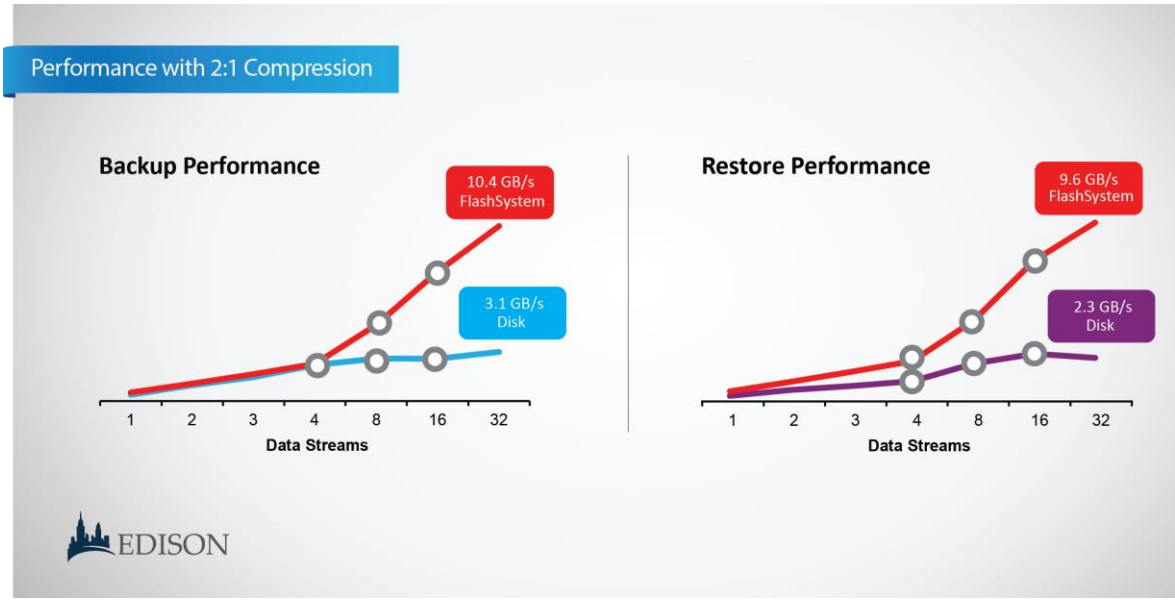


Figure 5: SD 5.0 performance with FlashSystem vs disk, with 2:1 compression

Running the same tests as above, but without compression, the results were also impressive, with backup and restore performance still over three times that of disk, as shown in Figure 6. In this test, 16Gb/s Fibre Channel interfaces as well as 8Gb/s Fibre Channel interfaces were tested with the FlashSystem array.

Figure 6: SD 5.0 performance with FlashSystem vs disk, without compression

These performance numbers can easily be placed into the context of a real-world use case. Imagine that a large bank must back up 100TB of data every night. Using FlashSystem as the Storage Director InfiniCache, the bank can write 100TB of data at a rate of 10 GB/s and complete the backup in less than three hours. To write the same 100 TB of data to disk at 3 GB/s would take almost ten hours. Once the data is written to FlashSystem, the data can be moved to its long-term home (i.e. tape) at a slower rate, without impacting application performance. In the 24x7x365 global economy, a ten hour backup window is no longer acceptable, especially if banking systems cannot process transactions during backup times.

Conclusion

Storage Director provides comprehensive enterprise-grade data protection solutions, functioning essentially as software-defined tape. The extreme performance of FlashSystem liberates Storage Director from the constraints of mechanical disk storage, enabling it to handle much higher data volumes and many more concurrent data streams at much higher velocities.

With both Storage Director and FlashSystem deployed, enterprises have the option to move in the direction of what might be called "tape at the speed of flash." This configuration offers many benefits. Storage Director as a storage virtualization engine enables software-defined storage leveraging tape and FlashSystem. The combination of Storage Director's effective inline data compression plus the low cost of tape reduce both storage capital investments and operational costs, especially when compared to traditional disk-based solutions. And there's no comparison when system performance, latency, efficiency, and resiliency are included in the equation.

Tape at the speed of flash isn't just a slogan with no basis in reality; it is, in fact, something very real, very deployable, very capable, and surprisingly cost effective – it's Tributary's Storage Director at the speed of IBM FlashSystem.

For more information on IBM FlashSystem, see www.ibm.com/systems/storage/flash/.

For more information on Tributary Systems and Storage Director, see http://www.tributary.com/products/virtualization/tributary-storage-director.