

# All-Flash Arrays: Not Just for the Top Tier Anymore

Falling prices, new technology make all-flash arrays a fit for more financial, life sciences and healthcare applications



**DAYMARK**  
*Navigate information technology*



## EXECUTIVE SUMMARY

Real-time financial analytics, genomic profiling, and medical imaging are examples of how financial services, life sciences and healthcare enterprises are driven by data and must process an ever-greater volume and variety of data to develop new products, serve their customers and meet regulatory requirements.

The faster a pharmaceutical company can analyze the results of early stage drug tests the more quickly it can shut down unproductive research and steer funds to areas with more promise. Financial services companies can lose millions of dollars if a database is seconds slow in reporting a shift in the market.

Then there are “everyday” needs such as unpredictable development, test and production patterns that require superior performance to support new products, partnerships, mergers or acquisitions. The constant for all of these businesses is the need to meet these requirements while reducing, or at least minimizing, costs.

**Modern all-flash storage arrays can deliver exponential performance improvements at a total cost of ownership that is competitive to, or in some cases, even lower, than traditional spinning disk.**

This white paper describes how the latest flash arrays can cost-effectively optimize performance for your business. It offers key purchase considerations and deployment tips based on our years of experience with hundreds of financial, life sciences, and healthcare clients.

## TODAY'S FLASH DELIVERS EXPONENTIAL PERFORMANCE IMPROVEMENTS

By storing data in physical cells rather than on spinning magnetic disk, flash drives (also known as solid state) provide much faster performance and require far less space, power and cooling.

However, because of its higher cost per GB, flash-based storage, has largely been limited to use as a cache or as a high-performance “tier” of storage used only for the most demanding and business-critical applications. As data aged, was accessed less often or became less essential it was moved to slower, but less expensive tiers of storage such as SAS, near-line (NL) SAS or SATA.

All that is changing. Reductions in the raw price per GB and new technical capabilities are rapidly moving flash from this high performance niche to a broader range of mixed read/write workloads. These include not only databases, but virtual server and virtual desktop infrastructure (VDI) environments that slash computing costs by creating virtual “pools” of capacity that can be easily scaled and allocated to different workloads. In VDI, flash eliminates the latency which traditional hard drives are subject to, dramatically improving the user experience while reducing capital and operational costs.

**Field  
Tip**

**EVALUATING THE TCO OF FLASH ARRAYS ON A COST PER I/O BASIS**

When evaluating the TCO of flash arrays, remember that while they are still more expensive on a cost per “physical” GB basis, they are often less expensive on a cost per I/O basis. That’s an important metric when faster access to, or analysis of, data helps reduce costs, increase sales or minimize compliance risk.

Be sure to also consider the fact that flash can reduce storage management costs by up to 90 percent. An all-flash array eliminates the need to allocate data among “tiers” of slow but inexpensive and fast but expensive media. Some modern all-flash arrays also boast highly intuitive management interfaces that require only the creation of LUNs (logical unit numbers) and masking them to the appropriate hosts. This can cut implementation time of a new array from several days to a few hours.

Finally, factor in how much less power, cooling and space flash arrays require than spinning disk, especially when deduplication and compression are used to maximize their capacity.

Flash is not a cure for every problem. For example, flash-based deduplication in databases will deliver significant improvements in performance, but not capacity. However, taking all the relevant factors into consideration may show that flash pays for itself more often than you think.

Among the workloads to consider for flash are those with very high I/O requirements or that are performance sensitive, and those that involve large amounts of duplicate data such as VMware.

Some examples of workloads that benefit from flash include:

- ERP systems (e.g. SAP)
- Virtual desktop implementations
- Large VMware environments with mixed workloads
- Analytics and reporting for financial services or life sciences

## 7 KEY ATTRIBUTES TO CONSIDER WHEN EVALUATING FLASH ARRAYS

Despite every vendor's claims of blazing performance, not all flash arrays are created equal. Getting the maximum performance and lowest TCO requires specific design aspects and technical capabilities.

- 1. First, the array should be designed to scale all critical components (processing, networking and storage) linearly to assure none of these forms a bottleneck as your environment grows.** Solutions that expand only the underlying storage but not the associated compute and network capacity are adding only capacity, but not performance, as you scale because a single shelf of SSD is faster than any controller available on the market.
- 2. The most important data services to look for are global inline deduplication and compression.** Inline deduplication reduces the amount of data that is stored by a significant margin (up to 10X or more) with certain workloads, while compression can offer significant improvements for database workloads. Inline deduplication also increases performance and throughput because incoming deduplicated data does not need to be written to a cell. All that is required is a look up to a metadata table to find where the original data is stored.

But that's not all.

- 3. Inline deduplication also extends the life of a flash array by reducing the number of writes, each of which causes wear to the flash cells.** Reducing the amount of data stored and output to hosts minimizes the performance bottlenecks caused by the very wide range of I/O patterns common to virtual environments.

Compression is applied to unique blocks of data that cannot be deduplicated. It also improves performance by allowing flash controllers to reduce the amount of data written to each flash drive.

- 4. Make sure to look for arrays that perform both deduplication and compression in-line, as a function of the write procedure, rather than as a software process.** This is an important distinction as some vendors that tout inline deduplication perform it as a "process" that can and will be disabled in favor of other data services such as garbage collection. It is critical to make these data services intrinsic to the write procedure to ensure they are never disabled, because that would reduce the performance and life cycle of the underlying flash. After all, why invest in a flash array that can accelerate performance only under optimal conditions? Only solutions that can guarantee consistent performance under the most demanding workload cycles are worth the investment.

- 5. Be sure that both inline deduplication and compression are performed globally, across the entire storage array and all LUNs.** This allows you to merge workloads and maximize efficiency while increasing performance for all workloads.
- 6. Be careful to choose arrays that are built using enterprise-grade, rather than consumer-grade, flash storage.** Such arrays are designed for significantly higher write cycles, and include hardware - rather than software-based flash management functions such as garbage collection. Performing these operations in software can reduce the initial investment but will come back to bite you when the array is too busy performing flash management operations to deliver I/O to your workloads in a timely manner.

If consistent performance as you scale is a requirement, consider flash arrays built using a “building block” architecture that combines storage, compute and network resources in one device so all the needed capabilities scale every time you add storage capacity.

- 7. Depending on your needs, you should also consider which software tools an array supports for functions such as business intelligence, data backup, disaster recovery, security, and data management.** Since you’ll often deploy flash in virtual environments, make sure you research how well your array will work with virtualization monitoring and management tools.

### BEWARE OF THE “WRITE CLIFF”

Many flash arrays suffer steep declines in performance after 90 to 100 days of use. That is often the point where every cell has been written to and will need to go through the process of being “flushed” (or erased) so that new data can be written to it. This requires “garbage collection” to clear data still present in the cells so that new data can be written.

When garbage collection is performed through software, the required reads and writes of data to free up more space on the array can significantly reduce performance. This is referred to as a “write cliff” because performance tests show typical write performance can drop by more than 90% once all free flash cells have been written to. Using enterprise class flash drives enables garbage collection to be performed on the drives, in hardware to mitigate this performance bottleneck.

To sum it up, an all-flash array should have the following features as part of its core design and architecture. In other words, all-flash arrays should be built from the ground up to support these features natively as part of their fundamental design and architecture.

- Fully redundant architecture with no single point of failure
- True scale-out growth model in both capacity and performance
- Global in-line deduplication and compression
- Enterprise-grade flash drives
- A simple and intuitive management UI

**Field  
Tip**

**TUNE THE ENTIRE APPLICATION STACK**

When deciding whether an upgrade to all-flash arrays makes economic sense, remember that every component of your application stack must be able to get the maximum performance from flash. Take into account the cost and payback of upgrading anything from servers to databases and networks so they don't become a bottleneck. (We recommend the use of at least 8GB and ideally 16GB Fibre Channel networks.) Don't forget that even with flash arrays you may need to tune your operating systems, applications and databases to maximize performance.

**CHOOSING THE RIGHT FLASH SERVICE PROVIDER**

The best service providers have in-depth knowledge of the flash market, possess important technical certifications in leading products, and have a track record of successful deployments in complex environments managing multi-PB environments. Check references carefully to be sure the provider is actually vendor-neutral, and will recommend products because they are the best fit for your needs.

Look for a partner that will keep the same senior personnel who were involved in the sale and design process engaged throughout the implementation. That assures you actually get the level of skill and professionalism you saw in the sales call, and that you don't have to retrain new staff in your environment during the engagement.

Finally, choose a provider with a proven commitment to customer satisfaction. Flash and virtualization are quickly evolving technologies. The more you want the benefits of "cutting edge" technology, the more you'll need a reliable partner who understands the solutions in the market and who can take ownership of the design, deployment and optimization process.

**CONCLUSION**

The pressures for cost-effective performance are everywhere. Employers, customers and business partners demand ever faster and easier access to applications and data. Investors and management demand IT infrastructure that can grow and shrink quickly to meet changing business needs, while minimizing IT capital and operational costs.

Two fast-developing technologies – virtualization and flash arrays – can help meet these requirements. But getting the highest ROI requires deploying these technologies for the most

appropriate applications, ensuring and quantifying cost-effectiveness, and leveraging guidance from a partner experienced in deploying these technologies within your industry.

To learn more about working with Daymark solutions to plan and implement a powerful all-flash solution for your business using XtremIO technology, please contact Brian Casey, General Manager, by calling (781) 359-3000 or email [bcasey@daymarksi.com](mailto:bcasey@daymarksi.com).

### COMPANY OVERVIEW



Daymark Solutions, Inc. architects, sells, and implements data center infrastructure, data protection, virtualization, cloud, and managed services. Daymark provides deep technical knowledge, extensive experience, and proven methodologies and documentation to help its clients make educated decisions, optimize the installation, configuration, and testing process, and successfully implement cost-effective solutions and service.

Daymark boasts:

- 450 successful and complex deployments to date
- 10PB+ of storage under management
- 250 technical certifications held by its consultants
- 5 “Best Places to Work” awards from the Boston Business Journal.