Tintri IntelliFlash vs. Pure Storage FlashArray

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PRODUCTS

Tintri IntelliFlash

URL ▶ https://www.tintri.com/intelliflash

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Santa Clara, CA 95054
(408) 419.2800

Pure Storage FlashArray

URL ▶ https://www.purestorage.com/products/flasharray-x.html

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Mountain View, CA 94041
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Both IntelliFlash and the Pure Storage FlashArray have moved the enterprise storage industry forward in various ways.

IntelliFlash designers focused on revolutionizing the total cost of ownership for enterprise-class storage. It was perhaps the first unified multiprotocol block and file all-flash storage system. IntelliFlash was one of the first products to make inline deduplication and compression work for active data in both hybrid and all-flash systems. It was also among the first to offer customer-friendly all-inclusive software licensing.

Pure Storage began with a focus on the customer experience. Pure Storage innovations span technical and non-technical considerations. For example, FlashArrays globally manage data placement on proprietary DirectFlash modules, enabling the arrays to deliver consistent low latency. Pure Storage rehabilitated the term "evergreen" from a rapacious end-of-term profit play into a customer-pleasing, non-disruptive, in-place upgrade.

Intelliflash Differentiators

Tintri IntelliFlash intelligent Infrastructure provides the simplicity, performance, and capacity enterprises need at a cost they can afford. Thus, IntelliFlash can meet the needs of a broader set of customers and workloads than Pure Storage FlashArray. Tintri's focus is on providing Intelligent Infrastructure that maximizes uptime and efficiency, and simplifies administration for IntelliFlash storage systems through automation so you can focus on adding business value.

Multi-layered Architecture for Cost-effective Infrastructure

Both the IntelliFlash and FlashArray make use of an NVDIMM cache to accelerate and consolidate writes. While FlashArray is essentially a single-tier storage architecture, IntelliFlash takes advantage of multiple layers of both DRAM, NVDIMM, and flash caching as well as NVMe-flash, SAS-flash, and HDD storage media. This multi-layered architecture also enables IntelliFlash to integrate new media cost-effectively, whether that media is ultra-low-latency persistent memory or slower large-capacity media.

Scalable Capacity

IntelliFlash's multi-layered metadata aggregation and placement accelerates advanced data services even for massive amounts of data. A single IntelliFlash system can provide 2,580 TB of raw all-flash storage capacity. This is 2.9x the maximum capacity of FlashArray.

Customers can expand the capacity of any IntelliFlash system to its maximum capacity by adding SAS-attached storage shelves supporting both SSDs and HDDs—without being forced to replace the system's existing controllers with expensive new controllers. Based on customer demand, Tintri is developing an ***NVMe-attached shelf*** that will combine the processing efficiency of NVMe with multiple media types, including SSDs and HDDs.

Store More in Less Space

Intelliflash storage systems not only store more data than FlashArray; they can do so in much less space. For data centers that are running out of rack space, the ability of IntelliFlash to provide up to 169 TB of flash memory per rack unit may be the key to consolidating multiple data centers or avoiding the costs and delays associated with establishing and managing additional data centers or leasing additional space in a colocation facility.

One Operating Environment Across NVMe-flash, SAS-flash, and Hybrid

Another benefit of IntelliFlash's multi-layered architecture is a family of systems offering a single storage OE across hybrid, SAS-flash, and NVMe-flash storage arrays. Thus, IntelliFlash can address varied cost/capacity/performance requirements while providing a single, consistent set of management tools.

- IntelliFlash NVMe-flash systems address the most demanding enterprise workloads
- IntelliFlash SAS-flash systems accelerate multiple mixed workloads at greater scale
- IntelliFlash hybrid systems balance performance and economics

IntelliFlash is Optimized for NVMe

NVMe is a high-performance storage protocol that is designed specifically for flash and storage class memory. The NVMe protocol leaves behind overhead associated with legacy SAS and SATA disk-oriented protocols. Thus, NVMe reduces the demand that I/O puts on CPUs, allowing CPUs to do more real work. Another benefit of the NVMe protocol is that it

replaces the single SAS/SATA queue with many parallel queues ideal for multicore CPUs, unlocking more low-latency IOPS from each SSD.

Tintri engineers have addressed these features in IntelliFlash and optimized for NVMe by refactoring the storage operating environment to improve the data pipeline in IntelliFlash 3.10 in the following ways:

- Enhanced parallelism through lockless page buffer caching and lockless I/O queues
- Accelerated metadata handling by taking advantage of advanced CPU SHA/AVX instructions
- Reduced the number of I/O events by converting a greater number of random writes into sequential write operations

The combined effect of these improvements is a doubling of write performance with 60% lower latency—without having to upgrade the underlying hardware.

IntelliFlash and FlashArray Similarities

The IntelliFlash and FlashArray products are both designed to function as primary enterprise storage. As such, they have many features in common. These include:

Data Availability

Both products provide high availability through active-active controllers. Should one controller fail, the other continues to service all workloads without interruption. Both products also offer integrated data protection features, including asynchronous replication to another array from the vendor.

Both products can also send snapshots to S3-compliant object storage for low-cost data protection or hybrid-cloud enablement.

Mixed-workload Consolidation

Both products provide unified multi-protocol block and file storage. Supported protocols include iSCSI, FC, NFS, CIFS, and SMBv3. One caveat regarding FlashArray file support: It is provided via Windows File Services running in a partition on the array. FlashArray file services are provided by a maximum of 4 vCPUs and 16 GB of memory per controller and are not intended for heavy-duty filer tasks.

Both products use an NVDIMM cache to enable low latency writes (under 250 microseconds), facilitate data efficiency features, and coalesce multiple random writes into a smaller number of sequential writes.

Both products can provide more than 800 TB of raw all-flash capacity, with IntelliFlash able to deliver 2,580 TB per system. Both products effectively multiply this raw capacity through inline deduplication and inline data compression.

A Great Customer Experience

Both Tintri and Pure Storage add value to the core technology through a focus on the customer experience. Consequently, both offer:

- All-inclusive licensing
- Cloud-based predictive storage analytics
- Proactive support based on analytics
- Flexible acquisition options, including zero-CAPEX Storage-as-a-Service (STaaS)

All-inclusive licensing creates extra value by reducing the number of decision points in the purchasing process. It also increases agility and smooths the path to full utilization of the array's capabilities. All-inclusive licensing eliminates the ordering and purchasing processes associated with the traditional a-la-carte approach to licensing that can add weeks or even months to the implementation process.

Cloud-based predictive analytics increase uptime by gathering and analyzing telemetry and configuration data such as capacity usage, configurations, system health, and performance. The results of these analyses are visible to both customers and support personnel.

Proactive support kicks in when system health alerts or the predictive analytics identify an issue. Cases are opened. Parts are shipped. Administrators are notified. Problems are resolved, in many cases, without the downtime that would otherwise have occurred.

Both vendors offer flexible acquisition options, including zero-CAPEX storage-as-a-service (STaaS) offerings that charge for actual capacity utilized each month. Both also offer support plans that include periodic replacement of the controllers.

Seeking the Best Fit

There are many similarities between the Tintri IntelliFlash system and Pure Storage FlashArray. Both enable mixed workload consolidation and provide enough all-flash capacity to meet the needs of many enterprises, though IntelliFlash offers 2.9x greater storage capacity. Both offer rich, but not identical VMware integrations. Both companies offer flexible acquisition options, including cloud-like storage-as-a-service and a built-in hardware refresh after three years.

Tintri IntelliFlash offers many of the same capabilities as the Pure Storage FlashArray but with a difference.

- IntelliFlash is Intelligent Infrastructure without the sticker shock. It delivers the deep intelligence, intuitive tools, and automation needed to maximize uptime and performance and keep IntelliFlash systems operating at peak efficiency.
- IntelliFlash's greater all-flash capacity and flexible media options enable customers to optimize the balance between performance, capacity, and cost for a wider range of use cases. These use cases include primary storage and secondary storage on-site or at a disaster recovery site.

KEY QUESTIONS TO ASK:

- *Is it important for your company to grow storage capacity incrementally without being forced to replace the system's existing controllers with expensive new controllers?*
- *Is it important for your company to grow storage capacity to 1 or 2 PB without having to purchase and manage 2 or 3 separate storage systems?*
- *Is your company running out of space in its primary data center?*
- *Is it more important for your company to balance performance and cost at its DR site than to get identical performance from its DR site and its primary site?*

If the answer to any of these questions is "Yes," then IntelliFlash may be the best fit for your organization.

Key Features—Summary Comparison

FEATURE		Tintri IntelliFlash	Pure Storage FlashArray
Deployment Options	*Hybrid Flash and HDD*	✓	○
	AFA with SAS Flash	✓	✓
	AFA with NVMe Flash	✓	✓
	NVMe-oF	Roadmap	Roadmap
	NVMe-oF Hybrid Flash & HDD	Roadmap	○
	Software-Defined Storage Running in Public Cloud	Roadmap	✓
Performance Resources	*Active-Active, Scale-up Architecture*	✓	✓
	CPU Cores per System (Max)	80 cores	Not published
	DRAM per System (Max)	1,440 GB	Not published
	NVRAM Cache	16 GB NVDIMM	Not published
	Flash Storage Capacity	2,580 TB	878 TB
	NVMe Flash Capacity (Max)	184 TB	878 TB
	SAS Flash Capacity (Max)	2,580 TB	180 TB
	HDD Capacity (Max)	300 TB	○
	Storage Density (Max)	169 TB/RU	7-146 TB/RU depending on model
	Storage Latency (Claimed)	200 microseconds	250 microseconds
	IOPS (Claimed)	1.7 Million IOPS	Not published
	Host Connectivity	Ethernet: 10GbE x 24, 40GbE x 12 FC: 8/16 Gb x 12	Ethernet: 10/25GbE x 16, 40 GbE x 12 FC: 16/32 Gb x 24 ports
Data Services	*Inline Deduplication & Compression*	✓	✓
	Asynchronous Replication	✓	✓
	Synchronous Replication	v3.11	✓
	Snapshot to S3	✓	✓

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Key Features—Summary Comparison (continued)

FEATURE		Tintri IntelliFlash	Pure Storage FlashArray
VMware Integration	*vCenter management plug-in*	✔	✔
	VAAI Block	✔	✔
	VAAI NAS	✔	●
	VAAI Thin Provisioning	✔	✔
	Virtual Volumes (vVols)	●	✔
Protocol Support	*Block (iSCSI, FC)*	✔	✔
	File (NFS, CIFS, SMBv3)	✔	✔
Ease of Ownership (Customer Experience)	*All-inclusive Licensing*	✔	✔
	Cloud-based Predictive Analytics	✔	✔
	Proactive Support	✔	✔
	Periodic Non-disruptive Controller Refresh	✔	✔
	Zero-CAPEX STaaS	✔	✔

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