Enhancing Consumer NAS Performance with SANDISK® NAS 800 NVMe™ SSD Caching

Overview

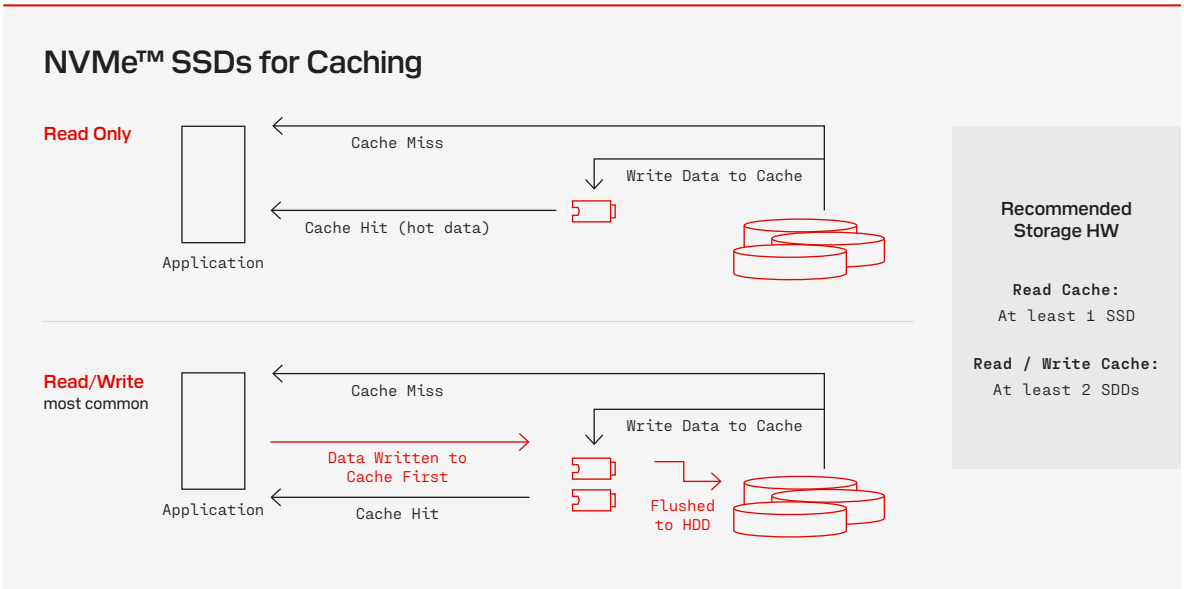
Consumer Network Attached Storage (NAS) has become a go-to storage platform for small and medium businesses, creative professionals, and prosumers. As data volumes accelerate and AI-assisted media workflows become more common, consumer NAS systems can struggle to sustain the responsiveness modern teams expect. At the same time, many leading NAS vendors now support M.2 2280 NVMe™ SSDs, creating a practical path to modernize performance without replacing the full system.

By integrating a high-performance NVMe™ SSD in the caching tier, NAS deployments can improve throughput, lower latency, and better support always-on collaborative workloads—helping teams keep pace with demanding content, application, and data pipelines.

The benefits of SSD caching

Adding NVMe™ SSDs as a cache in a NAS can improve responsiveness across demanding workloads such as file sharing, virtual machines, databases, AI-assisted media management, and professional video pipelines. In many hybrid NAS systems, M.2 2280 NVMe™ SSD slots are available, making configuring an NVMe™ SSD cache straightforward. You can install one or two M.2 SSDs and configure either as a read cache (1 x SSD) or a read/write cache (2 x SSDs in RAID 1), as shown in Figure 1. Read caches serve frequently accessed ("hot") data, such as in file sharing, while a read/write cache have the additional performance benefits for multiuser environments, virtualization, databases, and video editors creating high amounts of metadata. When configuring as a read/write cache, it is recommended to ensure your NAS is connected to a functioning Uninterruptible Power Supply (UPS). While RAID-1 helps protect against a single-drive failure, it does not protect against data loss resulting from an unexpected power loss before data is written to the HDDs.

FIGURE 1



Choosing SSDs for caching

Choosing the right SSDs for caching is critical to achieving consistent performance and long-term reliability. SSDs should be designed and tested specifically for NAS deployments including caching and tiering, or as primary storage.

NAS systems can widely vary both in PCIe® generation and lanes routed to the M.2 2280 slots, and will ultimately determine the performance that can be achieved. PCIe® 5.0 is the latest storage interface offering the highest possible performance. SSDs supporting PCIe® 5.0 x4 offer high performance and flexibility when considering adding a cache, and are typically backwards compatible with prior PCIe® generations. SSDs should also be designed for performance consistency when configured as a cache or as primary storage under sustained heavy NAS workloads. A standard consumer SSD, while compatible, may not provide deterministic performance for specific workloads, or over its lifespan.

Caching is very demanding on the write endurance of an SSD, as many NAS workloads will perform a lot of small and large writes to the cache. As a practical baseline for NVMe™ caching in demanding NAS environments, consider SSDs with a minimum of 1,000TBW[3] per 1TB[1] of capacity, along with a sustained 24/7 duty-cycle.

When choosing the amount of SSD cache, cache size is dependent on the workload and can be between 2.5% to 10% of the HDD storage pool. For example, if the HDD storage pool is 80TB[1], then consider 5% or 4TB[1] to be the recommended size. For a prosumer , the size could be determined by the typical application dataset size such as media asset file sizes. For a read/write cache in RAID 1, this would include two 4TB[1] SSDs.

Compatibility is equally important. SSDs should be tested for NAS interoperability, thermal stability, and sustained behavior over time to help ensure dependable operation across their service life.

Choose the SANDISK® NAS 800 NVMe™ SSD to energize your NAS

Tackle intense NAS workloads with SANDISK® NAS 800 NVMe™ SSDs with PCIe® 5.0 for demanding 24/7 NAS systems. Creative teams can quickly access and transfer large media and project files with sequential read/write speeds up to 14,900/13,200MB/s[2] (1.92TB[1] model). SANDISK® NAS 800 NVMe™ SSDs are engineered with a high endurance rating of up to 14 PBW[3] (7.68TB[1] model) for caching and storage tiering, or as primary storage in all-flash NAS systems. For multiuser collaborative workspaces, databases, and virtualization, the SANDISK® NAS 800 SSDs can help increase system responsiveness with random read/write speeds up to 2.3M/2M IOPS[2] (3.84TB[1] model). Available in capacities from 960GB[1] to 7.68TB[1] and built with SANDISK® TLC 3D NAND, you can easily scale your NAS storage capacity as your data grows. SANDISK® NAS 800 NVMe™ SSDs are also tested for compatibility with many leading NAS systems supporting M.2 2280. For added peace of mind, these SSDs are backed by a 5-year limited warranty.[4]

The SANDISK® NAS 800 SSDs do not have the typical decimal capacities for each of its models; 960GB (1TB), 1.92TB (2TB), 3.84TB (4TB), and 7.68TB (8TB). The SANDISK® NAS 800 SSDs are purpose-built for 24/7 NAS systems and have been **over-provisioned** to reserve extra NAND blocks. These reserved NAND blocks help the SSD manage data writes smoothly, minimizes NAND block wear, and ensures high performance over time, so the SSD lasts through heavy use.

Performance improvements with SANDISK® NAS 800 NVMe™ SSD caching

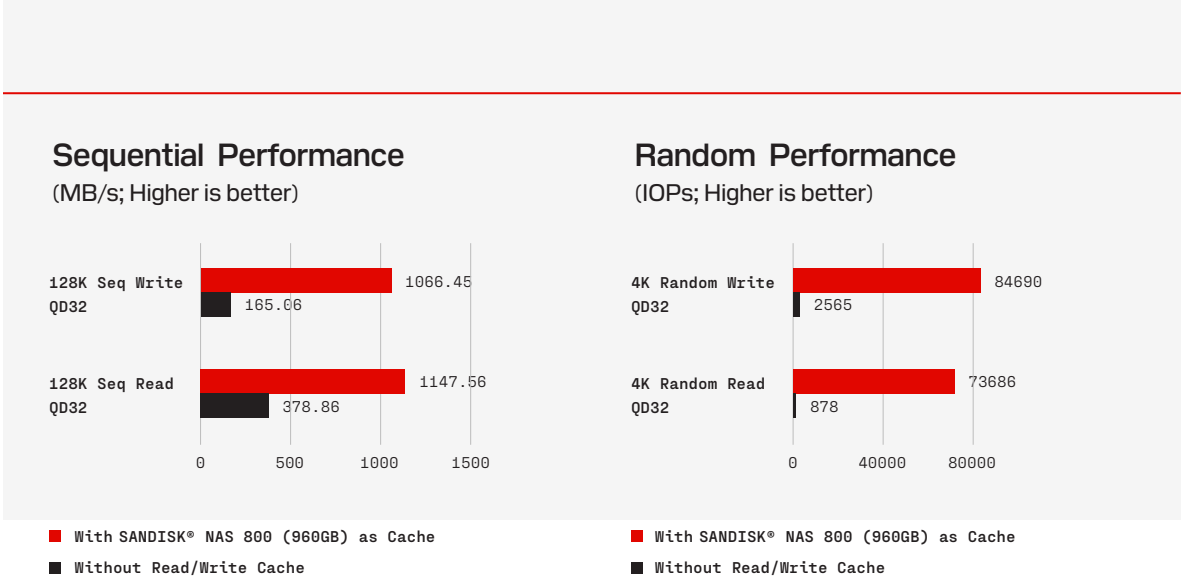
To demonstrate the improvements possible with SSD caching, we configured 2x 960GB SANDISK® NAS 800 NVMe™ SSDs on a UGREEN DXP 4800 NAS and ran the CDM8 benchmark. The 960GB SANDISK® NAS 800 NVMe™ SSDs were configured in a RAID 1 as read/write cache, with 5x HDD storage volumes configured in RAID 5.

The following performance improvements were observed:

Read/Write Cache Improvements

- 203% faster sequential reads (MB/s)[2]
- 5.4x faster sequential writes (MB/s)[2]
- 82x faster random reads (IOPS)[2]
- 33x faster random writes (IOPS)[2]

These improvements may significantly increase performance for video editing applications for large files, and random performance could have significant increases for responsiveness in multiuser environments across a range of business applications.



Conclusion

For prosumer and SMB users running diverse applications, workflows, and datasets, configuring a read/write SSD cache can significantly improve NAS responsiveness when paired with high-speed networking such as 10GbE. When configured and deployed as a cache, SANDISK® NAS 800 NVMe™ SSDs, which are purpose-built for NAS, can help accelerate application access to data with reduced latency and help improve performance at scale for a variety of workloads. Since they are engineered and tested for durability and compatibility, they are an ideal choice when considering SSD caching for your NAS.

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Disclosure statement

1. 1GB = 1 billion bytes, 1TB = 1 trillion bytes, and 1PB = 1 quadrillion bytes. Actual user capacity may be less depending on operating environment.
2. 1MB/s = 1 million bytes per second. IOPS = input/output operations per second. Based on internal testing; performance may vary depending upon host device, usage conditions, drive capacity, and other factors.
3. 1 PBW (petabytes written) = 1,000 TBW (terabytes written). TBW (terabytes written) and/or PBW (petabytes written) values calculated using JEDEC client workload (JESD219) and vary by product capacity. MTTF = Mean Time To Failure based on internal testing using Telcordia™ stress part testing (Telcordia SR-332, GF, 25°C). MTTF is based on a sample population and is estimated by statistical measurements and acceleration algorithms. MTTF does not predict an individual drive's reliability and does not constitute a warranty.
4. See www.sandisk.com/support for additional details.

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