StorONE Achieves 1.7M IOPS Using Only 24 Western Digital Flash Drives

EXECUTIVE SUMMARY

Users today are challenged by the high cost of deploying high-performance enterprise storage. Drive performance has improved tremendously over time, especially flash drives, but performance is being gated by the storage software which requires too much computational power to provision and manage storage and to protect data. Therefore users are overspending on compute hardware to try to deliver more of their drives' performance to the clients.

StorONE S1 is a new software-based enterprise storage solution that reduces the required amount of compute, network and hardware resources by up to 80%, while achieving performance identical to other, more expensive storage solutions. The software operates identically in any storage environment, supporting all storage protocols without configuration changes or special drivers for the ultimate ease of use. It has enterprise-class features: Unlimited, writable snapshots, user-definable drive redundancy on a per-volume basis and a cache-free design with persistent data integrity.

StorONE benchmarked the capabilities of StorONE S1 to demonstrate achieving high performance using only two 2U off-the-shelf servers with standard components and a Western Digital 2U24 Flash Storage Platform. The results were exceptional: 1.7M IOPS for random reads, 15 GB/s sequential reads, 7.5 GB/s sequential writes and 10 GB/s for a mixed workload of 80/20 reads/writes. By comparison, an all-flash array competitor in the market requires at least 4 times the amount of hardware and expense to deliver 1.5M IOPS.

The software also supports virtual environments. In another benchmark test, StorONE S1 tripled the storage I/O rate in a VMware ESXi Server without altering the hardware, achieving 500,000 IOPS. This test demonstrated how to turbocharge storage performance in a virtual environment simply by adding the StorONE software.

StorONE S1 demonstrated that efficient software can overcome the compute bottleneck in storage performance. It is truly a software solution to a hardware problem.

The combination of less hardware with complete enterprise functionality translates to the lowest TCO possible. It is lower because of fewer hardware resources, no RAID cards, no drivers and no extra solutions for data protection which are included by default with StorONE. OPEX is reduced because less hardware consumes less power, cooling, support and management. Hosting the software in a virtual environment can further contribute to TCO reductions.

With StorONE S1, users can afford to run more applications on high-performance storage. It is suitable for a wide range of use cases that need high performance and enterprise-class availability, including VDI, big data and analytics, AI and storage consolidation.

MARKET CHALLENGE – COMPUTE HAS BECOME THE BOTTLENECK OF STORAGE PERFORMANCE

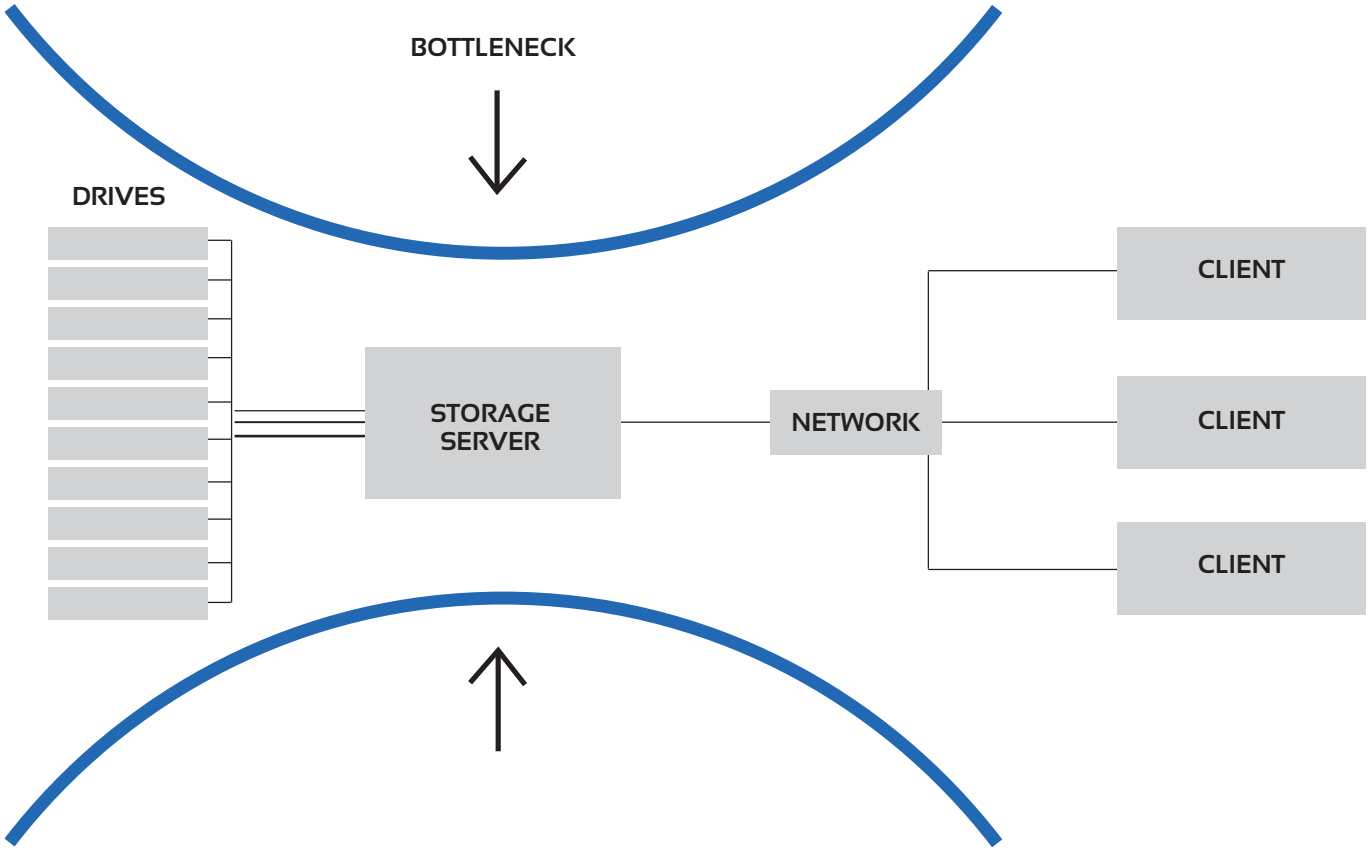
Users today are challenged by the high cost of deploying high-performance enterprise storage. Drive performance has improved tremendously over time, especially flash drives. But delivering the performance to clients requires significant additional compute hardware to provision and manage the storage and protect data. Users have resorted to purchasing numerous storage servers with more processors and memory or high-end proprietary systems, both of which involve large capital expenses (CAPEX). Applications are spread across different storage solutions, increasing complexity of management. More hardware also consumes power, cooling and floor space, so operating expenses (OPEX) are higher. All of this increases storage TCO.

Drive innovations over time have dramatically improved the performance and capacity, but storage software has become the bottleneck for achieving high performance and gaining the full benefit of modern drives. The performance and capacity of enterprise drives have increased by 1,000x – from 100 IOPS to over 100,000 IOPS and from 18 GB to over 16 TB per drive. Price per TB has fallen. Network speeds, which determine how the storage performance reaches clients, have greatly improved as well – Ethernet (iSCSI, NAS) from 1Gb to 100Gb and Fibre Channel from 2/4Gb to 32Gb. But users are not experiencing anything close to the full benefit of their drive performance and pricing. The problem is that drive performance is gated by the storage software, which requires so much computational power to provision and manage storage and to protect data. Moore's Law, which predicts the doubling of transistor density in integrated circuits every couple years, is breaking down, and microprocessor performance has not kept pace with the improvements in drive technology. This has created an imbalance in the system where compute resources have become the bottleneck (Figure 1). So users are overspending on hardware to try to achieve something close to the performance potential of their drives.

High CAPEX and OPEX for Storage Performance:

WHAT IF IT WAS POSSIBLE TO UNLEASH THE HIGH PERFORMANCE OF YOUR DRIVES USING EFFICIENT STORAGE SOFTWARE INSTEAD OF ADDING COMPUTE HARDWARE, COMPLEXITY AND COST?

Figure 1: Bottleneck for storage performance



StorONE S1 – TRU SDS

StorONE S1 is a TRU (Total Resource Utilization) software-based enterprise storage solution that reduces the required amount of compute, network and hardware resources by up to 80%, while achieving performance identical to other, more costly storage solutions. The software was designed from the ground up for storage efficiency and is backed by 50 patents and 7 years of R&D. StorONE is led by a successful entrepreneur with a proven track record of developing enterprise-class storage systems.

StorONE S1 operates identically in any storage environment, supporting all storage protocols without configuration changes – no special drivers and no changes to applications for ultimate ease of use. The software is hardware agnostic, supporting both physical and virtual environments. With minimal hardware requirements, a deployment can start with as little as 64GB of memory, 8 cores and a few drives.

StorONE S1 offers enterprise-class data protection, data retention and efficiency technologies:

- Integrated, unlimited, writable, nested snapshots with zero performance degradation in all workloads – and support for VSS and consistency groups
- Instantaneous full-volume backup and restore, regardless of volume size
- Backups may be taken manually or automatically, based on a per-volume backup policy
- Drive redundancy definable on a per-volume basis
- Fast, distributed drive rebuilds
- Cache-free design (write-through) enables persistent data integrity, providing consistent volume recovery from power and hardware failures without needing any specialized hardware such as UPS, NVRAM, memory replication, etc.

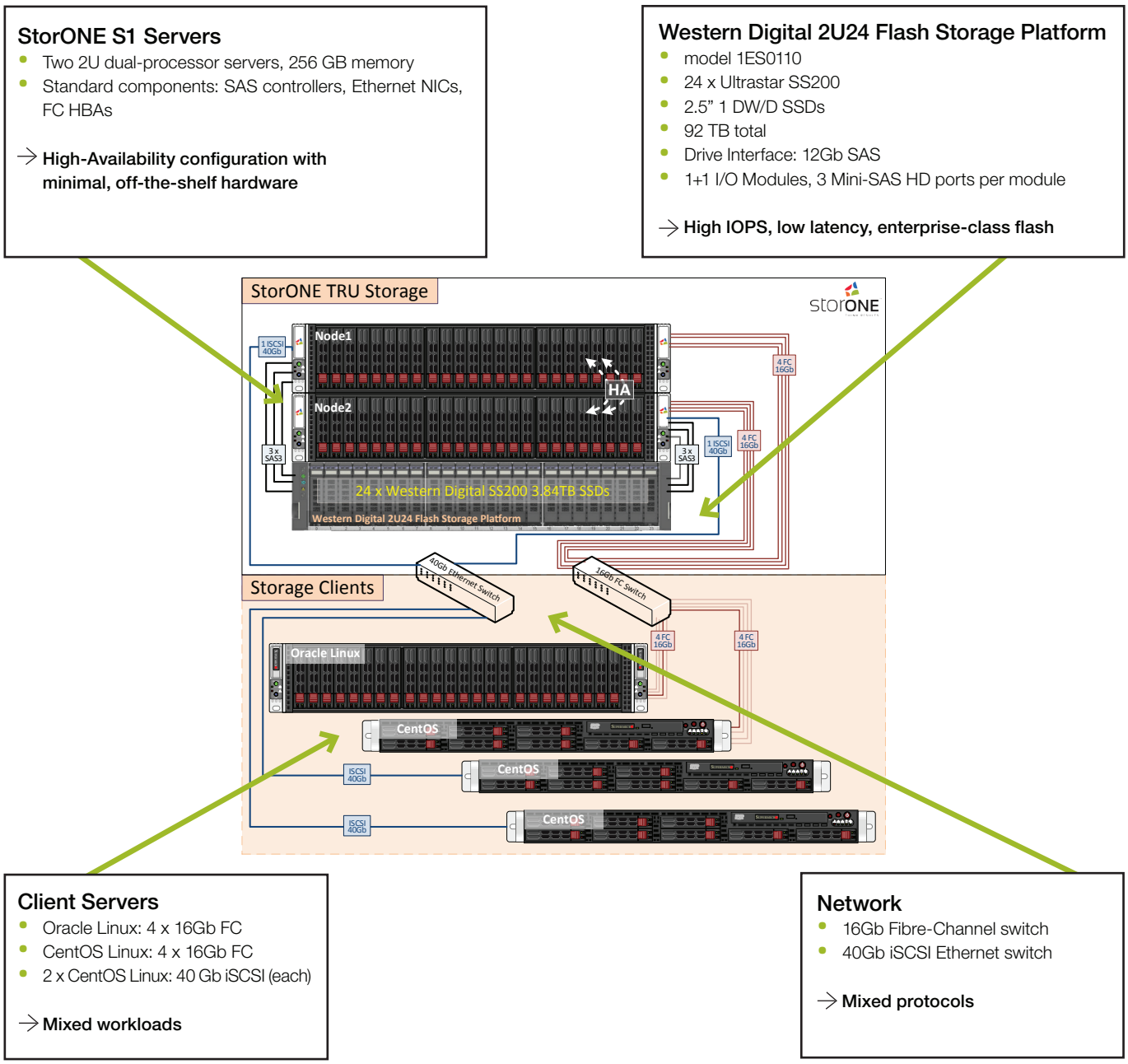
StorONE S1 ACHIEVES 1.7 MILLION IOPS USING ONLY 24 WESTERN DIGITAL FLASH DRIVES

StorONE benchmarked the capabilities of StorONE S1 software using a Western Digital 2U24 Flash Storage Platform to demonstrate achieving high performance with minimal hardware.

The benchmark configuration (Figure 2) consisted of a StorONE storage appliance connected over a network to client servers. StorONE S1 software ran on two 2U Supermicro dual-processor servers with standard components. It was configured for high availability and drive redundancy to reflect a real-world environment.

Four client servers running Oracle Linux and CentOS connected to the storage appliance by 16 Gb Fibre Channel and 40 Gb iSCSI Ethernet switches, demonstrating a mix of workloads and the flexibility of the solution.

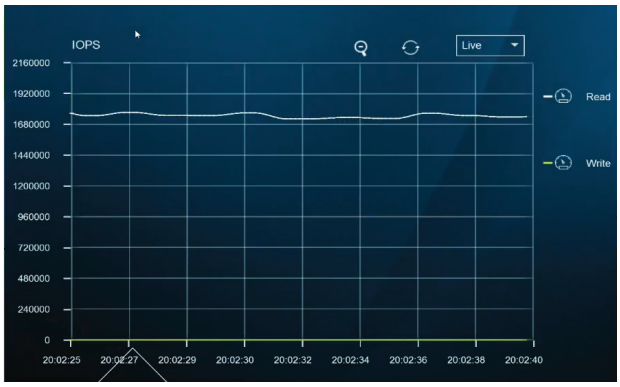
Figure 2: Benchmark configuration StorONE S1 storage solution



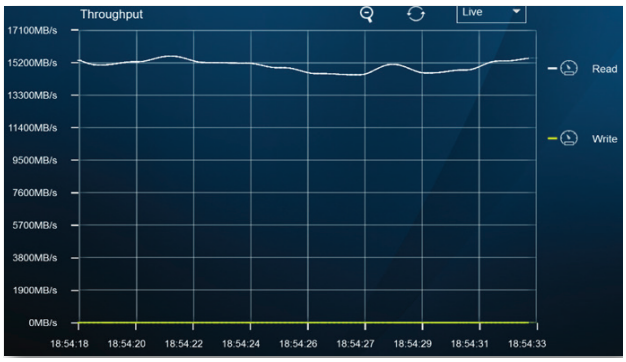
The results (Figure 3) demonstrated high performance across a variety of workloads. It achieved 1.7M IOPS with less than 0.3 ms latency using random 4K reads. Sequential reads were 15 GB/s (128KB/256KB), while consuming only 30% CPU utilization on the storage servers. Sequential writes were 7.5 GB/s. With a mixed workload 80/20 reads/writes (128KB), the benchmark test reached 10 GB/s.

StorONE unleashed the exceptional performance of the Western Digital Ultrastar flash drives with only 6 rack units of hardware – without requiring additional solutions for data protection, RAID cards or multiple systems for block, file and object storage. By comparison, an all-flash array competitor in the market requires at least 4 times the amount of hardware and expense to deliver 1.5M IOPS.

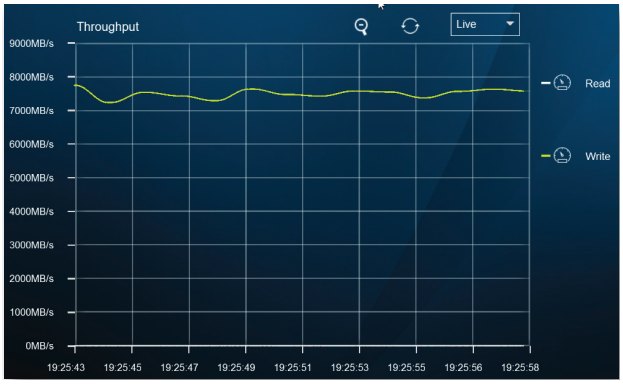
Figure 3: Benchmark performance results



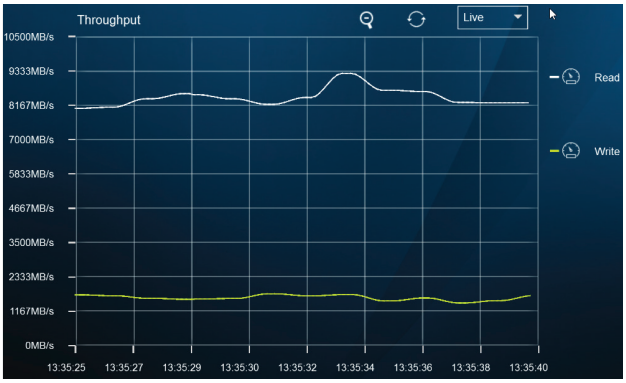
Random read:
Up to 1,700,000 IOP's
4KB
Latency < 0.3 ms



Sequential read:
Up to 15 GB/s
128KB/256KB



Sequential write:
Up to 7.5 GB/s
128KB/256KB



Sequential 80/20 read/write:
Up to 10 GB/s
128KB

USE CASES

StorONE S1 enterprise storage is suitable for a wide range of use cases and applications, including:

- **Virtual Environments –** Since StorONE S1 is a hardware-agnostic software solution, it also supports virtual environments like VMware. Users can turbocharge storage performance in a virtual environment simply by adding StorONE software. By loading the software onto a virtual machine and exporting storage to the hypervisor, storage performance can increase dramatically. It is also possible to create a StorONE S1 server on a virtual machine for storage consolidation, rather than using dedicated hardware.
- **VDI –** Recurring processes in VDI such as boot storms and VM administrative tasks spike I/O demand from 10 to 1,000+ times the average. StorONE can satisfy the performance demands during these peak times to maintain a satisfactory, productive desktop experience for users.
- **Hybrid cloud/private cloud –** Some have turned to cloud storage to take advantage of cloud providers' economies of scale, though there are drawbacks like data migration and being dependent on external networks to access data. By greatly reducing store hardware requirements, StorONE changes the economics of enterprise storage and makes onsite or distributed deployments more cost-effective.
- **Big data and analytics –** Very fast processing throughput is a requirement for big data and analytics applications. StorONE S1 efficiently delivers performance like no other enterprise storage solution.
- **AI –** Artificial intelligence and machine learning systems demand scalability, performance and high availability. StorONE's combination of efficiency and enterprise-class capabilities make it a great solution for AI.
- **Storage consolidation –** Consolidating multiple enterprise applications on one storage system is attractive for easier management and better utilization of storage resources. However, providing high performance to all the applications that need it has been a challenge that pushed back against the consolidation trend. StorONE S1 removes the performance hurdle by efficiently unleashing the performance of modern flash drives and can meet the different data protection and redundancy requirements for each application, enabling a greater degree of storage consolidation.

CONCLUSION

StorONE S1 demonstrated that efficient software can overcome the compute bottleneck in storage performance. With minimal hardware, StorONE S1 delivered 1.7M IOPS and 15GB/s of sequential throughput. StorONE can deliver performance results superior to similarly configured all-flash arrays, hyperconverged appliances and cloud storage services at a much lower cost.

StorONE S1 is truly a software solution to a hardware problem. This breakthrough in efficiency combines enterprise- class functionality and complete, end-to-end unified (FC/iSCSI/NFS/SMB/S3) storage: High availability, unlimited snapshots, persistent data integrity and tunable drive redundancy. All storage services in the S1 Unified Storage are available without changing client server configurations and without special drivers. Users can start with a few drives and scale as they need.

The combination of less hardware with complete enterprise functionality translates to the lowest TCO. CAPEX of the solution is lower because of fewer hardware resources, no RAID cards, no drivers and no extra solutions for data protection. OPEX is reduced because less hardware consumes less power, cooling, support and management. Hosting the software in a virtual environment can further contribute to TCO reductions.

With StorONE S1, users can afford to run more applications on high-performance storage. Its cost effectiveness allows more active data to be placed on a higher-performance tier and opens the door for more storage consolidation. Business productivity can also improve with faster application processing and response time.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