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Unifying Data and Optimizing Application Performance with Flash-Native, Software-Defined Storage

elastifile

Traditional storage infrastructure has become the fundamental bottleneck to performance, business process agility and cost. Enterprises want the best of all worlds from on-premises, public cloud, and hybrid cloud solutions—across container, VM, and bare metal workloads. Unfortunately, the required scalability, performance, and hybrid-cloud elasticity is impossible to achieve with traditional storage arrays, hyperconverged appliances, and the first generation of SDS (Software-Defined Storage). The ability to efficiently ingest, unify, access, and transform data underpins the business' ability to keep pace with its operational needs.

A Powerful Flash-Native, Software-Defined Solution

Elastifile™ has developed a flash-native, highly scalable, software-defined storage platform based on the Enterprise SSD family of Western Digital products, ushering in a new generation of software-defined solutions.

By combining the simplicity of file storage, the scalability of object storage, and the performance of block storage, this solution frees administrators from the trade-offs and limitations inherent to legacy solutions. Whether requiring a storage solution to accelerate HPC applications in Life Sciences or Electronic Design Automation (EDA) to deliver persistence for containers (e.g., via a Docker™ platform or Kubernetes system), or to unify data across on-premises and cloud environments, application architects and IT managers can now streamline and cost-optimize their infrastructure, while surpassing user performance expectations with linear elasticity. With SSD capacities increasing and $/GB cost steadily declining over time, the transition to flash-dominated infrastructure is well under way. The Elastifile platform, powered by the POSIX-compliant Elastifile Cloud File System, was designed from the ground up, as a flash-native solution. At the most fundamental levels, Elastifile's architecture was optimized to most effectively expose the high performance of SSDs, while also managing those devices appropriately to maximize their endurance. However, to deliver a truly optimized, complete solution, Elastifile requires the use of high-performance, high-capacity, reliable storage devices. Much as the data management infrastructure strengthens the overall business capability, storage hardware fortifies the capability of the overall storage solution.

Elastifile delivers this solution based on the Enterprise SSD portfolio of Western Digital products. The solution delivers a combination of performance, flexibility, scalability, and reliability to meet the demands of the most I/O-intensive requirements in today's cloud enviornments.

Western Digital Enterprise Flash Portfolio

Western Digital delivers a broad portfolio of NVMe™-compliant PCIe, SAS, and SATA flash drives, offering market-leading performance, optimal price/performance options, and capacities for software-defined data centers and clouds.

Western Digital's Ultrastar® SSDs enable highly scalable storage architectures for modern enterprise deployments by providing reliable throughput, data integrity and protection mechanisms, and optimized flash endurance. With capacities up to 7.68TB[1] per drive, these SSDs boost results for data-hungry applications while addressing growing data capacity demands.

With the combined solution of the Elastifile platform with Ultrastar SSDs, customers can choose from a range of storage devices with the performance and cost characteristics that best fit their requirements, as highlighted in Table 1.

Example Reference Architecture

To demonstrate how data services can be optimized using Elastifile, Elastifile used Western Digital SSDs to develop and test a solution for MySQL database deployments. The all-flash MySQL solution delivered over 70M Transactions Per Minute (TPM) and over 1M New Orders Per Minute (NOPM) using MySQL and standard x86 servers. This clearly demonstrates that the combined solution is capable of supporting scale-out, transactional workloads to accelerate a variety of applications. To learn more about the MySQL solution, see the Optimizing MySQL Performance and Scalability White paper.

Conclusion

The combined solution of Ultrastar SSDs and the Elastifile software-defined storage platform provides a uniquely powerful, all-flash, distributed storage solution. By deploying this performance-optimized, cost-effective platform, IT managers can ensure that the performance and scalability of data services do not hinder business operations. This enables businesses to keep pace with their operational needs and deliver the high-quality, flexible services that clients demand.

With the right type of flash storage from Western Digital, this solution can deliver the performance, flexibility, and scalability required to support the business-specific requirements for your environment.

Visit our websites to learn more about Elastifile and Ultrastar SSDs.

		Ultrastar DC SA620 SATA SSD		Ultrastar DC SS200 SAS SSD		Ultrastar DC SN200 NVMe SSD	
Application Workload		Read-Intensive	Mixed-Use	Read-Intensive	Mixed-Use	Read-Intensive	Mixed-use
Capacity (GB)[1]		480GB – 1.92TB	400GB – 1.92TB	480GB – 7.68TB	400GB – 3.2TB	960GB – 7.68TB	800GB – 6.4TB
Form Factor		2.5" SFF	2.5" SFF	2.5" SFF	2.5" SFF	2.5" U.2	2.5" U.2
Interface		6Gb/s SATA	6Gb/s SATA	12Gb/s SAS	12Gb/s SAS	PCIe 3.0 x4 or 2×2 NVMe 1.2	PCIe 3.0 x4 or 2×2 NVMe 1.2
NAND Type		15nm MLC	15nm MLC	15nm MLC	15nm MLC	15nm MLC	15nm MLC
Sequential Read/Write (MB/s, 128KiB)[2]		Up to 512/ 445 MiB/s	Up to 512/ 445 MiB/s	Up to 1,800/1,000	Up to 1,800/1,000	Up to 3,350/ 2,100MiB/s	Up to 3,350/ 2,100MiB/s
Random Read/Write (IOPS, 4KiB)[2]		Up to 76K/16K	Up to 76K/32K	Up to 250K/37K	Up to 250K/86K	Up to 835K/75K	Up to 835K/200K
Operating Temperature		0 to 70° C	0 to 70° C	0 to 70° C	0 to 70° C	0 to 70° C	0 to 70° C
Active Power (Typ.)		3.8W	3.8W	11W	11W	25W	25W
Endurance[3]	DW/D (Random)	0.6	1.8	1	3	1	3
	TBW or PBW (Random)[5]	480GB: 526 TBW 960GB: 1.05 PBW 1.92TB: 2.10 PBW	400GB: 1.31 PBW 800GB: 2.63 PBW 1.6TB: 5.26 PBW	480GB: 876 TBW 960GB: 1.75 PBW 1.92TB: 3.5 PBW 3.84TB: 7 PBW 7.68TB: 14 PBW	400GB: 2.2 PBW 800GB: 4.4 PBW 1.6TB: 8.7 PBW 3.2TB: 17.5 PBW	960GB: 1.75 PBW 1.92TB: 3.5 PBW 3.84TB: 7 PBW 7.68TB: 14 PBW	800GB: 4.4 PBW 1.6TB: 8.7 PBW 3.2TB: 17.5 PBW 6.4TB: 35 PBW
Reliability	Reliability (BER)	1 in 10^{17}	1 in 10^{17}	1 in 10^{17}	1 in 10^{17}	<1 in 10^{17}	<1 in 10^{17}
	Data Fail Recovery	✓	✓	✓	✓	✓	✓
	Powerfail Safety	✓	✓	✓	✓	✓	✓
	Temp. Throttling	✓	✓	✓	✓	✓	✓
	MTBF[4]	2M hrs	2M hrs	2.5M hrs	2.5M hrs	2M hrs	2M hrs
Limited Warranty[5]		5 years	5 years	5 years	5 years	5 years	5 years

Table 1: SATA/SAS/PCIe SSDs from Western Digital

[1] One megabyte (MB) is equal to one million bytes, one gigabyte (GB) is equal to 1,000MB (one billion bytes), and one terabyte (TB) is equal to 1,000GB (one trillion bytes) when referring to storage capacity. Accessible capacity will vary from the stated capacity due to formatting, system software, and other factors.

[2] Performance will vary by capacity point and/or configuration, host device, OS and application. All performance numbers are in full-sustained mode and are peak values. 1KB=1,000 bytes (10^3), 1MB=1,000,000 bytes (10^6), 1GB=1 billion bytes (10^9), 1KiB=1,024bytes (2^{10}), 1MiB=1,048,576 bytes (2^{20}), 1GiB=1,073,741,824 bytes (2^{30})

[3] Endurance at 100% 4KiB random-write workload.

[4] MTBF (Mean Time Between Failures) based on a sample population and is estimated by statistical measurements and acceleration algorithms under typical operating ns for this drive model. MTBF rating does not predict an individual drive's reliability and does not constitute a warranty

[5] The lesser of 5 years from the date of manufacture of the product or the date on which the product's relevant endurance thresholds set forth in the product specifications are reached. PBW=petabytes written, TBW=terabytes written

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