

Life After SATA: Value SAS as the Replacement for SATA SSDs

Tech Note by

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Summary

Value SAS SSD creates a new way of optimizing your enterprise. With faster data transfer rates and near price parity with SATA, customers can now boost performance at a significantly lower price point.

Dell EMC examines the performance of value SAS by comparing the Toshiba Memory RM5 Series SSD operational analytics to enterprise SATA, under various workload applications.

With the transition over to more affordable, unified SAS infrastructure, users can now rest assured in knowing that value SAS delivers incomparable performance per dollar.

Introduction to the Technology

Toshiba Memory Corporation, an independent spin-off company of Toshiba, created vSAS, short for Value Serial Attached SCSI, to be the storage technology capable of completely phasing out the SATA (Serial Advanced Technology Attachment) interface for SSDs. The transition to SAS-only has been slow because traditional SAS SSD drive pricing has typically been higher than SATA SSD drive pricing. Despite its throughput limitations, SATA proved to be the most cost-effective way to build dense server storage.

	SATA	SAS
Advantages	Inexpensive	Performance
Used When	Price is priority	Performance is priority

Figure 1: Current divide in SATA and SAS advantages and use cases

Finally, after years of development, Toshiba Memory Corporation has introduced the RM5-series value SAS SSD: a unique storage drive with SAS interface that will be priced close to typical SATA pricing. To reduce the total cost Toshiba Memory thoughtfully simplified the architecture of value SAS; low-impact, non-critical features were removed from the typical SAS SSD.

Reducing the SAS Feature Set

The primary focus of the vSAS redesign was to reduce SAS drive pricing to SATA levels while maintaining a higher performance, latency consistency and higher reliability. Note that vSAS does not replace standard server/storage SAS, which continues with a higher performance, albeit at a higher price. Three cost-reduction exercises were run on vSAS to remove features not required for SAS functionality:

1. Dual port support was removed
 - a. Drives are only compatible with a single controller
2. Sector size support has been limited to 512 bytes
 - a. The data transfer size is limited to the traditional 512 bytes
3. T10 Data Integrity Field (DIF) support was removed
 - a. T10 DIF protection from data corruption is removed

Comparing vSAS Performance to SATA

Customers have been requesting more aggressive SAS pricing for years, so once the value SAS solution had been developed, Dell EMC contracted an independent third party to prove that vSAS SSDs provided notable performance gains over the SATA SSDs. Three unique trials were exercised to evaluate performance characteristics among different PowerEdge servers and application workloads. All tests concluded a significant increase in performance per dollar, as shown below:

	Dell EMC PowerEdge MX with value SAS SSDs from Toshiba Memory	Dell EMC PowerEdge MX with enterprise SATA SSDs	Percentage win
Total orders per minute (OPM) across 24 VMs	1,334,660	948,294	40.7%
Read latency (ms)	2.1	1.4	-50%*
Write latency (ms)	3.6	9.9	63.6%
Total latency (ms)	5.7	11.3	49.6%

Figure 2: Test #1 had DVD Store 2 VMs performed on PowerEdge MX showing **49.6%** latency reduction when using vSAS.

Configuration	Total TPS	Total solution cost	TPS per dollar
Dell EMC PowerEdge R740xd with enterprise SATA SSDs (RAID)	2,779	\$41,872.00	0.0663
Dell EMC PowerEdge R740xd with enterprise SATA SSDs (no RAID)	4,453	\$41,872.00	0.1063
Dell EMC PowerEdge R740xd with RM5 Series value SAS SSDs (RAID)	4,771	\$41,472.00	0.1150
Dell EMC PowerEdge R740xd with RM5 Series value SAS SSDs (no RAID)	5,872	\$41,472.00	0.1415
Dell EMC PowerEdge R740xd with CD5 Series data center NVMe SSDs (no RAID)	5,987	\$43,072.00	0.1389

Figure 3: Test #2 had Benchmark Factory VMs performed on PowerEdge R740xd showing **71.6%** more transactions per second when using vSAS.

Drive type	Operations per second (OPS)	Percent win (OPS)	Average latency (ms)	Percent win (latency)
Enterprise SATA SSDs	22,204		8.64	
Value SAS SSDs from Toshiba Memory	45,902	106.73%	4.17	51.66%
Data center NVMe™ SSDs from Toshiba Memory	52,791	137.76%	3.63	57.97%

Figure 4: Test #3 had YCSB (Yahoo! Cloud Serving Benchmark) VMs performed on PowerEdge R840 showing **106.7%** more operations per second when using vSAS.

The exceptional performance of vSAS among such a broad array of test configurations accentuates the consistent superiority of the SAS interface compared to SATA. Furthermore, SAS speeds are forecasted to improve over time with a technology roadmap spanning throughout the next decade. Conversely, the SATA-IO (Serial ATA International Organization) has announced on multiple occasions that they have no plans to extend SATA bandwidth beyond the current 6Gbps rate. The SAS interface is also known to be more reliable and robust. At the other end of the scale, NVMe outperforms vSAS, but its higher price warrants it to be primarily used when peak performance is required.

In Conclusion

Toshiba Memory Corporation markets their value SAS SSD to enable a “life after SATA” and, so long as pricing remains competitive across all storage capacities, their campaign seems very fitting. All three PowerEdge configurations tested prove that value SAS SSDs deliver significant performance gains when compared to SATA SSDs, while also retaining the more reliable and robust SAS protocol. These transparent benefits should encourage users looking to optimize their workload performance to consider the advantages of replacing SATA SSDs with the innovative value SAS SSD.



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