



Reach important business insights sooner with Dell EMC PowerEdge R6515 servers and value SAS and data center NVMe SSDs from KIOXIA

A configuration with value SAS and data center NVMe SSDs from KIOXIA provided better data analytics performance and lower costs per iteration than a configuration with enterprise SATA SSDs

Dell EMC PowerEdge R6515 server running a data analytics workload

Many successful businesses use data analysis to help guide strategy and stay ahead of the competition. To process this huge amount of data, they need a storage solution that can keep up. Traditionally, businesses defaulted to SATA SSDs for affordable flash storage. But SATA transfer speeds haven't increased in over ten years.¹ Now, with their RM5 Series value SAS and CD5 Series data center NVMe™ SSDs, KIOXIA has introduced faster storage options. How do these new drives stack up against enterprise SATA SSDs on performance and per-system value?

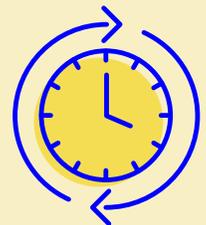
To find out, we configured a Dell EMC™ PowerEdge™ R6515 server with three different types of drives: enterprise SATA SSDs, RM5 Series value SAS SSDs, and CD5 Series data center NVMe SSDs. We put the drives through their paces with a data analytics workload that measured how quickly each configuration could complete a series of query sets. The configuration with value SAS SSDs handled the query sets in 45 percent less time than the SATA drives, while the configuration with data center NVMe SSDs pushed this performance further, processing the query sets in 59 percent less time. Taking total system cost into account, the configurations with drives from KIOXIA also provided up to 57 percent lower costs per iteration versus enterprise SATA SSDs. With Dell EMC PowerEdge R6515 servers and value SAS and data center NVMe SSDs from KIOXIA, your organization could reach data insights sooner with a solution that offers better per-system value than enterprise SATA SSDs.

Speed up data analytics



Process queries in 45% less time

Value SAS SSDs vs. enterprise SATA SSDs



Process queries in 59% less time

Data center NVMe SSDs vs. enterprise SATA SSDs

Get more performance for less



Up to 57% lower costs per iteration

Data center NVMe SSDs vs. enterprise SATA SSDs

Considering life after SATA with KIOXIA

Server performance can impact your whole business. If the drives in your servers can't handle heavy analytics workloads, your business might not be able to reach the data insights you need to gain a competitive edge. Yet many businesses are still relying on SATA, a technology that hasn't increased its 6Gb/s transfer speeds in over 10 years.² According to the Serial ATA International Organization, SATA SSDs have no roadmap for a future speed increase.³ Contrast that with SAS SSDs, which have a roadmap extending into 2029, and NVMe SSDs, which are quickly surpassing both SATA and SAS technology in enterprise storage sales.^{4,5}

Value SAS SSDs from KIOXIA offer transfer speeds that are twice as fast as those of enterprise SATA SSDs.⁶ Data center NVMe SSDs from KIOXIA push transfer speeds even higher, to 32 gigatransfers per second (GT/s), allowing your organization to reach business insights from your data sooner.⁷

In our testing, the configurations with drives from KIOXIA offered up to 57 percent lower costs per iteration. Read on to learn how value SAS and data center NVMe SSDs could help your business discover life after SATA.



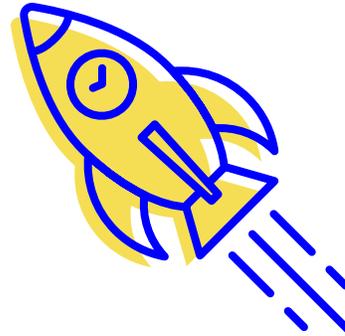
RM5 Series value SAS SSD from KIOXIA

How we tested

We ran a TPC-H-like workload on a single-node Dell EMC PowerEdge R6515 server with three different SSD configurations:

- Four 960GB enterprise SATA SSDs from Intel®
- Four 960GB RM5 Series value SAS SSDs from KIOXIA
- Four 960GB CD5 Series data center NVMe SSDs from KIOXIA

The data analytics workload from HammerDB mimicked a user running database queries (such as searching for shipping information) and measured how quickly each solution responded to a set of 22 read-only queries. We chose this workload to assess the ability of each drive configuration to complete common data analytics tasks. For more information about how we tested, see the [science behind the report](#).

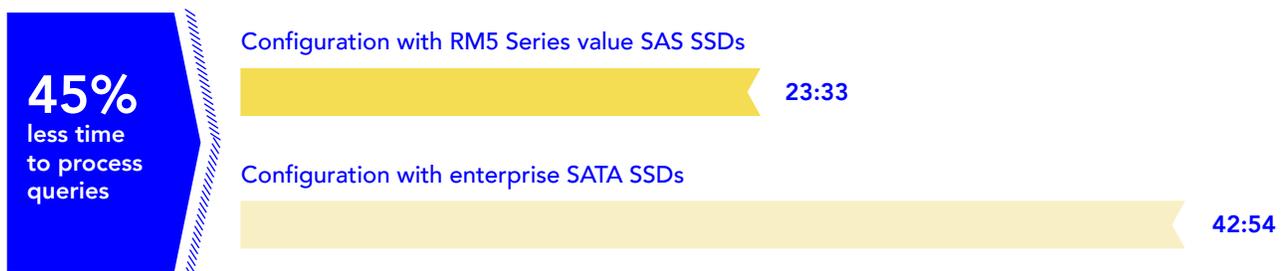


Gain crucial business insights sooner with faster query times

To survive in business, you have to stay ahead of the competition. Analyzing your business's data can yield important insights, showing you how to adjust your services in ways that can give you an edge over your competitors. The faster you can get these data insights, the sooner you can put them into action. In our testing, configuration with value SAS SSDs analyzed a set of 22 queries in just 23 and a half minutes—an improvement of 45 percent over the SATA SSD-based configuration, which took nearly 43 minutes to complete the same task. A Dell EMC PowerEdge R6515 server with data center NVMe SSDs got through the task in 17 minutes and 37 seconds, beating the SATA SSDs by 59 percent. These results indicate that a Dell EMC PowerEdge R6515 server with value SAS or data center NVMe SSDs could process large datasets much more quickly than a solution with SATA SSDs, potentially enabling your business to implement revenue-boosting strategies sooner.

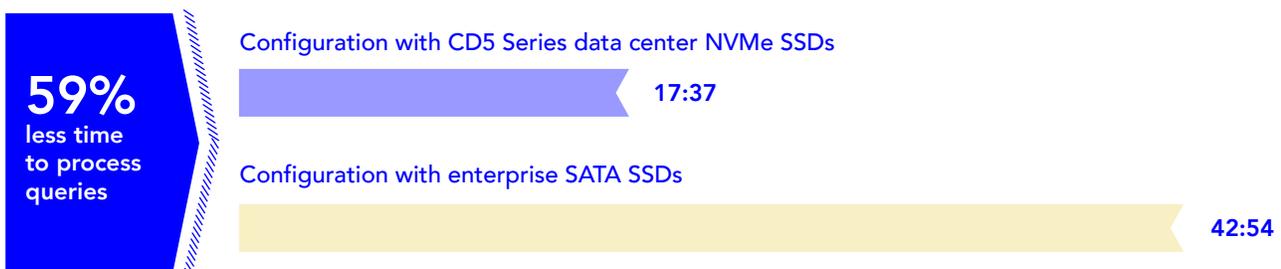
Time to complete data analytics queries (min:sec)

less time is better



Time to complete data analytics queries (min:sec)

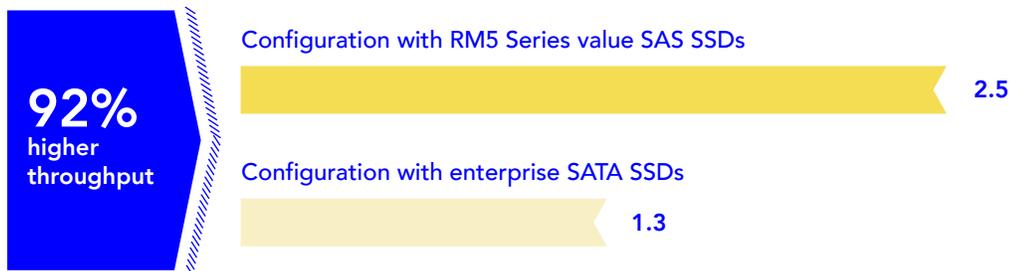
less time is better



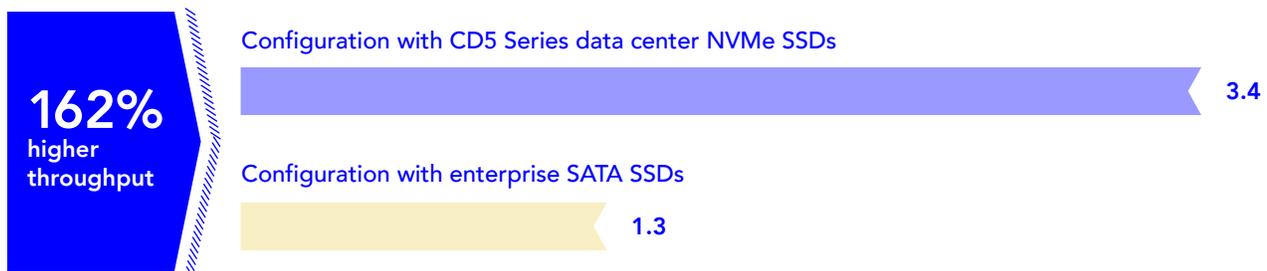
Achieve higher throughput with value SAS and data center NVMe SSDs from KIOXIA

A Dell EMC PowerEdge R6515 server with drives from KIOXIA attained higher throughput, processing more data per second than the SATA SSD-based solution. While a configuration with SATA SSDs achieved an average throughput of 1.3 GB/s, the configuration with value SAS SSDs performed at an average of 2.5 GB/s—a 92 percent increase. The configuration with data center NVMe SSDs performed at even greater speeds, pushing average throughput to 3.4 GB/s for an increase of 162 percent versus the SATA SSD-based configuration. A Dell EMC PowerEdge R6515 server with drives from KIOXIA also achieved greater maximum throughput compared to a configuration with SATA SSDs—up to 224 percent more with data center NVMe SSDs.

Average throughput (GB/s) *higher is better*



Average throughput (GB/s) *higher is better*

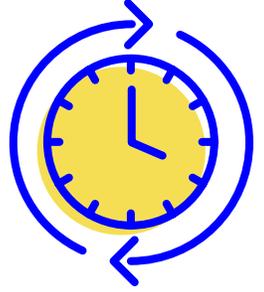


Throughput results

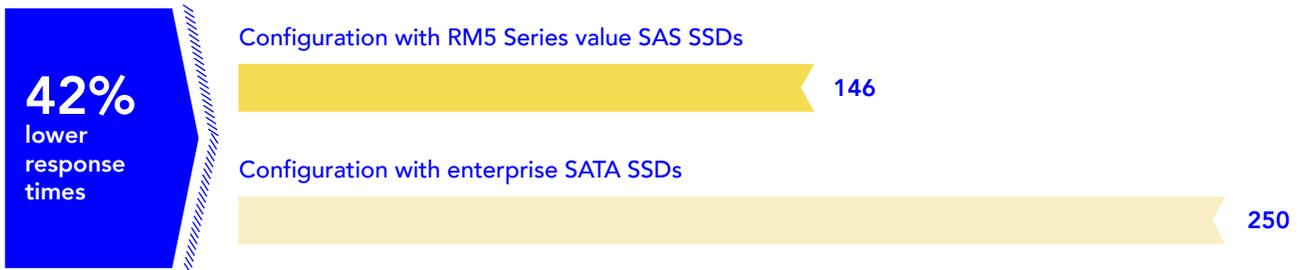
Configuration	Average throughput (GB/s)	Percentage win over SATA SSDs	Maximum throughput (GB/s)	Percentage win over SATA SSDs
SATA SSDs	1.3		1.7	
Value SAS SSDs	2.5	92%	3.2	88%
Data center NVMe SSDs	3.4	162%	5.5	224%

Get faster response times

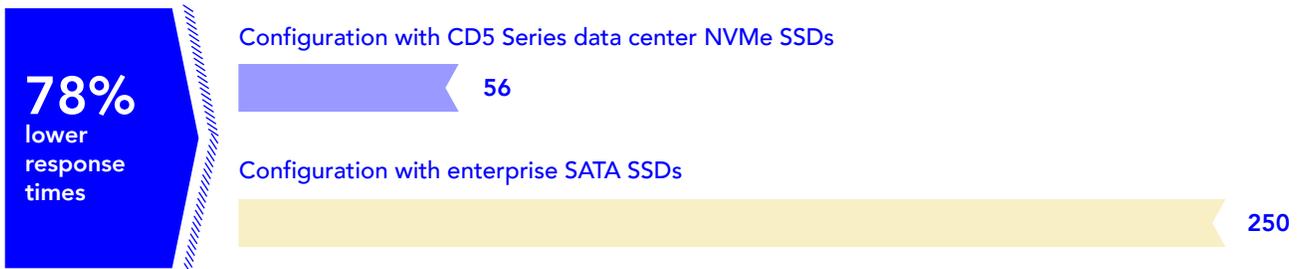
The HammerDB workload we used also measured read latency, or the amount of time each configuration took to respond to read requests. The configuration with value SAS SSDs responded in 42 percent less time on average than the SATA SSD-based configuration we tested, while the configuration with data center NVMe SSDs improved response times by 78 percent over the SATA SSDs.



Average latency (ms) *lower is better*



Average latency (ms) *lower is better*



About the Dell EMC PowerEdge R6515

The Dell EMC PowerEdge R6515 is a single-socket 1U server that features the enterprise-class 2nd Gen AMD EPYC™ processor with up to 64 cores. Dell EMC designed the server “to handle workloads like virtualization, HCI and OpenStack Ready Architecture.”⁸ To learn more, visit <https://www.dell.com/en-us/work/shop/povw/poweredge-r6515>.

Analyze data at a lower cost per iteration

Businesses seeking to improve their data centers can't consider only a solution's performance; they also need to account for cost. To arrive at a cost per iteration, we took the cost of each configuration and divided it by the number of times our sample dataset of 22 queries could run in an hour. We used normalization to show the performance results and pricing in relative terms compared to the baseline set by the SATA SSDs. As the below graphs show, the configuration with data center NVMe SSDs cost slightly more and the configuration with value SAS SSDs cost slightly less than the configuration with SATA SSDs, but in both cases the better data analytics performance lowered iteration costs. (For more details and some examples using our results and a three-year hardware lifecycle, see the [science behind the report](#).)

About the HammerDB workload

HammerDB is an open-source tool that tests the database performance of many leading databases, including Oracle® Database, Microsoft® SQL Server, PostgreSQL®, and MySQL™. The benchmark includes two built-in workloads derived from industry standards: a transactional (TPC-C-like) workload and an analytics (TPC-H-like) workload. Our test results do not represent official TPC results and are not comparable in any manner to the official TPC-audited results. For more information about HammerDB, visit www.hammerdb.com.



In our analysis, the configurations with value SAS SSDs and data center NVMe SSDs achieved 46 percent and 57 percent lower costs per iteration, respectively, versus the configuration with enterprise SATA SSDs. Whether your database admins were running data analytics workloads for an hour per week or 20 hours per week, the value provided by the configurations with KIOXIA drives would remain constant, allowing your business to accomplish more work at a lower cost per iteration.



Conclusion

Your business needs a storage solution that can help you quickly analyze large amounts of data. We used a data analytics workload to measure the analytics performance of a Dell EMC PowerEdge R6515 server with value SAS and data center NVMe SSDs from KIOXIA versus enterprise SATA SSDs. The configurations with drives from KIOXIA handled query sets in less time and provided lower costs per iteration than the configuration with SATA SSDs. With Dell EMC PowerEdge R6515 servers and value SAS and data center NVMe SSDs from KIOXIA, you could gain the data insights you need to grow your business.

- 1 The Serial ATA International Organization (SATA-IO) last announced a doubling of maximum transfer speeds on SATA (from 3Gp/s to 6Gp/s) in August 2008 ("New SATA Spec Will Double Data Transfer Speeds to 6 Gb/s," accessed October 2, 2019, https://sata-io.org/system/files/member-downloads/SATA_6Gb_Phy_PR_Finalv2.pdf). SATA-IO states on their FAQ page that "there are no plans to extend SATA bandwidth beyond the current 6Gb/s transfer rate" ("SATA-IO Frequently Asked Questions," accessed October 2, 2019, <https://sata-io.org/sata-io-frequently-asked-questions>).
- 2 SATA-IO, "New SATA Spec Will Double Data Transfer Speeds to 6 Gb/s," accessed October 2, 2019, https://sata-io.org/system/files/member-downloads/SATA_6Gb_Phy_PR_Finalv2.pdf.
- 3 SATA-IO, "SATA-IO Frequently Asked Questions," accessed October 2, 2019, <https://sata-io.org/sata-io-frequently-asked-questions>.
- 4 SCSI Trade Association (STA), "Serial Attached SCSI Technology Roadmap," accessed October 2, 2019, http://www.scsita.org/content/library/serial_attached_scsi_technology_roadmap/.
- 5 Eric Burgener, "NVMe in Enterprise Storage Systems," accessed October 2, 2019, https://www.flashmemorysummit.com/English/Collaterals/Proceedings/2018/20180808_MRES-201B-1_Burgener.pdf.
- 6 KIOXIA, "Life After SATA," accessed October 3, 2019, <https://business.kioxia.com/en-us/ssd/life-after-sata.html#value-sas>.
- 7 KIOXIA, "CD5 Series Data Center SSD," accessed October 3, 2019, <https://business.kioxia.com/en-us/ssd/data-center-ssd/cd5.html>.
- 8 Dell EMC, "PowerEdge R6515 Rack Server," accessed October 2, 2019, <https://www.dell.com/en-us/work/shop/povw/poweredge-r6515>

Read the science behind this report at <http://facts.pt/gk8sgms> ►



Facts matter.®

This project was commissioned by KIOXIA.

Principled Technologies is a registered trademark of Principled Technologies, Inc. All other product names are the trademarks of their respective owners. For additional information, review the science behind this report.