Handle more read-intensive data analytics work with an HPE ProLiant DL385 Gen10 server equipped with value SAS and NVMe mainstream SSDs from KIOXIA

RM5 Series and CD5 Series drives enabled an HPE ProLiant DL385 Gen10 server to process more analytics and offer better performance per dollar than a server with SATA drives

HPE ProLiant DL385 Gen10 server running an analytics workload

SATA technology has been one of the most widely used storage interfaces; however, the organization that governs the platform currently has no plans to improve its speed beyond the 6Gb/s specification introduced in 2008.[1] For businesses that need to be fast enough to stay ahead of the competition, SATA drives may not be enough. Value SAS and NVMe™ mainstream solid-state drives from KIOXIA offer speeds that exceed the capabilities of SATA SSDs, so if your company hasn't yet invested in these technologies, they may be well deserving of your consideration.

At Principled Technologies, we used a workload that simulates a data analytics application to test an HPE ProLiant DL385 Gen10 server in three storage configurations: with enterprise SATA drives, with RM5 Series value SAS drives, and finally, with CD5 Series NVMe mainstream drives. We found that the SAS and NVMe drives from KIOXIA had better performance at a lower latency than the enterprise SATA configuration. In addition, the server with KIOXIA drives offered better performance per dollar.
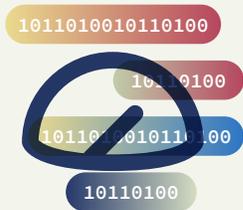
Process more analytics

139% more operations per second
Value SAS SSDs vs. enterprise SATA SSDs

177% more operations per second
NVMe mainstream SSDs vs. enterprise SATA SSDs

More bang for your buck

Up to 141% more operations per second for every dollar
NVMe mainstream SSDs vs. enterprise SATA SSDs

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October 2019

How can SAS and NVMe SSDs benefit your organization?

Choosing value SAS and NVMe mainstream SSDs for your company's read-intensive workloads can enable you to offer high-performing services to your customers. Whereas SATA drives can only offer a 6Gb/s connection,[2] KIOXIA RM5 Series value SAS SSDs provide an interface capable of speeds of 12Gb/s.[3] CD5 Series NVMe mainstream SSDs go even further, enabling transfer speeds of up to 32 gigatransfers per second.[4]

SATA-IO, the organization governing SATA technology, says it has no plans to improve the interface's bandwidth, whereas SAS and NVMe technologies have roadmaps for their respective standards that suggest more improvements over time. The SCSI Trade Association published a roadmap in 2019 that shows the availability of 12Gb/s SAS through at least 2021, with 24G SAS rolling out to end-user products in 2020.[5] Similarly, the NVM Express® Promoter Group released a new version of the NVMe base specification earlier this year that adds significant functionality that drive manufacturers will soon implement in new SSDs.[6] The NVMe organization also has over 50 ongoing projects in their technical working groups with over 130 companies working on them.[7]

KIOXIA NVMe mainstream SSD

About the HPE ProLiant DL385 Gen10 server

According to HPE, their ProLiant DL385 Gen10 server is for "High Performance Computing, virtualized, and memory-centric workloads."[8] The server supports up to 64 cores, 32 DIMMs (or 4 TB of memory), and up to 24 NVMe drives while offering management and security software such as HPE iLO Standard with Intelligent Provisioning and HPE iLO Advanced Premium Security. To learn more, visit https://buy.hpe.com/b2c/us/en/servers/rack-servers/proliant-dl300-servers/proliant-dl385-server/hpe-proliant-dl385-gen10-server/p/1010268408.

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October 2019 | 2

How we tested

We tested an HPE ProLiant DL385 Gen10 server with three different drive configurations:

- 4 x Intel® D3-S4510 SATA SSDs
- 4 x KIOXIA RM5 Series value SAS SSDs
- 4 x KIOXIA CD5 Series NVMe mainstream SSDs

We used Yahoo! Cloud Serving Benchmark (YCSB) to simulate a workload that read large amounts of data from a MongoDB database. YCSB measures these discrete actions in terms of operations per second (OPS). The more OPS a server solution can run, the better its ability to analyze data.

For more details on our test configurations and our test methodology, see the science behind this report.

Widen the scope of your analytics work

The server configurations with value SAS and NVMe mainstream SSDs from KIOXIA each processed more operations per second compared to the SATA drive-based server. Whereas the SATA drives only managed to deliver 17.6K OPS, the SAS-based configuration pushed more than twice that, at 42.2K OPS.

The server with NVMe SSDs processed the most OPS of the group at 48.8K OPS—2.7 times the OPS of the configuration with SATA drives. The increase in performance suggests an ability to perform analytics work at a faster rate, meaning users would be able to gain access to key data insights sooner.

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Up to 177% more operations per second

Operations per second
Higher is better

CD5 Series NVMe mainstream SSDs
48,827

RM5 Series value SAS SSDs
42,208

Enterprise SATA SSDs
17,603
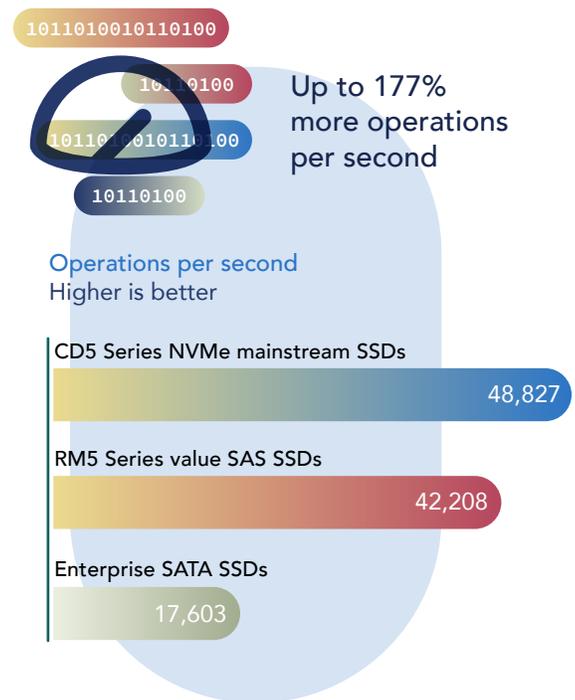
About the Yahoo! Cloud Serving Benchmark

According to Yahoo!, the Yahoo Cloud Serving Benchmark (YCSB) aims to create "a framework and common set of workloads for evaluating the performance of different 'key-value' and 'cloud' serving stores."[9] The benchmark supports databases such as MongoDB, Apache HBase®, and Apache Cassandra®—all NoSQL databases capable of handling large datasets. To learn more about YCSB, visit https://research.yahoo.com/news/yahoo-cloud-serving-benchmark.

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October 2019 | 3

Up to 63.97% lower data read latency

Read latency (ms)*
Lower is better

CD5 Series NVMe mainstream SSDs
5.238

RM5 Series value SAS SSDs
6.059

Enterprise SATA SSDs
14.538

*YCSB reports latency in microseconds.
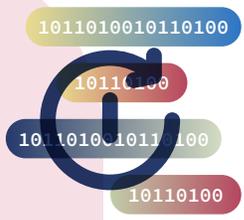
Low latency means less waiting for your end users

Systems that operate with low latency can make for a smooth experience for the end-user, as latency determines how quickly the system responds to user demand. The lower the latency, the better. In our tests of a read-intensive workload, enterprise SATA drive-configured servers ran with an average read latency of 14.538 milliseconds. The value SAS and NVMe mainstream drive-based server configurations had less than half that latency at 6.059 and 5.238 milliseconds, respectively.

Get more value from your HPE ProLiant server investment

Though enterprise SATA drives may appear to cost less than value SAS and NVMe mainstream SSDs at face value, we've shown that RM5 Series SAS and CD5 Series NVMe drives provide a better value overall.

To calculate a performance-per-dollar figure for each of the systems, we obtained pricing from HPE for a base-model HPE ProLiant DL385 Gen10 server that matched our configuration, as well as prices for the value SAS and NVMe mainstream SSDs. For the price of the SATA SSDs, we averaged together the prices Intel lists on their website, which draws data from eight retailers.[10]

We found that the NVMe SSD-configured server offered the best performance-per-dollar price, with its 48.8K operations per second spread out across the server price of $37,947 to yield 1.287 OPS per dollar. The SAS SSD-configured server was not far behind, at 1.149 OPS per dollar. Note that our cost evaluation includes only the cost of hardware. See the science behind this report for pricing and analysis details.

Up to 141% more operations per dollar

Operations per second per dollar
Higher is better

CD5 Series NVMe mainstream SSDs
1.287

RM5 Series value SAS SSDs
1.149

Enterprise SATA SSDs
0.534

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October 2019 | 4

Conclusion: HPE ProLiant servers with value SAS or NVMe mainstream drive-based servers offer better performance, low latency, and better value

Running analytics workloads is key for businesses that want to use their data to evolve their services and grow their customer base. If your company's servers struggle to process and analyze the data you've amassed, you may miss out on key insights that can help you remain competitive. In our tests, HPE ProLiant DL385 Gen10 servers equipped with value SAS and NVMe mainstream SSDs from KIOXIA offered better performance than enterprise SATA SSDs, delivering up to 2.7 times more operations per second. The KIOXIA drives also ran a workload with a significantly lower latency, which may contribute to improved response times and thus user experience. What's more, these server and storage combinations offer superior speed and performance, ensuring you get more than double the performance per dollar of the SATA drives.

1   "SATA-IO Frequently Asked Questions," accessed July 22, 2019, https://sata-io.org/sata-io-frequently-asked-questions

2   The Serial ATA International Organization (SATA-IO), which describes itself as "an independent, non-profit organization developed by and for leading industry companies" ("About SATA-IO," accessed May 16, 2019, https://sata-io.org/about-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 July 22, 2019, https://sata-io.org/system/files/member-downloads/SATA_6Gb_Phy_PR_Finalv2.pdf

3   "Toshiba Memory America First to Deliver Value SAS SSDs Targeting SATA Applications," accessed October 7, 2019, https://business.kioxia.com/en-us/news/2018/ssd-20180619-1.html

4   "Data Center SSD: CD5 Series," accessed October 7, 2019, https://business.kioxia.com/en-us/ssd/data-center-ssd/cd5.html

5   "Serial Attached SCSI Technology Roadmap," accessed August 22, 2019, http://www.scsita.org/content/library/serial_attached_scsi_technology_roadmap/

6   Billy Tallis, "NVMe 1.4 Specification Published: Further Optimizing Performance and Reliability," accessed July 26, 2019, https://www.anandtech.com/show/14543/nvme-14-specification-published

7   "The Evolution and Future of NVMe™," accessed July 22, 2019, https://nvmexpress.org/wp-content/uploads/NVMe-Roadmap-Webinar-2017.Final_.v2.pdf

8   "HPE ProLiant DL385 Gen10 Server," accessed July 22, 2019, https://h20195.www2.hpe.com/v2/GetDocument.aspx?docname=a00026913enw

9   "Yahoo Cloud Serving Benchmark," accessed July 22, 2019, https://research.yahoo.com/news/yahoo-cloud-serving-benchmark

10 "Intel SSD D3-S4510 Series," accessed July 22, 2019, https://www.intel.com/content/www/us/en/products/memory-storage/solid-state-drives/data-center-ssds/d3-series/d3-s4510-series.html

Read the science behind this report at http://facts.pt/gr5vkj0 ▶

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This project was commissioned by KIOXIA.

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October 2019 | 5