Process more transactions and create greater value with HPE ProLiant DL385 Gen10 servers configured with value SAS and NVMe mainstream SSDs

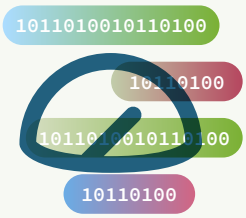
Configurations of an HPE ProLiant DL385 Gen10 server with RM5 Series value SAS and CD5 Series NVMe mainstream SSDs from KIOXIA had better transactional database performance than a configuration with SATA SSDs, yielding more performance for each dollar spent

HPE ProLiant DL385 Gen10 server running an OLTP workload

Enhancing your infrastructure with SSDs could boost transactional database performance and help you meet key business goals. Two types of SSDs, SAS and NVMe™, can offer faster transactional database performance now and should continue to show improvement as the technologies continue to develop over the next few years.[1,2] SATA SSDs, on the other hand, use a technology that has no future roadmap,[3] and won't help you prepare for growth.

To see how SAS and NVMe SSDs from KIOXIA can improve transactional database performance compared to SATA SSDs and help you prepare for more users and increased database utilization, we ran an online transaction processing (OLTP) workload on an HPE ProLiant DL385 Gen10 server in three configurations: with enterprise SATA SSDs, with KIOXIA RM5 Series value SAS SSDs, and with KIOXIA CD5 Series NVMe mainstream SSDs. The SAS and NVMe configurations delivered more transactions per minute (TPM) with lower write latencies.

Better OLTP workload performance enables you to support more users or allow users to search your databases more quickly. Lower disk latency can reduce user wait times, which contributes to a better overall user experience. In addition, the SAS and NVMe configurations offered a better value than the SATA configuration by completing more TPM per dollar spent on the SSDs.



Complete more database transactions

30% more TPM
Value SAS SSDs
vs. enterprise SATA SSDs

57% more TPM
NVMe mainstream SSDs
vs. enterprise SATA SSDs

Get a better return on your investment

Up to 35% more TPM for every dollar
NVMe mainstream SSDs
vs. enterprise SATA SSDs

Understanding the advantages of KIOXIA SAS and NVMe SSDs

What made transactional database performance for the value SAS and NVMe mainstream SSD configurations better than the enterprise SATA SSD configuration? Part of the answer is that SAS and NVMe interfaces offer faster transfer rates for data. Value SAS SSDs transfer data at 12Gb/s,[4] and NVMe mainstream SSDs offer a speed of 32 gigatransfers per second (GT/s).[5] Slower transfer speeds (6Gb/s)[6] limit SATA SSDs, and SATA-IO, the organization governing SATA technology, says it has no plans to improve the interface's bandwidth.

When you choose KIOXIA value SAS and NVMe mainstream SSDs for your HPE servers, you can do so knowing the underlying drive technologies have improvements to come. The SCSI Trade Association published a roadmap in 2019 that shows the availability of 12Gb/s SAS through at least 2021, with 24G SAS becoming available to end-user products in 2020.[7] Likewise, the NVM Express® Promoter Group released a new version of the NVMe base specification in early 2019 that adds significant functionality that drive manufacturers will soon implement in new SSDs.[8] The NVMe organization also has over 50 ongoing projects in their technical working groups with over 130 companies working on them,[9] a sign that we could see more advancements to come.

SATA SSDs might have adequately handled transactional workloads in previous years. But their connection speed limits their performance, and when you combine that with the lack of future improvements, the advantage of KIOXIA value SAS and NVMe mainstream SSDs becomes more clear. Choosing either KIOXIA SSD option could help your transactional database applications complete more transactions, support more customers, and offer faster responsiveness.

KIOXIA NVMe mainstream SSD

About the HPE ProLiant DL385 Gen10 server

The HPE ProLiant DL385 Gen10 features AMD EPYC™ 7000 Series processors and can support up to 24 KIOXIA value SAS or mainstream NVMe mainstream SSDs.[10]

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How we tested

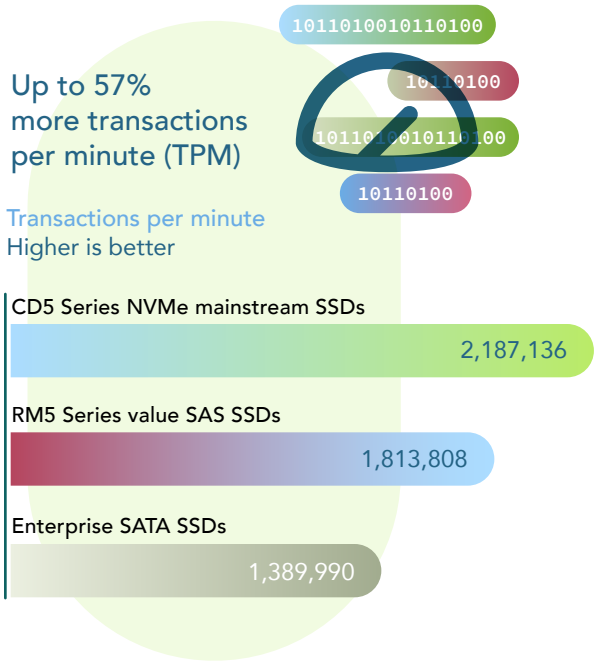
We wanted to learn about the online transaction processing (OLTP) performance organizations could experience by configuring new servers with value SAS or NVMe mainstream SSDs from KIOXIA versus enterprise SATA SSDs. We used the TPC-C-like workload from the HammerDB benchmark, which runs a transactional workload of many virtual users on a database. We ran the workload on three storage configurations of a single-node HPE ProLiant DL385 Gen10 server that used Microsoft SQL Server 2019 and Microsoft Windows Server 2019. The three storage configurations featured the following:

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

Get better OLTP performance with KIOXIA value SAS and NVMe mainstream drives

Choosing KIOXIA value SAS or NVMe mainstream SSDs over SATA SSDs can let you get better performance for your OLTP applications. Compared to the SATA SSDs, the KIOXIA SSDs enabled the server to process more TPM in our OLTP workload. The server configuration with SATA SSDs achieved just 1.4 million TPM on average, whereas the server configuration with value SAS SSDs achieved an average of over 1.8 million—30 percent more than the SATA configuration.

The server configuration with NVMe mainstream SSDs processed the most TPM of our testing—over 2.1 million, 57 percent more than the SATA SSD configuration. More TPM means more database application users, like those for ecommerce that can view, select, and order your products.



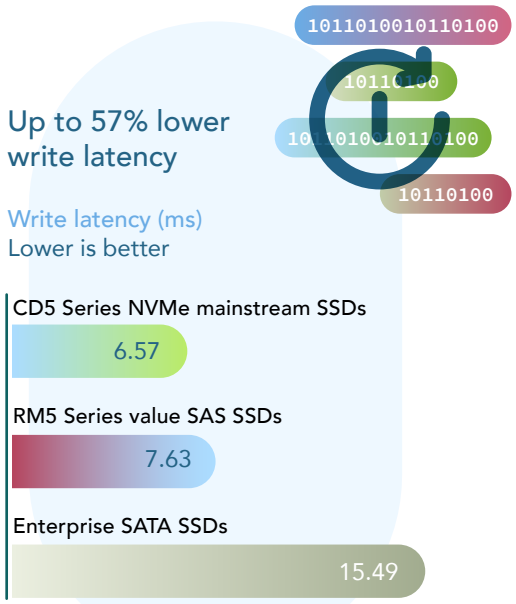
About the HammerDB 3.2 workload

We tested each server with an OLTP workload from the HammerDB suite of benchmarks. HammerDB is an open source, enterprise-grade database benchmarking application that supports Oracle Database, SQL Server, IBM Db2, MySQL, MariaDB, PostgreSQL and Redis.[11] Their TPC-C-like benchmark gives results in transactions per minute (TPM).

To learn more about HammerDB, visit https://www.hammerdb.com/.

Wait less with lower write latency

Low storage latency can minimize the wait times users experience when accessing a relational database. In our tests, the value SAS and NVMe mainstream SSD configurations delivered shorter write latencies than the enterprise SATA SSD configuration. The SATA configuration had an average write latency of 15 milliseconds, while the SAS and NVMe configuration latencies were less than half of that—7 milliseconds for SAS and 6 milliseconds for NVMe.

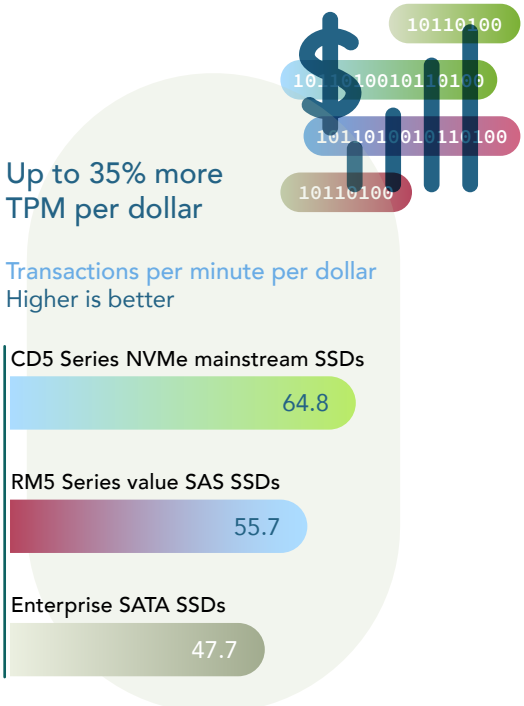


KIOXIA value SAS and NVMe mainstream SSDs could yield a better return

Of the storage we tested, the SATA SSDs cost the least, but the KIOXIA value SAS and NVMe mainstream SSDs offer a better value based on our test results. Think about the drive upgrade this way: Every dollar you spend on the value SAS or NVMe mainstream SSDs can translate to delivering better application performance and supporting more users.

We quantified that value. Comparing the cost of each server configuration to its performance in our transaction tests, we found the SAS and NVMe SSD configurations delivered more average TPM per dollar than the SATA SSD solution. The SAS configuration delivered 8 more TPM per dollar and the NVMe configuration delivered 17 more.

For the total solution cost, we obtained a quote for a base model of the HPE ProLiant DL385 Gen10 server matching our configuration minus the SSDs. Next, we obtained list pricing from HPE for value SAS and NVMe mainstream drives. For the price of the SATA SSDs, we used the list price from an online retailer.[12] Note that our cost evaluation includes only the cost of hardware.



Conclusion

Storage in your infrastructure should help your organization grow, not limit its potential. Choosing HPE ProLiant DL385 Gen10 servers with KIOXIA value SAS or NVMe mainstream SSDs could offer the transactional database performance that better meets your needs today, as well as those in the future. SAS and NVMe configurations outperformed a SATA configuration in our application simulation testing and offered lower write latency to help minimize wait times. In addition, the performance advantages of the KIOXIA SAS and NVMe configurations delivered more average TPM per dollar spent on the SSDs than the SATA configuration. Consider KIOXIA value SAS and NVMe mainstream SSDs for your servers to help your organization meet its goals.

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

2 Allen, David, and J. Metz, "The Evolution and Future of NVMe™," accessed November 22, 2019, https://nvmexpress.org/wp-content/uploads/NVMe-Roadmap-Webinar-2017.Final_.v2.pdf

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

4 "Toshiba Memory America First to Deliver Value SAS SSDs Targeting SATA Applications," accessed November 22, 2019, https://business.kioxia.com/en-us/news/2018/ssd-20180619-1.html

5 "Data Center SSD: CD5 Series," accessed November 22, 2019, https://business.kioxia.com/en-us/ssd/data-center-ssd/cd5.html

6 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 November 22, 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 November 22, 2019, https://sata-io.org/system/files/member-downloads/SATA_6Gb_Phy_PR_Finalv2.pdf

7 "Serial Attached SCSI Technology Roadmap," accessed November 22, 2019

8 "The Evolution and Future of NVMe™," accessed November 22, 2019

9 Billy Tallis, "NVMe 1.4 Specification Published: Further Optimizing Performance and Reliability," accessed November 22, 2019, https://www.anandtech.com/show/14543/nvme-14-specification-published

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

11 "HammerDB," accessed November 22, 2018, https://www.hammerdb.com/

12 "Intel DC S4510 960GB SSD 2.5IN SATA 3D2 TLC (SSDSC2KB960G801)," accessed November 26, 2019, http://www.tigerdirect.com/applications/searchtools/item-details.asp?EdpNo=5831558&SRCCODE

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