# PROWESS

# Dell™ PowerEdge™ R750 Servers with PCIe® Gen4 Data Center NVMe® RAID Increase Microsoft® SQL Server® Database Performance

Achieve faster results and expand database capacity with Dell PowerEdge R750 servers built with 3rd Generation Intel® Xeon® Scalable processors, fast, data-center-class NVM Express® (NVMe) drives, and the latest-generation Broadcom® RAID controllers.

Research Abstract

## Executive Summary

Small- and medium-sized businesses (SMBs) comprise 90 percent of the global business population, and many rely on Microsoft® SQL Server® for daily operations.[1] Because it's common for these organizations to run SQL Server on a standalone platform, the performance of that platform is critical. The RAID controller, in particular, is a key component on these systems because it not only enhances performance but it protects data from drive failures.

The overall performance of SQL Server depends on server hardware, especially the processor, memory, networking, and storage. To examine the benefits of upgrading hardware in greater detail, Prowess Consulting compared the latest generation of the popular 2U Dell™ PowerEdge™ rack server with the previous generation.

Dell PowerEdge R750 platforms offer several performance advantages for SQL Server over previous-generation platforms. These advantages include 3rd Generation Intel® Xeon® Scalable processors, 3,200 megatransfers per second (MT/s) memory, PCIe® Gen4 interfaces, and Dell™ PowerEdge RAID Controller 11 (PERC 11) H755N Front NVM Express® (NVMe®) drives, built with industry-leading Broadcom® RAID technologies. With PCIe Gen4 interfaces, Dell PowerEdge R70 platforms can be configured to include data-center-class NVMe solid-state drives (SSDs).

> **Modern RAID protects data and boosts storage performance.**
>
> RAID (Redundant Array of Inexpensive Disks) has been around for many years. Traditionally, RAID has been used to increase the resilience and reliability of critical storage applications. But now, with PCIe Gen4 RAID interfaces, RAID works with high-bandwidth solid state drives (SSDs) to significantly boost storage performance. The Dell PERC 11 H755N Front NVMe adapter, based on the Broadcom SAS3916 PCIe to SAS/SATA/PCIe RAID-on-Chip (RoC) controller with both PCIe Gen4 host and PCIe Gen4 storage interfaces, delivers double the bandwidth and 75 percent more IOPS, compared to previous generations.[2]
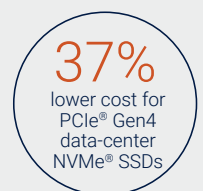
Prowess testing compared the components in the current-generation Dell PowerEdge R750 server against the 2nd Generation Intel Xeon Scalable processors, the Dell PERC 10 H740P, and the Serial ATA (SATA®)-based SSDs found in the previous-generation Dell PowerEdge R740xd platform. This testing allowed us to quantify what upgrading server infrastructure can mean for businesses.

Additionally, Prowess Consulting noted that the Dell PCIe Gen4 data-center NVMe SSDs in the Dell PowerEdge R750 platform offer not only higher data-transfer rates compared to the SATA-based Dell SSDs in the Dell PowerEdge R740xd platform, but they also cost 37 percent less:

- 960 GB Dell data-center NVMe read-intensive AG drive, U2, PCIe Gen4, with carrier: $1,063.55 USD[3]

- 960 GB SATA Dell SSD, read-intensive, 6 Gbps, 512e, 2.5-in with 3.5-in hybrid carrier drive: $1,689.00 USD[4]

The Dell PCIe Gen4 data-center NVMe SSDs used in the Dell PowerEdge R750 platform offer compelling value.[5]

A Dell™ PowerEdge™ R750 server, compared to a Dell PowerEdge R740xd server, can provide:.

Up to
**2.6x**
more new orders per minute (NOPM)

Up to
**3.5x**
higher disk-write performance

Up to
**1.4x**
Higher disk-read performance[5]

**37%**
lower cost for PCIe® Gen4 data-center NVMe® SSDs

# Higher Performance

The newer platform, built on a Dell PowerEdge R750 server, demonstrated an up to **2.6x** increase in performance over the older-generation Dell PowerEdge R740xd platform when using 16 NVMe drives, as shown in Figure 1.
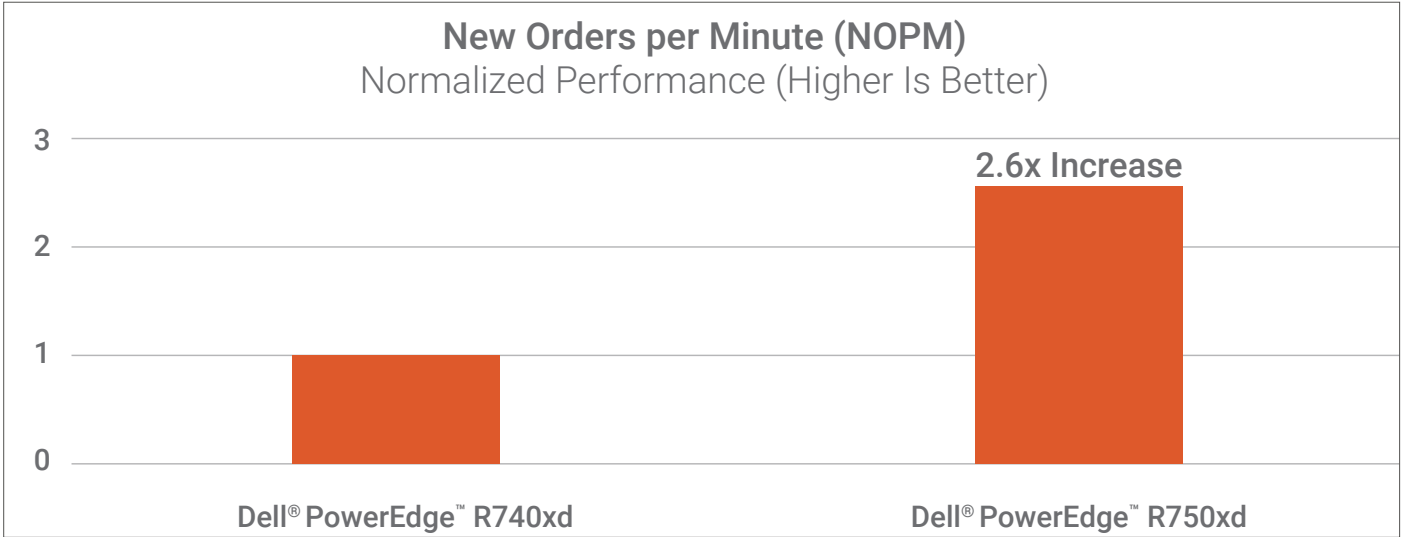


**Figure 1.** Combination of additional cores and the new PERC 11 in the newer Dell™ PowerEdge™ platform enabled it to process up to 2.6x the NOPM of the previous-generation platform

Disk read and write times were also improved for the newer server examined. For example, the Dell PowerEdge R750 server had up to **3.5x** greater log-disk write performance compared to the Dell PowerEdge R740xd platform when running eight NVMe drives, as shown in Figure 2.
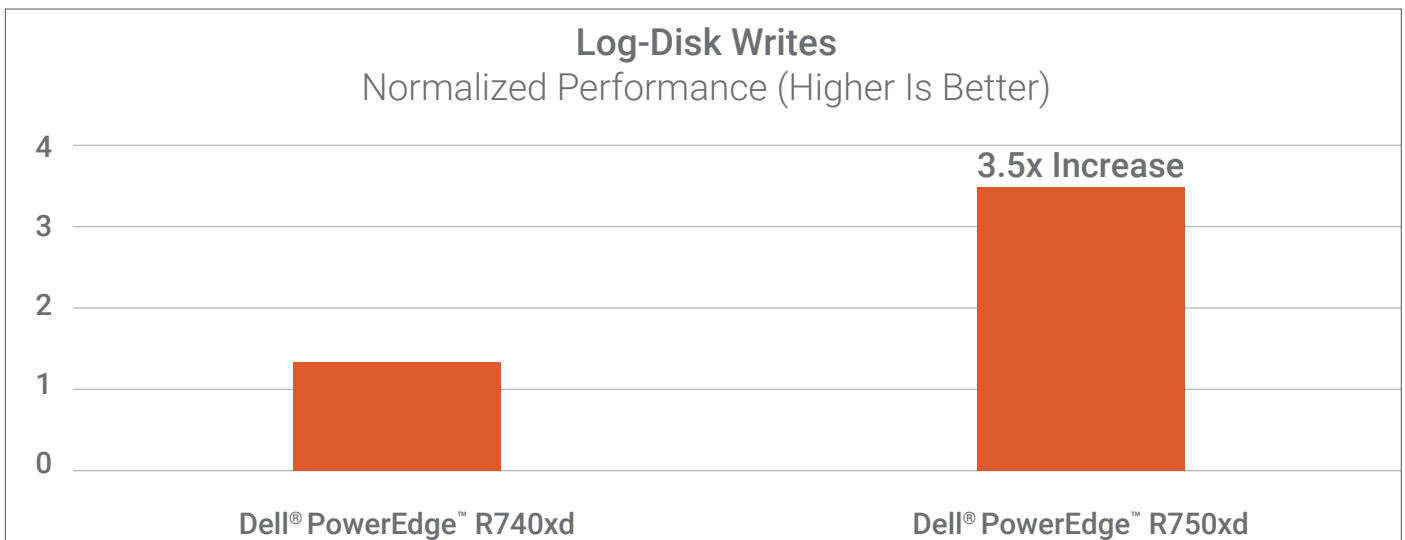


**Figure 2.** NVMe® drives in the newer Dell™ PowerEdge™ platform provide much more efficient disk writes than the SATA® SSDs in the previous-generation platform

For log-disk reads, the Dell PowerEdge R750 server was more performant than the Dell PowerEdge R740xd server, clocking in up to **1.4x** better read performance over the older platform with eight NVMe drives, as shown in Figure 3.
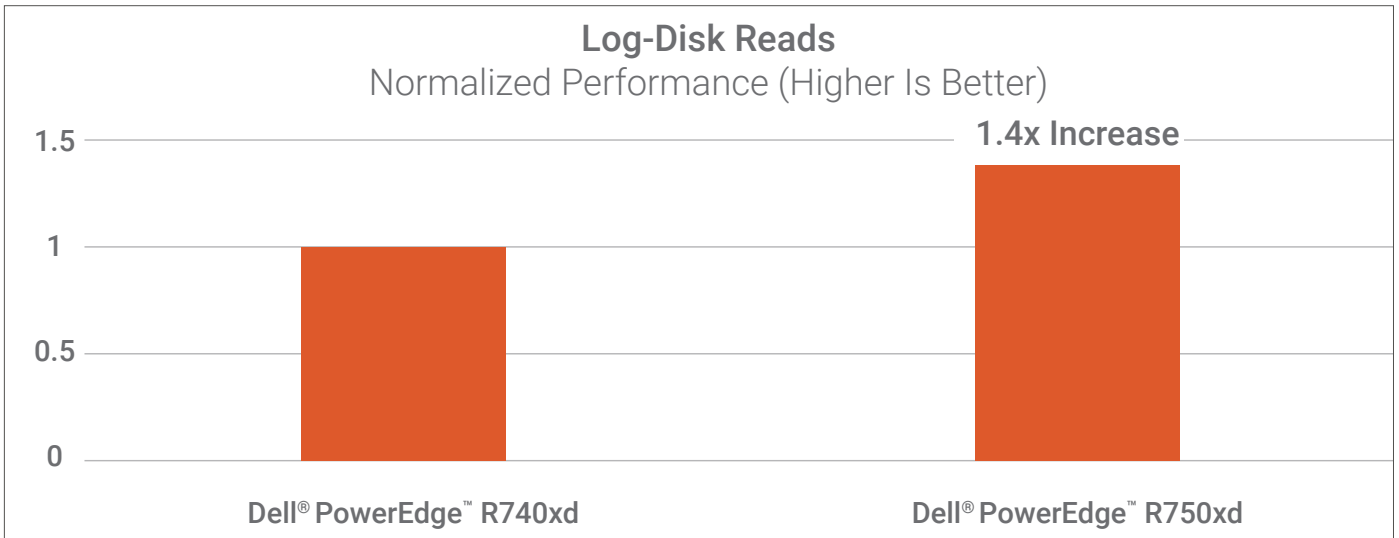
## Log-Disk Reads
### Normalized Performance (Higher Is Better)



**Figure 3.** NVMe® drives in the newer Dell™ PowerEdge™ platform provide higher performance for log-disk reads compared to the SATA® SSDs in the previous-generation platform

## Significant Performance Increase Justifies an Upgrade

Organizations are looking to maximize actionable information from massive and growing data volumes. For SMBs that run SQL Server databases on self-contained systems, the challenge is to maximize performance while ensuring all data is available and protected in the event of a drive failure. To address this challenge, businesses require modern platforms configured with high-performing processors, storage, interfaces, and controllers.

Testing by Prowess Consulting shows that the Dell PowerEdge R750 server with RAID storage based on data-center NVMe SSDs helps meet this requirement by providing critical protection for data, with significant improvements for database NOPM compared to older-generation servers built with SATA RAID drives. In addition, the data-center NVMe SSDs examined in our testing cost up to 37 percent less than the SATA-based SSDs we looked at.[3,4]

## Learn More

To learn more about the Dell PowerEdge R750 performance, read the Prowess white paper:

https://www.prowesscorp.com/project/dell-r750-vsr740xd/

[1] Finances Online. "63 Crucial Small Business Statistics for 2021/2022: Data Analysis & Projections" 2020. **https://financesonline.com/crucial-small-business-statistics/**.

[2] Source: Broadcom internal data, provided by Dell Technologies

[3] Pricing as of May 31, 2022, for Dell part number 400-BMTR. Subject to change without notice. Source: Dell Technologies. **www.dell.com/en-us/shop/dell- 960gb-data-center-nvme-read-intensive-ag-drive-u2-gen4-with-carrier/apd/400-bmtr/storage-drives-media**.

[4] Pricing as of May 31, 2022, for Dell part number 345-BBDJ. Subject to change without notice. Source: Dell Technologies. **www.dell.com/en-us/shop/960gb-ssd-sata-read-intensive-6gbps-512e-25in-w-35in-hyb-carr-drive/apd/345-bbdj/storage-drives-media**.

[5] Dell Technologies. "New PCIe Gen4 Data Center NVMe Drives Offer Unmatched Value for PowerEdge Servers." 2021. **https://infohub.delltechnologies.com/section-assets/new-pcie-gen4-data-center-nvme-drives**.