Research Abstract

PROWESS

Run Business Faster on Dell™ Servers with NVMe® RAID

Prowess Consulting testing demonstrated that the Dell™ PowerEdge™ R760 server with the Dell™ PowerEdge RAID Controller 12 (PERC 12) improves storage performance by more than 10x.[1]

Executive Summary

Running applications like analytics, AI, or real-time transaction processing on a server at speed requires high-performance storage. At the same time, high availability is a key requirement.

RAID can be a powerful tool for ensuring the availability of local storage because it combines multiple physical disk drives into a single virtual disk for data redundancy, performance improvement, or a combination of both. The Dell™ PowerEdge RAID Controller 12 (PERC 12) and PERC 11 offer native NVM Express® (NVMe®) RAID support, unlocking the ability to directly harness RAID's benefits for high-performance NVMe storage.

To help organizations evaluate the performance benefits of running data-intensive workloads on servers with NVMe RAID and to assess the benefits of upgrading to PERC 12 from PERC 11, Prowess Consulting tested a Dell™ PowerEdge™ R760 server with both PERC 12 and PERC 11. Our testing found that using PERC 12 instead of PERC 11 allowed us to improve storage performance more than 10x and increase storage throughput almost 5x, compared to PERC 11.[1] Additionally, with PERC 12, RAID 5 rebuilds were up to 110% faster, RAID 10 rebuilds were up to 56% faster, and Microsoft® SQL Server® database restores were up to 90% faster.[1]

Quantifying the Benefits of PERC 12 and PERC 11

Prowess Consulting ran several performance benchmarks on the PowerEdge R760 server, first with PERC 12 and then with PERC 11.

Measuring Disk Performance

When disk throughput is constrained, storage can become a bottleneck, impacting the speed of business operations and ultimately reducing profitability. Prowess Consulting engineers assessed the disk throughput of the PowerEdge R760 server platform using PERC 12 (H965i Front controller) and PERC 11 (H755N front NVMe controller). We used the benchmarks fio, RocksDB, and Dbench (part of the Phoronix Test Suite). Across these benchmarks, the PowerEdge R760 server platform with PERC 12 outperformed the same platform using PERC 11. These results can serve as a proxy indicator of how PERC 12 can increase storage system performance in other data-intensive workloads, including analytics and AI. See Figures 1 and 2 for fio test results. Refer to the Prowess Consulting technical research report for detailed results of the other tests.

Highlights

Data-intensive workloads running on servers with NVMe® RAID deliver higher performance with Dell™ PERC 12.[1]

Disk performance with PERC 12 was more than **10.8x higher** than with PERC 11.

Disk throughput with PERC 12 was more than **4.7x higher** than with PERC 11.

RAID 5 rebuilds on PERC 12 were up to **110% faster** than on PERC 11.

RAID 10 rebuilds on PERC 12 were up to **56% faster** than on PERC 11.

Microsoft® SQL Server® database restores were up to **90% faster** than on PERC 11.

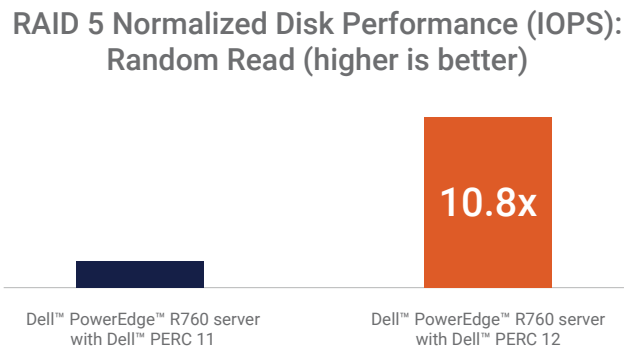

Figure 1. Dell™ PERC 12 delivers up to 10.8x better RAID 5 fio random read performance

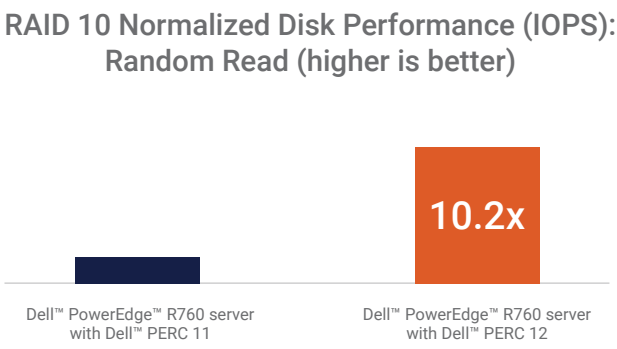

Figure 2. Dell™ PERC 12 delivers up to 10.2x better RAID 10 fio random read performance

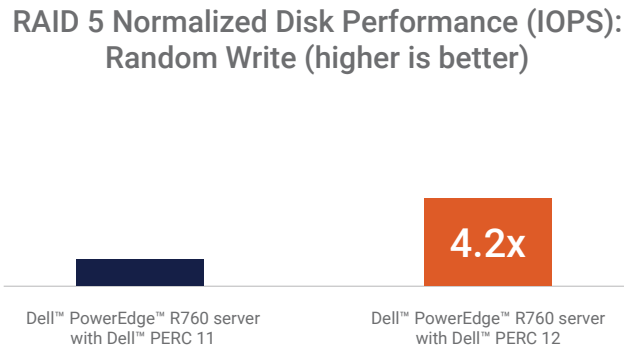

Figure 3. Dell™ PERC 12 delivers up to 4.2x better RAID 5 fio random write performance

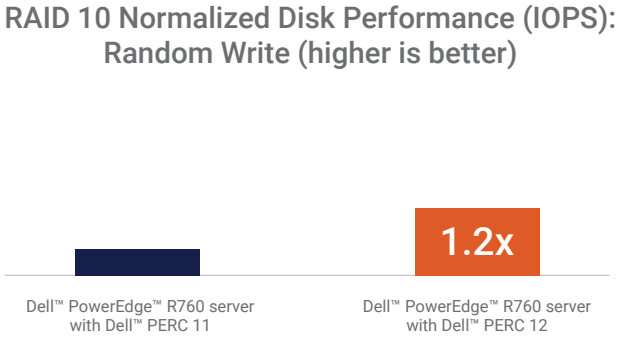

Figure 4. Dell™ PERC 12 delivers up to 1.2x better RAID 10 fio random write performance

The Upgrade Decision

Organizations that build their business strategies around analytics, AI, or real-time transaction processing need the right equipment in their data centers to meet the challenges of massive datasets and complex workloads. Deploying servers with fast storage like NVMe RAID is one approach to increasing performance, but there are other considerations, including processor performance, RAID features, and available management tools and services.

- For fast and accurate performance, a PowerEdge R760 server makes sense as an upgrade over previous generations, especially for workloads like AI and analytics. This server offers up to 2.9x greater AI inferencing with 4th Gen Intel® Xeon® Scalable processors with Intel® Deep Learning Boost (Intel® DL Boost) and Intel® Advanced Matrix Extensions (Intel® AMX) and up to 20% higher virtual desktop infrastructure (VDI) density measured in users per server.[2,3]
- Dell PERC 12 provides a RAID solution that's powerful and easy to manage. It's based on the Broadcom SAS4116W processor, a dual-core ARM® A15 1.6 GHz RAID-on-Chip (ROC) designed to offer high input/output (I/O) performance for data-intensive applications. PERC 12 supports 24 Gbps Serial-Attached SCSI (SAS) drives, increased cache memory speeds of up to 3,200 MHz, and a 16-lane host bus type.
- Dell Technologies offers various software tools and services in its Dell™ OpenManage™ systems management portfolio. These tools and services help simplify the management and support of PowerEdge servers, including the PowerEdge R760 server. With the help of these services, staff can spend more time on value-add tasks and less time fixing problems. The result is reduced complexity and lower total cost of ownership (TCO).

Achieving the Performance Edge

PowerEdge R760 servers with NVMe RAID—either PERC 12 or PERC 11—can help meet the performance requirements for workloads such as analytics, AI, and real-time processing. Our testing demonstrated that running transactions on the PowerEdge R760 server with PERC 12 instead of PERC 11 can increase storage performance by more than 10.8x. PERC 12 also reduced RAID rebuild times and SQL Server database restore times. This data suggests that an upgrade to PERC 12, built on Broadcom SAS4116W silicon, can help organizations achieve a performance edge and higher availability.

Our research also showed that the PowerEdge R760 server should be considered in upgrade discussions because of its generational performance improvements in areas such as AI/machine learning (ML) and VDI. Compared to the PowerEdge R750 server, the PowerEdge R760 server delivers:

- **Up to 2.9x greater** AI inferencing on 4th Gen Intel Xeon Scalable processors with Intel DL Boost and Intel AMX[2]
- **Up to a 20% increase** in the number of VDI users supported on one server[3]
- **Up to 50% more** SAP® Sales and Distribution users supported on one server[4]

Dell Technologies' tools and services also offer a large portfolio of solutions that can reduce complexity and lower TCO. These include the Dell OpenManage Enterprise console, the Dell OpenManage Server Administrator (OMSA), and the Integrated Dell™ Remote Access Controller (iDRAC).

Learn more about the Dell PowerEdge R760 rack server.

Read our technical research report for full testing details and results.

[1] Prowess Consulting. "Improve Storage Performance by More than 10x for Data-Intensive Workloads on Dell™ PowerEdge™ R760 Servers with Dell™ PowerEdge RAID Controller 12 (PERC 12)." April 2024.

[2] Testing commissioned by Dell Technologies in December 2022 and performed by Scalers AI, which delivers greater AI inferencing for object detection using INT8 on 4th Gen Intel® Xeon® Scalable processors. Dell™ PowerEdge™ R760 servers include 4th Gen Intel Xeon Scalable processors with updated Intel® Deep Learning Boost (Intel® DL Boost) instructions. Actual results will vary.

[3] Based on internal Dell testing results provided by Dell Technologies, in which a Dell™ PowerEdge™ R760 server with two Intel® Xeon® Gold 6454S processors hosted 220 VDI sessions, compared to a PowerEdge R750 server with two Intel Xeon Gold 6348 processors, which was able to host 183 VDI sessions.

[4] Based on test results approved by SAP under certification number 2023005, in which the Dell™ PowerEdge™ R760 server with two Intel® Xeon® Platinum 8480 processors with a total of 112 cores, 224 threads, and 2,048 GB DRAM hosted 72,250 SD users using SUSE® Linux® Enterprise Server (SLES) 15, compared to published results under certification number 2021026 for the PowerEdge R750 server with two Intel Xeon Platinum 8380 processors with a total of 80 cores, 160 threads, and 1,024 GB DRAM, which demonstrated support for up to 48,000 SD users using Red Hat® Enterprise Linux 8.2. Source: SAP. SAP Standard Application Benchmarks webpage. Accessed in August 2023.

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