

Research Abstract



NVMe® RAID Controllers Offer Performance Gains with Reliability for Critical Applications

Prowess Consulting benchmark tests on Dell™ PowerEdge™ servers demonstrate how NVMe RAID controllers help organizations meet the needs of demanding workloads.

VMware vSAN™ has become a mainstay for many organizations by providing manageability, reliability, and availability for traditional business applications. However, some applications based on modern workloads such as artificial intelligence (AI) and data-intensive analytics demand higher performance than VMware vSAN might be capable of providing. That's because VMware hypervisor and management software layers add latency, creating performance gaps that are difficult and costly to overcome by merely optimizing or upgrading servers, memory, and other components.

One way to accelerate performance would be to remove those latency layers by running critical workloads on a bare-metal server with RAID. This solution eliminates hypervisor latency while still providing reliability and availability, but only at the cost of introducing new latencies from Serial-Attached SCSI (SAS)-based RAID controllers.

NVMe RAID Brings Significant Performance Gains

Newer NVM Express® (NVMe®)-based RAID controllers can help solve this performance dilemma by overcoming the latency gaps caused by both VMware vSAN hypervisors and the slower SAS protocol.

Testing by Prowess Labs showed that Dell™ PowerEdge™ R750 servers, built with newer Dell™ PowerEdge RAID Controller 11 (PERC 11) NVMe RAID controllers, significantly boosted performance for critical workloads while still ensuring the high levels of reliability that businesses require. Microsoft® SQL Server® workloads on a single PowerEdge R750 server with RAID showed 13.9x more transactions in HammerDB TPROC-C database benchmark testing than did a four-server cluster built with VMware vSAN.¹

A single bare-metal server with NVM Express® (NVMe®) RAID controllers, compared to a four-server VMware vSAN™ cluster, demonstrated:

Up to
12.8x
more transactions
with 128
virtual users¹

Up to
13.9x
more transactions
with 192
virtual users¹

Database Workload

SQL Server was used for testing, as this application is commonly used with data-intensive workloads that require top performance for businesses and their customers. Prowess engineers used HammerDB with the TPROC-C benchmark to measure online transaction processing (OLTP) performance against the MySQL database. Specifically, the benchmark was run against a 640-warehouse database with 32, 64, 96, 128, 160, and 192 virtual users.

As Figure 1 shows, results showed significant performance gains across all tested scenarios when running SQL Server workloads on the bare-metal server. The PowerEdge R750 server with NVMe RAID demonstrated transactional performance gains ranging from 6.7x more new orders per minute (NOPM) at 32 virtual users up to 13.9x more NOPM at 192 virtual users. This represents an increase of up to 93 percent for the bare-metal configuration.

New Orders per Minute (NOPM):
Dell™ PowerEdge™ R750 as a Single Bare-Metal Server with RAID
versus a Four-Server VMware vSAN™ Cluster (Normalized)

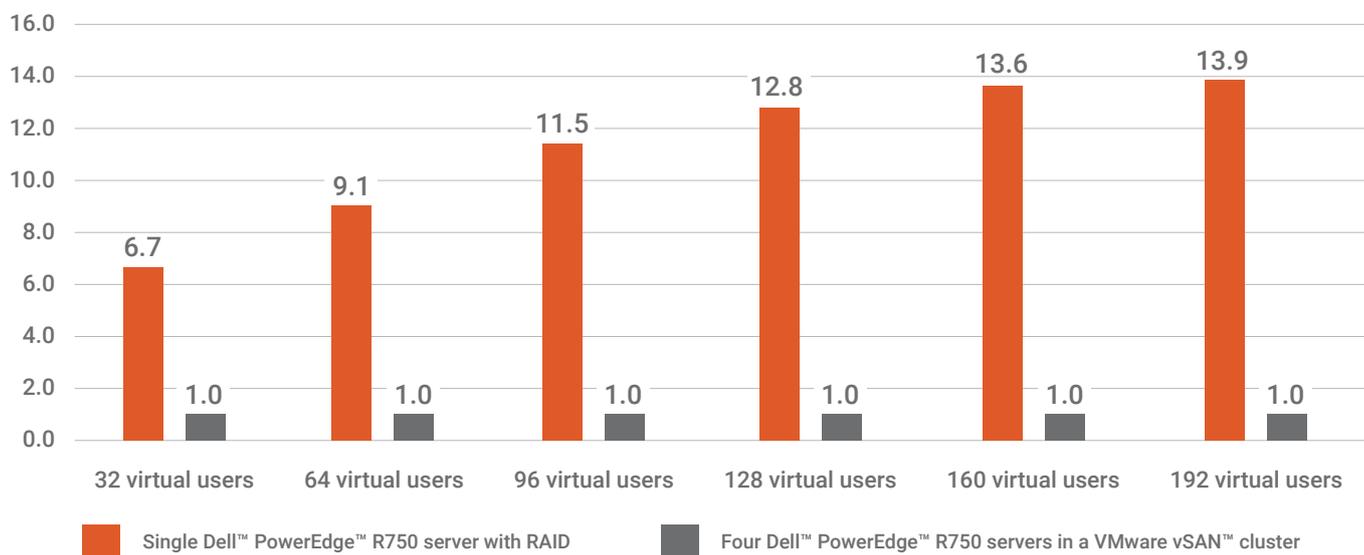


Figure 1 | Database performance comparing a bare-metal Dell™ PowerEdge™ R750 server with RAID to four PowerEdge R750 servers in a VMware vSAN™ cluster

Get the full story by reading the technical research report:

[“For Peak Performance, Bare Metal with NVMe® RAID Comes Out On Top”](#)

¹ Based on testing by Prowess as of December 2022. For configuration details, see “Behind the Report: For Peak Performance, Bare Metal Wins.” 2023. www.prowesscorp.com/project/dell-poweredge-r750-bare-metal-with-nvme-raid-boosts-performance/.



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