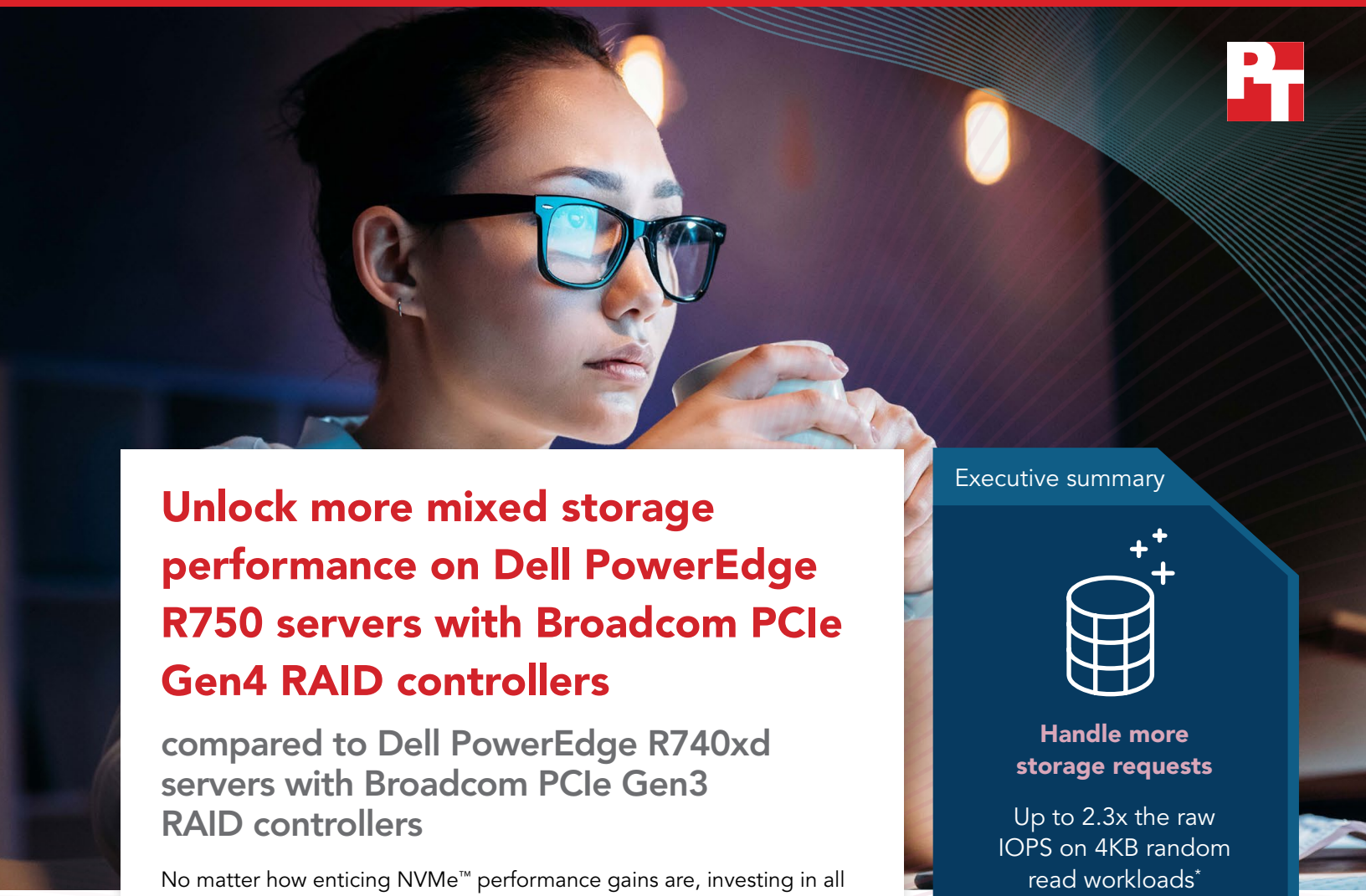

Unlock more mixed storage performance on Dell PowerEdge R750 servers with Broadcom PCIe Gen4 RAID controllers

compared to Dell PowerEdge R740xd servers with Broadcom PCIe Gen3 RAID controllers

No matter how enticing NVMe™ performance gains are, investing in all NVMe drives can be an expensive proposition—both economically and operationally. So it comes as no surprise that "IDC estimates that SAS is found in over 70 percent of enterprise storage drives and expects it to reach more than 85 percent of enterprise storage capacity by 2022."[1] Dell PowerEdge™ R750 servers include Broadcom PCIe® Gen4 RAID controllers, which not only deliver twice the bandwidth (throughput) of previous-generation servers with Gen3 technology, but also support SAS, NVMe, and mixed-drive environments.[2]

To explore the advantages of the 15G Dell PowerEdge R750 server in a mixed-storage environment, we compared its input/output operations per second (IOPS) and throughput to those of a 14G Dell PowerEdge R740xd server.

In our 16 SAS and 8 NVMe drive mixed-storage test configuration, the Dell PowerEdge R750 server with a PCIe Gen4 RAID controller handled over 7.5 million more IOPS in our 4KB random read workload and maintained over twice the gibibytes per second (GiB/s) in our 1MB sequential read workload compared to the previous-generation server.

Executive summary

Handle more storage requests

Up to 2.3x the raw IOPS on 4KB random read workloads*

Up to 1.2x the raw IOPS on 4KB random write workloads*

Maintain more concurrent throughput

Up to 2.0x the GiB/s on 1MB sequential read workloads*

Up to 1.3x the GiB/s on 1MB sequential write workloads*

*vs a PowerEdge R740xd server with a Broadcom PCIe Gen3 RAID controller

How we tested

We compared the server and mixed SAS/NVMe drive storage performance of a Dell PowerEdge R750 server with a Broadcom PCIe Gen4 RAID controller (Dell PERC H755) to that of a Dell PowerEdge R740xd server with a Broadcom PCIe Gen3 RAID controller (Dell PERC H740P). To measure each dual-processor solution's block storage performance in four mixed-drive configurations, we captured Flexible input/output (FIO) benchmark performance metrics.

In all of our FIO benchmark tests, we used the maximum number of cores per processor: 56 cores for the PowerEdge R750 and 48 for the PowerEdge R740xd. Our final mixed-drive test included eight NVMe drives—filling all NVMe slots in the backplanes of the servers under test. Running 4KB random read and write workloads as well as 1MB sequential read and write workloads provided an overarching view of how each server solution handled the transfer of different data types and sizes in mixed-drive environments. We show the 24 mixed-drive configuration results here.

Handle more outgoing storage requests

4KB random read FIO results with 16 SAS and 8 NVMe drives
IOPS | Higher is better

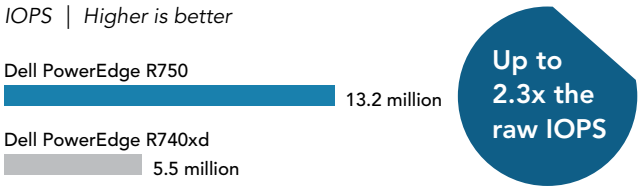

Figure 1: 4KB random read FIO benchmark results with 16 SAS and 8 NVMe drives. Higher is better.
Source: Principled Technologies.

Handle more incoming storage requests

4KB random write FIO results with 16 SAS and 8 NVMe drives
IOPS | Higher is better

Figure 2: 4KB random write FIO benchmark results with 16 SAS and 8 NVMe NVMe drives. Higher is better.
Source: Principled Technologies.

Maintain more outgoing concurrent throughput

1MB sequential read FIO results with 16 SAS and 8 NVMe drives
Throughput | Higher is better

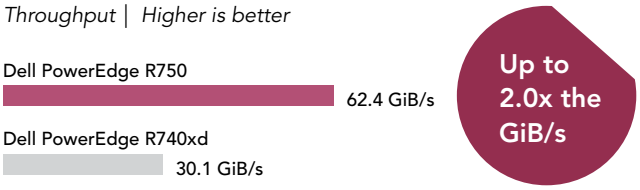

Figure 3: 1MB sequential read FIO benchmark results with 16 SAS and 8 NVMe drives. Higher is better.
Source: Principled Technologies.

Maintain more incoming concurrent throughput

1MB sequential write FIO results with 16 SAS and 8 NVMe drives
Throughput | Higher is better

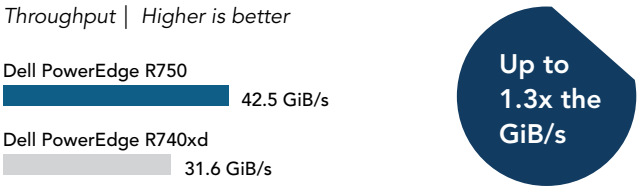

Figure 4: 1MB sequential write FIO benchmark results with 16 SAS and 8 NVMe drives. Higher is better.
Source: Principled Technologies.

We found that a 15G Dell PowerEdge R750 server with a Broadcom PCIe Gen4 RAID controller processed significantly more storage requests and sustained more concurrent throughput in four mixed SAS/NVMe drive configurations than a 14G Dell PowerEdge R740xd server with a Broadcom PCIe Gen3 RAID controller.

Read the report at https://facts.pt/4Xw0EX6 ▶

1. Data Center Dynamics, "SAS or NVMe? That is the question," accessed April 21, 2022, https://www.datacenterdynamics.com/en/opinions/sas-or-nvme-that-is-the-question/.

2. MiniTool Partition Wizard, "PCIe 3.0 vs. 4.0: What's the Difference and Which is Better [Clone Disk]", accessed April 21, 2022, https://www.partitionwizard.com/clone-disk/pcie-3-vs-4.html.

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