PT

Upgrade to Dell EMC PowerEdge R6515 servers and gain better OLTP and VDI performance

Additionally, PowerEdge R6515 servers with 3rd Gen AMD EPYC processors could lower licensing costs and also empower your business to explore Kubernetes with VMware Tanzu

Like many small- or medium-sized businesses (SMBs), you've probably recently made critical business decisions to stay competitive. Maybe you implemented a remote work policy, expanded to new markets, or moved more of your business online. You may have also paused technology upgrades just to stay above water. But as some pandemic restrictions ease and your business continues to adapt to this altered landscape, it may be time to refresh your hardware to better support employees working remotely, handle more ecommerce orders, enable modern app infrastructure, and utilize the latest hardware and software security features.

To understand the differences between legacy servers similar to what you may use today and a newer AMD EPYC™ processor-powered solution, we tested two four-node VMware® vSphere® with vSAN™ clusters with a combined workload of virtual desktop infrastructure (VDI) and online transaction processing (OLTP) applications, which might mirror the daily work your servers perform. Compared to the legacy solution, comprising dual-socket Dell EMC™ PowerEdge™ R630 servers, the newer solution, comprising single-socket Dell EMC PowerEdge R6515 servers powered by AMD EPYC 7543P processors, improved VDI and OLTP performance. And when we utilized the PowerEdge R6515 solution's available resources and vSphere 7.0.2 features to run a third workload—a containerized multi-tier web app on Kubernetes with Tanzu—it continued to outperform the PowerEdge R630 servers on the VDI and OLTP workloads. Finally, according to our estimates, the PowerEdge R6515 solution could cut down on software licensing costs.

Reduce software licensing costs

by **22.3%** with single-socket, 32-core PowerEdge R6515 severs vs. dual-socket, 40-core servers*

Improve VDI user experience

Storage Sensitive tasks: **34.8%** lower latency† (3.36s vs. 5.16s)

CPU Sensitive tasks: **10.5%** lower latency† (0.44s vs. 0.49s)

Enable more ecommerce transactions

with **32.1%** more orders per minute†

*for software we used in our testing; see for more information
†vs. the Dell EMC PowerEdge R630 cluster while both ran the mixed OLTP and VDI workload

Upgrade considerations to stay competitive

Before discussing our testing and results, we want to acknowledge some of the obstacles your business may face when it comes to upgrading your servers. Like most decisions, cost plays an important role. TechTarget recommends considering not only the price of the server, but also the costs of IT resources, housing the server, and software licenses.[1] Your IT department may be smaller than its corporate counterparts, potentially comprising just a few people, or even non-existent, if you choose a third party to manage your tech needs. During the server upgrade process—which can include researching data center solutions, deploying servers, learning new management tools, and providing support once the new tech is up and running—saving IT time might mean freeing up in-house IT admins to take care of other needs or keeping third-party costs low.

Once you decide it's time to upgrade, you face the complex consideration of matching your needs to a server solution. For example, the security features you require may lend themselves to only a certain type of hardware. Performance expectations are another important factor in your decision. A lower-cost solution that "might not be powerful or reliable enough to handle mission-critical workloads" could deliver a poor experience to both customers and employees.[2] Such a solution may not be worth the up-front savings, as it could have a shorter lifecycle, meaning an earlier investment in hardware, licensing, and IT resources for another upgrade.

However, overinvesting in the highest-performing solution could also negatively impact the value you get from your technology—you don't want to spend more to equip your data center for needs your organization doesn't have. Instead, you may consider whether your environment's requirements justify the cost of newer NVMe™ drives or more storage, for example, or whether SAS or SATA SSDs or less storage would suffice. And while your organization might benefit from the compute power of a dual-socket solution, a solution with fewer processors or cores could result in significant licensing savings. (To learn more about the ways a single-socket, 32-core server could reduce licensing costs, see the Possible scenario: Licensing costs callout in this report.) As you consider processor counts and performance, you may find that the processor architecture that fits your needs differs from the architecture you currently use. While we didn't test migrating the workloads from our legacy PowerEdge solution to our newer one, according to AMD, "virtual machines can easily be migrated between AMD EPYC™ processors and Intel Xeon processors without any specialized tools or software."[3]

Whatever your unique business needs are, assessing your current requirements and future opportunities— such as the types of workloads you run, the hardware specifications you need, the number of customers and employees you support, the IT resources you have, the security you require, and the growth you anticipate—can help you select a hardware solution to carry you into the future.

How we approached testing

Taking these considerations into account, we ran a mixed workload in the PT data center that reflects needs your organization may have in today's business environment. To demonstrate the performance you might expect from moving your current workloads to a newer Dell EMC PowerEdge R6515 solution versus a legacy solution, we ran a mixed VDI and OLTP workload on two server clusters:

- Four newer-generation single-socket Dell EMC PowerEdge R6515 servers powered by AMD EPYC™ 7543P processors
- Four legacy dual-socket Dell EMC PowerEdge R630 servers powered by Intel® Xeon® E5-2698 v4 processors (released in 2016)

For our legacy environment, we chose software versions based on the age of the servers with the latest updates available for each release. Table 1 presents more configuration details for each cluster.

Table 1: An overview of the hardware and software we used for the two clusters we tested. The older software versions and drives reflect what an organization may use in a legacy environment.

System	4 x newer-generation Dell EMC PowerEdge R6515 servers	4 x legacy Dell EMC PowerEdge R630 servers
Processor count per server and type	1 x AMD EPYC 7543P	2 x Intel Xeon E5-2698 v4
Total core count per server	32	40
Memory (GB)	256	256
Capacity storage drives	4 x 1.92TB 6Gbps SATA SSDs	4 x 1.6TB 6Gbps SATA SSDs
Cache storage drives	2 x 800GB 12Gbps SAS SSDs	2 x 400GB 6Gbps SATA SSDs
VMware vSphere version	7.0.2	6.7
VMware Horizon® version	8.3	7.13
Microsoft SQL Server version	2019	2012
Windows Server version	2022	2016

On both clusters, we ran the VDI and OLTP workloads simultaneously to reflect an organization using a single cluster of four servers to meet multiple needs, such as supporting remote workers and ecommerce transactions. For VDI, we used VMware View® Planner with Horizon running the Standard Profile workload to simulate an environment of 100 virtual users logging in and completing various workday tasks. We measured the latency—or time spent waiting—that users could experience while using virtual desktops to work. We used the DVD Store 3 (DS3) benchmark to test OLTP performance, which measures the number of orders per minute (OPM) a solution can process. To represent server usage that would leave processing headroom in the event of a server failure, we tuned the benchmark to keep the average CPU utilization in the 70 to 80 percent range while the workloads ran. We worked to balance the resource needs of both workloads to produce successful VDI runs and balanced performance across our OLTP database VMs while maintaining our target CPU utilization range.

When we tested with the mixed workload on the newer Dell EMC PowerEdge R6515 servers, we achieved the same number of VDI users with lower latency and a higher number of orders per minute than the legacy PowerEdge R630 servers. After running the initial mixed-workload test, we used new features in the newer-generation environment to run an additional test on the PowerEdge R6515 cluster. Read the Explore modern solutions with Tanzu section for more information.

Accomplish more transactional database work

As more of your online customers add items to their cart, make purchases on your site, or manage their accounts, a solution with the ability to support a higher rate of database transactions could mean reducing wait times as they perform each operation. Improved OLTP database performance could also make differences for businesses in the healthcare, finance, and travel sectors, who utilize these databases for updating patient records, tracking funds, managing bookings, and more. In the wake of the pandemic, each of these operations remains critical.

OLTP

With ecommerce sales growing up to two to five times faster than they did before COVID-19,[4] your online sales may be facing higher demand. For example, about three-quarters of consumers who used digital channels for the first time during the pandemic plan to continue to use them after it ends.[5] But increased ecommerce demand comes with its own challenges. Your company may still be dealing with physical issues that cause longer waiting times for customers, such as supply chain delays or slow shipping. Inconveniences can also happen on your site as more users visit your page and make online purchases. Prompter responses and less wait times are important for positive customer experiences.

In our data center, we ran the VDI and transactional database workloads simultaneously on both server clusters. For transactional database performance, we saw 32.1 percent more OPM from the Dell EMC PowerEdge R6515 cluster running SQL Server 2019 and Windows Server 2022 than we did from the legacy PowerEdge R630 cluster running SQL Server 2012 and Windows Server 2016 (see Figure 1).

Total orders per minute
Higher is better

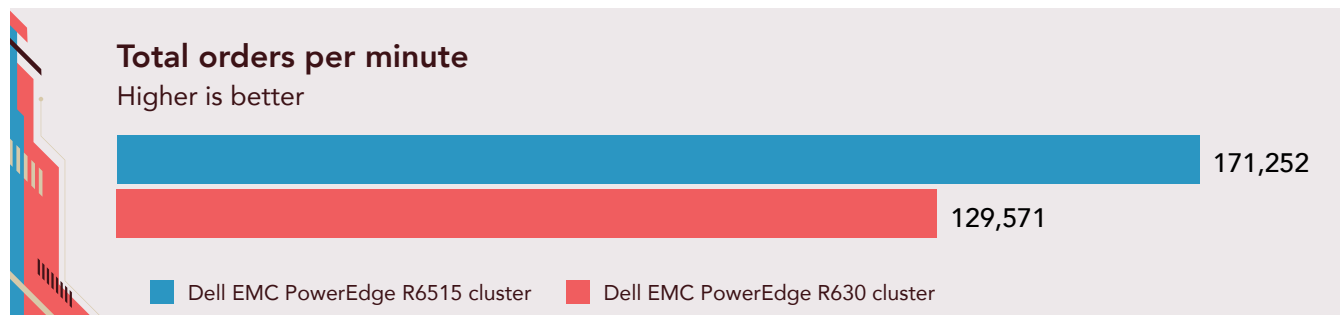|	
Dell EMC PowerEdge R6515 cluster	171,252
Dell EMC PowerEdge R630 cluster	129,571

Figure 1: The number of OLTP database orders per minute each cluster achieved with the DVD Store 3 benchmark. Both clusters simultaneously ran the OLTP workload and a 100-user VDI workload. Higher is better.
Source: Principled Technologies.

This increase in performance could translate to supporting more customer transactions on your ecommerce site, which could pave the way for more sales, a better user experience, and fewer customer support calls.

Deliver a better VDI user experience

If your employees work in a remote or hybrid model, your business may use VDI, which allows businesses to provide personnel with virtual desktops on thin clients or laptops rather than on-premises desktops. Each virtual desktop is equipped with exactly what your company specifies—so IT admins don't have to dedicate time troubleshooting each employee's unique configurations, OS, and apps. In addition to potentially reducing device and support costs, because VDI stores data in the data center instead of on end user devices, it can also help keep your data secure.

VDI
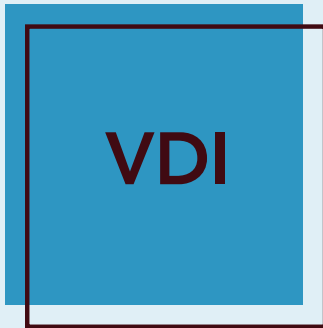
Besides the pervasive challenges of upgrading, the pandemic has changed the workplace. According to a study by McKinsey Global Institute, up to 25 percent of workers in advanced economies could work remotely three to five days per week.[6] With younger workers more likely than older counterparts to give up future earnings for the opportunity to work remotely,[7] workplace flexibility is key for the future. Whatever your workforce looks like now, your organization may be considering a remote or hybrid work approach in the long term.

Our VDI workload on each server cluster—which ran at the same time as the transactional database tests— consisted of 100 simulated virtual users logging into virtual desktops and performing work-related tasks using the Standard Profile. The View Planner benchmark measured latency across two types of tasks: CPU Sensitive and Storage Sensitive. According to View Planner documentation, CPU Sensitive tasks include quick, interactive operations such as scrolling through a PDF or modifying a Microsoft Word document.[8] As Figure 2 illustrates, the newer Dell EMC PowerEdge R6515 cluster delivered less latency for these types of tasks.

Operational latency while performing CPU Sensitive tasks
Seconds | Lower is better

Dell EMC PowerEdge R6515 cluster	0.44
Dell EMC PowerEdge R630 cluster	0.49

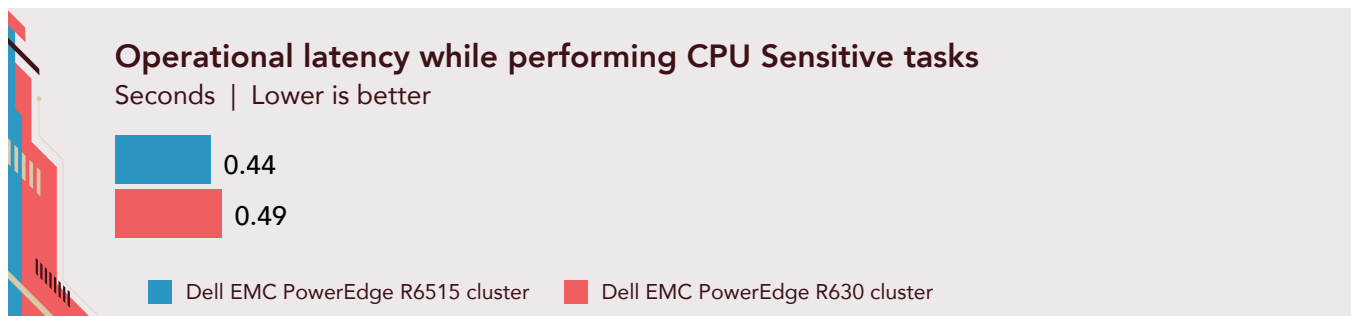■ Dell EMC PowerEdge R6515 cluster   ■ Dell EMC PowerEdge R630 cluster

Figure 2: Operational latency, in seconds, while performing CPU Sensitive tasks for a 100-user VDI workload with the View Planner benchmark. Both clusters simultaneously ran an OLTP workload and the 100-user VDI workload. Lower latency is better. Source: Principled Technologies.

Storage Sensitive tasks for VDI testing include slower operations, such as saving a slide deck or opening a large document.[9] Our results show that for these types of tasks, the Dell EMC PowerEdge R6515 cluster reduced latency by 1.8 seconds (see Figure 3).

Operational latency while performing Storage Sensitive tasks
Seconds | Lower is better

Dell EMC PowerEdge R6515 cluster	3.36
Dell EMC PowerEdge R630 cluster	5.16

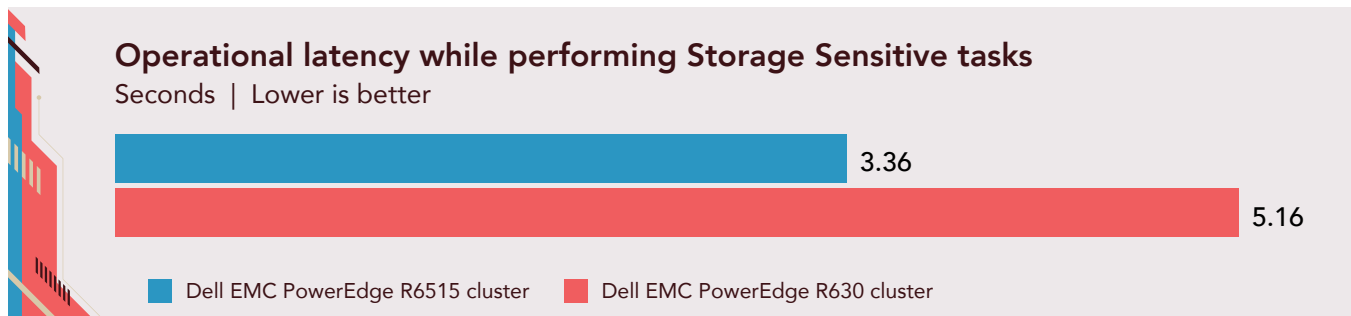■ Dell EMC PowerEdge R6515 cluster   ■ Dell EMC PowerEdge R630 cluster

Figure 3: Operational latency, in seconds, while performing Storage Sensitive tasks for a 100-user VDI workload with the View Planner benchmark. Both clusters simultaneously ran an OLTP workload and the 100-user VDI workload. Lower latency is better. Source: Principled Technologies.

Lower latency on tasks for VDI users could translate to a smoother experience for your hybrid and remote employees.

About Dell EMC PowerEdge R6515 servers

IIn our testing, we ran workloads on Dell EMC PowerEdge R6515 servers powered by mid-bin 32-core AMD EPYC™ 7543P processors. These single-socket 1U servers support up to 64 cores of compute, offer up to 16 DDR4 RDIMM/LRDIMM slots,[10] and have what Dell calls "best in class" embedded management tools.[11] They also feature Cyber Resilient Architecture, which includes Silicon Root of Trust and iDRAC9, and integrates with AMD EPYC processor security features. Dell Technologies says that their security is "built-in, not bolted-on after the fact, and is integrated into every step through Dell's Secure Development Lifecycle."[12]

To learn more, visit https://www.dell.com/en-us/work/shop/povw/poweredge-R6515.

Explore modern solutions with Tanzu

If your organization has been waiting to explore Kubernetes containers for your apps, an upgrade may be the right time to start. Your team can deploy and manage apps from this open-source platform, utilizing its scalability, flexibility, and ability to burst to cloud. While getting up and running with Kubernetes might present a challenge with limited IT resources, VMware vSphere 7 with Tanzu can enable your team to manage containers natively with the VMware tools and interfaces they are already familiar with.

For a hands-on perspective on exploring Kubernetes with Tanzu after upgrading, we put the AMD EPYC™ 7543P processor-powered Dell EMC PowerEdge R6515 servers to the test once more. After running the mixed-workload tests with only OLTP and VDI applications against the legacy PowerEdge R630 cluster, we added another workload for the PowerEdge R6515 cluster: a multi-tier web app running in Kubernetes containers. We used Weathervane, a benchmark tool that uses a containerized real-time auction app to measure the number of simulated users (WvUsers) that can access and interact with it while maintaining the benchmark's quality-of-service requirements.[13] Our scenario targeted 2,500 WvUsers, which the Dell EMC PowerEdge R6515 cluster supported in addition to the other mixed workload applications.

Comparing the Dell EMC PowerEdge R6515 servers running VMware vSphere with Tanzu and supporting 2,500 WvUsers—while also running the OLTP and VDI workloads—we saw that its transactional database performance was still an improvement over that of the legacy PowerEdge R630 servers running just the two OLTP and VDI workloads (see Figure 4).

Total orders per minute
Higher is better

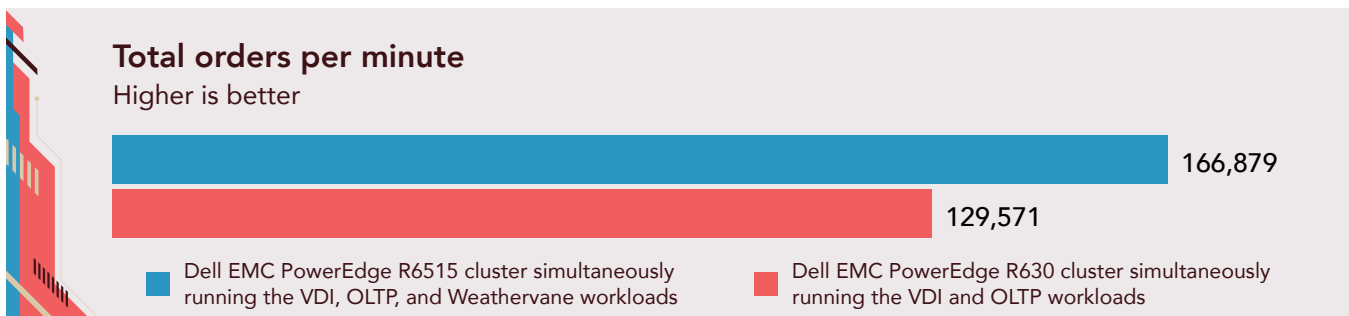|	
Dell EMC PowerEdge R6515 cluster simultaneously running the VDI, OLTP, and Weathervane workloads	166,879
Dell EMC PowerEdge R630 cluster simultaneously running the VDI and OLTP workloads	129,571

Figure 4: The number of OLTP database orders per minute each cluster achieved with the DVD Store 3 benchmark. The legacy PowerEdge R630 cluster simultaneously ran the OLTP workload and a 100-user VDI workload. The newer-generation PowerEdge R6515 cluster simultaneously ran the OLTP workload and a 100-user VDI workload while also supporting 2,500 WvUsers. Higher is better. Source: Principled Technologies.

Additionally, compared to our first tests with just the OLTP and VDI workloads, we found that the added Weathervane workload had a minimal impact on the Dell EMC PowerEdge R6515 cluster's OLTP performance, reducing OPM by only 2.6 percent.

New security features and more from AMD EPYC 7543P processors

The latest offering from AMD, 3rd Gen EPYC processors offer increased I/O with up to 32MB L3 cache per core, 7nm x86 hybrid die core, and AMD Infinity Guard security features. According to AMD, the EPYC 7543P model is well suited for workloads such as VDI, ERM/SCM/CRM apps, and value data management with NR/RDBMS.[14] 3rd Gen AMD EPYC processors work with Dell EMC PowerEdge servers to secure data with an integrated security processor, enabling features such as Secure Root-of-Trust Technology, Secure Run Technology, and BIOS live scanning.[15] 3rd Gen AMD EPYC processors also include Secure Encrypted Virtualization - Secure Nested Paging (SEV-SNP) and Encrypted State (SEV-ES).[16] Learn more at https://www.amd.com/en/processors/epyc-7003-series and https://www.amd.com/en/technologies/infinity-guard.

We also saw better VDI performance from the Dell EMC PowerEdge R6515 cluster simultaneously running the three workloads—OLTP, VDI, and Weathervane—than we did from the legacy cluster simultaneously running only the OLTP and VDI workloads. Figures 5 and 6 show the improved latency from the newer-generation solution.

Operational latency while performing CPU Sensitive tasks
Seconds | Lower is better

0.47	
0.49	

■ Dell EMC PowerEdge R6515 cluster simultaneously running the VDI, OLTP, and Weathervane workloads

■ Dell EMC PowerEdge R630 cluster simultaneously running the VDI and OLTP workloads
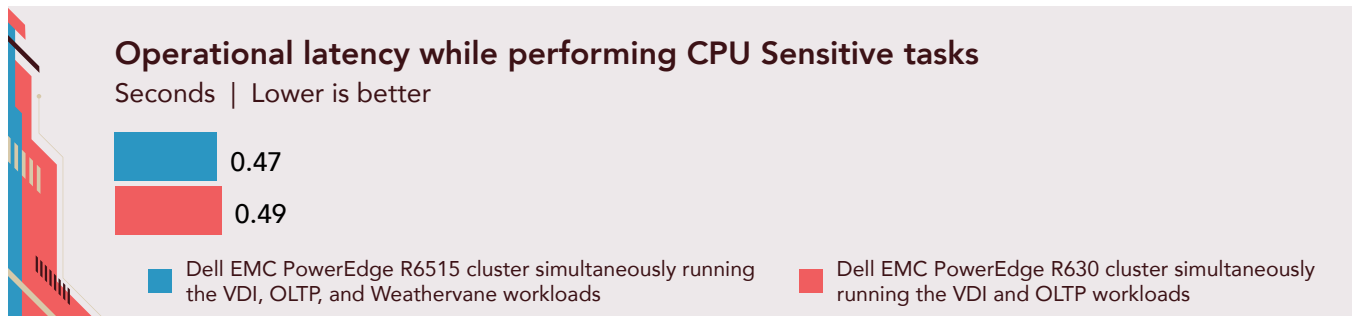
Figure 5: Operational latency, in seconds, while performing CPU Sensitive tasks for a 100-user VDI workload with the View Planner benchmark. The legacy PowerEdge R630 cluster simultaneously ran an OLTP workload and the 100-user VDI workload. The newer-generation PowerEdge R6515 cluster simultaneously ran the OLTP workload and 100-user VDI workload while also supporting 2,500 WvUsers. Lower latency is better. Source: Principled Technologies.

Operational latency while performing Storage Sensitive tasks
Seconds | Lower is better

3.51	
5.16	

■ Dell EMC PowerEdge R6515 cluster simultaneously running the VDI, OLTP, and Weathervane workloads

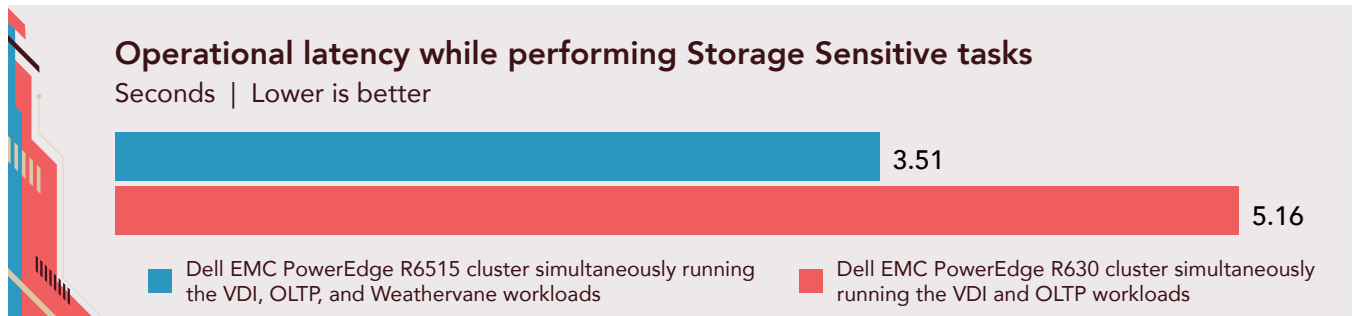■ Dell EMC PowerEdge R630 cluster simultaneously running the VDI and OLTP workloads

Figure 6: Operational latency, in seconds, while performing Storage Sensitive tasks for a 100-user VDI workload with the View Planner benchmark. The legacy PowerEdge R630 cluster simultaneously ran an OLTP workload and the 100-user VDI workload. The newer-generation PowerEdge R6515 cluster simultaneously ran the OLTP workload and 100-user VDI workload while also supporting 2,500 WvUsers. Lower latency is better. Source: Principled Technologies.

These results indicate that compared to the legacy cluster, the Dell EMC PowerEdge R6515 server cluster's better performance could provide the opportunity for more transactions and minimize latency for VDI users—all while enabling you to explore new possibilities for your business.

About VMware vSphere with Tanzu

To run our Weathervane workload, we used VMware vSphere with Tanzu. According to VMware, Tanzu is a Kubernetes platform that "enables you to build, run and manage modern apps on any cloud."[17] Further, VMware aims to "help you embrace new cloud native technologies like Kubernetes by embedding them in familiar tools your team already use to manage workloads."[18] With Premium Support included with a Tanzu subscription, organizations can get up and running with training, resources, and 24/7 access to product support engineers.[19]

In a PT study on Dell EMC PowerEdge R740xd servers, we added Tanzu to an existing vSphere environment in seven steps and with one additional license. See the report for more information: Make Kubernetes containers on Dell EMC PowerEdge R740xd servers easier to manage with VMware Tanzu.

Possible scenario: Licensing costs

As we discussed earlier in this report, a wise upgrade decision for your business is one that includes careful cost considerations. Software licenses, which often come in a per-core or per-processor price model, present an additional consideration. Compared to dual-socket servers such as the legacy configuration we used in our testing, single-socket 32-core Dell EMC PowerEdge R6515 servers could offer compelling savings when it comes to licensing costs.

Using publicly available sources on November 11, 2021, we calculated possible licensing costs for the software we used in our testing. Table 2 shows three-year licensing cost estimates for a server with the same processor- and core-count as the legacy server we tested compared to those of a PowerEdge R6515 server. (Note: We do not include VDI software in our calculations, as the Software-as-a-Service price for the required software was the same for both configurations.) For more information on the way we calculated these costs, see the science behind the report.

Table 2: A comparison of three-year licensing costs (including purchase cost plus three years of support) for a dual-socket, 40-core server and a single-socket, 32-core server such as the Dell EMC PowerEdge R6515 we tested. Amounts are in USD, do not include taxes, and do not include VDI software costs.

	Dual-socket, 40-core server	Single-socket, 32-core server	Potential cost savings
Microsoft Windows Server 2022 Datacenter[20]	$26,928.13	$21,542.50	$5,385.63
Microsoft SQL Server 2019 Enterprise[21]	$481,180.00	$384,944.00	$96,236.00
vSphere Enterprise Plus, with basic support for 1 CPU[22]	$11,176.40	$5,588.20	$5,588.20
VMware vSAN 7 Enterprise, with basic support for 1 CPU[23]	$26,200.00	$13,100.00	$13,100.00
VMware Tanzu basic (3-year term) for 1 CPU[24]	$5,970.00	$2,985.00	$2,985.00
Total for individual server	$551,454.53	$428,159.70	$123,294.83
Total for four-server cluster	$2,205,818.10	$1,712,638.80	$493,179.30

If your organization requires the above software licenses for the workloads you run, Dell EMC PowerEdge R6515 servers could present significant licensing cost reductions compared to a dual-socket, 40-core solution. Saving on software could free up resources for greater investments across your growing organization. Although we speculate that a newer-generation dual-socket server might offer further performance improvements, our hands-on testing shows that single-socket PowerEdge R6515 servers could already deliver better workload performance than a legacy PowerEdge R630 environment—while also helping your business remain cost-conscious.

Conclusion

While continuing to balance several business needs, your organization undoubtedly has more tough decisions ahead. Fortunately, some of those decisions may center on supporting a growing customer base or helping your employees adapt to a new normal. When it's time to upgrade to meet those challenges, you may benefit from a server solution that can not only smoothly support VDI users and increase capacity for digital transactions, but also offer the possibility of modern, value-adding technologies and security features.

When we ran a mixed workload on a cluster of single-socket Dell EMC PowerEdge R6515 servers with AMD EPYC™ 7543P processors and on a cluster of dual-socket legacy Dell EMC PowerEdge R630 servers, we found that the PowerEdge R6515 cluster delivered performance improvements with 32.1 percent more OPM and lower latency for VDI users on CPU Sensitive and Storage Sensitive tasks. When we deployed Tanzu on the newer-generation cluster, we were able to run a Weathervane workload of 2,500 simulated users on a multi-tier web app in Kubernetes while still offering transactional database and VDI performance improvements over the legacy cluster. With the increased efficiency from the newer cluster, you might choose to modernize your apps, support more VDI users, or expand your OLTP database workloads. When your business is ready for new data center technology, Dell EMC PowerEdge R6515 servers could be the right balance of value and performance while opening the door for future possibilities.

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Read the science behind this report at https://facts.pt/NIgeK0w ▶

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