Save on power and license costs and reduce your carbon footprint by consolidating into Dell PowerEdge C6615 server nodes

Powered by a 4th Generation AMD EPYC 8324P processor, the Dell node supports better online transaction processing (OLTP) performance and uses less power and fewer licenses than a legacy Supermicro server

Organizations with limited data center space face pressure to make the most of hardware resources. That pressure increases as solutions age, eventually forcing IT and data center administrators to make changes that can maximize the limited rack space while minimizing operating costs such as power and licensing. Workload consolidation through server upgrades is one option, and the Dell™ PowerEdge™ C6615 server node in a 2U chassis offers strong performance and energy savings necessary to consolidate transactional database workloads.

We captured SQL Server database performance and energy consumption metrics for the current-gen Dell PowerEdge C6615 node with a 32-core AMD EPYC™ 8324P processor and a legacy Supermicro server with two 16-core Intel® Xeon® Scalable processors. The Dell solution supported more database transactions than the legacy server, which by itself could mean faster updates for vital information. For example, a data manager at a public school unit (PSU) could quickly log student absences in an OLTP student information system (SIS) database each day to maintain accurate attendance. In addition, the PowerEdge C6615 node used less power in doing so. Using less energy could help save on power bills in addition to minimizing your carbon footprint to help meet sustainability goals. When we combined the OLTP output and energy consumption data, we found that the Dell solution can deliver a better value in terms of performance per watt.

Our performance results indicate that four of the Dell nodes could handle the OLTP work of five legacy servers while using 48.2 percent less power, potentially saving more on energy costs and licensing fees due to fewer VMware® licenses.

Support more OLTP database transactions

29.9% more new orders per minute (NOPM)

Get a better value

74.7% more NOPM per watt

Consolidate and save

With a Dell PowerEdge C6600 chassis with four C6615 nodes, consolidate 5U to 2U, use 48.2% less power, and reduce VMware licenses by 20.0%

- Dell PowerEdge C6615 node with 1x AMD EPYC 8324P processor
- Supermicro SYS-1029U-TN10RT server with 2x Intel Xeon Gold 5218 processors

How we tested

We used the TPROC-C workload from the HammerDB benchmark to process transactions on virtualized Microsoft SQL Server 2022 databases running on Ubuntu 22.04 LTS with VMware vSphere® 8 as the host hypervisor. While running the TPROC-C workloads, we captured power consumption by using IPMI and Redfish to measure the system power from each system's baseboard management controller (BMC). We recorded performance statistics from the benchmark and power utilization for the following systems:

- Legacy Supermicro SYS-1029U-TN10RT server with 2x 16-core Intel Xeon Gold 5218 processors
- Current-gen Dell PowerEdge C6615 node with 1x 32-core AMD EPYC 8324P processor in a Dell PowerEdge C6600 chassis

To learn more about the configurations we tested and see step-by-step test details, please see the science behind the report.

About the Dell PowerEdge C6615 server node

The Dell PowerEdge C6615 is a high-density server node that, according to Dell, can "[m]aximize value and minimize TCO for scale-out workloads using a scalable, dense compute infrastructure focused on performance per watt, per dollar."[1] Featuring a single AMD EPYC 8004 series processor, it offers robust performance, scalability, and energy efficiency, which could make it ideal for small and medium-sized business (SMB) data centers. Four PowerEdge C6615 sleds can fit into a 2U C6600 chassis.

To learn more about the PowerEdge C6615 server node, visit https://www.dell.com/en-us/shop/ipovw/poweredge-c6615.

What we found

Support more OLTP transactions

As Figure 1 shows, the Dell and AMD solution delivered better performance than the legacy Supermicro and Intel solution, handling nearly 30.0 percent more NOPM. We chose NOPM because the metric shows only the number of new-order transactions completed in one minute as part of a serialized business workload. HammerDB recommends using NOPM as a primary metric because it is "independent of any particular database implementation."[2] Handling more NOPM could help SMBs grow their OLTP workloads, potentially providing users with faster access to online databases.

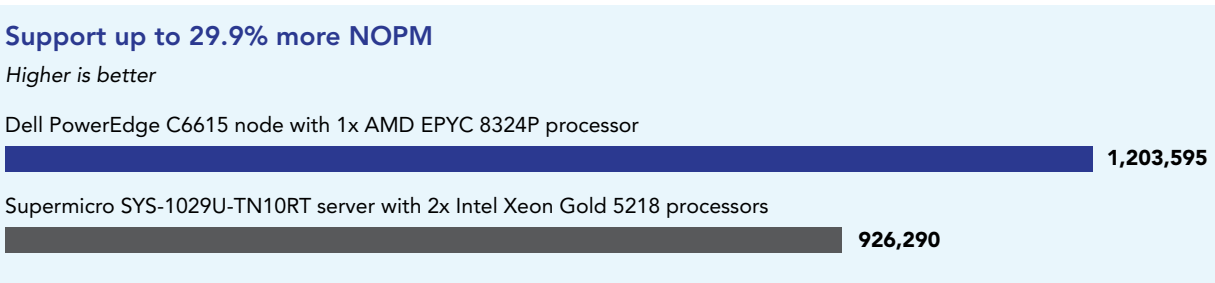


Figure 1: The NOPM each solution supported during testing. Higher is better. Source: Principled Technologies.

About the AMD EPYC 8324P processor

With 32 cores, AMD Infinity Guard, and AMD Infinity Architecture, 4th Generation AMD EPYC 8324P processors can support demanding workloads while providing essential security features, optimizing power consumption, and reducing operational costs. The processors also feature a 3GHz maximum boost frequency and 128 MB of L3 cache memory.[3]

The AMD EPYC 8324P processor is part of the AMD EPYC 8004 processor series. According to AMD, EPYC 8004 processors "are designed to deliver computing power where you need it—including challenging environments with wide temperature ranges."[4] The processors could help you to overcome environmental and infrastructure challenges while controlling costs and power consumption. AMD EPYC 8004 processors are for compact, single-socket servers (such as the Dell PowerEdge C6615 node) and feature up to 64 cores and 128 MB of L3 cache.[5]

For more information on AMD EPYC 8324P processors, visit https://www.amd.com/en/products/processors/server/epyc/4th-generation-9004-and-8004-series/amd-epyc-8324p.html.

Use less power in the data center

The power consumption data that we collected while running the TPROC-C tests shows that the Dell and AMD solution used 25.6 percent less power while handling more transactions (see Figure 2). The PowerEdge C6615 cannot run without a chassis, so power utilization for the Dell solution includes power for the PowerEdge C6600 chassis. Dell iDRAC includes data on total power draw and per-node power usage. To determine our power consumption, we measured the chassis power consumption with all blades powered off, then added the chassis power draw to the power consumption of the single node when under load. Consuming less power can help reduce data center expenses and can help organizations meet their sustainability goals. Consuming less power also generally means a smaller carbon footprint.

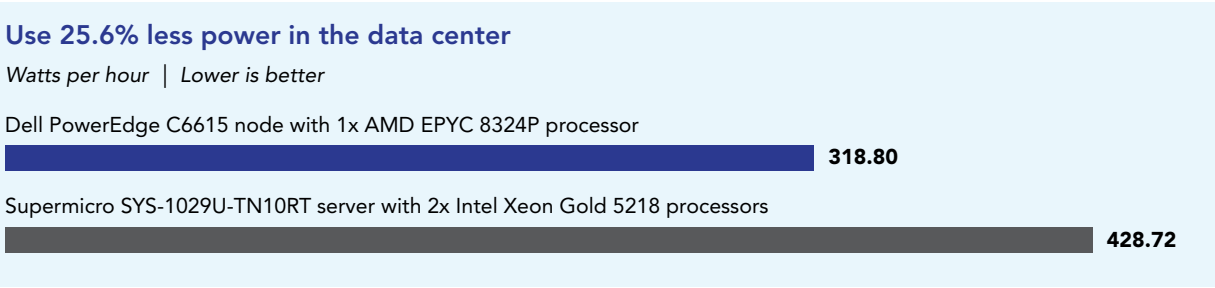


Figure 2: The watts per hour each solution consumed during testing. Lower is better. Source: Principled Technologies.

Get a better value with more performance per watt

Performance per watt is a useful metric for understanding energy efficiency, with higher values indicating greater efficiency. We took the median NOPM value and divided it by the reported watts consumed during testing. Due to the higher performance output and lower power consumption, the Dell and AMD solution delivered 74.7 percent more NOPM per watt than the legacy Supermicro and Intel solution (see Figure 3). In addition to better energy efficiency, better performance per watt could also indicate a better total cost of ownership and reduction in data center heat generation.

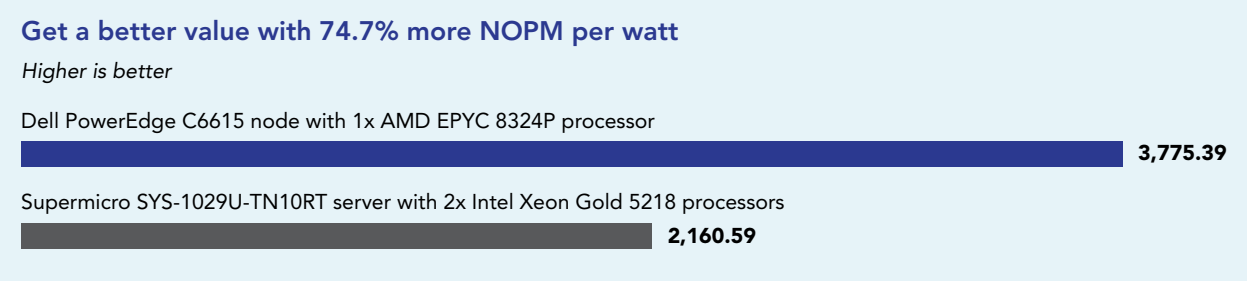


Figure 3: The performance per watt that we calculated for both solutions using output from our testing. Higher is better. Source: Principled Technologies.

The costs of powering a small-to-medium data center

One essential expense for data centers of any size is electricity consumption, which covers the power needed to run servers, storage devices, networking equipment, and cooling systems. However, IT teams of small and medium-sized organizations might face more pressure to audit expenses and justify every dollar. Efficient power usage is helpful in those situations, where decision makers must balance energy costs with the need for performance, reliability, and scalability.

There is little publicly available hard data on data center energy consumption, and estimates in recent years suggest "average power consumption per data center rack is around 7 kW, with peak demands often reaching 15-16 kW per rack."[6] This blog post goes on to claim that a single server rack in the US can generate an energy bill of nearly $30,000 a year.[7] Costs depend highly on solution configurations and usage, which is part of the challenge of estimating energy costs. However, technology directors or any member of an IT team can anecdotally convey that powering a data center is a significant expense. Every organization, especially those with tight budgets (e.g., many US school districts), seeks to squeeze as much value from each dollar they spend.

Do more with your data center through consolidation

Based on our performance metric, you could consolidate the SQL Server work of five 1U Supermicro servers powered onto four Dell PowerEdge C6615 nodes in a 2U PowerEdge C6600 chassis. At those server counts, the extrapolated NOPM would be similar (4,814,380 for the Dell solution vs. 4,631,450 for the Supermicro solution), showing that the chassis of PowerEdge C6615 nodes can handle the same performance as five legacy servers with some room to grow the workloads.

The energy consumption savings for the Dell solution would increase to 48.2 percent—that's our recorded PowerEdge C6615 energy consumption extrapolated to four nodes plus the power for the chassis vs. the legacy server energy consumption extrapolated to five nodes.

VMware licenses VMware vSphere 8 on a per-core basis, with a minimum of 16-core licenses per processor. The legacy Supermicro system we tested contains two 16-core Intel Xeon Scalable processors, requiring a total of 32 VMware vSphere 8 licenses. The Dell PowerEdge C6615 has one 32-core AMD EPYC processor, requiring the same number of vSphere licenses as the Supermicro server. However, scaling the licenses to match our consolidation scenario would bring the number of per-core VMware licenses down from 160 to 128, which means 32 fewer licenses—a 20.0 percent reduction—to handle roughly the same amount of OLTP work. Fewer licenses would cut operating costs, thus potentially helping the bottom line of your organization or department. For more information on licensing, see the science behind the report.

Key benefits of consolidation for small and medium-sized organizations

Consolidating the workloads of aging servers onto newer, higher performing servers could offer many operational and fiscal benefits, including:

- **Reduced operating costs**: Using fewer servers due to consolidation could reduce server maintenance costs, the number of software licenses (such as VMware virtualization software), and power and cooling expenses.
- **Less required administrative time**: Reducing the number of servers could mean spending less time backing up data and VMs, patching software and firmware, and monitoring and reporting resource usage, ultimately freeing hardware management teams to tackle other initiatives.
- **Smaller carbon footprint**: A reduction in servers can lead to lower energy consumption and CO_2 emissions, which helps organizations meet environmental obligations.
- **Better resource utilization**: Consolidating servers allows for better allocation of computing resources, which could help combat server sprawl in the data center and over-provisioning.
- **Better data center efficiency**: Servers running more workloads could use more of their resources, improving resource utilization per rack space and thus efficiency overall.

Medium-sized organization use case: A school district

Imagine a hypothetical school district that relies on aging servers that are increasingly prone to failure, slow performance, and high energy consumption. The student population has risen in the district over the past decade, and those legacy servers struggle to support the district's growing needs for digital learning platforms, administrative applications, and secure data storage. With the student population growth comes an increasing demand for online resources and remote learning capabilities, and the district must upgrade its data center infrastructure to ensure reliable, efficient, and scalable operations. The district's IT department is a pivotal part of its annual budget that can fluctuate due to state and regional backing, and any requested increase in the IT budget often competes with staff payroll increases and rising building maintenance costs.

The core of the district's services is an SIS application that all districts in the state use. The OLTP database behind the SIS offers many functions, including a repository for basic student data, a virtual grade book for teachers, and parent and student portals to monitor attendance, grades, and assignments. Data managers, teachers, and other district staff enter these many types of data from multiple PSUs throughout the district. The SIS database must support the disparate users editing and adding diverse data simultaneously throughout the course of the day.

With a small one-time budget increase and a grant from an education-based non-profit, the school district has decided to make the capital expenditure required to upgrade its data center with Dell PowerEdge C6615 server nodes powered by AMD EPYC 8324P processors, making way for the following advantages:

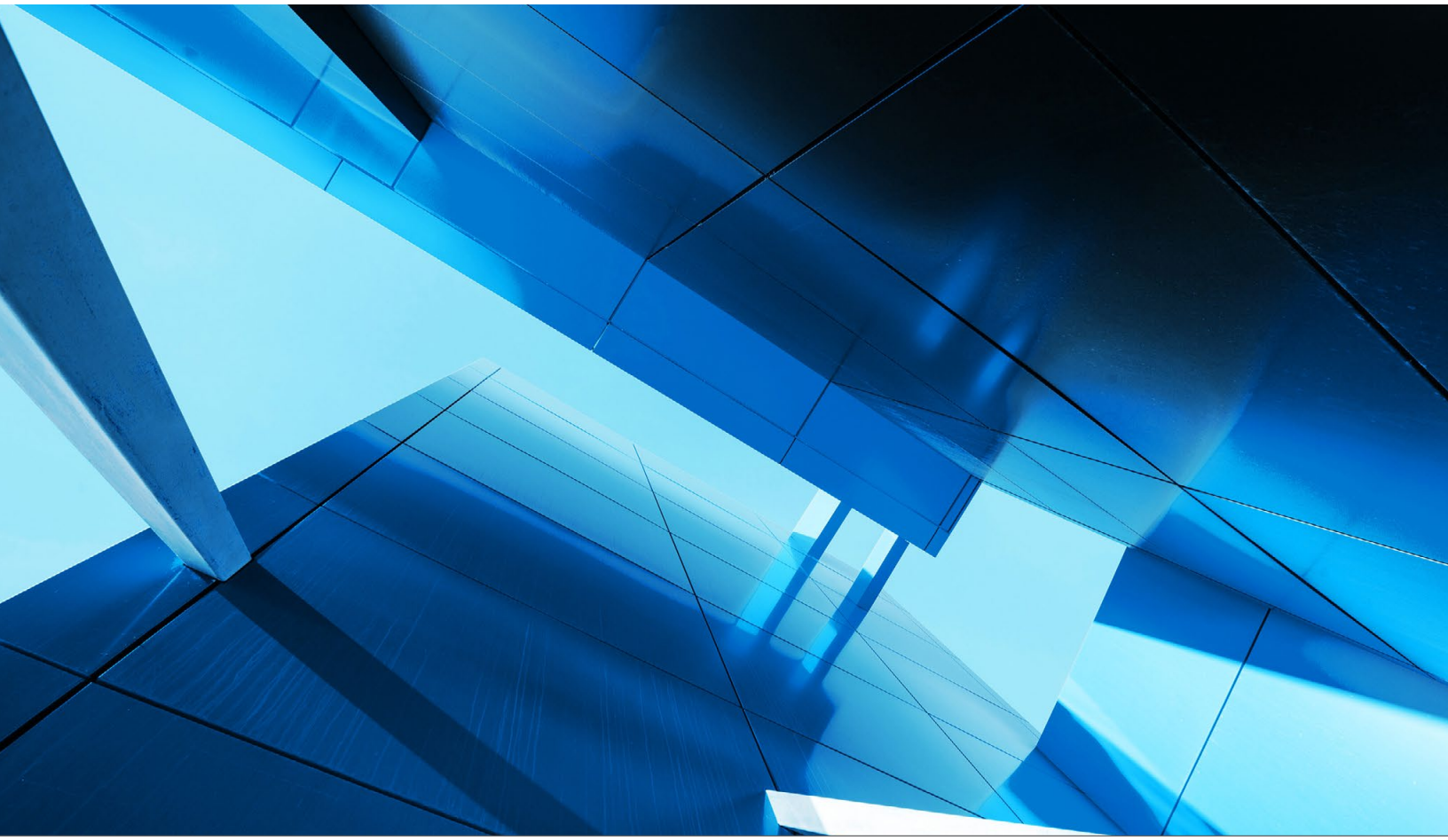
- **Consolidation**: Based on the 60.0 percent reduction in rack space shown in our testing, the district could use fewer PowerEdge C6615 nodes than their legacy servers to run their current number of workloads. The district could potentially expand their available resources and increase their workload capacity without adding rack space.
- **Improved performance**: Because they supported a 29.9 percent OLTP performance boost in testing, the servers with AMD EPYC 8324P processors could deliver faster processing speeds and greater reliability, potentially enhancing the performance of the SIS, digital learning platforms, and administrative applications.
- **Cost savings**: Our hypothetical scenario showed a 48.2 percent energy consumption savings and 20.0 percent reduction in vSphere licenses, demonstrating how energy-efficient hardware could lead to reductions in the district's IT operational costs.
- **Enhanced security**: Modern security features from the AMD EPYC processors could help protect sensitive student and administrative data.
- **Preparedness**: Scalable infrastructure could support the district's growth and evolving technological needs and could help ensure long-term efficiency and effectiveness.

By upgrading to Dell PowerEdge C6615 server nodes, the hypothetical school district could get high marks by potentially achieving a more efficient, reliable, and secure data center while also better supporting student and staff needs.

About HammerDB

HammerDB is an open-source benchmarking tool that tests the performance of many leading databases. The benchmark tool includes a built-in workload, TPROC-C, derived from industry standards for transactional workloads. The TPROC-C (TPC-C-like) workload runs a transaction processing workload that demonstrates the OLTP performance capabilities of each instance. TPROC-C simulates an organization with five types of transactions: receiving a customer order, recording a payment, delivering an order, checking an order's status, and checking stock in inventory.[8] Though the TPROC-C workload simulates ecommerce activity, the results could be helpful to any organization with an order-entry environment, similar to how an SIS application handles student data. An SIS application should support many disparate users performing different transactions simultaneously for diverse records, such as logging attendance or entering grades. Note that our test results do not represent official TPC results and are not comparable to official TPC-audited results.

To learn more about HammerDB, visit https://www.hammerdb.com/.



Conclusion

Consolidating the workloads of older servers onto newer ones offers many potential benefits, such as performance boosts and saving on power and licensing costs. These benefits can have an even greater impact on organizations with limited budgets and data center space. We found that a single Dell PowerEdge C6615 node handled 29.9 percent more SQL Server transactions than the legacy server we tested. While handling more transactions, the Dell and AMD solution used 25.6 percent less power, and thus delivered 74.7 percent more performance per watt than the Intel Xeon Scalable processor-based legacy server. Based on the OLTP performance output of the two solutions, you could condense the workloads of five aging servers, each powered by two Intel Xeon Gold 5218 processors, onto four AMD EPYC 8324P processor-based Dell PowerEdge C6615 nodes in a single chassis. The OLTP consolidation could yield greater energy savings (48.2 percent) and reduce the number of required VMware licenses (20.0 percent).

1. Dell, "PowerEdge C6615 Server Node," accessed July 18, 2024, https://www.dell.com/en-us/shop/ipovw/poweredge-c6615.
2. HammerDB, "Understanding the TPROC-C workload derived from TPC-C," accessed July 12, 2024, https://www.hammerdb.com/docs/ch03s05.html.
3. AMD, "AMD EPYC™ 8324P," accessed July 18, 2024, https://www.amd.com/en/products/processors/server/epyc/4th-generation-9004-and-8004-series/amd-epyc-8324p.html.
4. AMD, "AMD EPYC™ 8004 Series Processors," accessed August 20, 2024, https://www.amd.com/content/dam/amd/en/documents/products/epyc/amd-epyc-8004-series-processors-datasheet.pdf.
5. AMD, "AMD EPYC™ 8004 Series Processors."
6. Mike Schmitt, "How Much Does it Cost to Power One Rack in a Data Center?" accessed July 18, 2024, https://www.nlyte.com/blog/how-much-does-it-cost-to-power-one-rack-in-a-data-center/.
7. Mike Schmitt, "How Much Does it Cost to Power One Rack in a Data Center?"
8. HammerDB, "Understanding the TPROC-C workload derived from TPC-C."

Read the science behind this report at https://facts.pt/k9QfJCe ►

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