

# Benchmark Performance of AMD EPYC™ Processors

## Tech Note by

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## Summary

The Dell PowerEdge portfolio of servers with AMD EPYC processors have achieved several world record benchmark scores including VMMark, TPCx-HS and SAP-SD. These scores demonstrate the advantage of these servers for key business workloads.

## AMD 3<sup>rd</sup> Generation AMD EPYC™ Processors

The 3<sup>rd</sup> Generation of AMD EPYC™ Processors builds on the AMD Infinity Architecture to provide full features and functionality for both one-socket and two-socket x86 server options. The processor retains the chiplet design from the 2<sup>nd</sup> generation, with a 12nm based IO die surrounded by 7nm based compute dies and is a drop-in replacement option. With a range of options, from 8 cores all the way to 64 cores, and TDPs of up to 280W, these processors can target a wide variety of workloads. Configurations support up to 160 lanes of PCIe Gen4 allowing for options like 24x direct attach NVMe drives and dual port 100Gbps NICs that can run at line rate.

## Key New Features

The AMD 3<sup>rd</sup> Generation of processors builds on the previous generation but adds a few key optimizations that deliver significant performance improvements. The L3 cache in each CCD is now shared across all 8 cores instead of just 4. Thus, each core has up to 32MB of L3 cache allowing for flexibility, lower inter-core latency, and improved cache performance. The DDR memory latency has been further reduced along with a new 6-channel memory interleaving option. The IO memory management unit has been optimized to better handle 200Gbps line rate. There is improved support for Hot Plug surprise remove following PCIe-SIGs new implementation guideline. New features like SEV-SNP (Secure Nested Paging) provide enhanced virtualization security. There are a few other enhancements and optimizations targeting workloads around HPC, etc.

## What does this mean?

Technical specifications can only explain part of the story. Key workload-based benchmarks can explain some of the real-world applicability and real-world performance. Dell has worked to publish multiple key benchmarks to help customers gauge the real-world performance of the various Dell PowerEdge servers with AMD EPYC Processors

## Key Benchmarks

Some of the key benchmarks that are relevant to typical use cases are listed below:

### **VMMark:**

VMMark is a benchmark from VMWare that highlights virtualization. The VMMark benchmark runs multiple tiles on the system under test. Each tile consists of 19 different virtual machines, with each running a typical workload. This benchmark is great at identifying the capabilities for a typical IT server where the workloads are virtualized, and multiple workloads are running on a single server.

For AMD, EPYC, the large number of cores, the high speed memory, the high speed PCIe Gen4 for networking, and, when used, storage, all contribute towards a very positive result.

As of 3/15/2021, Dell has top scores on 4-node vSAN configurations with the R7515, the R6525 and the C6525. The R7515 and R6525 are 1 and 2-Socket servers with scores of [15.18@16](#) tiles and [24.08@28](#) tiles respectively. The C6525 is a modular server with 4-nodes in a single 2-U system with a score of [13.74@16](#) tiles and highlights the sheer density of compute possible in 2U of rack space.

Dell also has a leading score for a matched pair 2-socket configuration connected to a Dell EMC PowerMax. This configuration managed a score of [19.4@22](#) tiles from just 2 servers, achieving the maximum VM density for such a configuration. This score highlights the advantages of leveraging an excellent external storage array like the Dell EMC PowerMax to maximize reliability and performance.

Reference: <https://www.vmware.com/products/vmmark/results3x.html>

### **TPCx-HS**

The TPCx-HS benchmark is built to showcase the performance of a Hadoop cluster doing data analytics. In today's world, where data is critical, the ability to analyze and manage this data becomes very important. The benchmark can do batch processing with MapReduce or data analytics on Spark

As of 3/15/2021, Dell PowerEdge servers with AMD EPYC 3<sup>rd</sup> generation of processors have multiple world record scores for TPCx-HS at both the 1TB and 3TB database sizes. These include performance improvements of as much as 60% over the previous world records with as much as 40% lower \$/HSph.

Reference: [http://tpc.org/tpcx-hs/results/tpcxhs\\_perf\\_results5.asp?version=2](http://tpc.org/tpcx-hs/results/tpcxhs_perf_results5.asp?version=2)

### **SAP-SD**

SAP-Sales and Distribution is a core functional module in SAP ERP Central Component that allows organizations to store and manage customer and product related data. The ability to access and manage this data at high speed, and with minimal latency is a very critical requirement of the business architecture.

For this benchmark, Dell PowerEdge servers have world record scores on Windows and Linux for both 1-S and 2-S platforms. The 2-S Linux configuration score of 75000 benchmark users is higher than even the best 4-S score for this benchmark, highlighting the significant advantage of this architecture for database use cases.

Reference: <https://www.sap.com/dmc/exp/2018-benchmark-directory/#/sd>

## Conclusion

Dell PowerEdge servers with AMD EPYC processors have industry leading performance numbers. Benchmarks like VMmark, TPCx-HS and SAP-SD show that these platforms are excellent for the most common workloads and provide excellent business value.



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