White Paper

Manufacturing & Industrial
Intel® Xeon® 6 processors

Choosing Intel® Xeon® processors for Ansys Fluent workloads

We benchmark three generations of Intel® Xeon® processors and compare Intel® Xeon® 6 processors against AMD processors with the same core count

Authors

Chuanyu Feng
Software engineer

Manav Bhalla
Global account director

Aaron Tersteeg
Software and solution sales director

Executive summary

Organizations that use Ansys Fluent to model computational fluid dynamics (CFD) need highly performant processors. We tested a range of Intel® and AMD processors against the latest Ansys Fluent benchmarks.

We found that:

- Intel® Xeon® 6 processors with Performance-cores deliver a significant improvement in performance over 4th Gen and 5th Gen Intel® Xeon® processors, in both multicore and single-core configurations.
- Intel® Xeon® 6980P processors outperform other Intel processors we tested across all benchmarks, except for some larger model sizes, which perform better on the Intel® Xeon® 6972P processor.[1] This is because the available memory bandwidth per core becomes significant at 128 cores for larger models.
- Intel® Xeon® 6960P processor delivers the best single-core performance for Ansys Fluent, compared to other Intel processors we tested.[1]
- Intel Xeon 6 processors with 128 and 96 cores deliver higher performance than AMD EPYC processors of the same core count, across most benchmarks tested, and across all of the larger model sizes.[1]

The need for performance in modeling flow dynamics

Organizations use Ansys Fluent to model computational fluid dynamics in various sectors, including oil and gas, aerospace, and renewable energy. Their goals include reducing turbulence and improving the acoustics of product designs, as well as understanding the interactions between fluids and structures.

The simulations can be highly sophisticated, with more advanced models taking days or weeks to run. Faster simulation accelerates the design cycle and helps companies compete by getting their products to market sooner.

Choosing the optimal processor for running Ansys Fluent workloads is essential, so we've conducted tests to help you make an informed decision. This paper presents results for the Intel Xeon 6 processor family with Performance-cores (P-cores) running official Ansys Fluent benchmarks. We've tested the full suite of test cases, which range in size from 2 million cells to 280 million cells. Our report compares the results against older Intel® Xeon® processors that you might be using now, and also against processors from AMD.

Figure 5 (at the end of this paper) provides an overview of the nodes with Intel® processors we tested and their basic specifications.

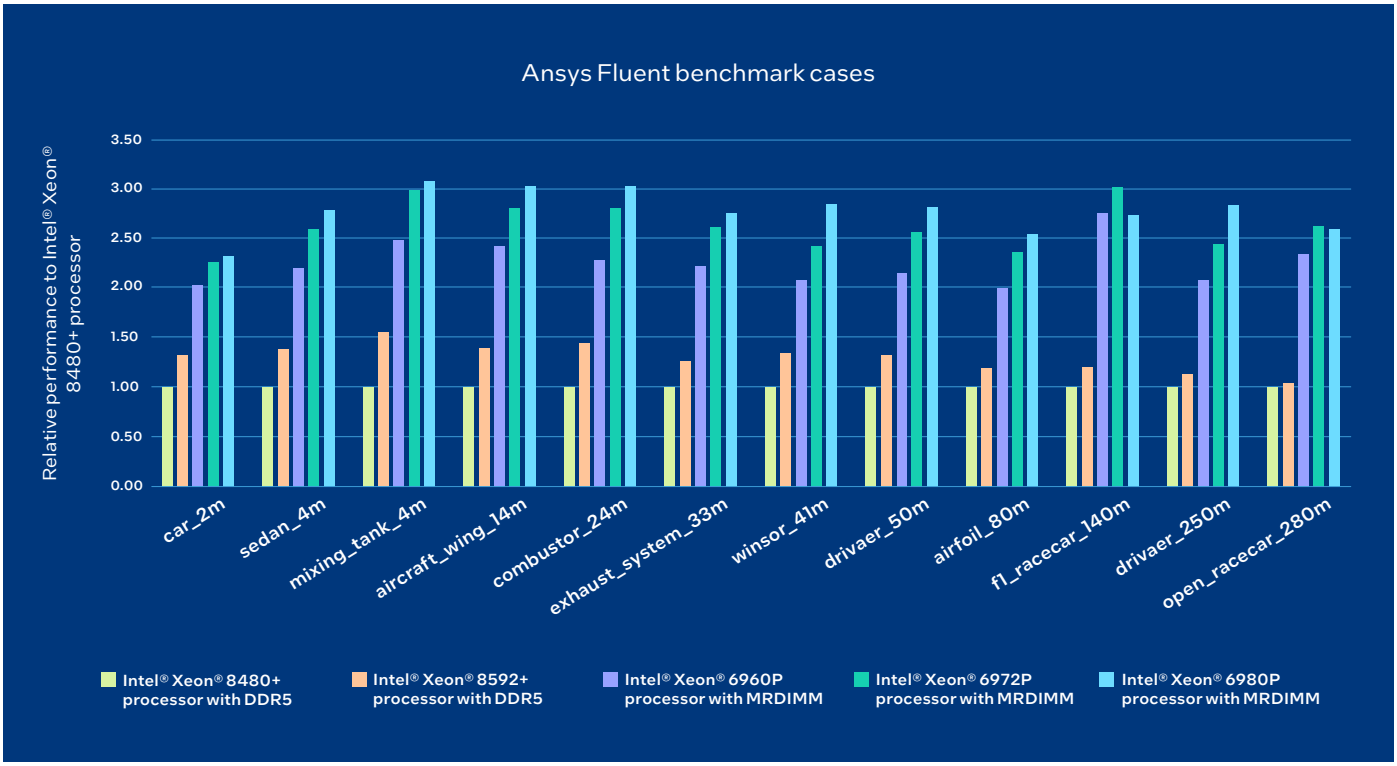

Figure 1. Multicore Ansys Fluent performance over three generations of Intel® Xeon® processors (higher is better).

Benchmarking multicore performance

When a fast time to solution is the top priority, the multicore capabilities of our latest processors enable you to achieve much better performance for Ansys Fluent than a single-core configuration does. Figure 1 compares two earlier generations of Intel Xeon processors with three Intel Xeon 6 processors. In these graphs, the performance of the 4th Gen Intel® Xeon® processor 8480+ serves as the baseline, and all tests were conducted using nodes with two sockets.

Across all model sizes—which go from small on the left of the graph to large on the right—moving to Intel Xeon 6 delivers a sharp increase in performance.[1] As Figure 5 shows, our test used Intel Xeon 6 processors with 72, 96, and 128 cores, compared to the 56 and 64 cores on the earlier generation processors. For some of the larger models, the memory bandwidth per core is a constraint, so the 96-core Intel Xeon 6972P delivers higher performance than the 128-core Intel Xeon 6980P.[1]

Intel Xeon 6 processors support MRDIMM, a new ultra-fast memory technology that enables two sets of memory chips to be accessed simultaneously. MRDIMM's peak speed is 8,800 MT/s, almost 40% higher than the RDIMM memory modules most often used in data centers. Ansys Fluent workloads require numerous random accesses to memory, so memory bandwidth is often a constraint. MRDIMM makes an important contribution to the results you see here.

Intel Xeon 6 processors can address up to 4TB of memory and we installed 1.5TB. The largest Ansys Fluent benchmark we tested was using less than 1.0TB, so the larger memory size in Xeon 6 would not have affected these benchmark results. However, companies working with large data sets will have plenty of room for growth with the larger memory size.

In brief, our research shows that the Intel Xeon 6980P processor achieves the highest performance across most benchmarks; however, some larger model sizes tend to perform better on the Intel Xeon 6972P processor.[1]

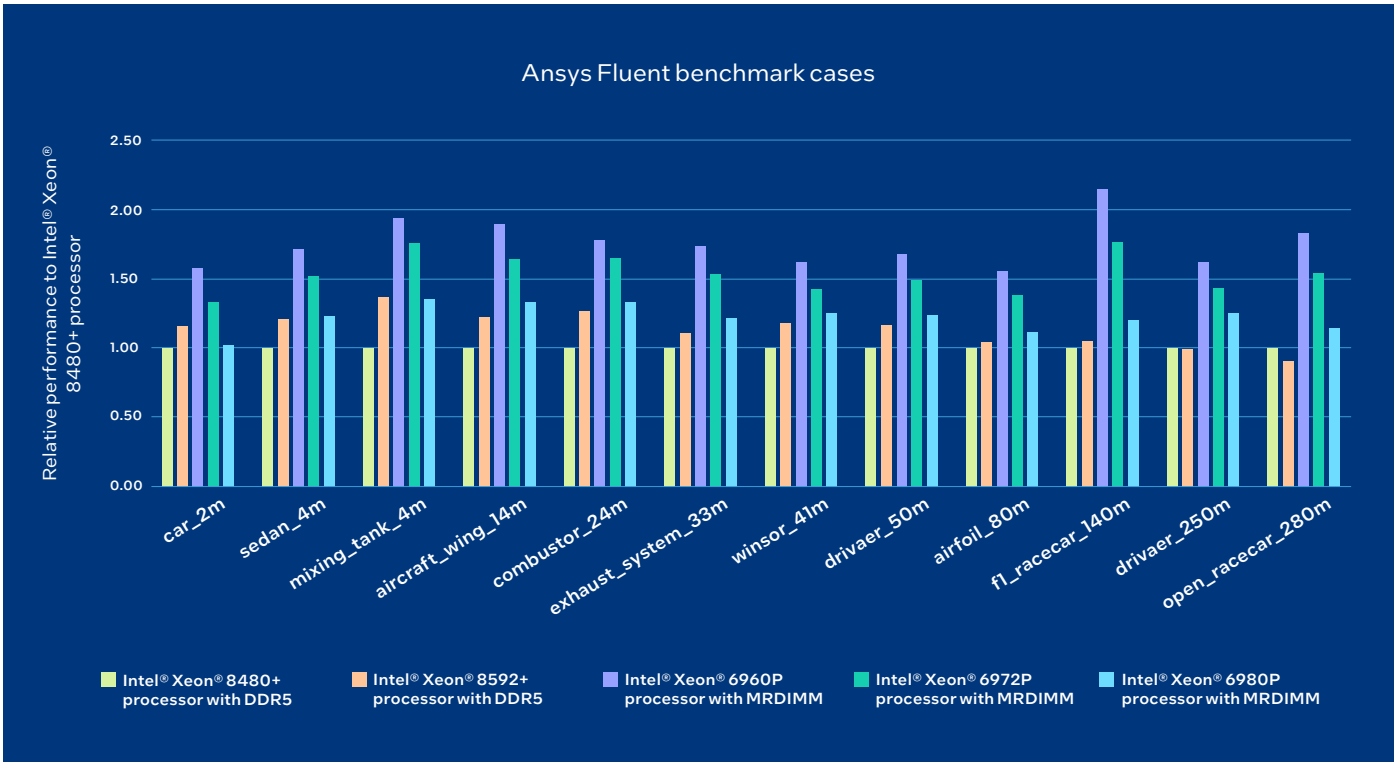

Figure 2. Per-core performance of Ansys Fluent over three generations of Intel® Xeon® processors (higher is better).

Benchmarking single-core performance

Because Ansys Fluent is licensed per core, many organizations place greater weight on the per-core performance when choosing their processors, even though a multicore configuration will deliver the solution faster. Figure 2 compares the same processors as our previous figure for single-core performance. Again, it demonstrates a significant performance increase for Intel Xeon 6 compared to previous processor generations, in part due to the higher bandwidth of MRDIMM.[1]

Within the latest generation, the processors with fewer cores have higher base frequencies (see Figure 5), while also benefiting from the microarchitecture improvements in Intel Xeon 6. Intel Xeon 6 processors feature P-cores, for example, which are optimized for compute-intensive workloads including simulation.

As a result of the high base frequency and improved architecture, Intel Xeon 6960P delivers the best single-core performance for Ansys Fluent, relative to other Intel processors we measured.[1]

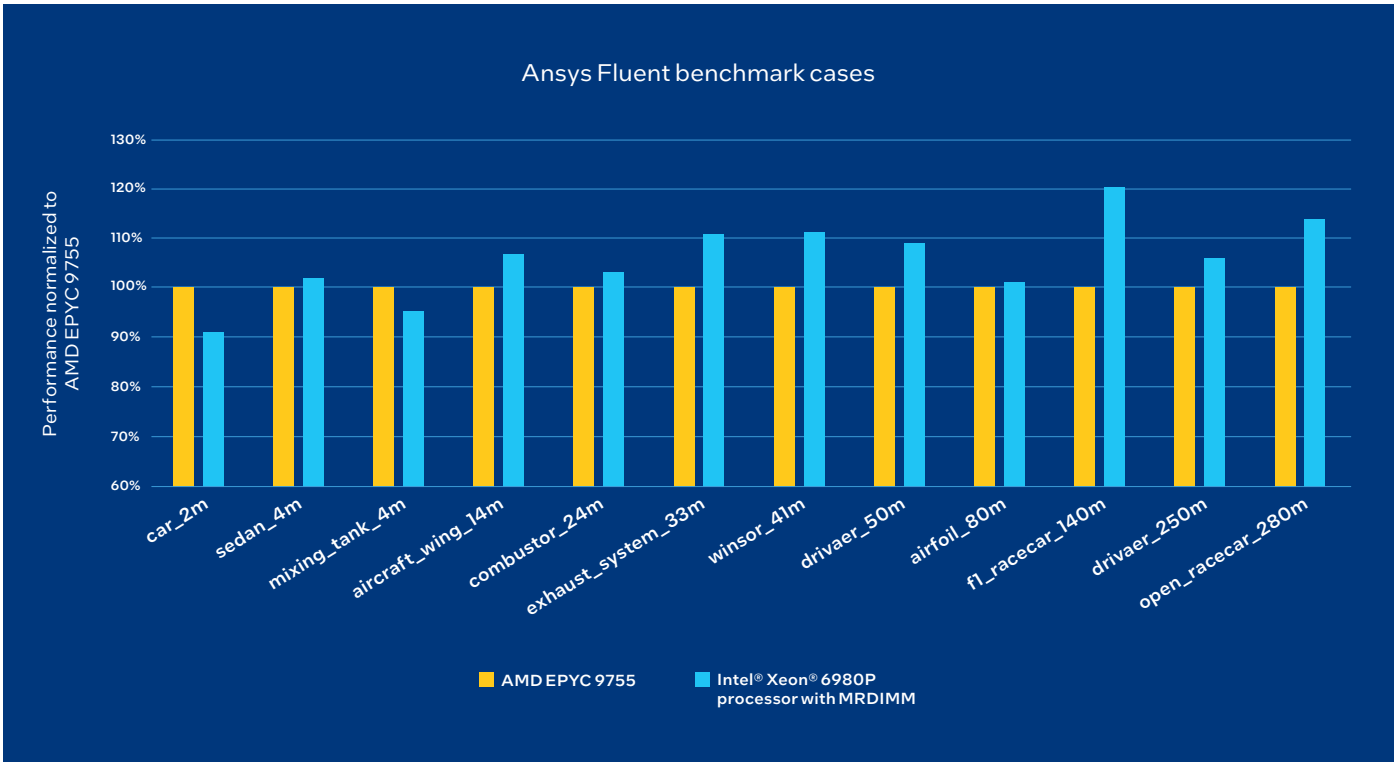

Figure 3. Comparing the Intel® Xeon® 6980P processor with AMD EPYC 9755 on Ansys Fluent benchmarks. Higher is better.[1]

Benchmarking Intel and AMD processors

We compared Intel Xeon 6980P processors with AMD EPYC 9755 processors, both of which have 128 cores. The Intel processors delivered higher performance across most benchmarks, including a 20% performance boost on the 140 million-cell F1_racecar benchmark.[1]

As noted earlier, Ansys Fluent workloads are often constrained by memory bandwidth. We measured the bandwidth of these two processors using the f1_racecar benchmark and found that Intel delivered 1.23 times faster throughput.[1]

For organizations that run simulations of 14 million cells or more, these benchmarks indicate that Intel Xeon 6 128-core processors would enable faster solve times than comparable AMD EPYC processors.[1]

We also compared 96-core processors of Intel and AMD: the Intel Xeon 6972P processor and AMD EPYC 9655 processor, as shown in Figure 4. At this core count, the Intel processors delivered higher performance for all but one of the benchmarks, and the same performance for the smallest model.[1]

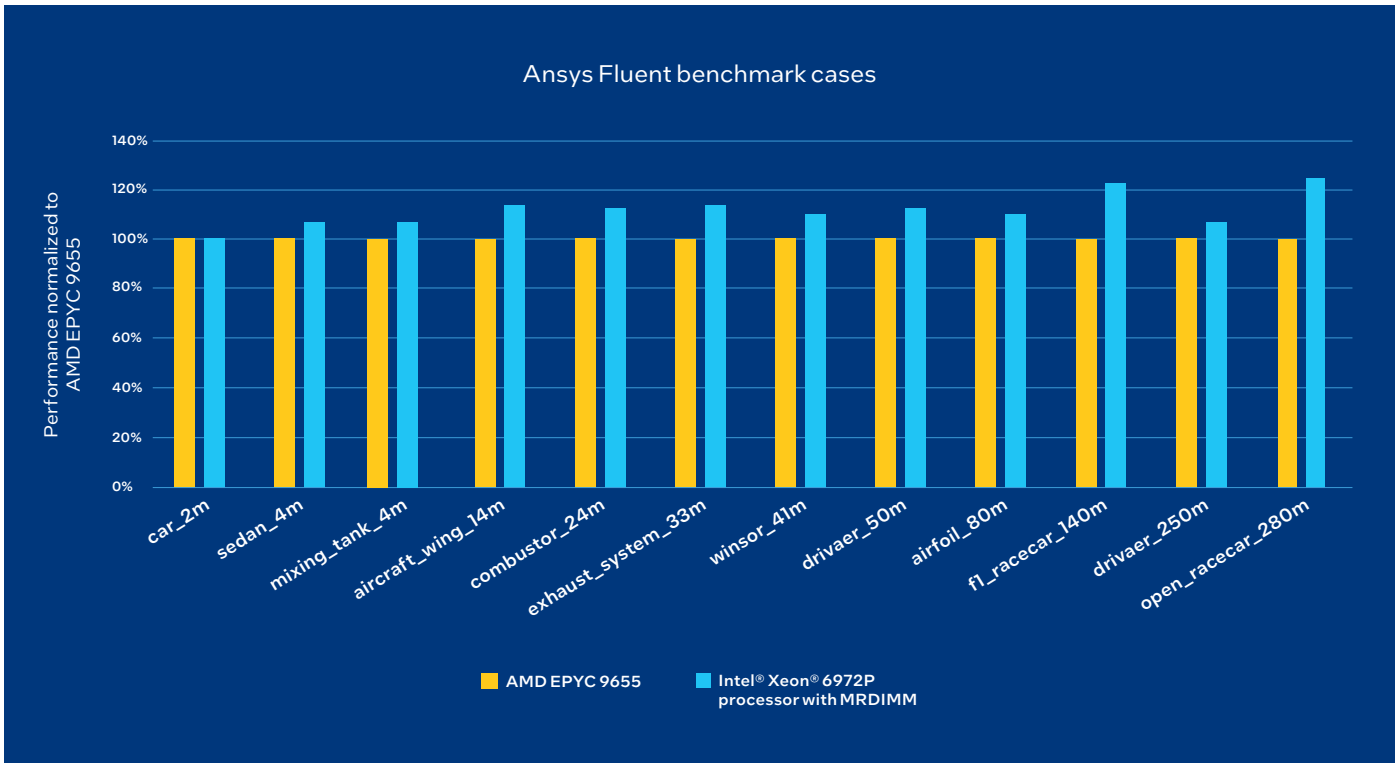

Figure 4. Comparing the Intel® Xeon® 6972P processor with AMD EPYC 9655 on Ansys Fluent benchmarks. Higher is better.[1]

Processor	4th Gen Intel® Xeon® 8480+ processor	5th Gen Intel® Xeon® 8592+ processor	Intel® Xeon® 6960P processor	Intel® Xeon® 6972P processor	Intel® Xeon® 6980P processor
Cores per socket	56	64	72	96	128
Max turbo frequency	3.8GHz	3.9GHz	3.9GHz	3.9GHz	3.9GHz
Base frequency	2.0GHz	1.9GHz	2.7GHz	2.4GHz	2.0GHz
Cache	105MB	320MB	432MB	480MB	504MB
Ultra Path Interconnect (UPI) speed	16GT/s	20GT/s	24GT/s	24GT/s	24GT/s
Thermal design power (TDP)	350W	350W	500W	500W	500W
Memory type	DDR5	DDR5	MRDIMM	MRDIMM	MRDIMM
Installed Memory	1.0TB	1.0TB	1.5TB	1.5TB	1.5TB

Figure 5. Specifications for the Intel® processors used in our Ansys Fluent benchmarking tests.

Conclusion

The Intel Xeon 6 processor family offers a range of core counts and frequencies. This latest generation delivers a significant performance boost compared to the two previous generations of Intel processors, across the full range of Ansys Fluent benchmarks.[1]

Of the processors we tested, the Intel Xeon 6960P processor delivers the best single-core performance for Ansys Fluent across all benchmarks.[1] The Intel Xeon 6980P processor achieves the highest multicore performance across most benchmarks.[1] Some larger model sizes perform better on the Intel Xeon 6972P processor when multicore performance is taken into account.[1]

Across most benchmarks tested, Intel Xeon 6 processors delivered higher performance than AMD EPYC processors with the same core count.[1]

About Ansys

Ansys Fluent is multiphysics computational fluid dynamics (CFD) software commonly used to model flow dynamics and related physical phenomena. It is used by thousands of companies worldwide as an integral part of their product design and optimization processes.

Learn More

Ansys Fluent benchmarks

New ultrafast memory boosts Intel data center chips

Intel® Xeon® 6 processors product brief

Find the solution that is right for your organization. Contact your Intel representative.

[1] Performance varies by use, configuration and other factors. See node configurations and notices and disclaimers.

Node configurations

4th Gen 8480+ Node
1x node, 2x 4th Gen Intel® Xeon® 8480+, Ubuntu 24.04 LTS, 6.8.0-38-generic, Microcode: 0x2b0001b0, HT on, Turbo On, 1.0TB DDR5 @ 4800MT/s, Fluent 2025R2(v252), Fluent prerelease v261, tested on Oct. 15-18 2025

5th Gen 8592+ Node
1x node, 2x 5th Gen Intel® Xeon® 8592+, Ubuntu 24.04 LTS, 6.8.0-62-generic, Microcode: 0x210002a9 HT on, Turbo On, 1.0TB DDR5 5600MT/s, QuantaGrid D54Q-2U, S6Q-MB-MPS, BIOS 3B08.TEL3P1, Fluent 2025R2(v252), Fluent prerelease v261, tested on Oct 18-19, 2025, also Nov. 12-13 2025

Intel® Xeon® 6960P Node
1x node, 2x Intel® Xeon® 6 6960P, AvenueCity, SUSE Linux Enterprise Server 15 SP6, kernel: 6.4.0-150600.23.73-default, HT:on, Turbo:on, 1.5TB MRDIMM 24x64GB @ 8800 MT/s, Hynix HMCG94BDJHA384N; BIOS BHSDCRB1.IPC.0035.D44.2408292336, Microcode 0x11000311; Fluent 2025R2(v252), Fluent prerelease v261, tested on Oct. 24-26 2025.

Intel® Xeon® 6980P Node
1x node, 2x Intel® Xeon® 6 6980P, AvenueCity SRPL2 B2 , 128c, SUSE Linux Enterprise Server 15 SP6, kernel: 6.4.0-150600.23.73-default, HT:on, Turbo:on, 1.5TB MRDIMM 24x64GB @ 8800 MT/s, Hynix HMCG94BDJHA384N; BIOS BHSDREL1.IPC.3544.P29.2412180043, Microcode 0x10003d0; Fluent 2025R2(v252), Fluent prerelease v261, tested on Oct. 25-27 2025.

Intel® Xeon® 6972P Node
1x node, 2x Intel® Xeon® 6 6972P, Supermicro SYS-222HA-TN, X14DBM-AP, BIOS American Megatrends International, LLC, 1.4, 07/24/2025, openSUSE Leap 15.6, 6.4.0-150600.21-default, Microcode 0x10003d0, 1.5TB MRDIMM 24x64GB @ 8800 MT/s, HT:on, Turbo:on, Fluent 2025R2(v252), tested on Nov. 8-9 2025.

AMD EPYC 9655 Node – 96c
1x node, 2x EPYC 9655, Supermicro, AS-2126HS-TN, BIOS: American Megatrends International, LLC 1.4 03/31/2025, Series# S920464X5310472, HT on, Turbo On, openSUSE 15.6, 1.5TB(24x64GB DDR5), 6400MT/s, 6.4.0-150600.21, Microcode: 0xb002147, Fluent 2025R2(v252), tested on Nov. 11-12 2025.

AMD EPYC 9755 Node – 128c
1x node, 2x EPYC 9755, HT on, Turbo On, Ubuntu 24.04 LTS, 1.5TB(24x64GB DDR5), 6400MT/s, 6.8.0-86-generic, Microcode: 0xb00211e, Fluent 2025R2(v252), Fluent prerelease v261, tested on Oct. 31-Nov. 1 2025.

Notices & disclaimers

Performance varies by use, configuration and other factors. Learn more on the Performance Index site.

Performance results are based on testing as of dates shown in configurations and may not reflect all publicly available updates. See backup for configuration details. No product or component can be absolutely secure.

Your costs and results may vary.

Intel technologies may require enabled hardware, software or service activation.

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