High Performance Computing

Computational Fluid Dynamics Solutions with AMD EPYC™ 7Fx2 Processors and Ansys® CFX®

APRIL 2020

AMD EPYC Processors for HPC

AMD EPYC™ 7Fx2 processors bring high frequencies and very highs ratios of cache per core to the 2nd Gen EPYC family of processors. EPYC 7Fx2 processors build on the large memory capacity, extreme memory bandwidth and massive I/O of the 2nd Gen EPYC family to deliver exceptional HPC workload performance.

High Frequency

Many HPC applications scale very well with frequency. EPYC 7Fx2 series processors offer *both* base and boost frequencies[4] up to 500 MHz faster than the current EPYC 7002 series models, enabling significant per-core performance.

High Cache Per Core

The 16-core EPYC 7F52 and 8-core EPYC™ 7F32 processors each boast 16 MB of cache for each core. The 24-core EPYC 7F72 processor offers 8 MB of cache per-core.

Model	Cores	Base Freq (GHz)	Boost Freq (Up to)[4]	Cache (MB)
7F72	24	3.2 GHz	3.7 GHz	192
7F52	16	3.5 GHz	3.9 GHz	256
7F32	8	3.7 GHz	3.9 GHz	128

A high ratio of cache per core helps feed data into HPC applications using very high-speed cache memory.

Scalability

With leadership architecture, 2nd Gen EPYC Series Processors demonstrate very high scalability for HPC applications by supporting 8 channels of memory per processor and PCIe® 4.

Superior Performance for Computational Fluid Dynamics on Ansys CFX with AMD EPYC 7Fx2 Processors

Ansys® CFX® is a high-performance computational fluid dynamics (CFD) software tool that delivers robust, reliable and accurate solutions quickly across a wide range of CFD and multi-physics applications. CFX is recognized for its outstanding accuracy, robustness and speed when simulating turbomachinery, such as pumps, fans, compressors, as well as gas and hydraulic turbines. AMD and Ansys have an ongoing collaboration to deliver exceptional performance for customers.

Single-Node Performance: AMD vs. Intel®

Figure 1 shows the 16-core AMD EPYC™ 7F52 CPUs outperforming the 16-core Intel® Xeon® Gold 6242 CPUs by up to an average of 112%. Testing was performed by AMD engineering.[1,2,3] Five runs were made for each test, with the average score shown.

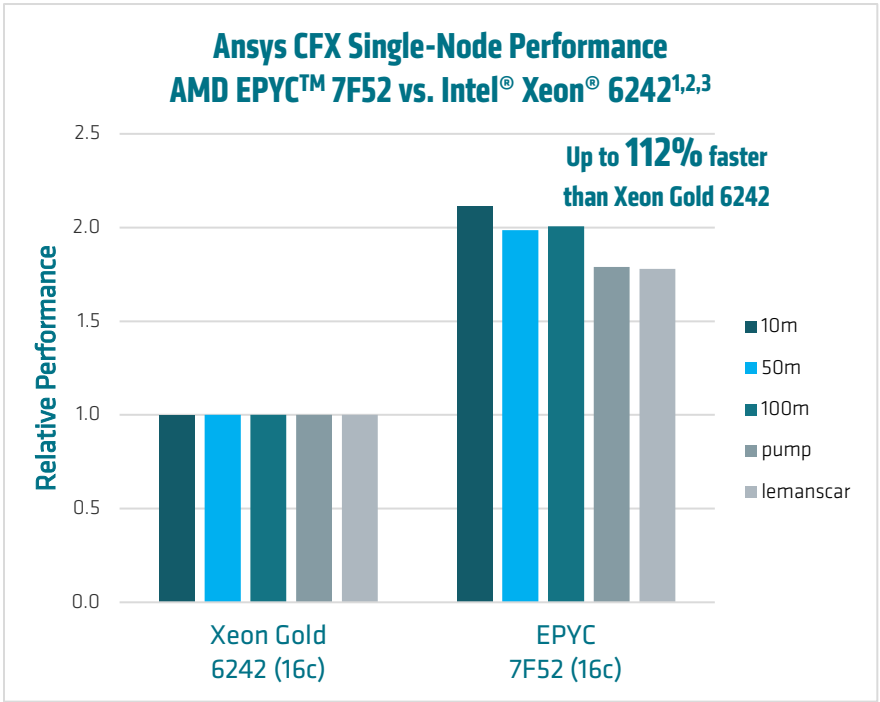

Figure 1 - Single-node AMD EPYC 7F52 (16C) vs. Intel Xeon Gold 6242 (16C)

Performance Per Core

Figure 1 also highlights the incredible per-core performance advantage the 16-core AMD EPYC 7F52 CPUs have over the 16-core Xeon 6242 CPUs when running CFX. Whether you are looking for great single node performance, or high performance per core to efficiently optimize a per-core software license investment, AMD EPYC 7F52 CPUs dominantly outperform the Intel Xeon Gold 6242 CPUs.

CFX Scaling Performance

Building on dominant performances at a single node, Figure 2 demonstrates how the EPYC 7F52 CPUs efficiently scale up to at least 16 nodes. This scaling is not only efficient, but is superlinear for the large CFX Airfoil 50M and 100M benchmark models. EPYC 7F52 CPUs deliver up to ~108% scaling efficiency at 16 nodes. Super-linear speedup of CFX is often caused by the availability and use of larger amounts of cache memory highlighting an architectural advantage of the EPYC 7Fx2 Series of processors.

Whether you are running jobs on a single node, or scaling out on a large cluster, AMD EPYC 7Fx2 processors are the right choice for optimizing your performance.

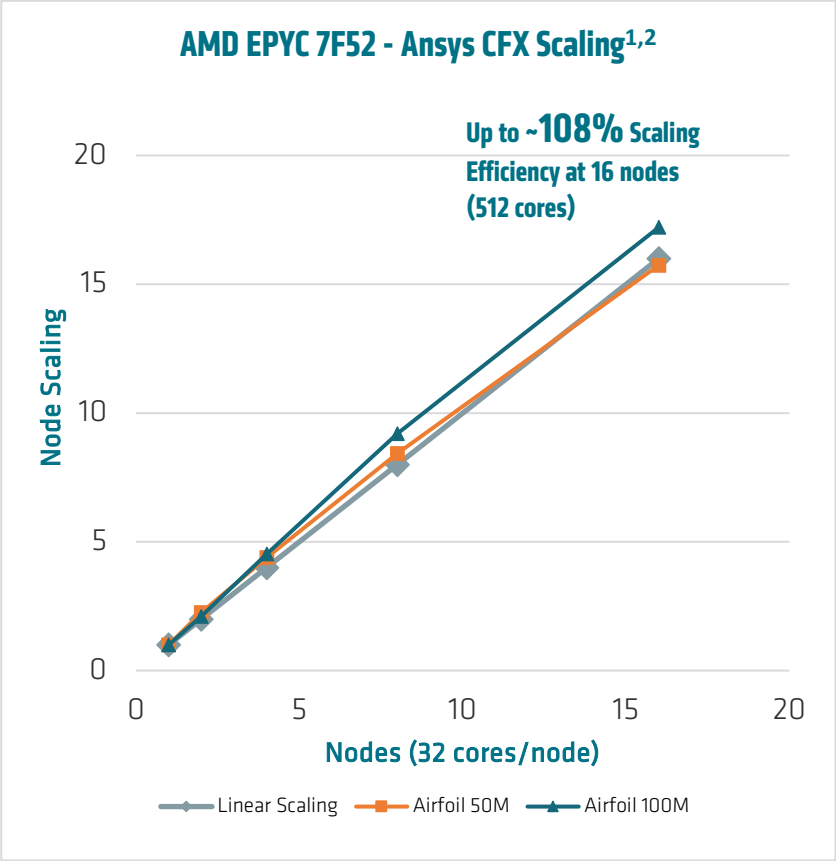

Figure 2 - AMD EPYC 7F52 scaling on Ansys CFX Airfoil 50M and 100M benchmarks.

Get started with Ansys CFX and AMD EPYC today

- 2nd Gen EPYC Processors - https://www.amd.com/en/processors/epyc-7002-series
- AMD EPYC Family of Processors for HPC - https://www.amd.com/en/processors/epyc-for-hpc
- Ansys - http://www.Ansys.com *

*Links to third party sites are provided for convenience and unless explicitly stated, AMD is not responsible for the contents of such linked sites and no endorsement is implied.

FOOTNOTES

1. Performance measured with Ansys CFX version 2019 R1 on RHEL 7.7 (3.10.0-1062.el7.x86_64), running the Airfoil 100M, Airfoil 10M, Airfoil 50M, LeMansCar, and Pump benchmarks
2. AMD EPYC Processor-based System - CPUs: 2x 7F72, 2x 7F52, 16x Micron® 64GB DDR4-3200 DR 1DPC, Mellanox® CX-6 HDR 200 Gb/s IB x16 PCIe® Gen 4, 1x Micron 1100 256 GB SATA (OS), 1x1 TB NVMe™ (Data), BIOS settings: Defaults, plus NPS=NPS4 (7F52), NPS=NPS2 (7F72), SMT = Off, Boost = On, APBDIS=1, Fixed SOC P state=P0, DLWM=off, X2APIC = On, Determinism Slider = Performance, Preferred IO=Enabled.
3. Intel Xeon Scalable Processor-based System - CPUs: 2x Platinum 8268, 2x Gold 6242, 12x 64GB DDR4-2933 DR 1DPC, 1x Micron 1100 256 GB SATA (OS), 1x1 TB NVMe (Data), BIOS settings: Defaults, plus Power Management=Extreme Performance, Hyper-threading=Off, SNC=On, ADDDC=Off.
4. Max boost for AMD EPYC processors is the maximum frequency achievable by any single core on the processor under normal operating conditions for server systems. EPYC-18