Achieve 1.55X Higher Ansys Fluent Price-Performance with Cornelis Omni-Path™

White Paper

Users can achieve equal performance at a lower cost – as much as 40% lower than the competition.

Cornelis Networks™ is the leading independent provider of purpose-built, open-source, scale-out interconnects for high-performance computing (HPC), artificial intelligence (AI), and data analytics. The Cornelis Networks Omni-Path 100Gbps high-performance networking fabric delivers class-leading message rate, latency, and scalability, while allowing customers to deploy solutions which enable faster time to solution and improved workload scalability combined with leading price/performance.

To highlight the capabilities of Omni-Path, this paper analyzes the performance of Ansys Fluent, an industry leader in Computational Fluid Dynamics (CFD) provided by Ansys. Ansys Fluent is a versatile CFD tool that includes well validated physical modeling capabilities to deliver fast, accurate results across a wide range of CFD and multiphysics applications. It is widely used in automotive, aerospace, academia, oil & gas, marine, and Formula 1 racing applications. Typical workload sizes range from two million to 500 million cells.

Imagine getting the most simulation throughput out of your investment by using a combination of the right software on the right networking fabric in your environment. When using Ansys Fluent with Omni-Path, users will see comparable and even indiscernible differences in performance versus NVIDIA® InfiniBand HDR. Since users often find Cornelis Omni-Path to be 25-40% less expensive than NVIDIA InfiniBand, depending on the exact cluster configuration, it makes both operational and financial sense to choose Omni-Path.

Cornelis Networks ran the standard benchmark suite released with Ansys Fluent 2022 R1 on up to 16 dual-socket Intel® Xeon® Platinum 8358 processor nodes, each installed with Cornelis Omni-Path and NVIDIA InfiniBand HDR. Intel MPI Library 2019.12 as packaged with Fluent were used for both fabrics, and the Cornelis Omni-Path Express (OPX) libfabric provider was used for Omni-Path. Complete configuration is given at the conclusion of the paper.

Figure 1 shows the Solver Rating (i.e., jobs per day) when running on 16 nodes normalized by the cost of building a 16-node cluster comprised of 16 PCIe adapters, 16 copper cables, and one managed edge switch[1]. Fluent customers can achieve up to 1.55X higher job throughput per fabric cost when using Cornelis Omni-Path compared to NVIDIA InfiniBand HDR. This ultimately means that customers running Cornelis Omni-Path can deploy an equally performant cluster for less money or redirect unused budget to purchase additional Ansys software licenses or compute power.

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[1] MSRP Pricing obtained on 7/11/2023 from https://store.nvidia.com/en-us/networking/store. Mellanox MCX653105A-HDAT $1628 per adapter. Mellanox MQM8700-HS2F managed HDR switch, $25555. MCP1650-H002E26 2M copper cable – $281. Cornelis Omni-Path MSRP pricing as of 7/11/2023. Cornelis 100HFA016LSN 100Gb HFI $880 per adapter. Cornelis Omni-Path Edge Switch 100 Series 48 port Managed switch 100SWE48QF2 – $19750. Cornelis Networks Omni-Path QSFP 2M copper cable 100CQQF3020 – $147. Exact pricing may vary depending on vendor and relative performance per cost is subject to change.
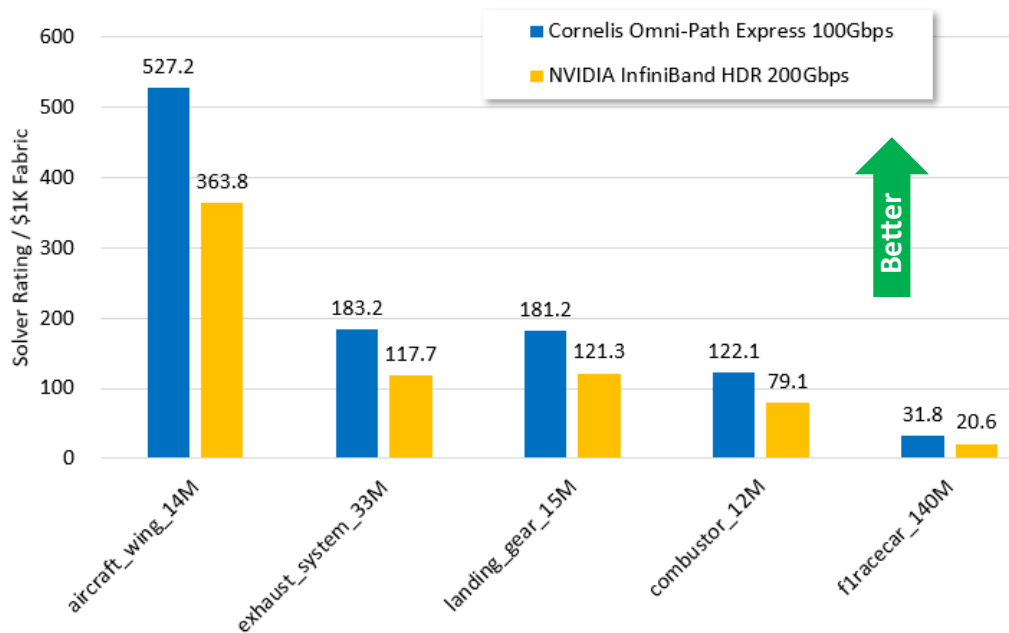
Figure 1. Price-Performance Comparisons for Ansys Fluent Benchmarks Showing Significant Advantages with Cornelis Omni-Path.

The new Cornelis OPX provider for libfabric unleashes additional performance on existing Omni-Path 100 Gbs hardware and is the provider of choice for Cornelis Networks' next generation CN5000 fabric. Thanks to a streamlined code path designed specifically for libfabric, it provides small message latency and message rate advantages over the traditional PSM2 provider. OPX is a drop-in replacement for PSM2 and can be evaluated for performance side-by-side with PSM2. Obtain OPX either through the Cornelis Omni-Path Express Suite (OPXS) software download at www.cornelisnetworks.com or build your own using libfabric version 1.16.1 or newer from https://github.com/ofiwg/libfabric.

Cornelis Omni-Path 100 is ready to ship with minimal lead time; contact your vendor of choice today to start experiencing 1.55X higher Ansys Fluent performance with Cornelis Omni-Path 100!

System Configurations

Tests performed on 2 socket Intel Xeon Platinum 8358 CPU @ 2.60GHz. Intel Hyper-Threading Technology disabled. Intel Turbo Boost Technology enabled with ACPI driver. Rocky Linux 8.4 (Green Obsidian). 4.18.0-305.19.1.el8_4.x86_64 kernel. Memory: 32x32GB, 512 GB total, 3200 MT/s.
NVIDIA InfiniBand HDR: MLNX_OFED_LINUX-5.4-2.4.1.3, mlx5_core version 5.4-2.4.1. FI_PROVIDER=mlx, UCX 1.15.0 from hpcx-v2.16-gcc-mlnx_ofed-redhat8-cuda12-gdrcopy2-nccl2.18-x86_64.
Cornelis Omni-Path: Omni-Path Express Fabric Suite (OPXS) 10.11.1.1.1, FI_PROVIDER=opx, libfabric 1.18.0.

The following data are used to generate the plot in Figure 1. These benchmarks scaled with greater than 70% efficiency at 16 node scale. The solver ratings are an average of five runs. The normalized standard deviation for the tests ranged from 0% to 3%.

Table 1. Solver Ratings Used in Figure 1 Price-Performance Comparisons.

Workload	NVIDIA InfiniBand HDR 200Gbps	Cornelis Omni-Path 100Gbps
aircraft_wing_14M	20411	19075
exhaust_system_33M	6606	6629
landing_gear_15M	6804	6555
combustor_12M	4435	4420
f1racecar_140M	1157	1152

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