



CORNELIS[®] NETWORKS

Scaling Ansys Fluent[®] and LS-DYNA[®] with Cornelis Networks Omni-Path[®]

Cornelis Networks: Built on a Foundation of Deep Innovation

Advanced, scalable solutions unlocking infrastructure performance at industry leading price/performance

Company Background

Founded 2020



- Established as a spin-out of Intel's high-performance interconnect business
- Deep heritage of interconnect innovation through InfiniBand startups, QLogic, Cray, Intel

200 Employees



- Deep technical expertise from industry leaders in AI and HPC focused on ASIC, software, and platform development
- Continuing to scale expertise in all key areas to meet customer expectations

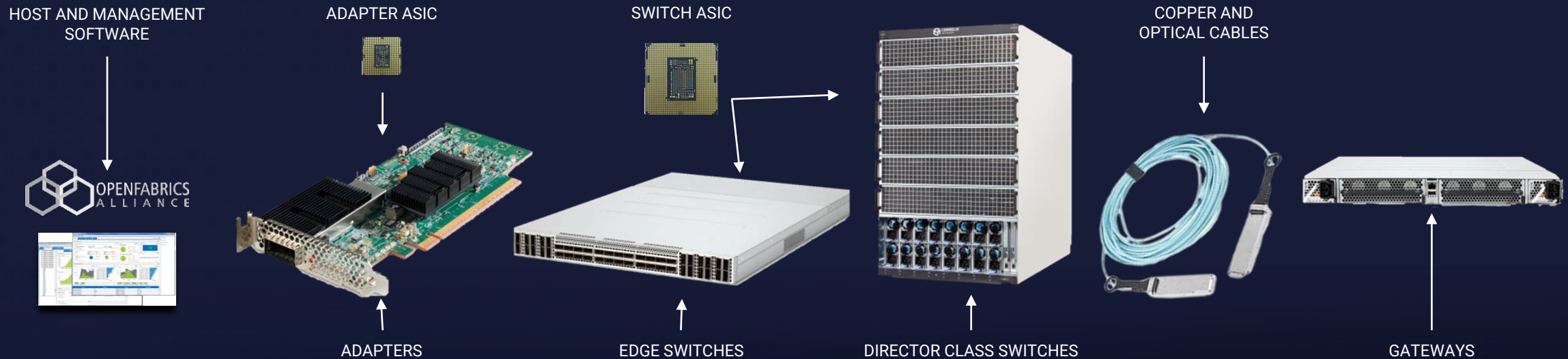
Global Deployments



- Product offerings validated by global blue-chip customers
- Winning competitive bids with superior performance and price-performance, freeing cluster budgets for more compute

Cornelis Networks: End-to-End High-Performance Network Solutions

Catalyzing the next wave of HPC & AI innovation through a portfolio of differentiated HW and SW IP



Best-in-Class AI/HPC-Focused Host Interface

- Purpose-built accelerated adapters supporting highly-optimized OFI host stack implementation

High-Bandwidth Low-Diameter Topologies

- High-radix, high-bandwidth switch building blocks supporting tree and advanced topologies

Low Latency at Any Utilization and Scale

- Minimum fall-through latency coupled with advanced traffic management

Advanced Adaptive Routing and QoS

- Multi-tenant security and QoS via dynamic virtual fabrics and fine-grained adaptive routing

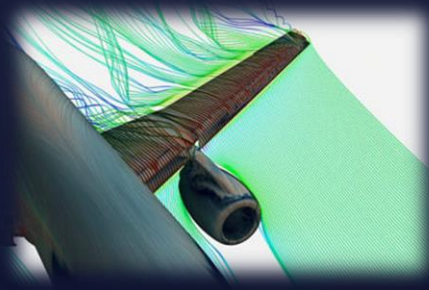
State-of-the-Art Congestion Control

- Comprehensive network telemetry synthesized to pace senders and modulate path selection

Our Partnership

Ansys

TECHNOLOGY PARTNER

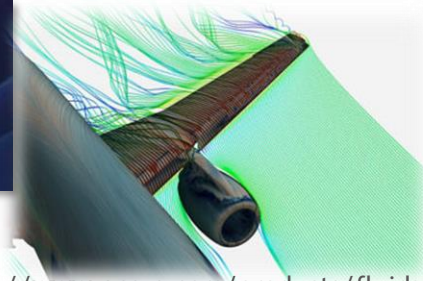


CORNELIS[®]
NETWORKS



Ansys Fluent 2024 R1 Performance

Cornelis Networks Omni-Path vs. NVIDIA InfiniBand HDR



Date: October 2024
Classification: **Work in Progress**

CPU: 25 AMD EPYC™ 9755 Eng Sample

Nodes: 8

PPN: 128 ppn

Application: Fluent 2024 R1

Dataset:
25_50_NHTSA_OBLIQUE_L-
ACCORD_Full_model.k

MPI: Open MPI 4.1.6

OS: Rocky Linux 9.4 (Blue Onyx)

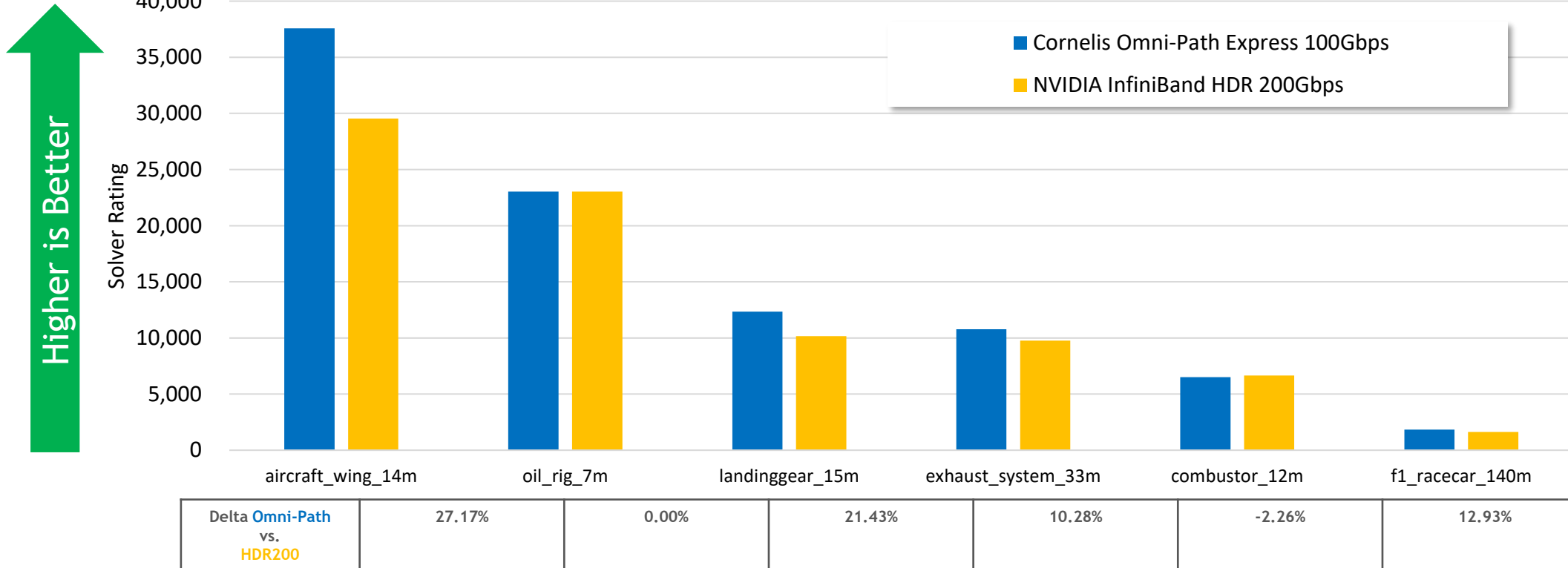
Kernel: 5.14.0-
427.13.1.el9_4.x86_64

OPXS: 10.14.4.0.8

M-OFED: MLNX_OFED_LINUX-
24.07-0.6.1.0-rhel9.4-x86_64,
Open MPI 4.1.7a1

<https://www.ansys.com/products/fluids/ansys-fluent>

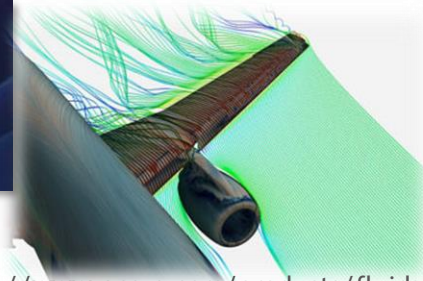
Up to 27% better performance with Cornelis Omni-Path at 8 nodes



Tests performed on 2 socket AMD EPYC™ 9745 (128c@3.7Ghz) Configured with 64c per socket. Rocky Linux 9.4 (Blue Onyx). 5.14.0-427.13.1.el9_4.x86_64 kernel. 24x32GB, 768 GB total, Memory Speed: 5600 MT/s. Omni-Path: Cornelis Omni-Path Express Suite (OPXS) 10.14.4.0.8, Open MPI 4.1.6. NVIDIA InfiniBand HDR: MLNX_OFED_LINUX-24.07-0.6.1.0-rhel9.4-x86_64, Open MPI 4.1.7a1 as packaged. Benchmarks were run with 128 ranks per node.

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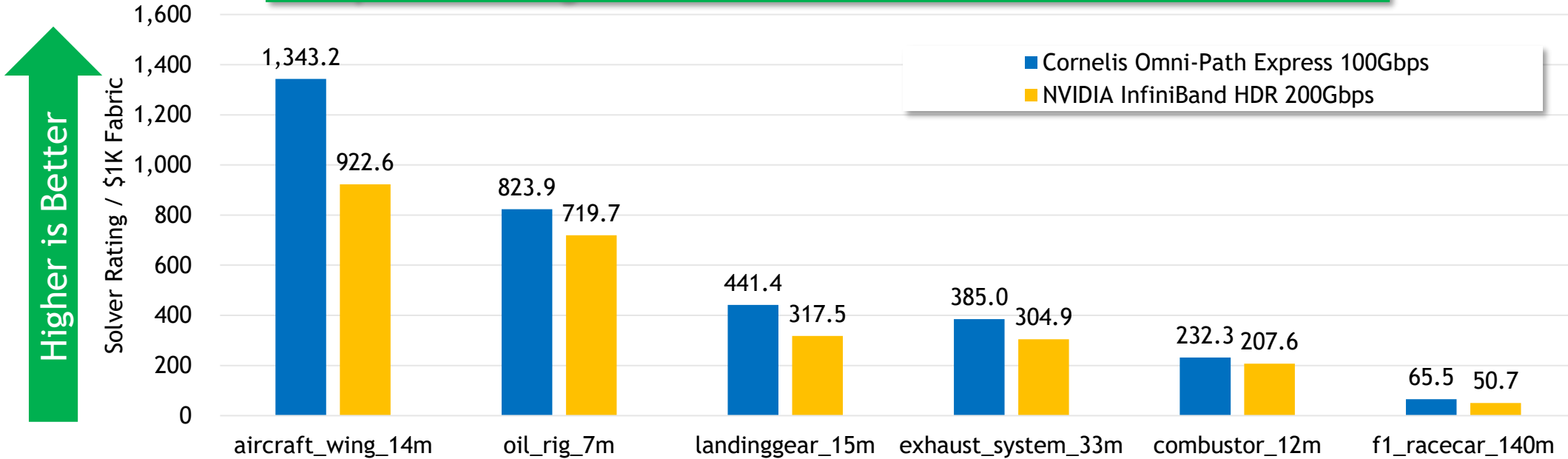
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Up to 1.35x Higher Price-Performance with Cornelis Omni-Path



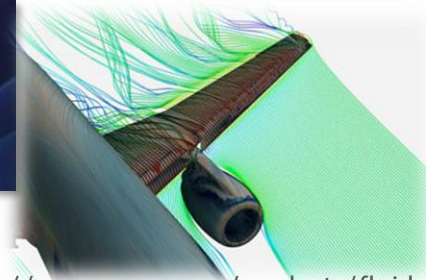
	aircraft_wing_14m	oil_rig_7m	landinggear_15m	exhaust_system_33m	combustor_12m	f1_racecar_140m
Cornelis Omni-Path	37565	23040	12343	10766	6496	1622
NVIDIA InfiniBand HDR	29538	23040	101645	9763	6646.2	1621.8

Solver Ratings

MSRP Pricing obtained on 10/18/2024 from <https://store.nvidia.com/en-us/networking/store>. Mellanox MCX653105A-HDAT \$1267 per adapter. Mellanox MQM8700-HS2F managed HDR switch, \$19895. MCP1650-H002E26 2M copper cable - \$248. Cornelis Omni-Path MSRP pricing as of 10/18/2024. 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.

Ansys Fluent 2024 R1 Performance

Cornelis Networks Omni-Path vs. NVIDIA InfiniBand HDR



Date: October 2024
Classification: **Work in Progress**

CPU: 25 AMD EPYC™ 9755 Eng Sample

Nodes: 1,2,4,8

PPN: 128 ppn

Application: Fluent 2024 R1

Dataset: 25_50_NHTSA_OBLIQUE_L-ACCORD_Full_model.k

MPI: Open MPI 4.1.6

OS: Rocky Linux 9.4 (Blue Onyx)

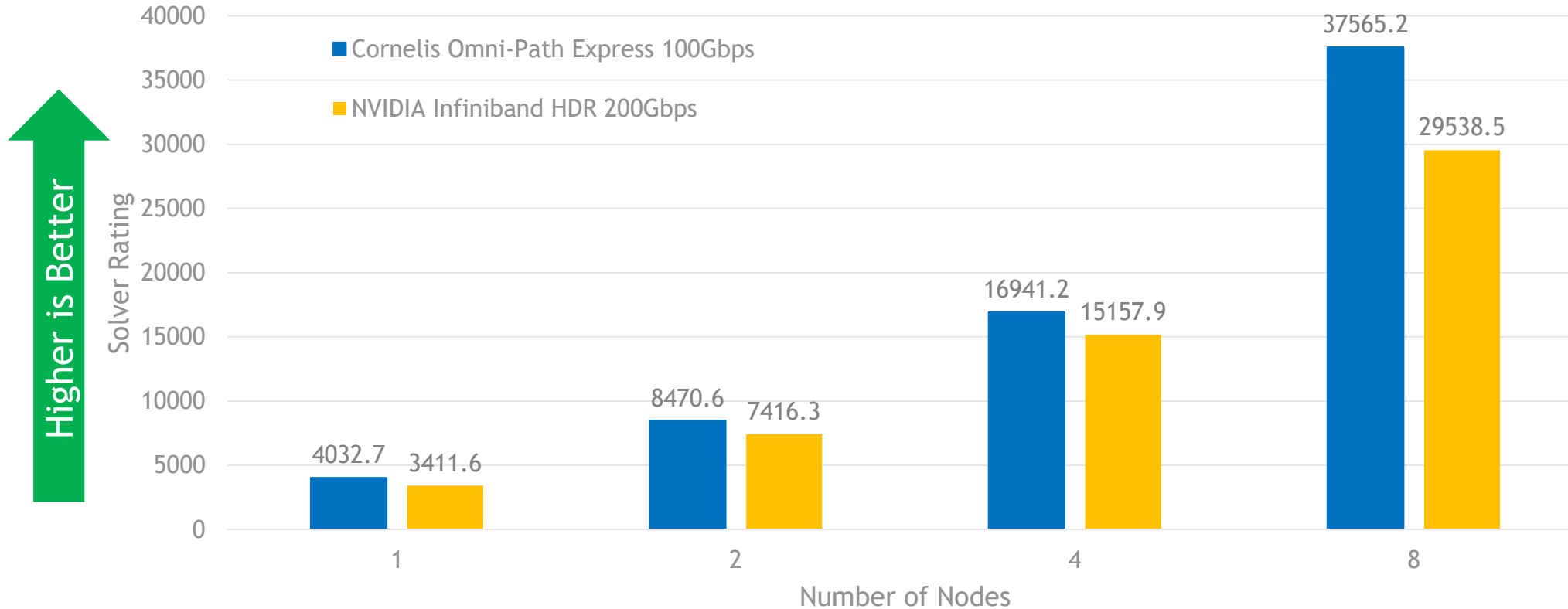
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<https://www.ansys.com/products/fluids/ansys-fluent>

Aircraft wing 14m



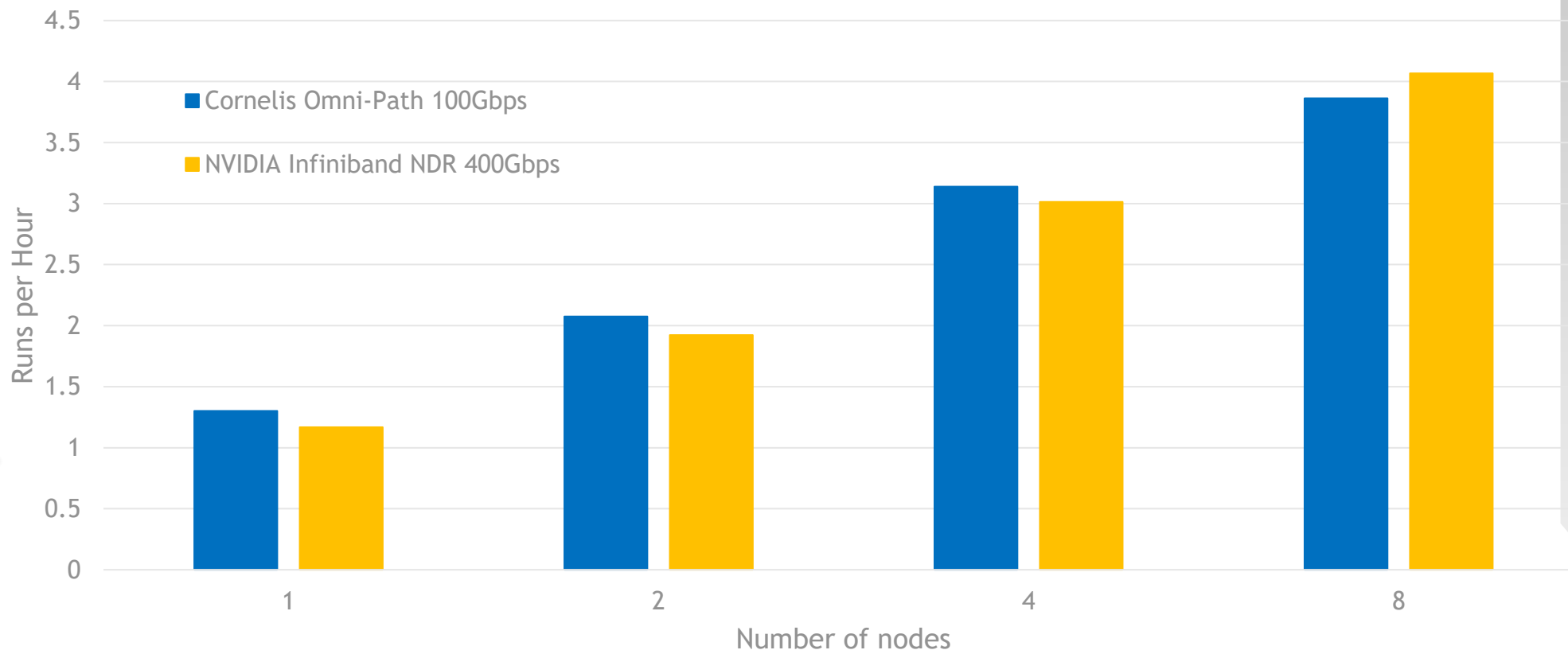
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Ansys LS-DYNA 12.2.2

Cornelis Networks Omni-Path vs. NVIDIA InfiniBand NDR



Car2Car



CPU: 25 AMD EPYC™ 9755
Eng Sample

Nodes: 1,2,4,8

PPN: 128 ppn (64c per socket)

Application: LS-DYNA 12.2.2

Dataset: c2c.inp

MPI: Open MPI 4.1.6 (OPA)

Open MPI 4.1.7a1 (NDR)

OS: Rocky Linux 9.4 (Blue Onyx)

Kernel: 5.14.0-427.13.1.el9_4.x86_64

OPXS: 10.14.4.0.8

M-OFED: MLNX_OFED_LINUX-24.07-0.6.1.0-rhel9.4-x86_64

Command Line:

Common config: mpirun -np \${NPROCS} --map-by ppr:128:node \${FABRIC_SPECIFIC_CONFIGURATIONS} -hostfile \${HOSTFILE} \${LSDYNA} i=\${MODELNAME} memory=2000M memory2=200M

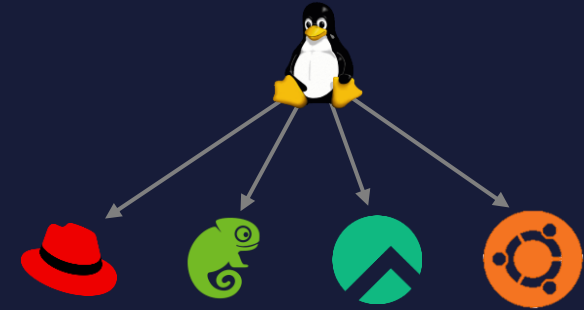
Omni-Path-Specific Configuration: -mca btl self,vader -mca mtl psm2

NVIDIA InfiniBand NDR-Specific Configuration: -mca btl ^vader,tcp,openib,uct -x UCX_NET_DEVICES=mlx5_0:1 -mca pml ucx -mca coll_hcoll_enable 0

Date: October 2024

Classification: NDA

Industry-leading fully open Software Stack



Committed to open-source community development

- Upstream-first In-tree kernel drivers
- Upstream-first user space providers via Libfabric interfaces
- OpenBMC switch-management via Redfish and Sunfish interfaces
- Fabric telemetry accessible via public API

Accelerating innovation by...

- Lowering barriers to entry
- Enhancing ease-of-use
- Enabling interoperability and convergence

Cornelis Networks High Performance End-to-End Network for HPC and AI

2025

CN5000

400G / PCIe Gen 5

Omni-Path

Advanced Performance

Delivering enhanced throughput and intelligent optimization for scalable, future-ready networks

2026

CN6000

800G / PCIe Gen 6

Omni-Path / Ethernet

Converged Connectivity

Offering seamless bandwidth and flexibility with multi-protocol support for next-gen heterogeneous deployments

2027

CN7000

1600G / PCIe Gen 7

Omni-Path/Ultra Ethernet

Ultra Fabric Efficiency

Providing revolutionary lossless interconnect for unparalleled performance and multi-vendor compatibility

Advanced Server Architecture Interconnects

Proven Hardware Foundation + Open Fabric Software

Unique Features & Capabilities

Best-in-Class AI/HPC-Focused Host Interface

Purpose-built accelerated adapters supporting highly-optimized OFI host stack implementation

High-Bandwidth Low-Diameter Topologies

High-radix, high-bandwidth switch building blocks supporting tree and advanced topologies

Low Latency at Any Utilization and Scale

Minimum fall-through latency coupled with advanced traffic management

Advanced Adaptive Routing and QoS

Multi-tenant security and QoS via dynamic virtual fabrics and fine-grained adaptive routing

State-of-the-Art Congestion Control

Comprehensive network telemetry synthesized to pace senders and modulate path selection

\$1B+ invested and 20+ years of technological innovations

Thank You