Cornelis Omni-Path Switches
Product Guide

Cornelis Omni-Path switches are high-performance interconnect solutions designed to meet the demand of modern HPC and AI workloads. They provide low-latency, high-bandwidth communication across compute nodes, enabling efficient scaling and workload distribution. With features like adaptive routing, congestion control, and advanced monitoring, Omni-Path technology supports reliable and cost-effective infrastructure for data-intensive environments.

The Cornelis CN5000 Switch is a 400 Gbps Omni-Path scale-out fabric designed for modern AI and HPC data centers, delivering lossless, congestion-free throughput, ultra-low latency, and exceptional scalability to more than 100K nodes while maximizing compute efficiency and lowering TCO.

Through features such as credit-based flow control, link-level retransmissions, fine-grained adaptive routing, and advanced real-time telemetry, the CN5000 ensures low tail latency, eliminates packet loss, and provides precise network visibility, making it an ideal interconnect for performance-critical, parallelized workloads

Figure 1. Cornelis CN5000 48-Port OPA 400Gbps Switch

Did you know?

Omni-Path Architecture eliminates packet loss and minimizes network congestion through built-in credit-based flow control and adaptive routing. Unlike Ethernet-based AI fabrics that often require extensive tuning to achieve lossless operation, CN5000 Omni-Path fabrics are designed to deliver predictable low-latency performance at scale, helping AI and HPC clusters achieve higher utilization and faster time-to-results.

Ordering information

The following table lists the Cornelis Omni-Path switches orderable from Lenovo.

Table 1. Ordering information

Model	Description*
Air-cooled switches	
7DMQCTO1WW	Cornelis CN5000 48-Port OPA 400Gbps Air-Cooled Switch PSE
7DMQCTO2WW	Cornelis CN5000 48-Port OPA 400Gbps Air-Cooled Switch oPSE
Water-cooled switch	
7DMQCTO4WW	Cornelis CN5000 48-Port OPA 400Gbps Liquid-Cooled Switch oPSE

* PSE = Port Side Exhaust; oPSE = Opposite Port Side Exhaust

Each switch comes standard with two 2m C14 power cables. Other cable lengths are also available as listed in the Power cables section.

Lenovo EveryScale

Lenovo EveryScale is a framework for designing, manufacturing, integrating, and delivering data center solutions, with a focus on High Performance Computing (HPC), Technical Computing, and Artificial Intelligence (AI) environments.

With EveryScale, Lenovo pre-tests and validates a wide selection of Lenovo and third-party components, including Cornelis Omni-Path switches, to create a "Best Recipe" of components and firmware levels that work seamlessly together as a solution. From this testing, customers can be confident that these best-practice solutions run optimally for their workloads and are tailored to their specific needs.

Lenovo EveryScale hardware is pre-integrated, pre-cabled, and pre-loaded, optionally with an OS image, and is tested at the rack level during manufacturing. This process ensures reliable delivery and minimizes installation time in the customer data center.

With EveryScale, customers can focus their efforts on maximizing business value instead of consuming valuable resources to design, optimize, install, and support the infrastructure required to meet business demands.

Learn more by reading the Lenovo EveryScale product guide.

Front and rear views

The following figure shows the front of the CN5000 Switch:

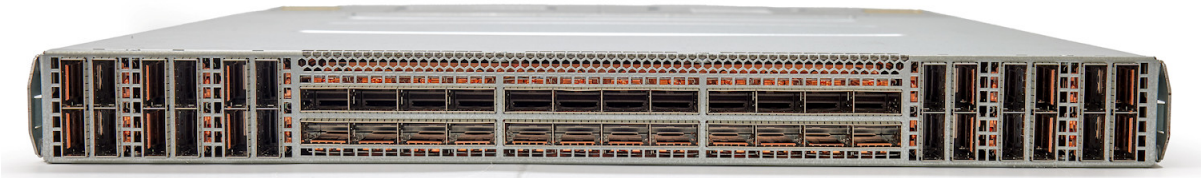

Figure 2. Cornelis CN5000 Switch front view

The following figure shows the rear of the CN5000 Switch with air cooling:

Figure 3. Cornelis CN5000 Switch rear view air-cooled

The following figure shows the rear of the CN5000 Switch with liquid cooling:

Figure 4. Cornelis CN5000 Switch rear view water-cooled

Features

The CN5000 Omni-Path Switch has the following key features:

- 48 ports of 400Gb connectivity
- 38.4Tb full duplex bandwidth
- Throughput greater than 800 million packets/second
- Less than 1µs MPI latency
- Supports more than 100K node clusters
- Optimization for message rate and latency
- Virtual lanes (VLs): Configurable from one to four VLs plus one management VL
- Low-Latency bit error recovery and optional correction
- Security: Secure key EEPROM, Secure Boot
- Hot swappable/replaceable fans & power supplies

Built for Scale and Efficiency

The CN5000 Switch delivers lossless, congestion-free networking at scale, supporting up to 500,000 endpoints through key architectural features: credit-based flow control, link-level retransmissions, fabric-level congestion management, and multipath routing without in-order delivery constraints. These innovations ensure low tail latency, eliminate packet loss, and drive higher compute utilization and lower TCO.

Optimized for AI and HPC Workloads

The CN5000 Switch delivers 400Gb of bandwidth per port and is purpose-built for AI training, inference,

and large-scale HPC performance demands. It provides ultra-low latency and congestion-free throughput, accelerating time-to-results for generative and agentic AI workloads. With exceptional efficiency and architectural robustness, CN5000 switches are the ideal fabric for parallelized compute environments and mission-critical HPC applications.

Reliability, Adaptability, and Efficiency

Consistent, reliable network performance is critical for AI and HPC applications. The CN5000 Switch enhances system-wide efficiency with advanced error correction and dynamic workload-aware traffic management, ensuring adaptability to changing communication patterns and sustained performance under load.

Advanced Telemetry for Intelligent Network Management

Equipped with cutting-edge telemetry capabilities, the CN5000 Switch provides real-time network insights and fine-grained visibility to optimize workload performance. By continuously analyzing traffic patterns, identifying congestion points, and dynamically adjusting network flows, it ensures smooth, high-efficiency operation, even in the most complex compute environments.

With industry-leading precision network intelligence, the CN5000 Switch enables greater control, efficiency, and performance across any scale. In contrast to RoCEv2 and legacy InfiniBand implementations, the CN5000 switch delivers lossless, congestion-free networking that scales with the demands of AI and HPC clusters.

Omni-Path Architecture

CN5000 Architecture delivers lossless and congestion-free data transmission with credit-based flow control and dynamic fine-grained adaptive routing. It is designed for maximum performance, reliability, scalability, and data integrity with dynamic lane scaling and optimized link protection. The CN5000 Switch requires the use of CN5000 SuperNIC adapters to fully enable its congestion-free, lossless operation at scale.

Air-cooled or Liquid-cooled Configurations

Available switch configurations:

- Air-cooled model with Port-side exhaust (PSE) fans - air flow travels from the power side to the port side of the switch
- Air-cooled model with Opposite-port-side exhaust (oPSE) fans - air flow travels from the port side to the power side of the switch
- Water-cooled model with 94% of heat removed using liquid cooling (PSE orientation for power supply fans)

Advanced Congestion Management

- Fine-Grained Adaptive Routing (FGAR)
- Static Dispersive Routing (SDR)
- Lossless, congestion-free networking through fabric-wide adaptive routing and incast-aware flow control

Management Features

- Integrated OpenBMC-based management
- Redfish protocol and data model/schema support
- In-band and out-of-band management options
- Command line interface through 10/100/1000 BASE-T Ethernet

Specifications

The following table shows the specifications of each switch. There are two variants for each switch:

- **PSE** (Port Side Exhaust): Airflow is Back-to-front - Air enters from power side and exits at port side
- **oPSE** (Opposite / reversed airflow): Airflow is Front-to-back - Air enters from port side and exits at power side

Table 2. Specifications

Feature	**CN5000 Switch**
Airflow	PSE (Fan-to-Port, F2P) oPSE (Port-to-Fan, P2F)
Typical use	AI training, AI inference, and High-Performance Computing (HPC) scale-out clusters.
Form factor	1U
Throughput (FD)	38.4 Tbps full-duplex aggregate bandwidth
Ports	48x QSFP112 Omni-Path ports, 400 Gbps each
Additional ports	1x 1GbE management (10/100/1000BASE-T) 1x USB-A serial port
Native speeds supported	400 Gbps and 200 Gbps operation
Breakout options	32 ports support subdivision into 2x 200 Gbps links, enabling up to 80 physical connections (64x 200 Gbps + 16x 400 Gbps).
Power supplies	2x hot-swap redundant AC power supplies with Anderson Saf-D-Grid 400 (SDG400) sockets
Fans	2x hot-swap fan trays, each with 6x fans (three pairs in tandem configuration)
Dimensions (H x W x D)	44mm x 438mm x 663mm (1.7" x 17.2" x 26.1")
Weight	Air cooled: 13.97 kg (30.8 lb) Water cooled: 15.79 kg (34.8 lb)

Networking cables

The following tables lists the supported cables.

In this section:

Cable length restrictions: The following cable length restrictions apply when configuring the CN5000 switch:

Table 3. Cable length restrictions for CN5000 switch

Connection	DAC Cables	ACC Cables	AOC Cables
Switch-to-SuperNIC	up to 2.5m	up to 5m	up to 100m
Switch-to-Switch	up to 1m	up to 4m	up to 100m

Use of the LLR (link-level retransmission) feature is subject to additional restrictions. Contact Cornelis for details.

Optical cables

Table 4. Optical cables

Part number	Feature	Description	Maximum supported		
			CN5000 Air PSE	CN5000 Air oPSE	CN5000 Water
Intel OPA 100 Active Optical QSFP28 Cables					
4X97A11034	B22J	5m Intel OPA 100 Series Active Optical QSFP28 Low Power Cable	48	48	48
4X97A11035	B22K	10m Intel OPA 100 Series Active Optical QSFP28 Low Power Cable	48	48	48
4X97A11036	B22L	15m Intel OPA 100 Series Active Optical QSFP28 Low Power Cable	48	48	48
4X97A11037	B22M	20m Intel OPA 100 Series Active Optical QSFP28 Low Power Cable	48	48	48
Cornelis CN5000 400G QSFP-QSFP AOC Active Cable-Straight					
4X97B11687	CDHF	Cornelis 5m CN5000 400G QSFP112 AOC Active Cable-Straight	48	48	48
4X97B11688	CDHE	Cornelis 10m CN5000 400G QSFP112 AOC Active Cable-Straight	48	48	48
4X97B09876	CBPR	Cornelis 20m CN5000 400G QSFP112 AOC Active Cable-Straight	48	48	48
4X97B11689	CDHD	Cornelis 30m CN5000 400G QSFP112 AOC Active Cable-Straight	48	48	48

Copper cables

Table 5. Copper cables

Part number	Feature	Description	Maximum supported		
			CN5000 Air PSE	CN5000 Air oPSE	CN5000 Water
Intel OPA 100 Passive Copper QSFP28 Cables					
00WE031	AU0E	0.5m Intel OPA 100 Series Passive Copper QSFP28 Cable	48	48	48
00WE039	AU0G	1m Intel OPA 100 Series Passive Copper QSFP28 Cable	48	48	48
00WE051	AU0K	2m Intel OPA 100 Series Passive Copper QSFP28 Cable	48	48	48
Cornelis CN5000 400G QSFP-QSFP DAC Passive Cable-Straight					
4X97B09871	CBPM	Cornelis 1m CN5000 400G QSFP112 DAC Passive Cable-Straight	48	48	48
4X97B09872	CBPN	Cornelis 1.5m CN5000 400G QSFP112 DAC Passive Cable-Straight	48	48	48
4X97B09873	CBPP	Cornelis 2m CN5000 400G QSFP112 DAC Passive Cable-Straight	48	48	48
4X97B12425	CDQW	Cornelis 3m CN5000 400G QSFP112 DAC Passive Cable-Straight	18	18	18
Cornelis CN5000 400G QSFP112 to 2x 200G QSFP56 Passive Copper Splitter Cable					
4X97B11690	CDHC	Cornelis 1m CN5000 400G QSFP112 - 2x200G QSFP56 DAC Passive Cable-Split	32	32	32
4X97B11691	CDHB	Cornelis 1.5m CN5000 400G QSFP- 2x200G QSFP56 DAC Passive Cable-Split	32	32	32
4X97B11692	CDHA	Cornelis 2m CN5000 400G QSFP- 2x200G QSFP56 DAC Passive Cable-Split	32	32	32
Cornelis CN5000 400G QSFP112 to 2x 200G QSFP56 Active Copper Splitter Cable					
4X97B11937	CDHH	Cornelis 3m CN5000 400G QSFP- 2x200G QSFP56 ACC Active Cable-Split	32	32	32
4X97B11938	CDHG	Cornelis 5m CN5000 400G QSFP- 2x200G QSFP56 ACC Active Cable-Split	32	32	32

RJ45 cables

Table 6. RJ45 Cables

Part number	Feature	Description	Maximum supported		
			CN5000 Air PSE	CN5000 Air oPSE	CN5000 Water
CAT6 Green cables					
00WE123	AVFW	0.75m Green Cat6 Cable	1	1	1
00WE127	AVFX	1.0m Green Cat6 Cable	1	1	1
00WE131	AVFY	1.25m Green Cat6 Cable	1	1	1
00WE135	AVFZ	1.5m Green Cat6 Cable	1	1	1
00WE139	AVG0	3m Green Cat6 Cable	1	1	1
90Y3718	A1MT	10m Green Cat6 Cable	1	1	1
CAT6 Blue cables					
90Y3721	A1MU	10m Blue Cat6 Cable	1	1	1
90Y3730	A1MX	25m Blue Cat6 Cable	1	1	1
CAT6 Yellow cables					
90Y3715	A1MS	10m Yellow Cat6 Cable	1	1	1
90Y3724	A1MV	25m Yellow Cat6 Cable	1	1	1
CAT5e Blue Cables					
40K5679	3801	e1350 .6 Meter Blue Ethernet Cable	1	1	1
40K8785	3802	1.5 Meter Blue Ethernet Cable	1	1	1
40K5581	3803	3m Blue Cat5e Cableupdate	1	1	1
40K8927	3804	e1350 10 Meter Blue Ethernet Cable	1	1	1
40K8930	3805	25m Blue Cat5e Cable	1	1	1
CAT5e Green Cables					
40K5643	3797	e1350 1.5 Meter Green Ethernet Cable	1	1	1
40K5793	3798	e1350 3 Meter Green Ethernet Cable	1	1	1
40K5794	3799	10m Green Cat5e Cable	1	1	1
40K8869	3800	25m Green Cat5e Cable	1	1	1
CAT5e Yellow Cables					
40K8933	3791	e1350 .6 Meter Yellow Ethernet Cable	1	1	1
40K8951	3792	e1350 1.5 Meter Yellow Ethernet Cable	1	1	1
40K8801	3794	10 Meter Yellow Ethernet Cable	1	1	1
40K8807	3795	25m Yellow Cat5e Cable	1	1	1

Rack mount kit

The Cornelis CN5000 OPA switches include a rack mount kit (rail kit). The rails support an adjustable depth from 26 inches to 32 inches.

Power cables

The Cornelis switches come standard with two 2m power cables (feature CJTM, as listed in the table below). Additional power cables can be ordered if needed.

Table 7. Power cables

Part number	Feature	Description	Maximum supported		
			CN5000 Air PSE	CN5000 Air oPSE	CN5000 Water
None	CCQF	0.5m, 10A/100-250V, Anderson SDG400 to C14 Rack Power Cable	2	2	2
None	CCQG	1.5m, 10A/100-250V, Anderson SDG400 to C14 Rack Power Cable	2	2	2
None	CJTM	Included - 2m C14 IEC 60320 to Saf-D-Grid 400 Rack Power Cable	2*	2*	2*
None	CCQH	2.8m, 10A/100-250V, Anderson SDG400 to C14 Rack Power Cable	2	2	2

* Two 2m power cables are included with the switches

Operating environment

The switches have the following operating characteristics:

- Normal operating temperature range:
  - 10 to 35°C (up to 900 m above sea level)
  - Temperature is derated 1°C per 175 m above 900 m)
- Storage temperature range: -40 to 70 °C
- Normal operating humidity: 5% to 85%, non-condensing
- Non-operating humidity: 5% to 95%, non-condensing
- Altitude:
  - Operating: 0 to 3,000 m
  - Storage: 0 to 12,000 m
- Acoustics (noise) - Air-cooled switch: 72.50 dB @ 25 °C

Water requirements (liquid-cooled switch):

- Up to 94% heat capture to liquid depending on cable configuration
  - ASIC, QSFP, and voltage regulators are liquid-cooled
- Quick disconnect couplings: no-drip/no-spill Staubli SCG06 with color indicators for flow
- Leak detection is indirect: Relies on the rack-level Coolant Distribution Unit (CDU) to monitor flow parameters (flow rate, pressure, temperature, etc.) to indicate a potential risk of a leak and to alert the user
- Liquid types supported:
  - Deionized (DI) Water with additives
  - Propylene Glycol mixture, 25% maximum (PG25)
  - Ethylene Glycol mixture, 25% maximum (EG25)
- Flow rate: 1.5 to 3.0 LPM
- Max Inlet Temperature: 45 °C (113 °F)

- Temperature rise (ΔT): 3.0 - 5.0°C
- Maximum system pressure guidance: 3 bar at the system connection

Related publications and links

For more information, see these resources:

- Lenovo EveryScale product guide
  https://lenovopress.lenovo.com/lp0900-lenovo-everyscale-lesi
- Cornelis CN5000 product web page and product brief
  https://www.cornelis.com/product/cornelis-cn5000-omni-path-switch
- Cornelis CN5000 Switch User Manual
  http://docs.cornelis.com/en/cn5000-product-family-descriptions/fabric-hardware-components/cn5000-switch.html

Related product families

Product families related to this document are the following:

- Omni-Path Switches

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This document, LP2461, was created or updated on July 10, 2026.

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